

## STUDIES ON THE VEGETATION OF CUVIER ISLAND

### I. THE PLANT COMMUNITIES AND A VASCULAR PLANT SPECIES LIST

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#### SUMMARY

The main terrestrial plant communities of Cuvier Island are described briefly and a vascular plant species list is presented.

#### INTRODUCTION

This paper is the first of a series based on data collected during a Field Club trip to Cuvier Island 24 August to 1 September 1968. As a background to a description of the terrestrial vegetation the main features and history of the island are briefly described.

Cuvier Island (Repanga) is a small island of 446 acres lying 25 miles east of the tip of the Coromandel Peninsula, New Zealand and near the edge of the continental shelf. The island, which rises to a height of 755 ft, is characterised by a very rugged coastline with steep eroding cliffs especially on the northern and eastern coasts. There are a number of small streams, the largest of which runs out through a broad valley to the northwest. Aspects of the geology of the island are described by Black (1967). Johnstone (1969) describes aspects of the marine algal ecology. Fig.1 shows the major landmarks.

#### HUMAN OCCUPATION

It is clear that the island was well known to the Maori and, indeed, it features in Maori legend (Takaanui, 1909). Artefacts from the island indicate that it was occupied in the 15th or 16th century and pa site records suggest Maori occupation during the 18th century (D.R. Simmons, pers. comm.).

The island was apparently bought from the Maori owners in the 1880's and, except for a small area (66 acres) acquired by the Marine Department for a lighthouse installation, remained in private hands until 1957 when it was acquired by the Crown and declared a reserve for the preservation of flora and fauna. This section of the island is now administered as a reserve in the Hauraki

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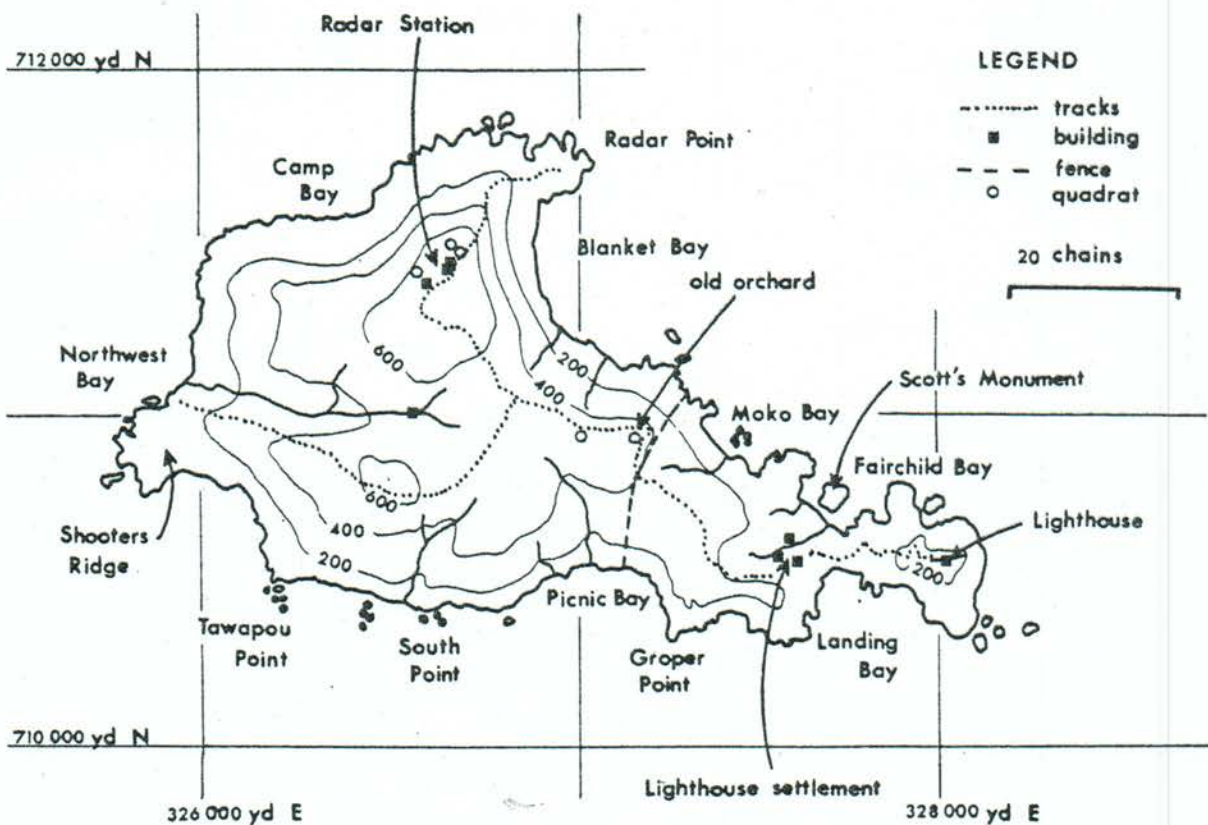


FIG. 1 Sketch map of Cuvier Island:

The marked fence indicates the boundary between the flora and faunal reserve and the lighthouse farm. The marked quadrats show the approximate positions of the permanent quadrats established by Parris (1969). (Based on maps of Black (1967), N.Z.M.S. 1. N35 and N36 (Dept. Lands Survey, New Zealand) and various sketch maps seen by the authors.)

Maritime Park. The lighthouse was built in 1888-9. During World War II a radar station was erected on the highest point of the island and a road bulldozed to it from the lighthouse settlement. A number of small clearings occur scattered throughout the forest. These may have been cleared during this period. The radar station is now derelict but the bulldozed road although partly overgrown is still well defined.

There is little evidence of any tree felling having taken place in the reserve except that which occurred in connection with the building of the radar station. A single stump of *Vitex lucens*, clearly cut many years ago, was seen on this visit. In January 1968 a fire occurred around the abandoned orchard at the northeastern corner of the reserve, destroying about 30 acres of vegetation (Merton, 1968).

#### INTRODUCED MAMMALS

Feral goats were probably released on the island between 1850 and 1900 (Atkinson, 1960). Considerable numbers built up despite occasional shooting by the lighthouse keepers. They were finally eradicated in the period from 1959 to 1961 when a total of about 500 goats was shot.

Although there was a stockproof boundary fence between the reserve and the lighthouse farm in the early part of this century, this fell into disrepair and for a considerable period cattle and sheep from the lighthouse farm were able to enter the reserve. In June 1963 a new stockproof fence was erected. Thus from 1963 the reserve has been free from herbivorous mammals.

Feral cats were once present on the island but have now probably been exterminated (Blackburn, 1967). The kiore (*Rattus exulans*) is found in considerable numbers on the island and may be having a significant effect on the vegetation (Merton 1961, 1964).

#### THE PLANT COMMUNITIES

The vegetation of the island has been described briefly by Atkinson (1960) and Blackburn (1967). The present discussion concerns mainly the reserve part of the island. The vegetation of this part of the island can be divided into three main communities:

##### 1. Forest

Forest, occupying about 220 acres, extends from approximately sea level at Northwest Bay to about 750 feet above sea level near the derelict radar station. It appears to be relatively uniform over most of the island with an open canopy of *Pseudotsuga* (*Metrosideros excelsa*) above a dense subcanopy dominated by *Dysoxylum spectabile*. Subsidiary members of the subcanopy include



*Corynocarpus laevigatus*, *Melicynus ramiflorus*, *Nestegis apetala* and *Vitex lucens*.

This pattern appears to be interrupted in only a few places. For example in some tracts up to a few acres in extent in the Northwest Bay valley system pohutukawa is absent. In other areas, for example on the northeastern coast above Blanket Bay, *Pseudopanax lessonii* forms the most important subcanopy tree. A few groves, almost exclusively composed of *Rhopalostylis sapida*, are present on the southern slopes of the island.

The well known inability of pohutukawa to regenerate under a forest canopy has led a number of writers to attribute its dominance in some coastal forest of the small islands off northern New Zealand to previous clearing of the vegetation. In some cases this may be a result of fire possibly associated with Maori activity as has been suggested for Mayor Island (Atkinson and Percy, 1956). In other cases volcanic activity may have played a role; for example on Rangitoto (Millener, 1953) and White Island (Hamilton, 1959). A sample of 50 pohutukawa trees measured along the Northwest Bay track had a mean diameter at 4 ft above ground level of 19.42 inches\*. No ring counts were made but by comparison with trees on White Island (one tree 10 inches diameter and 70 years old (Hamilton, 1959)), Mayor Island (outer slope trees 12-24 inches diameter and about 150 years old (Atkinson and Percy, 1956)) and Rangitoto Island (where the oldest trees are well under 200 years old (Millener, 1953)), most of these trees are probably between 100 and 200 years old. They may well have become established following clearing associated with Maori occupation of the island in the 18th century. The occasional large specimens may represent remnants of older populations. Pohutukawa is also found in the cliff and seaward slope communities as described later.

The effects of the damage to the forest caused by the presence of herbivorous mammals was clear at the time of the visit. Over much of the island dense stands of various shrubs and young trees that had become clearly established after animal removal, were seen. Many trees, such as *Melicynus ramiflorus*, showed obvious regrowth from regions of the trunk below the grazing level. Regeneration is further discussed in Blackburn (1967), Beaver and Beaver (1969) and Parris (1969). Permanent quadrats 3 and 4 established by Parris are in this community.

Two small patches of *Leptospermum scoparium* "scrub" were seen on the island on areas probably cleared of vegetation between 1939 and 1945.

## 2. Cliff and seaward slope communities

The cliff and seaward slope communities have been extensively modified by grazing mammals. Large areas on the northern and northeastern seaward

\*mean plus or minus standard error.

slopes are now dominated by introduced grasses and clovers with occasional pohutukawa trees. This has not always been the case, however. T.F. Cheeseman, who visited the island in October 1896, described the vegetation on the slopes below the highest peak as follows (Cheeseman, 1896)\*:-

"A little higher up the steep slopes were covered with a dense intertangled and matted shrubby vegetation composed of pohutukawa, *Sapota costata* (now *Planchonella novo-zelandica*), *Coprosmabaueriana* (now *C. repens*), *Hymenathera latifolia* (now *H. novae-zelandiae*), flax — the whole often not much more than 3 or 4 feet high but.....stiff rigid and interlaced that progress through it was difficult if not impossible, and one had to walk on top".

Presumably such coastal scrub was found over most of the seaward slopes on the island as it is on many less modified northern islands. Except for a few small patches, however, such scrub is now absent from the island although it is found on Scott's Monument, a rock stack in Fairchild Bay. It is virtually certain that grazing and trampling by goats destroyed this coastal scrub and led to its replacement by a grass and clover sward. This change resembles the induced dominance of *Microlaena avenacea* in areas of the Coromandel Peninsula (Moore and Cranwell, 1934). Especially on the northern coast removal of the scrub cover has contributed to extensive coastal slipping. A count of 50 pohutukawa trees on the ridge leading to Radar Point had a mean diameter at 4 feet above ground level of 11.1 inches. Although in a more exposed position, and hence possibly growing less rapidly than the trees in the forest, the size of these pohutukawa indicates a probable age of 70-100 years which agrees with the supposition that they are members of the original scrub community described by Cheeseman in 1896. Pohutukawa probably became established here after fire, as is suggested for the trees in the forest, and after coastal slips.

Regeneration of both pohutukawa and other potential members of coastal scrub does not appear to be progressing as rapidly as might be expected now that goats are absent, possibly because of the dense grass cover.

In other areas of the coast patches of *Cassinia retorta* and *Juncus effusus* occur. Both these species are probably resistant to goat grazing. On exposed clay regions *Displyma australe*, *Tetragonia tetragonioides* and *Pimelea prostrata* are important. On rocky outcrops above the sea *Asplenium flaccidum*, *Chelanthus distans*, *Peperomia wrightianum* and *Apium prostratum* are to be found.

## 3. Grass-bracken communities

In this category are placed those communities found on the old bulldozed road, the area around the Radar Station, some of the Northwest Bay and

\*Current scientific names given in brackets where applicable.



Shooters' Ridge areas and the isolated clearings in the forest. This community is dominated by bracken and exotic grasses. *Clematis paniculata* and *Sicyos angulata* were found scrambling over the grass and bracken. Whatever the cause of initial clearing of these areas the presence of grazing mammals probably helped maintain this community in this condition. In the five or so years since animal removal the coastal forest does not appear to have encroached rapidly on many of these sites possibly because of the dense grass and bracken cover. Permanent quadrats 1 and 2 established by Parris (1969) are in this community.

The community of the "burn" area mentioned earlier may be included under this heading. Here many exotic weed species have established themselves. Parris (1969) set up a permanent quadrat on this area (quadrat 5).

#### THE PLANT SPECIES

Cheeseman (1896) recorded a total of 123 species, all then grouped as indigenous. He did not record adventive plants. The present list totals 125 indigenous species and 40 adventive species (Appendix I). In addition 14 indigenous species recently recorded from the island by other authors but not recorded on the present visit are given in Appendix II. Of the 35 species listed by Cheeseman in 1896 but not recently recorded (Appendix III) 12 are grass and sedge species which were not extensively collected on the 1968 visit. Some of the 35, however, are now probably not present on the island but further work will be needed to establish firmly if many species have been lost.

#### DISCUSSION

The removal of grazing animals from the reserve portion of Cuvier Island is to be commended. Prior to their removal the undergrowth in the forest was largely destroyed and coastal scrub completely removed contributing to extensive coastal slipping. Regeneration following animal removal has been rapid in the forest.

A number of rare coastal species such as *Planchonella novo-zealandica*, *Heimeriodendron brunonianum*, *Nestegis apetala* and *Sicyos angulata* are found on the island, the first three being plentiful. In addition, areas of coastal forest in which *Metrosideros excelsa* and *Dysoxylum spectabile* are dominant are of restricted occurrence on the New Zealand mainland, and both are susceptible to opossum attack. These features amply justify retention of Cuvier as a flora and fauna reserve.

#### APPENDIX I

List of vascular plants recorded on the reserve portion of Cuvier Island, August 1968

Unless an authority is given nomenclature follows: Allan (1961)—gymnosperms, dicotyledons, psilopsids and lycopods; Crookes (1963) — ferns; Cheeseman (1925) — monocotyledons except asteliads; Moore (1966) — asteliads; Allan (1940) — adventives.

Where knowledge of distribution and numbers warrants it the species have been assessed as follows:

r : rare 1 Forest.  
o : occasional 2 Cliff and seaward slope communities.  
co : common 3 Grass-bracken communities.  
a : abundant

Species marked "C" were recorded by Cheeseman (1896). Specimens of all species except those marked \* are lodged in the herbarium of the Auckland Institute and Museum.

#### A. Indigenous

##### 1. *Psilopsids and lycopods*

*Lycopodium billardieri* r, 1  
*Psilotum nudum* r, 1  
*Tmesipteris tannensis* r, 1

##### 2. *Ferns*

*C. Adiantum cunningghamii* co, 1  
*A. hispidulum*  
*Anarthropteris lanceolata*  
*Arthropteris tenella*  
*C. Asplenium bulbiferum*  
*C. A. falcatum*  
*C. A. flaccidum* o, 2  
*A. lucidum* co, 1  
*Blechnum capense*  
*C. B. filiforme* a, 1  
*B. lanuginatum* co, 1

- C *Cheilanthes distans*  
 C *Cyathia dealbata*  
 C *C. medullaris*  
   *Cyclosorus penniger*  
   *Dicksonia squarrosa*  
 C *Doodia media*  
 C *Hypolepis tenuifolia*  
   *Lastreopsis microsofa*  
   *Mecodium dilatatum*  
   *M. flexuosum*  
   *M. sanguinolentum*  
   *Paesia scaberula*  
   *Pellaea falcata*  
   *Phymatodes diversifolium* (Willd.)  
     Pic. Ser.  
     *P. scandens* (Forst.f.) Presl.  
   *Polystichum richardii*  
   *Pteridium esculentum*  
   *Pteris comans*  
     *P. tremula*  
   *Pyrtrosia serpens*
3. *Gymnosperms*  
   *Podocarpus ferrugineus*
4. *Monocotyledons*  
   C *Acianthus fornicatus* R.Br. var. *sinclairii* (Hook.f.) Hatch  
   C *Astelia banksii*  
     *A. solandri*  
     *A. trinervia*  
   *Bulbophyllum pygmaeum*  
     *Carex* spp.  
   C *Collospermum hastatum*  
   C *Cortaderia fulvida* (Buchanan) Zotov?  
     *Dianella intermedia*  
     *Gahnia gahniaeformis*  
   C *G. lacera*  
   C *Mariscus ustulatus*
- 1, 1 (only one tree seen)  
 0, 2  
 0, 2  
 0, 1  
 a, 2  
 0, 1, 3  
 1, 1 (epiphytic on *Knightia excelsa*)  
 a, 1  
 0, 3  
 a

- C *Opismenus undulatifolius*  
 C *Phoridium tenax*  
 C *Pterostylis banksii*  
   *P. alobula* (Hatch) L.B.Moore  
   *Rhipogonum scandens*  
 C *Rhopalostylis sapida*  
 C *Scirpus nodosus*  
 C *Thelymitra* sp.  
 C *Uncinia australis*
5. *Dicotyledons*  
   *Acaena novae-zelandiae*  
   C *Apium australe*  
   *Beilschmiedia tawa*  
   C *Brachyglottis repanda*  
   C *Calyptegia sepium*  
   C *C. soldanella*  
   C *(Carnichaelia) aligera*  
   C *(C. cunninghamii)*  
   C *Cassinia retorta*  
   C *Centella uniflora*  
   C *Clematis paniculata*  
   C *. parviflora?*  
   *Coprosma macrocarpa*  
   C *C. repens*  
   C *. rhannoides*  
   C *C. robusta*  
   C *. robusta* x *C. propinqua*  
   C *Corynocarpus laevigatus*  
   *Cyathodes fraseri*  
   C *Dichondra repens*  
   C *Disphyma australe*  
   C *Dysoxylum spectabile*  
   *Elaeocarpus dentatus*  
   C *Entelea arborescens*  
   C *Epiobium nummularifolium*  
   *Erechtites scaberula*  
   C *Ged. koma ligustrifolium*  
   C *Gnaphalium collinum*
- a, 1  
 co, 2  
 0, 1  
 0, 1  
 1, 1  
 co, 1  
 co, 2  
 co, 3  
 a, 1, 3  
 0, 2  
 0, 1  
 a, 1  
 0, 2  
 co, 1, 3  
 co, 1  
 1, 2  
 co, 1  
 co, 1  
 0, 1  
 0, 1  
 1, 1, 3  
 a, 1



- C G. luteo-album  
 C Haloragis erecta  
 C Hebe stricta var. stricta  
 Hedyera arborea  
 C Heimeriodendron brunonianum  
 C Hymenanthera novae-zelandiae  
 Knightia excelsa  
 C Leptospermum scoparium  
 C Linum monogynum  
 C Lobelia anceps  
 C Macropiper excelsum  
 C Melicope ternata  
 C Melicytus ramiflorus  
 C Metrosideros excelsa  
 C Muehlenbeckia complexa  
 C Myoporum laetum  
 Myrsine australis  
 C Neopanax arboreum  
 C Nestegis apetala (Vahl) L. Johnson  
 Olearia furfuracea  
 C Oxalis corniculata  
 C Parietaria debilis  
 C Parsonsia heterophylla  
 C Pelargonium inodorum  
 C Peperomia urvilleana  
 C Pimelea prostrata  
 C Pitosporum crassifolium  
 C P. tenuifolium  
 Planchonella novo-zelandica  
 Pseudopanax crassifolium  
 C P. lessonii  
 C Ranunculus hirtus  
 C Rhabdanthus solandri  
 C Salicornia australis  
 C Samolus repens  
 C Senecio lautus  
 C Sicyos angulata  
 C Spergularia marginata

0, 1, 2  
 0, 1  
 0, 1  
 r, 2  
 co, 1  
 r, 1  
 r, 2  
 a, 1  
 0, 1  
 0, 1  
 a, 1  
 a, 1; co, 2  
 0, 2  
 co, 1  
 co, 1  
 r, 1  
 0, 2  
 co, 1  
 r, 3 (on burn)  
 r, 2  
 0, 2  
 0, 1  
 0, 1  
 0, 1, 2  
 0, 1  
 a, 1  
 0, 1, 3  
 co, 1  
 0, 2

- Tetragonia tetragonoides  
 C Tillaea sieberiana  
 C Vitex lucens

B. Adventive

1. *Monocotyledons*

- Dactyloctenium aegyptium  
 C Juncus effusus  
 \* Narcissus sp. (near old orchard)  
 Sporobolus capensis  
 Zantedeschia aethiopica

a, 2, 3  
 co, 2  
 a, 2, 3  
 r, 3 (near old orchard)

2. *Dicotyledons*

- Albizzia lophantha  
 Anagallis arvensis  
 C Bidens pilosus  
 Brassica campestris  
 Cerastium glomeratum  
 Cotula australis  
 \* Cirsium lanceolatum  
 Erigeron canadensis  
 Erodium moschatum  
 Euphorbia peplis  
 Funaria muralis  
 Galium mollugo  
 Geranium molle  
 Gnaphalium purpureum  
 Hypochaeris radicata  
 Lepidium ruderale  
 Lotus corniculatus  
 Malva silvestris  
 Medicago lupulina  
 Orobanche minor  
 Phytolacca octandra  
 Plantago lanceolata  
 P. ma  
 Prunella vulgaris

r, 3 (on burn)

r, 2

0, 2

r, 3

r, 3  
 r, 2

\* *Pyrus malus* L. (a few trees in old orchard)

*Rumex brownii* Campd.

C *Solanum nigrum*

*S. sodomacum*

*Sonchus asper*

C *S. oleraceus*

*Stellaria media*

*Taraxacum officinale*

\* *Trifolium* sp.

*Tropaeolum majus*

*Vicia tetrasperma*

r, 3 (on burn)

## APPENDIX II

List of plants recently recorded from the island but not listed in present survey (Appendix I)

Nomenclature as for Appendix I. Species marked "C" were recorded by Cheeseman 1896.

A. Recorded by Atkinson (1960)

### 1. Ferns

C *Cheilanthes sieberi*

C *Pellaea rotundifolia*

### 2. *Monocotyledons*

*Danthonia racemosa* R.Br.

*Isolepis cernua*

C *Poa anceps*

### 3. *Dicotyledons*

C *Coriaria arborea*

*Hebe macrocarpa*

*Leptospermum ericoides*

*Metrosideros perforata*

*Nestegis cunninghamii* (Hooker f.) L. Johnson

*Rhagodia triandra*

C *Tetragonia trigyna*

B. Recorded by Blackburn (1967)

### 1. *Dicotyledons*

*Litsea calicaris*

*Sophora tetralpera*

## APPENDIX III

List of plants recorded by Cheeseman in 1896 but not in 1968 collection or recent records

Names as given by Cheeseman (1896).

### 1. Ferns

*Asplenium obtusatum*

*Lomaria membranacea*

*Polypodium billardieri*

### 2. *Monocotyledons*

*Arthropodium cirrhatum*

*Bromus arenarius*

*Carex breviculmis*

C. *lucida*

C. *vacillans*

*Danthonia semiannullaris*

*Deyeuxia billardieri*

D. *forsteri*

*Dichelachne crinita*

*Echinopogon ovatus*

*Microlaena stipoides*

*Microtis porrifolia*

*Scirpus riparius*

*Trisetum antarcticum*

*Triticum multiflorum*

3. *Dicotyledons*

*Alternanthera sessilis*  
*Cardamine hirsuta*  
*Coprosma grandifolia*  
*C. lucida*  
*Daucus brachiatus*  
*Epilobium junceum*  
*Erechtites arguta*  
*E. quadridentata*  
*Euphorbia glauca*  
*Geranium dissectum*  
*Gnaphalium involucreatum*  
*Hydrocotyle moschata*  
*Lagenophora forsteri*  
*Lepidium oleraceum*  
*Muehlenbeckia australis*  
*Solanum aviculare*  
*Wahlenbergia gracilis*

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