

Vascular flora and vertebrate fauna of Harakeke Island and five associated islands, outer Bay of Islands

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Introduction

Harakeke Island (Galakek I.) (Figs. 1–3) (see also Cover illustration) occupies 11.5 ha (all island sizes are from Taylor 1989) and is the main island off Cape Wiwiki on the western side of the outer Bay of Islands. Two islets form 'stepping-stones' between the Cape Wiwiki and Harakeke Island: "Gorse" and "Flax"; and another islet is just west of "Gorse" islet: "Steep" islet. There are also two islets supporting vascular plants lying off the NE side of Harakeke Island: "NE Harakeke islet" and Tikitiki/Ninepin (Figs. 3A, 4).

EKC surveyed Harakeke Island on 16 Dec 2015 and GAT surveyed "NE Harakeke islet" and Tikitiki/Ninepin on 24 Jan 1990. Based on surveys by other people, the floras of the three smaller islets between Cape Wiwiki and Harakeke Island (Fig. 3), and earlier surveys of Harakeke, are also presented (see Appendix). Note – the species names of the earlier lists have been 'updated' to the most likely modern equivalent name. Collectively the three-islet chain off Cape Wiwiki and Harakeke Island are referred to below as the "Harakeke chain".

Harakeke Island, 11.5 ha, 90 m asl

Harakeke Island is a deeply dissected island, 585 m across (W to E) × 405 m (N to S), composed of basement Waipapa Terrane greywacke of Permian to Jurassic age and weakly metamorphosed, as is the whole group of the Cape Wiwiki islands (Bruce Hayward pers. comm.). Viewed from the boat there was a series of large deep caves on the south-east coast (Fig. 2 and Cover), and two of these at the eastern end are tunnels that go right through the island. Due to the steep topography and limited time ashore the only section of the shoreline surveyed was confined to the landing area. There are two nearly equal high points, one towards the west, and the other in the northern-centre being the taller at 90 m asl. EKC spent 4 hours on the island on 16 Dec 2015 "botanising" in perfect weather while three Department of Conservation (DoC) staff, rat dog, Tike, and volunteer Webber Booth, checked the bait stations, DoC200 traps and tracking tunnels. The

Cape Wiwiki islands are mammalian-pest-free, maintained by permanent bait stations since 1992 on "Gorse" and "Flax" islets and Harakeke Island.

EKC landed on the steep rocky shore in the middle of the south coast (Fig. 5); from there he generally followed the trap lines to the east in the forest above the cliffs, turned west up the main ridge (in places close to the northern cliff tops) to the central high point for lunch, then proceeded to the western high point and finally turned east back to the starting point along the southern cliffs. Thirty-one voucher specimens of vascular and non-vascular plants were collected during the survey.

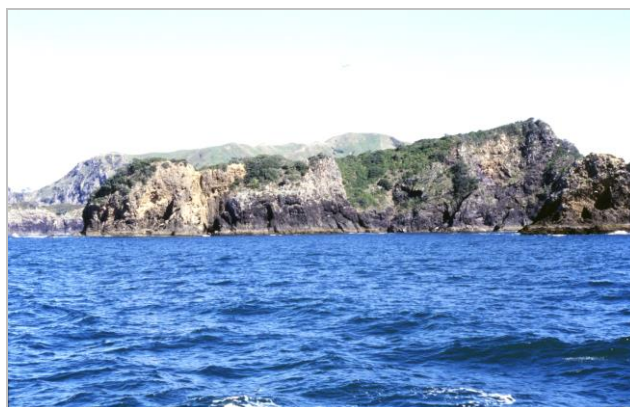


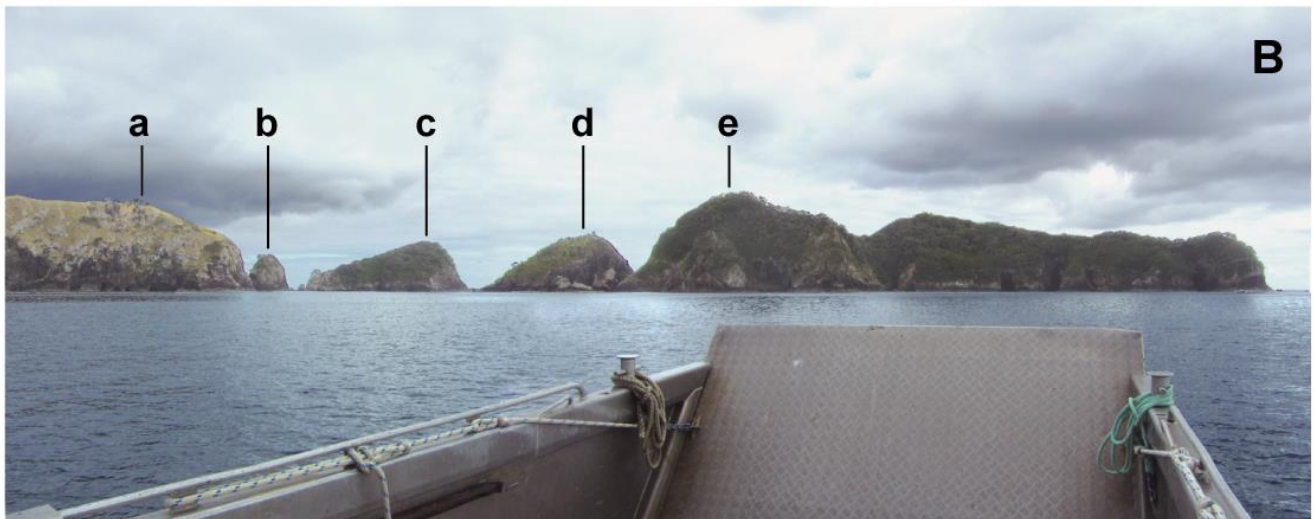
Fig. 1. Northern cliffs of eastern Harakeke I. including the summit, showing the rather bare rocky cliffs. Mainland visible in the distance. Photo: EKC, 14 Apr 1995.



Fig. 2. Eastern end of Harakeke Island, looking north. Showing sea caves and advanced regenerating pohutukawa-broadleaf forest. Also see Cover Illustration.



A



B

Fig. 3A. Location of Harakeke Island and associated islands off Cape Wiwiki, outer western Bay of Islands: **a** Cape Wiwiki; **b** "Steep islet."; **c** "Gorse islet"; **d** "Flax islet"; **e** Harakeke I.; **f** "NE Harakeke islet"; and **g** Tikitiki/Ninepin. The squares are 1 km across. Topomap50 modified by Joshua Salter. **3B.** The photograph was taken approaching Harakeke I. from the south. Note: "NE Harakeke islet" and Tikitiki are not visible. Unless stated otherwise, all photos taken by EKC on 16 Dec 2015.

Vegetation of Harakeke Island

Forest

Most of the island is steep, with good vegetation on much of the south-facing slopes. However, the northern slopes are too steep for larger plants and are mainly bare rock (Fig. 1). Pohutukawa (*Metrosideros excelsa*) forms much of the overall forested canopy. Some of the less-steep, more-sheltered south-facing slopes locally supported broadleaf coastal forest (Fig. 6), composed of coastal maire (*Nestegis apetala*), houhere (*Hoheria populnea*), karaka (*Corynocarpus laevigatus*), kohekohe (*Dysoxylum spectabile*), mahoe (*Melicactus ramiflorus*), puriri (*Vitex lucens*), tawapou (*Planchonella costata*); and more locally milk-tree (*Streblus banksii*), wharangī (*Melicope ternata*) and whauwhaupaku (*Pseudopanax arboreus*). On the exposed forest edges houpara (*Pseudopanax lessonii*), karo (*Pittosporum crassifolium*), haekaro (*P. umbellatum*) and taupata (*Coprosma repens*) were common. There were no large, ancient trees and in the more protected gullies the broadleaf canopy reached 8–10 m tall. The occasional larger trees seen included puriri 50(–80) cm dbh (Fig. 7) and a coastal maire 45 cm basal diameter (Fig. 8), but most of the canopy trees were smaller and many multi-trunked.

Kanuka (*Kunzea robusta*) was locally present around the western high point, reaching up to 7 m tall. Apart from the presence of kanuka and manuka (*Leptospermum scoparium*), another sign of past fire was an old charcoaled tree stump on a forested ridge towards the eastern side (Fig. 9). Pohutukawa on the main ridge, eastern side, reach some 15 m tall with wide branching indicating that they established in the open. These appeared to be the largest trees on the island.

Understorey forest shrubs are scattered and vary in density. The main ones are kawakawa (*Piper excelsum*), coastal karamu (*Coprosma macrocarpa*), rangiora (*Brachyglottis repanda*) and hangehange (*Geniostoma ligustrifolium*); these are often associated with regenerating broadleaf canopy species. The kawakawa is present in two forms, the normal duller form with non-overlapping leaf bases, and the “Hauraki Gulf form” as per Gardner (1997) with shiny leaves and overlapping leaf bases (Fig. 10).

The ground cover varies from locally abundant bamboo sedge (*Gahnia lacera*) to scattered clumps



Fig. 4. “NE Harakeke islet”, 31 m asl in foreground, Tikitiki/Ninepin 710 m behind, and Motukokako (Piercy I.) in the far upper right. Photo from the summit area of Harakeke I., looking east.



Fig. 5. Lichen-encrusted, steep greywacke, southern coast of Harakeke I. by the landing spot looking east, c.90 minutes before high water.



Fig. 6. Pohutukawa-broadleaf forest near the centre of the island, broadleaf in foreground, S-facing slope taken from the boat.



Fig. 7. A large puriri c.50 cm dbh (mahoe foliage in foreground), between the two high points.

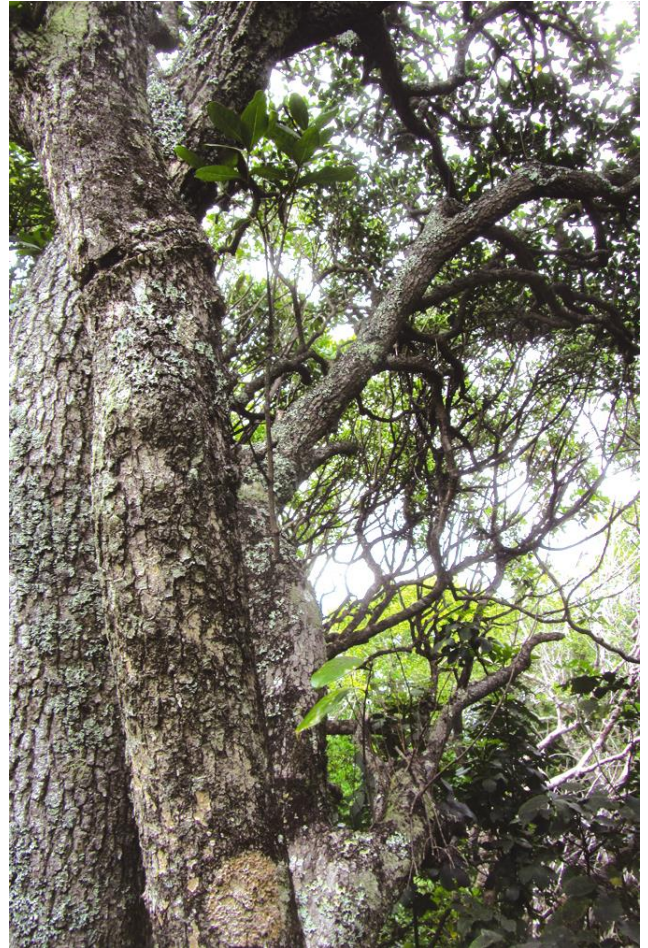


Fig. 8. An exposed large coastal maire near the highest point, 8 m tall and twice as broad as tall. Note the rough bark.



Fig. 9. Charcoaled tree stump, on main forested ridge, eastern side, Harakeke I.



Fig. 10. The "Hauraki Gulf form" of kawakawa with its shiny leaves and overlapping leaf bases, which occurs alongside the normal duller form of kawakawa on Harakeke Island.



Fig. 11. Bare burrowed ground from petrel/shearwater activity in 4 m-tall houpara-karo forest on main ridge, E of summit.



Fig. 12. Lush koru (*Lobelia physaloides*) locally common in patches to 6 m across and stems to 1.1 m tall, in the wettest part of the broadleaf-pohutukawa forest, lower mid-south side.

of *Carex* spp. and ground ferns to bare areas which were heavily burrowed by petrels/shearwaters (Fig. 11). The ground is bare because the nesting seabirds pluck off adjacent vegetation to line their burrows.

In the best developed ground cover in the lower south-facing centre of the island there is the tall herb koru (*Lobelia physaloides*, Fig. 12) and a large terrestrial patch of *Blechnum filiforme* covering some 8 × 6 m. In the same area was one of the two ground orchids seen: *Pterostylis banksii* (no flowers observed); the other one was fruiting, *P. ?graminea*, on the dryer main ridge in pohutukawa-broadleaf forest. Three liana have been reported: *Parsonsia heterophylla* (not seen by EKC) and two species of *Clematis*, *C. cunninghamii* and *C. paniculata*, the latter seen fruiting high in the central canopy from the boat. A single epiphyte was commonly present: *Pyrrhosia elaeagnifolia* on branches and trunks of pohutukawa, tawapou and puriri.

In the splash zone on the south coast, most of the rocky habitat is coloured by various lichen species (Fig. 5). The vascular plants are mainly confined to the cracks in the rock where they can get a foothold. These commonly include small plants of flax (*Phormium tenax*), taupata, karo and pohutukawa. Herbaceous plants are also present, including: *Ficinia nodosa*, *Plantago coronopus*, *Centaureum erythraea*, *Erigeron sumatrensis*, *Sonchus oleraceus*, scarlet pimpernel (*Lysimachia arvensis*), catsear (*Hypochaeris radicata*) and *Silene gallica*. Many grasses are present, including: *Rytidosperma biannulare*, *Lachnagrostis littoralis*, *Poa anceps*, *Aira caryophylla*, *Briza minor*, *Parapholis incurva* and *Vulpia bromoides*. Two fleshy herbs spread across the rock face: *Samolus repens* and ice-plant (*Disphyma australe*). On the upper margin of this splash zone, partially sheltered from the forest above, *Peperomia urvilleana*, rengarenga (*Arthropodium bifurcatum*), *Asplenium haurakiense* and *Parietaria debilis* occurred.

The steep north-facing slopes were bare and rocky with few woody plants (Fig. 1). Large tussocks of *Chionochloa bromoides* were locally common (Fig. 13) with a scattering of rengarenga, and in places this is bordered by tussocks of flax, grading into regenerating pohutukawa. Along the top of the northern, windswept cliffs were shrubs of polygala (*Polygala myrtifolia*), flax, *Astelia banksii*, houpara, *Ficinia nodosa*, bracken (*Pteridium esculentum*), *Poa anceps*, *Bromus catharticus*, *Microsorium pustulatum* and pohutukawa. Exposed cliff top pohutukawa branches were frequently festooned with pendulous lichen, *Usnea nidifica* (Fig. 14).

Table 1. Vascular flora totals of the islands off Cape Wiwiki, Bay of Islands, showing the different plant groupings, native and naturalised status and island size (See Appendix for data sources). Motukokako Island included for comparison, using data from Cameron & Taylor (1991) with two additions from Cameron (2006).

Plant Group/Island	"Steep"	"Gorse"	"Flax"	Harakeke	"NE Harakeke islet"	TOTALS	Motukokako
Native Ferns	2	10	3	21	2	22	9
Native Dicots	15	32	29	62	14	63	52
Native Monocots	5	14	12	24	6	27	22
Naturalised Dicots	7	7	10	19	5	24	10
Naturalised Monocots	-	4	2	10	5	14	8
TOTALS (% exotic)	29 (24%)	67 (16%)	56 (21%)	136 (21%)	32 (31%)	150 (25%)	101 (18%)
Island size (hectares)	0.55	2.0	1.2	11.5	0.6	15.3	6.9

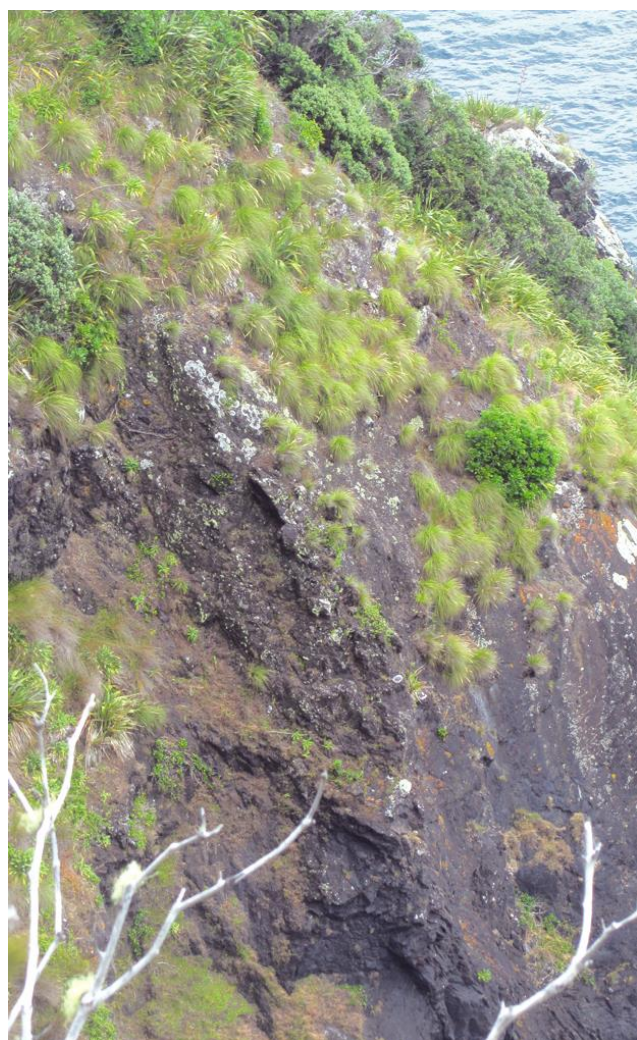


Fig. 13. Tussocks of *Chionochloa bromoides* on the northern rocky slopes below the summit of Harakeke I.

"Steep", "Gorse" and "Flax" islets

(from the DoC files)

The informal names of two of the three islets ("Gorse" and "Flax") suggest young and modified vegetation, the third name "Steep" suggests little vegetation. The DoC Kerikeri Office had on file several previous flora and fauna surveys of the Harakeke chain of islands. We have included the findings of all the surveys in separate columns (see Appendix).

"Steep islet", 0.55 ha, c.45 m asl, is only c.5 m off the north side of Cape Wiwiki (may be joined at low tide). From the Site of Special Biological Interest (SSBI) sheet (22 Apr 1999): there is no general account of the islet. However, from the species list it has a flora of 29 species of which a quarter are naturalised (Table 1, Appendix); there are no woody weeds recorded.

"Gorse islet", 2.2 ha, 66 m asl, appears to be joined to Cape Wiwiki at low tide and separated from "Flax" islet by c. 20 m at low tide (the Wiwiki Passage). From SSBI sheet (by Richard Parrish, 12 Jan 1994): "c.80% young forest-scrub of native species of pohutukawa, houpara with kowhai (*Sophora chathamica*), coastal maire, cabbage tree (*Cordyline australis*), coastal karamu, hangehange and mapou (*Myrsine australis*); a couple of cleared areas, c. 10% of the islet, are now in gorse [*Ulex europaeus*]". Separately he recorded "prostrate kowhai (*Sophora*

prostrata)" (see comment under Discussion). The two woody weeds, polygala and gorse (*Ulex europaeus*), are present.

"Flax islet", 1.2 ha, c.50 m asl, is separated from Harakeke by c.50 m with a rock outcrop between them. From SSBI sheet (by Tim Shaw, 12 Jan 1994): "has steep areas of bare rock and a good vegetation cover of bracken, thick flax; occasional emergent pohutukawa 4-6 m tall on the less-steep areas." It has a flora of 56 species of which 21% are naturalised species (Table 1, Appendix). The only woody weed is gorse, and the bulbiferous lilac oxalis (*Oxalis incarnata*) is present.

Flora of the Harakeke chain

The total vascular flora for Harakeke Island is 136 species, of which 21% are naturalised species (Table 1, Appendix). The 2015 survey added 23 species to the earlier lists for the island. However, 35 of the earlier records were unrecorded by EKC (see Appendix). Reasons for some of these being missed include: only part of the island was surveyed; open sites were poorly surveyed; different time of year; small populations could easily be missed; some may have been wrongly identified; some may have died out. For example, the tree ferns may have died out in a severe drought, as has been recorded at a similar time on other northern east coast islands (e.g. see Cameron 2014, 2015).

The other three islands of the Harakeke chain add an additional 14 species (64% of those being exotic). All these additions are species of open habitats. Although this type of habitat is also quite extensive on Harakeke, due to constraints of time and the steepness of the topography, open habitat was poorly surveyed by EKC. Therefore, many of these plant additions are also likely to occur on the open and often steep areas of Harakeke Island. The combined flora of these four islands is 150 species, 75% indigenous.

Naturalised species

Although a total of 38 naturalised species are recorded for the Harakeke chain, most are herbaceous and are not a threat to the native vegetation which is dominated by indigenous species. However, the three exotic woody species present, hakea (*Hakea sericea*), gorse and polygala, are all environmental weeds and on such steep topography all three have the potential to

permanently dominate open sites. The only other undesirable exotic plant present is the lilac oxalis recorded for "Flax" islet. This is an unusual record for an uninhabited island and the only other such record that we are aware of is on Lady Alice Island of the Hen and Chickens Islands group, where it was recorded as probably introduced as a contaminant of a bird aviary (Cameron 1984). It cannot reproduce sexually in New Zealand; however, it can multiply asexually by bulbils. How it reached the chain is a mystery – perhaps introduced in a marijuana (*Cannabis sativa*) planting in potting bag soil.

Non-vascular plants

Bryophytes were collected during EKC's visit to Harakeke Island: *Cheilolejeunea* sp. (AK 359978), *Frullania rostellata* (AK 359977), *Frullania solanderiana* (AK 359974), *Hypnum cupressiforme* (AK 359979), *Lejeunea ?tasmanica* (AK 359975), *Metzgeria ?furcata* (AK 359976); and a quite striking green lichen with a white border, *Bacidia* sp. (AK 359980). Also, a lichen was photographed: *Usnea nidifica* (Fig. 14).



Fig. 14. A pendulous lichen, *Usnea nidifica*, commonly festooned exposed pohutukawa branches along the northern clifftops.

Fauna of the Harakeke chain

It is uncertain when ship rats (*Rattus rattus*) invaded the Cape Wiviki islands, including Harakeke Island, but poison baiting began in 1992 by DoC and was deemed successful in 1994 (Russell 2007). Brush-tailed possums (*Trichosurus vulpecula*) were thought to have invaded the island chain c.1990 and they were also successfully eradicated at the same time as the ship rats (Russell 2007) using ground-based bait stations. The islands were kept rodent-free from 1992 until 2000 when rats and stoats (*Mustela erminea*) reinvaded soon after the DoC pest control

program stopped in the late 1990s. Hugh Rihari, Ariki, Ngati Torehina, blessed the launch of the new eradication project from the vessel 'Mahal' anchored off Harakeke in August 2011 when more than 50 bait stations, together with snap traps, tracking tunnels, possum and stoat traps were set on Harakeke, "Gorse" and "Flax" islands over the next couple of months. There was a huge input from DoC staff, and all members of the Booth whanau and other volunteers. Bait stations have been maintained since that time and incursions of rats and stoats have been few once the initially large number of pests was controlled. Reinvasion of the managed island chain is a continual threat as the Wiwiki passage is only c. 20 m wide at low tide (W. Booth and A. Walker, pers. comm.).

Various people recorded the birds they saw on several of the islands in the Harakeke chain and these are presented in the Appendix. They totalled 25 species, 28% being introduced species. Two species of lizards, *Oligosoma smithi* and *Woodworthia maculatus*, have been recorded from "Flax" islet in good numbers (T. Shaw on 12 Jan 1994, SSBI Survey Sheet), but despite searching none have been found on Harakeke Island (NZ Wildlife Service, Nov 1978, Fauna Habitat Survey sheet) or "Gorse" islet (R. Parrish, 12 Jan 1994, SSBI Survey Sheet).

During the 2015 visit to Harakeke Island shearwater/petrel burrows (most likely grey-faced petrel burrows) were locally common and in these burrowed areas the ground was bare (Fig. 11). Also observed during that visit were several silk-lined tunnels in the ground under open pohutukawa forest, which John Early (pers. comm.) confirmed were spider tunnels, probably from "one of the species of the lidless trapdoor spiders in genus *Aparua*". The minute land snails (14 taxa) are recorded for Harakeke Island by the NZ Wildlife Service in Nov 1978 (Fauna Habitat Survey Sheet).

"NE Harakeke islet" and Tikitiki/Ninepin

During the Offshore Islands Research Group (OIRG) trip based on Moturoa Island in January 1990, GAT on 24 Jan 1990 surveyed "NE Harakeke islet" and the tall stack Tikitiki/Ninepin off the NE side of Harakeke Island. No previous account of their biota was located.

"NE Harakeke islet" (Figs. 3A, 4): 0.6 ha, 31 m asl, 180 m NE of Harakeke. GAT recorded 32 species of vascular plants, a third of them naturalised species. None were additional to the Harakeke chain flora (see Table 1 and Appendix) and none are considered to be environmental weeds. The vegetation on the upper slopes was dominated by flax with a lower fringe of *Chionochloa bromoides* and below this the salt-tolerant herbs of ice-plant, salicornia (*Salicornia quinqueflora*), *Samolus repens*, and *Senecio lautus*. Amongst the flax were occasional shrubs of houpara, a few karo and one or two pohutukawa. *Chenopodium trigonum* and *Parapholis incurva* were vouchered from here.

Petrel burrows were abundant in the clay soil over the summit of the island under the flax and *Chionochloa bromoides* (c.1 burrow/m²). They were the size of grey-faced petrel or sooty shearwater burrows; hard to tell if occupied or not. One egg shell that had hatched was grey-faced petrel size. No lizards seen; no rodent sign but not methodically looked for.

Tikitiki/Ninepin (Figs. 3A, 4, 15): 0.25 ha, c. 22 m asl, c. 0.87 km east of Harakeke Island. A steep stack mostly bare rock with only small patches of soil caught in rock cracks; only five vascular plant species were present in 1990. Taupata was the main vegetation cover. It was mostly <0.5 m tall, a few shrubs 1.5-2.0 m tall near the summit. Ice-plant throughout and a co-dominant with taupata. Other plants seen: *Sonchus oleraceus* (4 plants), *Muehlenbeckia complexa* (single large patch on the summit) and *Spergularia tasmanica* (4 plants on lower slopes). The *Spergularia tasmanica* is additional to the flora of the Harakeke chain. However, it is likely to be present in the inaccessible, or unsearched, upper splash zones of some of those islands.

Two lizard species, *Oligosoma smithi* and *Woodworthia maculatus*, were abundant and the the islet appeared to be rat-free. There was also abundant guano present from roosting gannets. The stack lacked soil for nesting petrels/shearwaters to burrow into. Note – the adjacent reef to the south would be wave-washed by the sea during stormy weather.

Discussion

In terms of its botany and conservation values, Harakeke Island possibly has the best forest in the western part of the Bay of Islands. Although still youthful, its flora contains three of the special "northern island plants" mentioned by Cameron (2013): coastal mahoe, coastal maire and milk-tree. Three other species on Harakeke, tawapou, *Lobelia physaloides* and *Senecio repangae*, could also be added to that special "island" list.

Published vascular floras of other islands in the outer Bay of Islands include: the past farmed islands of Ipipiri (the eastern Bay of Islands) by Beever et al. (1984), updated by Young (2009) and further updated by Parris (2015); the partly-farmed Moturoa Island, published by Cameron (2017); and the two far-less modified outer eastern islands, an unclassified islet (Cameron 1982) and Motukokako (Piercy) I. (Cameron & Taylor 1991).

The most comparable island in the Bay of Islands to Harakeke appears to be Motukokako. At 6.9 ha and 152 m asl it is taller, but smaller than Harakeke Island. Unlike Harakeke Island, Motukokako is not connected to the mainland by a chain of islets and appears to have always been rodent-free (Cameron & Taylor 1991). The canopy is at a more advanced regenerating phase, with less pohutukawa and completely lacking manuka and kanuka. Woody species present on Motukokako but unrecorded for Harakeke include: titoki (*Alectryon excelsus*), whau (*Entelea arborescens*), ngaio (*Myoporum laetum*), parapara (*Pisonia brunoniana*) and nikau (*Rhopalostylis sapida*). Hopefully with time these species may establish on Harakeke, as they were likely to have been present in pre-human times.

There was a single kowhai tree on each the two high points on Harakeke Island: 3 m tall (25 cm dbh) on the central summit and 5 m tall on the western high point, and a few seedlings close by the central summit. No other kowhai was seen on this island – the two trees are possibly Maori plantings? For "Gorse" islet in 1994 R. Parrish noted "prostrate kowhai" as being present. After surveying Harakeke Island in 2015 a brief landing was made on Motutui off Howe Point (1.75 km SSW of Harakeke I.) to view some low dense bushes of kowhai that occur there. There's possibly a selected form (freak or hybrid?) of low-growing, shrubby kowhai that has been planted by Maori in this area. Other evidence of past Maori

activity on Harakeke Island was occasional shell middens and a series of low terraces along the main ridge east of the high point.

Adrian Walker (pers. comm. to EKC), recollected that seabird burrows on Harakeke Island were in much lower densities in the 1990s and he estimated that the current grey-faced petrel nesting activity on this island has increased at least 10-fold from his original observations. He also recollected that a cohort of saplings e.g. tawapou, kohekohe, and coastal maire, has developed since his visits in the 1990s. This fits with what GAT has observed on the west coast of Auckland on Ihumoana Island where the removal of ship rats has led to increase in plant species diversity, especially those plants with fleshy fruits favoured by rats.

The high density of burrows on the "NE Harakeke islet" would suggest that grey-faced petrels have overflowed onto Harakeke once rats were removed and this emigration of birds is supporting a rapid population increase well above levels of natural rates of increase. For example: the Ihumoana Island populations over a similar time have increased only by 300%.

These are both excellent signs that the island is regenerating well, and that the ship rats and brush-tailed possums have been eliminated. The Harakeke chain with its 'stepping-stone' islets is a challenge to maintain as predator free. The Maori owners, DoC and volunteers are to be congratulated in its current management.



Fig. 15. Tikitiki/Ninepin looking SE. This exposed islet supports a vascular flora of five species. Photo: EKC, 14 Apr 1995.

Acknowledgments

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GAT thanks: the OIRG team, including the late Roger Grace, for transporting him over to the islands in 1990.

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Appendix: Vascular flora of "Steep", "Gorse" and "Flax" islets and Harakeke Island (Harakeke chain), and "NE Harakeke islet". Based on:

<u>"Steep" islet</u> – DoC file SSBI dated 20 Apr 1999	<u>"Flax" islet</u>	<u>Harakeke Island</u>	
<u>"Gorse" islet</u>	1994 – surveyed by Tim Shaw on 12 Jan 1994, DoC file SSBI Survey Sheet	1971 – surveyed by NZ Wildlife Service	2000 – surveyed by Karen Riddell and Adrian Walker on 12 Apr 2000
1994 – surveyed by Richard Parrish on 12 Jan 1994, DoC file SSBI Survey Sheet	1999 – surveyed by Peter Herbert, Clare Wooldridge Way, Dan O'Halloran and Andrew Taylor on 20 Apr 1999, DoC file SSBI Survey Sheet	1978 – surveyed by NZ Wildlife Service	2015 – surveyed by EKC, 16 Dec 2015 (4 hours on the island)
1999 – surveyed by Clare Wooldridge Way, Katrina Upperton and Dan O'Halloran on 20 Apr 1999; DoC file SSBI Survey Sheet		1990 – surveyed by Richard Parrish on 26 Sep 1990, DoC file SSBI Survey Sheet	<u>"NE Harakeke islet"</u> – surveyed by GAT on 24 Jan 1990
		1999 – surveyed by Leigh Honner, Peter Herbert, Clare Wooldridge Way and Dan O'Halloran DoC file SSBS dated 21 Apr 1999	

Key:

* = naturalised; a = abundant; c = common; l = local; o = occasional; s = scarce (<5 plants seen); H = based only on the herbarium record [two previous herbarium specimens – collected in 1990 and 1996]; x = recorded as present in surveys by other people; [] = square brackets indicate an identification most likely from the original record which was a different species or as a genus only – in such cases the original name is given in square brackets in the Comments column

	Steep	Gorse		Flax		Harakeke Island						NE Hara.	Comments for Harakeke (2015 visit) and vouchers
	1999	1994	1999	1994	1999	1971	1978	1990	1999	2000	2015	1990	
FERNS (22 + 0) (= native + naturalised)													
<i>Adiantum aethiopicum</i>		x	x										
<i>Adiantum cunninghamii</i>		x	x					x		x	l		
<i>Asplenium decurrens (A. northlandicum)</i>								x		x		s	
<i>Adiantum hispidulum</i>		x							x		o		
<i>Asplenium haurakiense</i>	[x]		[x]	x				x	[x]	x	c	o	From coast to high points [<i>A. flaccidum</i>] AK 360018, 360046
<i>Asplenium oblongifolium</i>		x	x	x	x	x			x	x	c		AK 203008
<i>Asplenium polyodon</i>										x			
<i>Blechnum filiforme</i>								x		x	l		Single large patch
<i>Cyathea dealbata</i>								x		x			
<i>Cyathea medullaris</i>										x			
<i>Dicksonia squarrosa</i>			x						x				
<i>Doodia australis</i>		x	x			x		x	x	x	o-lc		
<i>Loxogramme dictyopteris</i>										x			
<i>Microsorium pustulatum</i>	x	x						x	x	x	o-lc		
<i>Pellaea falcata</i>										x			
<i>Polystichum wawranum</i>									[x]		o		[<i>P. richardii</i>] AK 360074
<i>Pteridium esculentum</i>		x	x	x	x	x	x	x	x	x	lc		
<i>Pteris comans</i>								x	x	x	o-lc		
<i>Pteris macilenta</i>								x		x			
<i>Pteris tremula</i>											l		
<i>Pyrrhosia elaeagnifolia</i>		x							x	x	lc		Mainly as epiphytes in canopy branches
<i>Sticherus flabellatus</i>									x				
Woody DICOTS (43 + 3)													
<i>Beilschmiedia tarairi</i>						x							
<i>Beilschmiedia tawaroa</i>								x		x			
<i>Brachyglottis kirkii</i>						x				x			
<i>Brachyglottis repanda</i>		x	x			x	x	x	x	x	o		
<i>Carmichaelia australis</i>			x	[x]	x			x	x	x	l		

	Steep	Gorse		Flax		Harakeke Island						NE Hara.	Comments for Harakeke (2015 visit) and vouchers
	1999	1994	1999	1994	1999	1971	1978	1990	1999	2000	2015	1990	
<i>Clematis cunninghamii</i>									x	x	o		
<i>Clematis paniculata</i>								x	x	x	l		Based on fruiting material in the canopy seen from the boat
<i>Coprosma macrocarpa</i>		[x]	x	x	x	x		x	x	x	c		[<i>C. robusta</i>]
<i>Coprosma repens</i>	x			x	x			x	x	x	o-lc	c	
<i>Coprosma rhamnoides</i>									x	[x]			[<i>C. neglecta</i>] AK 282133, KA Riddell & JA Walker, Apr 2000
<i>Corynocarpus laevigatus</i>						x	x	x	x	x	o-lc		
<i>Dysoxylum spectabile</i>			x			x		x	x	x	o		
<i>Geniostoma ligustrifolium</i>		x	x		x	x	x	x	x	x	o		
<i>Hakea sericea</i> *						[x]			x				[<i>Hakea</i> sp.]
<i>Hebe stricta</i>								[x]	x	[x]	s		[<i>Hebe</i> "Whangarei"]
<i>Hoheria populnea</i>		x	x				x	x	x	x	o-lc		
<i>Kunzea robusta</i>		[x]							[x]		lc		[<i>K. ericoides</i>] AK 360033
<i>Leptecophylla juniperina</i>				x				x	x	x			
<i>Leptospermum scoparium</i>			x			x	x		x				
<i>Leucopogon fasciculatus</i>			x	x	x	x		x	x	x	l		
<i>Leucopogon fraseri</i>			x	x						x			
<i>Melicope ternata</i>						x		x	x	x	l		
<i>Melicytus novae-zelandiae</i>	x			x				x	x	x	o	o-lc	
<i>Melicytus ramiflorus</i>		x	x		x	x	x	x	x	x	c		AK 360031-32
<i>Metrosideros excelsa</i>	x	x	x	x	x	x	x	x	x	x	c	s	
<i>Muehlenbeckia complexa</i>	x			x	x	x		x	x	x	lc		
<i>Myrsine australis</i>		x	x	x	x	x	x	x	x	x	o		
<i>Nestegis apetala</i>		x	x		x	x		x	x	x	c		AK 282126
<i>Olearia furfuracea</i>								x	x	x	lc		
<i>Parsonsia heterophylla</i>								x		x			
<i>Pimelea tomentosa</i>									x				AK 294565, JA Walker, Oct 1997
<i>Pimelea urvilleana</i>	[x]		x						x				[<i>Pimelea prostrata</i>]
<i>Piper excelsum</i> subsp. <i>excelsum</i>		x	x			x	x	x	x	x	c		AK 360119
<i>Piper excelsum</i> "Hauraki Gulf form"											l		AK 360121 (Fig. 10)

	Steep	Gorse		Flax		Harakeke Island						NE Hara.	Comments for Harakeke (2015 visit) and vouchers
	1999	1994	1999	1994	1999	1971	1978	1990	1999	2000	2015	1990	
<i>Oxalis exilis</i>		x											
<i>Oxalis incarnata</i> *				x									
<i>Parietaria debilis</i>								H		x	o		AK 205006, 360019
<i>Peperomia urvilleana</i>	x							x	x	x	o-lc		
<i>Physalis peruviana</i> *									x		s		AK 359965
<i>Phytolacca octandra</i> *								x		x			
<i>Plantago coronopus</i> *		x						x	[x]	x	lc		[<i>P. sp.</i>] AK 360002
<i>Polycarpon tetraphyllum</i> *				x							c	c	
<i>Pseudognaphalium luteoalbum</i>		x		x								o	
<i>Rumex sp.</i> *	x												
<i>Sagina apetala</i> *											l	s	
<i>Salicornia quinqueflora</i>		x	x	x	x				x		o	o-lc	
<i>Samolus repens</i>	x	x	x	x	x			x	x	x	lc	c	
<i>Senecio hispidulus</i>										x	lc		
<i>Senecio lautus</i>		[x]	[x]		[x]			x		x	lc	o-lc	[<i>Senecio sp.</i>]
<i>Senecio repangae</i> subsp. <i>repangae</i>									H				AK 225304, <i>PJ de Lange</i> , Jan 1996
<i>Silene gallica</i> *		x									l		
<i>Solanum americanum</i>	[x]	x	[x]		[x]			x	[x]	x	o	o-lc	[<i>Solanum. nigrum</i>]
<i>Sonchus asper</i> *								x		x			
<i>Sonchus oleraceus</i> *	x				[x]				[x]		o		[<i>Sonchus sp.</i>]
<i>Stellaria media</i> *	x				x			x	x	x			
<i>Taraxacum officinale</i> *	x				x				x				
<i>Tetragonia implexicoma</i>	x	x	x	x	x			x	x	x	o		
<i>Trifolium dubium</i> *	[x]											o-lc	[<i>Trifolium sp.</i>]
<i>Wahlenbergia vernicosa</i>	[x]	[x]	[x]		[x]				[x]		o		[<i>Wahlenbergia sp.</i>]
MONOCOTS (27 + 14)													
<i>Aira caryophyllea</i> *											lc	l	
<i>Anthoxanthum odoratum</i> *		x		x	x								
<i>Arthropodium bifurcatum</i>	[x]	[x]	[x]	[x]		[x]		[x]	[x]	[x]	o-lc		[<i>A. cirratum</i>] AK 360013

<i>Astelia banksii</i>	x	x	x	x	x	x		x	x	x	o		
<i>Austroderia splendens</i>				x	x					x			
<i>Avena barbata</i> *											lc	s	
<i>Briza minor</i> *											o		
<i>Bromus catharticus</i> *											l	s	
<i>Bromus diandrus</i> *											l		
<i>Carex solandri</i>									[x]		lc		[<i>Carex</i> sp.] AK 360120
<i>Carex spinostris</i>											lc		
<i>Carex uncinata</i>		x								x	l		AK 360030
<i>Chionochloa bromoides</i>	x	x	x	x	x					x	lc	a	exposed cliffs (Fig.13)
<i>Cordyline australis</i>		x	x	x	x	x		x	x	x	o		Apart from the scattered normal adults there were also some with skinny trunks <1 m tall and narrow leaves - hybrids?
<i>Dactylis glomerata</i> *								x		x			
<i>Dianella nigra</i>									x				
<i>Dichelachne crinita</i>		x											
<i>Dichelachne rara</i> *											l		AK 359964
<i>Echinopogon ovatus</i>										x	l		
<i>Eragrostis brownii</i> *		x											
<i>Ficinia nodosa</i>	[x]	[x]	[x]	[x]	[x]			x	[x]	x	c	c	[<i>Juncus maritimus</i> / <i>J. kraussii</i>]
<i>Gahnia lacera</i>		x		x		x	[x]	x		x	la		[<i>Gahnia</i> sp.]
<i>Lachnagrostis billardierei</i>		x		x								o-lc	
<i>Lachnagrostis littoralis</i>											o		AK 360012
<i>Libertia ixioides</i>									x	x			
<i>Lolium arundinaceum</i> *		x		x									
<i>Microlaena avenacea</i>										x			
<i>Microlaena polynoda</i>			[x]		[x]			x	[x]	x	la		[<i>Oryzopsis rigida</i>] AK 360036
<i>Microlaena stipoides</i>											lc		
<i>Oplismenus hirtellus</i>		x	x							x	o		
<i>Parapholis incurva</i> *											l	o	AK 194533
<i>Phormium tenax</i>	x	x	x	x	x	x	x	x	x	x	o-lc	a	
<i>Poa anceps</i>			x		x					x	o	c	

	Steep	Gorse		Flax		Harakeke Island					NE Hara.	Comments for Harakeke (2015 visit) and vouchers	
	1999	1994	1999	1994	1999	1971	1978	1990	1999	2000	2015		1990
<i>Pterostylis banksii</i>								[x]		[x]	s		[<i>Pterostylis</i> sp.] leafy stems that had been decapitated
<i>Pterostylis</i> ? <i>graminea</i>											s		Single fruiting plant seen
<i>Rytidosperma biannulare</i>		[x]									lc	l	[<i>Rhytidosperma</i> sp.] AK 360011
<i>Rytidosperma racemosa</i> *											o		
<i>Rytidosperma unarede</i>											l		
<i>Sporobolus africanus</i> *		x										c	
<i>Thelymitra</i> sp.				x									
<i>Vulpia bromoides</i> *											o-lc		
Unaccepted Records													
<i>Coprosma grandifolia</i>									x				most likely <i>Coprosma macrocarpa</i>
<i>Coprosma robusta</i>									x				most likely <i>Coprosma macrocarpa</i>
<i>Melicytus macrophyllus</i>								x	x	x			most likely <i>Melicytus ramiflorus</i> (see AK 360031)
<i>Juncus maritimus</i> / <i>J. kraussii</i>	x	x		x					x				most likely <i>Ficinia nodosa</i>
Birds observed (18 + 7)													
kereru / kukupa								x			x		
shining cuckoo											x		
variable oystercatcher				x									
black-billed gull		x						x			x		
red-billed gull							x	x			x		
white-fronted tern							x						
little blue penguin							x	x					
grey-faced petrel							x	x		x	?x		Only burrows seen in Dec 2015
gannet													
pied shag				x				x					
harrier				x				x					
sacred kingfisher						x				x	x		
Eastern rosella *								x					

tui								x		x		
grey warbler		x				x	x	x		x	x	
fantail						x	x	x		x	x	
welcome swallow							x	x		x	x	
silvereve		x				x	x	x		x	x	
starling *								x				
myna *		x		x			x					
blackbird *		x				x	x	x		x	x	
house sparrow *		x										
NZ pipit								x				
chaffinch *						x		x			x	
goldfinch *						x		x				