Vegetation and flora of North Cove, Sandy Bay and Vivian Bay, Kawau Island

Mike Wilcox, Maureen Young, Jessica Beever and Rick Kooperberg

Introduction

John Buchanan, FLS, gave the first account of plant life on Kawau Island (Buchanan 1876). At that time Kawau Island was owned by Sir George Grey who had by then already introduced many exotic plants and animals and had cleared some bush and established pastures for sheep grazing. Buchanan recorded the presence of tea tree scrub as the after-growth of fire, and extensive patches of bush, and particularly mentioned the abundance of pohutukawa (*Metrosideros excelsa*), taraire (*Beilschmiedia tarairi*), puriri (*Vitex lucens*), tawapou (*Pouteria costata*), and rewarewa (*Knightia excelsa*).

The area of the island is 2058 ha and lies 8.4 km from Sandspit and 1.5 km from the Tawharanui Peninsula (Figure 1). It is in Rodney District and is mostly privately owned. The two highest points are Grey Heights (182 m) in the south and Mt Taylor (164 m) in the north between Bon Accord Harbour and North Cove.

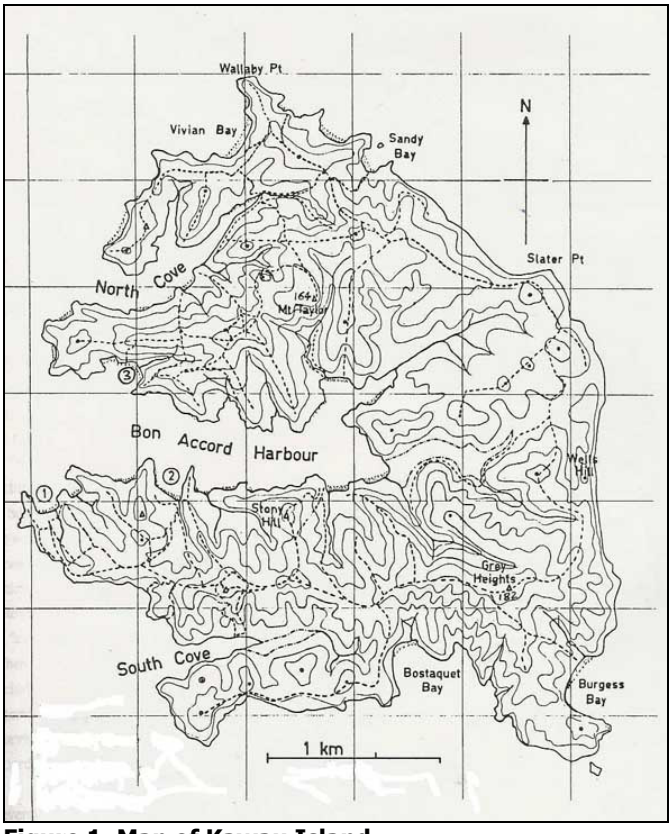

Figure 1. Map of Kawau Island.

Geologically most of the island is composed of very hard, somewhat metamorphosed greywackes, argillites and interbedded volcanics of the Waipapa Group (Late Jurassic) similar to those of nearby Cape Rodney and Takatu Point, and also the Hunua Ranges, most of Motutapu Island, and Waiheke Island (Edbrooke 2001). This rock weathers to give soft, white to yellowish-brown clay soils. At the north end of Sandy Bay and at a few other sites on the southern end and eastern side of the island are sandstone cliffs of the Waitemata Group (Figure 2). The oldest, lowermost of the Waitemata rocks are basal greywacke conglomerates and breccia, with interbedded pebbly sandstone and grit, constituting the Cape Rodney Formation of Early Miocene age (20 million years). Above this is the Pakiri Formation of thick-bedded volcanic-rich sandstone and siltstone.

Figure 2. Waitemata Sandstone cliffs at the northern end of Sandy Bay, 18/10/03 (MDW).

Wallabies

Wallabies need to be highlighted because of their profound influence on the vegetation (Taylor 1990; Esler 1993; Shaw & Pierce 2002). There are four species of wallaby on Kawau Island – all introduced by Sir George Grey- and they have been much studied there (Wodzicki & Flux 1967; Kinloch 1973; Vujcich M.V. 1979; Vujcich V.C. 1979; Warburton 1986; Warburton & Sadleir 1990;).

Macropus eugenii (Desmarest)

Dama wallaby or dammar wallaby, "silver grey" wallaby (Kawau). This is a small grey-brown wallaby. In Australia it is restricted to SW Western Australia and southern South Australia, including Kangaroo Island. In New Zealand it occurs on Kawau Island and at Rotorua. During the day it generally stays in cover and feeds at night on grassy clearings and pasture. It is primarily a grazer. On Kawau grasses are the main diet, although kanuka leaves are also eaten. It is largely nocturnal and is the most numerous species on Kawau, especially the southern end.

Macropus parma Waterhouse

Parma wallaby, white-throated wallaby, "small brown" wallaby (Kawau). This is the smallest wallaby in New Zealand, and is uniformly light brown. In Australia it is

a rare species, found in the Great Dividing Range of NSW. In New Zealand it is found only on Kawau Island where it is plentiful at the northern end, frequenting kanuka during the day, and sometimes visiting gardens in Vivian Bay at night. It feeds mainly on grasses and herbs.

Petrogale penicillata penicillata Griffith
Brush-tailed rock wallaby, rock wallaby, black-tailed rock wallaby. In Australia it is common from Victoria to Queensland. This wallaby is found on Kawau Island, but has been eliminated from Rangitoto and Motutapu Islands where it was once common. Distinguished by bushy tail and rufous coloured rump. It frequents cliff faces and rocky ground. On Kawau it is found in the pine forests of Bon Accord Harbour, and on the eastern cliffs. It feeds by grazing on grass, but will also browse on pohutukawa leaves. This is an agile, gregarious animal and it can climb trees.

Wallabia bicolor (Desmarest)
Swamp wallaby, wallaroo, black wallaby. This is the biggest of the wallabies on Kawau Island. It has a dark-grey back and yellow-buff belly. In Australia it ranges from Queensland to Victoria. It frequents thick undergrowth, and on Kawau is found mainly in the northern end, though it is rather solitary and not so common. It is a browser rather than a grazer. They feed at all times of the day and night and prefer a habitat with a dense understorey.

Features of Kawau's flora and vegetation

Exotic trees
Sir George Grey introduced many unusual tree species to Kawau and these can be seen particularly at Mansion House Bay (Gardner 1993; Goffart-Hall 1997). Prominent there still are hoop pine (*Araucaria cunninghamii*), Cook pine (*Araucaria columnaris*), bunya (*Araucaria bidwillii*), Mexican weeping pine (*Pinus patula*), Canary Island pine (*Pinus canariensis*), radiata pine (*Pinus radiata*), maritime pine (*Pinus pinaster*), macrocarpa (*Cupressus macrocarpa*), swamp cypress (*Taxodium distichum*), Japanese cedar (*Cryptomeria japonica*), camphor laurel (*Cinnamomum camphora*), bay laurel (*Laurus nobilis*), holly (*Ilex aquifolium*), Norfolk Island hibiscus (*Lagunaria patersonia*), loquat (*Eriobotrya japonica*), brush cherry (*Syzygium australe*), blush bloodwood (*Baloghia inophylla),* Moreton Bay fig (*Ficus macrophylla*), blackwood (*Acacia melanoxylon*), flooded gum (*Eucalyptus grandis*), swamp mahogany (*Eucalyptus robusta*), Australian frangipani (*Hymenosporum flavum*), sycamore (*Acer pseudoplatanus*), English oak (*Quercus robur*), coast erythrina (*Erythrina caffra*), Australian cabbage palm (*Livistona australis*), phoenix palm (*Phoenix canariensis*), Chinese fan palm (*Trachycarpus fortunei*), Chilean wine palm (*Jubaea chilensis*), black bamboo (*Phyllostachys nigra*) and borak bamboo (*Bambusa balcooa*). Another of Grey's introductions, *Furcraea foetida*, has become thoroughly naturalised, and box (*Buxus sempervirens*) and tree privet (*Ligustrum lucidum*) are also commonly naturalised.

Grey's planting activities did not extend to northern Kawau. However, in Vivian Bay are several fine specimens of coral tree (*Erythrina* x*sykesii*), and two Norfolk Island pines (*Araucaria heterophylla*), and there are veteran *Pinus radiata* scattered about, and one prominent stand above Moana Cove. One property up the Starboard arm has a number of coast redwood (*Sequoia sempervirens*).

South African weeds
Several of the most widespread and prominent weeds on Kawau Island hail from South Africa – a probable legacy again of Grey who was at one time Governor of the Cape Province. Kawau residents refer to bone seed (*Chrysanthemoides monilifera*) as Kawau daisy. This yellow-flowered shrub is very abundant on the coastal cliffs and headlands all around Kawau and is a spectacular sight in August – early October when in flower (Figure 3). It tolerates infertile soils, drought, and salt spray, and produces large numbers of seeds that are spread by birds and possums, and can remain viable in the soil for ten years. Honey flower (*Melianthus major*) (Figure 4) and sweet pea shrub (*Polygala myrtifolia*) are commonly seen on coastal fringes (McSweeney 1997).

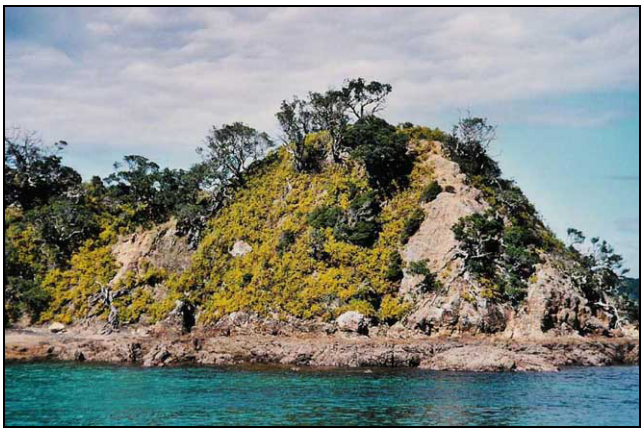

Figure 3. Boneseed or "Kawau daisy" clothing the greywacke cliffs, Little Vivian Bay, 7/10/03 (MDW).

Figure 4. Honey flower (*Melianthus major*), North Cove, 7/10/03 (MDW).

Agapanthus (*Agapanthus praecox*) occurs on cliffs and in clearings, stinking iris (*Iris foetidissima*) occupies the margins of clearings, and arum lily (*Zantedeschia aethiopica*) forms dense colonies in wetlands (Figure 5). Creeping sage or kruipsalie (*Salvia repens*) is an aromatic herbaceous species very common in the northern part of Kawau, spreading by both seed and rhizomes (Webb *et al.* 1994; Yeo 1995; Goldplatt & Manning 2000). It also occurs on the nearby Takatu Point.

Figure 5. Dense colony of arum lily (*Zantedeschia aethiopica*) in wetlands at the head of North Cove, 19/10/03 (MDW).

Kanuka forest

Forest of kanuka (*Kunzea ericoides*) dominates much of Kawau Island and is the most prominent feature of the vegetation. Much of it is even-aged over large areas and is probably mostly c. 60-70 years old, having regenerated since the abandonment of farming in the 1920s and 30s, though some protected enclaves approach 100 years of age. It is a monotonous monoculture on the ridges and drier slopes, with a canopy of kanuka trees 8-14 m tall (Figure 6), and also manuka (*Leptospermum scoparium*). Since kanuka is not palatable to wallabies it has grown unchecked. In the 1930s and 40s there was a thriving kanuka firewood cutting business. There is hardly a trace now of the formerly cleared land in North Cove and Vivian Bay.

There is no understorey to speak of in the kanuka forest except for occasional bushes of mingimingi (*Leucopogon fasciculatus* and *Leptocophylla juniperina*), akepiro (*Olearia furfuracea*), some mapou (*Myrsine australis*) and patches of silver fern (*Cyathea dealbata*). Rocky outcrops are commonly covered in the lichen *Canoparmelia texana*, whilst foliose lichens such as *Pseudocyphellaria carpoloma, P. crocata* and *Sticta latifrons* (Figure 7) occur at the base of kanuka trees. In places there are colonies of the herbs *Lagenifera lanata, Veronica plebeia* and *Galium divaricatum*, and the introduced Australian wallaby grass (*Rytidosperma racemosum*) is very prominent.

The ground cover in this forest is of particular interest. The soil is covered in an extensive and diverse carpet of mosses (Figure 8). Thirteen species of moss were recorded here, the most abundant being *Dicranoloma billardierei*, *Campylopus clavatus*, *Leucobryum candidum* and *Ptychomnion aciculare*, with a few patches of the large liverwort *Chandonanthus squarrosus*. In addition large areas of the lichens *Cladina confusa, Cladia aggregata* and *Cladia retipora* cover the forest floor.

Figure 6. Open kanuka forest (*Kunzea ericoides*) on hills above North Cove, 7/10/03 (MDW).

Figure 7. A large foliose lichen, *Sticta latifrons*, found on the bark of kanuka, 15/04/04 (RK).

Figure 8. Wallaby-induced cryptogamic grazing lawn under kanuka forest (MDW).

Wallaby-induced cryptogamic grazing lawns
There is evidence from Australian studies that the indigenous marsupials of that country cause less mechanical disruption of the soil surface than do the mammals introduced to Australia for animal husbandry (Eldridge & Tozer 1997; Bennett 1999). It is thought that the relatively sharp-edged hooves and high pressures exerted on the ground by ungulates disrupt the surface-binding cryptogamic cover of the soil, and are thus a prime cause of erosion in Australia.

The vegetation of Kawau has been under intense pressure from introduced vertebrates. However, the animals involved are primarily Australian marsupials, rather than goats and deer, which have caused major modification to forests elsewhere in New Zealand. On Kawau unusually diverse cryptogamic grazing lawns have been induced (Figure 8). The cryptogamic plants are successful in this habitat, not as competitors *sensu stricto*, but as superior tolerators of stress (Grime *et al.* 1990). The vascular plants with the significant exceptions of kanuka and manuka, have ineffective defences against the stress of herbivory.

It has been suggested (see discussion p 209 of Worthy & Holdaway 2002) that introduced herbivores may to some extent mimic the earlier browsing effects of the moa. During a brief 'interregnum between the moas departing and the deer arriving' the New Zealand vegetation lacked significant herbivore pressure (Caughley 1989). With European contact came a suite of mammalian herbivores from the northern hemisphere, reinforced by selected marsupials from across the Tasman, which resulted in the New Zealand vegetation being once again heavily browsed and grazed. It may well be that the wallaby's foot structure, gait, and ratio of body weight to foot contact area is more similar to that of a moa, than it is to that of ungulates. Under the 'regime of defoliation enforced by moas' (Caughley 1989) it is possible that truly natural grazing lawns, dominated by cryptogams, occurred in New Zealand. What we observe on Kawau today should perhaps, then, be interpreted, not as a highly degraded vegetation but as one containing significant structural elements of the pre-human forest vegetation.

Native bush remnants
Native bush is confined to a few gully heads, stream banks, and the flanks of Mt Taylor where it was protected from past fires. Taylor (1990) has given a good account of this. The main forest tree species are taraire (*Beilschmiedia tarairi*), puriri (*Vitex lucens*), pohutukawa (*Metrosideros excelsa*), and kauri (*Agathis australis*), together with tawaroa (*Beilschmiedia tawaroa*), white maire (*Nestegis lanceolata*), nikau (*Rhopalostylis sapida*), karaka (*Corynocarpus laevigatus*), pigeonwood (*Hedycarya arborea*), hinau (*Elaeocarpus dentatus*), miro (*Prumnopitys ferruginea*) and towai (*Weinmannia silvicola*). Much more rarely may be encountered kowhai (*Sophora microphylla*), tawapou (*Pouteria costata*), matai (*Prumnopitys taxifolia*) and kohekohe (*Dysoxylum spectabile*). There are a few scattered trees of hard beech (*Nothofagus truncata*) on bush-clad promontories in North Cove. Interestingly there does not now seem to be any rimu (*Dacrydium cupressinum*) or totara (*Podocarpus totara*) on Kawau, other than a few planted specimens. Because of wallabies, the understorey is very sparse or absent in the bush remnants. However, where wallabies have been excluded from fenced exclosures, *Coprosma rhamnoides*, *C. arborea* and *Myrsine australis* become prominent.

Domestic gardens
The influence of wallabies in maintaining a grazing lawn was also seen in the clearings around houses. Dominant plants in the turf are *Axonopus fissifolius, Oxalis exilis*, *Dichondra repens, Euchiton gymnocephalus, Callitriche muelleri, Ranunculus parviflorus*, *Hydrocotyle heteromeria, H. moschata, H. tripartita, Hypericum japonicum,* and *Carex inversa*. Common mosses were *Kindbergia praelonga*, and in more shaded sites, *Hypopterygium rotulatum*.

Wetlands
Several small streams drain from the hills into the bays on the western side of Kawau Island. Wetlands occupy the lower reaches and floodplains of these streams. Some streams also drain to the east, such as at Sandy Bay. Typical plants here are *Zantedeschia aethiopica*, *Carex virgata*, bulrush (*Schoenoplectus tabernaemontani*), raupo (*Typha orientalis*), *Polygonum salicifolium*, and *Ranunculus amphitrichus*.

Coastal vegetation
Pohutukawa on the coast of Kawau Island was once in a very sorry state because of severe defoliation by possums (*Trichosurus vulpecula*). In Bostaquet Bay in the far south of Kawau Island, the pohutukawa trees had a skeleton appearance in the early 1960s. In 1988-89, the survey done on the health of pohutukawa on the Northland, Auckland and Coromandel coasts drew attention to the situation on Kawau, describing it as the worst affected of all. Today the trees seem to have made a good recovery in response to severe reduction in the possum population. The vegetation on the eastern coastal cliffs is nonetheless in a poor state, with just sparse pohutukawa interspersed with boneseed and pampas grass, and completely lacking the usual coastal shrub species (like *Pseudopanax lessonii* and *Pittosporum crassifolium*).

Conglomerate/sandstone cliffs at the north end of Sandy Bay have colonies of *Arthropodium cirratum, Lachnagrostis billardierei, Poa anceps, Lagenifera pumila*, *Ranunculus reflexus, Epilobium nummularifolium* and *Lobelia anceps*, and *Disphyma australe* occurs above Stony Bay. We noted too, a single plant of the dwarf form of *Cortaderia splendens*. The dunes support a fine, thriving population of pingao

(*Desmoschoenus spiralis*) and spinifex (*Spinifex sericeus*), with plentiful *Cakile edentula* and shore bindweed (*Calystegia soldanella*). The reddish-coloured sedge *Carex testacea* abounds towards the back of the dunes. At Sandy Bay can be commonly found the native annual herb *Parietaria debilis*, and in North Cove are populations of New Zealand spinach (*Tetragonia tetragonioides*) and New Zealand celery (*Apium prostratum*).

The upper, sheltered part of the Starboard Arm of North Cove has a narrow belt of mangroves (*Avicennia marina* ssp. *australasica*), in the lee of which is salt marsh dominated by shore ribbonwood (*Plagianthus divaricatus*), saltwort (*Sarcocornia quinqueflora*), sea primrose (*Samolus repens*), *Selliera radicans, Cotula coronopifolia, Lilaeopsis novae-zelandiae*, *Chenopodium ambiguum*, *Atriplex prostratum*, sea rush (*Juncus krausii* var. *maritimus*), oioi (*Apodasmia similis*), salt marsh needle tussock (*Austrostipa stipoides*), knob sedge (*Ficinia nodosa*), *Baumea juncea* and local patches of marsh club-rush (*Bolboschoenus medianus*). There are also several plants of *Juncus acutus* – a fearsome giant rush otherwise best known in our region from the Kaipara Harbour and Manukau Heads.

Bot Soc visit of 18 October 2003

The Group: Mike Wilcox (leader), Colleen Crampton, Jan Riddick, Peter Riddick, Doug Shaw, Pat Seyb, Rick Kooperberg, Patsy Schwabe, Ross Beever, Jessica Beever, Jan Butcher, Juliet Richmond, Carol McSweeney, Gary McSweeney, Maureen Young, Enid Asquith, Bénédicte Lebas, Arnaud Blouin, Ségolere Lebas, Sandra Jones, Harry Beacham, Leslie Haines, Peter White, Elaine Marshall, Bernie Salmon, Derryl Hayman, Lawre Taylor, Stan West (local resident).

The visit commenced with the trip by the Kawau Kat from Sandspit, and we landed at the Starboard Jetty in North Cove. Once ashore we immediately found a patch of wild New Zealand spinach (*Tetragonia tetragonioides*) with shore celery (*Apium prostratum*) beside it. Amongst the shore needle grass (*Austrostipa stipoides*), which was in flower, were several giant clumps of *Juncus acutus*. Our first major foray was up the valley behind the McKenzie property. We made a thorough investigation of the wallaby turf (a kind of self-mowing lawn) and stream banks choked with numerous invasive monocots such as *Zantedeschia aethiopica*, *Iris foetidissima* and *Agapanthus praecox*. The ferns *Hypolepis ambigua* and *Deparia petersenii* were prominent. The kanuka forest, more or less bare of understorey, and with an impressive carpet of mosses, was a stark introduction to the reality of Kawau's forest ecology. Nonetheless there were treasures to be discovered, the most noteworthy here being the orchid *Drymoanthus adversus*, high up on a kanuka tree, and with the hornwort *Dendroceros granulatus* (Campbell 1986) on the lower trunk. Three herbs – *Lagenifera lanata*, *Veronica plebeia*, and *Euchiton gymnocephalus* – were frequently seen amongst the mosses. A pleasant lunch spot was kindly provided for us in the garden of John & Shirley Pettit.

Our visit continued with a walk to the upper reaches of the Starboard Arm, taking in mangrove and salt marsh vegetation. Turf vegetation on damp, peaty margins kept us occupied, and we found *Isolepis cernua*, *Triglochin striata*, *Lilaeopsis novae-zelandiae*, *Euchiton delicatus, Centella uniflora* and *Cotula australis*. There was a nice suite of rushes beside the track – *Juncus pallidus*, *J. edgariae*, *J. usitatus* and *J. australis*.

In the kanuka forest along the stream which drains into the Starboard Arm we came across an interesting patch of ferns. In one place we found *Blechnum filiforme*, *B. novae-zelandiae* and *B. membranaceum*. Normally this would not rate as a startling discovery, but here it was because no *Blechnum* species had been recorded on the previous species lists since Buchanan (1876). Other ferns noted here were *Pneumatopteris pennigera*, *Hymenophyllum dilatatum*, *Trichomanes reniforme*, and *Grammitis ciliata*. Further up the stream were a couple of nice kahikatea (*Dacrycarpus dacrydioides*), several puriri (*Vitex lucens*), taraire (*Beilschmiedia tarairi*), a lacebark (*Hoheria populnea*), and several tawaroa (*Beilschmiedia tawaroa*). Even deep into this bushy gully the main plant lining the stream bank was *Zantedeschia aethiopica*.

Stan West led us up a kanuka ridge, on the way viewing a fine remnant stand of kauri (*Agathis australis*) where trees of both matai and miro could also be seen (Figure 9). Among the nice botanical discoveries in this area was a big isolated patch of umbrella fern (*Gleichenia dicarpa*), several orchids (*Corybas cheesemanii*, *Acianthus sinclairii*, *Thelymitra* sp., *Nematoceras triloba*, and *Petalochilus bartlettii*), and the diminutive ferns *Lindsaea linearis* and *Schizaea fistulosa*. The sundew (*Drosera auriculata*) was in flower and fairly common on bare clay areas. Another prominent plant in flower was *Pomaderris* aff. *phylicifolia*, which grows as a sprawling bush on the ridges.

Above Stony Bay we noted the cliff vegetation of pohutukawa and boneseed, and in one area where the kanuka had died and poroporo (*Solanum aviculare*) and a narrow-leaved fireweed (*Senecio diaschides*) had invaded. On the descent to Vivian Bay we noted the massive regeneration of kawakawa (*Macropiper excelsum*) from trees originally planted there by Stan West, and thriving patches of *Carex flagellifera.*

Follow-up visit 15 April 2004

Mike Wilcox, Maureen Young, Enid Asquith and Rick Kooperberg visited the area again to further substantiate the plant records. Our route was from Vivian Bay over the hill into the head of North Cove, to

Sandy Bay (Figure 10), returning via the Starboard Arm of North Cove and thence across the bay (by dinghy) to the northern bush slopes on North Cove, and returning to Vivian Bay by the main ridge. Significant discoveries were patches of the threatened native annual herb *Centipeda minima* subsp. *minima* (Walsh 2001, de Lange *et al*., 2004), a lone flowering plant of *Metrosideros fulgens*, abundant colonies of the weedy Australian sedge (*Carex longebrachiata*), some fine specimens of hard beech (*Nothofagus truncata*), a hinau tree (*Elaeocarpus dentatus*), and large, lone tawapou (*Pouteria costata*).

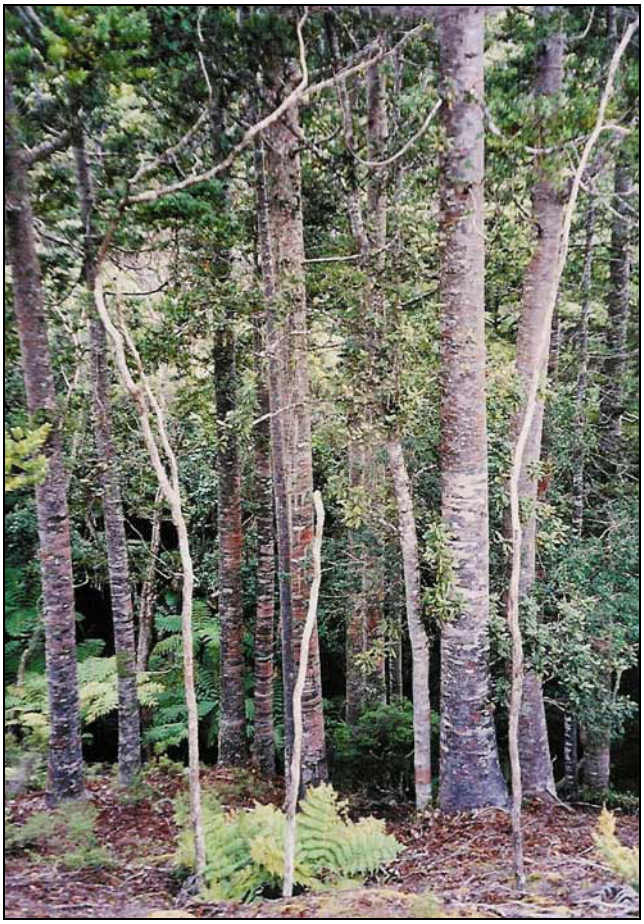

Figure 9. Regenerating grove of kauri (*Agathis australis*) in a gully at head of North Cove, 18/10/03 (MDW).

Figure 10. Sandy Bay, with pingao (*Desmoschoenus spiralis*) and pampas grass (*Cortaderia selloana*), 15/04/04 (MDW).

Conclusion

The northern part of Kawau Island has a complete vegetation cover, with no cleared land except for small private gardens. Despite the continued presence of wallabies, which have browsed out the undergrowth, there is still much of botanical interest to be observed, such as the native herbs *Lagenifera lanata*, *Centipeda minima* subsp. *minima*, and *Parietaria debilis* – seldom encountered on the mainland. The kanuka forest is generally very bare and open, with a spectacular moss carpet, but there are pockets of bush with the nucleus of canopy species still in good condition. What has largely been lost or greatly reduced by browsing are palatable understorey and coastal shrub species of *Coprosma*, *Pseudopanax* and *Pittosporum*, and any effective advanced regeneration of canopy trees, including kauri. The three most widespread and prolific exotic weeds are boneseed, pampas grass, and arum lily, with Australian sedge, agapanthus and Jerusalem cherry locally prevalent. These weeds now have to be accepted as part of northern Kawau's ecology. Creeping sage is of particular interest as it is little known elsewhere in New Zealand.

Acknowledgements

For access to private land and for logistic support we express our sincere thanks to northern Kawau residents and land owners Jock & Jan Bilger, Ray Weaver, John & Shirley Pettit, Don & Alison McKenzie, Lyn & Alan Hume, Stan West, David Kingston, Andy Coleman, Gael Archer, Linda Whitehead, and Alan & Mary Paterson (Camp Bentzon). We particularly thank Stan West for guidance in the field, and Enid Asquith for her contribution to the moss species list. Carol Lockett kindly helped with identifications lichens in the genera *Sticta* and *Pseudocyphellaria*, and John Braggins identified *Dendroceros granulatus*.

References

Bennett, M. B. 1999. Foot areas, ground reaction forces and pressures beneath the feet of kangaroos, wallabies and rat-kangaroos (Marsupialia:Macropodoidea). *Journal of Zoology 247*: 365-369.

Buchanan, J. 1876. On the botany of Kawau Island. *Transactions of the New Zealand Institute 9*: 503-527.

Campbell, E. O. 1986. Notes on some Anthocerotae of New Zealand. *Tuatara 28*(2): 83-94.

Caughley, G. 1989. New Zealand plant-herbivore systems: past and present. *New Zealand Journal of Ecology 12*(Suppl.): 3-10.

de Lange, P.J.; Norton, D.A.; Heenan, P.B.; Courtney, S.P.; Molloy, B.P.J.; Ogle, C.C.; Rance, B.D.; Johnson, P.N.; Hitchmough, R. 2004. Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany 42*: 45-75.

Edbrooke, S. W. (compiler) 2001. *Geology of the Auckland area*. 1:250 000 geological map. Institute of Geological and Nuclear Sciences Ltd, Lower Hutt.

Eldridge, D.; Tozer, M. E. 1997. *A practical guide to soil lichens and bryophytes of Australia's dry country*. Department of Land and Water Conservation, Sydney.

Esler, A. E. 1978. Botanical features of Tiritiri Island, Hauraki Gulf, New Zealand. *New Zealand Journal of Botany 16*: 207-226.
Esler, A. E. 1993. Plant life of some inner Hauraki Gulf islands. *Horticulture in New Zealand 4*(2): 2-5.
Gardner, R. O. 1993. Some plants of Kawau Island. *Auckland Botanical Society Journal 48*(2): 23-27.
Grime, J. P.; Rincon, E. R.; Wickerson, B. E. 1990. Bryophytes and plant strategy theory. *Botanical Journal of the Linnean Society 104*: 175-186.
Goffart-Hall, L. 1997. Notable trees of Mansion House, Kawau Island. *Auckland Botanical Society Journal 52*(2): 63-64.
Goldplatt, P.; Manning, J. 2000. *Cape plants. A conspectus of the Cape flora of South Africa.* Strelitzia 9. Missouri Botanical Garden.
Kinloch, D. I. 1973. Ecology of the parma wallaby, *Macropus parma* Waterhouse 1846 and other wallabies on Kawau Island, New Zealand. M Sc thesis, University of Auckland (unpublished).
McSweeney, C. 1997. Kawau Island – botanical dilemma. *Auckland Botanical Society Journal 52*(2): 61-63.
Shaw, W. B.; Pierce, R. J. 2002. Management of North Island weka and wallabies on Kawau Island. *DOC Science Internal Series 54*, Department of Conservation, Wellington.
Taylor, C. M. 1990. *Assessment of the regeneration potential of a disturbed native forest subject to continued marsupial browse: some management options for Kawau Island.* M Sc thesis, University of Auckland (unpublished).
Tennyson, A. J. D.; Cameron, E. K.; Taylor, G. A. 1997. Fauna, flora and history of Moturekareka, Motutara and Kohatutara Islands, Hauraki Gulf. *Tane 36*: 27-56.
Vujcich, M. V. 1979. *Aspects of the biology of the parma (*Macropus parma *Waterhouse) and dama (*Macropus eugenii *Desmarest) wallabies with particular emphasis on social organisation*. M Sc thesis, University of Auckland (unpublished).
Vujcich, V. C. 1979. *Feeding ecology of the parma,* Macropus parma *Waterhouse and tammar* Macropus eugenei *(Desmarest) wallabies on Kawau Island*. M Sc Thesis, University of Auckland (unpublished).
Walsh, N. G. 2001. A revision of Centipeda (Asteraceae). *Muelleria 15*: 33-64.
Warburton, B. 1986. Wallabies in New Zealand: history, current status, research, and management needs. *Forest Research Bulletin No. 114*.
Warburton, B.; Sadleir, R. M. F. 1990. Species accounts: Dama wallaby, Parma wallaby, brushtailed rock wallaby and swamp wallaby. *In* King, C. (ed.). *The handbook of New Zealand mammals*. Oxford University Press, Auckland.
Webb, C. J.; Sykes, W. R.; Garnock-Jones, P. J. 1988. *Flora of New Zealand. Vol. IV. Naturalised pteridophytes, gymnosperms, dicotyledons.* Botany Division, DSIR, Christchurch.
Wodzicki, K.; Flux, J. E. C. 1967. Guide to the introduced wallabies in New Zealand. *Tuatara 15*(2): 47-59.
Worthy, T. H.; Holdaway, R. N. 2002. *The lost world of the moa – prehistoric life in New Zealand*. Canterbury University Press, Christchurch.
Yeo, C. 1995. *Salvias*. Pleasant View Nursery, Devon, England.

Plant species list for North Cove-Sandy Bay-Vivian Bay, Kawau Island

Compiled by Mike Wilcox, 29/3/03 and 7/10/03, Auckland Botanical Society group, 18/10/03, and MW, MY, RK and Enid Asquith, 15/4/04
* (introduced species)
(Taylor) = recorded in Taylor (1990)

Lichens (compiled by Rick Kooperberg)	
Amandinea punctata (Hoffm.) Coppins & Scheid. (1993)	crustose, on *Bougainvillea* stems
Arthonia nigrocincta C. Knight & Mitt. (1860)	on *Oleander* bark in a garden
Brigantiaea chrysosticta (Hook.f. & Taylor) Hafellner & Bellemére (1982)	on dry decaying branch
Caloplaca allanii Zahlbr. (1934)	on coastal greywake
Canoparmelia texana (Tuck.) Elix & Hale (1986)	on rock outcrops
Chrysothrix candelaris (L.) J.R.Laundon (1981)	in dry habitats, corticolous
Cladia aggregata (Sw.) Nyl. (1876)	terricolous in clearings
Cladia retipora (Labill.) Nyl. (1876)	terricolous in clearings
Cladina confusa (R.Sant.) Follmann & Ahti *in* Follmann (1981)	terricolous in clearings
Cladonia ochrochlora Flörke (1828)	terricolous in clearings
Colema fasciculare var. *fasciculare* (L.) Weber *ex* Wigg. (1780)	corticolous in kanuka forest
Collema laeve Hook.f. & Taylor (1844)	corticolous in kanuka forest
Collema kauaiense H. Magn. (1943)	corticolous in kanuka forest
Heterodermia microphylla (Kurok.) Swinscow & Krog (1996)	
Hyperphyscia adglutinata (Flörke) H.Mayrhofer & Poelt (1979)	on *Bougainvillea* twigs in garden
Lecanora sp. Ach. (1810)	
Leptogium azureum (Sw.) Mont. (1840)	corticolous in kanuka forest
Leptogium cyanescens (Rabenh.) Körb. (1855)	corticolous in kanuka forest
Lobaria dictyophora (Müll. Arg.) D.J.Galloway (1983)	corticolous in kanuka forest
Megalospora gompholoma subsp. *gompholoma* (Müll. Arg.) Sipman (1993)	corticolous in kanuka forest
Menegazzia aucklandica (Zahlbr.) P.James & D.J. Galloway (1983)	on trunks and small branches

Normandina pulchella (Borrer) Nyl. (1861)	scarce, in low light conditions
Pertusaria sp. DC. (1805)	on decorticated wood
Phaeographis mucronata (Stirt.) Zahlbr. (1923)	crustose near coast
Pseudocyphellaria carpoloma (Delise) Vain. (1898)	corticolous and terricolous in kanuka forest
Pseudocyphellaria crocata (Müll. Arg.) Malme (1899)	corticolous and terricolous in kanuka forest
Pseudocyphellaria montagnei (C. Bab.) D.J.Galloway & P. James (1980)	corticolous in kanuka forest
Pseudocyphellaria multifida (Nyl.) D.J.Galloway & P. James (1980)	corticolous in kanuka forest
Pseudocyphellaria pickeringii (Tuck.) D.J.Galloway (1988)	corticolous in kanuka forest
Pseudocyphellaria poculifera (Müll Arg.) D.J.Galloway & P. James (1980)	corticolous in more open areas near water
Pyrenula cyrtospora (Stirt.) Müll. Arg. (1894)	crustose, on smooth bark
Pyxine subcinerea Stirt. (1898)	scarce, on twigs
Ramalina celastri (Spreng.) Krog & Swinscow (1976)	on trees and man-made structures, confined to coast
Rimelia austrocetrata (Elix & J.Johnst.) Hale & A.Fletcher (1990)	on trunks of pohutukawa
Rimelia sp. Hale & Fletcher (1990)	on trees and rocks, mostly coastal
Stereocaulon ramulosum (Sw.) Räuschel (1797)	saxicolous and terricolous in open areas of kanuka forest. dry, bare clay banks
Sticta fuliginosa (Hoffm.) Ach. (1803)	corticolous in kanuka forest
Sticta latifrons A. Rich (1832)	corticolous in kanuka forest
Sticta squamata D.J. Galloway (1983)	corticolous in kanuka forest
Sticta subcarperata (Nyl.) Nyl. (1888)	corticolous in kanuka forest
Teloschistes chrysophthalmus (L.) Th. Fr.(1861)	on low divaricated shrubs on exposed stream bank
Teloschistes sieberianus (Laurer) Hillm. (1930)	on low divaricated shrubs on exposed stream bank
Usnea nidifica Taylor (1847) (syn.*U. societatis*)	on trunks of pohutukawa
Usnea sp. Dill. *ex* Adans. (1763)	corticolous, hanging from higher branches in open areas
Xanthoria parietina (L.) Th. Fr. (1860)	on rocks and man-made structures, confined to coast

Mosses (compiled by Jessica Beever)	
Achrophyllum dentatum	wet soil beside stream in grazing lawn under kanuka
Barbula calycina	sloping exposed soil on cliff top
Bryum billardierei	grazing lawn under kanuka
Bryum campylothecium	exposed site in grazing lawn at back of beach
Bryum sp.	disturbed soil
Camptochaete pulvinata	exposed tree roots and cabbage tree trunk
Camptochaete ?*arbuscula*	grazing lawn under kanuka
Campylopus clavatus	ground in kanuka forest
Campylopus introflexus	soil on ridge in animal track
Campylopus pyriformis	grazing lawn under kanuka
Dicranoloma billardierei	ground in kanuka forest; a major carpet moss
Dicranolomoa fasciatum	rotting wood
Dicranoloma menziesii	ground in kanuka forest, and on cabbage tree trunks
Didymodon torquatus	on concrete path
Echinodium hispidum	on exposed root
Entosthodon acaulis	disturbed soil on root plate of a fallen tree
Fissidens asplenioides	on vertical soil
Fissidens pallidus	on vertical soil
Fissidens taxifolius	on soil under kanuka
Hypnodendron sp.	on damp soil
Hypnum chrysogaster	epiphytic on manuka
Hypnum cupressiforme	grazing lawn under kanuka
Hypopterygium rotulatum	dampish, shady glades
**Kindbergia praelonga (*syn. *Stokesiella praelonga)*	grazing lawns in gardens and under kanuka; epiphytic on cabbage tree
Leptostomum macrocarpon	nikau trunks, and also on ground
Leucobryum candidum	ground in kanuka forest, and on rotten wood

Macomitrium gracile	epiphytic on trunks of cabbage tree
Macomitrium submucronifolium	epiphytic on kanuka
Orthorrhynchium elegans	epiphytic
Pendulothecium punctatum	at base of cabbage tree and on soil
Ptychomnion aciculare	grassy glades and kanuka forest
Racopilum robustum	on grazing lawn under kanuka
Rhaphidorrhynchium amoenum	
Sematophyllum homomallum	on exposed rock
Thuidium furfurosum	on grazing lawn under kanuka
Tortula muralis	on concrete path
Weissia patula	exposed site, on soil

Liverworts and hornworts	
Chandonanthus squarrosus	ground in kanuka forest
Dendrocerus granulatus	epiphytic on kanuka
Lepidolaena taylorii	rocks on steep slopes
Lunularia cruciata	wallaby turf and stream edge, North Cove
Marchantia berteroana	wetland margin, North Cove
Monoclea forsteri	rocks in damp, shaded stream beds in bush remnants
Symphyogyna hymenophyllum	damp bank, kanuka forest
Trichocolea mollissima	damp sites above head of Starboard Arm, North Cove

Ferns and fern allies	
Adiantum cunninghamii	cliffs at Sandy Bay
Adiantum diaphanum	banks in forest remnants
Adiantum hispidulum	common on dry banks
Asplenium flaccidum	terrestrial, North Cove
Asplenium haurakiense	coastal cliff areas, Vivian Bay
Asplenium oblongifolium	uncommon
Asplenium polyodon	low epiphyte
Blechnum discolour	very occasional small plants
Blechnum filiforme	uncommon
Blechnum membranaceum	uncommon, damp banks in bush remnant
Blechnum novae-zelandiae	uncommon, damp banks and wetland
Cyathea dealbata	the most abundant fern in kanuka forest
Cyathea medullaris	plentiful at head of North Cove
Deparia petersenii	damp gully heads and on stream alluvium
Diplazium australe	damp gully heads and on stream alluvium
Dicksonia squarrosa	rare
Doodia australis	coastal banks
Gleichenia dicarpa	some colonies in open glades near kauri forest
Grammitis billardierei	rare, on rocks in kanuka forest
Grammitis ciliate	rare, banks
Histiopteris incise	plentiful on swampy margins
Huperzia varia	high epiphytic on puriri
Hymenophyllum dilatatum	very uncommon, shaded banks
Hymenophyllum rarum	very uncommon
Hymenophyllum sanguinolentum	rare, on rocks in kanuka forest
Hypolepis ambigua	abundant in glades, unpalatable
Lastreopsis glabella	bush remnants
Lindsaea linearis	occasional in kanuka forest
Lygodium articulatum	occasional in kauri- taraire-puriri forest
Microsorum pustulatum	terrestrial, head of North Cove
Microsorum scandens	terrestrial, head of North cove
**Nephrolepis cordifolia*	colonies at Vivian Bay
Paesia scaberula	patches in kanuka forest
Pellaea rotundifolia	very uncommon
Pneumatopteris pennigera	uncommon, dampish shaded places
Polystichum neozelandicum subsp. *neozelandicum*	coastal cliffs, Vivian Bay

Pteridium esculentum	coastal cliffs, Vivian Bay
Pteris macilenta	occasional, Vivian Bay
Pteris tremula	frequent on disturbed sites
Pyrrosia eleagnifolia	terrestrial and low epiphyte
Schizaea fistulosa	uncommon, amongst moss carpet in kanuka forest
**Selaginella kraussiana*	extensive colonies near exclosures, North Cove
Trichomanes reniforme	damp banks, kauri forest

Conifers	
Agathis australis	several groves of trees in North Cove
**Araucaria heterophylla*	planted, Vivian Bay
**Cupressus macrocarpa*	North Cove
Dacrycarpus dacrydioides	several at head of North Cove
Dacrydium cupressinum	planted, Vivian Bay
Phyllocladus trichomanoides	planted, Camp Bentzon
**Pinus pinaster*	Horner Reserve, (P. White *pers. comm.*)
**Pinus radiata*	several big trees, and a prominent tall stand above Little Vivian Bay
Podocarpus totara	planted, Camp Bentzon
Prumnopitys ferruginea	bush remnants, head of North Cove
Prumnopitys taxifolia	kauri bush, head of North Cove
**Sequoia sempervirens*	planted, North Cove

Dicot trees, shrubs & climbers	
**Abelia* X *grandiflora*	North Cove
**Acacia longifolia*	Horner Reserve, (P. White *pers. comm.*)
**Acacia mearnsii*	North Cove
**Acmena smithii*	young trees in bush remnants
Alseuosmia macrophylla	(Taylor)
Avicennia marina subsp. *australasica*	Mangroves, sheltered arms of North Cove
Beilschmiedia tarairi	the commonest tree in bush remnants
Beilschmiedia tawaroa	occasional in bush remnants
Brachyglotttis repanda	rare
**Carica pubescens*	naturalised at Vivian Bay
Carmichaelia australis	gullies above Sandy Bay
**Cestrum nocturnum*	Vivian Bay
**Chrysanthemoides monilifera*	abundantly naturalised on the coast
Clematis paniculata	occasional liane in kanuka forest
Coprosma arborea	taraire-puriri forest, northern side of North Cove
Coprosma rhamnoides	frequent shrub in wallaby exclosures
Coprosma robusta	planted, Vivian Bay
Corynocarpus laevigatus	occasional in bush remnants
**Cotoneaster glaucophyllus*	coastal rocky cliffs in North Cove
Dysoxylum spectabile	(Taylor)
**Echium candicans*	cultivated , Vivian Bay
Elaeocarpus dentatus	with hard beech, northern side of North Cove
Entelea arborescens	planted, bush above Vivian Bay
**Erythrina* x *sykesii*	planted, several at Vivian Bay
**Eucalyptus cinerea*	planted, Vivian Bay
Geniostoma ligustrifolium	frequent in bush remnants
Griselinia lucida	(Taylor)
**Hakea salicifolia*	planted, Camp Bentzon
Hebe macrocarpa	cliffs at Sandy Bay
Hedycarya arborea	common in understorey of bush remnants
Hoheria populnea	bush gullies at head of North Cove; planted at Sandy Bay
**Impatiens sodenii*	Vivian Bay
Knightia excelsa	fairly common, but very stunted on ridges
Kunzea ericoides	the dominant tree over large areas
Laurelia novae-zelandiae	several groves in Mt Taylor valley
Leptecophylla juniperina	understorey in kanuka forest

Leptospermum aff. *scoparium* (prostrate form)	common associate of kanuka
Leptospermum scoparium	eastern cliffs
Leucopogon fasciculatus	understorey in kanuka forest
**Lupinus arboreus*	naturalised on beach, Vivian Bay
**Melianthus major*	common on coastal margins near houses
Melicope ternata	occasional in understorey
Melicytus ramiflorus	bush remnants
Meryta sinclairii	planted, Sandy Bay
Metrosideros excelsa	coastal cliffs and bush remnants
Metrosideros fulgens	on *Dicksonia squarrosa*, head of North Cove
Metrosideros perforata	common liane in bush remnants
Muehlenbeckia complexa	Vivian Bay
Myoporum laetum	planted, Sandy Bay
Myrsine australis	common in bush remnants and kanuka
**Nerium oleander*	planted, North Cove
Nestegis lanceolata	fairly common in bush remnants
Nothofagus truncata	bush on northern side of North Cove
Olearia furfuracea	in kanuka forest
Olearia rani	North Cove, in bush
**Paraserianthes lophantha*	common on the beach margins, Vivian Bay
Parsonsia heterophylla	rare
**Passiflora edulis*	wild at Sandy Bay and North Cove
Pittosporum crassifolium	planted, Camp Bentzon
Pittosporum eugenioides	(Taylor)
Pittosporum tenuifolium	(Taylor)
Pittosporum umbellatum	planted, Vivian Bay (S. West)
Plagianthus divaricatus	salt marsh, North Cove
**Polygala myrtifolia*	coastal banks, North Cove
Pomaderris kumeraho	planted, Camp Bentzon
Pomaderris aff. *phylicifolia*	common in kanuka forest
**Populus nigra* cv 'Ítalica'	planted, North Cove
Pouteria costata	large tree above Vivian Bay
Pseudopanax arboreus	(Taylor)
Pseudopanax crassifolius	(Taylor)
Pseudopanax discolor	(Taylor)
Pseudopanax lessonii	(Taylor)
Rhabdothamnus solandri	bush gullies
Rubus cissoides	very scarce in kanuka forest
Schefflera digitata	planted?, Vivian Bay
**Senecio mikanioides*	Vivian Bay
**Senna septemtrionalis*	commonly naturalised, North Cove
Solanum aviculare	recently disturbed forest margins and clearings
**Solanum mauritianum*	common weedy small tree in wetlands
**Solanum pseudocapsicum*	abundant on damp sites at head of North Cove,
Sophora microphylla or *S. chathamica*	(Taylor)
**Tecomaria capensis*	naturalised at Vivian Bay
Vitex lucens	dominant tree in bush; some very large specimens
Weinmannia silvicola	(Taylor), Horner Reserve (P. White *pers comm.*)

Dicot herbs

Acaena novae-zelandiae	grassy glades, Vivian Bay, Sandy Bay
**Ageratina adenophora*	Vivian Bay
Apium prostratum	coast at North Cove and Sandy Bay
**Anagallis arvensis*	abundant near the shore, North Cove
**Atriplex prostrata*	salt marsh, North Cove; dunes at Sandy Bay
**Cakile edentula*	sand dunes, Sandy Bay, Vivian Bay
Callitriche muelleri	abundant in wallaby turf
Calystegia soldanella	Sandy Bay
Cardamine debilis	damp areas, head of North Cove
**Carpobrotus edulis*	beaches in North Cove and Vivian Bay
**Centaurium erythraea*	North Cove

Centipeda minima subsp. *minima*	wetland fringes, North Cove
Centella uniflora	salt marsh fringes, North Cove
**Cerastium glomeratum*	North Cove
Chenopodium ambiguum	salt marsh, North Cove
**Cirsium vulgare*	wallaby turf and disturbed sites
**Conyza albida*	dunes at Sandy Bay
Cotula australis	North Cove, turf
Cotula coronopifolia	salt marsh, North Cove
**Crassula multicava*	naturalised in North Cove near houses
**Crepis capillaris*	(Taylor)
**Cymbalaria muralis*	stony sites, North Cove
Dichondra repens	abundant, grazing lawns
Disphyma australe	cliffs, Stony Bay
Drosera auriculata	clay slopes above Sandy Bay
**Epilobium ciliatum*	wetland, head of North Cove
Epilobium nummularifolium	cliffs at Sandy Bay
**Erechtites valerianifolia*	North Cove
**Erigeron karvinskianus*	North Cove, rocky banks
Euchiton delicatus	peaty turf, North Cove
Euchiton gymnocephalus	grazing lawns
**Euphorbia peplus*	North Cove
**Fumaria muralis*	Vivian Bay
**Galium divaricatum*	common in kanuka forest, North Cove
**Gamochaeta coarctatis*	(Taylor)
**Gamochaeta simplicicaulis*	(Taylor)
**Geranium homeanum*	North Cove (J. & S Pettit property); Vivian Bay
Geranium solanderi "coarse hairs"	coastal fringes, Sandy Bay, North Cove
Gonocarpus incanus	(Taylor), Horner Reserve, (P. White *pers comm.*)
Gonocarpus micranthus	(Taylor)
Haloragis erecta	Vivian Bay
**Helminthotheca echioides*	(Taylor)
Hydrocotyle heteromeria	wallaby turf
Hydrocotyle moschata	wallaby turf
**Hydrocotyle tripartita*	wallaby turf
Hypericum japonicum	kanuka forest and wallaby turf
**Hypochoeris radicata*	(Taylor)
Lagenifera lanata	common on rocky banks, kanuka forest
Lagenifera pumila	coastal cliffs, Sandy Bay
**Leontopodium taraxacoides*	Sandy Bay, Vivian Bay
Lilaeopsis novae-zelandiae	wetland and salt marsh, North Cove
**Linum trigynum*	North Cove, near shore; Vivian Bay
Lobelia anceps	coastal cliffs, salt marshes, wetlands
**Ludwigia palustris*	wetland, North Cove
**Ludwigia peploides* subsp. *montividensis*	(Taylor)
**Lythrum hyssopifolia*	wetland, North Cove
**Mentha pulegium*	(Taylor)
**Mentha spicata*	a patch at Sandy Bay
**Modiola caroliniana*	
**Myosotis sylvatica*	abundant weed near houses, North Cove
Oxalis exilis	abundant in wallaby turf
**Oxalis incarnata*	garden walls, North Cove
**Oxalis pes-caprae*	Vivian Bay
Oxalis rubens	Vivian Bay beach
Parietaria debilis	coastal forest and glades, Sandy Bay
Peperomia urvilleana	rocks in bush , North Cove
**Physalis peruviana*	Vivian Bay
**Phytolacca octandra*	Vivian Bay
Polygonum salicifolium	wetland, head of North Cove
**Pratia pedunculata*	wallaby turf, North Cove (J. & S. Pettit property)
Pseudognaphalium luteoalbum	(Taylor)
Ranunculus amphitrichus	wetland, North Cove

**Ranunculus parviflorus*	wallaby turf
Ranunculus reflexus	coastal cliffs, Sandy Bay
**Rumex brownii*	Starboard Arm, North Cove
**Sagina procumbens*	Sandy Bay
**Salvia repens*	this weed is unpalatable to wallabies
Samolus repens	salt marsh, North Cove
Sarcocornia quinqueflora	salt marsh, North Cove
Selliera radicans	Horner Reserve, (P. White *pers comm.*)
**Senecio angulatus*	Vivian Bay
**Senecio bipinnatisectus*	common in upper North Cove
**Senecio diaschides*	dense colonies on recently disturbed site above Stony Bay
Senecio hispidulus	North Cove, beside track in upper Starboard arm
Senecio lautus	cliff tops above Stony Bay
Senecio minimus	common in wetlands, North Cove
**Senecio jacobaea*	beside track, head of North Cove
**Senecio petasitis* (syn. *Roldana petasitis)*	North Cove
**Senecio skirrhodon*	
**Solanum nigrum*	(Taylor)
**Sonchus oleraceus*	
**Taraxacum officinale*	(Taylor)
Tetragonia tetragonioides	a patch near shore in North Cove
**Trifolium repens*	wallaby turf
**Veronica arvensis*	Horner Reserve, (P. White *pers comm.*); J. & S. Pettit property
**Veronica plebeia*	common in kanuka forest, eaten by wallabies
**Vicia tetrasperma*	Vivian Bay
Wahlenbergia violacea	Vivian Bay

Monocots	
Acianthus sinclairii	in kanuka forest, head of North Cove
**Agapanthus praecox*	very common near houses
**Agave americana*	North Cove and Vivian Bay
**Alocasia brisbanensis*	North Cove, in damp, shaded places
**Aloe arborescens*	Vivian Bay
Apodasmia similis	salt marsh, North Cove
**Aristea ecklonii*	North Cove
Arthropdium cirratum	coastal cliffs, Sandy Bay
**Arum italicum*	Vivian Bay
**Arundo donax*	Vivian Bay
**Asparagus asparagoides*	established at Sandy Bay and Vivian Bay
Austrostipa stipoides	salt marsh, North Cove
**Axonopus fissifolius*	a common grass in wallaby lawns
Baumea juncea	sedge vegetation in salt marsh
Baumea tenax	North Cove
Bolboschoenus medianus	a few colonies in North Cove
**Bromus diandrus*	beach at Vivian Bay
**Bromus willdenowiii*	Vivian Bay
Carex breviculmis	(Taylor)
**Carex divulsa*	gardens at Vivian Bay
Carex flagellifera	gullies above Vivian Bay
Carex inversa	wallaby turf, North Cove
**Carex longebrachiata*	common in kanuka above Vivian Bay; wild, but some has been planted
Carex pumila	sandy beach, Vivian Bay
Carex testacea	back of dunes, Sandy Bay,
Carex virgata	wetland and drier slopes, head of North Cove
Collospermum hastatum	epiphyte in bush and on pohutukawa
**Colocasia esculenta*	wetland, head of North Cove
**Cortaderia selloana*	abundant near the shore, in wetlands, and in kanuka
Cortaderia splendens (dwarf form)	cliffs at north end of Sandy Bay
Cordyline australis	frequent large trees at head of North Cove
Corybas cheesemanii	(Taylor), Horner Reserve, (P. White *pers comm.*)

**Cyperus brevifolia*	common in wallaby turf
Cyperus ustulatus	wetlands
Cyrtostylis oblonga	(Taylor)
Desmoschoenus spiralis	Sandy Bay
Deyeuxia avenoides	(Taylor)
Dianella nigra	Vivian Bay, cliffs
**Digitaria sanguinalis*	(Taylor)
Drymoanthus adversus	occasional high epiphyte on kanuka, North Cove
Earina mucronata	epiphytic on taraire, North Cove
Ficinia nodosa	generally common near the sea
Freycinetia banksii	a few large colonies in shaded stream heads, North Cove
Gahnia lacera	bush remnants
**Gladiolus undulatus*	sandy sites, Vivian Bay, Sandy Bay
**Iris foetidissima*	extensive in glades, North Cove
Isolepis cernua	salt marsh
Isolepis inundatus	edge of wetland, North Cove
Isolepis reticularis	damp areas in forest, head of North Cove
**Juncus acutus*	a few clumps near shore, North Cove
**Juncus articulatus*	(Taylor)
Juncus australis	frequent in North Cove
Juncus edgariae	wetland fringes , Starboard Arm, North Cove; common also on slopes in bush remnants
Juncus effusus	wetland fringes, Starboard Arm, North Cove
Juncus kraussii var. *australiensis*	salt marsh, Starboard Arm, North Cove
Juncus pallidus	wetland fringes, Starboard Arm, North Cove
Juncus planifolius	(Taylor)
Juncus usitatus	wetland fringes, North Cove, Sandy Bay
Lachnagrostis billardierei	cliffs at Sandy Bay
**Lagurus ovatus*	dunes at Sandy Bay
Lemna minor	standing water in wetlands
Lepidosperma laterale	coastal cliffs, Stony Bay
Microlaena stipoides	
Morelotia affinis	coastal cliffs, Stony Bay
Nematoceras triloba	(Taylor)
Oplismenus imbecillis	kanuka forest, heavily grazed by wallabies
Petalochilus bartlettii	amongst moss, kanuka forest
Poa anceps	coastal banks, Vivian Bay and North Cove
**Poa annua*	North Cove, in grassy turf
Phormium tenax	coastal banks, Sandy Bay and wetlands, North Cove
Pterostylis graminea	(Taylor)
Pterostylis trullifolia	(Taylor)
Rhopalostylis sapida	common in bush remnants
**Rytidosperma racemosum*	abundant in kanuka forest
Rytidosperma unarede	to be confirmed
Schoenoplectus tabernaemontani	wetland at Sandy Bay
Schoenus maschalinus	dampish spots in kanuka forest
Schoenus tendo	occasional in kanuka forest
Spinifex sericeus	dunes at Sandy Bay
**Sporobolus indicus* var*. capensis*	Sandy Bay
**Stenotaphrum secundatum*	Sandy Bay
Thelymitra sp.	moss carpets under kanuka forest
Triglochin striata	freshwater margins and salt marsh, North Cove
Typha orientalis	wetland, Sandy Bay and head of North Cove
**Watsonia borbonica* subsp. *ardernei*	North Cove, near houses
**Watsonia marginata*	North Cove, near houses
**Zantedeschia aethiopica*	abundant in wetlands and glades

Fungi (by Petra White)

Along the foreshore growing on driftwood we found a collection of a tiny black fungus. A sample was collected and later identified by Landcare scientist Peter Johnston from its characteristics in culture as *Nemania maritima*, a species described by Ju and Rogers (2002) and supposedly confined to mangrove wood. This is the first time the species has been recorded in New Zealand and has previously only been reported from Taiwan.

Reference
Ju, Y.M.; Rogers, J.D. (2002): The genus *Nemania* (Xylariaceae), *Nova Hedwigia* **74**: 75-120.

Fungi

* = exotic
(L) = previously recorded as present by Landcare Research

Agaricus sp.
Aleurodiscus ochraceoflavus
*Amanita muscaria** (Lyn Hume pers. comm.)
Amanita sp. (black cap under *Kunzea*)
Antrodia vaillantii (L)
Antrodiella zonata
Asbolisia sp. (L)
Biscogniauxia capnodes var. *rumpens*
Chaetomium trigonosporum (L)
Coltricia cinnamomea (L)
Coltricia strigosa (L)
Cyclomyces tabacinus
Echinochaete russiceps (L)
Eutypella sp. (L)
Ganoderma ?cf. *applanatum*
Gloeoporus dichrous (L)
Glomerella cingulata (L)
Hymenochaete villosa (L)
Hyphodontia barba-jobi (L)
Hysterangium neotunicatum
Lanzia sp. (L)
Lycoperdon perlatum (L)
Meliolina leptospermi (L)
Nemania maritima (on driftwood)
Nemania sp. (on pine wood)
Phellinus wahlbergii
Phlebia livida (L)
Plectania rhytidia (L)
Pleurotus australis (L)
Pleurotus djamor
Podospora anserina (L)
Polyporus arcularius (L)
Polyporus citreus (L)
Porostereum fulvum (L)
Pycnoporus coccineus
Rosellinia radiciperda (L)
Schizopora radula (L)
Scleroderma sp.
Septoria passifloricola (L)
Stereum hirsutum (L)
Stereum illudens
Stereum ostrea (L)
Stereum vellereum (L)
*Suillus granulatus**
*Thelephora terrestris**
Trametes versicolor
Trametes zonata (L)
Tremella fuciformis (L)
Trichoglossum hirsutum
Wentiomyces melioloides

Field Trip: New Caledonia. 30/11/03 – 11/12/03

Mike Wilcox

Sixteen people from the Auckland Botanical Society visited New Caledonia from 30 November to 11 December 2003. Our objective was to see some of the famous and curious plants of the Territory, and to gain an appreciation of the main features of the flora on acidic (schist), ultramafic (peridotite), and calcareous (coral limestone) substrates. Specialists in the group were able to pursue their particular interests, and there were good opportunities for photography. The weather was mostly fine and pleasant. We concentrated on plants, but there was much to interest the general naturalist and zoologist as well, with many beautiful butterflies, a rich forest birdlife and very plentiful lizards (skinks).

The members of the group were Jessica Beever, Ross Beever, Ewen Cameron, Colleen Crampton, Pam Dale, Geoff Davidson, Anne Fraser, Graeme Hambly, Peter Johnston, Helen Preston-Jones, Jill Rapson, Juliet Richmond, Alison Wesley, Barbara White, Mike Wilcox (Leader) and Maureen Young.

Central West Coast

Sunday 30 November: Auckland to Tontouta (Aircalin SB 411). We had three minibuses awaiting us which were to be our reliable transport for the next nine days. By way of introduction, the journey north from Tontouta to La Foa is notable mainly for the dry open rangeland of *Heteropogon contortus* (Poaceae), extensive woodland of niaouli *Melaleuca quinquenervia* (Myrtaceae), thickets of ironwood *Casuarina collina* (Casuarinaceae) and *Acacia spirorbis* (Fabaceae: Mimosoideae), and hedgerows of the introduced thorny tree *Pithecellobium dulce* (Fabaceae: Mimosoideae). *Furcraea foetida* (Agavaceae) was also much in evidence. Five colourful ornamental flowering trees were commonly seen in the towns – *Bauhinia monandra* (Fabaceae: Caesalpinioideae), *Cassia javanica* (Fabaceae: Caesalpinioideae), *Delonix regia* (Fabaceae: Caesalpinioideae), *Samanea saman* (Fabaceae: Caesalpinioideae), and *Spathodea spathulata* (Bignoniaceae). At one spot near Boulouparis was a small lake infested with water hyacinth (*Eichhornia crassipes*).