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To cite this article: A. E. Esler (1978) Botanical features of islands near the west coast of the Coromandel Peninsula, New Zealand, *New Zealand Journal of Botany*, 16:1, 25-44, DOI: [10.1080/0028825X.1978.10429655](https://doi.org/10.1080/0028825X.1978.10429655)

To link to this article: <http://dx.doi.org/10.1080/0028825X.1978.10429655>



Published online: 05 Mar 2012.



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Botanical features of islands near the west coast of the Coromandel Peninsula, New Zealand

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(Received 18 March 1977)

ABSTRACT

An account is given of 28 islands of various sizes from small rock stacks to 70 ha. An assessment is made of the influence of physiography, man, introduced plants and animals, and successional trends on the patterns of vegetation. An annotated list of 225 species of native plants and 150 wild exotic plants is presented.

INTRODUCTION

Recalling the islands of the western Coromandel coast (Fig. 1) J. C. Bidwill (1841, p.2) wrote ". . . grand and beautiful scenery as is rarely to be found in any country — a close piece of water, as large as a bay, thickly studded with islands of every variety, some merely high basaltic rocks, others beautiful low islets covered with trees and grass, and almost surrounded by beaches; . . .".

James Adams (1889, p. 34) commented on the landforms too: "The islets near the shore are worthy of some remarks, as they extend, at various distances from the mainland, along the coast from Coromandel Harbour to Cabbage Bay. They can be observed in every stage of formation. In the first stage the end of a projecting spur has a passage between it and the mainland; then there are islands that are left high and dry at low water; and lastly there are in some places, as at Paparoa, a long line of small islands parallel to the shore and distant from it perhaps two miles. This all tends to show the inroads that the sea has been making for ages on the peninsula. The pohutukawa is sure to be found on any of these islands, no matter how small it may be."

The survey reported here arose from a request from the Department of Lands and Survey for an inventory of the biological, scenic, and recreational features of the islands, to extend the information recorded by the Auckland University Field Club (Newhook *et al.* 1971). Field work was in two parts:

1. 7-18 October 1971 in the yacht *Siesta* skippered by R. M. Lockley in company with C. R. Veitch

(Wildlife Service, Department of Internal Affairs). Thirteen islands were visited in 6½ working days. Much time was lost sheltering from storms.

2. 4-14 November 1971 in the launch *Spindrift* skippered by G. McKenzie in company with C. R. Veitch, J. C. Smuts-Kennedy (Wildlife Service), and W. W. Sander (Hauraki Gulf Maritime Park). Fifteen islands were visited and no time was lost through adverse weather.

The survey did not include Whanganui (Beesons) I. or the minor islets of Motupohukuo (Turkey) I., Motutakupu (Gannet) I., and Motupotaka (Black Rocks).

The surveyed islands (Fig. 2) are all uninhabited. Many are customary Maori land, some are privately owned. No two of the islands are alike in topography, size, or botanical features. The largest island covers 70 ha, the smallest are mere rock stacks. Seven islands are grassy, the largest three of them being farmed; eight have young woody vegetation; eight have older vegetation approaching forest in stature; on two manuka (*Leptospermum scoparium*) is giving way to pohutukawa (*Metrosideros excelsa*) forest. The remaining three islands are very small and have little vegetation. Mature forest, relics of the original vegetation, occurs on Waimate I., Motutapere, and Motuoruhi.

Because only a short time was spent on the survey the information presented here is not definitive. In view of this, and because of the diversity of habitats and varied vegetation history, no attempt was made to compare islands or to analyse their floras.



Fig. 1 Islands west of Coromandel Peninsula viewed from the south. Islands 26, 27, and 28 are in the left foreground. Motuoruhi is the dark prominent island (arrowed) in the upper left. Above it (left to right) are Moturua, Motukaramarama, Motuwi, and Motuwinkenuke.

Photo: Whites Aviation, 4.3.1959.

PHYSICAL FEATURES

Some islands are low domes, others rise straight above the sea or shore platform for 30 m or more. Most are quite steep along the shore. Motuoruhi (169 m) and Motutapere (168 m) rise to well-defined summits, but many have a ridge along the top, or a minor plateau. Most smaller islands have been terraced by Maoris more than a century ago.

All islands fall within the same geological group named Beesons Island Volcanics. This includes andesitic lava, breccia, and fine volcanic material. The lava and breccia are fairly resistant to erosion and faces stand nearly vertical or are undercut by wave action in some places. The fine material varies in its composition. On the north and west of Waimate I. it is a yellowish, clay-like mass that slumps and scours; on Motuwi it is a loose whitish grit.

CLIMATE

The islands lie within a climatic zone that has very warm humid summers and mild winters, and a mean annual rainfall exceeding 1 500 mm. The prevailing wind is from the SW, but there are occasional gales from the E or NE.

SOME EFFECTS OF MAN AND ANIMALS

Without the direct and indirect influences of man all islands except the very smallest would be forested. Little of the Maori history is known, but the presence of terraces and middens is evidence of intense human activity. During this occupation there would have been very little forest vegetation. Since the islands were abandoned by their Maori occupants many have been ravaged by fire and some have been cleared for farming.

On Cow and Motuokino nesting petrels have burrowed underground and disturbed the low vegetation. Nesting gannets on Motukaramarama and an adjacent islet have bared the ground in places, and guano has enriched the soil.

Rabbits on Moturua and Motuwi have influenced the type of vegetation which is developing to the extent that these two islands are quite unlike others in their plant cover. The scrubland on Motukahaua is under the same influence, but the vegetation there is much younger, having been swept recently by fires. Rabbits on these islands do not suppress pohutukawa, mapou (*Myrsine australis*), mahoe (*Melicactus ramiiflorus*), *Asplenium lucidum*, or *Phymatodes diversifolium*. Selective browsing has allowed pohutukawa to

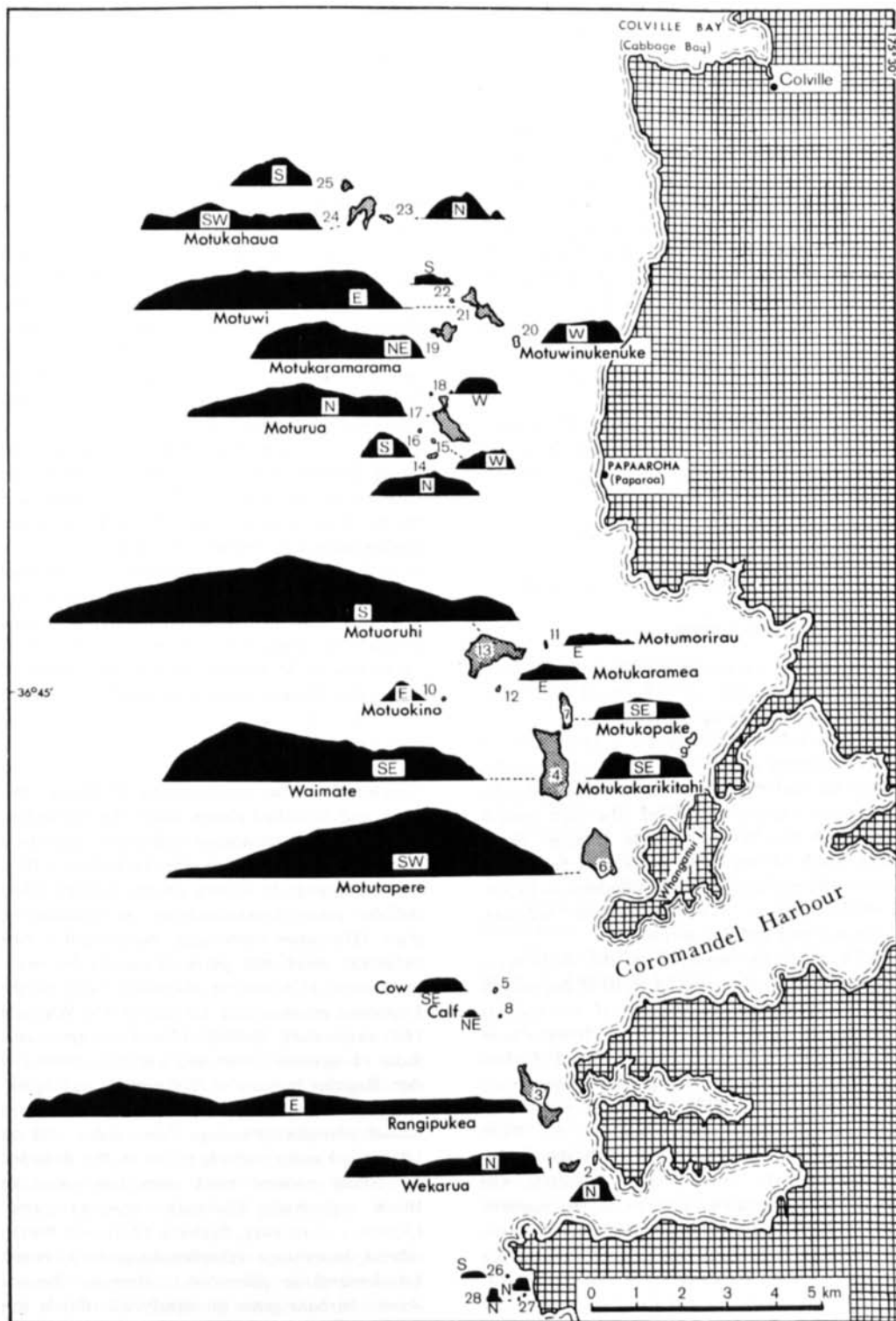


Fig. 2 Locality and islands surveyed. Each island profile is drawn from the direction indicated and is not to scale.

become dominant on Moturua (Fig. 4) and Motuwi. Species eaten by rabbits are *Apium australe*, *Avena barbata*, ice plant (*Disphyma australe*), *Dichondra repens*, *Carex divulsa*, taupata (*Coprosma repens*), *Coprosma macrocarpa*, *Hymenanthera novae-zelandiae*, houpara (*Pseudopanax lessonii*), kawakawa (*Macropiper excelsum*), kohekohe (*Dysoxylum spectabile*), renga lily (*Arthropodium cirratum*), *Peperomia urvilleana*, and karo (*Pittosporum crassifolium*).

Nearly all the islands have rats, mostly the Norway rat (*Rattus norvegicus*), but the ship rat (*R. rattus*) occurs on some islands in the northern group. Their effects were not assessed, but it is evident from other islands in the Hauraki Gulf that their predation on seeds of such species as tawapou (*Planchonella novo-zelandica*) has brought the species close to extinction in some places.

There are pigs on Motuoruhi, but at the present numbers they do not appear to be having a significant effect. No evidence of opossums was seen in the survey area.

VEGETATION

Vegetation in relation to terrain

Shore to summit vegetation profiles of the islands without recent disturbance are influenced largely by terrain and the erodability of the rock.

At the high-tide mark there are a few plants of mangrove (*Avicennia resinifera*), *Salicornia australis*, *Stipa teretifolia*, and *Plagianthus divaricatus*, all salt-tolerant species representative of the salt marsh vegetation which has been unable to develop. Seepages within reach of sea spray harbour a few other characteristic shore plants in small numbers — *Leptocarpus similis*, *Apium australe*, *Selliera radicans*, *Scirpus cernuus*, and *Lobelia anceps*.

The cliffs that rise steeply from the shore have several plants on the ledges and in clefts if the rock is soft but not eroding freely, and few if the rock is hard. Characteristic plants are ice plant, *Senecio lautus*, *Rhagodia triandra*, taupata, and a form of *Asplenium* akin to *A. flaccidum*. The gentler slopes have flax (*Phormium tenax*), *Hebe stricta*, *H. pubescens*, *Poa anceps*, *Astelia banksii*, and renga lily.

On the toe at the base of the cliffs the spray-tolerant karo, taupata, and houpara dominate. On small islands this community extends to the summit. If the toe is large there may also be karaka (*Corynocarpus laevigatus*), large-leaved milk tree (*Paratrophis banksii*), mahoe, and wharangi (*Melicope ternata*). A minor forest of kohekohe and karaka has developed in some gullies.

The position of pohutukawa is very dependent on terrain unless there are habitats for colonisation which

are not severely shaded by other plants. Most grow on rocks, but pohutukawa is also a feature of wind channels where apparently it can thrive better than other species.

Rocky outcrops are not readily covered in tall plants. These places are occupied by a few tolerant native plants such as *Cheilanthes sieberi*, *C. distans*, and *Tillaea sieberiana*, along with short-lived exotics which complete a life cycle before summer drought sets in. Characteristic plants are the hair grasses (species of *Aira* and *Vulpia*), scarlet pimpernel (*Anagallis arvensis*) and its blue-flowered form, allseed (*Polycarpon tetraphyllum*), *Avena barbata*, and *Bromus diandrus*. On the southern islands *Linum trigynum* and smooth catsear (*Hypochaeris glabra*) are common in these situations. On deeper soils *Notodanthonia racemosa* and ratstail (*Sporobolus africanus*) are plentiful.

Where there has been burning the profile is vastly different because factors other than terrain determine the composition of the communities, at least on the less extreme sites. Higher fertility and more shelter appear to promote the growth of bracken and broad-leaved shrubs. The poorer sites are marked by manuka and kanuka, or, in more extreme cases, by a heathland community where *Cyathodes fasciculata*, *Pomaderris phyllicifolia*, *P. rugosa*, akepiro (*Olearia furfuracea*), *Morelotia affinis*, *Haloragis procumbens*, and *Drosera auriculata* grow with manuka.

Exotic plants

Exotic plants are widespread. Many invade the open and disturbed places which the native flora, with its paucity of herbaceous colonisers, fails to occupy. Some of the exotics are closely linked with farming and gardening. It is only on the farmed islands that buffalo grass (*Stenotaphrum secundatum*), barley grass (*Hordeum marinum*), horehound (*Marrubium vulgare*), shepherd's purse (*Capsella bursa-pastoris*), twin cress (*Coronopus didymus*), and parsley piert (*Aphanes microcarpa*) are found. On Waimate I. iris (*Iris orientalis*), daffodil (*Narcissus* sp.), and snowflake (*Leucojum aestivum*) are relics of an old garden. Regular burning of Wekarua I. and its neighbour has maintained a habitat for species such as narrow-leaved plantain (*Plantago lanceolata*) and oxtongue (*Picris echinoides*) which thrive in the denuded areas.

Many exotics need even less encouragement. Black nightshade (*Solanum nigrum*), sow thistle (*Sonchus oleraceus*), fleabane (*Erigeron floribundus*), allseed, broomrape (*Orobanche minor*), sweet vernal (*Anthoxanthum odoratum*), *Bromus diandrus*, and *Avena barbata* grow on nearly all islands regardless of their vegetation and history. The widespread dispersal of species with wind-borne and bird-borne seeds is not surprising, but some wide-ranging plants

have much less specific and effective ways of reaching distant places.

The thin soil over rocks near the shore is a habitat not readily occupied by native plants, but is inhabited by the exotics listed for rocky outcrops.

Successional trends

Some islands have not been grossly disturbed this century. Motukaramarama, for instance, is well covered with vigorous young trees. Motutapere is a little behind in its development. Much is in manuka and kanuka (*Leptospermum ericoides*) scrubland, but this is giving way to forest. On Motuoruhi, Motukarikitahi and Motukahaua the scrubland is younger. On the grassy islands early phases of forest reestablishment are prevented by grazing and burning.

The sequence of appearance of species is not the same for all islands. Usually manuka is the first prominent woody species to appear. It is quickly overtopped by young forest trees. On Moturua and Motuwi rabbits have selectively removed most of the competitors of pohutukawa and dense young stands of this species have developed.

Where manuka has been replaced by its taller and longer-lived relative kanuka the return to forest is much slower. Kanuka towers above the plants which establish beneath it and the new vegetation does not emerge until the kanuka dies. During this long delay a dense understorey develops in some kanuka stands. Common species in this understorey are mapou and *Coprosma arborea*, each becoming dominants at a later phase. These will be replaced by taller species such as kohekohe.

Manuka and kanuka may not appear in the succession. In some places bracken (*Pteridium aquilinum*) has succeeded grass and is itself replaced by flax, tutu (*Coriaria arborea*), *Coprosma* spp., mahoe, and other broad-leaved trees and shrubs. On small islands, and on slopes close to the shore, houpara, wharangi, karo, *Hymenanthera*, and *Coprosma* spp. probably arise in this manner and form a long-term cover better regarded as shrubland than forest because the canopy is not more than 5 m high in most places. On large islands the end point seems to be kohekohe and mahoe forest with pohutukawa, karaka, tawapou, and a few other species locally dominant. There are some stands of taraire, but there is no indication of how they arose. Their future is not clear either; it is possible that they will give way to kohekohe.

Pohutukawa is the most prominent feature of the vegetation of the region. Normally if it does not gain entry in the early stages of succession it is relegated to broken ground on ridge spines, rocky faces, and outcrops. On Moturua and Motuwi and parts of Motuoruhi it established at the same time as manuka,

has faced relatively little competition from other plants, and thus occupies more regular terrain than is typical of pohutukawa sites.

DOCUMENTATION OF ISLANDS

This section presents the salient vegetation features of the islands.

Scrubland is applied to areas dominated by manuka or kanuka, although the term is not descriptive of the older stands.

Shrubland is vegetation dominated by broad-leaved shrubs and small trees such as *Coprosma* spp., karo, mapou, *Hymenanthera*, and houpara which are mainly up to 5 m tall.

Forest is applied to those areas with kohekohe, mahoe, karaka, taraire, or pohutukawa with trees mostly over 5 m tall.

Fernland is dominated by bracken.

Because not all the islands have names they are here given reference numbers (see Fig. 2).

1. WEKARUA. A small grassy island (7 ha) with level top reaching 45 m and with cliffs on most sides.

Grassland covers half the island — mostly sweet vernal with *Notodanthonia* in a few droughty places.

Fernland to 60 cm tall covers the other half. Blackberry (*Rubus fruticosus*) occurs in some places.

Scrubland above cliffs on the E and W ends is limited in extent. The main species are manuka, *Pomaderris* spp., *Hebe stricta*, and akepiro. There is a patch of tutu on S side.

Shrubland below the cliffs consists mostly of mahoe, *Coprosma macrocarpa*, mapou, rangiora (*Brachyglottis repanda*), and houpara.

There is some pohutukawa. There is evidence of burns from 2 years and 4 years earlier.

Trees and shrubs, 22. Dicot. herbs, 39. Monocot. herbs, 6. Ferns, 6. Grasses, 18. Total, 91 species.

2. A small (c. 2 ha), high (52 m), grassy fortress rock with every available square metre terraced.

Grassland covers most of the island — mostly narrow-leaved plantain with *Notodanthonia* on steeper slopes and other droughty places.

Low forest is limited to a pocket at the foot of cliffs on the W side with a few individuals of pohutukawa, karaka, kohekohe, mapou, houpara, and karo.

There is evidence of very recent fires.

Trees and shrubs, 15. Dicot. herbs, 38. Monocot. herbs, 7. Ferns, 11. Grasses, 15. Total species, 86.

3. RANGIPUKEA. A farmed island (37 ha) with minor coastal cliffs and easy slopes rising to a ridge with the highest point at 67 m.

Grassland of good quality, but with winged thistle (*Carduus* sp.) and apple of Sodom (*Solanum sodomeum*).

Scrubland mostly of brush wattle (*Albizia lophantha*) in limited areas.

Fernland occurs in patches.

Forest mostly below cliffs and in a few gullies. It is very open forest of pohutukawa, mahoe, karaka, tawapou, and ngaio (*Myoporum laetum*).

Forest on the W side was not examined.

Trees and shrubs, 21. Dicot. herbs, 50. Monocot. herbs, 10. Ferns, 8. Grasses, 18. Total species, 107.

4. WAIMATE. A farmed island (71 ha) reaching to 137 m. Cliffs mainly on the W side. Most land steep to rolling.

Grassland of poor quality covers four-fifths — mostly subterranean clover (*Trifolium subterraneum*), cocksfoot (*Dactylis glomerata*), sweet vernal, some ryegrass (*Lolium perenne*), and many weeds — madder (*Sherardia arvensis*), allseed, and thistles (species of *Cirsium* and *Carduus*).

Scrubland of mainly manuka with some kanuka and akepiro covers much of the N and W sides, particularly on soft, eroding soils. Some has invaded pasture on the E.

Forest covers a few hectares in the S. Is 10–13 m high on moderately steep, rocky slope. Taraire is the main species with much kohekohe, tawapou, tawa, and some rewarewa, wharangi, kawakawa, mangeao (*Litsea calicaris*), and karaka.

Fernland in minor patches.

Trees and shrubs, 47. Dicot. herbs, 80. Monocot. herbs 30. Ferns, 18. Grasses, 26. Total species, 201.

5. COW. A small island (c. 1 ha) with a flashing beacon. Nesting petrels are abundant.

Shrubland with 4-m-tall canopy of *Coprosma macrocarpa*, houpara, karo, and *Hymenandra* over most of the island. The fine-leaved form of *Asplenium flaccidum* is the only ground species.

Wasteland ensued after clearing of c. 400 m² to expose the beacon. Lush cover of sow thistle, blackberry, and inkweed (*Phytolacca octandra*). The clearing extends to cliffs in two places. These extensions have abundant ratstail.

Trees and shrubs, 10. Dicot. herbs, 29. Monocot. herbs, 5. Ferns, 5. Grasses, 7. Total species, 56.

6. MOTUTAPERE. A large island (50 ha) reaching to a peak at 168 m.

Scrubland mainly of kanuka (possibly 50 years old) 3–9 m tall covers three-quarters of the island (has recently replaced manuka on the E side). *Coprosma arborea* prominent in the understorey with mahoe.

Shrubland of *Coprosma arborea* on the SW and

NE faces — probably succeeded manuka.

Forest in the SW runs almost from shore to summit. Mainly taraire with tawa, rewarewa, karaka, kohekohe, and tawapou. Understorey of nikau (*Rhopalostylis sapida*), kawakawa (*Macropiper excelsum*), and *Coprosma arborea*.

Fernland has invaded grassland towards the SE corner of the island. Is being replaced by *Coprosma* spp., hangehange (*Geniostoma ligustrifolium*), tutu, and rangiora.

Grassland of only a few hundred square metres remaining. Mainly sweet vernal, cocksfoot, Yorkshire fog (*Holcus lanatus*), and narrow-leaved plantain.

Trees and shrubs, 49. Dicot. herbs, 48. Monocot. herbs, 22. Ferns, 22. Grasses, 25. Total species, 166.

7. MOTUKOPAKE. The smallest farmed island, said to contain 12 ha, but the area is probably c. 18 ha. It has steep sides and mainly level ridge reaching 59 m.

Grassland to shore on the E and extending W down some steep spurs, passing into scrubland and pohutukawa in places. Poor pasture of ratstail, *Microlaena stipoides*, paspalum (*Paspalum dilatatum*), and sweet vernal with winged thistle and *Juncus australis*.

Scrubland of limited areas of manuka on the steep W slopes.

Shrubland of *Coprosma* spp., karo, and houpara along the W shore.

Forest of discontinuous pohutukawa on the W. Isolated trees on the E and about the summit.

Trees and shrubs, 31. Dicot. herbs, 54. Monocot. herbs, 14. Ferns, 13. Grasses, 19. Total species, 131.

8. CALF. A small rock stack. Few hundred square metres on cliff-bound summit sloping E. Major cover is *Senecio lautus*, ice plant, taupata, and *Bromus diandrus*. A single pohutukawa grows on the summit.

Trees and shrubs, 5. Dicot. herbs, 7. Monocot. herbs, 1. Ferns, 1. Grasses, 3. Total species, 17.

9. MOTUKAKARIKITAHI. A small island (c. 3 ha) with steep sides and mainly level summit ridge with a saddle to 59 m.

Scrubland of manuka, akepiro, and *Pomaderris* spp. on the E face and most of the NW bay above cliffs. On the steep face on the W there is more *Hebe pubescens*, *Astelia banksii*, renga lily, and flax.

Low forest of mahoe, kohekohe, whau (*Entelea arborescens*), karaka, and tawapou from saddle to shore.

Pohutukawa on cliffs. Young plants in scrubland.

Grassland in minor patches on the ridge — mainly sweet vernal, *Notodanthonia*, and ratstail.

Trees and shrubs, 37. Dicot. herbs, 41. Monocot. herbs, 11. Ferns, 16. Grasses, 21. Total species, 126.

See Newhook et al. (1971).

10. MOTUOKINO. A high, steep rock stack with a cap of shrubland, and a sloping plateau with nesting petrels.

Shrubland of houpara with *Hymenanchera*, wharangi, taupata, and karo on summit and extending down sides. Canopy c. 4 m high. Ground mostly bare around burrows. *Asplenium flaccidum* (fine-leaved form), *Solanum nodiflorum*, and *Parietaria* plentiful in some places.

Clearing on the W end of the summit has ice plant and *Senecio lautus*.

Trees and shrubs, 8. Dicot. herbs, 16. Monocot. herbs, 2. Ferns, 3. Grasses, 7. Total species, 36.

11. MOTUMORIRAU. A long low island reaching 20 m at one part of the ridge which forms the spine. Area 1–2 ha.

Shrubland predominantly of houpara sparsely covers the W face and occupies minor gullies on the E. Fringe of karo along the shore and much *Hebe pubescens* towards the summit.

Grassland in minor patches on thin soils on the ridge and some spurs — mostly of exotic annuals, *Scirpus nodosus* and stunted bracken.

Pohutukawa mostly small and scattered.

Trees and shrubs, 10. Dicot. herbs, 27. Monocot. herbs, 4. Ferns, 5. Grasses, 14. Total species, 60.

See Newhook *et al.* (1971).

12. MOTUKARAMEA. A small island (3 ha) with steep sides and sloping summit plateau reaching 32 m.

Shrubland has recently invaded bracken and flax on the summit and extends to shore in places on the S side. Consists of houpara, mahoe, *Coprosma* spp., karo, hangehange, and tutu.

Grassland on steep N and E faces is mostly *Notodanthonia*, *Bromus diandrus*, and ratstail with some bracken. Small remnant of grassland on the plateau has sweet vernal, cocksfoot, and *Scirpus nodosus*.

Pohutukawa — a few trees on the S face.

Trees and shrubs, 15. Dicot. herbs, 23. Monocot. herbs, 8. Ferns, 8. Grasses, 12. Total species, 66.

13. MOTUORUHI. A large island (64 ha) running to a peak at 169 m.

Scrubland covers most of the island — mainly tall kanuka with mapou and mahoe gradually replacing it. The N face and W spur have scattered manuka, but on the E spur and ridge running S of trig station there is a low, dense cover of manuka with mapou and *Gahnia lacera*.

Shrubland of mahoe and kohekohe is prominent in the E valley and extends W as a layer below scattered pohutukawa and kanuka. Mapou is dominant in a short valley running W from summit.

Forest of old pohutukawa over taraire and kohekohe fills much of the head of the W valley. Light understorey of mahoe, kawakawa, and hangehange. Pohutukawa is prominent on the coast, particularly in the E and W.

Flax grows in extensive stands in the lower W valley and extends over the spur to the E. Has shrub species well established in it.

Grassland. Minor patches of ratstail, paspalum, and *Lotus* spp. on the W spur. Some grassland on the N face not visited.

Trees and shrubs, 59. Dicot. herbs, 63. Monocot. herbs, 23. Ferns, 29. Grasses, 25. Total species, 199.

See Newhook *et al.* (1971).

14. (IN NGAMOTUKARAKA GROUP). A high (44 m), long, steep-sided island of 3 or 4 ha well clad with low trees.

Shrubland of houpara, *Coprosma macrocarpa*, wharangi, karo, and *Hymenanchera*, large-leaved milk-tree, and whau. Fifteen plants of *Carmichaelia williamsii* counted.

Grassland is limited to small areas of the N face and summit crests at each end of the island. The patches consist mostly of exotic annuals with *Bidens pilosa*, *Astelia banksii*, and *Hebe pubescens* on their margins.

Trees and shrubs, 19. Dicot. herbs, 25. Monocot. herbs, 7. Ferns, 7. Grasses, 12. Total species, 70.

15. (IN NGAMOTUKARAKA GROUP) (Fig. 3). A small island little more than a rock stack, steep on all sides but can be scaled in a gut to the summit at 38 m.

Shrubland 3–4 m tall of houpara and *Hymenanchera* with mapou, *Coprosma macrocarpa*, karo, and mahoe. Much *Astelia banksii* and renga lily.

Grassland. Very small patches on the summit ridge.

Pohutukawa on narrow part of the summit ridge. Trees and shrubs, 13. Dicot. herbs, 25. Monocot. herbs, 5. Ferns, 7. Grasses, 12. Total species, 62.

16. (IN NGAMOTUKARAKA GROUP). A small steep-sided island much less than a hectare in extent, rising to 53 m. There is a steeply-tilted face with woody vegetation facing the SW.

Shrubland is an open stand of karo and houpara. *Astelia banksii* is plentiful.

Pohutukawa is mainly on the crest, but there are some near the shore.

Trees and shrubs, 6. Dicot. herbs, 9. Monocot. herbs, 4. Ferns, 3. Grasses, 7. Total species 28.

17. MOTURUA (Fig. 4). An island over a kilometre long (26 ha) with a beach isthmus forming a waist



Fig. 3 Island 15 in the Ngamotukaraka group is typical of many small islands. It has a crown of pohutukawa and flanking shrubland of houpara and *Hymenanthera*.

between the two sections. There are fairly steep slopes on all sides but the interior is not steep. On the S section most of the island slopes to the SW from a ridge reaching 86 m. The smaller N section slopes to the S. It has a beautifully terraced slope just N of the waist. There are rabbits on the island.

Pohutukawa forest covers much of the W slopes, having recently replaced manuka. There is an understorey of mahoe and mapou and a light ground cover of *Doodia media* and sedges. Older pohutukawa trees grow on the N section.

Scrubland of manuka with mapou and mahoe is mainly on the summit and the E slopes of the S section. There are low tangles of *Muehlenbeckia complexa* on Maori terraces near the waist.

Trees and shrubs, 22. Dicot. herbs, 33. Monocot. herbs, 16. Ferns, 13. Grasses, 17. Total species, 101. See Newhook *et al.* (1971).

18. (NEAR MOTURUA). An elongated rock stack of much less than a hectare. It has very steep rock faces rising to almost 33 m from a narrow, encircling rock platform.

Shrubland — mostly of karo and houpara, little more than 3 m wide and c. 20 m long.

Trees and shrubs, 8. Dicot. herbs, 10. Monocot. herbs, 5. Ferns, 1. Grasses, 5. Total species, 29.

19. MOTUKARAMARAMA (Fig. 5). An attractive forest-clad island (18 ha) rising steeply on all but the S side. The highest point (75 m) is above the

cliffs on the N side of the island. There are two large colonies of nesting gannets and several smaller groups.

Shrubland of houpara on the summit and all easy slopes with *Coprosma* spp. and *Hymenanthera* on the fringes. There is much kohekohe in the understorey.

Forest of kohekohe and mahoe with some karo and tawapou in the gullies. Pohutukawa is scattered throughout, mainly on ridges and steep coastal faces.

Grassland is limited in area, but very lush. Cocksfoot, prairie grass, and *Poa pratensis* are prominent, but there are over 30 other non-woody species in the turf.

Trees and shrubs, 29. Dicot. herbs, 28. Monocot. herbs, 11. Ferns, 14. Grasses, 15. Total species, 97. See Newhook *et al.* (1971).

20. MOTUWINUKENUKE. A 3 ha island rising steeply to 45 m with a cap of shrubland.

Shrubland extends over the summit and down the sides in places — mostly karo, houpara, *Coprosma macrocarpa*, and mahoe.

Grassland is fairly extensive on steep slopes and there are large clumps of renga lily.

Trees and shrubs, 12. Dicot. herbs, 23. Monocot. herbs, 7. Ferns, 8. Grasses, 14. Total species, 64.

21. MOTUWI. A long island covering 26 ha with steep flanks falling away from a narrow ridge 73 m high at its highest point. Immediately S of the waist the rock is crumbling and eroding in places.

Fig. 4 On the western slopes of Moturua selective browsing by rabbits has eliminated many early seral shrub species and simplified the succession which has replaced manuka by pohutukawa.



Fig. 5 Southern slopes of Motukaramarama. Pohutukawa is prominent on the shore and ridges. Young forest of kohekohe and mahoe in the gullies grades into houpara shrubland with an understorey of kohekohe on the island's summit. Kohekohe will become dominant on this rabbit-free island.



Forest. Nearly the whole island is covered with young pohutukawa with a light understorey of mapou on the gentler slopes. Rabbits have greatly depleted the floor. On the N section the forest is taller, but mapou is in the canopy in places. Pohutukawa is more scattered on the steeper parts.

Scrubland of manuka occupies parts of the summit ridge and the S and E of the island.

Grassland of *Notodanthonia* and moss occurs in patches on the NE slopes among bluffs.

Trees and shrubs, 21. Dicot. herbs, 34. Monocot. herbs, 14. Ferns, 14. Grasses, 10. Total species, 89.

22. (NEAR MOTUWI). A small rock stack under 33 m high, but steep on some sides. There is a small colony of nesting gannets.

Shrubland of *Hymenanthera* and taupata is not continuous over the top.

Grassland in patches on minor ledges.

Pohutukawa is present, but not prominent.

Trees and shrubs, 6. Dicot. herbs, 9. Monocot. herbs, 2. Ferns, 1. Grasses, 4. Total species, 22.

23. (NEAR MOTUKAHAUA). A pair of rock stacks, the larger (78 m) mostly with steep cliff faces and nesting spotted shags.

Shrubland of *Coprosma* spp., houpara, and *Hymenanthera* covers the large stack. A few pohutukawa emerge through it. A small stack has taupata and stunted pohutukawa on its upper slopes.

Ice plant is conspicuous on the N and W faces of the large stack and the lower slopes of the small stack.

Trees and shrubs, 7. Dicot. herbs, 26. Monocot. herbs, 6. Ferns, 5. Grasses, 10. Total species, 54.

24. MOTUKAHAUA. An island of possibly 24 ha shaped like a horseshoe and rising steeply from the shore in nearly all places. The highest point is 72 m. A beach isthmus attaches one part of the shoe to the rest of the island.

Scrubland in the N is dominated by manuka not more than 20 years old.

Pohutukawa is scattered on cliffs, but forms an almost complete narrow band on the NE slope.

Grassland of *Notodanthonia* with flax occupies ledges on cliffs and lower coastal slopes in the NE.

Trees and shrubs, 10. Dicot. herbs, 27. Monocot. herbs, 7. Ferns, 9. Grasses, 14. Total species, 67.

See Newhook *et al.* (1971).

25. (NEAR MOTUKAHAUA). An island of c. 4 ha bordered by low cliffs and rising gently to 53 m.

Shrubland of mapou with some *Coprosma macrocarpa* c. 3 m high covers most of the island.

Pohutukawa is widely scattered with greatest aggregations above the low cliffs. The trees are fairly large and have dense stands of associated *Astelia banksii*.

Trees and shrubs, 14. Dicot. herbs, 12. Monocot. herbs, 9. Ferns, 7. Grasses, 7. Total species, 49.

26. (IN MATARIKI GROUP). A low domed island lacking cliffs and covering much less than 1 ha.

Grassland. Has a dense cover of grasses, *Scirpus nodosus*, *Senecio lautus*, and ice plant.

Pohutukawa. A single plant grows near the centre of the island.

Trees and shrubs, 4. Dicot. herbs, 21. Monocot. herbs, 4. Ferns, 2. Grasses, 9. Total species, 40.

27. (IN MATARIKI GROUP). A small, steep grassy island.

Grassland spreads over the summit and down the sides.

Pohutukawa in two small stands shelters karaka, karo, *Coprosma macrocarpa*, and kawakawa.

Trees and shrubs, 6. Dicot. herbs, 27. Monocot. herbs, 1. Ferns, 4. Grasses, 8. Total species, 45.

28. (IN MATARIKI GROUP). A small tower of rock with a cap of vegetation consisting of low pohutukawa and taupata. Patch of ice plant and *Senecio lautus* occurs on the lower slope.

Trees and shrubs, 4. Dicot. herbs, 4. Monocot. herbs, 0. Ferns, 1. Grasses, 3. Total species, 15.

THE FLORA

The following list of 375 species and varieties of wild plants contains 225 native plants and 150 exotics. One hundred and twenty-seven of the 229 dicotyledonous plants are natives; 57 of the 103 monocotyledonous plants; and all of the 40 ferns and fern allies.

Refer to Fig. 1 for the location of islands indicated by name or number. An asterisk indicates introduced species.

Gymnosperms

Agathis australis Salisb. Kauri. A single tree with a diameter of c. 50 cm on Motuoruhi. There were no seedlings.

**Cupressus macrocarpa* Gord. Macrocarpa. Has escaped from plantings on Waimate I.

**Pinus radiata* D. Don Radiata pine. One mature tree and several smaller ones established on the SW of Motutapere.

Dicotyledonous plants

- Acaena anserinifolia* (Forst.) Druce A few plants seen on pig rootings on Motuoruhi.
- **Albizia lophantha* (Pers.) Benth. Brush wattle. Well established below cliffs on Rangipukea.
- Alectryon excelsus* Gaertn. Occasional seedlings seen in the forest on Motutapere.
- **Anagallis arvensis* L. Scarlet pimpernel. This and the blue-flowered pimpernel (var. *foemina*) are widespread on dry exposed soil. The variety was usually on thinner, drier soils and flowered earlier than the species. 1-4, 6, 7, 9, 11-13, 15, 17, 19-21, 23, 24, 26, 27.
- **Aphanes microcarpa* (B. & R.) Rothm. Parsley piert. In pasture on Waimate I.
- Apium australe* Thouars On coastal rocks a little above high-tide mark on many islands but not abundant anywhere. 2-4, 7, 9, 13, 21, 26, 27.
- **Atriplex hastata* L. Orache. On some shores but not plentiful. 2, 5, 12.
- Avicennia resinifera* Forst. f. Mangrove. Isolated plants grow on rocky shore platforms. 2, 6, 11.
- Beilschmiedia tarairi* (A. Cunn.) Benth. et Hook f. ex Kirk Taraire. Forms the major part of the forest canopy on Waimate I., Motutapere, and Motuoruhi. Not seen on other islands.
- Beilschmiedia tawa* (A. Cunn.) Benth. et Hook. f. ex Kirk Tawa. A minor element in taraire forests on Waimate I. and Motutapere.
- Bidens pilosa* L. In open habitats, usually in droughty soils on ridge-crests. 14, 19, 20, 27.
- Brachyglottis repanda* J. R. et G. Forst. Rangiora. Mainly in advanced regeneration and on forest margins. There are small stands with dense, long, inclined stems on Motutapere. 1, 3, 4, 6, 9, 13, 14, 17, 19, 25.
- **Brassica napus* L. Plants 1 m tall with stems c. 5 cm thick growing close to the shore are probably rape, the crop plant, which has persisted without cultivation. Similar plants grow on the Coromandel coast. 2, 27.
- Callitriche muelleri* Sond. Abundant in scrubland on Moturua on moist soil bared by rabbits; much less plentiful on Waimate I.
- Calystegia soldanella* (L.) R. Br. Sand convolvulus. On the shores of many islands, but not plentiful. On the southern islands most smaller plants growing in grassland, in bracken, and in blackberry away from the shore are probably of the same species, but some are intermediate between *C. soldanella* and *C. tuguriorum* in their floral morphology. 1, 2, 4-6, 9, 12, 13, 20, 27.
- **Capsella bursa-pastoris* (L.) Med. Shepherd's purse. In disturbed soil near stockyards on Rangipukea and Waimate I.
- Cardamine debilis* Banks ex DC. A few plants on a rocky outcrop in forest on Waimate I.
- **Carduus tenuiflorus* Curt. Winged thistle. Mostly in small numbers in open vegetation, but a significant weed on Motukopake. Most plants were not flowering when surveyed and some *C. pycnocephalus* may be included in this record. 3, 4, 7, 21, 23, 24.
- Carmichaelia aligera* Simpson In small numbers in scrubland. This is listed as *C. australis* in Newhook *et al.* (1971). 4, 6, 7, 9, 11, 12, 18, 20.
- Carmichaelia williamsii* Kirk A few plants on Motuoruhi and on 14.
- Cassinia retorta* A. Cunn. ex DC. Plentiful on Motuwi, occasional on two other northern islands. Mostly on coastal slopes. 17, 21, 24.
- **Celsia cretica* L. Cretan mullein. Occasional on Waimate I. and Motutapere.
- **Centaurium erythraea* Rafn. Centaury. Common in open vegetation. 1, 3, 6, 7, 11, 13, 14, 17, 20, 21, 24, 25.
- **Cerastium glomeratum* Thuill. Annual mouse-ear chickweed. Frequent on rocks near the shore; some in pastures. 1, 3, 4, 6, 7, 9, 11-13, 15, 17, 24.
- **Cerastium holosteoides* Fries. Mouse-ear chickweed. A few plants noted on Motukopake and Motuoruhi.
- **Cirsium vulgare* (Savi) Ten. Scotch thistle. Abundant in pastures on Motukopake, occasional plants in open places on other islands. 1, 3, 4, 6, 7, 13, 17, 21, 24, 27.
- Clematis paniculata* Gmel. In advanced regeneration on Motutapere, Motuoruhi, and Moturua.
- Clematis parviflora* A. Cunn. Occasional in scrubland. Newhook *et al.* (1971) recorded this as *Clematis* sp. 2, 3, 6, 7, 9, 13, 14, 17, 19.
- Coprosma arborea* Kirk Abundant on Motutapere beneath kanuka and as a dominant in late regeneration. Grows also on Motuoruhi, but its role there is taken by *Myrsine australis*.
- Coprosma lucida* J. R. et G. Forst. Occasional plants in scrubland. 1, 2, 3, 7, 9, 13, 25.
- Coprosma macrocarpa* Cheesem. A common component of shrubland, particularly in gullies. Although a coastal plant it does not grow on exposed shores. Small-leaved forms noted on 7 and 26 are possibly hybrids with *C. propinqua*. 1, 2, 4-7, 9, 12-15, 17-20, 23, 25-28.
- Coprosma repens* A. Rich. Taupata. Mainly a species of the shore, ledges, and screes. On some small islands it extends over the summit, particularly where sea birds nest as on Cow and Motuokino. 1, 4, 5, 7-22, 26, 28.
- Coprosma rhamnoides* A. Cunn. Abundant only on Motutapere where it forms dense stands beneath *Leptospermum*. 4, 6, 13, 21.

- Coprosma robusta* Raoul Occasional plants noted on 6, 9, 13, 17, 19.
- Coriaria arborea* Lindsay Tutu. Occasional in young vegetation. On Wekarua it has resprouted after fire. 1, 4, 6, 7, 9, 12, 21.
- **Coronopus didymus* (L.) Sm. Twin cress. Grows in pasture on Waimate I.
- Corynocarpus laevigatus* J. R. et G. Forst. Karaka. Isolated trees in forests, some in the open. 1-4, 6, 7, 13, 14, 19, 27.
- **Cotula australis* (Sieb.) Hook. Mainly in open vegetation, e.g., on rocks near the shore, some in open scrubland. 3-5, 7, 9, 19, 21, 24.
- **Crassula decumbens* Thunb. In dry pasture on Waimate I. and on rocks on Motuokino.
- **Crepis capillaris* (L.) Wallr. Hawksbeard. Occasional on disturbed soil. 1-7, 9, 13, 17, 27.
- Cyathodes fasciculata* (Forst.f.) Allan In scrubland on exposed slopes, but nowhere in abundance. More prevalent on islands with soft, eroding rocks. 4, 6, 7, 13, 21.
- Cyathodes fraseri* (A. Cunn.) Allan On eroding rock on Motuwi, and recorded from Motukahaua by Newhook *et al.* (1971).
- Daucus glochidiatus* (Labill.) Fisch., Mey. et Lallemand A few plants on shaded rocks on Motutapere.
- Dichondra repens* Forst. Widespread in scrubland, shrubland, and forest, often in large patches. Leaves reach 5 cm in diameter, but only small leaves were seen on islands with rabbits. It has a fairly high tolerance of salt spray. 1, 2, 4-27.
- Disphyma australe* (Ait.) N.E. Br. Ice plant. A characteristic plant of rocks near the shore and on ledges on cliffs, usually associated with *Senecio lantus* and often with taupata. 1-3, 5, 7-24, 26-28.
- Dodonaea viscosa* Jacquin Akeake. Few trees on Motutapere, Motukakarikitahi, and Moturua.
- Drosera auriculata* Backh. ex Planch. Sundew. Occasional in dry infertile places with manuka and *Pomaderris* spp. 2, 4, 6, 7, 9, 13, 21.
- Dysoxylum spectabile* (Forst. f.) Hook. f. Kohekohe. Well represented on the islands and dominant in parts of Waimate I., Motuoruhi, and Motukaramarama. 2, 4, 6, 9, 13, 15, 17, 19.
- Elaeocarpus dentatus* (J. R. et G. Forst.) Vahl Hinau. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Entelea arborescens* R.Br. Whau. In small numbers on many of the larger islands. 1, 6, 7, 9, 13, 14, 19.
- **Erechtites atkinsoniae* F. v. M. Occasional plants in semi-shaded situations. 1, 4, 13, 17.
- Erechtites minima* (Poir.) DC. A few plants on Motuwi.
- Erechtites scaberula* Hook. f. Occasional in open to semi-shaded places. 3, 4, 6, 7, 9, 11, 13-15, 19, 21, 23-25.
- Erechtites quadridentata* (Loeb.) DC. Occasional in open vegetation. 6, 11, 14.
- **Erica lusitanica* Rud. Spanish heath. A few plants on Wekarua and Motukakarikitahi.
- **Erigeron floribundus* (HBK.) Sch.-Bip. Fleabane. Very widespread in open places, but occurring only as scattered individuals. 1-15, 17, 20, 21, 23-27.
- **Erodium moschatum* (L.) L'Hérit Musky storksbill. A few plants in pastures on Rangipukea, Waimate I., and Motukopake.
- **Eupatorium adenophorum* Spreng. Mexican devil. Occasional in scrubland and open shrubland. 6, 9, 12, 13, 17, 23.
- **Euphorbia peplus* L. Spurge. Widespread on rocks near the shore and on disturbed ground beneath trees and shrubs. 1, 2, 4, 6, 9, 12-15, 17, 19, 21, 23, 27.
- Fuchsia excorticata* (J. R. et G. Forst.) Linn. f. Recorded for Motuoruhi by Newhook *et al.* (1971).
- **Galium aparine* L. Cleavers. Occasional on disturbed soil and grassy places. 2, 3, 9, 27.
- **Galium parisiense* L. In pastures on Motukopake.
- Galium popinquum* A. Cunn. In moist places in scrubland on Motutapere and Motuoruhi.
- Geniostoma ligustrifolium* A. Cunn. Plentiful on Motuoruhi, less abundant in scrubland on other islands. 4, 6, 9, 12, 13, 17, 19-21, 25.
- **Geranium dissectum* L. Cut-leaved geranium. Frequent on rocky outcrops with the pimperlins. 1, 2, 4, 7, 9, 13-15, 17, 19, 23, 25, 27.
- **Geranium molle* L. Dovesfoot. Occasional in bare and grassy places. 3, 4, 6, 7, 19, 26.
- Geranium solanderi* Carolin Mostly in grassy places, but can persist for some time after scrubland has developed. 1, 2, 4, 6, 7, 9, 12-14, 19, 20, 26, 27.
- Gnaphalium gymnocephalum* DC. Occasional in open places. 6, 13, 17, 20, 24.
- Gnaphalium luteo-album* L. Mostly on rocks near the shore. 3, 5, 9, 12, 13, 17, 18, 20, 23-25.
- Gnaphalium simplicicaule* Willd. ex Spreng. Occasional plants on Motuoruhi.
- Gnaphalium sphaericum* Willd. Occasional in open scrubland. 5, 6, 11, 13, 14, 23, 25.
- **Gnaphalium spicatum* Lam. A few plants on Cow, Motutapere, and Motuoruhi.
- Gnaphalium subfalcatum* Cabr. A few plants in open places. 5, 13, 14, 26.
- Haloragis erecta* (Banks ex Murr.) Eichl. Scattered plants in open scrubland. 1, 2, 4, 6, 9-11, 13, 17, 20, 21, 24, 26.

- Haloragis procumbens* Cheesem. Occasional plants on infertile soil on Motuoruhi and Motuwi.
- Hebe pubescens* (Banks et Sol. ex Benth.) Ckn. et Allan. Mainly on ungrazed slopes above the shore. Plentiful in some places. It becomes drawn up and almost lianoid before giving way to taller plants. On Motuwi it forms an understorey with mapou beneath pohutukawa. 4, 6, 7, 9, 11–14, 17, 19–21, 24, 25.
- Hebe stricta* (Benth.) L. B. Moore. A few plants noted on the shore and in open scrubland. 1, 4, 6, 7.
- Hedycarya arborea* J. R. et G. Forst. Pigeonwood. A few plants near forest on Waimate I.
- Heimerliodendron brunonianum* (Endl.) Skottsb. Parapara. A few large trees and many seedlings on Motuoruhi. Newhook *et al.* (1971) recorded it also for Motukakarikitahi.
- Hydrocotyle moschata* Forst. f. A few plants seen on Moturua, Motuwi, and Motukahaua.
- Hymenanthera novae-zelandiae* (A. Cunn.) Hemsl. Mainly on the edge of tall scrubland, but on small islands, particularly those with ground-nesting sea birds, it forms a major part of the canopy and extends to the summit.
- Hypericum japonicum* Thunb. Occasional in scrubland on Moturua.
- **Hypochaeris glabra* L. Smooth catsear. Grows with the pimpurnels on droughty soils. 2–6, 11, 13.
- **Hypochaeris radicata* L. Catsear. Fairly frequent in open places on disturbed soils. 1, 3–5, 9, 11, 13, 15–21, 23, 25, 26.
- **Kickxia elatine* (L.) Dum. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Knightia excelsa* R.Br. Rewarewa. A few medium-sized trees on Waimate, Motutapere, and Motuoruhi and young plants in scrubland on Motuoruhi.
- **Lactuca virosa* L. A few plants on Waimate I.
- Lagenifera pumila* (Forst. f.) Cheesem. A few plants on Waimate I. under trees.
- **Lapsana communis* L. Nipplewort. A few plants on 14.
- **Leontodon taraxacoides* (Vill.) Mérat. Hawkbit. On disturbed soil on Motutapere, Motukopake, and Motuoruhi.
- Lepidium oleraceum* Forst. f. Cook's scurvy grass. A single plant on 26 just above the high-tide mark.
- Leptospermum ericoides* A. Rich. Kanuka. Plentiful on many islands where scrubland has not been disturbed by fire for 30 years or more and uncommon on islands with rabbits. 3, 4, 6, 7, 9, 13, 17, 19, 21.
- Leptospermum scoparium* J. R. et G. Forst. Manuka. More plentiful than kanuka in young scrubland but replaced by kanuka on most islands (except those with rabbits). Absent from islands with ground-nesting sea birds and from small islands. Invading pasture in some places where there is soil erosion. 1, 3, 4, 6, 7, 9, 13, 15, 17, 19, 21, 24, 25.
- **Linum trigynum* L. Yellow flax. Frequent on slopes above the shore. 1–4, 6, 7, 9, 13.
- **Linum marginale* A. Cunn. Australian flax. Occasional in grassland. 1–4, 6.
- Linum monogynum* Forst. f. A few scattered plants on slopes above the shore. 9, 11, 13–15, 17, 18, 20.
- Litsea calicaris* (A. Cunn.) Benth. et Hook. f. ex Kirk. Mangeao. Plentiful in taraire forest on Waimate I. and a single plant noted on Motuwi.
- Lobelia anceps* Linn. f. Uncommon on wet rocks above high-tide mark. 3, 4, 7, 12, 13, 21, 24.
- **Lotus pedunculatus* Cav. Occasional in wet places on Waimate I. and Motutapere.
- **Lotus angustissimus* L. and *L. subbiflorus* Lag. These were not recorded separately because they were not flowering when surveyed. On some grassy islands some plants (probably *L. subbiflorus*) formed large patches to the exclusion of most other species. 1–4, 6, 7, 9, 13, 23, 26.
- Macropiper excelsum* (Forst. f.) Miq. Kawakawa. Prominent in unbrowsed parts of tall scrubland, shrubland, and forest, but absent from many places where it could be expected to grow. 4, 7, 9, 13, 17, 27.
- Macropiper excelsum* (Forst. f.) Miq. var. *majus* (Cheesem.) Allan. More often associated with shrubland than with scrubland or forest. 3, 7, 9, 13, 14, 19.
- **Marrubium vulgare* L. Horehound. A few plants in the sheepyards on Rangipukea.
- **Medicago arabica* (L.) Huds. Spotted bur medick. Occasional near the shore in dry places. 3, 4, 27.
- **Medicago polymorpha* L. Bur medick. Occasional near the shore in dry places. 1, 3, 4, 13, 20, 27.
- Melicope ternata* J. R. et G. Forst. Wharangi. In coastal shrubland and low forest, an important canopy species on some small islands. 3, 4, 6, 7, 9, 10, 13, 14, 19, 21, 25.
- **Melilotus indica* (L.) All. King Island melilot. In open situations close to the shore in a few places. 3, 4, 6, 13, 17, 18.
- **Melilotus officinalis* (L.) Pall. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Melicytus macrophyllus* A. Cunn. Large-leaved mahoe. Plentiful on 14 and noted on 15.
- Melicytus micranthus* Hook. f. Locally plentiful under kanuka on Motutapere.

- Meliclytus ramiflorus* J. R. et G. Forst. Mahoe. Present on most islands, abundant on some, particularly in gullies with kohekohe, also forming part of the canopy on Motutapere where taraire dominates. It grows beneath pohutukawa and is prominent in shrubland and scrubland as smaller plants. Mahoe can establish in the presence of rabbits. 1-4, 6, 7, 9, 10, 12-15, 17, 19-21, 25.
- **Mentha pulegium* L. Pennyroyal. Small quantities in pastures on Rangipukea and Waimate I.
- Metrosideros excelsa* Sol. ex Gaertn. Pohutukawa. One of the most conspicuous landscape features of the islands. There are few shores and coastal slopes where it does not grow. It is also prominent where wind funnels up gullies. Pohutukawa forms pure stands by replacing manuka on islands with rabbits (Fig. 4). Generally fairly open places are required for establishment, but on Motuoruhi there are healthy saplings among manuka which is 2-3 m high. 1-9, 11-17, 19-28.
- Metrosideros perforata* (J. R. et G. Forst.) A. Rich. On Waimate I. climbs trees in the forest and on the forest margin forms rounded bushes. A few plants grow in the pohutukawa stands on Motuwi. It was recorded for Motuoruhi by Newhook *et al.* (1971).
- Metrosideros robusta* A. Cunn. Northern rata. A single tree on the upper margin of forest on Waimate I. and a small plant on Motutapere.
- **Modiola caroliniana* (L.) Don Creeping malow. Occasional near the shore in grassy places. 3, 4, 9, 13.
- Muehlenbeckia australis* (Forst. f.) Meissn. Prominent in shrubland on the summit of 14 and a few plants on Motukaramarama.
- Muehlenbeckia complexa* (A. Cunn.) Meissn. A regular plant of shore lines, extending up slopes where there is open vegetation. It forms almost a pure community on a pa site near the waist on Moturua. 1-23, 26-28.
- Myoporum laetum* Forst. f. Ngaio. Not a conspicuous tree on these islands; rather more on Motukopake than in other places. 3, 4, 6, 7, 13.
- **Myosotis arvensis* (L.) Hill Forget-me-not. A few plants on Waimate I. and Moturua.
- Myrsine australis* (A. Rich.) Allan Mapou. A widespread hardy species in scrubland, becoming dominant in some places. On parts of Motutapere it is very prominent beneath kanuka. 1, 2, 4-7, 9-21, 23-25.
- Myrsine salicina* Hew. ex Hook. f. Toro. A few plants in scrubland on the summit of Motuoruhi.
- **Nasturtium officinale* R.Br. Watercress. In a creek near a former house site on Waimate I.
- Neomyrtus pedunculatus* (Hook. f.) Allan A few plants under kanuka on Waimate I.
- **Nepeta cataria* L. Plentiful on disturbed soil in pasture on Motukopake.
- Nertera depressa* Banks et Sol. ex Gaertn. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Nestegis cunninghamii* (Hook. f.) L. Johnson Black maire. Several small plants on the summit of Motuoruhi.
- Olearia furfuracea* (A. Rich.) Hook. f. Akepiro. Occasional in scrubland on exposed places. Persists for a time after forest has developed. 1, 4, 6, 7, 9, 13, 21, 24.
- **Orobanche minor* Sm. Broomrape. Fairly common as a parasite on a wide range of exotic plants and the natives *Wahlenbergia gracilis*, *Erechtites scaberula*, *Asplenium lucidum*, and karaka. 1, 2, 5, 7-15, 19, 20, 23, 26, 27.
- Oxalis corniculata* (A. Cunn.) Hook. f. var. *corniculata*. Occasional on disturbed soils, mostly on coastal slopes.
- Oxalis exilis* A. Cunn. A fairly versatile species occupying open and shaded habitats (pasture and forest), but not plentiful. 7, 9, 14, 17, 21, 24.
- **Oxalis pes-caprae* L. Bermuda buttercup. Abundant on a beach on Waimate I.
- Paratrophis banksii* Cheesem. Milk tree. Occasional plants in shrubland. 9, 13, 14, 19.
- **Parentucellia viscosa* (L.) Car. Tarweed. Occasional plants in open places. 1, 6, 13.
- Parietaria debilis* Forst. f. Fairly frequent on exposed soil in forest, shrubland, and scrubland. It is luxuriant on islands with ground-nesting sea birds. 5, 6, 10, 14, 19, 22.
- Parsonsia heterophylla* A. Cunn. Occasional vines in forest, some reaching 13 cm in diameter. Less frequent in shrubland and scrubland. 4, 6, 9, 13, 19.
- Pelargonium inodorum* Willd. A few plants in disturbed soil. 1, 5, 13, 23.
- Peperomia urvilleana* A. Rich. Mostly on rocks in forest, but grows also on the ground on islands which do not have sheep, cattle, or rabbits. 3, 4, 9, 11-17, 19, 20, 23, 25.
- **Physalis peruviana* L. Cape gooseberry. A few plants in sheltered places. 1, 7, 13, 14.
- **Phytolacca octandra* L. Inkweed. Widespread on fairly fertile soils but not abundant. Luxuriant around bird colonies on Motukaramarama. Seeds are carried by birds. 1-5, 7, 13, 14, 16, 19, 21, 23, 24, 28.
- **Picris echioides* L. Oxtongue. Occasional plants on land which has been burnt fairly regularly. 1, 2.
- Pimelea prostrata* (J. R. et G. Forst.) Willd. Occasional on coastal slopes, usually on eroding soil. 7, 9, 11-13, 20.
- Pittosporum crassifolium* Banks et Sol. ex A. Cunn. Karo. A characteristic plant near the shore, often

- growing with flax and houpara, and very tolerant of wind-borne salt but not entirely immune from damage. 1, 2, 5, 7, 9–20, 22, 23, 25.
- Plagianthus divaricatus* Forst. A few plants on shores. 2, 3, 6, 7, 13.
- Planchonella novo-zelandica* (F. Muel.) Allan Tawapou. Far from being a rare plant on these islands. Some trees have irregular trunks over 60 cm in diameter. Seedlings occur in many places on ungrazed islands. In these places rats are probably few or absent. 1–4, 7, 9, 13, 15, 19, 23, 25.
- **Plantago lanceolata* L. Narrow-leaved plantain. Occurs in some places where the vegetation has been kept open by burning, grazing, trampling, or erosion. Is the dominant plant on 2 which is burnt regularly. 1, 2, 4, 6, 7, 9, 21.
- Plantago raoulii* Decne A few plants on Motuwi.
- **Polycarpon tetraphyllum* L. Allseed. Flourishes on thin soils, particularly near the shore. 1–15, 19, 20, 22–28.
- Polygonum decipiens* R.Br. In a creek on Waimate I. This is probably not *P. decipiens* but an unidentified species common in northern New Zealand.
- Pomaderris phycifolia* Lodd ex Link Forms a minor part of low scrubland in exposed places, particularly on poor soils. 1, 4, 6, 7, 9, 12, 13, 17, 19, 21, 24.
- Pomaderris rugosa* Cheesem. Scattered plants in scrubland. 1, 3, 4, 6, 9.
- **Prunus persica* Batsch Peach. A single tree near the beacon on Cow.
- **Prunus* sp. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Pseudopanax arboreum* (Murr.) Philipson Five-finger. An uncommon plant, mostly in forest. Plants on Waimate I. in forest have the dimensions of trees. 4, 6, 13.
- Pseudopanax crassifolius* (Sol. ex A. Cunn.) C. Koch Lancewood. A few mature trees on Motutapere.
- Pseudopanax lessonii* (DC.) C. Koch Houpara. Prominent on most islands without rabbits. Grows in shrubland on the coastal fringe and forms an almost pure canopy to the summit of several islands. The most extensive stand is on the summit of Motukaramarama where a low forest has formed with trees up to 5 m high. 1–23, 25.
- Pseudopanax crassifolius* x *lessonii*. A few plants on Motuoruhi.
- Quintinia serrata* A. Cunn. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Ranunculus acaulis* Banks et Sol. ex DC. A few plants in a seepage on the shore of Waimate I.
- Ranunculus hirtus* Banks et Sol. ex DC. Occasional in woody vegetation on Motuoruhi.
- **Ranunculus parviflorus* L. Small-flowered buttercup. Occasional in grassy places. 3, 4, 7, 17, 21.
- **Ranunculus sardous* Crantz Hairy buttercup. Recorded for Motuoruhi by Newhook *et al.* (1971).
- **Ranunculus sceleratus* L. Celery-leaved buttercup. A few plants in a creek on Rangipukea.
- Rhagodia triandra* (Forst. f.) Aellen An inhabitant of steep exposed rocks, usually on the coast. 1–5, 9, 10, 15, 16, 19, 21, 27, 28.
- Rhabdothamnus solandri* A. Cunn. Recorded for Motuoruhi by Newhook *et al.* (1971).
- **Rosa rubiginosa* L. Sweet brier. Fairly widespread in pasture and scrubland on Waimate I.
- Rubus cissoides* A. Cunn. Lawyer. A few plants in young forest on Motuoruhi.
- **Rubus fruticosus* agg. Blackberry. In small quantities. 1, 2, 5, 6, 13.
- **Rubus illecebrosus* Focke Strawberry-raspberry. A single group of plants among brush wattles on Rangipukea.
- **Rumex acetosella* L. Sheep's sorrel. Small quantities in pasture on Waimate I.
- **Rumex brownii* Campd. Hooked dock. A few plants on Waimate I. and Motukopake.
- **Rumex conglomeratus* Murr. Clustered dock. Occasional in some moist grassy places. 2–4, 7.
- **Rumex crispus* L. Curled dock. On the shore in several places. 1, 3, 4, 7.
- **Rumex obtusifolius* L. Broad-leaved dock. Occasional plants on Waimate I.
- **Rumex pulcher* L. Fiddle dock. Occasional plants on Rangipukea and Motukopake.
- **Sagina ciliata* Fr. Fairly frequent in dry places, usually in shallow soil over rock. 1–7, 11, 13, 24.
- **Sagina procumbens* L. Pearlwort. Occasional in moist open habitats. 4, 13, 17, 18, 21, 23, 24.
- **Sagina* sp. A plant resembling *S. ciliata* but flowers 5-merous; petals spreading, a little shorter than sepals; capsule much longer than sepals, stamens 8 (or possibly 10). In dry places on Waimate I. and Motuwi, also in similar habitats on Coromandel Peninsula. Specimens 225571, 225573 in Botany Division Herbarium.
- Salicornia australis* Sol. ex Benth. Scattered plants on rocky shores. 2, 4, 5, 7, 9, 11, 12, 18, 20–24, 28.
- Scleranthus biflorus* (J.R. et G. Forst.) Hook. f. A single plant on the shore on Motutapere.
- Selliera radicans* Cav. Occasional plants in seepages on the shores of Waimate I. and Motukopake.
- Senecio lautus* Willd. Widespread and locally plentiful, particularly on rock ledges near the shore where it forms extensive communities with ice plant, *Bromus diandrus*, and taupata. It is not very tolerant of salt spray. 1, 2, 4–24, 26, 28.

- **Senecio sylvaticus* L. A few plants on disturbed soil on Waimate I.
- Senecio* sp. A plant akin to *S. lautus* but with stems more erect, fewer plainer leaves, phyllaries c. 7.5 mm long. In small numbers in dry open sites, usually on eroding soil. Specimens 225559, 225569, 225603 in Botany Division Herbarium. 4, 7, 11, 15.
- **Sherardia arvensis* L. Madder. Occasional in grassy places and open scrubland. 3, 4, 7, 13.
- Sicyos angulata* L. Scrambles over shrubs and small trees on Motukakarikitahi and Motukaramarama.
- **Silene gallica* L. Catchfly. Fairly frequent in dry open habitats. 1, 3-7, 9, 11, 13, 15, 19, 21, 26, 27.
- **Sisymbrium officinale* (L.) Scop. Hedge mustard. A few plants on disturbed soil in grassland. 3, 4, 27.
- Solanum aviculare* Forst. f. Poroporo. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Solanum laciniatum* Ait. Poroporo. Scattered plants only. These are luxuriant near the gannet colonies on Motukaramarama. 9, 16, 19, 21.
- **Solanum nigrum* L. Black nightshade. Fairly frequent in the shade of shrubs. On islands with ground-nesting sea birds it is quite luxuriant. 1-3, 5, 7-10, 12, 14-17, 19, 21-24, 26-28.
- Solanum nodiflorum* Jacq. Occasional except on Motuokino where it is plentiful among bird burrows. 5, 6, 10, 12-15, 19, 21, 25.
- **Solanum sodomaeum* L. Apple of Sodom. Troublesome in pasture on Rangipukea and Waimate I.
- **Sonchus asper* (L.) Hill Prickly sow thistle. Scattered plants in disturbed soil in open places and semi-shade. 4, 6, 7, 17.
- **Sonchus oleraceus* L. Sow thistle. Quite widespread, mostly in open places near the sea. 1-7, 9-27.
- Sophora microphylla* Ait. Kowhai. Occasional on Motutapere and Motukopake. Recorded also for Motukakarikitahi by Newhook *et al.* (1971) — as *S. tetraptera*.
- **Stellaria media* (L.) Vill. Chickweed. Fairly common in shade on disturbed soil. 4, 7, 15, 21, 23, 26.
- Stellaria parviflora* Banks et Sol. ex Hook. f. Occasional under trees and tall shrubs. The leaves on some plants are quite large, approaching *S. media* in size. 10, 11, 15, 19, 21.
- **Taraxacum officinale* Weber ex Wiggers Dandelion. A few plants on moist ground on Waimate I.
- Tetragonia tetragonioides* (Pall.) Kuntze A few plants only. 23, 25.
- Tillaea sieberiana* Schult. Fairly common on dry rocks. 1, 2, 4-6, 8-13, 15-19, 21-23, 26.
- **Trifolium dubium* Sibth. Suckling clover. In grassland, clearings and on rocks near the shore, locally plentiful on some southern islands. 2-7, 9, 11, 12, 19, 20.
- **Trifolium fragiferum* L. Strawberry clover. In pasture near the shore on Waimate I.
- **Trifolium glomeratum* L. Clustered clover. In a few dry grassy places. 1, 2, 4.
- **Trifolium repens* L. White clover. Occasional in pastures on Rangipukea and Motukopake; plentiful on Waimate I.
- **Trifolium subterraneum* L. Subterranean clover. Occasional in pastures on Rangipukea, more plentiful on Motukopake.
- **T. suffocatum* L. Occasional in pasture on shores on Waimate I. and Motukopake.
- **Ulex europaeus* L. Gorse. Small areas close to the shore on Motutapere, more widespread on Motukakarikitahi.
- **Verbascum thapsus* L. Woolly mullein. Plentiful on disturbed soil on Motukopake; a few plants on Motuwi.
- **Verbascum virgatum* Stokes Few plants on Moturua.
- **Veronica arvensis* L. A few plants on disturbed soil. 2-4, 7.
- **Veronica persica* Poir. Occasional on disturbed soil on Rangipukea.
- **Veronica plebeia* R. Br. A few scattered plants. 4, 6, 9, 13, 17.
- **Vicia sativa* L. Vetch. Fairly common in grassy places. 6, 9, 26, 27.
- **Vicia* spp. Unidentified non-flowering plants on Motutapere and Rangipukea may have been *V. tetrasperma*, *V. angustifolia*, or *V. hirsuta*.
- **Vinca major* L. Periwinkle. Spread from a former garden to a limited extent on Waimate I.
- Vitex lucens* Kirk Puriri. A few unhealthy mature trees and very few seedlings. 3, 4, 6, 13, 19.
- Wahlenbergia gracilis* (Forst. f.) Schrad. Fairly common in short vegetation and open scrubland. 1-7, 9-15, 17, 19, 24.

Monocotyledonous plants

- Acianthus fornicatus* R. Br. var. *sinclairii* (Hook. f.) Hatch A few plants in scrubland on Motutapere and Motukahaua.
- **Agave americana* L. May have been planted on Waimate I., but plants on Motuoruhi and Motukahaua have probably established from offshoots dispersed by the sea.
- Agropyron scabrum* (Lam.) Beauv. Recorded for Motukakarikitahi by Newhook *et al.* (1971).

- **Agrostis tenuis* Sibth. Browntop. A constituent of pasture on Waimate I.
- **Aira caryophylla* L. and *A. multiculmis* Dum. Silvery hair grass. These were not distinguished in the records because of their similarity. Usually with *A. praecox* on rocks near the shore, also on some coastal slopes. 11, 13–17, 19–21, 23–26.
- **Aira praecox* L. Early hair grass. A fairly regular plant on thin soil over rock, particularly near the shore. 1, 4, 6, 7, 9, 11–13, 17.
- **Allium cepa* L. A plant resembling the vegetable onion and probably of the same species is established along the shore of Waimate I.
- **Anthoxanthum odoratum* L. Sweet vernal. Is the main grass on Wekarua, prominent on Motukopake, but elsewhere only occasional plants in grassy places, open scrubland, and seepages. It was not recorded on islands with rabbits. 1–7, 9, 11–13, 16, 18–20, 25–27.
- Arthropodium cirratum* (Forst. f.) R. Br. Renga lily. Occasional plants on steep ground on some islands, and plentiful on some others. Occupies both sunny situations and shaded rocks in forest. 1, 3, 4, 6, 7, 9, 12–15, 17–21, 23, 25.
- **Arum italicum* Mill. Wild on a former house site on Waimate I.
- Astelia banksii* A. Cunn. Widespread and plentiful on rocky, ungrazed coastal slopes and in forest relics, usually more abundant near the shore under pohutukawa. 1–7, 9, 10, 12–25.
- **Avena barbata* Brot. A conspicuous feature of nearly all grassy slopes where there are no grazing animals. The record of *A. fatua* in Newhook *et al.* (1971) is probably this species which is widespread on the eastern coast of northern New Zealand. 1, 2, 5–7, 9–16, 18–21, 23, 24, 26–28.
- **Briza minor* L. Shivery grass. Common on coastal slopes and occurs also on some rocks near the shore, but requires a greater depth of soil than *Aira* spp. 1–4, 6, 7, 9, 11, 12, 14, 15.
- **Bromus diandrus* Roth. Widespread and conspicuous on dry grassy slopes and open grassy ridge tops usually with *Avena barbata*. It is also prominent with *Senecio lautus* in some level places. 1–17, 19, 20, 22, 26–28.
- **Bromus mollis* L. A few plants noted. 17, 18.
- **Bromus unioides* (of NZ authors). Prairie grass. Because of its higher moisture and fertility requirements it is less widespread than *B. diandrus*. It is luxuriant on the margins of the gannet colonies on Motukaramarama. 1, 3, 4, 6, 19, 20, 22–24.
- Caladenia carnea* R. Br. Several plants in dry scrubland on Motutapere.
- Carex breviculmis* R. Br. Occasional in scrubland. 6, 9, 11, 13, 14, 17, 19–21, 24.
- **Carex divulsa* Good. Occasional in grassy places. 4, 7, 9, 12, 21.
- Carex flagellifera* Col. Occasional plants in open places and in scrubland, scrubland, and under pohutukawas. 2, 6, 7, 9, 13, 14, 17, 24, 26.
- Carex inversa* R. Br. Noted in grassy places and in scrubland; probably overlooked in some places because of its small size. 2, 4.
- Carex lambertiana* Boott in Hook. f. In forest and scrubland on Motuoruhi.
- Carex solandri* Boott in Hook. f. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Carex spirostris* Col. In shaded places, plentiful on some islands. 4, 6, 9, 13, 17, 19, 25.
- Carex virgata* Boott in Hook. f. Many plants in moist places, particularly near the shore. 1–4, 6, 7, 13, 17.
- **Catopodium rigidum* (L.) C. E. Hubbard A few plants noted in one area. 14.
- Collospermum hastatum* (Col.) Skottsb. Occasional epiphytic and terrestrial plants in some forests. 4, 6, 13, 19, 21.
- Cordyline australis* (Forst. f.) Endl. Cabbage tree. A few small trees on Motuoruhi and Motukaramarama.
- Cordyline banksii* Hook. f. A few plants on Motuoruhi.
- **Cortaderia jubata* (Lem.) Stapf Purple pampas. Widely scattered but nowhere in high numbers. 5, 6, 9, 13, 17.
- **Cortaderia splendens* Connor Toetoe. In low shrubby vegetation on Waimate I. and Motu-morirau.
- Corybas oblongus* (Hook. f.) Reichb. f. Plants possibly belonging to this species seen on 25.
- Corybas trilobus* (Hook. f.) Reichb. f. A few plants on Motuoruhi and 25.
- **Cynodon dactylon* (L.) Pers. Indian doab. Restricted to very limited areas in pasture on Rangipukea and Waimate I.
- **Cyperus brevifolius* (Rottb.) Hassk. Single colony on the shore of Waimate I.
- Cyperus ustulatus* A. Rich. Abundant in some places where vegetation has been disturbed by man or animals, occasional elsewhere. 1, 3–7, 10, 13, 17, 21, 23, 24, 26.
- **Dactylis glomerata* L. Cocksfoot. Occasional in grassy places on soils of moderate fertility. 1–4, 6, 7, 9, 12, 19, 20, 23, 24.
- Deyeuxia billardieri* Kunth Occasional on coastal slopes, sometimes on rocks near the coast. There was probably another species of *Deyeuxia* in the region, but flowering specimens could not be obtained. 8, 9, 11–13, 15–17, 20, 22, 24.
- Dianella nigra* Col. Very few plants seen. 4, 6, 7, 13.

- Dichelachne crinita* Hook. f. Plume grass. Occasional on ungrazed grassy slopes. 1, 4, 6, 7, 9, 11, 13-15, 19-21, 24, 25, 28.
- Dichelachne sciurea* (R. Br.) Hook. f. Recorded for Motuoruhi by Newhook *et al.* (1971), but possibly more widespread than this.
- Earina mucronata* Lindl. A few plants on rocks on Moturua. Recorded for Motuoruhi and Motukaramarama by Newhook *et al.* (1971).
- Echinopogon ovatus* (Forst. f.) Beauv. Hedgehog grass. In scrubland on Motutapere and recorded for Motuoruhi by Newhook *et al.* (1971).
- **Festuca arundinacea* Schreb. Tall fescue. A few plants in moist places near the shore on Waimate I., Motutapere, and Motuoruhi.
- **Festuca rubra* L. In pasture on Motukopake but possibly in pastures on other islands also.
- Gahnia lacera* (A. Rich.) Steud. Plentiful with woody vegetation on Waimate I. and Motuoruhi, occasional elsewhere. 4, 6, 7, 9, 12, 13, 17, 19, 20.
- **Gladiolus* sp. A single non-flowering plant on 2.
- **Holcus lanatus* L. Yorkshire fog. Mostly in moist open places, plentiful in some southern islands. 1-4, 6, 13, 17, 26, 27.
- **Hordeum murinum* L. Barley grass. A pasture weed of some significance on Rangipukea.
- **Iris orientalis* Mill. Persists on the site of a former garden on Waimate I. where it forms dense clumps, but may not have spread far from where it was planted.
- Juncus australis* Hook. f. Plentiful in pasture on Motukopake, less prevalent on Rangipukea and Waimate I.
- **Juncus bufonius* L. Occasional in open dry habitats. 4, 8, 23, 26.
- **Juncus effusus* L. A few plants on Moturua.
- Juncus gregiflorus* Johnson On Waimate I. in a few places.
- **Juncus microcephalus* H.B.K. Established in a creek on Waimate I.
- Lepidosperma laterale* R. Br. A few plants on poor soils on Waimate I., Motutapere, Motukarikitahi, and Motuoruhi.
- Leptocarpus similis* Edgar Small clumps in seepages on the shores of Waimate I. and Motukopake.
- **Leucojum aestivum* L. Snowflake. A garden relic on Waimate I.
- **Lolium perenne* L. Perennial ryegrass. Plentiful in pastures, particularly on Rangipukea. 2-4, 7.
- **Lolium temulentum* L. Darnel. A single plant on a foreshore on Motuoruhi.
- Microlaena polynoda* Hook. f. A few patches in scrubland. 2, 3, 14, 23.
- Microlaena stipoides* (Lab.) R. Br. A major part of inferior pasture on Motukopake, less common elsewhere. In some places it tolerates fairly intense shade under trees and shrubs. 1-4, 6, 7, 9, 15, 17, 19, 21, 27.
- Microtis unifolia* (Forst. f.) Reichb. f. Small colonies in a few grassy places. 12, 14, 19, 23, 25.
- Morelotia affinis* (Brong.) Blake Uncommon in very poor soils on Motutapere, Motuoruhi, and Motuwi.
- **Narcissus* sp. A garden relic on Waimate I.
- Notodanthonia clavata* Zotov In small numbers in grassy places. 4, 6, 7, 14.
- Notodanthonia gracilis* (Hook.f.) Zo:ov In scrubland on Motutapere and Motukarikitahi. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Notodanthonia penicillata* (Lab.) Zo:ov Recorded for Motuoruhi by Newhook *et al.* (1971). Likely to be more widespread than indicated here.
- Notodanthonia purpurascens* (J. Vickery) Zo:ov Common in grassy places but outnumbered by *N. racemosa*. 3, 4, 6, 7, 9, 10, 13-15, 17, 19-21, 23, 24, 26, 27.
- Notodanthonia racemosa* (R. Br.) Zo:ov Plentiful in dry exposed grassy places, sometimes to the exclusion of all other grasses. Is the main grass on 2, occupying the face of the Maori terraces whereas narrow-leaved plantain dominates on the level parts covered with midden shells. One of the few grasses to withstand constant grazing by rabbits. 1, 2, 9, 12, 13, 17, 20, 21, 24.
- Oplismenus imbecillus* Beauv. Common under the canopy of woody plants, most frequent in scrubland. 2-4, 6, 9, 10, 12-15, 17, 19, 20, 25.
- **Parapholis incurva* (L.) C. E. Hubbard Within the reach of sea spray on many islands. It seems that *P. strigosa* is fairly common also, but could not be positively identified in the non-flowering state. 1-4, 11-13, 16, 18, 20-22, 26.
- **Paspalum dilatatum* Poir. Plentiful as a pasture species on Motukopake, but fairly insignificant elsewhere. 1-4, 6, 7, 13, 17.
- Paspalum scrobiculatum* L. Uncommon. 2, 6.
- **Pennisetum clandestinum* Hochst. Kikuyu grass. Established in a seepage on the shore of Waimate I. where it dominates several hundred square metres. Recorded for Motuoruhi by Newhook *et al.* (1971), but I failed to find it there.
- **Phalaris minor* Retz. A few plants on Motutapere.
- Phormium tenax* J.R. et G. Forst. New Zealand flax. A conspicuous part of the vegetation on many islands, particularly where there has been burning. On fertile soil flax soon gives way to broadleaved shrubs. 1-7, 9, 11-21, 24, 25.
- Poa anceps* Forst. f. A regular feature of ungrazed grassy coastal slopes and clearings in

- shrubland and scrubland. On grazed islands it is confined to less accessible places on rocks. 1-4, 6, 7, 9, 11-17, 19, 20, 24, 25.
- **Poa annua* L. Mostly on islands where there is some grassland. Restricted by lack of suitable open moist habitats. 1, 3-5, 7, 8, 10.
- **Poa pratensis* L. Occasional in some grassy places. 19, 26, 27.
- **Poa trivialis* L. Recorded for Motukahaua by Newhook *et al.* (1971). Probably overlooked in moist pastures.
- Pterostylis banksii* A. Cunn. in Hook. In scrubland and shrubland in a few places. 6, 13, 25.
- Pterostylis trullifolia* Hook. f. In scrubland in a few places. 6, 13, 16, 17, 25.
- Rhopalostylis sapida* Wendl. et Drude Nikau. Adult and seedling palms on Motutapere, but seedlings only seen on Motuoruhi.
- Ripogonum scandens* J.R. et G. Forst. Supplejack. Nowhere as abundant as in the west valley on Motuoruhi where it forms dense tangles. On Waimate I. dead stems only were seen. 4, 6, 13.
- Schoenus tendo* (Hook. f.) Hook. f. Occasional plants in scrubland on Motuoruhi.
- Scirpus cernuus* Vahl Few colonies on wet shores. 3, 4, 6, 7, 17.
- Scirpus chlorostachyus* Levyns On wet slopes on Rangipukea. There are very few habitats for this plant in the region.
- Scirpus nodosus* Rottb. On shores and coastal slopes, abundant on some islands. 1-7, 9, 11-24, 26, 27.
- Scirpus* sp. Plants of the *S. fluviatilis* group grow in seepages on the shores of Rangipukea and Waimate I.
- **Sporobolus africanus* (Poir.) Robyns & Toïrn. Ratstail. In all open places where perennial grasses can thrive and occasionally with annual grasses on thin soils. 1-7, 9-13, 15, 17, 19, 20, 26, 27.
- **Stenotaphrum secundatum* (Walt.) Kuntze Buffalo grass. Established in pasture on Waimate I. and Motutapere.
- Stipa teretifolia* Steud. Occasional plants on rocky shores within reach of salt spray. On Motumoirau it grows beneath shrubs 10 m above the high-tide mark. 2, 6, 7, 11, 24.
- Thelymitra longifolia* J.R. et G. Forst. The commonest orchid in the region. Grows in open places. Most plants have wide leaves, particularly those near the shore. 4-7, 9, 11-13, 15, 18-21.
- Triglochin striatum* Ruiz et Pav. A few plants on the shore of Waimate I.
- Trisetum antarcticum* Trin. Few plants on rocks near the shore. 9, 13, 19, 21, 23, 24.
- Uncinia banksii* Boott in Hook. f. Few plants in scrubland on Motutapere.
- Uncinia uncinata* (Linn. f.) Kirk In forest and shrubland on Waimate I., Motutapere, Morioruhi, and Moturua.
- **Vulpia bromoides* (L.) S. F. Gray Vulpia hair grass. Common in dry soil over rock. 9, 11, 13, 17, 19, 21, 23-25.
- **Vulpia myuros* (L.) Gmel. More plentiful and widespread than *V. bromoides*. 4, 5, 7, 9, 10, 13-15, 18, 21, 23.
- **Zantedeschia aethiopica* (L.) Spreng. Arum. Established as a weed on Waimate I.
- Zoysia* sp. Occasional patches on the shore line. 1, 6, 7, 24.

Ferns and fern allies

- Adiantum cunninghamii* Hook. Scattered plants in forest and among rocks in open places. 3, 6, 7, 9, 13, 21.
- Adiantum fulvum* Raoul A few colonies in scrubland on Motutapere.
- Adiantum hispidulum* Swartz In many places among rocks and in exposed places. 1-3, 6, 7, 9, 13, 14, 19, 20, 26, 27.
- Anarthropteris lanceolata* (J. Smith) L. B. Moore In tall scrubland on the summit of Motutapere.
- Arthropteris tenella* (Forst. f.) Smith A few plants in forest. 4, 6, 15.
- Asplenium bulbiferum* Forst. f. A few plants in forest on Waimate I., Motuoruhi, and Motukaramarama.
- Asplenium falcatum* Lam. Recorded for Motuoruhi and Moturua by Newhook *et al.* (1971).
- Asplenium flabellifolium* Cav. Occasional plants on Motukakarikitahi and Motukaramarama.
- Asplenium flaccidum* Forst. f. A few plants on trees and rocks, mainly in forest. 2, 4, 9, 13, 17, 19, 21, 22, 24, 25.
- Asplenium flaccidum* (fine-leaved form). A common inhabitant of rocks near the shore, but grows also in fairly deep shade, sometimes as an epiphyte. Under fertile conditions where seabirds nest the frond reaches 60 cm and a stout caudex 30 cm long develops. 1, 4-6, 8-19, 21, 23, 26-28.
- Asplenium hookerianum* Col. Recorded for Motuoruhi by Newhook *et al.* (1971).
- Asplenium lamprophyllum* Carse Plentiful in forest on Motutapere.
- Asplenium lucidum* Forst. f. Widespread and plentiful on many islands even in the presence of rabbits. 2-7, 9, 11-13, 15, 17, 19-21, 23-25, 27.
- Blechnum capense* (L.) Schlecht. Occasional plants in damp places. 4, 7, 13, 24.
- Blechnum filiforme* (A. Cunn.) Ettingshausen On the ground and ascending trees on Waimate I., Motutapere, and Motuoruhi.

- Blechnum lanceolatum* (R. Br.) Sturm Recorded for Motuoruhi by Newhook *et al.* (1971).
- Cheilanthes distans* (R. Br.) Mett. Occasional on rocks in the open. 1, 2, 7, 9, 12, 14, 19, 20, 25.
- Cheilanthes sieberi* Kunze Widespread, often with *C. distans*. 4-7, 9, 11, 13-15, 17, 19, 21, 23, 24.
- Ctenitis decomposita* (R. Br.) Cop. Occasional plants in forest on Motuoruhi and Motukakarikitahi. A plant on Motutapere thought to be *C. glabella* (A. Cunn.) Cop. may have been *C. decomposita* which also has a fairly tufted growth form in this region.
- Ctenitis velutina* (A. Rich.) Cop. Occasional plants in forest on Motukaramarama.
- Cyathea dealbata* (Forst. f.) Swartz Silver tree fern. Plentiful on Motuoruhi, occasional on Motutapere and Motuwi.
- Cyathea medullaris* (Forst. f.) Swartz Mamaku. A few plants in forest on Waimate I., Motutapere, and Motuoruhi.
- Doodia media* R. Br. Prolific under *Leptospermum*, less abundant in open places. 1-4, 6, 7, 9, 12-14, 17, 19-21, 24, 25.
- Hymenophyllum sanguinolentum* (Forst. f.) Swartz A few plants on trees on Motutapere and Motuoruhi.
- Hypolepis tenuifolia* (Forst. f.) Bernh. A few small colonies on Waimate I., Motuoruhi, and Motuwi.
- Lindsaea linearis* Swartz Recorded for Motuoruhi by Newhook *et al.* (1971).
- Lycopodium billardieri* Spring Epiphytic on Motutapere and Moturua.
- Lygodium articulatum* A. Rich. In forest on Motuoruhi.
- Paesia scaberula* (A. Rich.) Kuhn A few colonies on Motukopake.
- Pellaea rotundifolia* (Forst. f.) Hook. A few scattered plants. 2, 4, 6, 7, 9, 12, 14, 15, 19, 20, 23, 25.
- Phymatodes diversifolium* (Willd.) Pic. Ser. In a wide range of habitats from exposed rocks on the coast to forest. 2, 4-7, 9, 10, 12-17, 19-21, 23-25.
- Phymatodes scandens* (Forst. f.) Presl. In forest on Waimate I. and Motuoruhi. It is much more sensitive to exposure than the hardy *P. diversifolium*.
- Polystichum richardii* (Hook.) J. Smith Occasional on shaded coastal slopes; plentiful on Motuoruhi. 2-4, 6, 7, 9, 13, 17, 21, 24.
- Psilotum nudum* (L.) Beauv. A small colony among rocks on the northern end of Moturua.
- Pteridium aquilinum* (L.) Kuhn Bracken fern. In small amounts except where fairly recent burning has favoured its spread. 1-7, 9-13, 17, 20, 21, 24, 25.
- Pteris comans* Forst. f. Many plants in forest on Motuoruhi.
- Pteris tremula* R. Br. Widespread but in small numbers. 2-4, 9, 12, 13, 17, 19, 21, 24.
- Pyrrhosia serpens* (Forst. f.) Ching A hardy plant in habitats ranging from rocks near the coast to branches of forest trees, but not a conspicuous part of the vegetation. 1-4, 6, 7, 9, 11, 13, 15, 17, 19-21, 27.
- Tmesipteris tannensis* Bernh. Occasional plants on Motuoruhi.
- Trichomanes reniforme* Forst. f. Kidney fern. In small quantities on Motuwi.

ACKNOWLEDGMENTS

I am grateful for critical comments by Dr E. J. Godley, Dr I. A. E. Atkinson, and Mrs Elizabeth M. Miller (née Dickson).

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