

BOTANY OF THE LARGE ISLANDS OF THE EASTERN BAY OF ISLANDS, NORTHERN NEW ZEALAND

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SUMMARY

The botanical features of the islands of Urupukapuka, Moturua, Motuarohia, Waewaetorea, Motukiekie and Okahu in the eastern Bay of Islands are described briefly. All have a long history of modification by man, first by the Maori and then by Europeans. The islands are now predominantly covered by grassland and *Leptospermum* scrubland with a coastal fringe dominated by pohutukawa (*Metrosideros excelsa*); on Motuarohia and Motukiekie substantial areas are planted with exotic conifers. A vascular plant species list is given for each island. A total of 208 indigenous species and 177 adventive species is recorded for the group as a whole.

INTRODUCTION

Botanical explorations of the Bay of Islands began when the *Endeavour* visited the region in November and December 1769. However, although Banks and Solander landed on both Motuarohia and Moturua and also visited the mainland, Banks was disappointed. He remarked of Motuarohia, '.... of all the places I have landed in this was the only one which did not produce one new vegetable' (Beaglehole 1962). Nevertheless they found a total of 85 vascular plants during their stay (Hatch 1981) including the rare kakabeak (*Clianthus puniceus*) and the famous Cook's scurvy grass (*Lepidium oleraceum*) now also, unfortunately, rare. There is ample evidence from both Cook's and Banks' journals that the area was intensively populated by Maoris at the time of their visit. Indeed Cook remarked 'The Inhabitants of this Bay are far more numerous than at any other place we have yet been in

(Beaglehole 1955). Subsequently many botanists visited the Bay of Islands including Dumont D'Urville, the Cunningham brothers, and J.D. Hooker (Cheeseman 1906). However, with the movement of the capital from the Bay of Islands to Auckland in 1840, fewer botanists called. There is no general account of the botany of the area although some information can be gleaned from the major floras.

This paper deals with the 6 large islands of Urupukapuka, Moturua, Motuarohia, Waewaetorea, Motukiekie and Okahu (Fig. 1). Sites indicating past Maori occupation are common on all the islands.

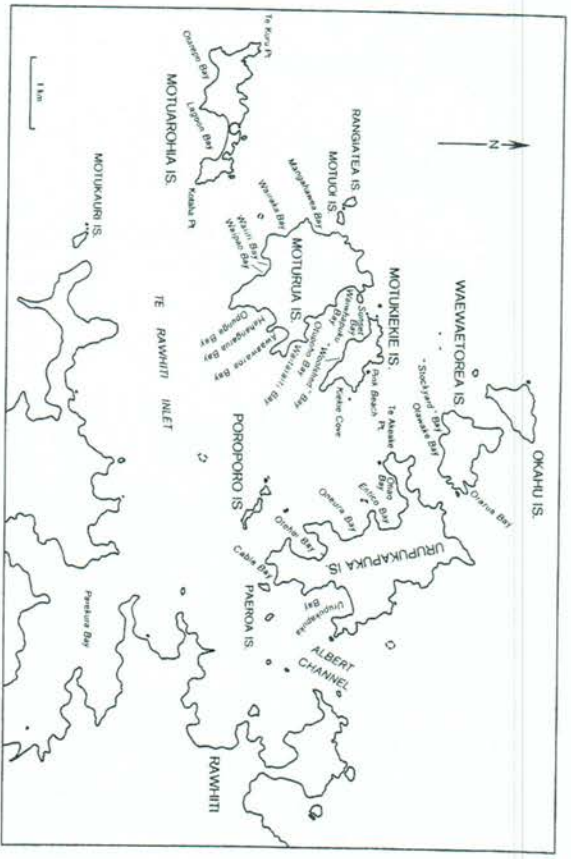


Fig. 1. Map of the eastern Bay of Islands showing the islands discussed in the text. Place names in quotation marks are informal.

D'Urville reported the presence of pigs on Motuora in 1827 (Wright 1950) and, following European settlement later in the nineteenth century, all islands were farmed with sheep, cattle and possibly goats. Burning to encourage grass growth was practised regularly. Aerial photographs taken in the 1950s show the islands to be covered predominantly by grassland with only small areas of scrub or forest (Fig. 2 and see also Lennard 1959). Since this time farming has been less intensive or abandoned and *Leptospermum* scrubland has spread over many areas; conifers and broadleaf trees have been planted extensively on Motuaroa and Motukiekie. Our account is based on visits in February 1973 (AEE: Uruupukapuka, Motuora and Okahu), and in January 1980 (REB: Uruupukapuka, Motuaroa and Okahu), and in Uruupukapuka, Waewaetorea and Okahu) with the Offshore Islands Research Group (Hayward 1980). In view of the size of the islands, and the relatively short time spent on each (1/2 to 3 man days), our survey is of a preliminary nature. Except where noted the island accounts apply to the situation in 1980.

THE ISLANDS

Uruupukapuka Island

With an area of 208 hectares, Uruupukapuka is the largest of the islands. It is part of the Bay of Islands Maritime and Historic Park.

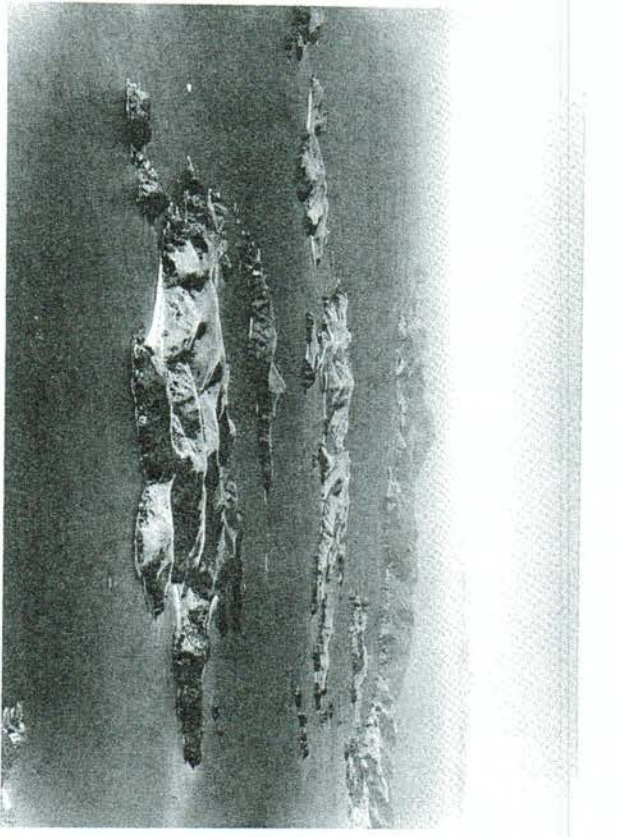


Fig. 2. Aerial view looking north-east over the eastern Bay of Islands in 1959 showing the extensive grassland present at that time. From the foreground Motuora, Motukiekie and Uruupukapuka with Okahu to the left and Cape Brett behind. (Photo: 14 April 1959, Whites Aviation).

although a portion at Orehei Bay is leased for activities associated with the tourist industry and deep sea fishing. A recent aerial view is shown by Hayward (1980, fig. 2). Cattle are grazed over much of the island.

Uruupukapuka is an island of peninsulas and bays with a coastline of about 14 km. Cliffs fringe most of the island except where there are sandy beaches. The whole island has a history of grazing, and pasture has been maintained with difficulty against invasion by *Leptospermum* scrubland. Repeated burning to check this scrubland, which occupies about half the island, has destroyed most other native vegetation except for pohutukawa (*Metrosideros excelsa*) trees on headlands and cliffs and small pockets of coastal forest (see fig. 3, 4, Hayward and Hayward 1980).

Pastures were examined in some detail in 1973. In the southern and eastern parts of the island *Paspalum diatatum*, ratstail (*Sporobolus africanus*) and *danthonia* (*Rytidosperma* spp.) were the most prominent plants, indicating relatively poor soils. The potential for improving pasture quality was apparent in the

Footnote
* denotes species adventive to New Zealand and species indigenous to New Zealand that are considered adventive to the islands.

presence of dark green parallel strips which had received fertiliser and seed in a poorly distributed sowing from the air. White clover (**Trifolium repens*) was flourishing in these strips. In the east particularly, Australian sedge (**Carex longebrachiata*), a noxious weed, was common. Kikuyu grass (**Pennisetum clandestinum*) was spreading from the beaches. In the north, the soil fertility is lower and danthonia, sweet vernal (**Anthoxanthum odoratum*), meadow rice grass (*Microaena stipoides*) and **Lotus angustissimus* made a thin sward covering little more than 20% of the ground. There was some red-leg grass (**Bothriochloa macra*) and widely dispersed small patches of kikuyu grass, but little paspalum or white clover. Stinkwort (**Inula grueolens*) a weed from the Mediterranean was recognised for the first time in New Zealand on Urapukapuka in 1973.

The *Leptospermum* scrubland is of varying ages from very young stands invading pasture to stands possibly over 60 years old. It is dominated by manuka (*Leptospermum scoparium*) and kanuka (*Leptospermum ericoides*) almost to the exclusion of other species; their absence is probably a result of the deficiency of suitable seed sources, intense shading in dense stands, and removal of palatable species by stock.

Pockets of coastal forest persist on shaded slopes such as on the southern side of the headland leading to Te Akeake Point. Plants recorded here include rangiora (*Brachyglottis repanda*), *Coprosma* spp., mapou (*Myrsine australis*), mahoe (*Meliclytus ramiflorus*), *Pitiosporum umbellatum*, karo (*Pitiosporum crassifolium*), houpara (*Pseudopanax lessonii*), waiu-aktua (*Rhabdotoxum solandri*) and the tree ferns manaku (*Cyathea medullaris*) and ponga (*Cyathea dealbata*).

Swamps of the sedge *Baumea articulata*, raupo (*Typha orientalis*) and swamp millet (*Isachne australis*) fill the floors of some valleys in the north.

Two species of sea grass (*Zostera* spp.) are present in Urapukapuka Bay.

Moturua Island

This island of about 150 hectares is roughly oblong with deep-set bays on all sides. Except where there are bays, the coast is bordered by steep slopes changing to cliffs on the north-west side. When Cook visited in 1769 he wrote '.... this Island is about 3 Miles in circuit and hath upon it 40 or 50 Acres of land cultivated and planted with roots This Island as well as most others in this Bay seems to be well inhabited. sent the Long boat to the above Id for water and some hands to cut grass' (Beaglehole 1955). Marion du Fresne established a hospital camp and garden near Waititi Bay before he was killed on the adjacent mainland in 1772 (Kelly 1951). Some early writers have remarked that the wild onion (**Allium vineale*) was introduced by du Fresne and it is probably this

species that Darwin noted as abundant in the Bay of Islands when he visited in 1835 (Thomson 1922). Healy and Edgar (1980), however, offer the more prosaic suggestion that the species was originally introduced both in soil around horticultural plants and as impurities in agricultural seeds and credit the first record to Kirk in 1870. D'Urville landed near the site of Du Fresne's hospital in 1827 and walked to the highest point '.... only gathering a few plants here and there, for its vegetation is neither varied nor flourishing and consists for the most part of bracken and brushwood, neither of them at all remarkable' (Wright 1950).

Although stock was only finally removed in 1976 (Hayward 1980) the extent of scrubland present indicates farming had been at a low ebb for some years; in 1973 only a little grassland remained, mainly between Otupoho Bay and Waitapaku Bay. Most of the island is in the Maritime and Historic Park. Scrubland covers most of the island with pohutukawa frequent along the coast. The scrubland is predominantly composed of manuka and kanuka but gorse (**Ulex europaeus*), black wattle (**Acacia nearnsi*), brush wattle (**Albizia lophantha*) and woolly nightshade (**Solanum mauritanium*) are also present. The giant reed (**Arundo donax*) and blackberry (**Rubus fruticosus* agg.) are established in a number of places.

The native sand dune grass *Spinifex hirsutus* and the golden sand sedge pingao (*Desmoschoenus spiralis*) occur at Opunga Bay but will probably be obliterated by kikuyu grass.

A small swamp near Otupoho Bay contains the sedges *Baumea rubiginosa*, *Scirpus lacustris* and *Eleocharis acuta* along with swamp millet and a range of exotic wetland species.

The only remnant of coastal forest noted was along the stream at Waipao Bay where kawakawa (*Macropiper excelsum* var. *excelsum*), whau (*Entelea arborescens*), mahoe, cabbage tree (*Cordyline australis*) and the two species of *Cyathea* tree fern occur.

Motuarohia Island (Robertson Island)

This long narrow island of 52 hectares consists of two relatively hilly regions connected by a low narrow isthmus (Fig. 3). The isthmus region with its rocky outcrops, sandy beaches and lagoons is part of the Maritime and Historic Park while the remainder is in private ownership.

When the *Endeavour* visited in 1769 both Cook and Sporing drew profile sketches which have been reproduced by Skelton (1955) and Begg and Begg (1969) respectively. While concentrating on the topographical features, these sketches do show occasional small patches of scrub or trees and suggest that the remaining regions were predominantly covered by low (grassy?) vegetation. In addition both Sporing and Parkinson made detailed sketches of the fortified pa on Kotaha Point at the eastern end of the island. Parkinson's sketch has been reproduced by Beaglehole (1955) and Sporing's by Begg and Begg

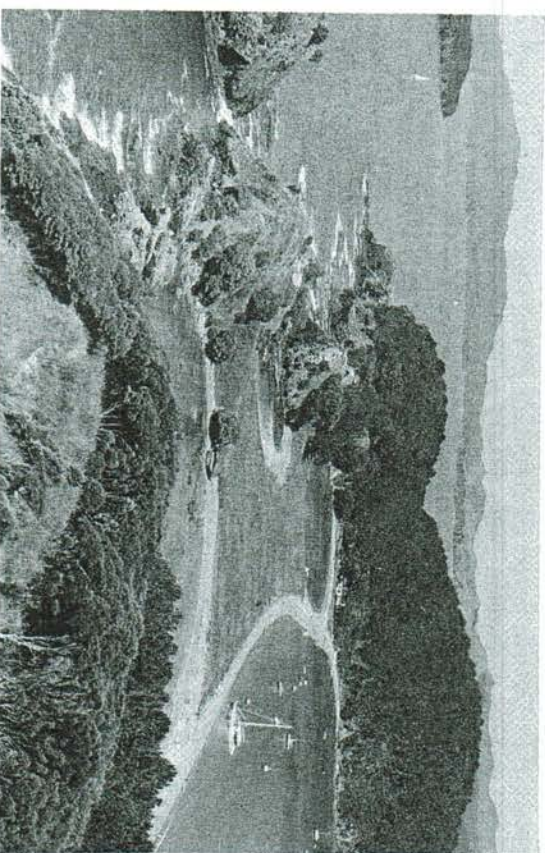


Fig. 3. View east over the isthmus of Motuarohia with yachts anchored in Lagoon Bay. In the foreground is grassland surrounded by *Leptospermum* scrubland with some maritime pine to the right. Pohutukawas are visible on the rocky outcrops near the lagoons, and a maritime pine plantation covers the hillsides in the distance. The rough grassland behind the beach is mown and grazed occasionally. (Photo: 13 January 1980).

1969); both are reproduced and discussed by Lysaght (1979). In these, a few trees (pohutukawa?) are visible on the seaward end of the ridge but otherwise the steep slopes below the pa appear free of tall vegetation. Sporing's sketch shows what appears to be felled scrub on some of the steep slopes and, near the middle, feathery heads possibly of the tussock grass *Chionochloa bromioides*. Considered together these records suggest that even at that time the island was predominantly covered with low vegetation. Certainly Cook's men were able to collect much 'sellery' (Maori celery, *Apium australe*) and, as on Moturua, cut grass for their sheep (Beaglehole 1955). Some forest remnants presumably remained, however, as Banks and Solander collected parataniwha (*Elatostema rugosum*) here (Hatch 1981). This plant, as Solander noted, is found in damp shaded places and today seems to be absent from all the islands.

The island was purchased by John Robertson in 1839 and he began farming there with his family. Although he was soon drowned, and his family tragically murdered, subsequent occupiers continued farming mainly with sheep (Lennard 1959). There has been recent grazing by cattle but now there is only periodic grazing by sheep to control the rank growth and reduce the fire hazard.

The eastern and about half the western hilly regions are covered by

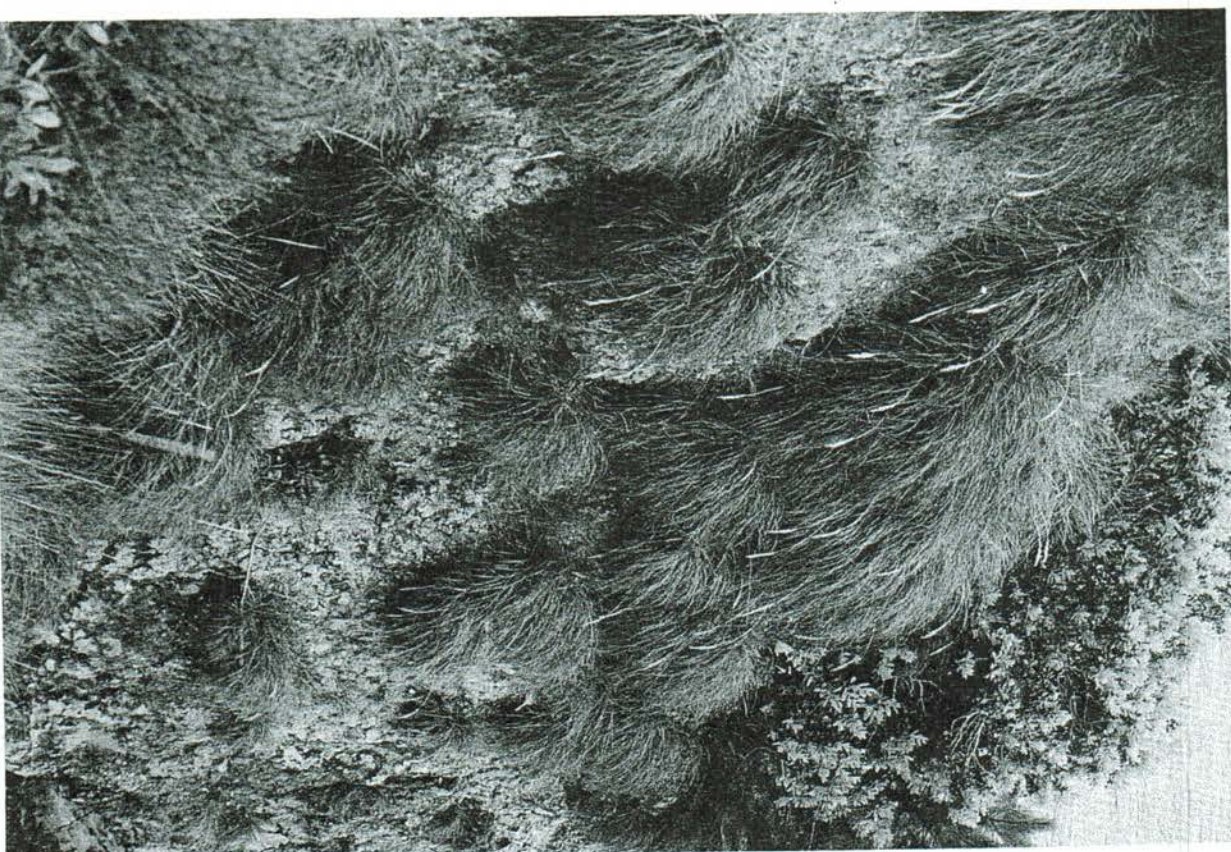


Fig. 4. A cliff face on Motuarohia showing the distinctive tussocks of *Chionochloa bromioides*. Young pohutukawa and naturalised maritime pine are visible behind. (Photo: 7 January 1980).

stands of maritime pine (**Pinus pinaster*) planted about 1945, with occasional trees of **Pinus radiata* emergent above the canopy. Vegetation underneath the pines is relatively sparse although hybrid swarms of *Coprosma macrocarpa* x *C. propinqua* and *C. repens* x *C. rhannoides* are present. One gully near Kotaha Point is notable because of the extensive development of the maidenhair fern makaka (*Adiantum aethiopicum*) in it.

That part of the western region not planted with pines is largely covered by *Leptospermum* scrubland of less than about 20 years of age. The scrubland is dissected by a series of bulldozed roads and grassed areas around and between dwellings and other buildings. Climbing dock (**Rumex sagittatus*) is abundant, particularly along road margins. In some areas plantings of puriri (*Vitex lucens*) and pukā (**Meryta sinclairii*) have been made along with a variety of fruit trees.

A small remnant of coastal forest with pohutukawa, *Pittosporum umbellatum*, karo and mahoe remains on Te Kuru Point, isolated from the rest of the island by a narrow razor back ridge infested by gorse. Species found here, but not on any of the other large islands, include nīnāo (*Helichrysum aggregatum*) and tukauki (*Libertia grandiflora*); broad-leaved maire (*Nestegis apetala*) is found here and also on Motukiekie.

The pine and *Leptospermum* communities are girdled by coastal scrub of scattered pohutukawa with karo, taupata (*Coprosma repens*), N.Z. flax (*Phormium tenax*) and various grasses. Sweet pea shrub (**Polygala myrtilifolia*) is common particularly in the eastern region. Maritime pine has spread naturally into this coastal community in some regions. On rocky cliffs species such as *Astelha banksii*, rengarenga (*Arthropodium cirratum*), N.Z. ice plant (*Disphylla australe*), glasswort (*Salicornia australis*) and the attractive tussock grass *Chionochloa bromioides* become important (Fig. 4).

The rough grassland near the main sandy beach is mown and grazed occasionally. Species close to the beach include sea rocket (**Cakile maritima*), sea radish (**Raphanus maritimus*) and Indian doab (**Cynodon dactylon*).

Waewaetorea Island

Following European settlement this small island of 47 hectares was in private ownership until 1980 when it was purchased by the Crown; it was incorporated into the Maritime and Historic Park the following year. Hayward and Wright (1980, fig. 2) provide a recent aerial view. Farming continued into the late 1970s and grassland covers much of the island.

On the cliffs west of 'Stockyard' Bay several steep gullies inaccessible to stock support remnants of coastal forest. Pohutukawa provides the canopy, with a dense shrub layer of houpara, hangehange (*Geniostoma*

ligustrifolium), kawakawa, whau and mamaku. Groundcover plants include rengarenga, *Asplenium flaccidum* subsp. *haurakiense*, *A. oblongifolium*, *Carex flagellifera*, *Doodia media*, *Polystichum richardii* and *Pteris comans*.

Areas of *Leptospermum* scrubland occur, particularly on the south-western slopes. One such area above 'Stockyard' and Otawake Bays had been recently burnt at the time of the 1980 visit. The N.Z. carrot (*Daucus glouchiatus*) was particularly abundant amongst the weeds and grasses recolonising the burnt area.

A small area of raupo swamp in poor condition is present in the valley behind Otawake Bay. It appears to be drying out, and has been invaded by weeds such as Brazilian fireweed (**Erechtites valerianifolia*), beard grass (**Polypogon monspeliensis*) and clustered dock (**Rumex conglomeratus*). The area around the actual stockyards supports a diverse and well established adventive flora.

Management plans for Waewaetorea Island prepared in 1981 provided for continued grazing of open areas with further planting of kikuyu grass to produce enough herbage for over-summering of stock. Remnant coastal forest areas are to be fenced sufficiently clear of their margins to keep the kikuyu grass at bay and allow some spread of the forest community.

Motukiekie Island

This island of 29 hectares is in private ownership but is leased to the Maritime and Historic Park. There are a few small sandy coves, but for the most part the coastline consists of steep rocky slopes and cliffs. For some time prior to 1958 it was leased for sheep grazing and regularly burnt off; some scrub remained in gullies and some pohutukawa near the coast. Since this date grazing has ceased and there have been no fires. Two small huts have been built near Kiekie Cove but there are no roads. Recently a track has been marked and cut along the length of the island.

In the period 1958 to 1964, a large number of trees and shrubs were planted. In the central region of the island these included **Pinus radiata*, Norfolk Island pine (**Araucaria heterophylla* (Salisb.) Franco), Japanese cedar (**Cryptomeria japonica* (L.f.) D. Don.), macrocarpa (**Cupressus macrocarpa*) and species of *Acacia*. Exotic species that have become naturalised include Tasmanian blackwood (**Acacia melanoxylon*) and silver tree (**Leucadendron argenteum* R.Br.); the latter has not previously been reported as naturalised in New Zealand. *Leptospermum* scrubland of 2-4 m tall trees separated by relatively bare impoverished soil occupies much of the area above Pink Beach. The north-eastern sector of the island is occupied by an extensive grassland sward of almost pure meadow rice grass; associated species include the creeper *Calystegia marginata*. As on the other islands pohutukawa is

the major tree of the steep seaward slopes and cliffs; *Lilaeopsis orbicularis* and Maori celery are found in seepage areas and sand sedge (*Carex pumila*) was noted in a small sandy cove.

The following list, based on one supplied by A. Goodwin, records the species indigenous to New Zealand that were planted on the island in the period 1958–1964 (the name(s) actually supplied are indicated by brackets; † indicates that the species is not known from the islands in the wild state; in some instances the provenance of the material is indicated):

†*Agathis australis* (kauri); †*Alectryon excelsus* (tikoki); †*Aristotelia serrata* (wineberry); †*Beilschmiedia tawa* (tawa); †*Brachyglottis repanda* (rangiora); (*Clematis paniculata*); *Coprosma repens* (taupata); †*Coprosma* sp., ex West Coast; *Cordyline australis* (cabbage tree); †*Corokia buddleioides*; *Corynocarpus laevigatus* (karaka); †*Dacrydium cupressinum* (rimu, one only); (*Docossea viscosa*, akeake); †*Dysoxylum spectabile* (kohokohe); †*Fuchsia excorticata*, konini); †*Hebe macrocarpa*, purple flowered; †*Hebe parviflora* (*Hebe* sp., long narrow leaf, ex Hen Island); †*Hedycarya arborea* (pigeonwood); *Hoheria populnea* (lacebark, ex Queen Charlotte Sound); †*Knightsia excelsa* (rewarewa); †*Libocedrus plumosa* (kawaka, one only); †*Litsea calcaris* (mangeo); †*Lophomyrtus bulata* (ramarama); †*Melicope ternata* (wharangi, ex Gt Barrier Island); †*Meryta Sinclairi* (puka, ex Hen Island); *Metrosideros excelsa* (pohutukawa, hundreds planted); †*Metrosideros fulgens*, rata); †*Myoporum laetum* (ngaito, ex nursery at Kamoi); †*Olearia albida*, ex Kāiawa; (*Parsonsia* sp., kaiwhiria); †*Phyllocladus trichomanoides* (tanekaha); †*Pitosporum crassifolium* (karo); †*Pitosporum eugenioides* (arata); †*Planchonella novozelandica* (tawapou, ex Gt Barrier Island); †*Podocarpus ferrugineus* (miri); *Podocarpus totara* (totara); *Pomaderris kumeraho* (kumarahou, ex Albany); †*Pseudopanax arboreus* (Murr.) Phillipson (*Neopanax arboreum*); *P. crassifolius* (lancewood); (*Pseudopanax lessonii*, houparai); †*Rhopalostylis sapida* (nikau); *Sophora microphylla* (kowhai, ex Parekura Bay and Clevedon); *Vitex lucens* (puriri). The major area of planting was above 'Woolshed' Bay on the western side of the island, an area we did not visit. Further studies are thus required to document how many of the species have survived and those that are spreading. We did however, record kumarahou growing wild near the huts at Kiekie Cove. This species is otherwise unknown from the island and we conclude it is spreading from the introduced stock and is thus marked adventive in the Flora list.

Okahu Island

This is a small island of only 21 hectares, bordered by high cliffs except in the south-east where there is a beach. The island was farmed until 1976 when it was incorporated into the Maritime and Historic

Park (Hayward 1980), and there is still extensive grassland.

The central valley is clothed in grassland, dotted with small 'islands', or more commonly individual shrubs, of flax, pohutukawa and *Leptospermum* spp. (mainly kanuka). Clumps of *Cyperus ustulatus* occur scattered through the grassland along with a small patch of two or three plants of gorse. Large almost pure pockets of the rush-like sedge *Baumea juncea* are located on the lower slopes of the central valley and at the summit of the ridge leading down to the eastern end of the island.

The grassland presents a complex ecological picture which was more easily understood in 1973 when danthonia grassland occupied the dry upland rim and higher slopes; paspalum was spreading up from the valley floor replacing the danthonia pasture with a sward of nearly-pure paspalum. By 1980, paspalum had become the dominant species over most of the grassland. The combination of dense tangles of 1 to 1.5 m long flowering culms and its sticky seed-heads (exuding copious quantities of honeydew as a result of a particularly heavy infestation of the ergot fungus *Claviceps paspali* Stevens and Hall) made walking through the sward both slow and uncomfortable. Although mixed grassland does occur in the remaining areas, discrete pure stands are more common. Dry cliff- and ridge-tops support colonies of meadow rice grass, danthonia, sweet vernal and red-leg grass. Kikuyu grass which had established on the beach in 1973 has spread rapidly inland.

There is a large swamp in the bottom of the central valley. Raupo, which occupies the centre, is surrounded by a broad fringe of N.Z. flax, *Baumea juncea* and *Carex virgata*, which shelters six species of fern: *Blechnum capense*, manmaku, wheki, ring fern (*Paesia scaberula*), *Pteris comans* and *P. tremula*. **Cyperus brevifolius* and *Eleocharis acuta* are present amongst the raupo.

Mature pohutukawa trees are abundant around the coastline. In small, sheltered gullies, dense stands of *Coprosma macrocarpa*, mahoe, hangehange, cabbage tree, kanuka and manuka have developed beneath and around the pohutukawa canopy. Exposed cliffs support scattered pohutukawa, N.Z. flax, taupata, koromiko (*Hebe stricta* var. *stricta*), *Astelia banksii* and *Pittosporum umbellatum*.

Leptospermum shrubland containing some prickly hakea (**Hakea sericea*) is largely restricted to the eastern headland.

THE FLORA

Unless authorities are given, nomenclature follows Allan (1961), the New Zealand Weed and Pest Control Society (1969), Moore and Edgar (1970), Healy (1975) or Healy and Edgar (1980) with the latest publication being given precedence where appropriate. Families are listed alphabetically as are the genera and species within families.

An * denotes adventive species; + indicates the species is present; (+) that it is sparingly naturalised; P indicates the species is known only from planted material on that island, but is wild on others (species known only from cultivation are not listed); G indicates the species was recorded by A. Goodwin in 1959 but not seen by us. Voucher specimens are deposited in the herbaria of Auckland Institute and Museum (AK), Botany Division, DSIR (CHR) or the private collection of A.E. Wright (AEW).

	Ururukapuka	Motuzua	Motuaroia	Waewaetorea	Motukeikie	Okahu	Voucher No
<i>Lycopodium bilardieri</i> — a clubmoss	-	-	-	-	-	-	AK 151349
<i>L. volubile</i> — waewaetokou	-	-	-	-	-	-	
<i>Adiantum athleticum</i> — makaka	-	-	-	-	-	-	AK 156652
<i>A. cumingiense</i> — common maidenhair	+	+	+	+	+	+	AK 156551
<i>A. hispidulum</i> — rosy maidenhair	+	+	+	+	+	+	
<i>Cheliophanes distans</i>	-	-	-	-	-	-	
<i>Asplenium filicoides</i> subsp. <i>filicoides</i>	+	+	+	+	+	+	AKW 1846
<i>A. filicoides</i> subsp. <i>hauratense</i> Brownsey	+	+	+	+	+	+	AK 156757
<i>A. oblongifolium</i> Col. — shining spleenwort	+	+	+	+	+	+	AK 156743
<i>A. polyodon</i> Forst. f.	+	+	+	+	+	+	
<i>Athyrium australe</i>	-	-	-	-	-	-	AK 156548
<i>A. japonicum</i>	+	+	+	+	+	+	AK 151324
<i>Alachnum capense</i> — kiokio	+	+	+	+	+	+	AK 156755
<i>B. filiforme</i>	-	-	-	-	-	-	AK 156977
<i>B. membranaceum</i>	-	-	-	-	-	-	AKW 1862
<i>Boocla media</i>	+	+	+	+	+	+	AK 151354
<i>Cyathea dealbata</i> — ponga	+	+	+	+	+	+	AK 156653
<i>C. medullaris</i> — nanaku	+	+	+	+	+	+	AK 156654
<i>Hypolepis tenuifolia</i>	-	-	-	-	-	-	
<i>Dicksonia squarrosa</i> — wiohi	+	+	+	+	+	+	
<i>Polytaetium richardii</i>	+	+	+	+	+	+	AK 156983
<i>Phytotodes diversifolium</i>	+	+	+	+	+	+	
<i>Pyrosia serpens</i>	+	+	+	+	+	+	AK 156984
<i>Histioglossis lucida</i>	-	-	-	-	-	-	
<i>Paesia scaberula</i> — ring fern	+	+	+	+	+	+	AK 156750
<i>Pteridium acutilinum</i> var. <i>esculentum</i> — bracken	+	+	+	+	+	+	
<i>Pteris comans</i>	-	-	-	-	-	-	AK 156544
<i>P. maculenta</i>	+	+	+	+	+	+	AKW 1894
<i>P. tremula</i> — turawera	+	+	+	+	+	+	AK 156553

	U	NR	NA	N	NK	O	Voucher No
* <i>E. psallia</i> — smooth fleabane	+	-	-	-	-	-	CHR 246593
* <i>Eupatorium adenophorum</i> — Mexican devil	+	+	+	+	-	-	NK 156756
* <i>E. litorale</i> — nat. flower	+	+	+	+	-	-	NK 156976
<i>Chaptalia arida</i> — creeping cubweed	+	-	+	-	-	-	NK 156881
<i>G. gymnocephalum</i> — creeping cubweed	+	-	+	-	-	-	NK 151166
<i>G. luteo-album</i> — Jersey cubweed	+	-	+	+	+	+	NK 156886
* <i>G. simplicicaule</i> Willd. ex Spreng.	+	+	+	+	+	+	NK 156885
<i>G. sphaericum</i> — Japanese cubweed	-	-	-	-	-	-	
* <i>G. spicatum</i> — purple cubweed	-	-	-	-	-	-	NK 156882
<i>Helichyrum aggregatum</i> Yeo — nainso	-	-	-	-	-	-	
* <i>Hypochaeris radicata</i> — catsear	+	+	+	+	+	+	NK 156760
* <i>Inula graveolens</i> — ribwort	+	-	+	+	-	-	CHR 246546
* <i>Lactuca saligna</i> L. — least lettuce	+	-	-	-	-	-	CHR 246547
* <i>L. serrifolia</i> — prickly lettuce	-	-	-	-	-	-	
<i>Lagotisera psallia</i>	-	-	-	-	-	-	NK 151138
<i>L. stipitata</i> (Labill.) Druce	-	-	-	-	-	-	NK 151322
* <i>Leontodon taraxacoides</i> — hawkbit	+	-	+	-	-	-	NK 159546
<i>Olearia furfuracea</i> — akapple	+	+	+	+	+	+	NK 156745
* <i>Pleuris echinoides</i> — ortongone	-	-	-	-	-	-	
<i>P. hieracifolias</i>	-	-	-	-	-	-	NK 151350
* <i>Senecio bignoniifolius</i> — Australian fireweed	+	+	+	+	+	+	NK 156966
* <i>S. diascnides</i> Drury	+	+	+	+	+	+	NK 156528
<i>S. glomeratus</i> — fireweed	+	-	-	-	-	-	
* <i>S. hispidulus</i> — fireweed	+	-	-	-	-	-	NK 157098
* <i>S. jacobaeae</i> — ragwort	+	-	-	-	-	-	NK 156802
<i>S. Kirkii</i> — Kirk's tree daisy	+	-	-	-	-	-	NK 156991
<i>S. lanatus</i> — shore groundsel	+	-	-	-	-	-	NK 151130
<i>S. minimum</i> — fireweed	+	+	+	+	+	+	NK 156989
<i>S. scaberrulus</i>	+	-	-	-	-	-	NK 157100
* <i>Silybum marianum</i> — variegated thistle	+	-	+	+	+	+	NK 157106
* <i>Sonchus asper</i> — prickly sow thistle	+	-	-	-	-	-	
* <i>S. oleraceus</i> — sow thistle	+	+	+	+	+	+	
* <i>Taraxacum officinale</i> — dandelion	+	-	-	-	-	-	
* <i>Tragopogon porterioides</i> — calistly	-	-	-	-	-	-	NK 156741
<i>Calystegia marginata</i>	-	-	-	-	-	-	NK 156740
<i>C. sepium</i> — greater bindweed	+	-	+	+	-	-	NK 157052
<i>C. soldanella</i> — shore bindweed	+	+	+	+	+	+	NK 156972
<i>Dichondra repens</i> — dichondra	+	+	+	+	+	+	
<i>Jipsona palata</i>	+	-	-	-	-	-	NK 151163
<i>Coriaria arbores</i> — tutu	+	-	-	-	-	-	NK 156960
<i>Corynocarpus laevigatus</i> — karaka	+	-	-	-	-	-	
<i>Lillaea sieberiana</i>	-	-	-	-	-	-	NK 157107

	U	NR	NA	N	NK	O	Voucher No
<i>Cruciferae</i>							
* <i>Chale maritima</i> Scop. — sea rocket	+	+	+	+	+	+	NK 156511
<i>Cardamine debilis</i> N.Z. bitter cress	+	-	-	-	-	-	
* <i>Coronopus didymus</i> — twin cress	+	-	-	-	-	-	
* <i>Lythidum pseudo-cammipicum</i> Thell.	-	-	-	-	-	-	NK 151162
* <i>Nasturtium officinale</i> — watercress	+	+	+	+	+	+	
* <i>Phyllanthus maritimus</i> — sea radish	+	+	+	+	+	+	NK 156804
<i>Melampyrum silvicolae</i> — kowai	+	-	-	-	-	-	NK 156987
<i>Cathodes fasciculata</i> — mangiangi	+	+	+	+	+	+	NK 157136
<i>C. fraseri</i> — pitohaha	+	-	-	-	-	-	NK 159558
<i>C. juniperina</i> — mangiangi	+	-	-	-	-	-	NK 156988
<i>Erioseae</i>							
* <i>Erica laetevirens</i> — Spanish heath	-	-	-	-	-	-	NK 151400
<i>Gaultheria antipoda</i> — snowberry	+	-	+	+	+	+	NK 157102
* <i>Euphorbia repens</i> — ailweed	+	-	+	+	+	+	NK 156963
* <i>Blacksaea perfoliata</i> — yellow-wort	+	+	+	+	+	+	NK 156962
* <i>Centaurium erythraea</i> — centaury	+	+	+	+	+	+	NK 158551
<i>Geranium homocarpum</i> Turcz.	+	+	+	+	+	+	NK 156877
<i>G. sp.</i> (aff. <i>G. solanderei</i> Carolin)	+	-	-	-	-	-	NK 151314
<i>Polegonum inodorum</i> — kopata	+	-	-	-	-	-	NK 157182
<i>Rhodiocymbium solandrei</i> — vai-u-tua	+	+	+	+	+	+	
<i>Sollera radicans</i>	+	+	+	+	+	+	
<i>Halocorys erecta</i> — shrubby haloragis	+	-	-	-	-	-	NK 156758
<i>H. lanca</i>	+	-	-	-	-	-	NK 151305
<i>Hypericum japonicum</i> — swamp hypericum	+	-	-	-	-	-	NK 156961
* <i>Sedum pulgense</i> — pennyroyal	+	-	-	-	-	-	
* <i>S. suaveolens</i> — round-leaved mint	+	-	-	-	-	-	
* <i>Prunella vulgaris</i> — selfheal	+	-	-	-	-	-	NK 157138
* <i>Alnus triplaryum</i> — yellow flax	+	+	+	+	+	+	NK 156981
<i>Labellia anceps</i>	-	-	-	-	-	-	
<i>Pratia physaloides</i> — coltsfoot	+	+	+	+	+	+	NK 156736
<i>Centasecum ligustrifolium</i> — hangehange	+	-	-	-	-	-	
* <i>Lycium hyssopifolia</i> — looserstrife	-	-	-	-	-	-	
<i>Boerhaavia populina</i> — lacebark	+	+	+	+	+	+	NK 156887
* <i>Knottia caroliniana</i> — creeping willow	+	+	+	+	+	+	NK 157105
<i>Platanthus divaricatus</i> — match ribbonwood	+	-	-	-	-	-	
* <i>Psyllanthus major</i> — Cape honey flower	-	-	-	-	-	-	NK 157058
* <i>Nacella rostralis</i> De Willd. — black wattle	+	-	-	-	-	-	NK 156808
* <i>A. melanoxylon</i> — Tasmanian blackwood	+	-	-	-	-	-	NK 156978
* <i>Albizia lophantha</i> — brush wattle	+	-	-	-	-	-	
* <i>Pyrea carlica</i> L. — fig	+	-	-	-	-	-	(+)
<i>Myoporum laetum</i> — ngalo	+	-	-	-	-	-	NK 156735
<i>Myrsine australis</i> — mupou	+	-	-	-	-	-	NK 156975

	U	NR	MA	N	NK	O	Voucher No
Myrtaceae							
<i>Leptospermum ericoides</i> — kamuka	+	+	+	+	+	+	
<i>L. scoparium</i> — manuka	+	+	+	+	+	+	
Mitrosideros carnifera — carmine rata	+	-	-	-	-	-	AK 151135
<i>M. excolta</i> — pohutukawa	+	+	+	+	+	+	AK 150554
<i>M. perforata</i> — clinging rata	-	-	-	-	-	-	
<i>Monticola apetala</i> — broad-leaved maire	-	+	-	G	-	-	AK 151179
<i>Epilobium ciliatum</i> Raf. — tall willow herb	+	-	-	-	-	-	AK 151333
<i>E. nummularifolium</i> — creeping willow herb	+	-	-	-	-	-	AK 151284
<i>E. pallidiflorum</i> — swamp willow herb	+	-	-	-	-	-	
<i>E. rotundifolium</i>	-	-	-	-	-	-	AK 156803
<i>Oclobanum minor</i> — broomrape	+	+	+	+	+	+	
<i>Oxalis corniculata</i>	+	+	+	+	+	+	AK 157103
<i>O. corniculata</i> var. <i>crassifolia</i>	+	+	+	+	+	+	AK 156807
<i>Ceratophyllum demersum</i> var. <i>algebra</i> — N.Z. broom	+	-	-	-	-	-	
<i>Lotus angustissimus</i>	+	+	+	+	+	+	AK 157012
<i>L. pedunculatus</i> — lotus major	+	-	-	-	-	-	
<i>L. subbiflorus</i> — lotus hispidus	+	+	+	+	+	+	AK 157061
<i>L. sp.</i> (aff. <i>L. angustissimus</i>)	-	-	-	-	-	-	CHR 246544
<i>Medicago arabica</i> — spotted bur medick	+	+	+	+	+	+	
<i>M. lupulina</i> — black medick	+	+	+	+	+	+	AK 157060
<i>M. polymorpha</i> — bur medick	+	+	+	+	+	+	AK 157064
<i>Melilotus indica</i> — King Island melilot	+	+	+	+	+	+	AK 156800
<i>Sophora microphylla</i> — kowhai	-	+	-	P	-	-	
<i>Trifolium dubium</i> — suckling clover	+	-	-	-	-	-	
<i>T. glomeratum</i> — clustered clover	+	-	-	-	-	-	AK 157063
<i>T. pratense</i> — red clover	+	-	-	-	-	-	
<i>T. repens</i> — white clover	+	-	-	-	-	-	
<i>T. repens</i> — white clover	+	-	-	-	-	-	
<i>T. repens</i> — white clover	+	-	-	-	-	-	AK 151000
<i>T. subterraneum</i> — subterranean clover	+	-	-	-	-	-	
<i>Vicia europaea</i> — gorse	+	+	+	+	+	+	
<i>Vicia sativa</i> — vetch	+	+	+	+	+	+	AK 156811
<i>Phytolacca octandra</i> — lakweed	+	+	+	+	+	+	AK 156754
<i>Macropiper excelsum</i> var. <i>excelsum</i> — kawakawa	+	+	+	+	+	+	AK 156995
<i>Peperomia urvilleana</i>	+	+	+	+	+	+	
<i>Pitcairnum grasseifolium</i> — karo	+	+	+	+	+	+	
<i>P. umbellatum</i>	+	+	+	+	+	+	AK 156555/7
<i>Plantago lanceolata</i> — narrow-leaved plantain	+	+	+	+	+	+	AK 156959
<i>P. major</i> — broad-leaved plantain	+	+	+	+	+	+	
<i>P. esculi</i>	-	-	-	-	-	-	AK 151321
<i>Polygona myricifolia</i> — sweet pea shrub	+	+	+	+	+	+	AK 156747
<i>Muhlenbergia australis</i>	+	-	-	-	-	-	
<i>M. complexa</i> — wire vine	+	+	+	+	+	+	AK 156965

	U	NR	MA	N	NK	O	Voucher No
<i>Polygonum decipiens</i> — swamp willow weed	+	-	-	-	-	-	AK 151335
<i>P. hydrophilum</i> — water pepper	+	+	+	+	+	+	
<i>Rumex acetosella</i> — sheep's sorrel	+	+	+	+	+	+	AK 157056
<i>R. bromoides</i> — hooked dock	+	+	+	+	+	+	AK 157055
<i>R. conglomeratus</i> — clustered dock	+	+	+	+	+	+	AK 156889
<i>R. crispus</i> — curled dock	+	+	+	+	+	+	AK 156815
<i>R. pulcher</i> — fiddle dock	-	-	-	-	-	-	
<i>R. sagittatum</i> — climbing dock	-	-	-	-	-	-	AK 156749
<i>Portulaca oleracea</i> — wild portulaca	+	+	+	+	+	+	
<i>Amphibolis arvensis</i> — scarlet pimpernel	+	+	+	+	+	+	
<i>Samolus repens</i>	+	+	+	+	+	+	
<i>Hakea sericea</i> — prickly hakea	+	+	+	+	+	+	AK 156801
<i>Leucadendron argenteum</i> R. Br. — silver-tree	-	-	-	-	-	-	
<i>Clematis paniculata</i> — clematis	+	+	+	+	+	+	AK 156752
<i>C. patriflora</i>	+	+	+	+	+	+	
<i>Ranunculus acris</i>	+	+	+	+	+	+	AK 163663
<i>R. hirtus</i>	+	+	+	+	+	+	AK 156990
<i>R. repens</i> — creeping buttercup	+	+	+	+	+	+	AK 156679
<i>R. flammula</i> — variegated	+	+	+	+	+	+	AK 151304
<i>R. scardus</i> — hairy buttercup	+	+	+	+	+	+	
<i>R. urvilleanus</i>	+	+	+	+	+	+	
<i>Ranunculus kumeraho</i> — kumeraho	-	-	-	-	-	-	AK 157054
<i>P. physalifolia</i> var. <i>ericifolia</i> — whaitiri	+	+	+	+	+	+	AK 156677
<i>Acaena novae-zelandiae</i> — pipitiri	+	+	+	+	+	+	AK 156875
<i>Erigeron japonica</i> (Thunb.) Lindl. — lognuc	+	+	+	+	+	+	
<i>Prunus pensilvanica</i> (L.) Batsch — peach	+	+	+	+	+	+	AK 151149
<i>Rubus fruticosus</i> agg. — blackberry	+	+	+	+	+	+	AK 156986
<i>Coprosma arborea</i>	+	+	+	+	+	+	
<i>C. areolata</i>	+	+	+	+	+	+	AK 156663
<i>C. macrocarpa</i>	+	+	+	+	+	+	AK 156661
<i>C. macrocarpa</i> x <i>C. robusta</i>	+	+	+	+	+	+	AK 157574/82
<i>C. macrocarpa</i> x <i>C. prorepens</i>	+	+	+	+	+	+	AK 156662
<i>C. repens</i> — tangata	+	+	+	+	+	+	AK 156668
<i>C. repens</i> x <i>C. rhannonoides</i>	+	+	+	+	+	+	AK 156674
<i>C. rhannonoides</i>	+	+	+	+	+	+	
<i>C. robusta</i> — karame	+	+	+	+	+	+	
<i>Gallium spartium</i> — cleavers	+	+	+	+	+	+	
<i>G. palustre</i> — marsh bedstraw	+	+	+	+	+	+	
<i>G. parviflorum</i> — slender bedstraw	+	+	+	+	+	+	AK 156678
<i>Godonia viscosa</i> — akake	+	+	+	+	+	+	
<i>Dielsia purpurea</i> — fongiove	+	+	+	+	+	+	AK 156738
<i>Hebe stricta</i> var. <i>stricta</i> — koromiko	+	+	+	+	+	+	

	U	NR	NA	W	KK	O	Voucher No
* <i>Cynopus cristatus</i> — crested dogtail	+	-	-	-	-	-	AK 151337
* <i>Dactylis glomerata</i> — cocksfoot	+	+	+	+	+	+	
<i>Deyoukia billardieri</i> — sand wind grass	+	+	+	+	+	+	AK 156798
<i>Dichelachne crinita</i> — long-hair plume grass	+	+	+	+	+	+	
<i>D. nigrantha</i> (Cav.) Domin — short-hair plume grass	+	+	+	+	+	+	AK 156525
* <i>Echinochloa crus-galli</i> — barnyard grass	+	-	-	-	-	-	
<i>Echinochloa ovata</i> — hedgehog grass	+	-	-	-	-	-	AK 156992
<i>Elymus multiflorus</i> (Hook. f.) Löve & Connor	+	-	-	-	-	-	AK 151126
<i>E. rectilactus</i> (Thees) Löve & Connor	+	-	-	-	-	-	
* <i>Eragrostis bromii</i> — bay grass	+	-	-	-	-	-	
* <i>Eragrostis brunnica</i> — tall fescue	+	-	-	-	-	-	AK 156657
* <i>Gastridium ventricosum</i> — nit grass	+	-	-	-	-	-	AK 156794
* <i>Holcus lanatus</i> — Yorkshire fog	+	+	+	+	+	+	
* <i>Hordeum bogotense</i> — barley grass	+	+	+	+	+	+	AK 157101
<i>Isachne australis</i> R. Br. — swamp millet	+	-	-	-	-	-	AK 151318
<i>Lachnagrostis filiformis</i> — N.Z. wind grass	+	-	-	-	-	-	
* <i>Lepurus ovalus</i> — haretail	+	+	+	+	+	+	
* <i>Lolium perenne</i> — perennial ryegrass	+	+	+	+	+	+	
<i>Microstena stipoides</i> — meadow rice grass	+	+	+	+	+	+	AK 151318
<i>Oplismenus lamellatus</i> (R. Br.) Horn, et Schult.	+	+	+	+	+	+	AK 156978
* <i>Parapholis incurva</i> — sickle grass	+	-	-	-	-	-	
* <i>Paspalum dilatatum</i> — paspalum	+	+	+	+	+	+	AK 157062
<i>P. distachnum</i>	+	+	+	+	+	+	AK 156739
<i>P. orbiculare</i> Forst. f. — scroble	+	+	+	+	+	+	
* <i>P. paspalodes</i> — Mercer grass	+	+	+	+	+	+	
* <i>Pennisetum clandestinum</i> — Kikuyu grass	+	+	+	+	+	+	
<i>Poa anceps</i> Forst.	+	+	+	+	+	+	AK 151142
* <i>P. annua</i>	+	-	-	-	-	-	
* <i>P. trivialis</i>	+	+	+	+	+	+	
<i>P. sp.</i> (fine-leaved)	+	+	+	+	+	+	AK 158337
* <i>Polypogon monspeliensis</i> — beard grass	+	-	-	-	-	-	
<i>Pytilidopogon blanniniae</i> (Zorov) Connor & Edgar	+	-	-	-	-	-	
— <i>danthonia</i>	+	-	-	-	-	-	
* <i>R. penicillatum</i> (Lamill.) Connor & Edgar — <i>danthonia</i>	+	-	-	-	-	-	
* <i>R. racemosum</i> (R. Br.) Connor & Edgar — <i>danthonia</i>	+	+	+	+	+	+	AK 156655
<i>R. uncinata</i> (Pavon) Connor & Edgar — <i>danthonia</i>	+	-	-	-	-	-	AK 157106
<i>Spinifex hirsutus</i>	+	+	+	+	+	+	
* <i>Sporobolus africanus</i> — ratetail	+	+	+	+	+	+	AK 156964
* <i>Stenotaphrum secundatum</i> — buffalo grass	+	+	+	+	+	+	
<i>Stipa setipoides</i> (Hook. f.) Veldkamp	+	-	-	-	-	-	AK 156969
* <i>Vulpia hircynoides</i> — vulpia hair grass	+	+	+	+	+	+	AK 156795
* <i>Vitis germanica</i> — bearded iris	+	-	-	-	-	-	AK 156665
<i>Libertia grandiflora</i> — tukouki	+	+	+	+	+	+	AK 158552

	U	NR	NA	W	KK	O	Voucher No
Juncaceae							
* <i>Watsonia bulbiflora</i> — <i>watsonia</i>	-	-	-	-	-	-	AK 156684
* <i>Juncus articulatus</i> — jointed rush	+	-	-	-	-	-	
<i>J. australis</i> — rush	+	+	+	+	+	+	
* <i>J. bitorquatus</i> var. <i>compertus</i> — woodrush	+	-	-	-	-	-	AK 156971
* <i>J. effusus</i> — rush	+	+	+	+	+	+	
<i>J. graciflorus</i> — rush	+	+	+	+	+	+	AK 151300
<i>J. maritimus</i> var. <i>australensis</i> — sea rush	+	-	-	-	-	-	
* <i>J. microcephalus</i>	+	-	-	-	-	-	
<i>J. planifolius</i>	+	-	-	-	-	-	
<i>J. satophorus</i> — rush	+	-	-	-	-	-	
<i>J. uncinatus</i> — rush	+	-	-	-	-	-	
Juncaginaceae							
<i>Triglochin striatum</i>	+	+	+	+	+	+	
Liliaceae							
* <i>Agapanthus orientalis</i>	-	(+)	(+)	-	-	-	
* <i>Allium vineale</i> — wild onion	+	+	+	+	+	+	AK 156806
<i>Archipodium ciliatum</i> — rengarenga	+	+	+	+	+	+	AK 156746
<i>Asterella banksii</i>	+	+	+	+	+	+	AK 157140/1
<i>Collosporum hartatum</i> — kahakaha	-	-	-	-	-	-	
<i>Dianella nigra</i> — tarutu	+	+	+	+	+	+	AK 156658
<i>Microtis</i> sp	-	-	-	-	-	-	
<i>Orchoceras strictum</i>	-	-	-	-	-	-	
<i>Thelymitra longifolia</i> — sun orchid	+	+	+	+	+	+	AK 151348
<i>Leptocarpus stabilis</i> — ototo	+	-	-	-	-	-	AK 156541
<i>Dypha orientalis</i> — raupo	+	+	+	+	+	+	
<i>Zosterocarya capricornii</i> — sea-grass	+	-	-	-	-	-	AK 151406
<i>Z. muelleri</i> — sea-grass	+	-	-	-	-	-	

DISCUSSION

The botany of the islands bears the stamp of their history. In pre-Maori days it is probable that the islands bore a cover of coastal scrub and forest, but centuries of Maori occupation followed by a century and a half of European farming has reduced this forest to a few depauperate remnants. These remnants are floristically poor and many species are represented by only a few individuals but, provided stock is kept out, such areas should regenerate in future years to provide at least an indication of the original cover. The future of the grassland areas will depend on the management policies adopted. Grazing is to be continued on Urukakapuka and Waewaetorea and pasture on these islands will be extended. The grassland in other places will pass to *Leptospermum* scrubland although the rank grass on Okahu may delay *Leptospermum* spp. establishing there. *Leptospermum* scrubland is not self-perpetuating, but because of the few seed sources available, further regeneration to coastal forest will be slow.