



Great Barrier Island
ENVIRONMENTAL TRUST
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ENVIRONMENTAL NEWS



Gannets of the Hauraki Gulf
Pest-free Ahuahu Great Mercury
Spectacular kohekohe | Marine protection
Beyond Barrier



Editorial

EMMA J. WATERHOUSE

In early December, I took part in an island-wide bird count, largely carried out by volunteers, and supported by Auckland Council and the Department of Conservation. Our counting team had an early start, walking over an hour up the Forest Road from the Whangaparapara side to reach our first counting station by 7am. Then we counted birds, more than we'd expected, along a 200 m transect.

There were kākā, tui, and riroriro (grey warbler) by the dozen, and the highlight, a long-tailed cuckoo (koekoeā) seen flying overhead. A few kererū and piwakawaka.

The idea for the Aotearoa Bird Count (ABC) evolved from within the community, and was successful in engaging many on the island. Auckland Council staff coordinated the training and information provided to the volunteer counters. Those with experience doing five-minute counts were teamed up with 'beginners'. In all, teams of two to three people established 80 permanent count stations along 16 transect lines in different habitats across the island. Quite an effort and a great example of how data can be gathered effectively, using a recognised method, driven by a community wanting to know about the state of the bird populations on the island.

The results from the count are currently being analysed and will be compiled into detailed and summary reports. Not surprisingly, tui

were the most frequently observed species, followed by kākā. And marked differences were observed between bird diversity (and species) between some of the transects. We will incorporate the results of the ABC, including some comparisons with previous bird counts/surveys on the island, in the forthcoming *Aotearoa: State of our Birds Report* that the Trust is preparing.

The report comes 10 years after the first *State of the Environment Report* for Aotearoa was prepared and published. The new report aims to provide a level of detail about Aotearoa's birds that is not currently available through existing national or regional reporting processes. *State of our Birds* will update information on this very visible aspect of Aotearoa's biodiversity, pulling together data from disparate sources into a single resource. A key objective for this project is making sure the findings of the report and its data are accessible, interesting and meaningful to readers (and helps inform decision-making).

Yes, birds do get a lot of air time and attention in New Zealand conservation. People (and funders) like birds, our other native animals tend to be less appealing (lizards, fish, snails, insects...), and Aotearoa missed out on furry mammals. But speak to any ecologist and they will tell you that a focus on single species (bird) conservation misses the point. Namely, that for an ecosystem to function properly, it needs fundamental processes to be working

Cover: Takāpu (Australasian gannet) at the colony on Mahuki Island, off the northeast coast of Aotearoa Great Barrier. (Photo: N. Adams). Back page: Islets off Aotearoa Great Barrier's coast. Over 50 small motu and islets are located around the main island. Many have never been properly surveyed. We gratefully acknowledge the support of Chris Morton (co-author of the recent book, Aotearoa Great Barrier), for the use of his image on this issue's back page.



as they should. For example, healthy regeneration in a forest, with understorey, effective pollinators and seed dispersers; and cycling of nutrients through this system, in the way seabirds have done on Aotea Great Barrier in the past.

The magnitude of loss, of habitat, species and ecosystem function in both terrestrial and marine environments in New Zealand (including on Aotea Great Barrier) is staggering and ongoing. The latest state of the environment report for New Zealand *Environment Aotearoa* clearly documented this ongoing decline. We're losing species and ecosystems faster than nearly any other country and about 1,000 of our known animal, plant, and fungi species are threatened. Many populations have disappeared from areas where they were once found.

But species losses are often the result of loss of natural ecosystem function and habitats. A once continuous range of ecosystems has turned into a patchwork of isolated fragments. We see this on Aotea too, farmland, manuka scrub where farmland once was, weed-infested waterways, terrestrial and aquatic links lost between mountains and the sea.

The problem is that we don't really 'see' ongoing declines, accepting the current 'state' as something that has not changed, not recently anyway. Accepting that, what we have is enough, good even. But take the time to speak to someone who lived on, or visited, or heard a story from Aotea Great Barrier 50, 60, or even 100 years ago and they will tell you about what was here then. And then you start to understand the ongoing nature of the loss.

I saw a flock of six kererū in our tī kōuka (cabbage trees) a couple of days ago. I thought that was pretty amazing until I spoke to our neighbour who said flocks of 30 were seen a few years ago, but not now (records tell us that kereru flocks of 100 or more were a common sight in New Zealand). Yesterday, I heard a story about a boy in the 1920s walking along Kaitoke and Medlands beaches wearing a raincoat, for the 'rain' of birds, not clouds, everyday, on his way to school.

While I'm not too keen on 'bird rain', I would love to see this island's ecosystems supporting flocks of 50 kereru one day soon.

Noho ora mai



Photo: E. Waterhouse

Tui on flax, a common sight across Aotea Great Barrier, and the most common bird recorded in the recent Aotea Bird Count. The organisers hope that the count will become an annual community event, with participation from across agencies, residents and visitors. The full report on the ABC results will be available in March 2020, with a summary document also planned.



Takāpu (Australasian gannet) in the Hauraki Gulf

Nigel Adams (School of Environmental and Animal Sciences, Unitec)

The coastal waters of the northern parts of New Zealand are the hunting ground for one of our most visible seabird predators of this ecosystem: the Takāpu or Australasian gannet (Morus serrator). After a short winter wandering more widely from their colonies, birds return to nest and breed.

The Hauraki Gulf, between the Mokohinau Islands to the north and the bottom of the Firth of Thames to the south, has a particularly high concentration of colonies. Every day during the summer, flotillas of gannets take off from their colonies in search of food. They spread out across the gulf, dramatically falling out of the sky to dive-bomb their prey.

Current populations



Photo: E. Waterhouse

Takāpu undertake characteristic dives into the sea to hunt their prey.

With a stable or perhaps increasing total population, the species is not threatened. Accordingly, our work seeks to understand key feeding interactions between seabird predators and their prey to inform ecosystem-based management decisions.

The proximity of the Hauraki Gulf to New Zealand's biggest urban area, exacerbated by its partly confined nature, means this area faces severe challenges to its ecological functioning. The nature of these challenges is likely to be different between the inner and outer gulf and may account for differences in gannet population trends.

Counts of occupied nests at Mahuki Island, just off the coast of Aotea [Great Barrier], have increased substantially between 1980 and November 2017, when around 6,000 nests were counted. At the colony on Horuhoru Rock (off the northeast corner of Waiheke Island), occupied nests have decreased from 2,000 to about 1,000 over the same period¹.

Comparing two colonies in the Hauraki Gulf

The ability to find food is critical to meet the needs of an energy intensive lifestyle and feed chicks. Over the last four summers, we have been studying the diet and feeding biology of gannets at Mahuki Island and Horuhoru Rock, some 55 km south of Mahuki (Figure 1).

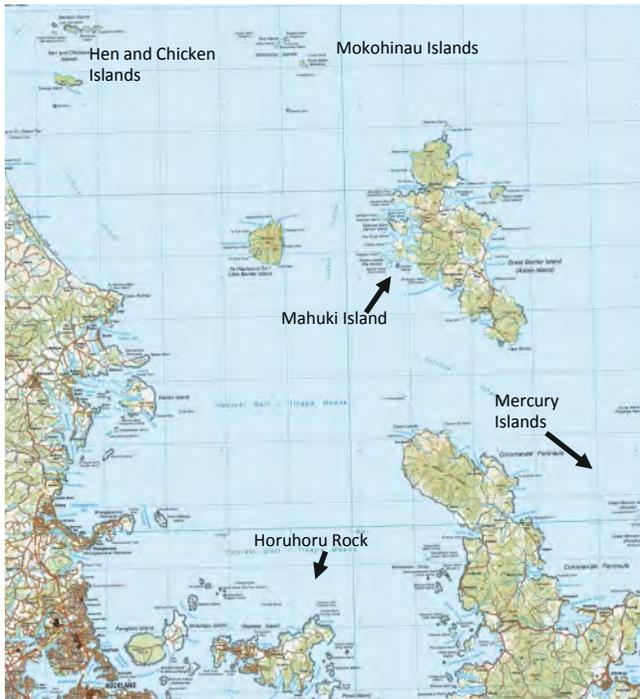
Our methods have included collecting and analysing regurgitation and faecal samples from gannets arriving at colonies after feeding at sea to determine prey type. We were able to recover highly digested food from stomachs of fish and squid ingested by gannets.

Prey differences between colonies and years

Gannets consume a range of surface shoaling fish and squid. The most consistent signal in the diet samples across all years and between colonies has been the persistence of Jack mackerel and anchovy. Other important species taken in the gulf include arrow squid, pilchard, saury, redbait and blue mackerel. The proportion of one species to the other varies between years, and the inner and outer gulf colonies reflecting variation in availability of potential prey species among years and between breeding sites.

In 2017, squid was particularly important for Mahuki birds followed by anchovy at Mahuki and pilchard at Horuhoru. In 2018, a reduction in squid was seen, replaced by Jack mackerel, redbait and saury at Mahuki and pilchard and anchovy at Horuhoru Rock. Jack mackerel was a frequently encountered prey species during 2019 at both colonies. The occurrence of species such as saury, flying fish and redbait in the diet of Mahuki birds is consistent with these birds being closer to more oceanic waters, with their associated fish species, than birds breeding at Horuhoru.





avoided mostly the shallower waters of the Firth of Thames. Our more extensive data set from December 2019 similarly indicated that birds from each colony avoided the waters immediately around their neighbouring colony, although some overlap was seen particularly between Cape Rodney and the Whangaparaoa Peninsula—an activity ‘hotspot’. Other hot spots included the coast of the northwestern Coromandel Peninsula (Horuhoru and Mahuki birds) and off the northern end of Aotea|Great Barrier (Mahuki birds).

While birds usually forage within 50 km or so of their breeding colony, birds do occasionally show more extended foraging trips. Birds from both colonies ventured into the Bay of Plenty.

Although the mechanism by which such separation of foraging areas is maintained is not well understood, it will have the effect of birds from one colony not foraging in areas potentially depleted of food by birds from the neighbouring colony. One implication of this pattern of Hauraki Gulf use is that Horuhoru gannets are sampling the inner gulf and aspects of their biology will be reflective of conditions there; and the Mahuki gannets of conditions in the outer gulf.

Future work on gannets could consider whether the location of these hotspots changes and how the foraging area of gannets from other colonies fits the patterns described here. Combined with data from other species, a picture is emerging of how the greater Hauraki Gulf is being utilised by its array of seabirds.

Notes:

Work described in this article was supported with funding from G.I.F.T. (Foundation North) to the Northern New Zealand Seabird Trust, Unitec and Birds New Zealand. The privilege of working at these sites was accorded by Ngāti Rehua and Ngāti Manuhiri.

¹Gaskin, C; Frost, P. & Friesen, M. 2019. Indirect effects on seabirds in northern North Island. POP2017-06.

Gannets from the colony off Waiheke Island were found to forage mostly in the inner gulf, while birds from Mahuki Island off Aotea foraged from the Hen and Chickens down to the Mercury Islands.

Where do Aotea and Waiheke gannets forage?

To understand where breeding gannets forage, we have been deploying GPS units attached to the birds’ tails at the time they make regular trips to sea to collect food for chicks. A preliminary study was conducted in January 2019, when 21 birds were tagged, followed by a more intensive study in December 2019, when 50 birds were tagged.

Gannets foraging trips are in the order of 20 to 30 hours long, with the birds capable of flights speeds of 50 to 60 km/h, placing the Mahuki colony and Horuhoru Rock colony within an hour’s flight of each other—and potential for a large degree of overlap in foraging area. Overlap was not however observed and likely explains some of the differences in the diets of these two populations. The January 2019 data indicated most Mahuki birds concentrated foraging trips along an axis running from the Hen and Chicken islands to the Mercury Islands off the western Coromandel. Horuhoru birds were restricted mainly to the inner Gulf but



The restoration of Ahuahu-Great Mercury Island

KATE WATERHOUSE with Peter Corson

Last November, five years on from the removal of the last rat from the last island in the Mercury group, Peter Corson shared his experiences in an interview with Kate Waterhouse.

Pete Corson is a modest man. He's not saying it in so many words, but he's enormously proud of the results they're seeing on Great Mercury five years down the track. Three species of seabirds, kākāriki out of nowhere, kākā, kererū, pāteke, regeneration of kohekohe and puriri through a pine forest that will never be cut. The results of the five-year post-eradication monitoring are due in 2020 but it's looking very good indeed.

A passion for the Mercury Islands

Pete has been a member of the Department of Conservation's Island Eradication Advisory Group and has worked for the department in Taranaki, Tauranga/Waikato, Rotorua, then nationally in Species and Ecosystem Optimisation – finding the best mix of spending, resource use and representation across the country. It was in 1994 that his passion developed for the Mercury Islands,



working on projects to unearth the biodiversity treasures they held, like the tusked wētā (*Motuweta isolata*) and Whitaker's skink (*Oligosoma whitakeri*) - see box opposite.

Pete knew the islands were really important and met one of Great Mercury's owners, Michael Fay, doing earlier work, but it wasn't until 2009 that the process began. A feasibility study said eradication was possible - only three mammalian pests (ship rats, kiore, and feral cats) and no hedgehogs, stoats, rabbits, or wild pigs. In 2010, ecological surveys were completed and in 2012 Pete started full-time as Project Manager.

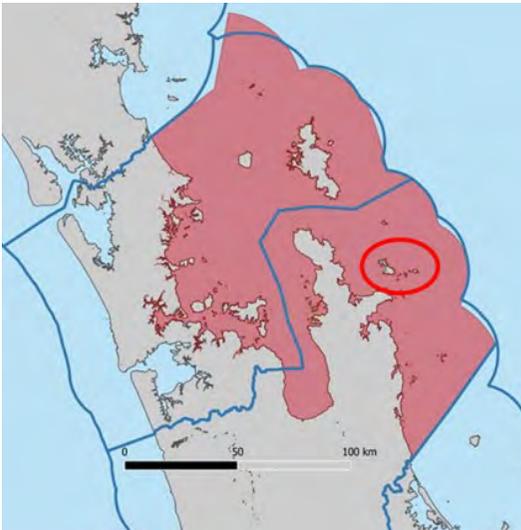
Together with the owners, iwi and community members, a team led by the Department of Conservation successfully eradicated ship rats, kiore and feral cats from Ahuahu Great

Mercury during the winter and spring of 2014. The department declared it successful in May 2016, completing the last piece of the puzzle – the whole Mercury Group was pest-free once more. But, Pete says, it was the right conversations that led to the right outcome.

About Ahuahu Great Mercury

The island is located in the Mercury group off the eastern Coromandel coast, within the Hauraki Gulf Marine Park (Figure 1). Only Great Mercury is inhabited today—owned by businessmen Michael Fay and David Richwhite and open to the public.

Figure 1: The Mercury group is located in the Hauraki Gulf Marine Park (pink shaded area), about 65 km from Aotea Great Barrier.



The Mercury Islands - a conservation treasure

The Mercury Islands consist of seven islands, Great Mercury Island Ahuahu, Red Mercury Island Whakau, and five smaller islands - Korapuki Green Island, Atiu Middle Island, KawhITU Stanley Island and Moturehu Double Island. They are conservation treasures, partly because two, Green and Middle islands, have never had mammalian pests or predators. Small, at just 3 ha and 13 ha respectively, they have provided a window into the pre-human ecology of New Zealand.

Threatened species

Many species found on the Mercury Islands are threatened or 'conservation dependant' including Whitaker's skink, robust skink, Pacific gecko and Duvaucel's gecko, and tieke (saddleback). A high diversity of invertebrates is present— a common feature of rat-free islands. Fifty species of land snail are found in the group. Middle island has 10 species of lizards plus tuatara.

Moturehu Double Island and Whakau Red Mercury are home to the critically endangered Mercury Islands tusked wētā. Discovered in 1970 by Tony Whitaker, and only known on one island, in 1989 the population was down to just two males and one female. Captive breeding and subsequent translocations mean that there are wētā on five islands, including four of the Mercury group.

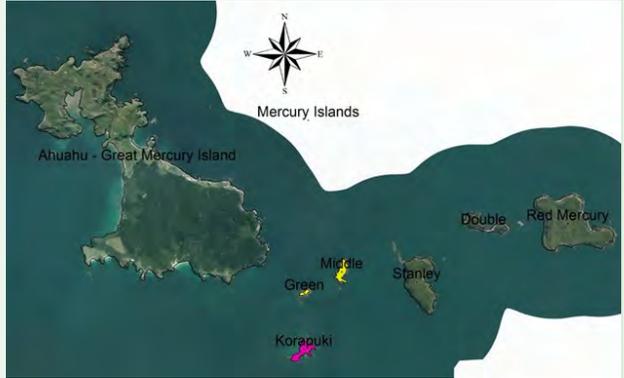


Photo: R Chappell

Mercury Island tusked wētā was once on the brink of extinction - to two females and one male.

Pioneering pest eradications

Pest eradication work in 1986/1987 saw kiore (*Rattus exulans*) removed from 18 ha Korapuki Green Island. At the time, it was the largest New Zealand island to have rats removed. By the early 1990s, three other islands also had pests removed - Double Island at 31 ha in 1989, Stanley Island (99 ha) in 1991 and Red Mercury Island (225 ha) in 1992. These six pest-free islands have since been managed by the Department of Conservation on behalf of the Crown as Nature Reserves - the most highly protected reserves under New Zealand legislation, with access by permit only.



The smaller islands in the group are identified as an Important Bird Area (IBA) by BirdLife International, as they provide nesting sites for up to 10,000 breeding pairs of Pycroft's petrel (*Pterodroma pycrofti*). Petrel burrows bring nutrients deep into the island's soils and provide a labyrinth of habitat for other creatures.



Photo: NZ Birds Online/M Dahling

Pycroft's petrel - the largest breeding colony on Red Mercury Island has an estimated 75% of the global breeding population.



A volcanic past

Great Mercury Island is what remains of an andesite volcano in the north and a Pliocene rhyolitic volcano in the south, connected by an isthmus of sand, called a tombolo. As recently as 8,000 years ago the islands in the archipelago were all still connected. By 6,000 years ago, the islands had approximately their current coastline.

Human occupation

Ngati Hei are the mana whenua for Ahuahu with a 100-year unbroken relationship with the three subsequent owners of the island. Other iwi have interest in the Mercury Islands group due to the islands' historic significance for Māori, including Ngati Whanaunga, Ngati Porou ki Hauraki, Ngati Maru, Ngati Tama Te Ra, and the Hauraki Collective. Oral history tells that Ahuahu was the first landing point for Polynesian ocean-going waka in Aotearoa. The island has the highest density of intact archaeological sites in New Zealand.



Photo: J Mendonca

Culturally significant to Māori, the 180-m-high cliffs of Pari-Nui-Te Ra on Ahuahu are known as 'The Beacon' and clearly visible from Aotea Great Barrier, as they would have been to anyone arriving by sea.

Habitat restoration

Great Mercury is 1,872 ha – half the size of Te Paparahi, or about six times the size of Rakitu. Corson estimates 600 ha is in farmland, 675 ha in pine forest, and 600 ha is native ecosystems in various states of recovery. The owners had been undertaking restoration initiatives including goat eradication in 1981 and the planting of more than 600,000 native trees.

Many different habitats with surprisingly good ecological values were found during a survey undertaken in 2010, despite a history of

burning. A pine forest was planted after a fire in 1981 that burned 675 ha of bush. Even the pine forest had good levels of native vegetation in the understorey and the island was found to be large enough for self-sustaining populations of many species. But there were almost no birds. After 700 years of kiore and at least 100 years of ship rats, they simply couldn't withstand the plague proportions that by now prevailed on Great Mercury. Pete takes up the story.

Can you describe why ship rats, kiore and feral cats were eradicated from Great Mercury?

Two reasons, plagues of rats and human reasons. We knew we were losing things, and that we would gain things in the absence of cats and rats. Like the kākā that were trying to nest, we were finding raided kaka nests or skeletons of seabirds eaten by cats and rats.

But the human reasons were things like not having rats coming into bedrooms at night. Michael Fay said it was war when the rats chewed the collars of his dinner jackets, after they had chewed the generator cables, after the farm manager's wife was almost electrocuted because a rat chewed the electrical cable behind the shower - which also started a fire. Rats were coming out to people's boats at night. Some diseases are carried by rats – Leptospirosis, Yersinia is like the plague; and food and gardens were affected. There was the cost of people having to deal with rat invasions in the 45% unoccupied houses – there was huge potential for damage.

With six high-value conservation islands just to the south, rat-infested Ahuahu Great Mercury presented a huge risk and a certain beneficiary, from source populations of endangered species, right next door. It was also an island people could land - and they did.

While just 18 people live permanently on the island, there are many frequent visitors. Ahuahu Great Mercury is a focal point for the boating community, with thousands visiting each year, including hundreds every summer weekend from Coromandel towns as well as large cruising vessels from elsewhere. Many spend time on the island - some regular, some not, and some semi-permanent. At least 400 people are to be found in the main anchorages at New Year.



Making it happen: the human factor

The owners approached the Department of Conservation. They had had enough of the rats. After 700 years it was time to give the wildlife a chance to fight back. Pete continues: *We started in 2010, talking about the values and threats and what was needed. There were no expectations but we tried to understand what we had, what was there that was of value. Collectively, what did we think - DOC technical people and owners. But we hadn't had to manage people before, more the species and vegetation.*

"You can't do conservation without people. Conservation is a value set."

He highlights how important it is that iwi feel they have had a say and can protect their interests. We always recognised these interests and gave them information. We always said: "Come and talk to us - we can have a joint conversation about this". There was also a requirement under the Hauraki Gulf Marine Park Act to work collectively.

Engaging stakeholders

The project had a database of more than 100 stakeholders, including the Department of Conservation, owners, residents, the Whitianga/Mercury Bay community and businesses. Whitianga's school connected often to the island and projects looked at "wicked" (complex) problems - involving iwi, the department and Ministry for the Environment, on issues such as ecology, heritage, and coastal erosion. Champions were identified - cray fishers, long liners, builders, the Commodore of the boating club and more.



Engaging boaties was an important part of the project.

Photo: P Carson

The team had conversations with those who spent a lot of time at on the island. Before the feasibility study, they visited people to gauge thoughts and opinions, always asking who, how and why should we engage?

What were people's requirements and expectations? Examples of issues discussed included: *If you catch kiore can they go to the museum so we don't lose that genetic information?; Can you tell us about the impact on ruru?; and, I want to close off the water tanks in my houseboat during the operation.*



Photo: R. Chappell

Ahuahu Great Mercury, at 1,872ha in area is about half the size of Te Paparahi in Aotea Great Barrier's north.

There was discussion about the rodent toxin being used and information about broadifacoum was provided. *Pete recalls: Someone said that the shellfish at Kaikoura had brodifacoum in them - I said well yes they had 16 tonnes go into the sea in one spot (from a truck crash) - we are going to have 8 kg per hectare and 1 kg per hectare in the marine environment, most of which will float to shore and break up rapidly. We showed them some videos of process and the GPS flight lines showing the boundaries - and we put a Go-pro on a bucket to show what happens and gave them still images.*

During the cull of pūkeko ahead of the operation (a risk as they take baits) - Hauraki Collective took feathers for cloak making. There were karakia for the entire operation well before the drops - protocol. Assets of fishers and fishing areas were allowed for, and cray fishers pulled back from the shore prior to the operation.

Support from other agencies was also there, including the Harbour Master and Coast Guard who played information every weather forecast. Key messages were consistent: Great Mercury and other islands are pest free: Please check your boats and gear for pests.



Making it happen: the project details

By end of 2012, outcomes were settled and a feasibility study completed. Fay and Richwhite stumped up \$750,000, matching the Department of Conservation's contribution. The objectives of the project, which began in 2014, were to reduce the threat of incursions to other pest-free islands in the group from Ahuahu Great Mercury, assist ecosystems to function, revive species populations and showcase conservation.

Pete again: *We looked at a small governance group to work through a project plan to achieve the objectives. This comprised DOC, an owner, and an eradication expert. We kept it very small to make sure it made decisions. We said we want this to be open access and a showcase for conservation. We had dedicated time and resourcing to develop and plan the (communication) work. Of the project management hours about 3,000 (60%) were about dealing with people or issues people had. So after a while we brought in an extra role 12 months ahead of the eradication to do the technical planning work.*

Rodent baiting was done using helicopters due to the rugged terrain and size of the island, with hand baiting around sensitive and difficult areas. Baiting was followed up with cat control. A conservation dog and handler took five months to find the last three cats.

On 13 May 2016, the Department of Conservation announced that Ahuahu Great Mercury was free of mammalian pests.

Pete believes having a consistent face to deal

with over the eight to nine years of the project was really important to people. *Someone to have a conversation with. Conservation, he says, is all about having cups of tea.*



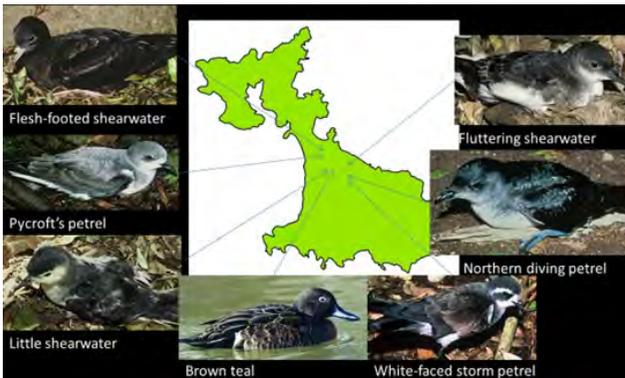
Photo: P. Corson

Petrel burrows 'engineer' the forest floor and add nutrients to the soil.

After five years, what have the results been?

Pete is excited: *We've found 60 pāteke when we didn't see any between 2010 and 2016. (Australasian) bittern are turning up, and the New Zealand dotterel population hit 58. The 675 ha of pine forest now will not be logged ever, it's a nursery forest. This has never been done before on this scale. There's great understory of pūriri and kohekohe. We are repeating the forest bird survey soon ... kākā are going ballistic. There were one or two records of kakariki before the eradication - now they are heard multiple times every day. Kererū are more apparent now, so we now have seed dispensers, seed rain and carpets of seedlings.*

In the Mercury group, natural seabird recolonisation potential was high¹. Six species of seabird are believed to have recolonised naturally (Figure 2), including grey-faced petrel (*Pterodroma macoptera*), fluttering shearwater (*Puffinus gavia*) and diving petrel (*Pelecanoides urinatrix*), which usually reappear quickly after eradication of rats, and three more exciting arrivals – flesh-footed shearwaters, Pycroft's petrel and little shearwater. Suppression of seabirds and other species by rats has had an as yet unquantifiable knock on effect on soil health, lizards, insects, snails and vegetation. 10



Six species of seabird are suspected to have self (re)-introduced naturally Ahuahu Mercury Island. Source: P Corson



What else have you seen change?

Pete: *Socially, the boat ramp surveys show 95% of people are aware that the islands are pest free, up from 50%. Before the eradication, 20 or more islands were pest-free but people hadn't known, so there are benefits for all the islands not just Great Mercury... there's a halo of boats going from Great Mercury to Aotea and on to the Poor Knights. We've had only one incursion, a ship rat which was immediately detected in the surveillance network.*

Pete explains that the islands are being managed as an archipelago—ecologically, for biosecurity, weeds, fire risk, Argentine ants, restoration planning and translocations – across ownership, working in partnership. Incursion response is critical and volunteer response is a benefit of high levels of community ownership.

What did you learn on Great Mercury that would help other inhabited islands go pest-free?

- Ask: What are the values? Use this as the basis for everything you do.
- Ask: What do we want to protect and why? What are the threats? How can they be addressed?
- Ask: What tools do we need to meet the objectives? Use all the technical advice and experience available
- Work in cycles - do the work, assess the outcomes, reassess tools and/or outcomes.
- Resource the people side of the work to develop and plan properly – involve people, share information, have the conversations.

What advice would you give on how to protect and restore Aotea?

Start with the conversations - before any feasibility study, visit people to gauge thoughts and opinions. Start with why we are starting to think about this, and the 'why' comes from values. Acknowledge the values of the place (Aotea). It's 27,000 ha, has potential for conservation recovery, is a large, globally significant biodiversity site. You've got Chevron skink, endemic kanuka forest, kauri forest, it's a merging point for northern and southern species. There are ecosystems and species to warrant scientific and government interest and investment.



Ahuahu Great Mercury's eastern coastline.

Pete suggests that on top of these conservation values come iwi and social values. Connecting with nature, community efforts and marine ecosystems will yield additional values. Start with no expectations, understand what you have, what is of value? And stop any new pests arriving.

If you decide, "Let's do something", ask, what should we do? Who, and how and why should we involve different groups? Be clear about that. What would the objectives be? For example, celebrate the possum and stoat-free status, let's not allow any more pests here, let's do some island eradications. Rule 1 here is: Tools that are acceptable to the community.

And you need a clear story. With Rakitu, DOC didn't create a clear enough story, so what is it? On the Orkneys and Lord Howe Island ecologists fronted (the story) but were seen as pushing their own barrow, be aware of that. You need to be really open in the early phases, setting values in the group that are common, the things (you) agree on. For example: Don't let more pests get to the island. What is the 100 year view? With iwi, DOC, landowners, what might the outcomes be? You need a collective understanding of the vision for the place. How will we observe that? What will we see?

Inspired now by the Ahuahu Great Mercury story, I wonder about this. Do people want to see functioning ecosystems on Aotea, without rats and cats, and with healthy abundant native species? Just as they are starting to see on Ahuahu Great Mercury now, five years on. Cuppa anyone?

Notes and sources:

¹Towns, D.R., Borrelle, S.B., Thoresen, J., Buxton, R.T., & Annette Evans, A. 2016. Mercury Islands and their role in understanding seabird island restoration. NZ Journal of Ecology, January 2016.

Presentation to Gulf Islands Trusts Forum, Peter Corson, October 2019.

New Zealand Geographic Issue 137: Treasure Island <https://www.nzgeo.com/stories/treasure-island/>

Forgotten kohekohe - a most spectacular tree

EMMA J. WATERHOUSE *with June Brooks*

In 1915, the member of Parliament for Otaki, a Mr W. H. Field, described kohekohe (*Dysoxylum spectabile*) as "...a very beautiful tree and easily our most valuable native tree."¹ He was speaking in the parliamentary debate on the Scenery Protection Amendment Bill and went on to pronounce not only its value as a scenic and forest tree but also for its use in carpentry and furniture-making.

In the same debate, Mr Field, also noted that seeds of the tree had been sent to India and elsewhere "...for the purpose of planting in places where it is thought that it will grow quickly enough to be of value for timber in the course of a comparatively few years."

New Zealand mahogany

The only New Zealand representative of a mainly tropical/subtropical plant family, the endemic kohekohe is also known as the New Zealand mahogany. A clue perhaps to the value kohekohe was initially thought to have as a timber tree. It wasn't long before the bold statements of Mr Field were proved wrong. Large trees are rare (kohekohe becomes hollow as it grows) and its timber potential was never fully exploited.



Photo: Chris Morten

Kohekohe is often found associated with nikau in forest gullies and lower slopes.

Māori used kohekohe for constructing river canoes, for which it was highly regarded. The lack of large trees and its rapid decay in water, meant the wood was not used for many other purposes².

Medicinally, the leaves and bark of kohekohe were used by Maori for a variety of complaints, as a tonic or infusion, to treat coughs and stomach ailments, skin problems and for fever³. The leaves were described as being very bitter.

A most spectacular tree

Described as one of New Zealand's most spectacular trees⁴, kohekohe grows to about 15 m in height and is found naturally in the north to central North Island and in Marlborough.



Watercolour by Fanny Osbourne

Fanny Osbourne painted numerous plant species Aotea Great Barrier, including kohekohe. The distinctive pods each contain three to four seeds encapsulated in an orange covering.

They prefer dampish, fertile, shaded coastal lowland sites, where puriri and taraire are often also found, and do not tolerate frost.

Kohekohe has large, glossy compound green leaves which gives it a tropical appearance. Fruit are produced from the previous years' flowering (fruiting and flowering do not occur in the same year) and three to four-celled fruit capsules open about 15 months after flowering.

Kohekohe flowers are an important and favoured source of nectar for many of New Zealand's bush birds including tūī (*Prosthemadera novaeseelandiae*) and bellbird (*Anthornis melanura*).



Try growing kohekohe

by June Brooks

Kohekohe (*Dysoxylum spectabile*) is a handsome forest tree that deserves to be more appreciated and widely used in revegetation programmes.

Flowers and seeds

The tree produces flowers in late autumn to early winter, and capsules (fruit) from the previous years' open from mid-autumn, providing welcome early-winter food sources for birds and bats.

Fruits are produced in green ovoid pods and the three to four brown to black seeds inside the pods are covered in a fleshy orange outer covering. The seed has a high viability and does not have a dormant period. Seeds collected from pods in mid-May can be propagated in seed trays immediately and the first seedling leaves appear two to three weeks later.

Propagating kohekohe

We asked Alan Phelps for advice on propagation and he advised that rats love eating kohekohe fruit to the point that none will survive to germinate if left unprotected while maturing on the tree. He advised protecting fruiting trees with rat traps and bait stations until we were ready to collect the pods/ fruits to propagate.



Photo: J. Ogden

Kohekohe fruit, each green pod contains three to four seeds. Rats eat most of the seeds produced by unprotected trees.



Photo: J. Brooks

Kohekohe are relatively easy to grow - seedlings first appear two to three weeks after placing the seeds in bays.

when young and from cattle grazing.

Kohekohe are very rewarding to propagate and are fast growing. I am eyeing up a tree at our gate which flowered this past May for seed collection next year.

Aotea Great Barrier needs more kohekohe!

As our tree is next to the driveway, we were able to see when the fruit pods were forming and installed rat traps and bait dispensers around the tree until the pods were mature and started falling off naturally. We collected about 60 seeds, put them in moist folded paper towels for about one week and then into seed trays with growing medium (leaf litter compost and some well-rotted garden compost of our own). We kept them moist but not wet and saw the first show of green leaf buds in about two to three weeks.

We contacted Okiwi Green Nursery to ask if they could help us out as we had to return to Auckland and didn't want to take them back and risk introducing Argentine ants or plague skink eggs to another site on Aotea Great Barrier. We will give the majority of the plants for sale, taking a few for our place. They need to be protected from rabbits

Cauliflory

One of kohekohe's distinguishing features is its habit of 'cauliflory' or stem flowering. Drooping greenish-white waxy flowers and fruit panicles sprout directly from the trunk and branches during late autumn to early winter.



Photo: C. Parris

Flowers of kohekohe grow directly from the trunk and branches.

Few other New Zealand plants exhibit this unusual habit—flowers of the tree fuchsia (*Fuchsia excorticata*) sometimes appear directly on the trunk; and two rare plants species on the Three Kings Islands, *Tecomanthe speciosa* and *Pennantia baylisiana* are also cauliflorous⁵. Cauliflory is thought to be evidence of a tropical origin, where pollination and seed dispersal is by bat or bird that fly beneath the forest canopy.

Kohekohe on Aotea

On Aotea Great Barrier, kohekohe occurs in broadleaf forest and in damp gullies and lower slopes. The tree is commonly found with tawa (*Beilschmeidia tawa*) and taraire (*B. tarairi*). Nikau (*Rhopalostylis sapida*) are often prevalent in the sub-canopy. Kohekohe occurs up to altitudes of around 400 m although is more dominant below 200 m.

On the mainland, kohekohe is a favourite food of brushtail possums (*Trichosurus vulpecula*) which heavily browse the leaves, flowers and fruit⁶ and also affect seedling survival⁷. Although possums are not an issue for kohekohe on Aotea|Great Barrier, rats significantly inhibit regeneration by eating the fruits and seeds⁸. A study on Hauturu|Little Barrier showed that kohekohe seedling numbers increased significantly following the eradication of rats⁸.

Giving kohekohe a helping hand

Once common in coastal and lowland forests, kohekohe is likely to continue to decline in unmanaged area and disappear from large parts of its natural range⁹. Kohekohe was one of the first tree species collected by Joseph

Banks and Daniel Solander in 1768. This first specimen is in the Te Papa collection¹⁰.

As June Brooks reports (see box previous page), protecting fruiting trees from rats can help seeds mature which in turn become available for seed raising and eventually planting out as small trees. Kohekohe can tolerate a range of conditions, including shade. Trapping rats and using the species in replanting projects are practical ways of helping to ensure the ongoing survival of kohekohe as one of our most unusual trees.



Photo: Tiritiri Matangi Open Sanctuary

Notes:

¹ Parliamentary Debates, Volume 174. 20 September to 12 October, 1915. By New Zealand Parliament.

² <https://www.tanestrees.org.nz/species-profiles/kohekohe>. Accessed 8 February 2020.

³ <https://maoriplantuse.landcareresearch.co.nz/WebForms/PeoplePlantsDetails.aspx?firstcome=firstcome&PKey=2F50FE1A-D3FF-40D7-AC65-693B0C946607>. Accessed 2 December 2019.

⁴ Medway, D. 2008. Kohekohe - a spectacular New Zealand tree. <http://kete.pukekura.org.nz>. May 2008.

⁵ Dawson, J.W. 1998. Forest vines to snow tussocks: The story of New Zealand plants. Victoria University Press, Wellington.

⁶ Nugent, G., Sweetapple, P., Coleman, J., Suisted, P. 2000. Possum feeding patterns; dietary tactics of a reluctant folivore. In: Montague, T.L. (Editor), The brushtail possum. Biology, impact, and management of an introduced marsupial, pp.10-23. Manaaki Whenua Press, Lincoln, N.Z.

⁷ Buddenhagen, C. E., & Ogden, J. 2010. Growth and survival of *Dysoxylum spectabile* (Meliaceae) seedlings in canopy gaps, 41:1, 179-183, DOI:

10.1080/0028825X.2003.9512838.

⁸ Campbell, D.J. 2011. Seedling recovery on Hauturu/Little Barrier Island, after eradication of Pacific rats *Rattus exulans*. DOC Research & Development Series 325. Department of Conservation, Wellington. 53p.

⁹ New Zealand Plant Conservation Network. 2020. http://www.nzpcn.org.nz/flora_details.aspx?ID=1825. Accessed 9 February 2020.

¹⁰ Lebneback, c. 2010. Kohekohe, one of the funkiest trees in town! <https://blog.tepapa.govt.nz/2010/04/08/kohekohe-one-of-the-funkiest-trees-in-town>. Accessed 9 February 2020.



Beyond Barrier

ENVIRONMENTAL NEWS FROM NEW ZEALAND & AROUND THE WORLD

Five Islands—a progress report

The Aotea community is not alone in tackling the impact of introduced pests. Here’s an overview of what’s happening on five other inhabited islands from our close neighbours to further afield. Some of these communities, have been there and done it, and others are just getting on with it.

Island	What’s going on?
<p>Kawau Area: 2,000 ha Population: c. 80 Ownership: Private, c.10 % managed by Department of Conservation</p>	<p>Proposing combined eradication for wallaby, possums, rats and stoats. Feasibility and community consultation underway lead by Auckland Council.</p> <p>Long established Pohutukawa Trust (1992) is a community-led organisation of residents and ratepayers aiming to restore the Island’s native flora and fauna.</p>
<p>Waiheke Area: 9,320 ha Population: c.9,000 permanent residents and c.3,400 holiday homes, New NZ’s most populous island Ownership: Mixed</p>	<p>Large, community-led, multi-agency project funded by Auckland Council and Predator Free NZ2050, Te Korowai o Waiheke has begun work to eradicate stoats and eventually rats (there are no possums).</p> <p>The Te Korowai programme team includes an operations manager, fieldworkers, communications officer and a programme manager. Marine protection conversations have also begun.</p>  <p>Te Korowai o Waiheke TOWARDS PREDATOR FREE WAIHEKE</p>
<p>Rakiura Area: 174,600 ha Population: c.400 mainly in Oban, tourism is the key industry Ownership: 85% is national park, private</p>	<p>Memorandum of understanding signed with iwi, Department of Conservation, community, councils, hunting and tourism groups to develop predator free strategy. Goal is to remove rats, possums, feral cats and hedgehogs from main island and Titi Islands – latter became pest-free in January 2020.</p> <p>Project facilitator in place and local SIRCET trust (goals include tieke/saddleback in backyards and increasing seabird breeding). Home to unique endemic plants and wildlife e.g. Rakiura tokoeka kiwi, Stewart Island robin, Harlequin gecko.</p>
<p>Lord Howe Area: 1,455 ha (main island is largest of 28 islets in the group) Population: c. 382, tourist limit of 400 at any one time Ownership: Permanent Park Preserve covers about 70% of the island, World Heritage Area, surrounding waters marine park</p>	<p>With unique ecology and some similar species to Aotea Great Barrier. Eradication of rats from the main island took place in winter 2019 after extensive community debate spanning more than two decades.</p> <p>Community is expecting reduced impacts of “plagues” of rats on homes and business and on 207 bird species and a wide range of other wildlife, some of which are found nowhere else.</p> 
<p>Ahuahu-Great Mercury Area: Largest in Mercury group at 1872 ha Population: 18 plus thousands of visitors annually Ownership: Private</p>	<p>See feature article. Eradication of kiore, ship rats and feral cat in 2014, lead by Department of Conservation in partnership with owners, iwi and residents.</p> <p>Entire Mercury group now pest free and an internationally significant bird area. Five years on the results are impressive – including six species of seabirds self-introducing, along with kākā, kākāriki, pāteke, and bittern; kererū and dotterels thriving. Visible forest recovery.</p>



Marine Protection: Tell me what you want, what you really really want

What are the marine protection tools available to Aotearoa and why would we bother? KATE WATERHOUSE takes stock as the Hauraki Gulf Marine Park turns 20.

On 27 February the Hauraki Gulf Marine Park is 20. It is no cause for celebration. The state of biodiversity, fish stocks, reefs, seabed and water quality has in most cases, never been worse. Climatic changes are set to make life more difficult for thousands of birds, marine mammals and fish species that make their home in Tikapa Moana/Te Moananui-ā-Toi.

This milestone will pass without the presence of Roger Grace, the man dubbed the father of marine reserves, who passed away in July 2019. At a Hauraki Gulf Forum seminar some years ago, he presented his famous talk on just how well marine reserves restore the sea. He noted how much effort it takes to restore bush and wetlands, then said: *It's easy to restore a marine environment. No planting, weeding or pest control. Just stop fishing.*



Photo: EMR

Dr. Roger Grace, the father of marine reserves.

It's hard to go past his logic, and yet in the Hauraki Gulf, marine protection is the kind of topic that gets you trolled on social media, any media, and guarantees criticism from the fishing industry and recreational fishers alike. Marine reserves are not a fisheries management tool they say. On the overwhelming scientific evidence, we beg to differ. Marine reserves are clearly going to be the engine of the recovery of the Gulf. All the scientific evaluation of the existing reserves at Goat Island, Hahei and Tawharanui shows this.

Snapper and crayfish are bigger, more numerous and breed better, and act as seed populations for surrounding areas up to 30 km away, helping restore kelp reefs by eating kina.



Photo: R. Grace

Kina keep the rock bare grazing kelp all due to not enough snapper to control kina.

This is also why in mid-2019 the Hauraki Gulf Forum declared a “long term aspirational goal” of 20% of the Gulf under some form of marine protection. The Forum backed off the 30% target (called for as part of the UN’s Global Ocean Treaty). It also didn’t define just how much of the 20% would be no-take reserves.

Lack of action

There is huge frustration amongst participants in the Sea Change process at the lack of action. There are calls for reductions in takes of terakihi, snapper, trevally, dory and kahawai before the so called ‘hard limit’, or collapse, is reached. Now crayfish stocks have plummeted to below 10% of their unfished state, fishers have opted not to fill quotas, and even MPI have had to act to save the stocks.



Photo: R. Grace

Crayfish at Tawharanui, inside the marine reserve, out in the open, numerous, and larger.



The Motiti Trust is now clear to implement their marine protection spatial plan, which includes taonga areas of no fishing and restrictions on fishing methods to restore and protect cultural values and marine biodiversity. Restricting no-take to three specific areas rather than all around the island means Motiti Māori, as kaitiaki, will still be able to obtain kaimoana.

...It also paves the way for any iwi or community groups to argue for controls on fishing in the coastal marine area, and for councils to provide for this in their plans.

Trust member Te Atarangi Sayers says: *This is concept ... opens exciting opportunities for communities and hapu/iwi to get involved in*

practical ways to better manage shallow coastal habitats confronted with serious fishing pressure and biodiversity and habitat threats.

Legislative tools: there's no shortage

At a presentation to the Hauraki Gulf forum seminar in August 2019, MAC member Raewyn Peart outlined the options available. She regularly snorkles and dives around Aotea. The table below sums up her presentation.

There are other tools too, including cable exclusion areas (fishing activities and anchoring are excluded to avoid damage to submarine cables – may inadvertently provide environmental benefits), and special legislation. Sugar Loaf Islands Marine Protected Area Act 1991; Fiordland (Te Moana Atawhenua) Marine Management Act 2005, are examples of this.

Tool	Legislation	What's it for?	Decision-makers
Marine reserves	Marine Reserves Act 1971	<ul style="list-style-type: none"> Marine life, natural features protected, preserved and maintained in state of nature. Public freedom of access, available for scientific research; no-take but restricted harvest possible. Permanent protection. 	Minister of Conservation (concurrence from ministers of fisheries, transport)
Sustainability measures	Fisheries Act 1996	<ul style="list-style-type: none"> Purpose is <i>to provide for the utilisation of fisheries resources while ensuring sustainability.</i> Manage the effects of fishing on fish stocks and aquatic environment; can include spatial exclusions of fishing methods and activity. Can be reviewed at any time. 	Minister of Fisheries
'Significant natural areas'	Resource Management Act 1991	<ul style="list-style-type: none"> Purpose is <i>sustainable management of natural and physical resources</i>. Protect indigenous biological diversity and preserve natural character. 	Auckland Council and Waikato Regional Council
Customary management tools	Fisheries Act 1996	<ul style="list-style-type: none"> Tāiapure (local fisheries): Recognition of rangatiratanga and Treaty fisheries rights. Mātaitai reserve: Created on application by tangata whenua. Commercial fishing not normally permitted. Permanent tool. Temporary closure: <i>Recognise and make provision for the use and management practices of tangata whenua in the exercise of non-commercial fishing rights.</i> Temporary closures for up to two years, then revoke, or continue them for further two years. 	Mana whenua and Minister of Fisheries
Marine Protection Rules	Maritime Transport Act 1994	<ul style="list-style-type: none"> Protects sensitive areas from shipping risks, primarily oil spills 	Maritime New Zealand
Marine Mammal Sanctuaries	Marine Mammals Protection Act 1978	<ul style="list-style-type: none"> Purpose: Protection of marine mammals Restrict activities that endanger marine mammals including fishing (e.g. set net/trawl) Permanent protection – e.g., West Coast North Island Marine Mammal Sanctuary. 	Minister of Conservation



A striking lack of marine reserves

There are only six existing marine reserves (totalling just 0.3% of the marine area), and some existing spatial fisheries restrictions in Hauraki Gulf Marine Park. The use of other tools in the Gulf is limited. Only one temporary closure is in place at Umupuia (for cockles/ tuangi). There are no taiāpure or mātaītai, no fishing exclusions under regional coastal plans, no areas to be avoided by shipping and no marine mammal sanctuaries.

In 2016, Sea Change recommended 13 new marine protected areas (MPAs) and extension of two existing marine reserves at Leigh and Hahei, plus establishment of Ahu Moana: Mana Whenua and Community Coastal Co-Management Areas out to 1km from shore. Sea Change also recommended phased withdrawal of benthic-damaging fishing methods (from the gulf. But as yet, nothing has changed.

What are the options on Aotea Great Barrier?

Aotea Great Barrier Local Board are currently putting together their three year and annual plans. The 2017 plan included a marine protection objective, but little progress has been made. Newly-elected board member Valmaine Toki, also a member of the Sea Change MAC, has talked about MPAs on Aotea Great Barrier. Residents contributed to the Sea Change process and protests against marine dumping have demonstrated the community's desire to protect the sea. The Voluntary Fishing Code developed by Bill Carlin in 2016 received good local support.

But the ability to enforce local rules is problematic in the face of regular stripping of some local reefs, and trawling and seining is still permitted off the east coast of Aotea. Many people express a feeling that "something's got to be done".

Notes:

¹ Sea Change online information: <https://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/our-fishery-management-initiatives/the-sea-change-marine-spatial-plan-for-the-hauraki-gulf/>

² Mountains to Sea Conservation Trust – update on Motiti Rohe Restoration Trust decision <https://www.howtokit.org.nz/case-studies/rma-processes/motiti-rohe-moana-trust.html>

³ Newsroom, December 2019: <https://www.newsroom.co.nz/2018/06/20/126202/motiti-island-template>
RMLA report on High Court Motiti decision: <https://www.rmla.org.nz/2016/12/14/motiti-rohe-moana-trust-v-bay-of-plenty-regional-council-2016-nzenvc-240/>

⁴ Peart, R. 2019. Legislative Tools (Presented to Hauraki Gulf Forum State of Our Gulf Seminar, 27 August 2019.

⁵ Speir, D. 2014. Marine Conservation on Great Barrier Island. Environment News June 2014. GBIFET.
Grace, R. Want More Fish? Experiencing Marine Reserves. <https://emr.org.nz/images/emr/pdf/why-mr/Why-do-we-need-MR-Dr%20Roger-Grace.pdf>

⁶ Outputs of the Aotea Conservation Workshop 18//11/19 session 1 feedback <https://www.gbiet.org/aotea-collaborative-conservation-workshop>.

At a recent conservation hui on the island, participants highlighted the need for a iwi and community led process for marine protection, baseline monitoring of the state of the marine environment, community education on damage done by overfishing and marine pests, fisheries management reform, more use of customary tools, and a more holistic Ahu Moana view.

This is the time to be practical and ask: *What is our goal? Should it be to protect 30% of Aotea's coasts? If so, which 30% would we choose and how should we do it? If not, then what is our goal?* The tools are there.

It has taken tiny trust Motiti to go to the High Court to uphold the tenets of the Resource Management Act - to protect significant coastal sites and biodiversity, such as Aotea has, from overfishing. Why wouldn't we as community, mana whenua, residents and ratepayers, lead a process to make sure that our grandchildren can experience what we experienced as children. The flash of blue mau mau across the bow, watching a work-up move across the bay, the heavy tug of trevally or snapper on your line, watching a big moki cruise the kelp channels in the clear blue sea.

Want to take action now?

- Talk to the Aotea Great Barrier Local Board, currently putting together three year and annual plans. Ask for action on marine protection goal from the 2017 plan.
- Contact local board member Dr Valmaine Toki, also on the Sea Change Ministerial Advisory Committee, and express your support for marine protection.
- Contact Pippa Coom, Aotea's new councillor, and co-chair of the Hauraki Gulf Forum.
- Submit on the Aotea Area Plan being prepared by Auckland Council for consultation in 2020.





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