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THE VEGETATION AND FLORA OF RAKITU (ARID) ISLAND, NORTHERN NEW ZEALAND

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SUMMARY

Despite modification of much of the vegetation of Rakitu (Arid) Island by man, it still supports a diverse flora which includes a number of notable species and several interesting plant communities. Although the island is presently farmed, several stream valleys and cliff areas are sufficiently steep to deny access to grazing animals, and thus some natural vegetation survives.

The major plant communities are described in detail, and presented as a vegetation map. Accompanying the vegetation descriptions is an annotated list of the vascular plants of the island totalling 321 taxa, of which 240 taxa are indigenous to New Zealand.

INTRODUCTION

Rakitu (Arid) Island is a privately owned island of nearly 350 hectares situated only 2.5 kilometres off the eastern seaboard of Great Barrier Island in the outer Hauraki Gulf (Fig. 1). The island is approximately 2.75 km long by 1.75 km wide, and except for the small north-western harbour known as Arid Cove, is fringed by precipitous, partly vegetated cliffs. The Cove offers the only safe anchorage (except in north-westerlies), and the only sizeable and sandy beach. Boulder beaches occur elsewhere on the island at the base of cliffs and steep slopes.

On either side of the central Abbott's Stream lie two high blocks, each rising to approximately 220 m above sea level. These blocks are drained centrally by several creeks which flow into Abbott's Stream, which in turn discharges into Arid Cove. On the seaward side, the blocks are drained by steep, narrow-sided creeks which were mostly dry at the time of our visit.

Grassland, mostly improved pasture, covers approximately half the island, mainly on the easier central slopes. Tea-tree (*Leptospermum* spp.) covers approximately one quarter, particularly the higher areas and much of the Waterfall Creek catchment. Pre-European coastal forest and shrubland occupies less than one quarter of the island and is confined to those tributaries of Abbott's Stream with steep and narrow valleys, and to steep coastal slopes on the seaward faces.

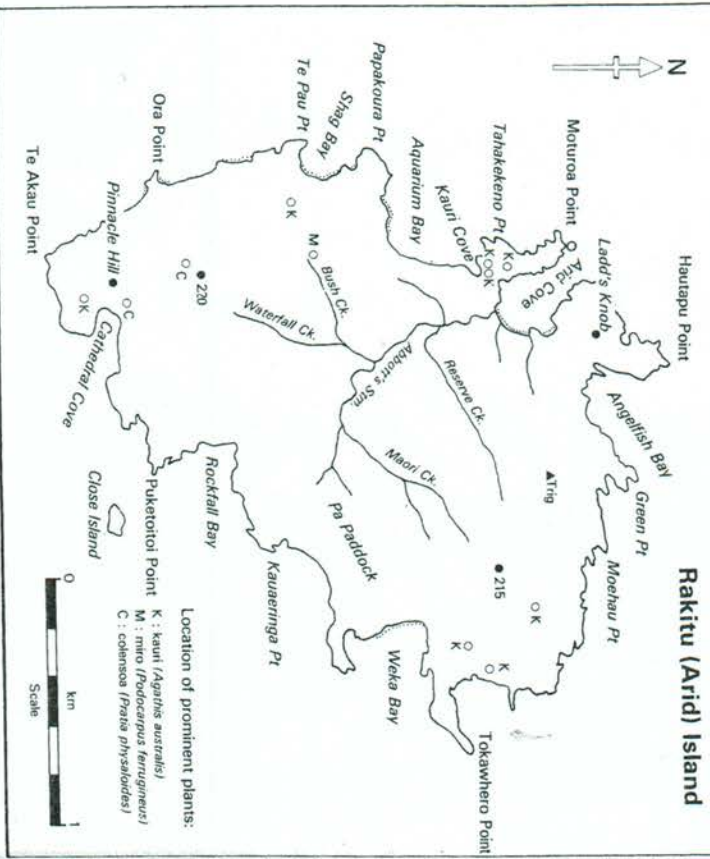
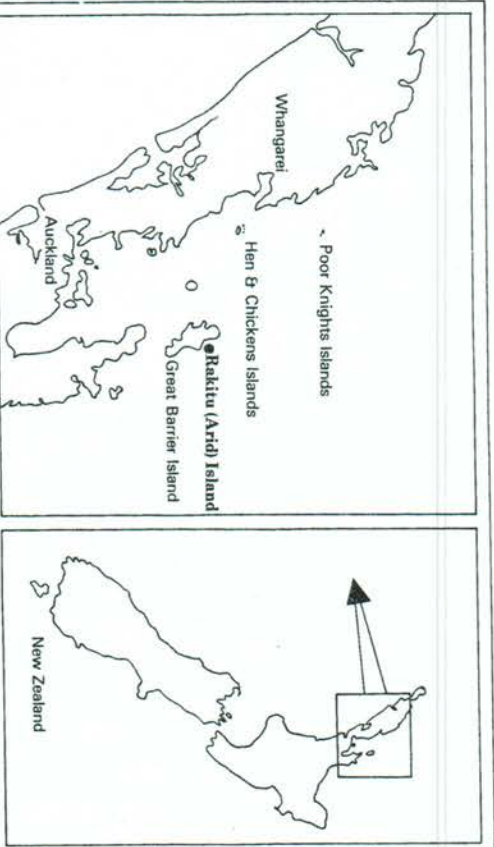


Fig. 1. Place names, localities, major streams, spot heights (in metres) and interesting plants for Rakiu (Arid) Island. Insets show location with respect to Great Barrier Island and the North Island of New Zealand.

Although most of the pasture is fenced, stock (sheep and cattle) have access to most of the forested areas. Consequently, most of these forests are very open. In Reserve Creek valley a small area of forest has been fenced to exclude stock and regeneration here is prolific. The only other forest with a good understory is that above Te Akau Point where Pinnacle Hill forms a natural barrier to stock.

The studies on which this paper is based were made during the Offshore Islands Research Group scientific trip to Rakiu from 30 December 1980 to 8 January 1981 (Hayward 1982) and by E.K.C. during an earlier visit to the island from 2 — 4 June 1980.

BOTANICAL HISTORY

The first known record of the vegetation is a short account by Hutton and Kirk (1868) who visited the island for a few hours in December 1867. Their notes give an indication of the island's vegetation at that time, and their sketch map is reproduced as Fig. 2. They mention that most of the open land had been burnt by a party of Maori nutton-bird hunters a few days before they landed. These Great Barrier Island Maoris probably seasonally set fire to the island to make the avian burrows more accessible. Even so, Hutton and Kirk mention "...sheltered valleys covered with luxuriant fern and bush..." They recorded 41 indigenous and 2 adventive vascular plants for the island. The present survey discovered all but 11 of these plants.

Hutton and Kirk mention that most of the central area of the island and its encompassing cliffs had open vegetation, with a cover of manuka (*Leptospermum scoparium*) and many other shrub species on the higher areas; while lower down, tall bracken (*Pteridium aquilinum* var. *esculentum*) with occasional tufts of New Zealand flax (*Phormium tenax*) predominated. The forest vegetation was limited to sheltered open spaces at the base of exterior cliffs and large portions of the northern and southern sides of the interior. Pohutukawa (*Metrosideros excelsa*) was abundant in the coastal forest type association.

Rakiu Island was surveyed by the Crown in 1870, and a map (Fig. 3) was produced. This map is important as it indicates the extent of modification even at that time. The three small peripheral "bush" areas shown are undermapped as pre-European forest remains in several outer areas today. Of the two sizeable central bush areas shown, less than one third remains today.

G.A. Buddle, ornithologist, photographer and explorer, visited the island several times in the 1930s and 1940s (Wilson 1959, p. 146). His notes (Notebook 4 in the possession of E.G. Turbott) for 12 January 1944 state "Since my last visit (about nine years ago) the island has been stocked and is now running about 40 head of cattle, half a dozen

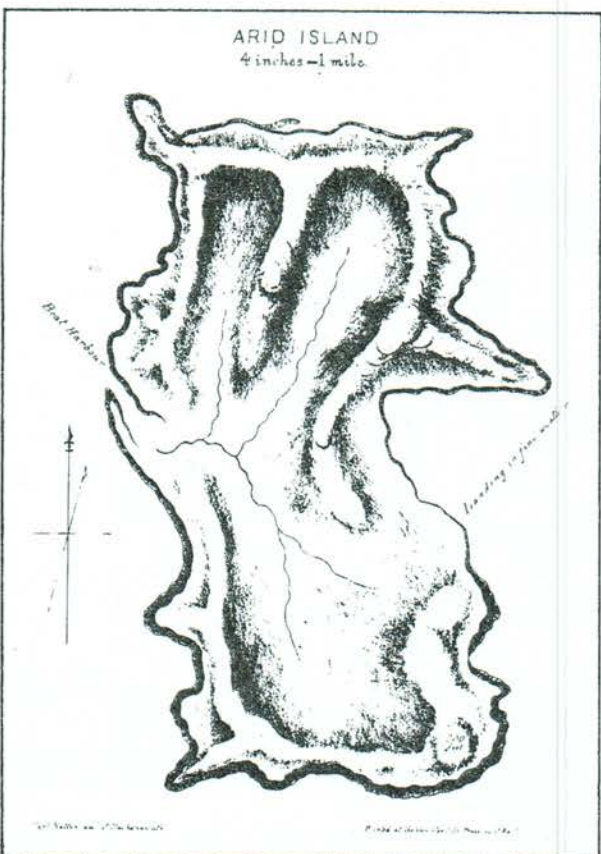


Fig. 2. Sketch map from Hutton and Kirk (1868).

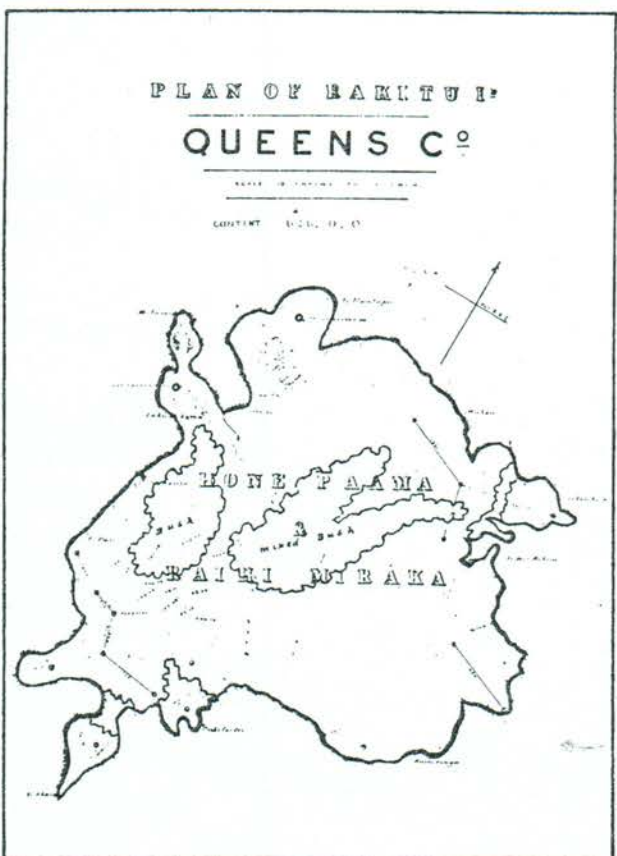


Fig. 3. Plan of Rakitu in 1870. Original held in Lands and Deeds Office, Auckland.

horses, and a lot of sheep: it has apparently been burnt over (that is the grassed areas) several times: figs which were plentiful then are now pretty nearly cleared out; we have seen some rooting, but very little of it fresh and have seen no pigs". Further notes describe walking "round the high ground on the west side keeping above the bush which is fairly intense in the two gullies on this side". Brief references to the western forested areas indicate a similar state of affairs to that prevailing during our visit.

When the present owner, D.B. Rope (pers. comm.) acquired the island in 1956, it was unfenced and stocked with 200 head of wild cattle. Although the present central pastoral land was strongly reverting in 1956, there had been stock on Rakitu for some time.

The only vegetation account since Hutton and Kirk was made 112 years later by Cameron (1980), who recorded 148 indigenous and 15 adventive taxa of vascular plants for the first time, and substantiated 29 of Hutton and Kirk's 43 records.

VEGETATION DESCRIPTIONS

The present day vegetation (Fig. 4) is superficially similar to the vegetation described by Hutton and Kirk (1868). The open land of 1867 is now improved pasture and the central mature forest has been further reduced in size. (compare Fig. 3 and 4). Except for a few seaward slopes where natural physical barriers have excluded sheep and cattle; ground cover, shrubs and regenerating canopy species have all been browsed by stock and even eliminated in some areas.

The island's vegetation has been divided into nine communities, and these are described below.

Grassland

The grasslands of Rakitu Island fall into two categories: the induced and improved pastures associated with the formally farmed area in the central basin, and the areas of rough, predominantly native grassland found on forest margins and the peripheral ridges.

The dominant element of the improved pastures is kikyuu (*Pennisetum clandestinum*). Without this species, the summer stocking capacity of the island would be severely reduced. Despite the hot, dry conditions encountered during our visit, the kikyuu sward was still green and growing. Smaller areas of ryegrass (*Lolium perenne*) - browntop (*Agrostis tenuis*) - clover (*Trifolium* spp.) pasture were found in damper areas. The adventive species sweet vernal (*Anthoxanthum odoratum*), tall fescue (*Festuca arundinacea*) and Yorkshire fog (*Holcus lanatus*) were also found in damper areas and around streams.

By contrast, the rough pasture of marginal areas was in poor condition during our visit. Providing a thin cover at the best of times, it

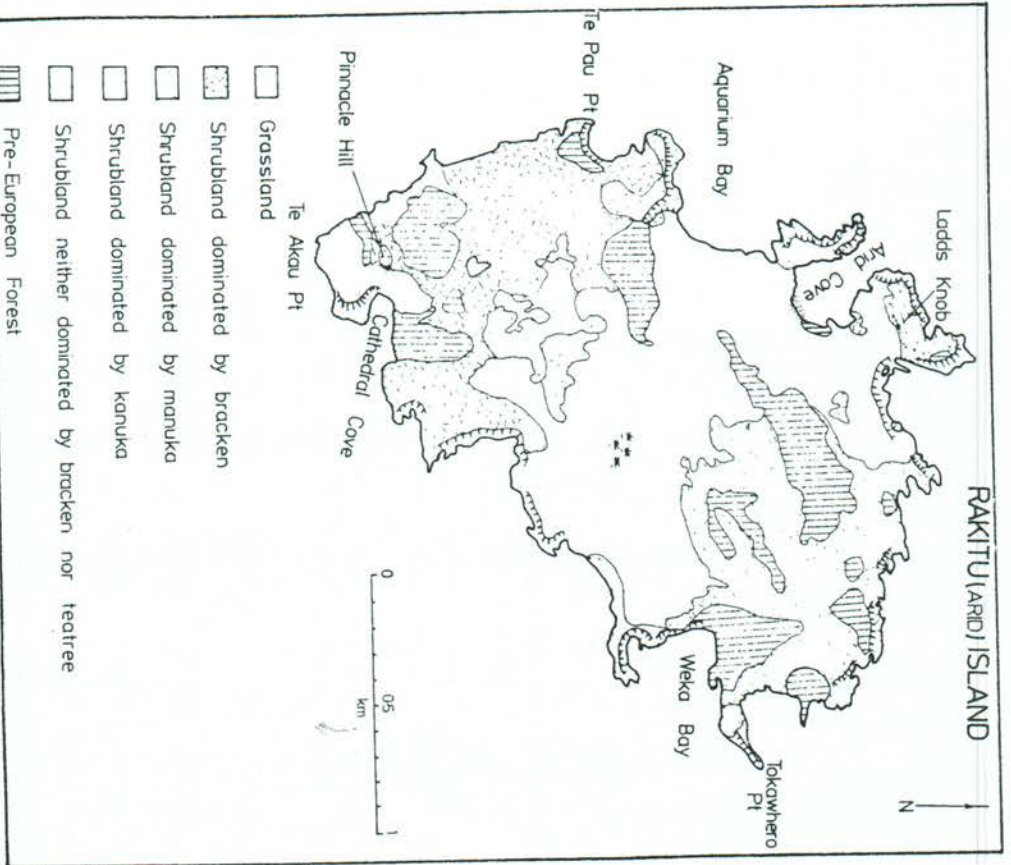


Fig. 4. Vegetation map for Rakitu (Arid) Island in 1981.

was dried out and browned by the summer drought. The common species were meadow rice grass (*Microlaena stipoides*), danthonias (*Rytidosperma biamulare*, *R. racemosum*, *R. tenuis* and *R. unarede*), cocksfoot (*Dactylis glomerata*), paspalum (*Paspalum dilatatum*) and ratstail (*Sporobolus africanus*).

Sandy beach

The island's only sizeable sandy beach is found in Arid Cove. Hutton and Kirk (1868) recorded three specialised sand plants there: *Coprosma*

aerosa, *Calystegia soldanella* and *Spinifex hirsutus*. Today, only the *Calystegia* survives. Hutton and Kirk also recorded the wild radish (*Raphanus sativus*) as growing just above the beach, but this has also gone.

The beach is subject to periodic browsing by stock and further modification by humans. All traffic arriving at or leaving the island crosses the beach. This disturbance may account for the absence of expected beach weeds such as sea rocket (*Cakile maritima*).

Swamps and seepage areas

Although there are several small swampy areas by the creeks and main stream, there is only one sizeable swamp, located at the head of Abbott's Stream. The only swamp plant recorded by Hutton and Kirk was raupo (*Typha orientalis*) which is no longer growing on the island. This larger swamp is surrounded by pasture and is extensively browsed by stock, but it still retains some interesting plants including the rushes *Juncus articulatus*, *J. effusus*, *J. gregiflorus*, *J. pallidus* and *J. planifolius*; the sedges *Eleocharis acuta*, *E. gracilis*, *Scirpus inundatus*, *S. lacustris* and *S. reticularis*; the water buttercup *Ranunculus rularis*; the fern *Blechnum capense* "swamp form"; and the swamp willow weed (*Polygonum decipiens*).

With continual browsing more species will be lost from this habitat. Already the taller species (*Juncus pallidus* and *Scirpus lacustris*) can scarcely grow tall enough to flower before being grazed almost to ground level.

Creek margins and seepage areas may contain isolated patches of *Juncus* and *Scirpus* species. Swamp willow weed is abundant along the grassy margin of Abbott's Stream. *Carex virgata* tussocks are present at the lower end of the Reserve Creek by the forest margin.

Shaded seepage areas may contain the creeping willow herb (*Epilobium rotundifolium*) or *Juncus pauciflorus*, though more commonly kiokio (*Blechnum capense*), *Cyperus ustulatus*, water fern (*Histiopteris incisa*) and N.Z. flax are found.

Sunny, exposed seepage areas on coastal slopes may support colonies of the clubmoss *Lycopodium cernuum*, the sundew *Drosera binata*, the striking sedge *Machaerina sinclairii* or the native buttercup *Ranunculus hirtus*.

Coastal rocks and cliffs

The precipitous cliffs which dominate the coastline allow few sites for plant establishment. On the coastal rocks two small ferns may be found: *Asplenium flaccidum* subsp. *haurakiense* and *A. obtusatum* subsp. *northlandicum*. The latter appears to be confined to Arid Cove. Common flowering plants of the coastal rocks include *Samolus repens*, glasswort (*Salicornia australis*), *Scirpus nodosus*, taupata (*Coprosma repens*),

shore lobelia (*Lobelia anceps*), *Aira multicalmis*, *Rhagodia triandra*, Mercury Bay weed (*Dichondra repens*), Maori celery (*Apium australe*), shore groundsel (*Senecio lautus*), *Scirpus cervinus*, annual pearlwort (*Sagina procumbens*), *Tililea sieberiana*, N.Z. wind grass (*Lachnagrostis filiformis*) and sand wind grass (*Deyeuxia billardieri*). Oioi (*Leplocarpus similis*) and *Selliera radicans* occurred less commonly in this habitat.

Rock ledges on the northern coastal cliffs of Ladd's Knob support toetoe (*Cortaderia splendens*), shrubby pohutukawa, renga lily (*Arthropodium cirratum*), long-hair plume grass (*Dichelachne crinita*) and danthonias. Other cliff dwellers found on the island include the grass *Agropyron kirchii*, the sedge *Carex flagellifera*, N.Z. flax, *Oxalis perennans*, Strathmore weed (*Pimelea prostrata*), *Gnaphalium audar*, manuka, mingimingi (*Cyathodes fasciculata*), patotara (*C. fraseri*), *Psilotum nudum* and dune tauhinu (*Cassinia retorta*).

These bare and often near-vertical sites which are frequently exposed to the salt spray have, to a large extent, escaped fires and damage by browsing mammals. The self-introduction of the exotic grass species *Aira multicalmis*, shivery grass (*Briza minor*), *Bromus mollis*, *Rytidosperma racemosum*, *R. tenuis* and vulpia hair grass (*Vulpia bromoides*) would be the major modification of the vegetation on these sites.

Shrubland dominated by bracken

This type of cover is induced by fire and is limited to a single exposed area on the island, Ladd's Knob. The top of the knob is covered with bracken and manuka about 50 cm tall. Scattered through this is N.Z. flax and dune tauhinu up to 1 m tall. Rocky outcrops are common where low lying plants such as *Oxalis perennans*, kopata (*Pelargonium inodorum*) and danthonias may be found.

To the south of this knob there is pasture and to the north, almost vertical cliffs to the sea. In places there are more gentle coastal slopes and in such places dune tauhinu abounds, associated with bracken, N.Z. flax, manuka and *Scirpus nodosus*.

Shrubland dominated by manuka (less than 3 m tall)

There are three main areas of low tea-tree on the island which are all predominantly manuka. The catchment of Waterfall Creek contains the largest area of low tea-tree and has been burnt or cleared several times since 1956. Stock freely browse the area and this coupled with the fact that the manuka is very dense precludes the presence of other plant species.

The crown of Pinnacle Hill and the flat ridge between Bush Creek Valley and Shag Bay are the other two areas of low tea-tree. They are probably older than the Waterfall Creek area and because of their exposed position the vegetation has grown more slowly. The flanks of

both these areas are steep with numerous rock bluffs. Plants associated with the manuka include: young pohutukawa, akepiro (*Olearia furfurea*), mingimingi, mapau (*Myrsine australis*) and five finger (*Pseudopanax arboreus*). Occurring less commonly are N.Z. flax, snowberry (*Gaultheria antipoda*), kanuka (*Leptospermum ericoides*) and prickly heath (*Cyathodes juniperina*). Underneath this cover the ground is usually bare, but bracken, huruhuruwhenua (*Asplenium oblongifolium*), *Astelia banksii*, danthonias and *Pyrrhosia serpens* may occur.

Shrubland dominated by kanuka (greater than 3 m tall)

This vegetation type is variable in height ranging from rather low tea-tree to tall kanuka forest. Generally the tall kanuka is found in the valleys adjacent to the pre-European forests and grades to low manuka on the exposed ridges.

Underneath the kanuka canopy, regeneration is poor due to browsing. In some areas, especially in the interior part of the island, regeneration is virtually absent under the kanuka, such as above Maori Creek and most of Waterfall Creek catchment.

Under the kanuka canopy common shrubs include: pohutukawa, mapou, *Coprosma rhamnoides*, rangiora (*Brachyglottis repanda*), ponga (*Cyathea dealbata*), akepiro, mingimingi and *Helichrysum aggregatum*. Five-finger, rewarewa (*Knightsia excelsa*) and kohokohe (*Dysoxylum spectabile*) are less commonly found. Near the coast karo (*Pitiosporum crassifolium*), houpara (*Pseudopanax lessonii*), *Coprosma macrocarpa*, koromiko (*Hebe stricta*) and toetoe may be present. *Hypolepis tenuifolia*, *Pteris comans* and *Oplismenus imbecillus* are locally common ground cover plants, although more usually the ground is rather bare. Other ground plants noted include: *Doodia media*, huruhuruwhenua, kopata, *Astelia banksii*, *Parietaria debilis* and *Gnaphalium* spp. Lianes include carmine rata (*Metrosideros carminea*) and clematis (*Clematis paniculata*) while *Pyrrhosia serpens*, Hound's tongue (*Phymatodes diversifolium*) and the orchid *Drymoanthus adversus* are found as epiphytes.

In several cases the predominant canopy is below 3 m but it has been included under this vegetation community because it contains taller emergents. The 2 m high vegetation on the headland on the western side of Arid Cove is an example of such an area as it contains emergent pohutukawa from 2 m to 8 m high.

Shrubland neither dominated by bracken nor tea-tree

Unlike the previous shrubland categories this one is predominantly natural, that is, not induced by man. The sites are coastal and usually so steep that it is impossible for a forest to develop. The main species of

this community is pohutukawa which is typically prostrate and spreading; also toetoe, N.Z. flax and manuka are common. Other constituents may include houpara, hangehange (*Geniostoma ligustrifolium*), *Astelia banksii*, akepiro, bracken, mingimingi, kanuka, Strathmore weed and kiokio. Clinging rata (*Metrosideros perforata*) may in some places cover large areas of vertical cliff such as the coastal slope east of Pinnacle Hill (Fig. 5). Dune tauhinu, kawakawa (*Macropiper excelsum*) rangiora, five-finger, *Linum monogynum*, mapau, *Carex spinirostris*, *Scirpus nodosus* and *Gnaphalium* spp. are occasionally present, and close to the coast taupata may occur.

Pre-European forest

Most commonly a mixed canopy of pohutukawa, taraire (*Beilschmiedia tarairi*), kohekohe and tawaroa (*Beilschmiedia* sp. aff. *taua*) is found in the pre-European forest. Less common is rewarawa, puriri (*Vitex lucens*), karaka (*Corynocarpus laevigatus*), coastal maire (*Nestegis apetala*), tawapou (*Planchonella nou-zealandica*) and less common again are mahoe, parapara (*Pisonia brunoniana*), mangao (*Litsea calcaris*) and kanuka. The most common canopy species is pohutukawa except in the forested coastal valley north of Pinnacle Hill where taraire forms a continuous canopy about 10 m tall with trunks 25-60 cm diameter at breast height.

The pre-European forest understory is dominated by kawakawa, rangiora, mapau and waiu-aiua (*Rhododotamnus solandri*). *Coprosma macrocarpa*, nikau (*Rhopalostylis sapida*), pigeonwood (*Hedyocarya arborea*), *Coprosma rhamnoides*, karaka and hangehange are commonly present. Houpara, wharangi (*Melicope ternata*) and whau (*Ertelia arborescens*) are occasionally present. Where there is heavy browsing the understory may be lacking (Fig. 7) or *Coprosma rhamnoides* and/or kawakawa may dominate. In the few areas where there is little to no browsing the understory is thick and diverse in species. For example a valley inaccessible to stock, south of Pinnacle Hill (Fig. 5 and 6) contained at least 19 species in the understory. Several of these species are occasional to absent elsewhere on the island; such as shining karamu (*Coprosma lucida*), raurekan (*C. australis*), N.Z. honeysuckle (*Aseuosmia x quercifolia*) and toropapa (*A. macrophylla*). The remarkable regeneration of the small area which was fenced to exclude stock over two years ago in the Reserve Valley forest clearly illustrates the damage due to browsing (Fig. 8).

The commonest ground species is *Pteris comans* followed by *Doodia media* and *Blechnum norfolkianum*. Other common ground species include: *Blechnum filiforme*, *Asplenium lamprophyllum*, *A. oblongifolium*, *Opismenus imbecillis* and *Adiantum cunninghamii*. *Astelia banksii*, *Blechnum capense*, *Polystichum richardii* and *Pteris tremula* are occasionally present. *Trichomanes endlicherianum* is

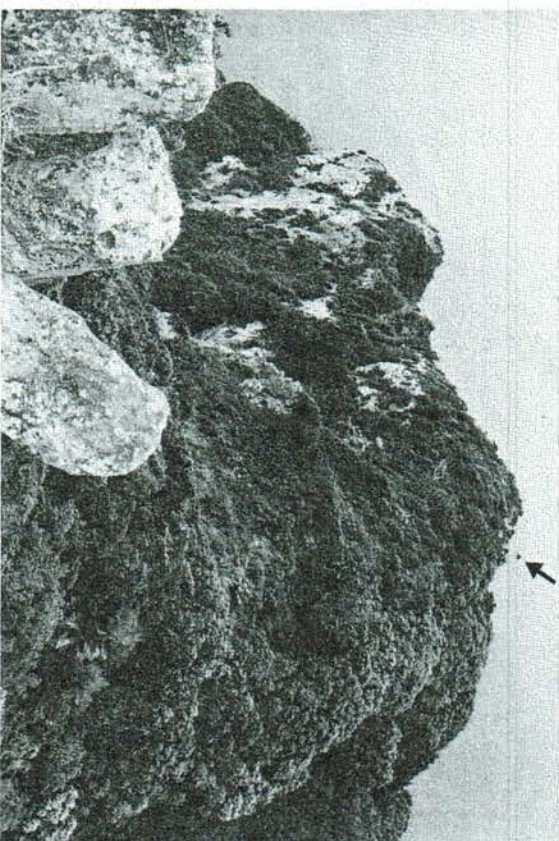


Fig. 5. Looking towards Te Akaun Point from Pinnacle Hill over unbrowsed coastal forest. Leader of solitary kauri (*Agathis australis*) tree arrowed, and clinging rata (*Metrosideros perforata*) on cliff-face.



Fig. 6. Dense undergrowth in pohutukawa forest south of Pinnacle Hill. Note the dense tangles of mangemange (*Lyrodium articulatum*) above the figure.

common rupestrally near creeks in the central forested valleys. Climbers such as clinging and carmine rata, bush-lawyer (*Rubus cissoides*), *Blechnum filiforme*, *Arthropteris tenella* and supplejack (*Ripogonum scandens*) are occasionally present. Epiphytes are not abundant, but *Colospermum hastatum* and *Astelia solandri* are the two most common followed by *Earia macronata*, *Pittosporum cornifolium* and *Pyrosia serpens*; occasionally found are *Phymatodes* spp., *Asplenium flaccidum* subsp. *flaccidum*, and *Lycopodium billardieri*.

It can be concluded that the major influence on the presence or the absence of regenerating canopy species under the pre-European forest was browsing. Generally kohekohe was always present in most size classes and pohutukawa was absent. Tarairi and tawaroa were present, but usually not in all size classes and rarely as common as kohekohe.

ANNOTATED SPECIES LIST

321 taxa of native and adventive plants are listed below for Rakitu Island. No attempt has been made to include cultivated plants from the settlement area in Arid Cove.

Nomenclature of indigenous plants follows Allan (1961), Moore and Edgar (1970) and Cheeseman (1925). Names from other sources are referenced. Adventive plants are named according to various works, e.g. Healy and Edgar (1980), New Zealand Weed and Pest Control Society (1969) and Clapham *et al.* (1962). Where applicable, common names are also taken from New Zealand Weed and Pest Control Society (1969).

Families are ordered according to Volumes I and II of the 'Flora of New Zealand', with adventive families inserted according to the order given in Hutchinson (1959). Genera are listed alphabetically within families as are species within genera.

Within the notes on each taxa an attempt has been made to assess the frequency according to a five-tiered scale: abundant, common, frequent, occasional, rare. These frequencies to some degree relate to the presence or absence of habitat, and to the frequency within a suitable habitat.

Where specimens exist to support records, the appropriate herbarium sheet numbers are listed. Herbarium abbreviations follow Holmgren *et al.* (1981).

* denotes adventive species.

Family	Species	Common name/Notes	Voucher
PSILOPSIDA	<i>Psilotum nudum</i>	Occasional amongst rocky outcrops at various localities. (Chinnock 1975).	AK 153480 AKU 10755
Psilotaceae	<i>Thespispteris elongata</i> subsp. <i>elongata</i>	Rare; epiphytic on <i>Dicksonia squarrosa</i> in the	AK 153481 AKU 10764

T. elongata subsp. *robusta*

head of Reserve Creek valley and on *Cyathea dealbata* in dry forest above Shag Bay. (Chinnock 1975). Occasional; hanging down from clumps of *Colospermum hastatum*, e.g. at head of Reserve Creek.

AK 153552
AKU 10765

T. lanceolata

Rare, growing with *T. elongata* subsp. *elongata* in Reserve Creek valley.

AKU 10763

LYCOPOSIDA

Lycopodiaceae

Lycopodium billardieri

Clubmoss. Occasional; as an epiphyte in forest and rupestral/terrestrial on ridge east of trig and above Kauri Cove.

AK 153520
AKU 10758

L. cernuum

Clubmoss. Rare; found in two localities, both disturbed open areas with water seepage.

AK 153487
AKU 10756

L. volubile

Clubmoss. Occasional under *Leptospermum* and with *L. cernuum*.

AK 153509
AKU 10757

Phylloglossum drummondii

Not encountered during the present survey, although an undated specimen from Arid Island supplied by Eric Craig (see Goulding 1977) is in AK.

AK 46154

FILICOPSIDA

Ophioglossaceae

Ophioglossum coriaceum

Not encountered during the present survey but recorded by Hutton and Kirk (1868). Specimens from Arid Island can be found in AK (ex Eric Craig) and WELT* (collected T. Kirk in 1867).

AK 115918
WELT*
P4579

Schizaeaceae

Lygodium articulatum

Mangemange. Occasional in dry forest and *Leptospermum* scrub, e.g. south of Pinnacle Hill.

AK 153473
AKU 10768

Hymenophyllaceae

Hymenophyllum demissum

Filmy fern. Occasionally found terrestrial in forest at south-west end of the island. Locally abundant on damp rock bluffs at head of Bush Creek valley.

AK 153489

H. dilatatum

Filmy fern. Rare, at base of bluffs at the head of Bush Creek valley.

AK 153490
AKU 10771

H. flabellatum

Rare, with *H. dilatatum*

AKU 10744

	<i>H. rurum</i>	Rare; growing in a bryophyte mat on a rock ledge on a coastal slope leading down to Te Pau Point.	AKU 10745
	<i>H. sanguinolentum</i>	Occasional; terrestrial by the top of coastal slopes above Ora Point.	AKU 10770
	<i>Trichomanes endlicherianum</i>	Frequently found rupestral on creek-banks in Reserve Creek and Bush Creek valleys, and above Waka Bay.	AK 153530 AKU 10769
	<i>T. reniforme</i>	Kidney fern. Occasional; rupestral at top of Bush Creek valley and on rocky bluffs on south side of Pinnacle Hill.	AK 153474
Dicksoniaceae	<i>Dicksonia squarrosa</i>	Wheki. Occasional; one large stand in Reserve Creek valley below the trig.	
Cyatheaceae	<i>Cyathea dealbata</i>	Ponga. Frequent, scattered throughout the forest; juveniles beneath <i>Leptospermum</i> .	
	<i>C. medullaris</i>	Mamaku. Occasional in the central forested valleys.	
Polypodiaceae	<i>Anarthropteris lanceolata</i>	Rare, rupestral on boulders in coastal forest above Cathedral Cove and behind Waka Bay.	AK 153483 AKU 10777
	<i>Phymatodes diversifolium</i>	Hound's tongue. Common on rocks and trees throughout.	
	<i>P. scandens</i>	Occasional on inland rocks and trees.	
	<i>Pyrrhosia serpens</i>	Abundant on rocks and trees throughout.	
Thelypteridaceae	<i>Thelypteris penniger</i>	Occasional by watercourses in inland valleys.	
Dennstaedtiaceae	<i>Hypolepis 'dicksonioides'</i>	Rare, amongst tall grasses on a coastal slump face above Rockfall Bay.	AK 153494 AKU 10762
	<i>H. tenuifolia</i>	Common beneath <i>Leptospermum</i> and forest, especially where other undergrowth has been grazed out.	AK 153512 AKU 10761
Davalliaceae	<i>Arthropteris tenella</i>	Common on rocks and boulders in the forest; occasionally ascending trees.	AK 153475
Psilotaceae	<i>Histiopteris incisa</i>	Water fern. Sporophytes frequent in seepage areas and beneath <i>Leptospermum</i> .	AK 153511

Asplenaceae	<i>Asplenium bulbiferum</i> subsp. <i>bulbiferum</i>	Plants over 1m tall abundant along northern margin of Bush Creek forest. Scented fern. Frequent, open areas.	
	<i>Pasia scaberula</i>	Bracken.	
	<i>Pteridium aquilinum</i> var. <i>esculentum</i>	Locally abundant in open coastal and inland areas, e.g. Ladds Knob.	
	<i>Pteris comans</i>	Frequent beneath mature forest canopy.	AK 106984 AKU 9575
	<i>P. tremula</i>	Turawera. Occasional beneath coastal forest and on forest margins.	AKU 10759
	<i>Asplenium bulbiferum</i> subsp. <i>bulbiferum</i>	Hen and Chickens fern. Occasional in coastal forest by stream beds, e.g. head of Bush Creek.	AK 153606 AKU 10775
	<i>A. flaccidum</i> subsp. <i>flaccidum</i>	Occasional; epiphytic in mature coastal forest.	AK 153533 AKU 10747
	<i>A. flaccidum</i> subsp. <i>haurakiense</i>	Common; terrestrial on coastal rocks and coastal cliffs. Ascending to 100m altitude above Aquatum Bay by Papakoura Point.	AK 153184 AKU 10748
	<i>A. lamprophyllum</i>	Frequent; terrestrial and rupestral under tall forest.	AK 153318 AKU 10760
	<i>A. oblongifolium</i>	(Brownsey 1979) Huruhuru-whenua. Abundant throughout.	AKU 10749
	<i>A. obtusatum</i> subsp. <i>northlandicum</i>	(Brownsey 1977). Occasional in coastal rock crevices in Arid Cove.	AK 153482 AKU 10776
	<i>A. polyodon</i>	(Brownsey 1977). Occasional, epiphytic in forest.	AKU 10746
Blechnaceae	<i>Blechnum capense</i>	Kioiio frequent in open, well lit forest, e.g. below cliffs in Rockfall Bay.	AK 153492
	<i>B. capense</i> 'swamp form'	Small fern with fertile fronds only 30 cm long and sterile fronds c. 23 cm long. Rare, only found in the browsed swamp at the head of Abbotts Stream.	AKU 10772
	<i>B. filiforme</i>	Common terrestrially under tall forest; occasionally ascending trees.	
	<i>B. norfolkianum</i>	Frequent beneath tall forest.	AKU 10761
	<i>Doodia media</i>	Abundant in forest and scrub throughout.	AKU 10774

Dryopteridaceae	<i>Lastreopsis glabella</i>	(Tindale 1957). Frequent in tall forest in Reserve and Maori Creek valleys.	AKU 10760
	<i>L. velutina</i>	(Tindale 1957). Velvet fern. Occasional in dry coastal forest in the south-west corner of the island.	AK 153488
	<i>Polystichum richardii</i>	Frequent in dry forest throughout.	
Athyriaceae	<i>Athyrium australe</i>	Locally abundant on stream-banks in the forested valleys in the centre of the island.	AKU 10766
	<i>A. japonicum</i>	Usually growing in association with <i>A. australe</i> .	AKU 10767
Adiantaceae	<i>Adiantum aethiopicum</i>	Makaka. Locally common; open coastal grassy slopes, e.g. southern face of Ladd's Knob.	AK 153491
	<i>A. cunninghamii</i>	Maidenhair. Common; open grassy coastal slopes to beneath mature forest.	AKU 10752
	<i>A. diaphanum</i>	Occasional; beneath tall forest by margin of Reserve Creek and above Waka Bay.	AK 153529
	<i>A. hispidulum</i>	Rosy maidenhair. Frequent, coastal forest margins and in open, dry forest.	AKU 10753
	<i>Pellaea rotundifolia</i>	Frequent in dry, rocky forest and open grassy areas.	AKU 10754
SPERMATOPSIDA			
GYMNOSPERMAE			
Podocarpaceae	<i>Dacrydium cupressinum</i>	Rimu. Recorded by Hutton and Kirk (1868) as one of the '...principal trees of large size...'. Probably recorded in error as reasonably large areas of forest in the central valley remain in much the same state as they were in 1870 (Cameron 1980), and no rimu were seen during the present survey.	
	<i>Podocarpus ferrugineus</i>	Miro. One female tree was found in the head of Bush Creek Valley, c. 15m tall and 47.5 cm D.B.H. (diameter at breast height). Several seedlings were growing in the vicinity with a few more on the coastal slope towards Te Pau Point.	AK 153538 AKU 10743
	<i>P. totara</i>	Totara. Single seedling c. 1m tall growing in	

Araucariaceae

Agathis australis

kanuka/pohutukawa forest below the trig in the head of Reserve Creek valley. Kauri. 8 trees found ranging in height from 1 to 11 m; five trees with D.B.H. over 13 cm; three bearing cones. All growing on the outer coastal slopes of the island, usually in exposed sites (Figs. 1 and 5). AK 153522 shows particularly broad leaves reminiscent of *A. robusta* from Queensland.

AK 153470
AKU 10742

ANGIOSPERMAE
DICOTYLEDONES

Lauraceae

Beilschmiedia tarriri

Tarraire. Abundant forest tree, forming pure stands on the south-west side of the island. The largest tree seen had a dbh of 95.4 cm; was c. 10 m tall; and was found at the head of the coastal valley north-west of Pinnacle Hill. Several of the larger trees, although apparently healthy, had the fungus *Agrocybe caegeria* growing from clefts in their trunks. Tawaroa. The large-leaved tawa was of frequent occurrence in most tall forest on the island. The largest tree recorded was 53.4 cm D.B.H. c. 20 m tall and located on the coastal slope on the northern side of Cathedral Cove.

AK 152644
AKU 10789

B. sp. aff. tawa

Litsea calicaris

Monimiaceae

Hedycaarya arborea

Pigeonwood. Frequent in the under-storey of tall forest throughout, increasing in occurrence in un browsed areas.

AKU 10847

Ranunculaceae

Clematis paniculata

Frequent in regenerating forest and pure *Leptospermum* stands.

AKU 10847

C. parviflora

Occasional, damp areas beneath *Leptospermum* or forest canopy.

AK 153571
AKU 10849

Ranunculus hirtus

	<i>R. rivularis</i>	Rare, swamp at the head of Abbotts Stream.	AKU 10848
Piperaceae	<i>Macropiper excelsum</i>	Kawakawa. Abundant throughout the forest understory. The largest shade leaf lamina measured was 205 x 210 mm. Common on rocks and boulders throughout forested areas. (Garnock-Jones 1979). Locally abundant at one site behind the beach in Weka Bay.	CHR257013 AKU 10788
	<i>Peperomia urvilleana</i>		AK 153317 AKU 10889
Cruciferae	<i>Brassica rapa</i> subsp. <i>sylvestris</i> *		AK 153291
	<i>Capsella bursa-pastoris</i> *	Shepherd's purse. Frequent weed in pasture, particularly around stockyards. New Zealand bitter cress. Rare, only found in one locality below a slip face near Te Pau Point. Recorded by Hutton and Kirk (1868) but not seen during the present survey. (Garnock-Jones 1978). Occasional in damp places. The largest population observed was situated in the Shag Bay - Te Pau Point area. Odd plants were found beneath forest and scrub, e.g. a small plant growing on a moss-covered boulder in Reserve Creek Valley. Hedge mustard. Occasional pasture weed.	AK 153519 AKU 10846
	<i>Cardamine debilis</i>		AKU 10846
	<i>Raphanus sativus</i> *		AK 153477 AKU 10846
	<i>Rorippa gigantea</i>		
Violaceae	<i>Hymenandra novae-zelandiae</i>	Occasional forest and forest margins close to the sea. Two trees in the western corner of Angelfish Bay measured c. 5 m tall and 18 cm D.B.H. Mahoe. Common in forest understory throughout. Frequent on exposed rocks and cliffs throughout.	AK 153195 AKU 10882
	<i>Meliccytus ramiflorus</i>		AKU 10817
Crassulaceae	<i>Tillaea sieberiana</i>		AKU 10785
Droseraceae	<i>Drosera auriculata</i>	Sundew. Recorded by Hutton and Kirk (1868) though not seen during the present survey. In view of the frequency of apparently suitable habitats this absence is surprising.	

	<i>D. binata</i>	Sundew. Rare, found in a single locality above Angelfish Bay growing amongst mosses on an open seepage face. New Zealand iceplant. Frequent, coastal rocks and cliffs. New Zealand spinach. Frequent, scrambling over coastal cliffs and at back of beaches. Annual mouse-ear chickweed. Frequent weed of disturbed ground. Allseed. Abundant weed of disturbed sites throughout. Annual pearlwort. Common weed of dry, rocky sites from the coast to ridgelops. Pearlwort. Occasional weed in exposed seepage areas. Catchfly. Common weed of dry sites from the coast to ridgelops. Sea spurry. Occasional, rocks and cliffs in reach of salt-spray. Chickweed. Common weed in fertile damp pastures. Common on dry ground beneath well-lit forest. Wire vine. Frequent on coastal grassy slopes and at the back of boulder beaches. Swamp willow weed. Abundant in Abbott's Stream swamp, surrounded by pasture. Sheep's sorrel. Locally common pasture weed. Clustered dock. Abundant weed on the banks of Abbott's Stream. Inkweed. Frequent in scrub and forest areas; sometimes the only exotic plant present. Frequent, hanging down steep, bare coastal cliffs. Glasswort. Occasional, coastal rocks. Locally abundant shore plant in Angelfish Bay.	AK 153467 AKU 10859
Aizoaceae	<i>Disphyma australe</i>		AKU 10888
	<i>Tetragonia trigyna</i>		
Caryophyllaceae	<i>Cerastium glomeratum</i> *		
	<i>Polycarpon tetraphyllum</i> *		AK 153525 AKU 10829 AKU 10782
	<i>Sagina opetala</i> *		
	<i>S. procumbens</i> *		AK 153536
	<i>Silene gallica</i> *		
	<i>Spergularia marginata</i>		AKU 10830
	<i>Stellaria media</i> *		
	<i>Stellaria parviflora</i>		AK 153553 AKU 10887
Polygonaceae	<i>Muehlenbeckia complexa</i>		
	<i>Polygonum decipiens</i>		AKU 10792
	<i>Rumex acetosella</i> *		
	<i>R. conglomeratus</i> *		AK 153309
Phytolaccaceae	<i>Phytolacca octandra</i> *		
Chenopodiaceae	<i>Rhagodia triandra</i>		AK 153192 AKU 10799 AK 153548
	<i>Salicornia australis</i>		

Geraniaceae	<i>Geranium dissectum*</i>	Cut-leaved geranium. Rare, steep grassland on bush margin, eastern Rockfall Bay.	AK 153560	Thymelaeaceae	<i>Pinelea prostrata</i>	and measured 23.7 cm D.B.H. Strathmore weed. Common on coastal cliffs.	AKU 10803
	<i>G. molle*</i>	Dove's foot. Common weed of pasture areas.	AKU 10793	Proteaceae	<i>Krighia excelsa</i>	Rewarawa. Occasional, in mature forest or in <i>Leptospermum</i> stands.	AKU 10804
	<i>G. potentilloides</i>	Rare, rock crevice on a boulder, margin of Abbott's Stream below Maori Creek.	AKU 10794	Coriariaceae	<i>Coriaria arborea</i>	Tutu. Occasional, in scrub on coastal banks and screens on the south-east side of the island.	AKU 10805
	<i>Pelargonium inodorum</i>	Kopaka. Frequent, open exposed areas (e.g. summit of Ladd's Knob) and under <i>Leptospermum</i> .	AK 153573 AKU 10885	Pitosporeaceae	<i>Pitiosporum cornifolium</i>	Frequent, usually epiphytic from <i>Colloospermum</i> clumps, though terrestrial on the high ridge from the top of Bush Creek to Pinnacle Hill.	AK 153189 AKU 10790
Oxalidaceae	<i>Oxalis exilis</i>	(Reid 1975). Frequent, widespread from coast to beneath tall forest. Usually in shady places.	AKU 10784	Onacrotiaceae	<i>P. crassifolium</i>	Karo. Common, on margins of coastal forest by sea.	AKU 10791
	<i>O. perennans</i>	(Haworth 1803). Frequent, dry, open clay sites.	AK 153314	Myrtaceae	<i>Sicyos angulata</i>	Mawhai. Rare, scrambling over vegetation at back of boulder beach in Weka Bay.	AK 153523 AKU 10800
Linaceae	<i>Linum marginale*</i>	Australian flax. Occasional weed of pasture and tall grassland.	AKU 10864		<i>Leptospermum ericoides</i>	Kanuka. Locally abundant, forming pure stands especially at the head of Waterfall Creek valley. A reflection of past clearing operations. Several old trees up to 12 m tall and 63 cm D.B.H. were found at the top of the valley north-west of Pinnacle Hill.	AKU 10806
	<i>L. monogynum</i>	Rauhuia. Occasional, coastal cliffs at Mohuroa and Tokawhero Points.	AKU 10883		<i>L. scoparium</i>	Manuka. Common in exposed areas of low vegetation, usually near the coast, or associated with kanuka. Locally abundant, e.g. on Ladd's Knob. Commonly with pinkish flowers up to 23 mm diameter.	AK 153198 AKU 10844
Haloragaceae	<i>Haloragis erecta</i>	Shrubby haloragis. Frequent shrubby areas, forest margins, coastal slopes.	AK 153566 AKU 10881		<i>Metrosideros carminea</i>	Carmine rata. Occasional, shrubby epiphyte in forest.	AK 153517 AKU 10842
	<i>H. incana</i>	Occasional, under low <i>Leptospermum</i> .			<i>M. excelsa</i>	Pohutukawa. Abundant throughout. The largest trees are found in the central valleys; one tree growing on a large boulder in Bush Creek valley had a diameter of 3.4 m 0.5 m above ground level. Many trees had pale salmon-coloured flowers.	AK 153510 AKU 10807
Onagraceae	<i>Epilobium rotundifolium</i>	Creeping willow herb. Frequent in wet areas beneath forest, and in swampy pasture at head of Abbott's Stream.	AK 153186 AKU 10821		<i>M. perforata</i>	Chinging rata. Common, spreading over rocks in open places; less common as a forest epiphyte. A large	AK 153441 AKU 10808
	<i>Fuchsia excorticata</i>	Kotukutuku. Occasional, on forest margins in areas free from browsing. One large tree growing in a gully in Cathedral Cove was c. 7 m tall and 14.6 cm D.B.H.	AK 153561				
Callitricaceae	<i>Callitriche muelleri</i>	Starwort. Locally abundant, e.g. at lower end of Bush Creek on wet mud under a mixed forest canopy.	AK 153752 AKU 10878				
	<i>C. stagnalis*</i>	Starwort. Common in mud surrounded by pasture in Abbott's Stream.					
Nyctaginaceae	<i>Pisonia brunoniana</i>	Parapara. Frequent through scattered, component of coastal and inland forests. The largest tree seen was located in the valley north-west of Pinnacle Hill	AK 11289 AKU 10819 WELT 51266				

		vertical rock-face at the head of Bush Creek valley and the rock-face east of Pinnacle Hill are completely covered with this rata.						
Ylliacae	<i>Entelea arborescens</i>	Whau. Frequent in understory of open coastal and inland forests, particularly in clearings or on forest margins.			<i>T. glomeratum*</i>	Clustered clover. Locally frequent in pasture.		AKU 10780
					<i>T. repens*</i>	White clover. Common constituent of damp pasture.		
					<i>T. subterraneum*</i>	Subterranean clover. Common throughout pasture areas.		
Malvaceae	<i>Hobelia populnea</i>	Houhere. Frequent, understory of coastal and inland forests.			<i>Ulex europaeus*</i>	Gorse. Frequent in scrubby areas and on pasture margins.		
					<i>Paratrophis banksii</i>	Large-leaved milk tree. Occasional small tree in understory of coastal and inland forests.		AK 153299
	<i>Modiola caroliniana*</i>	Creeping mallow. Occasional weed in damp, disturbed pasture.			<i>Parietaria debilis</i>	Locally abundant, e.g. under open forest canopy in the bottom of Bush Creek valley.		AK 153514 AKU 10855
Euphorbiaceae	<i>Euphorbia pepylus*</i>	Milkweed. Common in damp disturbed ground			<i>Corynocarpus laevigatus</i>	Karaka. Common, present in all forest on the island, often reaching into the canopy.		
Cunoniaceae	<i>Weinmannia silvicola</i>	throughout.			<i>Rhamnaceae</i>			
		Towai. Occasional, the largest specimen (c. 5 m tall) sited above Te Pau Point.			<i>Pomaderris phyllifolia</i>	Tauhini. Recorded by Hutton and Kirk (1868) but not seen during the present survey.		
		Smaller trees were found scattered along the base of inland cliffs in the head of Bush Creek valley.			<i>var. ericifolia</i>	Wharangi. Frequent in coastal scrub and occasionally in the understory of well-lit inland forests.		
Hydrangeaceae	<i>Hydrangea macrophylla*</i>	Hydrangea. Persists in old orchard in Lower Reserve Creek valley.			<i>Rutaceae</i>			
Rosaceae	<i>Acaena anserinifolia</i>	Piripiri. Frequent, open scrub and grassy areas.			<i>Melicope ternata</i>			
	<i>Rubus cissoides</i>	Bush lawyer. Occasional; ranging from young plants sprawling in open scrubby areas to a mature liane with stem diameter 7.6 cm in mixed forest in Bush Creek valley.			<i>Meliaceae</i>			
					<i>Dysoxylum spectabile</i>	Kohekohe. Abundant, present in all forest, usually in all stages (seedlings, saplings and canopy trees).		AKU 10801
					<i>Sapindaceae</i>			
Papilionaceae	<i>Carrichtera aligera</i>	New Zealand broom. Recorded by Hutton and Kirk (1868) but not seen during the present survey. Frequent in disturbed coastal areas.			<i>Dodonaea viscosa</i>	Akeake. Occasional, exposed coastal scrub e.g. the ridge east of the Trig.		
					<i>Araliaceae</i>			
					<i>Pseudopanax arboreus</i>	Five finger. Common in coastal scrub, on ridges and cliff-tops and in <i>Leptospermum</i> scrub; occasionally found in open coastal forest.		AKU 10814
	<i>Lotus angustissimus*</i>	Lotus major. Occasional, wet places about streams and in Abbott's Stream swamp.			<i>P. lessonii</i>	Houpara. Common, coastal scrub and open forest usually close to the sea.		AK 153191
	<i>L. subbiflorus*</i>	Lotus hispidus. Frequent throughout modified areas, particularly coastal sites.			<i>Coroniaceae</i>			
		Stuckling clover. Abundant weed of exposed rock crevices and dry pasture.			<i>Schefflera digitata</i>	Pate. Occasional under tall forest.		AKU 10815
	<i>Trifolium dubium*</i>				<i>Corokia buddleioides</i>	Korokia. Recorded by Hutton and Kirk (1868) but not seen during the present survey. Possibly a misidentification of the		

			somehow similar and common <i>Helichrysum aggregatum</i> , Maori celery. Common, coastal rocks and cliffs. Frequent, browsed areas underneath <i>Leptospermum</i> and swampy pasture. Fennel. Occasional in settlement area.	AK 153556 AKU 10851
Umbelliferae	<i>Apium australe</i> <i>Centella uniflora</i>			
	<i>Foeniculum vulgare</i> *		Occasional, collected from the northern margin of Reserve Creek valley forest below the Trig (beneath low manuka) and on the dry ridge between Pa Paddock and Weka Bay (beneath kanuka).	AK 156823 AKU 10853
	<i>Hydrocotyle moschata</i>		Watercress. Occasional in Abbott's Stream.	
	<i>Nasturtium officinale</i> *		(Dawson 1967). Angelica. Frequent, coastal banks and among low coastal vegetation.	AK 153442 AKU 10852
	<i>Scandia rosaeifolia</i>		Berry heath. Locally frequent in low scrub, e.g. on upper south-eastern slopes of Ladd's Knob.	AK 153545
Ericaceae	<i>Erica baccans</i> *		Snowberry. Occasional, inland rocky outcrops and amongst manuka on the ridge above Bush and Waterfall Creek valleys.	AK 153196 AKU 10886
	<i>Gaultheria antipoda</i>		Mingimingi. Common in exposed scrub throughout Patokara. Frequent, exposed bare ground, e.g. cliff-tops at southern end of Aquarium Bay.	AKU 10880
Epacridaceae	<i>Cyathodes fasciculata</i> <i>C. fraseri</i> <i>C. juniperina</i>		Prickly heath. Occasional below <i>Leptospermum</i> on ridge above Bush and Waterfall Creek valleys.	AK 153508
	<i>Planchonella novozelandica</i>		Tawapou. Scattered throughout coastal forest, though never abundant. One tree (with a dead head) south of Pinnacle Hill was c. 10 m tall and measured 64.2 cm D.B.H.	AKU 10795
Sapotaceae			Mapau. Abundant throughout forest and	AKU 10860
Myrsinaceae	<i>Myrsine australis</i>		<i>Leptospermum</i> stands. Coastal maire. Common	AKU 9574
Oleaceae	<i>Nestegis apetala</i>			
			forest tree. One specimen above Te Pau Point measured c 10 m high and 54.4 cm D.B.H.	
			White maire. Two trees observed with leaf dimensions fitting this species. No narrow-leaved <i>Nestegis</i> seedlings observed.	AKU 10831
	<i>N. lanceolata</i>		Hangehange. Common as understory shrub in coastal forest of on coastal cliffs.	AKU 10876
			New Zealand jasmine. Occasional twining liane in coastal forest, e.g. forest behind western corner of Angelfish Bay.	AK 153549 AKU 10783
	<i>Loganiaceae</i> <i>Geniostoma ligustrifolium</i>		Toropapa. Occasional in forest in south-eastern corner of island. Heavily browsed where accessible to stock.	AKU 10781
	<i>Apocynaceae</i> <i>Parsonsia capsularis</i>		New Zealand honeysuckle. Rare, only found in forest south of Pinnacle Hill in an area inaccessible to stock.	AK 153471
	<i>Caprifoliaceae</i> <i>Alseuosmia macrophylla</i>		Growing with <i>A. macrophylla</i> . Recorded by Hutton and Kirk (1868) but not seen during the present survey.	
			Tree coprosma. Rare, a few plants seen on a kanuka ridge between Bush and Waterfall Creek valleys.	AKU 10809
	<i>Rubiaceae</i> <i>Coprosma acerosa</i> <i>C. arborea</i>		Raurekan. Occasional, forest understory, especially in areas inaccessible to stock, e.g. south of Pinnacle Hill.	
			Shining karamu. Occasional, understory of coastal forest. Common in understory of coastal forest and on shrubby coastal slopes.	AK 153504 AKU 10810 AKU 10813
			Single shrub on rocky outcrop between Reserve and Maori Creek valleys.	AKU 10812
			Taupata. Frequent, prostrate over rocks and cliffs above high-tide mark.	
			Locally abundant, especially <i>Leptospermum</i> stands where browsing is heavy. Also prevalent as a shrub in well-lit forests, where its	AK 153526 AKU 10856

		abundance is induced by its ability to withstand browsing.	
	<i>C. robusta</i>	Karamu. Frequent, shrubby exposed areas away from the coast, e.g. on summit of Ladd's Knob.	AKU 10811
	<i>Galium aparine</i> *	Occasional, margins of pasture and scrub.	AK 153478
	<i>Sherardia arvensis</i> *	Field madder. Uncommon pasture weed.	AK 153444
Compositae	<i>Aster subulatus</i> *	Sea aster. Occasional weed around settlement area.	
	<i>Bidens pilosa</i>	Cobbler's pegs. Rare, found only on a grassy slope above Te Pau Point.	AK 153448 AKU 10841
	<i>Brachyotaxis repanda</i>	Rangifora. Abundant throughout. The lamina of one shade leaf measured 38 x 27 cm, with a petiole 14 cm long.	AKU 10838
	<i>Carduus pycnocephalus</i> *	Slender winged thistle. Locally common in pasture.	AK 153446
	<i>Cassinia retorta</i>	Dune tanhinn. Frequent, small shrub on exposed coastal slopes.	AKU 10840
	<i>Cirsium vulgare</i> *	Scotch thistle. Common in pasture and on open coastal slopes.	
	<i>Cotula australis</i>	Occasional, under <i>Leptospermum</i> where there has been soil disturbance and on coastal cliffs.	AK 153524 AKU 10837
	<i>Crepis capillaris</i> *	Hawksbeard. Frequent weed throughout.	
	<i>Erechtites valerianaeifolia</i> *	Brazilian fireweed. Occasional damp pasture and disturbed soil around streams.	
	<i>Erigeron floribundus</i> *	Broad-leaved fleabane. Abundant weed in open and disturbed sites.	
	<i>Eupatorium adenophorum</i> *	Mexican devil. Occasional clumps around streams and on forest margins.	
	<i>Gnaphalium audax</i>	Frequent, coastal rocks and cliffs.	AKU 10826
	<i>G. gymnocephalum</i>	Creeping cudweed. Frequent under <i>Leptospermum</i> and in grassy areas.	AK 153570 AKU 10828
	<i>G. luteo-album</i> agg.	Jersey cudweed. Common, coastal rocks and open areas throughout.	AKU 5292
	<i>G. spicatum</i> *	Purple cudweed. Frequent	AKU 10822

	<i>Helichrysum aggregatum</i> (Yeo 1970). Locally abundant on shrubby coastal slopes, in open forest and on <i>Leptospermum</i> covered ridges.	AK 153554 AKU 10824	
	<i>Hypochoeris radicata</i> *	Catsear. Abundant weed in pasture and exposed or disturbed sites.	
	<i>Lagenophora pumila</i>	Rare, grazed grassy banks on steep slopes near Kauerhanga Point.	AK 153315
	<i>Lapsana communis</i> *	Nipplewort. Locally common, e.g. on northern margins of Bush Creek forest.	AK 153513
	<i>Olearia furfuracea</i>	Akepiro. Common, shrubby coastal slopes and amongst <i>Leptospermum</i> on ridges.	AK 153193 AKU 10839
	<i>O. rani</i>	Haketara. Recorded by Hutton and Kirk (1868) but not seen during the present survey.	
	<i>Picris hetractoides</i>	Locally common in open areas and amongst manuka.	AK 153486 AKU 10825
	<i>Senecio bipinnatisectus</i> *	Australian fireweed. Common weed of disturbed sites throughout.	
	<i>S. hispidulus</i>	Fireweed. Frequent in open areas and amongst <i>Leptospermum</i> .	AK 153307 AKU 10778
	<i>S. jacobaea</i> *	Ragwort. Single population in pasture in Pa Paddock above Welke Bay.	
	<i>S. lautus</i>	Shore groundsel. Common on rocks and cliffs close to the sea.	AK 153455 AKU 10823
	<i>S. scaberulus</i>	Fireweed. Occasional in openings in <i>Leptospermum</i> scrub and in coastal forest.	
	<i>Sonchus asper</i> *	Prickly sowthistle. Common weed around stockyards.	AK 153518
	<i>S. oleraceus</i> *	Sowthistle. Common weed in disturbed sites throughout.	AK 153456
	<i>Taraxacum officinale</i> *	Dandelion. Occasional weed around settlement area.	AKU 10779
	<i>Anagallis arvensis</i> *	Scarlet pimpernel. Common weed in settlement and pasture areas.	
	<i>Samolus repens</i>	Locally common on coastal rocks above high-tide mark.	
Plantaginaceae	<i>Plantago lanceolata</i> *	Narrow-leaved plantain. Common in pasture.	
Campanulaceae	<i>Wahlenbergia gracilis</i>	New Zealand harebell	AKU 10857

Goodeniaceae	<i>Selliera radicans</i>	Frequent to locally common on top of coastal cliffs and in grassy areas between manuka. Both blue and white flowered forms are present. Occasional, herbfield above the rocky coast east and west of Kaureinga Point.	AKU 10854
Lobeliaceae	<i>Lobelia anceps</i>	Shore lobelia. Common amongst coastal rocks and cliffs near the sea. Corollae pale lilac to purple. Colensoa. Two healthy populations were found in sites inaccessible to stock in the south-west corner of the island: a narrow gully above Cathedral Cove and a vertical, south-facing rock face north-west of Pinnacle Hill (Fig. 1).	AK 153465 AKU 10798
Solanaceae	<i>Solanum aviculare</i>	Poroporo. Occasional, shrubby coastal slopes. Seedlings locally abundant in vicinity of large miro tree in the head of Bush Creek valley.	AK 153537 AKU 10832
Convolvulaceae	<i>S. nigrum</i> *	Black nightshade. Occasional weed in disturbed sites around the settlement in Aird Cove.	
	<i>S. nodiflorum</i>	Small-flowered nightshade. Common amongst <i>Leptospermum</i> and on shrubby coastal slopes.	AKU 10796
	<i>Calystegia soldanella</i>	Shore bindweed. Frequent at the back of sandy or rocky beaches.	AK153463 AKU 10858
	<i>Dichondra repens</i>	Mercury Bay weed. Occasional, well lit coastal forest, e.g. western corner of Angelfish Bay.	AKU 10787
Scrophulariaceae	<i>Hebe stricta</i> var. <i>stricta</i>	Koromiko. Frequent, shrubby coastal slopes, e.g. Ladd's Knob.	AK 153199 AKU 9573
	<i>Veronica arvensis</i> *	Field speedwell. Rare, only seen beneath <i>Leptospermum</i> on dry ridge between Pa Paddock and Weka Bay.	AK 153527
Orobanchaceae	<i>Orobanche minor</i> *	Broomrape. Frequent, open shrubby coastal slopes.	
Gesneriaceae	<i>Rhabdothamnus solandri</i>	Wai-ata. Locally abundant shrub in dry coastal forest.	AK 153567 AKU 10876
	<i>Myoporum laetum</i>	Ngao. Not recorded for	

Verbenaceae	<i>Viter lucens</i>	Rakitu but found on Close Island less than 200 m from Puketoiroi Point. Puriri. Frequent in inland forest and occasional in coastal forest. One tree in Maori Creek Valley had a D.B.H. of 276 cm.	AKU 10884
Labiatae	<i>Mentha pulegium</i> *	Pennyroyal. Occasional in damp pasture.	
	<i>Prunella vulgaris</i> *	Selfheal. Common in pasture areas.	
MONOCOTYLEDONES			
Liliaceae	<i>Arthropodium cirratum</i>	Renga lily. Frequent on coastal cliffs.	AKU 10925
	<i>Astelia banksii</i>	Common on coastal cliffs and on rocks in open forest on coastal slopes.	AKU 10924
	<i>A. solandri</i>	Common epiphyte in tall forest.	
	<i>Collospermum hastatum</i>	Common to locally abundant epiphyte in forest throughout. Occasionally rupestral.	
	<i>Dianella nigra</i>	Turutu. blueberry. Occasional under <i>Leptospermum</i> .	
Smilacaceae	<i>Ripogonum scandens</i>	Supplejack. Occasional in forest areas.	
Agavaceae	<i>Cordyline australis</i>	Cabbage tree. Rare, single adult seen on western margin of Reserve Creek forest. (NZMS 259/743852).	
	<i>Phormium tenax</i>	New Zealand flax. Abundant on coastal cliffs and exposed coastal forest margins.	
Juncaceae	<i>Juncus articulatus</i> *	Jointed rush. Common, swamp at head of Abbott's Stream and stream margins.	AK 153300 AKU 10918
	<i>J. bulbosus</i> var. <i>bulbosus</i> *	Toad rush. Frequent, margins of Abbott's Stream and on open ridges.	
	<i>J. effusus</i> *	Rush. Common, swamp at head of Abbott's Stream and stream margins.	
	<i>J. gregiflorus</i>	Rush. Common pasture rush; also found on steep coastal slopes and in Abbott's Stream swamp.	AK 153458 AKU 10919
	<i>J. maritimus</i> var. <i>australiensis</i>	Sea rush. Rare only found in the vicinity of Angelfish Bay, ranging from a steep grassy seepage area on the eastern side of the Bay to colonies growing amongst	AK 153454 AKU 10922

		small cobbles on the upper beach.	
	<i>J. pallidus</i>	Rare, confined to the swamp at the head of Abbott's Stream.	AK 153500 AKU 10920
	<i>J. pauciflorus</i>	Rush. Rare, seepage area in open coastal forest north of Tokawhero Point with <i>Machaerina sinclairii</i> .	CHR257011
	<i>J. planifolius</i>	Occasional, wet swampy places.	AK 153559 AKU 10921
	<i>J. usitatus</i>	Rush. Occasional to frequent, under <i>Leptospermum</i> in damp pasture, especially east of Arid Cove.	AK 153546 AKU 10917
Restionaceae	<i>Leptocarpus similis</i>	Oioi. Rare, above high-tide line, boulder beach north of Tokawhero Point.	AKU 10926
Typhaceae	<i>Typha orientalis</i>	Raupo. Recorded by Hutton and Kirk (1868) but not seen during the present survey. Probably eliminated by browsing.	
Palmae	<i>Rhopalostylis sapida</i>	Nikau. Occasional, coastal forest at the south-west end of the island.	
Pandanaceae	<i>Freyinetia baueriana</i> subsp. <i>banksii</i>	(Stone 1973). Kiekie. Occasional, steep forested areas, e.g. south of Pinnacle Hill.	AK 153302
Orchidaceae	<i>Acianthus formicatus</i> var. <i>sinclairii</i>	Frequent under inland forest.	
	<i>Bulbophyllum pygmaeum</i>	Occasional, epiphytic and rupesstral in forest and <i>Leptospermum</i> , e.g. south of Pinnacle Hill.	AK 153472
	<i>Caladenia carnea</i>	Occasional, under <i>Leptospermum</i> scrub, e.g. on ridge between Reserve and Maori Creek valleys.	AK 153535
	<i>Dendrobium cunninghamii</i>	Rare, epiphytic on tararua in forest above Cathedral Cove.	AKU 10930
	<i>Drymonanthus aduersus</i>	Frequent on kanuka in Reserve and Bush Creek valleys, and on ridge above Shag Bay.	AK 153479 AKU 10931
	<i>Earina autumnalis</i>	Rare, rupesstral on the eastern side of Pinnacle Hill, amongst low vegetation.	AK 153200 AKU 10928
	<i>E. mucronata</i>	Common epiphyte on forest trees. Rocks on the summit of Pinnacle Hill were covered in this orchid.	AK 153298 AKU 10927
	<i>Microtis unifolia</i>	Occasional, open grassy areas throughout.	AK 153534 AKU 10932

	<i>Pterostylis banksii</i>	Green-hood orchid. Occasional, inland forest, e.g. Reserve Creek valley.	AKU 10929
	<i>P. graminea</i>	Occasional, inland forest.	
	<i>Thelymitra longifolia</i>	Sun orchid. Frequent, open sites amongst inland and coastal rocks.	
Cyperaceae	<i>Carex breviculmis</i>	Frequent, open clay banks and dry pasture near the coast.	AK 153316 AKU 10988
	<i>C. flagellifera</i>	Abundant, open coastal slopes from sea-level to c. 100 m.	AK 153539 AKU 10899
	<i>C. inversa</i>	Common amongst poor pasture, e.g. slopes below Ladd's Knob.	AKU 10900
	<i>C. spinirostris</i>	Common, shaded and open coastal slopes from sea-level to c. 100 m.	AK 153203 AKU 10901
	<i>C. virgata</i>	Rare, lower margins of Reserve Creek.	AK 153204 AKU 10902
	<i>Cyperus brevisfolius</i> *	Occasional, damp pasture. Frequent, back of beaches and open stream margins.	AK 153443
	<i>C. ustulatus</i>	Rare, only found in the swamp at the head of Abbott's Stream.	AK 153499 AKU 10913
	<i>Eleocharis acuta</i>	As for <i>E. acuta</i> .	AKU 10914 AK 109779 AKU 10916
	<i>E. gracilis</i>	Occasional, open seepage areas along the south-east coast, e.g. at foot of cliffs in Rockfall Bay.	
	<i>Machaerina sinclairii</i>	Frequent, open areas in ridges and manuka slopes.	AKU 10915
	<i>Moreletia affinis</i>	Abundant, coastal rocks and boulder beaches.	AK 153203 AKU 10905
	<i>Scirpus cernuus</i>	Frequent along Abbott's Stream margin and its tributaries.	AKU 10904
	<i>S. chlorostachyus</i> *	Occasional, damp areas under <i>Leptospermum</i> and seepage areas.	AKU 10906
	<i>S. inundatus</i>	Rare, confined to swamp at the head of Abbott's Stream.	AK 153502 AKU 10908
	<i>S. lacustris</i>	Abundant, coastal rocks and inland rock outcrops.	
	<i>S. nodosus</i>	Rare, waterlogged pasture near the mouth of Abbott's Stream.	AKU 10907
	<i>S. prolixiflorus</i>	Occasional, damp places in the open and under <i>Leptospermum</i> .	AKU 10909 CHR379392
	<i>S. reticularis</i>	Hooked sedge. Rare, under <i>Leptospermum</i> on coastal slope north of Tokawhero Point.	AKU 10912
	<i>Uncinia banksii</i>		

Gramineae	<i>U. uncinata</i>	Hooked sedge. Occasional, coastal forest.	AK 153301	<i>Lachnagrostis filiformis</i> var. <i>filiformis</i>	New Zealand wind grass. Frequent, open coastal slopes near sea-level.	AK 153453 AKU 10893
	<i>Agropyron kirkii</i>	Occasional, coastal cliffs, e.g. northern side of Ladd's Knob.	AK 153306 AKU 10936	<i>L. filiformis</i> var. <i>littoralis</i>	Occasional, exposed coastal rock crevices.	AK 153305
	<i>Agrostis tenuis</i> *	Brownlop. Occasional, pasture areas.	AK 153445	<i>Lolium perenne</i> *	Perennial ryegrass. Common in pasture areas.	
	<i>Aira multiculmis</i> *	Locally common, coastal rocks and crevices.	AK 153304 AKU 10890	<i>Microlaena stipoides</i>	Meadow rice grass. Common under open forest and <i>Leptospermum</i> .	
	<i>Anthoxanthum odoratum</i> *	Sweet vernal. Frequent, damp pasture and forest and scrub openings.		<i>Oplismenus imbecillis</i>	Common under open forest and <i>Leptospermum</i> .	AK 153515 AKU 10935
	<i>Briza minor</i> *	Shivery grass. Occasional, coastal rocks and crevices.		<i>Paspalum diatatum</i> *	<i>Paspalum</i> . Common around settlement area and in tall coastal grassland.	
	<i>Bromus mollis</i> *	Frequent coastal cliffs.		<i>P. orbiculare</i>	Scrub. Rare, open grassy slope on eastern side of Angelfish Bay.	AK 153460 AKU 10941
	<i>B. unioloides</i> *	Prairie grass. Occasional, tall grassland on coastal slopes and around settlement.	AK 153462	<i>Pennisetum clandestinum</i> *	Kikuyu. Abundant, main pasture grass.	
	<i>Cortaderia setchouana</i> *	Pampas grass. A single large plant was found on the southern side of Reserve Creek valley; several smaller plants were found in open areas in the vicinity of Te Pau Point.		<i>Poa anceps</i>	Common, coastal slopes, extending down to sea-level in protected bays.	AK 153476 AKU 10891
	<i>C. splendens</i>	Coastal toebe. Common on exposed coastal cliffs and ridges.	AK 153544 AKU 10934	<i>P. annua</i> *	Occasional weed on disturbed sites around settlement.	
	<i>Dactylis glomerata</i> *	Cocksfoot. Common in rough pasture and grassland throughout.	AK 153303	<i>P. seticulmis</i>	Rare, under mature forest in Reserve Creek valley.	CHR257012
	<i>Deyuxia</i> aff. <i>avenoides</i>	Occasional under open <i>Leptospermum</i> scrub and in rock crevices on coastal slopes.	AK 153295 AKU 10897	<i>Rytidosperma binnullare</i>	Danthonia. Abundant, rock crevices around coast and inland on forest margins.	AK 153284 AKU 10894
	<i>D. billardieri</i>	Sand wind grass. Frequent, coastal rock crevices.	AK 153543 AKU 10939	<i>R. gracile</i>	Danthonia. Uncommon, forest margins.	AK 153287 AKU 10896
	<i>Dichelachne crinita</i>	Long-hair plume grass. Frequent, open coastal slopes and rock crevices.	AK 153295 AKU 10937	<i>R. pennicillatum</i> *	Danthonia. Rare, beneath sparse, tall <i>Leptospermum</i> on ridge near southern high point.	AK 153282
	<i>Digitaria sanguinalis</i> *	Summer grass. Occasional weed around settlement area.		<i>R. racemosum</i> *	Danthonia. Abundant, grassland on coastal cliffs and slopes, and dry ridges.	AK 153283
	<i>Echinopogon ovatus</i>	Hedgehog grass. Occasional, grassy coastal slopes and beneath tall <i>Leptospermum</i> .	AK 153568 AKU 10938	<i>R. tenuis</i> *	Danthonia. Common, coastal rock crevices and rough grassland.	
	<i>Eragrostis brownii</i> *	Bay grass. Occasional; open, dry coastal slopes.	AK 153469	<i>R. unurede</i>	Danthonia. Abundant, coastal cliffs and slopes, and poor inland pasture.	AK 153285
	<i>Festuca arundinacea</i> *	Tall fescue. Occasional coastal rock crevices and damp pasture.	AK 153542	<i>Spinifex hirsutus</i>	Silvery sand grass. Recorded by Hutton and Kirk (1868) but not seen during the present survey.	
	<i>Holcus lanatus</i> *	Yorkshire fog. Occasional, damp pasture and under margins of forest and scrub.	AK 153555	<i>Sporobolus africanus</i> *	Ratstail. Abundant in open, dry areas throughout.	
				<i>Vulpia bromoides</i> *	Vulpia hair grass. Abundant in rock crevices from the coast to open ridgetops.	AKU 10933

Table 1. Numerical breakdown of flora of Rakitu Island according to plant groupings and native or adventive status. Additional records by past workers are shown in parentheses.

	Native	Adventive	Total
Ferns and Fern Allies	53(2)	-	53(2)
Gymnosperms	3(1)	-	3(1)
Dicotyledons	111(6)	54(1)	165(7)
Monocotyledons	62(2)	26	88(2)
TOTAL	229(11)	80(1)	309(12)

THE "ISLAND" ELEMENT OF THE FLORA

The flora of Rakitu Island has a distinctive northern offshore island element to it. Two plants, *rangiora* and *kawakawa*, have larger leaves than are found on their mainland counterparts. Some of the plants included here may formerly have been common on the mainland, others were probably never widespread mainland species. Also included are plants that are not rare on the mainland, but are found more frequently on offshore islands. Grouped together these "island" plants include: *Blechnum norfolkianum*, *Pteris comans*, scrobic (*Paspalum orbiculare*), *colensoa* (*Pratia physaloides*), large-leaved milk tree (*Paratrophis banksii*), *parapara*, *Picris hieracioides*, *Rorippa gigantea*, *mawhai* (*Sicyos angulata*), *tawarapa* and *tawarua*.

The majority of these "island" plants are found on all the outer Hauraki Gulf islands, but collectively they are absent from the adjacent mainland coastal forest.

DISCUSSION

Changes in the vegetation and flora

For an island with such a large proportion of its vegetation modified, a high number (229) of native vascular plants are still retained. So far adventive species are mainly confined to the most modified sites; few have managed to penetrate the forested areas, except inkweed (*Phytolacca octandra*).

Although this current visit was the first comprehensive botanical survey of Rakitu Island, it failed to rediscover twelve previous plant records for the island. Eleven of these records date back to Hutton and Kirk (1868) and the other, *Phylloglossum drummondii*, to Eric Craig (see Goulding 1977).

Apart from *rimu* and *korokia* (*Corokia buddleioides*) which we feel were recorded in error (see annotated species list) the other ten unsubstantiated records suggest that the habitat has altered since Hutton and Kirk's visit. Ten species represent approximately 20% of

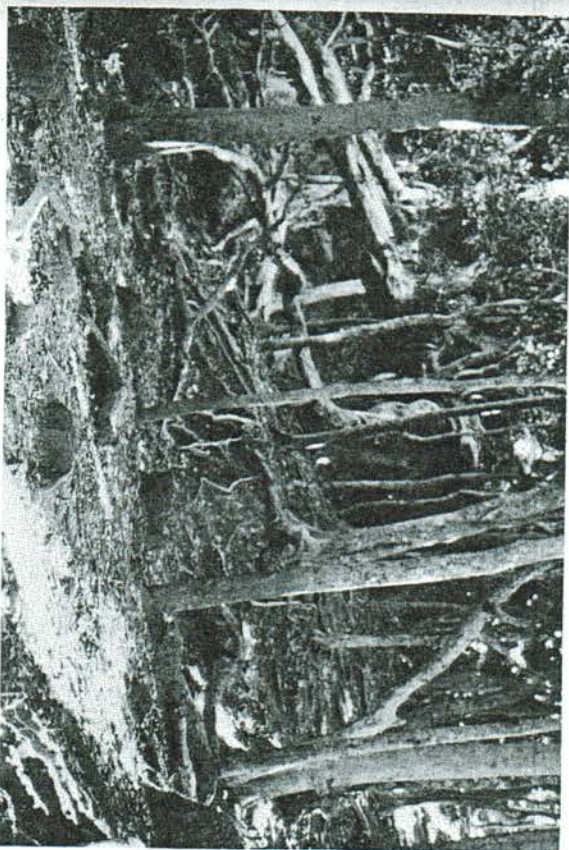


Fig. 7. Understorey eliminated due to stock browsing, Puriri Valley.

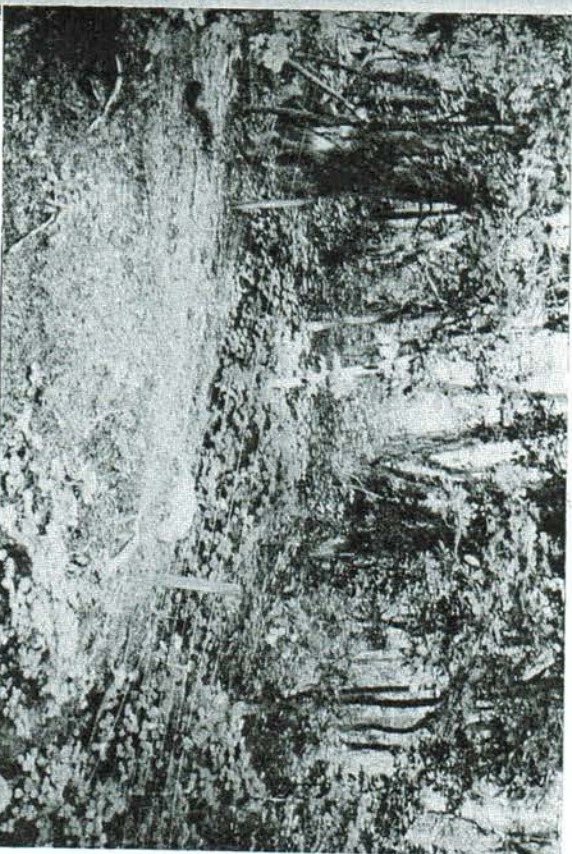


Fig. 8. Fenced area in Reserve Valley forest to exclude stock. Note the contrast between browsed (foreground) and two years of regeneration.

the previously recorded plants and/or herbarium specimens from this island. Raupo, *Coprosma acerosa* and *Spinifer hirsutus* are certainly now extinct on the island though the other seven species may still be present, if very local in their distribution. Although there has been a loss of native species, the total number of taxa for the island has probably increased due to additions to the adventive flora.

The comparison of Fig. 9 and 10 show how the central island's vegetation has changed in the previous 73 years. The reverting central valley of 1908 has been converted to improved pasture. On the higher slopes regeneration has been allowed to proceed without fire and the previous bare ground is now covered in tea-tree. The present absence of open, clay sites helps explain the disappearance of *Phylloglossum drummondii*, sundew (*Drosera auriculata*) and tauhinu (*Pomaderris phyllifolia*).

Overall the island's vegetation has undergone several changes since Hutton and Kirk's visit. The seaward slopes where burnt, have been allowed to regenerate. The central forest has been reduced to three creek valleys (Fig. 11 and 12) and the large central scrub has either been converted to pasture or allowed to regenerate. The introduction of browsing mammals has had the single greatest effect on the vegetation.

Possible future changes to the vegetation

The heavily browsed central forest areas (Fig. 7, 11 and 12) compare poorly in ground and shrub species to the pristine, diverse, totally unbrowsed forest south of Pinnacle Hill (Fig. 5 and 6). Palatable shrubs are uncommon to absent in places where there is browsing. Most of the island's forest canopy is still continuous as browsing has not proceeded long enough to effect it yet. Unless stock is totally excluded from the bush areas, these browsed forests will continue to deteriorate and soon, the canopy species will probably be replaced by adventive species or unpalatable shrubs only. When stock is excluded the undergrowth still has the capacity to regenerate quickly as seen in the Reserve Creek enclosure (Fig. 8).

It is fortunate that several pre-European forest areas still persist today as these areas give an insight into what the tea-tree and bracken dominated vegetation would eventually develop if regeneration was allowed to proceed unheeded. They also provide a major seed source for the regenerating areas. The proximity of the Great Barrier forests also provides a "seed-rain" to Rakitu Island, not only from wind-blown seed, such as kauri, but also larger, bird-carried seed such as miro and many of the shrub species.

The tea-tree areas will continue to increase in height and open out with age. However, if there is no taller growing canopy species established underneath (as is often the situation), this type of vegetation will also be replaced by adventive species, and unpalatable shrubs and possibly tea-

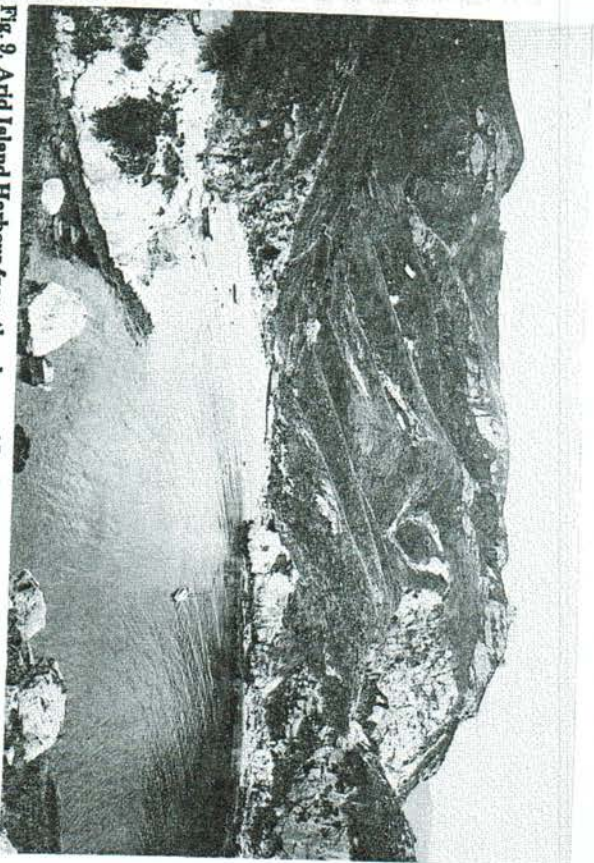


Fig. 9. Arid Island Harbour from the slopes of Ladd's Knob. Winkelmann photograph taken during the cruise of the *Matareira* in 1908. Photo: Auckland Institute and Museum.

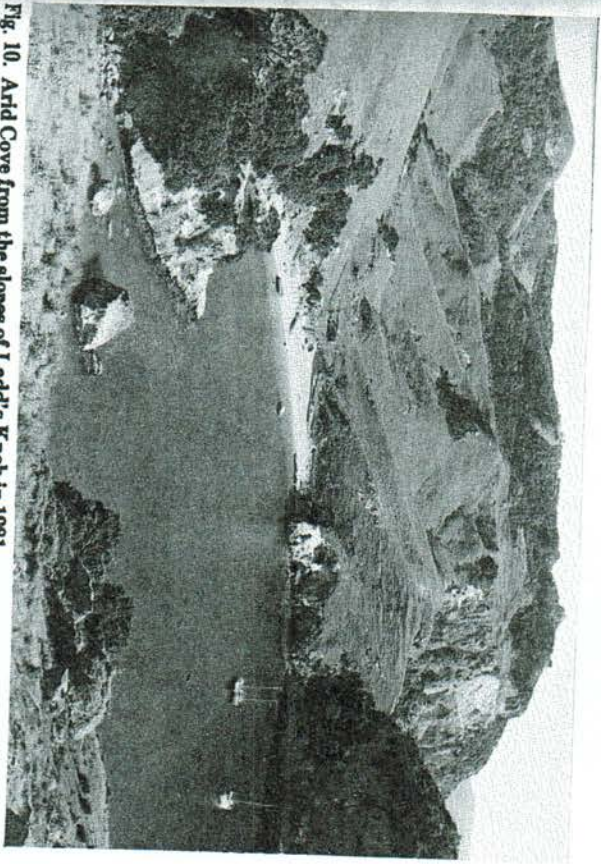


Fig. 10. Arid Cove from the slopes of Ladd's Knob in 1981.

tree will regenerate in the gaps.

The bracken area on Ladd's Knob will give way to manuka, which, with time, will follow the fate of the tea-tree discussed above, if browsing persists.

The natural shrubland, coastal rock and cliff communities should suffer only minor changes with time. They are inaccessible to stock, possibly making them vulnerable to fire and weeds only. Probably the largest threat to these habitats is the spread of pampas grass (*Cortaderia selkiana*) on the island. It would be desirable to eliminate this rapid growing adventive species while it is still so limited in its distribution.

The browsed swamp at the head of the Abbott's Stream will continue to degrade and become invaded by adventives unless stock is excluded. The sandy beach and grassland communities will probably not undergo any major changes, if the present management techniques continue.

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REFERENCES

- Allan, H.H. 1961: "Flora of New Zealand". Volume I. Government Printer, Wellington 1 085 p.
- Brownsey, P.J. 1977: A taxonomic revision of the New Zealand species of *Asplenium*. *New Zealand Journal of Botany* 15: 39-86.
- Brownsey, P.J. 1979: *Asplenium lucidum* Forst. f., an illegitimate name for the New Zealand shining spleenwort. *New Zealand Journal of Botany* 17: 217-218.
- Cameron, E.K. 1980: Plant life of Rakitu (Arid) Island. Unpublished Report, Department of Lands & Survey, Auckland. File No. 3/599/9.
- Cheeseman, T.F. 1925: "Manual of the New Zealand Flora." Second Edition. Government Printer, Wellington. 1 163 p.
- Chinnock, R.J. 1975: The New Zealand species of *Tmesipteris* (Psilotaceae). *New Zealand Journal of Botany* 13: 743-68.
- Clapham, A.R., Tutin, T.G. & Warburg, E.F. 1962: "Flora of the British Isles." Second Edition. Cambridge University Press. 1 289 p.
- Dawson, J.W. 1967: New Zealand Umbelliferae. *Lignocarpa* gen. nov. and *Scandia* gen. nov. *New Zealand Journal of Botany* 5: 400-417.
- Garnock-Jones, P.J. 1978: *Rorippa* (Cruciferae: Arabiaceae) in New Zealand. *New Zealand Journal of Botany* 16: 119-122.
- Garnock-Jones, P.J. 1979: Checklist of dicotyledons naturalised in New Zealand. 4. *Rhoeadales*. *New Zealand Journal of Botany* 17: 303-310.
- Goulding, J.H. 1977: Early publications and exhibits of New Zealand ferns and the work of Eric Craig. *Records Auckland Institute & Museum* 14: 63-79.
- Haworth, A.H. 1803: "Miscellanea naturalia." London.
- Hayward, B.W. 1982: Offshore Islands Research trip to Rakitu (Arid) Island, north-east New Zealand. *New Year 1980-1981, Tane* 28: 79-84.
- Healy, A.J. & Edgar, E. 1980: "Flora of New Zealand." Volume III. Government Printer, Wellington. 220 p.

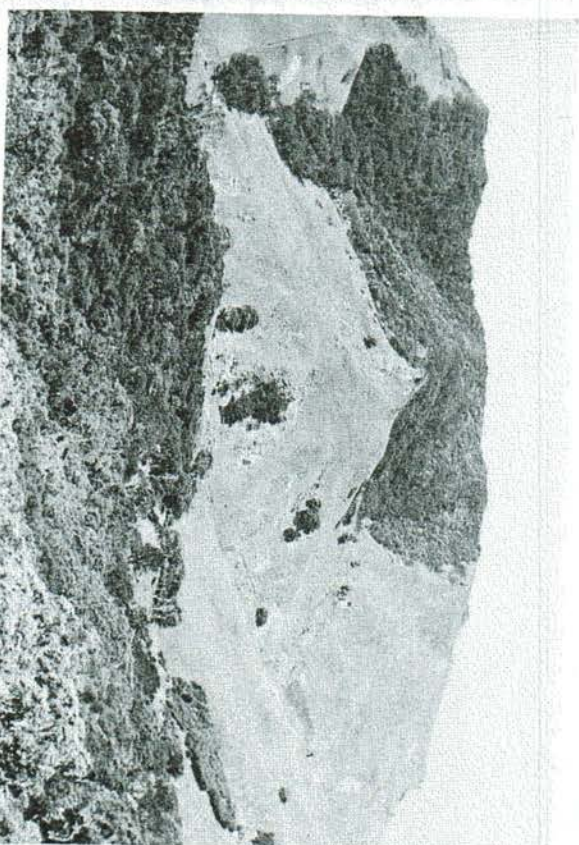


Fig.11. Extent of forest and scrub cover in Reserve and Maori Creek valleys in 1981, looking from the ridge above the heads of Bush and Waterfall Creeks.

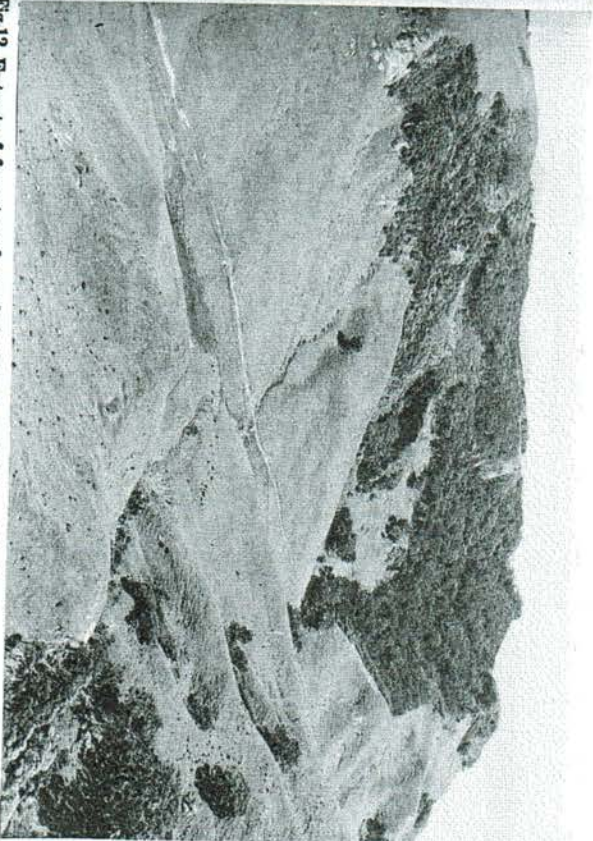


Fig.12. Extent of forest and scrub in Bush and Waterfall Creek valleys in 1981, looking from the ridge above Pa Paddock (Maori Creek right foreground).

- Holmgren, P.K.; Keuken, W. & Schofield, E.K. 1981: Index Herbariorum. *Regnum vegetabile* 106: 1-452.
- Hutchinson, J. 1959: "The families of flowering plants". Second Edition. Oxford University Press. 792 p.
- Hutton, F.W. & Kirk, T. 1868: Description of Arid Island, Hauraki Gulf. *Transactions and Proceedings of the New Zealand Institute* 1: 108-112.
- Moore, L.B. & Edgar, E. 1970: "Flora of New Zealand." Volume II. Government Printer, Wellington. 354 p.
- New Zealand Weed & Pest Control Society, 1969: "Standard Common Names for Weeds in New Zealand." Editorial Services, Wellington. 141 p.
- Reid, J.A. 1975: The distinction between *Oxalis corniculata* L. and *O. exilis* A. Cunn. *Watsonia* 10: 290-291.
- Stone, B.G. 1973: Materials for a monograph of *Freycinetia* Gaudich. XIV. On the relation between *F. banksii* A. Cunn. of New Zealand and *F. baueriana* Endl. of Norfolk Island, with notes on the structure of seeds. *New Zealand Journal of Botany* 11: 241-246.
- Tindale, M.D. 1957: A preliminary revision of the genus *Lastreopsis* Ching. *Victorian Naturalist Melbourne* 73: 180-184.
- Wilson, R.A. 1959: "Bird Islands of New Zealand". Whitcombe and Tombs, Christchurch. 202 p.
- Yeo, P.F. 1970: New names in *Helichrysum* and *Felicia* (Compositae). *Taxon* 19: 946.