

Updated vascular flora and vegetation of the Noises Islands, Hauraki Gulf

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Introduction

The vascular flora of the two main Noises Islands, Motuoropapa and Otata, were updated by Cameron (1998) along with a general introduction to the whole group and its terrestrial biota. This account updates that flora and is expanded to cover all ten islands/islets.

The islands and modifications

The Noises Islands lie at the north-east end of a chain of islands from Rangitoto, Motutapu, Rakino to the Noises at the outer limit of the inner Hauraki Gulf (Fig. 1). There are ten main islands/islets in the group that support vascular plants, and these are spread over 5 km of the Hauraki Gulf (Fig. 2). They



Fig. 1. Location of the Noises Islands at the end of the island chain from Rangitoto, Motutapu, Rakino Islands in the inner Hauraki Gulf. Area within dashed outline shown in Fig. 2. Topo250 map modified by Joshua Salter. Scale = 10 km grid.



Fig. 2. Place names of the Noises Islands, Hauraki Gulf. Islands shown as if at high tide, with rock platforms and intertidal reefs removed. Topo50 map modified by Joshua Salter. Scale = 1 km grid.

Table 1. Recorded wild vascular plant totals for each island/islet of the Noises Islands and some statistics for each island. Islands listed in decreasing size order. Recent survey date: 2015-2020.

Island	Ota*	Mho	Rup	DRn	DRs	Sco	Sun	Ike	Ora	Ter	Totals
Total no. of taxa	233	164	76	56	33	81	71	53	26	5	278
% native	59	69	50	63	67	63	58	72	58	100	59
Recent survey taxa only	185	100	58	40	27	61	49	42	20	5	210
% native	60	70	59	65	67	62	67	71	60	100	59
Area (ha)**	15.0	8.1	1.1	0.42	0.3	0.2	0.14	0.14	0.1	0.1	25.6
Height asl (m)	67	50	30	18	c.12	c.8	c.8	c.10	c.8	c.6	
Distance to larger plant source (km)	2.3	0.75	2.77	1.79	1.94	0.21	0.07	0.16	1.1	0.1	

* = Island abbreviations: **Ota** = Otata; **Mho** = Motuhoropapa; **Rup** = Ruapuke/Maria; **DRn** = David Rocks (north); **DRs** = David Rocks (south); **Sco** = Scott; **Sun** = Sunday; **Ike** = Ike; **Ora** = Orarapa/Haystack; **Ter** = Tern

**= areas mostly after Taylor (1989)

range in height from c.6 to 67 m ASL, and in size from 0.1 to 15.0 ha, comprising a total of 25.6 ha (Table 1). The islands are unoccupied except in the summer, when the owners holiday in a small historic bach on Otata. See Cumming (2016) for how the owners utilise and try to protect the islands' ecosystems. There is also a basic hut on Motuhoropapa built by the Wildlife Service in 1977–78 for their studies on Norway rats. Apart from Otata, Ruapuke/Maria is the only other island in the Noises with occasional visitors.

There are no landing structures on any of the islands, except for a small concrete pad on the SW corner of the main islet of Ruapuke/Maria Island, the Landing, which supports a derrick (now rusted and falling apart), and which in the 1970s was used to lift batteries from the service boat *Stella* for the navigation beacon erected on the island's summit in 1953 (Cunningham & Moors 1985, Rod Neureuter pers. comm.). The woody vegetation on the upper part of the island was clear-felled at that time.

Apart from the northern slopes of Otata which were burnt in c.1931, the vegetation on all the islands/islets is natural and has been allowed to persist/regenerate for at least over a century. The vegetation on Motuhoropapa appears to be the most intact and the best developed. Apart from a few garden plants near the bach on Otata and some nine phoenix palms (*Phoenix canariensis*) which were cut down in 1981–82, there have been no exotic plantings on any of the islands. Native plantings have been limited to a few individuals of some ten species near the bach, planted during the 1980s–90s (see Cameron 1998). In the autumn of 2021 the Neureuters planted 50–55 bare-rooted tawapou (*Planchonella costata*) seedlings to assist shading out

the aggressive vine, mile-a-minute (*Dipogon lignosus*), on Ruapuke Island (seed ex Ruapuke).

There are no permanent streams or creeks on the islands. However, a pre-European well, near the bottom of the largest valley close to the Otata bach, within the forest, is a useful source of water. There are also ephemeral freshwater/brackish ponds at the upper splash-zone on several of the islands.

Geology and ownership

The rocky islands are composed of Waipapa Group argillites and greywackes of Triassic–Jurassic age (Mayer 1968). When visiting in October 2016 we saw that the coastal cliffs just west of the Otata bach at the mouth of the largest valley, had greatly eroded after a recent storm (Fig. 3). Cameron (1998) outlined the early European history of the group which has been privately owned by the Neureuter family since 1933. In 1995 the islands were gifted to



Fig. 3. Eroding coastal cliff face at Otata beach by the bach after a severe storm. Photo: 11 Oct 2016. If not otherwise stated, all photographs are by the author.

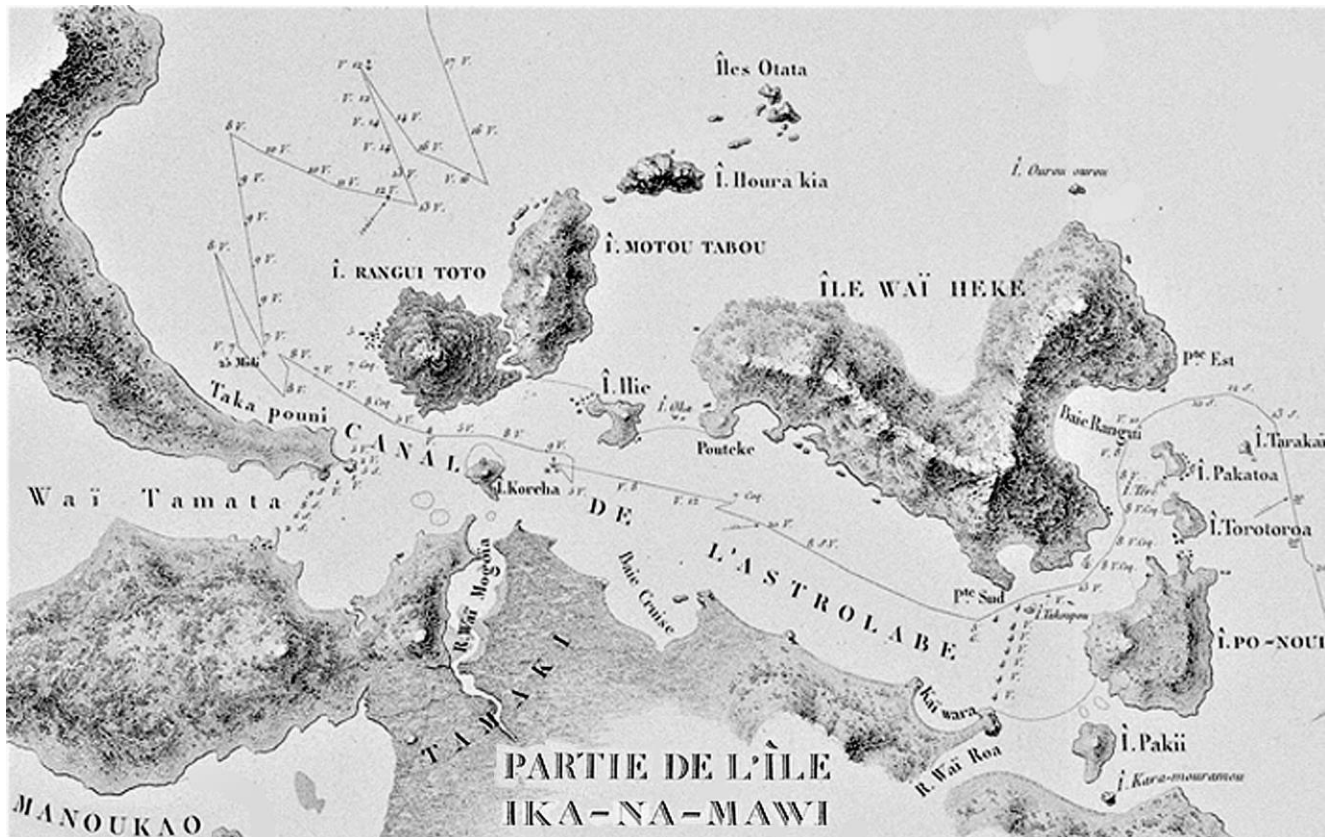


Fig. 4. Part of the Hauraki Gulf chart showing the Noises islands (as “Îles Otata”), based on Dumont d’Urville’s visit on the *Astrolabe* in 1827. “G490.D8 Carte particuliere de la Baie Shouraki et du canal de l’Astrolabe, ile Ika-na-Mawi Nouvelle-Zelande: Voyage de la corvette l’Astrolabe: execute pendant les annees 1826-1827-1828-1829; Histoire du Voyage atlas, plate no.18.” The Atlas volume is held by the Auckland Museum.

the Noises Trust which was created to help ensure their long-term protection with Rod Neureuter as Trustee and beneficiary – the extended family also regularly use the islands (Ritchie 2017). In June 2020 the original Noises Trust vested, and the beneficiary, Rod Neureuter, immediately gifted, the islands to a new Noises Trust with Rod Neureuter, Sue Neureuter, Zoe Neureuter, Rod’s son Joseph Neureuter and Zoe’s daughter Tessa Darwin as the five new Trustees. The island group lies within the rohe of Ngāi Tai ki Tāmaki, Ngāti Paoa and possibly Ngāti Wai.

Collective name of the group known as the Noises Islands (also known as Otata Is., Noisies Is.)

According to Lucy Cranwell (1981: 69), and also mentioned by Maddock and Whyte (2017: 84), the rocky island group known as the Noises Islands was named by an early French explorer who called them *Les Noisettes* – “Hazelnuts” which has been corrupted to the Noises Islands. However, the most obvious early French contender, Jules Dumont d’Urville, who visited and mapped the inner Hauraki Gulf in 1827, referred to the group as “*Les Îles Otata*”, the Otata Islands (Fig. 4, and Michael Lee pers. comm.). The first use of the name “Noisies” or “Noises” located, searching *Papers Past*, was “Noisies” in 1879 (*Auckland Star* 1879), and “Noises” in 1925 (*Auckland Star* 1925). The earliest map

found using Noises/Noisies was ‘The Noises’ in 1920 (Lands & Survey 1920 map). Although ‘Otata’ was used in early colonial times, it was frequently misspelt as “Otatou” on maps around 1843–1876. Maddock (in Maddock & Whyte 2017: 84) thought the “Noises” was: “...onomatopoeic and derived from booming of the waves and the wind roaring through the caves which fret the islands’ rugged coast.” The origin of the name “Noises / Noisies” therefore remains a mystery. “Noisies” appears to be the earlier spelling – perhaps it’s just a ‘boaties’ term for an island group with noisy seabirds?

Names of islands within the group

Four of the names are pre-European; the other names are informal. Three of them date back to Captain Frederick Stanley Wainhouse who owned the islands from 1933–1957, e.g., Scott, Sunday and Ike. Rod Neureuter (pers. comm.) and his siblings named Tern Island when they were kids due to the large numbers of nesting terns.

Names of all the Noises islands/islets from west to east (see Fig. 2):

Orarapa, Haystack

Tern – named after the nesting white-fronted terns

Motuhoropapa, Motuhurakia

Ike – named after Dwight David “Ike” Eisenhower

Scott

Sunday – named for the day the Wainhouses first walked to the island without getting their feet wet during a spring tide

Otata, Ōtata, Otatou, Trig

David Rocks – separated into a north and south group

Ruapuke, Maria

Auckland Botanical Society (ABS) visits

ABS visited Otata Island in 1951 (Hannken & Moynihan 1951) and over the last 30 years has had three field trips to the Noises Islands: 20 Mar 1993 (visiting Motuhoropapa and Otata Islands), 21 Mar 1998 (Otata), and on 26 Nov 2016 (Otata) (see Cameron 1998, 2017). Also, on 7 Apr 2008 several ABS members visited Otata, Scott and Motuhoropapa Islands (see Benham & Wilcox 2008).

Previous botanical publications, collections and visits

The flora and vegetation of the Noises Islands has been relatively well recorded over the last 140 years by different people, beginning with 18 herbarium collections by T.F. Cheeseman during 1880–83. His two trips in 1883 with the Auckland Naturalists' Field Club were recorded in the local newspapers (Anon. 1883a,b). Followed by publications by: Mason and Trevarthen (1950), Hannken and Moynihan (1951), Hannken and Trevarthen (1952), Atkinson (1960), Mason et al. (1960), Atkinson (1984) for the first flora for the whole group, Cameron (1998), and de Lange (unpubl.) for four of the smaller islands, recorded 4 Feb 1994 (David Rocks (north and south), Orarapa, Scott, Sunday).

Since 2015 EKC has been involved re-surveying the vascular plants of all ten islands/islets of the group, initially for the Noises Islands Biodiversity Plan (Richie 2017). Fuller results of that botanical survey are published here. Dates of the survey visits by EKC: 19 May 2015 (visiting Ruapuke, David Rocks N); 27–29 Nov 2015: (David Rocks N & S, Otata, Scott, Ruapuke); 15 Dec 2015 (Motuhoropapa, north end); 16 Jan 2016 (Orarapa, Tern, Ike, Sunday); 11 Oct 2016 (Otata); 22 Nov 2016 (Motuhoropapa, Ike); 26 Nov 2016 (Otata, ABS trip); 28 Sep 2017 (Scott); 23 Nov 2017 (Otata); and 17 Nov 2020 (Otata). Note – the connected steep islet off the northern coast of Otata was not visited during the current survey.

The vascular flora is supported by 333 herbarium specimens in Auckland Museum (AK), 86 in CHR, 1 in NZFRI, 3 in MNP and 1 in WELT (herbarium acronyms follow Thiers 2016). Some 72% of the flora is vouchered, mostly held in AK. Of the records confirmed during the recent survey 83% are vouchered (see Appendix). Many of the historical vouchers proved to be invaluable when checking for possible mistaken identifications of unconfirmed/doubtful records.

The two main islands:

Otata and Motuhoropapa

Otata Island (Figs. 5, 6) – the largest and tallest island of the group: roughly 0.5 km x 0.5 km, 67 m ASL, with a 110 m long tombolo and islet connected to the SW corner of Otata. The total flora is 233 species, 59% native (Table 1).

Motuhoropapa (Figs. 7, 8) – the second largest and second tallest island of the group: roughly 0.55 km long x 0.21 km across, 50 m ASL. The total flora is 164 species, 69% native (Table 1).

Vegetation of the two main islands:

Otata and Motuhoropapa

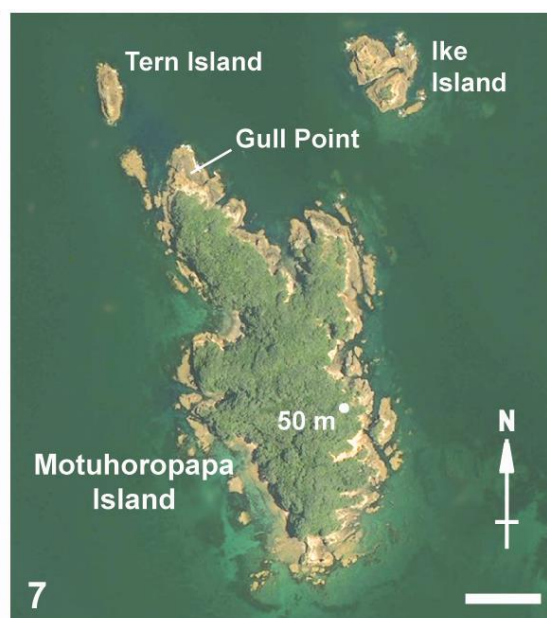
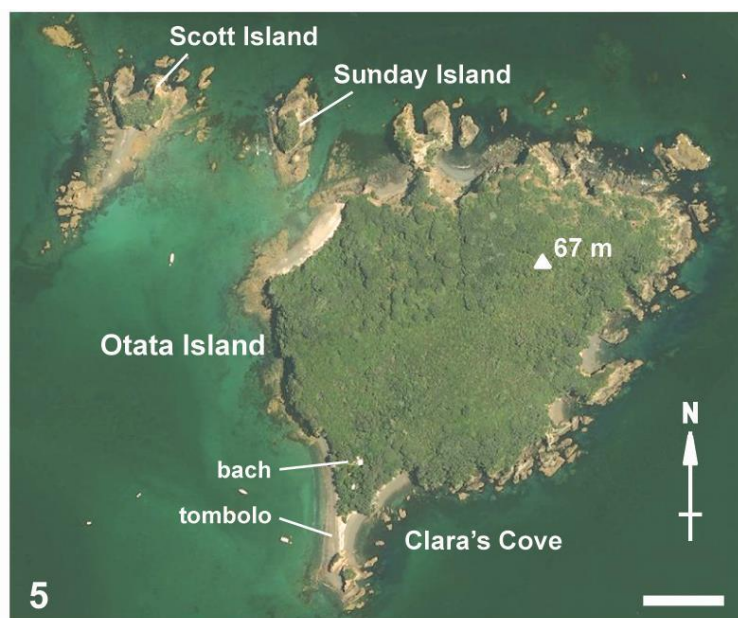
Canopy

The two largest islands, Otata and Motuhoropapa, support tall forest. On Otata it is advanced regeneration, recovering after a fire c.1931 on the northern slopes, which must have also included most of the plateau vegetation. Motuhoropapa forest is a similar composition, although the canopy is more diverse and the trees are generally larger – a reflection of the lack of disturbance over a longer time. The largest trees on both islands are pohutukawa (*Metrosideros excelsa*) c.16–18 m tall (Fig. 9). On both islands they are mostly wide-branching close to the ground, indicating that they established in the open and are most frequent on or above the coastal cliffs (Fig. 6). A fine pohutukawa on the W side of the southern valley of Otata measures just over 3 m diameter close to the ground (Fig. 10). Many of the pohutukawa on Motuhoropapa were the host of a pendulous lichen, *Usnea nidificia* (Fig. 11).

The present-day plateau canopy of Otata is dominated by houpara (*Pseudopanax lessonii*) 8–10 m tall, locally with whauwhaupaku (*Pseudopanax arboreus*), mahoe (*Melicytus ramiflorus*), coastal karamu (*Coprosma macrocarpa*), kohekohe (*Dysoxylum spectabile*), and shorter mapou (*Myrsine australis*) 5–6 m tall are locally dominant. Scattered pohutukawa are frequently emergent above this canopy. Karo (*Pittosporum crassifolium*) is common and taupata (*Coprosma repens*) occasional near the exposed edges. Very locally, whau (*Entelea arborescens*), wharangi (*Melicope ternata*), porokaiwhiri (*Hedycarya arborea*) and karaka (*Corynocarpus laevigatus*) also reach the canopy. Several houpara are dying of apparent senescence, while kohekohe has reached the canopy only locally on Otata but is currently widely and abundantly regenerating over the island.

Shrub layer

This layer is quite variable and consists of kawakawa (*Piper excelsum*), coastal karamu, hangehange (*Geniostoma ligustrifolium*), coastal mahoe (*Melicytus novae-zelandiae*), karo (Fig. 12) and

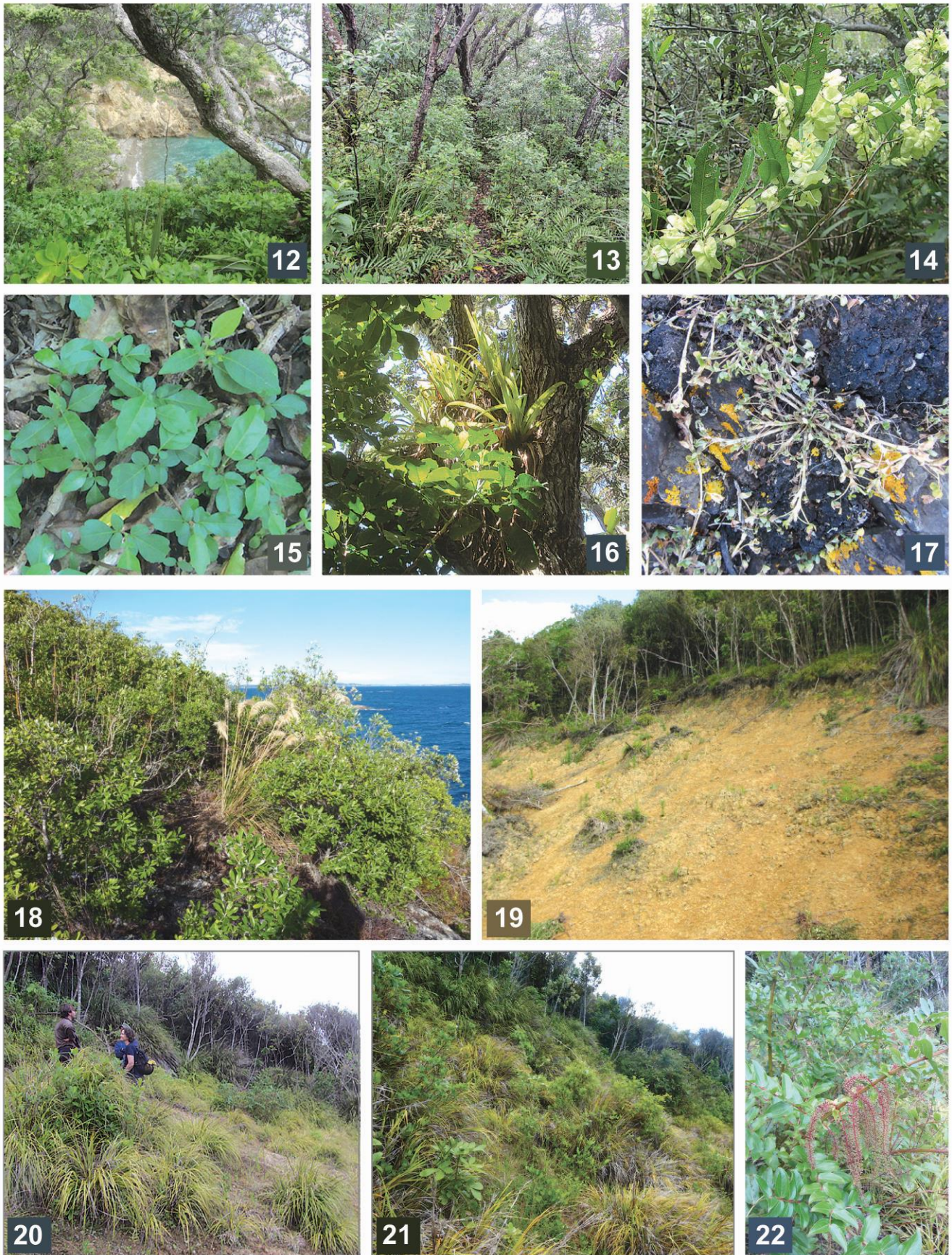


Figs. 5–11: **5.** Otata, Sunday and Scott islands. Auckland Council GeoMap, modified by Joshua Salter. Scale = 100 m. **6.** Otata looking north, tombolo 'island' in foreground, Scott I. on left, and Ike I. far left. Note how the larger trees (pohutukawa) ring the outer edges of Otata. Drone photo: Joseph Neureuter, summer 2019/20. **7.** Motuoropapa, Tern and Ike Islands. Auckland Council GeoMap, modified by Joshua Salter. Scale = 100 m. **8.** Motuoropapa, looking NW from Scott I. Photo: 28 Sep 2017. **9.** Trig of Otata, c.8 m tall, and the pohutukawa canopy another 8 m from the top of the trig. Photo: 17 Nov 2020. **10.** Largest-trunked pohutukawa, with a diameter just over 3 m, SW Otata. Photo: Richelle Kahui-McConnell, Sep 2018. **11.** The pendulous lichen, *Usnea nidificia*, to 25 cm long, commonly festooned exposed pohutukawa branches on several of the islands, but most abundantly here on NE Motuoropapa. Photo: 15 Dec 2015.

seedlings/saplings of canopy species (Fig. 13) (excluding pohutukawa), especially kohekohe, mahoe and mapou. On Motuoropapa there was a single area of akeake (*Dodonaea viscosa*, Fig. 14), most less than 2 m tall and looking youthful, but it has been recorded here since 1954.

Ground cover

Locally swards of ground ferns (*Adiantum cunninghamii* and *Doodia australis*), and scattered plants of *Asplenium oblongifolium*, are common on both islands. Thickets of bamboo sedge (*Gahnia lacerata*), patches of *Oplismenus hirtellus*, and clumps



Figs. 12–22: **12.** Under the pohutukawa canopy looking over the shrub layer of mostly houpapa 1–2 m tall, karo and coastal mahoe, W Motuhoropapa. Photo: 15 Dec 2015. **13.** Abundant regeneration of houpapa, karo, coastal karamu, mahoe and mapou under pohutukawa; *Asplenium oblongifolium* is common. SE Otata, near coastal cliffs. Photo: 28 Nov 2015. **14.** A single patch of fruiting akeake on a ridge crest on Motuhoropapa, under open pohutukawa canopy. Photo: 15 Dec 2015. **15.** Kohekohe seedlings under a mixed 6–8 m-tall canopy of kohekohe, houpapa and wharangi, plateau forest, Motuhoropapa. Photo: 22 Nov 2016. **16.** *Astelia hastata*, upper west side Motuhoropapa. Photo: 22 Nov 2017. **17.** White-flowering bird's-foot clover at the upper splash zone level, c.10 m ASL, NW Motuhoropapa. Photo: 22 Nov 2016.

of *Astelia banksii* near exposed edges, are also present. Other sedges (*Carex* spp.) and turutu (*Dianella nigra/latissima*) are uncommon. Seedlings of canopy species can be common (Fig. 15). Bare ground/leaf litter occupies some 50%.

Epiphytes

Large epiphytes are absent except for four clumps of kahakaha (*Astelia hastata*, Fig. 16) on pohutukawa on Motuhoropapa. Epiphytic ferns are virtually absent as are epiphytic mosses, a reflection of the dryness of these islands (Beever 1993).

Climbers

Only two native climbers are present in the forest: akakaikiore/NZ jasmine (*Parsonsia heterophylla*) and clematis (*Clematis paniculata*) which occur on both islands; akakaikiore is currently actively spreading on Otata. Three small patches were found of the climbing fern, *Blechnum filiforme*, by Sue Neureuter on Otata, two near the east coast, the other on the western side of the main valley climbing to 1 m, but this one could not be relocated recently – another casualty of the 2020 drought?

Open coastal herbfields

As seen on the NW peninsular of Motuhoropapa (Gull Point): the lower fringe of vegetation is frequently a herbfield next to small prostrate shrubs of taupata and miniature karo, ngaio (*Myoporum laetum*), pohutukawa, often in semi-protected rocky hollows. Between or below these low woody plants are commonly mixed mats or separate populations of glasswort (*Salicornia quinqueflora*), *Dichondra repens*, *Senecio lautus*, *Disphyma australe*, *Cotula coronopifolia*, NZ spinach (*Tetragonia implexicoma*), *Spergularia tasmanica*, *Chenopodium triandrum* (*C. trigonon* may be present in other places), *Ficinia nodosa*, *Crassula sieberiana* and *Lobelia anceps*. Exotics frequently present are: sickle grass (*Parapholis incurva*), *Polygonum tetraphyllum*, *Vulpia bromoides*, *Sporobolus africanus*, *Briza minor*, catsear (*Hypochaeris radicata*), scarlet pimpernel (*Lysimachia arvensis* s.str.), *Centaurium erythraea*, *Erigeron sumatrensis*, *Trifolium dubium*, *Crepis capillaris*, *Lotus suaveolens* and *Poa annua*. Locally in this habitat are tarweed (*Bellardia viscosa*) (NW Motuhoropapa), hare's-tail (*Lagurus ovatus*) and bird's-foot clover (*Trifolium ornithopodioides*) (Fig. 17); this last species is only known in the Hauraki Gulf from here and the adjacent Ike I.

Northern steep shrubby open coastal slopes of Otata

This is quite a different habitat from those seen elsewhere in the group. As already mentioned, this area is recovering from a fire in c.1931. Because it is exposed and N-facing it has been slow to regenerate compared with more sheltered/shaded locations. The main woody species include: houpara, karo, pohutukawa, coastal karamu, mapou; and more locally manuka (*Leptospermum scoparium*), NZ broom (*Carmichaelia australis*) and mingimingi (*Leucopogon fasciculatus*). Other common species are: bracken (*Pteridium esculentum*), *Doodia australis*, *Asplenium oblongifolium*, *Ficinia nodosa*, *Haloragis erecta*, bamboo sedge, *Astelia banksii* and *Clematis paniculata*. However, because of the openness, many species occur here that are absent or very local elsewhere in the Noises. These include: *Anthosachne kingiana*, toetoe (*Austroderia splendens*, Fig. 18), *Cheilanthes* (2 spp.), *Geranium solanderi*, *Morelotia affinis*, manuka, *Ozothamnus leptophyllus*, *Pelargonium inodorum*, *Pellaea rotundifolia* and *Pomaderris amoena*. *Asplenium haurakiense* was present only on the lower slopes.

The slump-face on Otata Island

During winter–spring 2011 a slump occurred on Otata approx. 75 m south of the trig (36.695454°S, 174.975448°E), during a very wet period (R. Neureuter pers. comm.). It measured c.20 m across x 15 m, on a steep SE-facing slope, resulting in an area of exposed bare clay with a few clods of plants (Fig. 19) which was rapidly colonised (Figs. 20, 21). EKC was shown the slump on 27 Nov 2015 and revisited it in Nov 2017 and Nov 2020. During those visits, 2 fern, 32 dicot and 13 monocot species were recorded (see Appendix, species present marked "S"), 57% of which were indigenous and 14 were woody species or vines. Some 50% of the area in 2015 was bare clay; bamboo sedge was the commonest species, the largest plants along the lower edge. By 2020 bamboo sedge had increased, to cover about 50% of the site. Interesting plants found on this new open clay site included: three new records for the island group (*Epilobium ?billardioreanum* subsp. *cinereum* - an old dried out specimen, *Senecio esleri*, and *Symphyotrichum subulatum*); *Cortaderia selloana* (weeded out by Rod Neureuter); some 40 specimens of *Microtis unifolia* (only population seen); four plants of tutu (*Coriaria arborea*) to 3 m tall (Fig. 22). Tutu were the tallest

Figs. 12–22 cont.: **18.** Only 3–4 seeding plants of toetoe were visible from the sea on the northern cliffs of Otata. It is present but scarce on four islands. Photo: S. Heiss-Dunlop, 23 May 2020. **19.** The slump-face which occurred late in 2011 on central Otata I. Photo: Rod Neureuter, Jan 2012. **20.** Slump-face four years old on Otata, looking east; bare areas and abundant small clumps of bamboo sedge. Photo: 27 Nov 2015. **21.** The same slump-face from a similar viewpoint five years later. Coastal karamu, koromiko and houpara are prominent; bamboo sedge has increased in size, and bare areas have been greatly reduced. Photo: 17 Nov 2020. **22.** Tall flowering tutu shrubs colonising the slump-face. Photo: 27 Nov 2015.

plants on the slip-site in 2015, utilising their advantage of possessing nitrogen-fixing root nodules. Sporelings of mamaku (*Cyathea medullaris*) were abundant along the upper, damp margin of the slump-face in 2015, but by 2020 there were only a few survivors, some with fronds to 1.0–1.6 m long that had survived the big drought of summer–autumn 2020. Pohutukawa seedlings were common and by 2020 had reached 80 cm tall. Most of these slump-face species have wind-blown seed/spores. This slump-face provided a unique opportunity to see what seeds were blowing in the “seed rain”.

Brief description of the smaller islands/islets

The vegetation of the smaller, rocky islands/islets is quite variable; most of them lack pohutukawa and have a woody vegetation dominated by karo, taupata, houpara and coastal mahoe. On one islet, Tern I., the only woody species present was taupata. Some of the islands have virtually no soil, e.g., David Rocks and Tern Island. However, Ruapuke/Maria I. has rich, deep topsoil fertilised by a large burrowing seabird population. All these islands are susceptible to droughts.

Ruapuke/Maria Island (Figs. 23, 24) – is the most isolated island in the group, being 1.7 km from David Rocks and 2.8 km from Otata, roughly oval in shape with a joined rock stack on its W side, totalling c. 210 m long x 130 m across, 30 m ASL. There is a dense cover of vegetation, the main woody vegetation being taupata, karo, coastal mahoe, tawapou (the best population of the Noises) with occasional wharangi and boxthorn (*Lycium ferrocissimum*), and coastal karamu is scarce. The upper areas that were cleared for the navigation light are dominated by bracken, mile-a-minute and inkweed (*Phytolacca octandra*) (Fig. 25, 26). In areas with tall dense taupata the mile-a-minute is generally absent in the shade (Fig. 27), but in the sun it climbs into the canopy and appears to cause the canopy to collapse (Fig. 28). A small patch of mile-a-minute was observed on the western islet of Ruapuke on 27 Apr 1994 (EKC and de Lange pers. obs.). Ruapuke is the only Noises locality for nine species of weeds, including tree mallow (*Malva arborea*) which thrives around the lower fringes of the vegetation and a single population of *Cyperus eragrostis* by the base of the beacon pole on the summit. The island has rich soil and is well-fertilised (Fig. 29) by the many seabirds that nest there. There is no ngaio, pohutukawa or flax (*Phormium tenax*) – too dry? The total flora is 76 species, 50% native (Table 1). Norway rats were eradicated from here in 1960 – making it famous for being the first recorded eradication of rats from a New Zealand island (Moors 1985, Towns & Broome 2003).

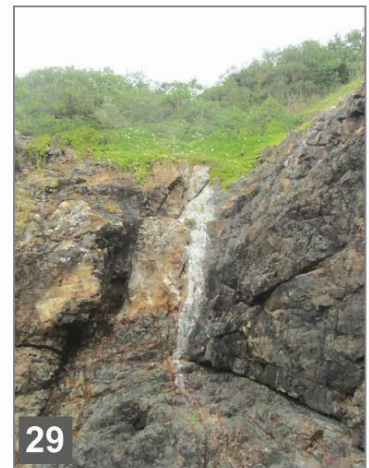
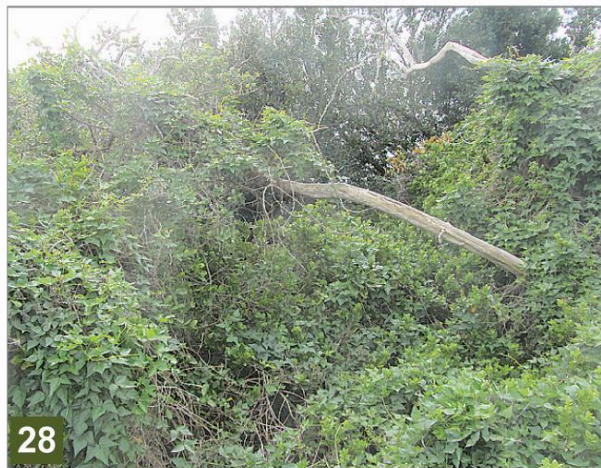
David Rocks (Fig. 30) – are a collection of five rocky peaks, four of them clustered together forming the north group, and a single peak to the south

separated by a channel of c.45 m wide at low tide. For this reason, they have been treated as two separate groups for this article. They are quite remote from the other Noises Islands, some 50% bare rock, stunted vegetation and prone to drought; e.g., when visited by EKC on 27 Nov 2015, it was dry and many species showed stress due to drought, with some woody species appearing close to death. The woody vegetation is dominated by taupata, karo, houpara with occasional coastal mahoe and boxthorn (mostly young plants or regrowth). As with Ruapuke, there is no ngaio, pohutukawa or flax, although pohutukawa was recorded in 1957 (Gillham 1960). Only EKC and Peter de Lange have separated their David Rocks records – earlier records are assumed to be from the larger N group.

David Rocks north (Fig. 31) – collectively measure c.180 m long x 180 m across, 18 m ASL. The best vegetation of squat houpara 3–4 m tall (Fig. 32) crowns the NW islet. There is a continuous forest canopy down the upper W side of the islet dominated by houpara (2–4 m tall), then karo and below that prostrate taupata (Fig. 33). All other islets of the group have a more stunted, broken woody cover (Fig. 34). In shady places there can be a dense ground cover of *Asplenium haurakiense*, and the white-flowered *Linum monogynum* was seen in full flower (Fig. 35) on a S-facing slope in the semi-open, growing amongst a mat of NZ spinach. What appeared to be drought damage was evident in places with emergent dead stems present and youthful regrowth around them. The total flora is 56 species, 63% native (Table 1).

David Rocks south (Fig. 36) – c.70 m long x 70 m across, c.12 m ASL. Woody shrubs are scattered over the island, the tallest, a small thicket on the S face of karo, taupata and houpara to 2 m tall. There was a small saltwater pond at the highwater spring level towards the northern end, with an associated herbfield of *Cotula coronopifolia*, *Spergularia tasmanica*, sickle grass, and mats of glasswort. The total flora is 33 species, 67% native. Spotted shags used to nest in a cave on the SW corner of this islet and were last observed breeding there in 1971 (Cunningham & Moors 1985).

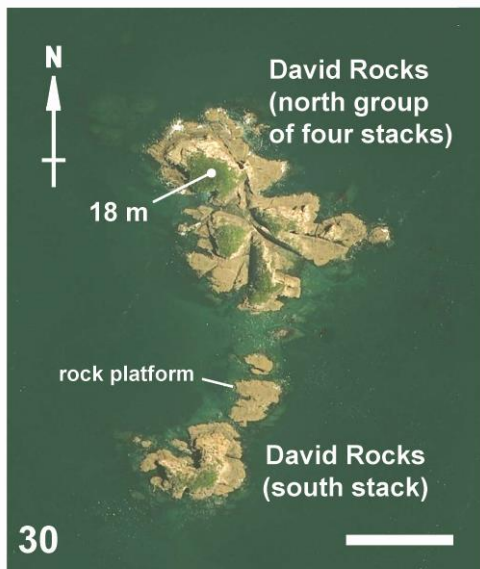
Scott Island (Figs. 5, 6, 37) – lies 120 m off the W side of Sunday and 200 m NW of Otata. It is nearly 200 m long, with a knob of rock c.4 m tall at the S end, joined by an intertidal gravel tombolo to the larger island at the N end which measures c.80 m across x 70 m, c.10 m ASL. The S half of the main island is forested, and the N half is open with low shrubs and herbs (Fig. 37). What disturbance may have caused this marked differentiation – a storm? Apart from the pohutukawa, 4–6 m tall, crowning the main ridge, the rest of the woody vegetation is mainly shrubs of houpara, karo, taupata, and, more



Figs. 23–29: **23.** Ruapuke/Maria Island. The nearby rocky reefs are submerged at high tide. Auckland Council GeoMap, modified by Joshua Salter. Scale = 100 m. **24.** Ruapuke/Maria Island from the north side. Photo: 19 May 2021. **25.** Mile-a-minute (*Dipogon lignosus*) vine with pink flowers, green and ripe pods, Ruapuke, N side. Photo: 29 Nov 2015. **26.** White-flowering mile-a-minute dominating the bracken area at the summit, Ruapuke I. Photo: 29 Nov 2015. **27.** Under a canopy of taupata, bare ground with clumps of *Asplenium haurakiense* surround the large burrows of oi (grey-faced petrels), which pluck adjacent foliage for their burrows. South side Ruapuke I. Photo: 29 Nov 2015. **28.** Taupata canopy collapse caused by the mass of mile-a-minute vine, Ruapuke. Photo: 19 May 2015. **29.** A white stream of rich seabird nutrients (guano) running down the northern rock face of Ruapuke Island. These nutrients fuel the rapid plant growth observed on the island. Photo: 29 Nov 2015.

locally, coastal mahoe, hangehange and mapou. Within the forest was a local, healthy population of the threatened *Senecio scaberulous* (Fig. 38). In the open NE part of the island were over 24 prostrate mats of *Pimelea urvilleana* (Fig. 39) – this is an

excellent healthy population. In the open area on 28 Nov 2015, a single variable oystercatcher and a black-back gull were sitting on nests containing eggs. The island has a total flora of 81 species, 63% native (Table 1).



Figs. 30–39: **30.** David Rocks – five peaks supporting vascular vegetation. The southern islet is separated by a channel approx. 45 m wide at low tide, increasing to approx. 100 m at high tide. Image: Auckland Council GeoMap, modified by Joshua Salter. Scale = 100 m. **31.** David Rocks north, from the south group. Photo: 27 Nov 2015. **32.** *Squat houpara* 3–4 m tall with *Asplenium haurakiense* underneath, summit of NW peak of David Rocks north. Photo: 19 May 2015.

Sunday Island (Figs. 5, 6, 40) – is just off the NW coast of Otata, and the separating channel can be waded across at low tide. The island is c.100 x 40 m, c.8 m ASL. The main ridge was crowned with pohutukawa to 6 m tall, flanked by houpara, karo, and mapou was present in one place. The pendulous lichen, *Usnea nidificia*, was frequent on the pohutukawa branches. Thickets of *Astelia banksii* were present and, coupled with the woody vegetation, created some of the densest vegetation of any of the islands. Seven phoenix palm seedlings were found and dispatched by Rod Neureuter. The island has a total flora of 71 species, 58% native.

Ike Island (Figs. 7, 41) – consists of two blocks which are joined on the E side by a reef; together they cover c.110 x 50 m, c.10 ASL. The slightly lower N block contains the tallest tree, a pohutukawa c.5 m tall partly sheltered on the W side (not on the summit area), a 4 m-tall pohutukawa stands out, otherwise the vegetation is scattered fairly low, woody plants. Two freshwater/brackish rock pools are surrounded by low herbfields (Fig. 42), dominated by *Cotula coronopifolia*, with *Lobelia anceps*, large mats of NZ ice plant (*Disphyma australe*) and bare rock common. A second location for the exotic bird's-foot clover (Fig. 17) was discovered here in the herbfield. The taller S block is crowned with several short (c.4 m) very wide pohutukawa. The total flora is 53 species, 72% native (Table 1). White-fronted terns were nesting there on 16 Jan 2016 (c.30 pairs present, many eggs broken – caused by a harrier?), which caused EKC to return on the 22 Nov 2016 to survey it more fully when the terns were not nesting.

Orarapa/Haystack Island (Figs. 43, 44) – excluding the wave-washed reef on its northern side, it is roughly oval, c.35–30 m across, 8 m ASL. The islet's sides are perpendicular to undercut making access to the flattish summit challenging. The summit was crowned with scattered woody vegetation – dominated by many gnarly taupata to 1.8 m tall (the tallest vegetation), seven youthful-looking karo to 1.5 m tall, occasional coastal mahoe, tangles of *Muehlenbeckia complexa*, and c.8 plants of boxthorn which were mostly uprooted by Rod Neureuter (Fig. 45). Apart from these woody species some 21 herbaceous species have also been recorded (see Appendix). No occupied bird's nests, only an old gull nest present. Orarapa is 1.4 km from Rakino Island

and 1.1 km from Motuhoropapa. Being the closest Noises' island to Rakino, it appears to act as a 'stepping-stone' for some species to reach the Noises, e.g., rhamnus, hare's-tail grass.

Tern Island (Figs. 7, 46) – c.80 x 30 m, c.6 m ASL is mainly bare eroded greywacke rock, with loose, bleached seashells (from seabirds) and no soil (Fig. 47). Vegetation is sparse among the bare rock, small mats of NZ ice plant being the main vegetation, also three low clumps of taupata and three other hardy halophyte species (*Senecio lautus*, *Spergularia tasmanica*, glasswort). Red-billed gulls and white-fronted terns nest on the island – however, harriers predate the tern eggs and chicks (R. Neureuter pers. comm.). Black-backed gulls frequent the island.

Wild vascular flora

The total recorded wild vascular flora is 278 taxa of which 59% is native. Individual island totals are also given in Table 1 and fully listed in the Appendix. If the records of only the recent survey are taken, then all these totals are reduced, except for the smallest island, Tern, with five species. For historical records without voucher a specimen synonymy is given as appears most probable. Some historical records are doubtfully correct and are either treated under 'Unaccepted records' or commented on under 'Comments' in the Appendix.

As expected, generally the larger islands have the larger floras, except for the two David Rocks groups, which both have smaller floras than their island size would suggest compared with the other islands (Table 1). This can be explained by their exposed nature, paucity of soil making the group extremely prone to droughts and storms, and their low height and sloping sides, which offer little protection from wind or the sea.

Five species are recorded for all ten of the islands, and not surprisingly they represent the total flora of the storm-washed Tern Island, and all five are native species (see Appendix) that are extremely tolerant of salt-laden winds, exposure and droughts. Eleven species are recorded for nine islands – and are on all the islands except Tern. Seven of these records are native, and four are naturalised: *Bromus diandrus*, *Parapholis incurva*, *Sonchus oleraceus* and *Vulpia bromoides*, three of which are annuals. Annuals avoid the extremes of droughts by surviving dry periods as seed.

Figs. 30–39 cont.: 33. Houpara dominates the upper layer, mixed with karo below, and prostrate taupata lower left. NW peak of northern group. Photo: 27 Nov 2015. **34.** Typical low scrub and exposed rock on three peaks of the north group, looking SE from the NW peak, at low tide. Ruapuke in the distance. Photo: 27 Nov 2015. **35.** *Linum monogynum*, in flower, on David Rocks north. Photo: 27 Nov 2015. **36.** David Rocks south, from the northern group, near low tide, exposing rock platform. Photo: 27 Nov 2015. **37.** Scott Island seen from Sunday I. looking northwest. Motuhoropapa beyond. Photo: 16 Jan 2016. **38.** *Senecio scaberulous* on Scott Island. Photo: 28 Sep 2017. **39.** *Pimelea urvilleana* in full flower. NE side of Scott I. Photo: 28 Nov 2015.



Figs. 40–51: **40.** Sunday Island, seen from Otata (Scott and Motuhoropapa Is. beyond). Photo: 11 Oct 2016. **41.** Ike Island in two blocks – the pohutukawa standing out; but the tallest one (5 m) blends in with the rock on the lower right of the left-hand block. Seen from Gull Point, Motuhoropapa I. Photo: 15 Dec 2015. **42.** Brackish/freshwater rock pool, fringed with *Cotula coronopifolia* and NZ ice plant. Ike I. looking N. Photo: 22 Nov 2016. **43.** Orarapa/Haystack Island. Auckland Council GeoMap, modified by Joshua Salter. Scale = 100 m. **44.** Orarapa/Haystack Island at low tide, seen from the northern cliffs of Rakino I. Photo: 22 Nov 2017. **45.** Rod Neureuter attacking boxthorn on the top of Orarapa. Photo: 16 Jan 2016. **46.** Tern Island from NW peninsular of Motuhoropapa. Photo: 15 Dec 2015. **47.** Small mats of NZ ice plants among the rocks are the main vegetation on Tern island. Note the white gastropod shells, presumably purposely dropped by feeding black-backed gulls to break them open. Photo: 16 Jan 2016. **48.** Poroporo (*Solanum aviculare*) in the forest near some windthrow on Motuhoropapa, the only location for this species in the Noises. Photo: 15 Dec 2015. **49.** Compact ngaio shrubs flowering on open rocky slopes of NW Motuhoropapa. Photo: 15 Dec 2015. **50.** Tawapou on Ruapuke I. that was "trimmed" by Maritime NZ contractors has since regrown. Photo: Rod Neureuter, Jan 2012. **51.** Louise Furey pointing out the midden, with charcoal below and above the Rangitoto ash layer, eroding out of the coastal bank at the mouth of the largest valley on Otata. Photo: 17 Nov 2020.

Table 2. Wild vascular plant totals for each different plant group / life form for the Noises Islands.

Plant group/life forms	Native taxa	Naturalised taxa	Total taxa
Ferns & Lycopods	29	–	29
Trees & shrubs (dicots & monocots)	47	9	56
Dicot climbers and related trailing taxa	8	4	12
Dicot herbs	46	70	116
Grasses	11	27	38
Rushes & Sedges	12	2	14
Monocot/dicot epiphytes	1	–	1
Monocot herbs (not covered above)	9	3	12
Totals	163	115	278

The totals under 'Plant group/life forms' and whether native or naturalised are presented in Table 2. It shows that by far the largest group of naturalised species is the herbaceous group, with most having minimal impact on the indigenous flora; naturalised woody species are only 16% of that group; there are no naturalised ferns or lycopods and only a single native epiphyte. A third of the dicot climbers are naturalised species and all are troublesome environmental weeds; fortunately two appear to have been eliminated (*Lathyrus latifolia*, *Passiflora edulis*), moth plant (*Araujia sericifera*) is ongoing and mile-a-minute is proving to be the hardest of all the weeds on the Noises to control.

Threatened and At-Risk species and their current status on the Noises Islands

Nationally Threatened and At-Risk vascular plants recorded for the Noises Islands (following de Lange et al. 2018)

Nationally Critical

Senecio scaberulus – local on Scott, and 1994 records for Otata and Sunday (Fig. 38).

Nationally Vulnerable

Geranium retrorsum – 3 island records by Atkinson (1984), unconfirmed.

Metrosideros excelsa – abundant to locally common on 5 islands.

Nationally At-Risk/Declining

Anthosachne kingiana – recorded on 5 islands, but only Otata confirmed during present survey.

Geranium solanderi – local on Otata.

Leptospermum scoparium – recorded for two largest islands, only Otata confirmed.

Solanum aviculare var. *aviculare* – currently 1–2 plants on Motuhoropapa (Fig. 48); evidently it was more common there after windthrow in the 1990s (Sue Neureuter pers. comm.).

Nationally At-Risk/Relict

Planchonella costata – recorded wild on 4 islands, and in April 2021 also planted bare-rooted on two of these from local seed.

Sicyos mawhai – historical wild records from Otata and re-introduced in 2011 from the Mercury Is., now spreading by seed.

Nationally At-Risk/Naturally Uncommon

Bromus arenarius – single sight record by P.J. de Lange in 1994–95 (Cameron 1998).

Ozothamnus leptophyllus – recorded on 3 islands, but only a few plants seen on northern regenerating slopes of Otata in recent survey.

Nationally Non-resident/Coloniser

Senecio ?linearifolius – on a mixed herbarium sheet (AK 32115), collected by Lucy Cranwell in 1932, and thought to possibly be this species.

Regionally Threatened & Uncommon vascular plants recorded for the Noises Islands and their current status on the islands (following Stanley et al. 2005)

Regionally Endangered

Scleranthus biflorus – recorded on 'Tombolo Id' by Mason & Trevarthen (1950), and Atkinson (1984) for Otata.

Regionally At-Risk/Declining

Myoporum laetum – recorded on 4 islands, locally common on Motuhoropapa (Fig. 49) which is a regionally important population isolated from Australian ngaio (*M. insulare*) which it can hybridise with.

Regionally At-Risk/Sparse

Chenopodium triandrum – this sp. and the more common Hauraki Gulf related species, *C. trigonon*, occur on 6 islands each, overlapping on 3 of them. Best population on Motuhoropapa.

Linum monogynum – recorded on 5 islands, four confirmed in the recent survey. In 1993 the population on northern Motuhoropapa was thriving (pers. obs.), now apparently almost gone (Fig. 35).

Pelargonium inodorum – recorded for 2 islands, only a few plants seen on northern regenerating slopes of Otata in recent survey.

Psilotum nudum – recorded for 2 islands, only one in recent survey – scattered plants in SW plateau forest on Otata.

Pteris carsei – recorded for 4 islands, the only ones seen in the recent survey were by the well on Otata; they died during a drought.

Wahlenbergia vernicosa – present during current survey on 8 islands, good populations on several.

Environmental weeds

Because of the Neureuters' continual vigilance and constant action on weeds over many decades, the Noises Islands have the least weed problem of any islands in the inner Hauraki Gulf (pers. obs.). The main environmental weeds that are being managed on the Noises Islands are listed in Table 3, and all plants being managed on the group are marked with an 'M' in the Appendix.

The only exception to the decreasing populations of all of the managed species is mile-a-minute vine which despite a vigorous effort over many years, has so far proved too difficult. This is mainly because of the complicated situation on the only island where it occurs, Ruapuke, which has a very large population of nesting seabirds, an abundance of nutrients, the upper canopy having been topped around the navigation beacon for the last 60 years, and the apparently long-lived nature of the seed. For example, white-faced storm petrels (*Pelagodroma marina*) are absent during Mar–Aug, and diving petrels (*Pelecanoides urinatrix*) are absent Dec–Mar/Apr (Matt Rayner pers. comm.). This leaves the best weeding window as March. Since installation of the beacon on the summit of Ruapuke in 1953, Maritime NZ has continually kept the upper woody vegetation cleared, mainly tawapou (Fig. 50), until c.2015 when agreement was reached to stop cutting the vegetation and discussions were initiated to raise the beacon instead (R. Neureuter pers. comm.). In April–May 2021 a boardwalk was partly constructed on the SW side of the main island, from the Landing track above the forest canopy to the summit, so that the beacon can be serviced at any time of the year without disturbing the nesting seabirds. The hope is to extend the boardwalk from the beacon down the ENE side to the existing canopy on that side in autumn 2022, to aid access for seabird research and allow better weed control while the seabirds are present.

Altogether, there are four legumes on Ruapuke that are unknown on any of the other islands of the group, i.e., mile-a-minute, brush wattle (*Paraserianthes lophantha*), everlasting pea (*Lathyrus latifolius*), and two-seeded vetch (*Vicia disperma*). There is a possibility that these may have been carried to the island by seabirds, e.g. white-

facéd storm petrels. This theory is based on Alan Tennyson (1995) observing kowhai (*Sophora* sp.) seeds in the guts of white-faced storm petrels on the Chatham Islands; from that observation he suspected that storm petrels had introduced brush wattle to the relatively unmodified Karewa Island, in the Bay of Plenty. More than 1000 breeding pairs of white-faced storm petrels nest on Ruapuke Island (Matt Rayner pers. comm.). Legume seeds frequently float in seawater and petrel species are known to often swallow floating objects at sea. Supporting this theory is the fact that Ruapuke is the only island in the Noises group with these four legume species, and mile-a-minute, brush wattle and gorse (*Ulex europaeus*) are also weeds on the native-dominated vegetation of the remote Moturemu Island in the Kaipara Harbour, where grey-faced petrels (*Pterodroma macroptera*) nest (Cameron & Beard 1990). Evidently Ruapuke is also a starling roost (S. Neureuter pers. comm.); however, no legume seed was recorded in traps under starling roosts at two sites in the Hauraki Gulf, Motuihe and Tiritiri Matangi Islands (Shelley Heiss-Dunlop pers. comm.). Alternatively, the legumes may have been accidentally introduced by people visiting the island.

Table 3. The main Environmental weeds that are being managed on the Noises Islands.

[x] = no. of islands not recorded by the present survey, but historically reported
 R = Rain, thought to be in the continual "seed rain" from other islands e.g. Rakino Island (via birds or wind)
 L = Local, established from a planted parent(s) now removed on Otata

Weed species	No. of islands	Rain/Local
boxthorn (<i>Lycium ferocissimum</i>)	8	R
brush wattle (<i>Paraserianthes lophantha</i>)	1	
everlasting pea (<i>Lathyrus latifolius</i>)	[1]	
inkweed (<i>Phytolacca octandra</i>)	3	
mile-a-minute (<i>Dipogon lignosus</i>)	1	
moth plant (<i>Araujia sericifera</i>)	2	R
pampas grass (<i>Cortaderia selloana</i>)	1 + [4]	R
phoenix palm (<i>Phoenix canariensis</i>)	2	L
ramnus (<i>Rhamnus alaternus</i>)	4 + [1]	R
stinking iris (<i>Iris foetidissima</i>)	[1]	L
tree mallow (<i>Malva arborea</i>)	1	
umbrella sedge (<i>Cyperus eragrostis</i>)	1	

Planted flora

Plantings on the Noises Islands have been limited to the area near the bach on Otata. Most of the exotics were planted by the Wainhouses (1940–57), and the natives were planted during the 1980s–1997 (see Cameron (1998) and the Appendix). Many of these plantings have died out or have been removed. The remaining exotic plantings are either not spreading or are controlled, with the exception of cineraria (*Pericallis × hybrida*) which has spread to SE Otata's coast. The spring bulbs that Cameron (1998) reported as unseen, probably had gone by the 1970s (Neureuter's pers. comm.). There are five native species reproducing on Otata that have most likely originated from an introduced planted specimen – these are separately marked (#*) in the Appendix, e.g.: karaka, kowhai (*Sophora chathamica*), nikau (*Rhopalostylis sapida*), tawapou and mawhai (*Sicyos mawhai*). The latter was historically recorded wild for Otata.

Non-vascular plants

Mosses – Mason & Trevarthen (1950) recorded six mosses from Otata Island. Beever (1993) recorded 30 species from the four main islands, based on her visit to Motuhoropapa and Otata in 1993 and earlier herbarium collections mainly by T.C. Chambers in 1950 and L.B. Moore in 1954. There are 86 moss specimens in AK, 8 in CHR and 9 in WELT.

Liverworts – Mason & Trevarthen (1950) recorded three liverworts from Otata. There are 11 liverwort specimens in AK and one in MPN, covering six species.

Lichens – 56 specimens in AK – nothing appears to have been published.

Algae – Dellow (1950) recorded 32 species of marine algae from the Noises. Wilcox (in Benham & Wilcox) and Wilcox (2018) described the rocky intertidal algal flora of Otata and commented that it was surprisingly bare. There are 47 specimens in AK, 4 in MNP collected by Betty Molesworth in 1938, and 6 in WELT.

Fauna – brief notes

Cameron (1998) summarised much of the faunal knowledge published up to that date; additional information is presented here. Unfortunately, rats did reinvade after the 1997 poisoning. However, by 2002 the Noises Islands were (again) declared rat-free (Ritchie 2017) and they have stayed that way. The presence of garden snails (*Cantareus aspersus*) on Otata was omitted by Cameron (1998) – they could negatively impact on the rengarenga and have been on the island as long as Sue Neureuter (pers. comm.) can remember. Wetapunga (*Deinacrida heteracantha*) were initially introduced to Motuhoropapa in 2015 by the Auckland Zoo, with additional releases the following year (Ritchie 2017). In June 2016 they were introduced to Otata, also by the Auckland Zoo, and followed by a couple

of subsequent releases. Duvaucel's geckos (*Hoplodactylus duvaucelii*) were released on Otata in Dec 2020 by Massey University (R. Neureuter pers. comm.).

Fur seals are quite regular now at the Noises, particularly during winter / spring months where at times there can be as many as ten hauled out on the rocks on the northern side of Otata. In summer there are often one or two that hang around that general area (R. Neureuter pers. comm.). Fur seals can influence plant growth by adding nutrients to the system.

There are 15 Nationally Threatened and At-Risk bird species recorded on the islands or from the sea around the islands (Richie 2017, from Department of Conservation 2014), including >1000 breeding pairs of white-faced storm petrels on Ruapuke (Matt Rayner pers. comm.).

Birds seen by EKC during the surveys, 2015–20

The birds seen during the botanical surveys are recorded in the Appendix. Also, Australasian gannets were frequently seen flying/fishing near the islands. Seabird burrows were most frequent on Ruapuke. A detailed bird account for the islands is given by Cunningham and Moors (1985).

Discussion

Gaps in the flora

The absence of kanuka (*Kunzea* spp.) and paucity of manuka usually indicates a recent history without fire. However, in this case we know that there was a fire on northern Otata in c.1931. The other sizeable island, Motuhoropapa, has a canopy that appears to have been mostly undisturbed for well over a century. Adjacent Rakino Island also appears to lack natural stands of kanuka (EKC and S. Heiss-Dunlop pers. obs.), so, in the case of the fire on Otata, the seed source of kanuka appears to have been too distant to reach the burnt area. If kanuka had managed to reach Otata, the regeneration sequence would have been different and some kanuka would still be present.

The coastal herb, *Samolus repens*, is another absentee from the Noises group that, curiously, also appears to be absent from Rakino Island (EKC and S. Heiss-Dunlop pers. obs.). The various brackish spring-high-tide/freshwater pools with coastal herbs around the Noises coast look ideal for this species. Perhaps in summer these areas are just too dry for it to survive, although it does occur on Rangitoto Island (Wilcox 2007) where conditions should be similar.

New arrivals

The possible mode of arrival to the Noises Islands of the 25 new species since 1998 is presented in Table 4. Note that a third of them are thought to be human

Table 4. Possible mode of arrival to the Noises Islands for all new wild vascular plant records during 1998–2021.

Dispersal method (long distance or local)	Native	Naturalised	Combined (%)
Human	–	<i>Daucus carota</i> <i>Ehrharta erecta</i> <i>Galium aparine</i> <i>Passiflora edulis</i> <i>Persea americana</i> <i>Poa trivialis</i> <i>Trifolium ornithopodioides</i> <i>Veronica arvensis</i>	8 (32)
Wind	<i>Blechnum filiforme</i> <i>Diplazium australe</i> <i>Epilobium ?billardierei</i> <i>Senecio esleri</i>	<i>Ageratina riparia</i> <i>Symphytotrichum subulatum</i>	6 (24)
Bird (internal)	<i>Beilschmeidia tarairi</i> <i>Hedycarya arborea</i> <i>Pittosporum tenuifolium</i> <i>Vitex lucens</i>	<i>Rhaphiolepis bibas</i>	5 (20)
Overlooked (not new)	<i>Lachnagrostis littoralis</i>	<i>Trifolium glomeratum</i> <i>Trifolium subterraneum</i>	3 (12)
From adjacent planted source	–	<i>Alocasia brisbanensis</i> <i>Prunus persicaria</i>	2 (8)
Bird (external)	<i>Sagina procumbens</i>	–	1 (4)
Totals	10	15	25 (100)

introductions, being exotic and all found near the Otata bach, except for bird's-foot clover, which was first located on NW Motuhoropapa (Cameron 2016) and later on Ike. At both locations it was in a low herbfield at the extreme upper splash zone. Cameron (2016) suggested that this previously unrecorded species for the Hauraki Gulf might have reached here via the dirty boots of scientists from southern New Zealand, accessing the hut on Motuhoropapa, or by the black-backed gulls which used to nest in reasonable numbers (c.20 pairs; now down to 1 pr) on the NW end of Motuhoropapa (Gull Point). Since then, EKC has checked the large black-backed gull colony on nearby Rangitoto Island for bird's-foot clover but failed to locate any – adding weight to the human-introduced theory. It was possibly spread later from Motuhoropapa to Ike by gulls. Table 4 shows the importance of the need for people and their gear to be weed-free when landing on any of the islands.

The forested area around the well on Otata in the southwest-facing valley is possibly the most humid area of the Noises. It therefore is not surprising that it is the locality for a new fern establishing (*Diplazium australe*), four wheki (*Dicksonia squarrosa*) sporelings recently establishing (second population known), and seedlings of three new

native tree species (*Beilschmeidia tarairi*, *Hedycarya arborea*, *Vitex lucens*). However, the first *B. tarairi* seedling was observed east of the trig. The well area was also the site of the only known *Brachyglottis repanda* and a recent population of *Pteris carsei* on Otata – both species perished during the recent droughts.

There are considerable areas that were not traversed by EKC, especially on the two larger islands – further searching should lead to more discoveries or rediscoveries of older records. Also, floras of small islands are never static; new species arrive and existing ones die out. The author has seen mangrove (*Avicennia marina*) propagules (and a small whole mangrove) and a spinifex (*Spinifex sericeus*) seed head washed up on the shores of Otata – indicating that water-dispersed seeds/propagules would be likely to establish if there was suitable habitat for them.

Weeds

Consistent management by the owners over many decades has resulted in all but one of the aggressive weed species being well-controlled on all of the islands. The only exception is mile-a-minute on Ruapuke. However, the owners are confident (pers. comm.) that the new boardwalk,

coupled with the forest canopy being allowed to recover on the islands' summit (planting of tawapou in autumn 2021 to expediate this process), and the possibility of a specific herbicide, will eventually lead to control of this aggressive vine. There can be no let-up in the control of weeds, as new species, and some of the old ones, continue to arrive, as shown by Tables 3 and 4.

For the long-term protection of the Noises Islands from a constant invasion of weeds, the adjacent Rakino and Motutapu Islands (Fig. 2) urgently require weed control. Populations of boxthorn, rhamnus, pampas grass (*Cortaderia jubata* and *C. selloana*) and moth plant are particularly bad on Rakino (EKC and S. Heiss-Dunlop pers. obs.) and Motutapu (S. Heiss-Dunlop pers. comm.). These species either have fleshy fruit ingested by frugivorous birds or windblown seed.

It is interesting that some naturalised species that have been historically recorded once, or only in a limited way, appear to have failed to establish further. These would include: *Cakile maritima*, *Catapodium rigidum*, *Echinochloa crus-gavonis*, *Lamium bienne*, *Melilotus indicus*, *Stellaria media*, *Torilis arvensis* and *Vulpia myuros*. This may be because of the frequent droughts, or perhaps in some cases the owners' vigilance in uprooting exotic species.

Native extinctions

Some native species also appear to have become locally extinct on the Noises. These would include three species that are scarce in the inner Hauraki Gulf: *Bromus arenarius*, *Parietaria debilis* and *Scleranthus biflorus*. Native species not confirmed by the present survey total: 1 lycopod, 7 ferns, 7 woody species and 24 herbaceous species. There are several possible explanations for this: they were just missed during the present survey (not every area of every island was searched, also there are seasonal differences in visibility of some plants); or they were wrongly recorded in the first place, (see Appendix, Unaccepted Records and the Comments column); or they have died out.

New archaeological evidence

On Otata, at the back of the beach near the bach, there is an extensive midden eroding out of a low coastal bank (Fig. 51). Archaeologist Louise Furey (pers. comm.) has recently led an archaeological excavation at the site and has discovered charcoal on both sides of the Rangitoto ash layer. These samples are being analysed by Rod Wallace at Auckland University – his analysis should give an insight into the vegetation of Otata Island prior to the Rangitoto Island eruption, estimated to be c.600 years ago.

Future

It is important to keep regularly monitoring the arrival of new species (weeds and natives), especially around the high-contact areas (Otata bach and Ruapuke). There are exciting plans proposed by the Auckland Museum for long-term monitoring of biota and habitats on Otata and these will include permanent vegetation plots to measure changes. These should include monitoring of the unique slump-face vegetation and flora.

The islands contain the best intact indigenous flora and vegetation of the inner Hauraki Gulf, except for Rangitoto Island which is a unique case. Although the vegetation is healthy, climate change is likely to increase the frequency and severity of both droughts and storms, which will put even more stress on these ecosystems. Over two decades ago Cameron (1998) said that there is a challenge for public agencies to protect one of the gems of the Hauraki Gulf (Noises Islands) from new pests (plants and animals) establishing there. This has partly been delivered by making the island chain from Rangitoto to the Noises mammalian-pest-free. Now the environmental weeds need to be controlled as well. The owners should not have to manage this battle alone.

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Appendix. Updated vascular plant species list for the Noises Islands

Key:

Islands/islets

Ota	Otata
Mho	Motuhoropapa
Rup	Ruapuke/Maria
DRn	David Rocks (north)
DRs	David Rocks (south)
Sco	Scott
Sun	Sunday
Ike	Ike
Ora	Orarapa/Haystack
Ter	Tern

Abbreviations

*	wild exotic species
**	exotic species established from a planted parent (Otata only)
^	past records of 'David Rocks' are assumed to be from the larger N group (only PdL and EKC separated the data of these two island groups)
#*	native species established from a planted non-ecosourced parent (Otata only)
M	an exotic managed species
pl.	planted
[YYYY]	the year collected where the sole record is based on a herbarium collection
[x]	presence not confirmed during the present survey, 2015-20
Year	first year recorded/collected on the Noises Islands

N	new record for Otata and Motuhoropapa since Cameron (1998)
S	present on the slump on Otata (2015–20)
U	unconfirmed by the recent survey, or only known population removed
V	voucher herbarium specimen held in Auckland Museum (AK), Landcare Research (CHR) or Massey University (MPN)

Abundance

a	abundant
c	common
o	occasional
l	local
lc	locally common
s	scarce (<5 plants seen)
x1	only 1 plant seen (x2 = 2 plants seen, etc)

Sources of pre-2015 records unconfirmed by this present survey

[At]	Atkinson (1984), recorded by him 1978–84; not recorded since
[Ca]	based on Cameron (1998); not recorded since
[dL]	recorded by Peter de Lange in 1994 (unpubl. list); not recorded since
[G]	based on Gillham (1960) recorded in 1957; not recorded since
[H&T]	Hannken & Trevarthen (1952); recorded for Otata in 1951, not recorded since
[M&T]	Mason & Trevarthen (1950), primarily compiled from a Field Club Excursion to Otata on 2 April 1950; not recorded since
[MKA]	Mason et al. (1960), seen on Motuhoropapa in 1954; not recorded since

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
FERNS and LYCOPODS (29 + 0) (= native + naturalised)														
<i>Adiantum aethiopicum</i>		[At]									1954	U		
<i>Adiantum cunninghamii</i>	o-la	lc									1950	S	AK	Frequent patches in forest
<i>Adiantum hispidulum</i>	o										1950			
<i>Asplenium haurakiense</i>	lc	c	c	la	a	lc	c	l	c		1883		AK	
<i>Asplenium oblongifolium</i>	o-a	a				l	o				1950		AK	
<i>Asplenium polyodon</i>	s										1993		AK	Terrestrial clump in plateau forest

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Blechnum filiforme</i>	x3										2015	N		Small, well-separated patches
<i>Blechnum novae-zelandiae</i>		[At]									1978–84	U		
<i>Cheilanthes distans</i>	lc										1951		AK	N cliffs
<i>Cheilanthes sieberi</i>	lc	[At]									1951		AK	N cliffs on Otata
<i>Cyathea dealbata</i>	o										1978–84			
<i>Cyathea medullaris</i>	l										1978–84	S	AK	Slump face main colony
<i>Dicksonia squarrosa</i>	o										1993		AK	
<i>Diplazium australe</i>	x2										2020	N	AK	10m from the well
<i>Doodia australis</i>	o-lc	l									1950			
<i>Lastreopsis velutina</i>		[At]									1954	U		
<i>Loxogramme dictyopteris</i>	[M&T]										1950	U		Possibly mistaken for juvenile <i>Microsorium pustulatum</i> ?
<i>Microsorum pustulatum</i>	o	o	o			l	s				1950		AK	
<i>Pellaea rotundifolia</i>	o-lc	[At x2]									1954		AK	Recorded by Cameron (2017) as <i>P. aff. falcata</i> ; also present on the northern slopes of Otata
<i>Phlegmariurus billardieri</i>	[H&T]	[At]									1951	U		
<i>Pneumatopteris pennigera</i>	[Ca]										1993	U		Was near the well – died; most likely result of drought
<i>Polystichum neozelandicum</i>	l	[At]									1954		AK	
<i>Psilotum nudum</i>	l	[1954]									1950		AK	
<i>Pteridium esculentum</i>	lc	lc	la								1950		AK	
<i>Pteris carsei</i>	[Ca]	[At]	[dL]			[dL]					1954	U	AK	Was still near the well in 2017 – later died; most likely result of drought
<i>Pteris macilenta</i>	s										1951		AK	
<i>Pteris tremula</i>	o	[At]									1950			
<i>Pyrrosia elaeagnifolia</i>	o	l				lc					1950			
<i>Tmesipteris elongata</i>	[Ca]	[At]									1978–84	U	AK	

DICOT and MONOCOT TREES and SHRUBS (47 + 9)

<i>Beilschmiedia tarairi</i> (seedlings)	x2										2015	N		The first seedling was in forest E of trig; second near the well
<i>Brachyglottis repanda</i>	[Ca]	[At]									1954	U		Single known plant on Otata by the well, died 2016
<i>Carmichaelia australis</i>	lc	o					[At]				1950	S	AK	

<i>Coprosma autumnalis</i> (as <i>C. australis</i>)	[M&T]	[MKA, IA]									1950	U		Possibly mistaken for a different <i>Coprosma</i> sp. or hybrid
<i>Coprosma lucida</i>		[At x1]									1978–84	U		Possibly mistaken for a different <i>Coprosma</i> sp. or hybrid
<i>Coprosma macrocarpa</i>	c	c	s	s		o	s	[At]			1950	S	AK	
<i>Coprosma macrocarpa</i> × <i>C. robusta</i>	l	[At]		[dL]							1978–84		AK	
<i>Coprosma repens</i>	o	c	c	c	lc	a	a	c	a	s	1950		AK	
<i>Coprosma rhamnoides</i>	[H&T]	[MKA]									1951	U		
<i>Coprosma robusta</i>	l	[1932]		[dL x1]							1932		AK	Some early unvouchered records for <i>C. robusta</i> (by M&T, MKA) may have been <i>C. macrocarpa</i> which they did not recognise at that time
<i>Cordyline australis</i>	s	x3	[At]								1950			The tallest seen was c.10m tall, near Otata trig
<i>Coriaria arborea</i>	l										1950	S	AK	Mainly on slump-face
<i>Corynocarpus laevigatus</i> #*	l & pl.	[At x1]									1978–84		AK	Large planted tree on Otata, near bach, carpet of seedlings under it
<i>Dodonaea viscosa</i>		lc									1954		AK	Healthy population on a single ridge
<i>Dysoxylum spectabile</i>	lc	a									1954			
<i>Entelea arborescens</i>	l										1880	S	AK	
<i>Geniostoma ligustrifolium</i>	o	o				l	[At]				1950		AK	
<i>Hebe stricta</i> var. <i>stricta</i>	o	l									1950	S	AK	
<i>Hedycarya arborea</i>	lc										2015	N	AK	
<i>Leptecophylla juniperina</i>	[At]					[At]					1978–84	U		
<i>Leptospermum scoparium</i>	lc	[IA]									1950	S	AK	
<i>Leucopogon fasciculatus</i>	o	o				[At]		[At]			1954	S		
<i>Lycium ferrocissimum</i> * M	s	s	lc	o	o	s	l		l		1978–84		CHR	
<i>Malva</i> (<i>Lavatera</i>) <i>arborea</i> *			c								1978–84		AK	
<i>Melicope ternata</i>	lc	a	o	[dL x1]							1950		AK	x1, 10m tall on Otata near trig
<i>Melicytus novae-zelandiae</i>	o	o	a	o	o	o	c	o	o		1883		AK	
<i>Melicytus ramiflorus</i>	a	o									1951		AK	
<i>Metrosideros excelsa</i>	a	a		[G]		a	c	lc			1950	S		The largest trees on the Noises; one on Otata has >3m diam. (Fig. 10)
<i>Myoporum laetum</i>	s	lc					x1	o			1950		AK	
<i>Myrsine australis</i>	a	o	s	[At]		o	l	[At]			1950		AK	
<i>Olea europaea</i> ssp. <i>europaea</i> * M		[At]									1980	U	AK	Removed 1980

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Olearia furfuracea</i>	l	lc									1951			
<i>Ozothamnus leptophyllus</i>	s	[At x1]				[At]					1950		AK	N cliffs on Otata
<i>Paraserianthes lophantha</i> * M			l								1978–84		AK	Long-lived seedbank
<i>Persea americana</i> * M	[2013]										2013	N,U	AK	Single occurrence removed
<i>Phoenix canariensis</i> * M (no adults)	s						l				1978–84		AK	Presumed from seed ex c.9 trees cultivated on Otata tombolo, cut down 1981–82 because naturalising. Germinating seed now >38 years old
<i>Pimelea urvilleana</i>	l	s				lc	[At]				1950		AK	
<i>Piper excelsum</i> "Hauraki Gulf form"	o	o									1950		AK	This form is discussed by Gardner (1997)
<i>Pittosporum crassifolium</i>	a	a	a	a	lc	a	a	c	l		1950	S	AK	
<i>Pittosporum crassifolium</i> × <i>P. umbellatum</i>		[At x1]									1954	U		
<i>Pittosporum tenuifolium</i>	x1										2015			Single established tree in forest, NE side
<i>Planchonella costata</i> #*	s & pl.	lc	o & pl.			[dL]					1954		AK	x3, new pl. in 2020 on E Otata as a bare-rooted trial for the first plantings on Ruapuke Apr 2021 of c.55 seedlings; all seed ex Ruapuke
<i>Pomaderris amoena</i>	l										1950		AK	N cliffs
<i>Prunus persicaria</i> **	s & pl.										2017	N	AK	Seedlings from a single old pl. tree by bach, c.4m tall; removed when seen
<i>Pseudopanax arboreus</i>	o-lc	o									1951	S	AK	To 8m tall and 17cm DBH on Otata
<i>Pseudopanax crassifolius</i> × <i>P. lessonii</i>	o	[At x2]									1950	S		
<i>Pseudopanax lessonii</i>	a	a	c	lc	lc	a	c	lc			1950	S	AK	To 10m tall with 24cm DBH on Otata
<i>Rhamnus alaternus</i> * M	o	o				s	s		[dL]		1978–84		AK	
<i>Rhaphiolepis bibas</i> (<i>Eriobotrya japonica</i>) * M	[2001]										2001	N,U	AK	x1, removed
<i>Rhopalostylis sapida</i> #*	s & pl.	s									1954			The single pl. on Otata has a 4m trunk
<i>Schefflera digitata</i>		[MKA x1]									1954	U		Recorded in mistake for <i>Pseudopanax arboreus</i> ?
<i>Solanum aviculare</i> var. <i>aviculare</i>		s									1954		AK	
<i>Solanum mauritianum</i> * M	x1		[At]								1978–84		AK	
<i>Sophora chathamica</i> #* (seedlings only)	l										1978–84			Planted one has died, but seedlings adjacent. Atkinson (1984) had a single record for Motuhoropapa – a mistake for Otata?
<i>Ulex europaeus</i> * M	[Ca]										1983	U		

<i>Vitex lucens</i> (seedling)	x1										2021	N		Earlier planted specimens evidently died without fruiting
DICOT CLIMBERS and related TRAILING PLANTS (8 + 4)														
<i>Araujia sericifera</i> * M	o	s									1993		AK	
<i>Calystegia soldanella</i>	l	[At]									1950			
<i>Clematis paniculata</i>	o	o									1950		AK	
<i>Dipogon lignosus</i> * M			a								1978–84		AK	Has proved difficult / near impossible to control
<i>Lathyrus latifolius</i> *			[At]								1978–84	U	AK	
<i>Muehlenbeckia australis</i>	o	[IA]									1950		AK	
<i>Muehlenbeckia australis</i> × <i>M. complexa</i>			o								1994	N	AK	
<i>Muehlenbeckia complexa</i>	o	o	lc	lc	lc	o	lc	o	lc		1950	S	AK	
<i>Parsonsia heterophylla</i>	o-la	c									1954	S		
<i>Passiflora edulis</i> *	[Ca x1]										1997	N,U		A wild seedling near bach, human introduced, wrongly entered as cultivated by Cameron (1998)
<i>Sicyos mawhai</i> #*	[1883] & pl.										1883		AK	Natural historical vouchered records; and pl. seeds (ex. Great Mercury I.) in 2011 which took nearly 5 years to germinate, now spreading by seed
<i>Tetragonia implexicoma</i>	o	lc	o	c	o	c	c	c	lc		1883		AK	
DICOT HERBS (46 + 70)														
<i>Acaena novae-zelandiae</i>	[M&T]										1950	U		A single occurrence
<i>Ageratina adenophora</i> *	[At]										1978–84	U		
<i>Ageratina riparia</i> * M	s										2018	E		By bach, uprooted
<i>Apium prostratum</i>	o	lc				o					1950		AK	
<i>Atriplex prostrata</i> *	o-lc	[At]		s		lc	[dL]				1978–84		AK	
<i>Bellardia viscosa</i> *		l									1978–84		AK	NW peninsula Gull Point
<i>Bidens pilosa</i> *	[At]		s								1978–84		AK	
<i>Cakile maritima</i> *	[Ca]										1995	U	AK	Wrongly reported as <i>C. edentula</i> by Cameron (1998)
<i>Cardamine hirsuta</i> *	l										1998		AK	Wrongly reported as <i>C. debilis</i> by Cameron (1998)
<i>Centaurium erythraea</i> *	o	lc				o	l	o			1978–84	S	AK	
<i>Cerastium glomeratum</i> *	l	l	[At]	l	o	o	[dL]	l			1978–84		AK	
<i>Chenopodium triandrum</i>	l	lc	l				[dL]	l	o		1883		AK	

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Chenopodium trigonon</i>	s		lc	l	o	l			[dL]		1994	N	AK	
<i>Cirsium vulgare</i> * M	s	s									1951			
<i>Cotula australis</i>		[At]		l		l	[At]	[At]			1978–84		AK	
<i>Cotula coronopifolia</i>	l	lc			lc	l		lc			1978–84		AK	
<i>Crassula decumbens</i> *	lc	[At]		l	lc	lc					1978–84		AK	
<i>Crassula sieberiana</i>	lc	lc	l	l	o	o	s	o	l		1950		AK	
<i>Crepis capillaris</i> *	l	o					[dL]				1951	S	AK	
<i>Daucus carota</i> * M	x2										2017	N		By bach, uprooted
<i>Dichondra repens</i> agg.	c	lc	o	l	[dL]	c	lc	l	l		1950		AK	
<i>Disphyma australe</i>	c	c	c	c	lc	a	lc	c	c	a	1950		AK	
<i>Drosera auriculata</i>	[At]										1978–84	U		
<i>Epilobium ? billardioreanum</i> ssp. <i>cinereum</i>	x1										2020	N,S		Single dead plant found on the slump face
<i>Epilobium nummulariifolium</i>	[M&T]										1934	U	MPN	Actual island not specified on the 1938 voucher
<i>Epilobium rotundifolium</i>	[Ca]										1993	U	AK	
<i>Erigeron sumatrensis</i> *	o	o	o			s	[At]	s	s		1951	S		
<i>Euchiton audax</i>	[At]										1978–84	U		
<i>Euchiton japonicus</i>	[Ca]										1993	U	AK	
<i>Euchiton sphaericus</i>	o-lc	[At]									1978–84	S	AK	
<i>Euphorbia peplus</i> *	l	[At]									1978–84		AK	
<i>Fumaria muralis</i> *	s										1978–84		AK	
<i>Galium aparine</i> * M	l										2006	N	AK	
<i>Galium propinquum</i>	[At]										1978–84	U		
<i>Gamochaeta coarctata</i> *	l	lc									1978–84		AK	
<i>Gamochaeta simplicicaulis</i> *	lc										1998	S	AK	
<i>Gamochaeta subfalcata</i> *			[1988]								1988	U	AK	
<i>Geranium molle</i> *	[At]					[At]					1978–84	U		
<i>Geranium retrorsum</i>		[At]	[At]			[At]					1978–84	U		Unvouchered; recorded in mistake? Possibly <i>G. solanderi</i> ?
<i>Geranium solanderi</i>	l										1950		AK	H&T recorded it as <i>G. pilosum</i>
<i>Gomphocarpus fruticosus</i> **	l & pl.										1978–84		AK	

<i>Haloragis erecta</i>	lc	s									1950	S		
<i>Helminthotheca echioides</i> *	s	[At]									1951	S		
<i>Hydrocotyle novae-zelandiae</i>	[M&T]										1934	U		
<i>Hypochaeris glabra</i> *	[H&T]										1950	U		Mistake? Possibly <i>H. radicata</i>
<i>Hypochaeris radicata</i> *	o	lc	l	lc		s	[At, dL]				1951	S	AK	
<i>Lagenophora pumila</i>		[1993]									1993	U	AK	
<i>Lepidium didymum</i> *	l						[At]				1978–84		AK	
<i>Lilaeopsis novae-zelandiae</i>	[M&T]										1934	U		Noted as “near shore” [M&T]
<i>Linum bienne</i> *	[At]										1978–84	U		
<i>Linum monogynum</i>	[At]	s	l	s		l					1954		AK	The thriving population on NW Motuhoropapa in 1993 (pers. obs.) appears to have greatly reduce
<i>Lobelia anceps</i>	o	o		s		[At]		l			1950			
<i>Lotus angustissimus</i> *	o		[At]				[At]				1978–84	S	AK	
<i>Lotus suaveolens</i> *	l	l	l								1990	S	AK	
<i>Lysimachia arvensis</i> var. <i>arvensis</i> *	o	o	l			o	l	o			1954	S	AK	
<i>Lysimachia arvensis</i> var. <i>coerulea</i> *	[At?]	[At?]						l			1978–84		AK	Atkinson (1984) lumped both colour forms together
<i>Malva sylvestris</i> *	[At]										1978–84	U		
<i>Medicago nigra</i> *	lc										1978–84		AK	
<i>Melilotus indicus</i> *	[At]	[At]									1978–84	U		
<i>Mentha × piperita</i> var. <i>citrata</i> **	s & pl.										1978–84		AK	
<i>Modiola caroliniana</i> *	l										1978–84		AK	
<i>Nicotiana tabacum</i> **	[Ca]										1998	U	AK	Cultivated by bach since WW2. Now eradicated
<i>Orobanche minor</i> *	lc	o	l	[At]		o	[At]	l			1951		AK	
<i>Oxalis exilis</i>	l	[At]									1950		AK	
<i>Oxalis rubens</i>		[MKA]									1954	U		
<i>Parietaria debilis</i>			[At]	[At]					[At]		1978–84	U		
<i>Pelargonium inodorum</i>	l	[At]									1978–84		AK	
<i>Peperomia urvilleana</i>	l	l		[dL]		o	l	s			1950		AK	
<i>Pericallis × hybrida</i> * M	lc		[At]								1978–84		AK	
<i>Physalis peruviana</i> *	l	[At]									1978–84		AK	
<i>Phytolacca octandra</i> * M	s	l	lc								1978–84			

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Plantago lanceolata</i> *	l	[At]						[At]			1978–84	S	AK	
<i>Polycarpon tetraphyllum</i> *	lc	lc	l		o	o	lc	[At]	[dL]		1978–84		AK	
<i>Portulaca oleracea</i> *	s		s								1994	N	AK	
<i>Pseudognaphalium luteoalbum</i> agg.	[At]	[At]	s			[dL]	s	s			1950		AK	
<i>Ranunculus parviflorus</i> *	[At]										1978–84	U		
<i>Rumex crispus</i> *	s										1978–84		AK	By bach
<i>Sagina apetala</i> *	lc	l		l		lc	[At]	[At]			1978–84		AK	Lumped by [At] with <i>S. procumbens</i>
<i>Sagina procumbens</i> *						l					2017	N		Lumped by [At] with <i>S. apetala</i>
<i>Salicornia quinqueflora</i>	a	a	lc	c	lc	c	lc	lc	o	c	1950		AK	
<i>Scleranthus biflorus</i>	[At]										1950	U		"Tombolo Id" [M&T]
<i>Senecio bipinnatisectus</i>		[At]									1978–84	U		
<i>Senecio esleri</i>	s										2017	N,S	AK	Slump-face only
<i>Senecio glomeratus</i>		[At, dL]					[At]				1978–84	U	CHR	
<i>Senecio glomeratus</i> × <i>S. hispidulus</i>		[1995]									1995	U	AK	
<i>Senecio hispidulus</i>	o	o				[dL]	o				1978–84	S	AK	
<i>Senecio lautus</i>	c	a	lc	o	lc	a	c	c	lc	o	1950		AK	
<i>Senecio ?linearifolius</i>		[1932]									1932	U	AK	
<i>Senecio scaberulus</i>		[1994]				l	[dL]				1951		AK	
<i>Senecio skirrhodon</i> *	l	[At]				[At]					1978–84		AK	
<i>Senecio vulgaris</i> *		[At]									1978–84	U		
<i>Silene gallica</i> *	o	[At]					[At]				1978–84		AK	
<i>Solanum americanum</i>	o-lc	lc	lc		s	o					1954		AK	
<i>Solanum lycopersicum</i> **	s										1993			
<i>Solanum nigrum</i> *	[At, 1993]		[At]								1978–84	U	AK	
<i>Sonchus asper</i> *				[dL]							1994	U		Based on a single dead specimen
<i>Sonchus oleraceus</i> *	o-lc	o	o	o	o	o	o	o	s		1954	S	CHR	
<i>Spergularia tasmanica</i>	o-lc	lc	lc	c	lc	lc	lc	c	o	l	1950		AK	
<i>Stellaria media</i> *			[At]			[At]	[At]	[At]			1978–84	U		
<i>Stellaria parviflora</i>	s	[At]									1954		AK	

<i>Symphyotrichum subulatum</i> *	l										2015	N,S	AK	Slump-face only
<i>Taraxacum officinale</i> *	s	[At]									1978–84			By bach
<i>Tolpis barbata</i> *	[At]		[1988]								1978–84	U	AK	
<i>Torilis arvensis</i> *				[1947]							1947	U	AK	
<i>Trifolium dubium</i> *	c	o	l			c	o				1932	S	AK	
<i>Trifolium glomeratum</i> *	s										2015	N	AK	Top of N cliffs
<i>Trifolium ornithopodioides</i> *		lc						l			2015	N	AK	Upper splash zone
<i>Trifolium repens</i> *	s										1978–84		AK	
<i>Trifolium subterraneum</i> *	s										2015	N	AK	Top of N cliffs
<i>Tropaeolum majus</i> **	lc										1978–84		AK	
<i>Veronica arvensis</i> *	l										2017	N	AK	By bach
<i>Veronica plebeia</i>	[M&T]										1948	U	CHR	Actual island not specified on 1948 voucher
<i>Vicia disperma</i> *			l								1978–84		AK	
<i>Vicia sativa</i> *	lc										2016	N	AK	N cliffs
<i>Vicia tetrasperma</i> *	c										1978–84		AK	
<i>Wahlenbergia vernicosa</i>	lc	l	s	o	lc	o	l	o			1951		AK	

GRASSES (11 + 27)

<i>Aira caryophyllaea</i> *			l						[dL]		1954		AK	
<i>Anthosachne kingiana</i>	l	[At]			[dL]	[At,dL]	[At]				1932		AK	N cliffs. <i>Bromus tectorum</i> records of [At] assumed to be this sp.
<i>Anthoxanthum odoratum</i> *	lc	[At]					[dL]				1978–84	S	AK	
<i>Austroderia splendens</i>	s	s		s				s			1950		AK	N cliffs on Otata
<i>Austrostipa stipoides</i>	lc							lc			1950		AK	
<i>Avena barbata</i> *	o-lc	lc	l	l	[dL]	o	l				1951		CHR	
<i>Bothriochloa macra</i> *	o-lc										1978–84		AK	
<i>Briza minor</i> *	o-lc	l						l			1978–84		AK	
<i>Bromus arenarius</i>	[dL]								[G]		1957	U		[dL] wrongly attributed to Motuhoropapa by Cameron (1998); [G] based on <i>B. sterilis</i> of Gillham (1960)
<i>Bromus catharticus</i> *	o		lc	s	s	[dL]	l				1978–84	S	AK	
<i>Bromus diandrus</i> *	o-lc	lc	lc	o	o	c	c	lc	l		1978–84	S		
<i>Bromus hordeaceus</i> *	lc					[dL]		lc			1978–84		AK	

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Bromus lithobius</i> *	o	o				[dL]					1993		AK	
<i>Bromus valdivianus</i> *	[Ca]										1995	U	AK	
<i>Catapodium rigidum</i> *				[1947]							1947	U	AK	
<i>Cortaderia selloana</i> * M	l	[At]	[At]	[dL]					[dL]		1978–84	S	CHR	Previous records may include <i>C. jubata</i> – both occur on Rakino I.
<i>Dactylis glomerata</i> *	l	l									1954		AK	
<i>Dichelachne crinita</i>	o-lc	o	l			s	[dL]				1950	S	V	
<i>Digitaria sanguinalis</i> *	[H&T]	[Ca]									1951	U	AK	
<i>Echinochloa crus-pavonis</i> *				[1932]							1932	U	AK	
<i>Ehrharta erecta</i> * M	x1										2017	N	AK	By bach, removed
<i>Holcus lanatus</i> *		[MKA]	[At]								1954	U		
<i>Lachnagrostis billardieri</i>	o	l		o	[dL]	[At]	o	[At]			1950		AK	
<i>Lachnagrostis filiformis</i>		l						l	[dL]		1994		AK	
87 <i>Lachnagrostis littoralis</i>		l	l	o			l				2015	N	AK	
<i>Lagurus ovatus</i> *	lc	lc				l	lc		c		1994	N	AK	
<i>Lolium perenne</i> *	l	[At]									1978–84		AK	
<i>Oplismenus hirtellus</i>	c	o									1954		AK	
<i>Parapholis incurva</i> *	lc	lc	c	c	la	a	c	c	o		1957		AK	
<i>Paspalum dilatatum</i> *	o		[At]								1951		AK	
<i>Poa anceps</i>	o	o	o	o	[dL]	l	o	lc			1932		AK	
<i>Poa annua</i> *	l	l	[At]			l	[At]				1978–84		AK	
<i>Poa trivialis</i> *	s										2015	N	AK	Only by bach
<i>Rytidosperma racemosum</i> *	lc	lc				i	[dL]				1978–84	S	AK	
<i>Rytidosperma unarede</i>	[At]	lc	o	[At]		[At, dL]	l				1950		AK	
<i>Sporobolus africanus</i> *	o-lc	lc	o	o	[dL]	lc	c	l			1950	S	CHR	
<i>Vulpia bromoides</i> *	o-lc	lc	lc	c	la	lc	lc	lc	o		1978–84	S	AK	
<i>Vulpia myuros</i> var. <i>myuros</i> *				[1932]							1932	U	AK	
RUSHES and SEDGES (12 + 2)														
<i>Carex breviculmis</i>	o										1978–84			
<i>Carex flagellifera</i>	lc	o	l	s		l		l			1978–84		AK	

<i>Carex inversa</i>	lc										1950		AK	
<i>Carex pumila</i>	[Ca]										1950	U	AK	
<i>Carex spinirostris</i>	[At]	lc									1978–84		AK	
<i>Carex testacea</i>	lc			[dL]		[dL]					1978–84	S	AK	
<i>Carex uncinata</i>	o	[At]									1950		AK	
<i>Cyperus eragrostis</i> * M			l								1994		AK	On summit by beacon
<i>Cyperus ustulatus</i>	s							s			1950			
<i>Ficinia nodosa</i>	o-lc	c	o	o	o	a	c	o			1950		CHR	
<i>Gahnia lacera</i>	a	o-lc				l					1950	S		
<i>Juncus bufonius</i> var. <i>bufonius</i> *			[At]	lc							1978–84		AK	
<i>Juncus edgariae</i> / <i>J. usitatus</i>		[MKA]									1954	U		
<i>Morelotia affinis</i>	s										1950			N cliffs

MONOCOT HERBS (10 + 3)

<i>Acianthus sinclairii</i>	l	lc									1954		AK	
<i>Alocasia brisbanensis</i> **	l & pl.										2016	N	AK	Planted pre-1940, near bach
<i>Arthropodium cirratum</i>	l	lc					l				1950		AK	
<i>Astelia banksii</i>	o-lc	a	l	o	l	c	la	l			1880		AK	
<i>Astelia hastata</i>		s									1993			4 epiphytic clumps
<i>Chlorophytum comosum</i> **	l & pl.										1993		AK	Spreading by bach
<i>Dianella latissima</i> / <i>nigra</i>	o	o									1950		AK	Both spp. thought to be present, but intergraded?
<i>Iris foetidissima</i> ** M	[At, Ca]										1978	U	AK, C HR	Successfully eradicated
<i>Microtis unifolia</i>	lc	[MKA]									1883	S	AK	Only on slump-site
<i>Phormium tenax</i>	o	o				o	l	x1			1950	S	AK	
<i>Pterostylis alobula</i>	[M&T]	[At]									1950	U		M&T recorded it as <i>P. trullifolia</i>
<i>Pterostylis banksia</i>		[At]									1954	U		
<i>Thelymitra longifolia</i>	l	lc	[At]			o		l			1954	S		

ADDITIONAL CULTIVATED PLANTS (5 + 7)

<i>Agathis australis</i>	x1										c.1984			x1, still small, just surviving
<i>Alectryon excelsus</i>	[Ca]										c.1984	U		Died

	Ota	Mho	Rup	DRn^	DRs	Sco	Sun	Ike	Ora	Ter	Year	status	V	Comments
<i>Chaenomeles japonica</i> *	x1										1940s–50s			By bach, c.4m tall x 6m across, salmon pink fls
<i>Ficus carica</i> *	x1										c.1940			By bach, c.3m tall
<i>Helianthus tuberosus</i> *	[Ca]										1950	U	AK	Removed/died out?
<i>Hibiscus</i> cv. *	x3										1940s–50s			By bach, c.1.5-5m tall, red simple fls (x2 are cuttings from the original)
<i>Knightia excelsa</i>	[Ca]										1997	U		Died
<i>Passiflora</i> ? <i>tarminiana</i> *	[x1]										pre-1970s	U		Banana passionfruit; cultivated near bach, removed 1970s
<i>Pectinopitys ferruginea</i>	[Ca]										c.1984	U		Died
<i>Persicaria odorata</i> *	s										2017		AK	By bach, growth controlled
<i>Vitex lucens</i>	[Ca]										c.1984	U		Died without fruiting
<i>Vitis vinifera</i> *	[Ca]										c.1950	U		By bach – dead/killed pre-2018
UNACCEPTED RECORDS (7 + 4) additional to the excluded list by Cameron (1998)														
<i>Asplenium bulbiferum</i>	I													Cameron (1998: 28) – in error
<i>Bromus tectorum</i> *		At		At		At	At	At			1978–84			(Atkinson 1984) – assumed to be <i>Anthosachne kingiana</i>
<i>Carex dissita</i>	[M&T]										1950			Only the single record, and M&T failed to record four <i>Carex</i> spp. present on Otata
<i>Carex</i> ? <i>ochrosaccus</i>								[At]			1978–84			A single "?" record by At – an unlikely record for an exposed islet
<i>Leontodon saxatilis</i> (as <i>L. taraxacoides</i>) *	[Ca]	[Ca]									1978–84			Atkinson's (1984) record of <i>Taraxacum officinale</i> wrongly assumed by Cameron (1998) to be <i>Leontodon</i>
<i>Poa billardierei</i>				[1947]							1947		AK	Assumed location error for the voucher
<i>Pomaderris phyllicifolia</i>				[1947]							1947		AK	Assumed location error for the voucher
<i>Pseudopanax crassifolius</i>	[M&T]										1933–50			Really hybrids rather than <i>P. crassifolius</i> ?
<i>Rumex conglomeratus</i> *	[Ca]										1993			More likely to be <i>R. crispus</i>
<i>Vicia</i> ? <i>hirsuta</i> *			[At]								1978–84			Unconfirmed by collector and it is the only record
<i>Zoysia pauciflorus</i>				[1947]							1947		AK	Assumed location error for the voucher

[illegible]