

Botany of Waikōwhai Park and Captains Bush, Manukau Harbour, Auckland

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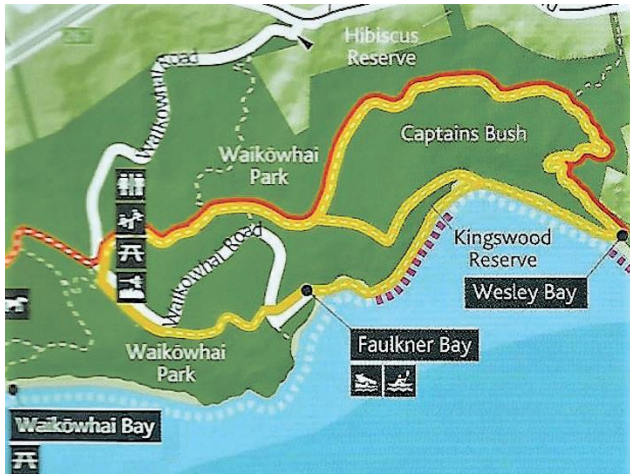


Fig. 1. Location map (from Puketāpapa Local Board 2016).



Fig. 2. Waikōwhai, 15 Aug 1955. The open area in middle distance is the site of the rubbish dump which operated from 1963 to 1974 (Whites Aviation).



Fig. 3. Waikōwhai, 4 July 2017. View across Wesley Bay and Waikōwhai Bay to Cape Horn. All photos by Mike Wilcox unless stated otherwise.

Introduction

This stretch of the bush-clad coastline of the Manukau Harbour (Fig. 1) is part of the land originally endowed in 1850 by the Crown to the Wesley Mission. It became public reserve land in 1911, with Waikōwhai Park officially opened in 1914 (Reidy 2007). The Park was very popular up to around 1950 as a family picnic area, but from 1963 - 1974 much of the coastal area was used as a public rubbish dump (landfill) (Fig. 2). There are three beaches in the area: Waikōwhai Bay, Faulkner Bay, and Wesley Bay (Fig. 3). To the west of Waikōwhai Park is Wattle Bay (Wilcox & Kowhai 2015) and to the east are the various Hillsborough coast reserves (Wilcox & Warden 2017).

The five reserves included here are Waikōwhai Park (23.0 ha), Captains Bush (7.5 ha), Kingswood Reserve in part (1.1 ha), Hibiscus Reserve (0.3 ha) and Hillsdale Reserve (0.1 ha). Plant life at Waikōwhai was touched on by Cranwell (1981), Millener (1979) and Esler (1983, 2004). Esler (1990) includes a species list covering the Manukau Coast and Lynfield. Captains Bush was purchased from the Captain family by the local council at the urging of the Forest & Bird Protection Society. Cameron and Beever (2017) reported on the plants there in 1991, recommending that a proposed subdivision for housing not go ahead as the bush had the best-known groves of *kōwhai* (*Sophora chathamica*) (Fig. 4), and kohekohe (*Dysoxylum spectabile*) (Fig. 5), anywhere in Auckland.

We have made numerous visits to Waikōwhai Park and Captains Bush, especially from October 2016 to August 2017, endeavouring to explore the whole area thoroughly (on and off-track) and record the species present at all seasons. Hopefully we have seen most, if not all, the plants found there. The Auckland Botanical Society held a field trip there on 16 September 2017, those attending being: Jenny Andrew, Ewen Cameron, Brian Cumber, Neil Davies, Frances Duff, Bev Gibbs, Ben Goodwin, Leslie Haines, Peter Moosberger, Tony Payne, Juliet Richmond, Joshua Salter, Sam Sutherland, Alison Wesley and Mike Wilcox (leader).

Coastal broadleaved forest

According to the classification system of Singers and Rogers (2014) (see also Singers et al. 2017) the Waikōwhai bush comes closest to their ecosystem unit WF 4: "Pohutukawa, puriri, broadleaved forest [Coastal broadleaved forest]. This unit is described as broadleaved forest of several variants, with pohutukawa and puriri, and locally with karaka,

kohekohe, titoki, mangeao, rewarewa, tawa, puka, tawapou, ngaio, nikau, taraire, and occasional tanekaha and kauri in northern part of range, and locally hard beech along the Bay of Plenty coast and East Cape (also with black beech). Kanuka and kowhai locally occur on dry, steep ridges.”

Pohutukawa (*Metrosideros excelsa*) is the dominant tree of the immediate coastal forest at **Waikōwhai, with many large trees, particularly in the Cape Horn area** and in the Kingswood Reserve. This feature is shared with adjoining stretches of the Manukau Harbour coastline at Wattle Bay (Wilcox & Kowhai 2015) and further west at Gittos Domain (Wilcox 2016), and at Hillsborough (Wilcox & Warden 2017). Three good-sized mangeao (*Litsea calicaris*) with associated seedlings are present in the **Waikōwhai Bay coastal forest, and kōwhai and karaka (*Corynocarpus laevigatus*) are plentiful.** Associated smaller trees and shrubs are mahoe (*Melicytus ramiflorus*), coastal karamu (*Coprosma macrocarpa* subsp. *minor*), houpara (*Pseudopanax lessonii*), wharangi (*Melicope ternata*) (Fig. 6), rangiora (*Brachyglottis repanda*), and kawakawa (*Piper excelsum*). Coastal astelia (*Astelia banksii*) is very sparse. Tutu (*Coriaria arborea*) is a feature of **the coastal margins of Wesley Bay and Waikōwhai Bay.** *Rhabdothamnus solandri* occurs locally in colonies on steep banks in Captains Bush and **Waikōwhai Park.**

The very fine groves of kohekohe forest are undoubtedly the top ecological feature of the **Waikōwhai bush. Excellent examples of this can be seen along the track from near the top of Waikōwhai Road** down to the exit track to the playground and main car park; below Cape Horn Road; bush below the Watercare pump off Hillsborough Rd; and in Captains Bush. Kohekohe is the dominant tree, and includes large mature spreading trees (the biggest we have found measuring 126 cm dbh) as well as **groves of young trees. Kōwhai, karaka (a very large one, 70 cm dbh, in Captains Bush), mahoe, puriri (*Vitex lucens*), and milk tree (*Streblus heterophyllus*) up to 40 cm in diameter are frequent.** Large kahikatea (*Dacrycarpus dacrydioides*) (Fig. 7), not mentioned by Singers and Rogers (2014) as being present in Unit WF 4 – and rewarewa (*Knightia excelsa*), as well as **as very big kōwhai as much as 80 cm in diameter (in full flower 16 Sep 2017),** are present as emergents, with coastal karamu, mapou (*Myrsine australis*), hangehange (*Geniostoma ligustrifolia*), pigeonwood (*Hedycarya arborea*), pate (*Schefflera digitata*) and kawakawa forming the understory. Pohutukawa occurs as scattered, large trees, and with younger trees taking root as epiphytes on *Cyathea dealbata*. Northern rata (*Metrosideros robusta*) was recorded in 1991 by



Fig. 4. *Sophora chathamica*, kōwhai, Waikōwhai, 16 Sep 2017. Numerous large kōwhai trees were in full flower during the ABS visit, attracting tui in abundance.



Fig. 5. *Dysoxylum spectabile*, kohekohe, forest, Waikōwhai Park, 5 Nov 2016. This is the most abundant canopy tree here, and is regenerating freely throughout the area.



Fig. 6. *Melicope ternata*, wharangi, Wesley Bay, 16 Sep 2017. A small tree or shrub mainly seen on the coastal forest margins. Photo: Alison Wesley.



Fig. 7. *Dacrycarpus dacrydioides*, kahikatea, Waikōwhai Park, 5 Nov 2016. Waikōwhai Park has a good number as tall emergent trees above the forest canopy.



Fig. 8. *Asplenium lamprophyllum*, Waikōwhai Park, 5 Nov 2016. This is the most abundant ground fern in the kohekohe forest.



Fig. 9. *Ptisana salicina*, king fern, 22 Nov 2016. King ferns here occur sparsely in damp steep gullies. Photo: Jack Warden.

Cameron and Beaver (2017) in Captains Bush, and there is also here one large rimu (*Dacrydium cupressinum*) of 67 cm dbh. A few titoki trees (*Alectryon excelsus*) have been found, including **some very large ones in Waikōwhai Park and Captains Bush**, and seedlings are fairly plentiful. Hinau (*Elaeocarpus dentatus*) is rare (the biggest being 62 cm diameter and 20 m in height), while kohuhu (*Pittosporum tenuifolium*) is frequent and of large size in the eastern part of Captains Bush. Towai (*Weinmannia sylvicola*) appears to be absent (though a common tree in Gittos Domain, Blockhouse Bay – Wilcox 2016), and taraire (*Bellschmiedia tarairi*) and tawa (*B. tawa*) are represented only by small seedlings. On damper sites there are tangles of supplejack (*Ripogonum scandens*), and a few terrestrial patches of kiekie (*Freycinetia banksii*). Otherwise, climbers and epiphytes are notably uncommon, except for the climbing ferns *Icarus filiformis* and *Microsorium scandens* and a few plants of pohuehue (*Muehlenbeckia australis*) smothering smaller trees, *Clematis paniculata* (in flower 16 Sep 2017), some robust vines of bush lawyer (*Rubus cissoides*), *Metrosideros perforata*, *M. fulgens* and *Parsonsia heterophylla*. Both Millener (1979) and Cranwell (1981) mention the occurrence of *Metrosideros carminea*, though no sightings have been made recently. The main ground orchid we have recorded is *Pterostylis banksii*, which is particularly plentiful in the westernmost part of **Waikōwhai Park, including beside the stepway down from Cape Horn Road**. Onion orchid (*Microtis unifolia*) occurs in a few places beside the track through Captains Bush.

The dominant tree fern throughout is silver fern (*Cyathea dealbata*), with mamaku (*C. medullaris*) present on moister sites. *Dicksonia squarrosa* is present but localised in just a few damper places.

Ground ferns are profuse in the bush and include *Asplenium lamprophyllum* (Fig. 8), *Austroblechnum membranaceum* (in damp gullies) and *Lastreopsis microsora* in great abundance. Gully fern (*Pneumatopteris pennigera*) is common throughout in moist gullies. Maidenhair fern (*Adiantum cunninghamii* and *A. viridescens*), *Lastreopsis glabella*, shining spleenwort (*Asplenium oblongifolium*), *Polystichum neozelandicum*, and rasp fern (*Doodia australis*) are frequent on drier slopes, together with occasional *Adiantum hispidulum* and *Pellaea rotundifolia*. *Austroblechnum lanceolatum* and king fern (*Ptisana salicina*) (Fig. 9), are uncommon and confined to damp, shady gullies. In more open low forest, including planted areas, *Pteris tremula* is abundant. *Lastreopsis velutina* is present in Captains Bush (the ABS group finding six plants there on 16 Sep 2017). Filmy ferns are absent except for one record of *Hymenophyllum flabellatum*, for the same reason that there are no perching epiphytes

(such as *Astelia hastata* or *A. solandri*) – the forest is not humid enough due to its proximity to the sea and consequent exposure to drying winds. Apart from *Icarus filliformis* and *Microsorium scandens* (which are both terrestrial, too), other climbing ferns here are leather fern (*Pyrrosia elaeagnifolia*) and hounds tongue (*Microsorium pustulatum*), while *Asplenium polyodon*, *Rumohra adiantiformis* (first recorded by Ben Goodwin on ABS visit, 16 Sep 2017), and *Tmesipteris lanceolata* (on *Cyathea dealbata* trunks) are low epiphytes.

Weed and pest control (possums, rats, mice, stoats, cats) has been carried out intensively and for several years in this bush, and the results are dramatic, with an abundance of seedling recruitment of numerous species. Control of rodents will have greatly reduced seed predation and increased birdlife, creating good opportunities for seed dispersal and germination success. Control of smothering ground weeds – particularly wandering jew (*Tradescantia fluminensis*), climbing asparagus (*Asparagus scandens*) and African clubmoss (*Selaginella kraussiana*) – will likewise have improved the chances of native seedling establishment.

Low regenerating forest

Much of Waikōwhai Park is clothed with a low forest of small trees, dominated by mapou, coastal karamu, pigeonwood, hangehange and silver tree fern. Native broom (*Carmichaelia australis*) is rare. Tree fuchsia (*Fuchsia excorticata*) occurs in small numbers as multi-branched bushes 1-3 m tall along the track through Kingswood Reserve. Substantial areas of this forest type were at one time the understorey in a pine plantation that was felled in the 1970s (Pishief & Shirley 2015). Pohutukawa are taking root on tree fern trunks, and kohekohe is starting to get established, indicating that in time a closed-canopy high forest may develop.

Planted native forest (revegetation)

The slopes below the main carpark down towards Faulkner Bay are clothed in planted native forest associated with the rehabilitation of the site following the closure of the rubbish dump in 1974. The predominant tree species in the forest are cabbage tree (*Cordyline australis*), pohutukawa, kanuka (*Kunzea robusta*), and totara (*Podocarpus totara*), the canopy being 6-10 m tall. There are also some tainui (*Pomaderris apetala*) and a few kauri (*Agathis australis*) and rimu. Other plantings include karamu (*Coprosma robusta*), lemonwood (*Pittosporum eugenioides*), haekaro (*Pittosporum umbellatum*), manuka (*Leptospermum scoparium*) and flax (*Phormium tenax*) – now largely suppressed except on the margins. The more mature planted forest has a developing understorey of pigeonwood, mapou, mahoe, kawakawa, coastal karamu and karo, and occasional kohekohe. The ground cover is mostly

bare in the younger stands, but with some *Carex uncinata* and *Oplismenus hirtellus* getting established in places. Wandering jew tends to take over in the denser stands on moist sites. Ferns are absent except for the occasional *Pteris tremula*. Cabbage tree has been a particularly successful performer in this reforestation project. The trees have stout trunks and healthy crowns. Totara has also grown well here and so has pohutukawa (though nearly all the latter are multiple-stemmed).

Coastal strand and cliff plants

Shore habitats include shell banks and cliff bases (some with fresh-water seepages). Native celery (*Apium prostratum*) is common. *Triglochin striata*, *Isolepis cernua* and *Lobelia anceps* can be found just above the high-tide mark at the base of cliffs at the western end of Waikōwhai Bay (and *Lobelia anceps* also along many of the bush tracks, too). Tall fescue (*Schedonorus arundinaceus*) and wild radish (*Raphanus raphanistrum*) are commonly seen on beaches, while *Carex flagellifera*, *Poa anceps* and *Lachnagrostis billardierei* are coastal grasses of cliffs and ledges. In April 2017 young plants of New Zealand spinach (*Tetragonia tetragonioides*) appeared in good numbers on the sandy beach at Faulkner Bay.

Exotic trees

A number of exotic trees have been planted within or on the edges of Waikōwhai Park. Norfolk Island hibiscus (*Lagunaria patersonii*), brush box (*Lophostemon confertus*), and crack willow (*Salix × fragilis*) can be seen on the main open grassed area, while bangalay (*Eucalyptus botryoides*) and Monterey pine (*Pinus radiata*) are prominent off the end of Cape Horn Road. There are several *Metrosideros collina* at the main carpark, and a fine specimen of strawberry tree (*Arbutus unedo*) beside the road between the main carpark and Faulkner Bay. A large coral tree (*Erythrina × sykesii*) and several Norfolk Island hibiscus trees have been planted at the end of Aldersgate Road at the entrance to Kingswood Reserve. Large trees of hawthorn (*Crataegus laevigatus*) can be found in open regenerating bush and sometimes in closed bush in Waikōwhai Park and Captains Bush. Many of these appear to be survivors of the early days when Captain farmed some of this land and it later reverted back to native vegetation. Two large maritime pines (*Pinus pinaster*) in Captains Bush probably also date back to Captain's farming activities. Unlike Wattle Bay (Wilcox & Kowhai 2015) there are no stands of *Acacia* species in Waikōwhai Domain.

A fine specimen of an 'exotic' native tree, black beech (*Fuscospora solandri*), can be seen near the bush edge beside the main track to Waikōwhai Beach (Wilcox 2004). Exactly when it was planted is not

known. Its diameter was 25 cm in 1980 (AK 151953), 55 cm in 2004, and 64 cm in 2017 (when its height was 12 m).

Weeds

The main environmental weeds of the area – those that have seriously penetrated coastal forest and kohekohe forest – are African clubmoss, climbing asparagus and wandering jew. African clubmoss is exceptionally bad at Waikōwhai, and a successful biological control agent cannot come quickly enough (see Blanchon 2016 regarding promising fungal pathogens being investigated at Unitec). It was not recorded in 1991 by Cameron and Beever (2017) and nor by Esler (1990) in Captains Bush, but is now abundant there. Within the kohekohe forest there is also some wild ginger (*Hedychium gardnerianum*), some seedlings and saplings of monkey apple (*Syzygium smithii*), and seedlings and a few saplings of *Fatsia japonica* (Fig. 10). Coastal weeds of note are Japanese spindle tree (*Euonymus japonicus*) along the coastline of Wesley Bay and the main Waikōwhai Beach, Mexican daisy (*Erigeron karvinskianus*) which has taken over most of the coastal bush slopes, and cineraria (*Pericallis ×hybrida*), now a spectacular spring wildflower. Veldt grass (*Ehrharta erecta*) is very abundant along all the tracks and road margins, together with selfheal (*Prunella vulgaris*).

Abundant marginal weeds of the bush edges are onion weed (*Allium triquetrum*), umbrella sedge (*Cyperus eragrostis*), ox-tongue (*Helminthotheca echioides*), cudweed (*Gamochaeta simplicicaulis*), hawks beard (*Crepis capillaris*), nipplewort (*Lapsana communis*), ox-eye daisy (*Leucanthemum vulgare*), toatoa (*Haloragis erecta*), willow-herb (*Epilobium ciliatum*), shivery grass (*Briza minor*), meadow grass (*Poa trivialis*), veldt grass, cocksfoot (*Dactylis glomerata*), prairie grass (*Bromus willdenowii*) and curled dock (*Rumex crispus*). Stone parsley (*Sison amomum*) occurs in one of the ditches, and has spread into adjacent open bush. Grassy slopes are dominated by kikuyu grass (*Cenchrus clandestinus*) and meadow grass, and in late summer, carpet grass (*Axonopus fissifolius*).

Scrambling or climbing weeds present include moth plant (*Araujia hortorum*), greater bindweed (*Calystegia silvaticum*), German ivy (*Delairea odorata*), greater morning glory (*Ipomoea indica*), honeysuckle (*Lonicera japonica*), blue passionflower (*Passiflora caerulea*), banana passionfruit (*Passiflora tarminiana*) and nasturtium (*Tropaeolum majus*). They mainly occur on slopes below Waikōwhai Road where garden rubbish is commonly dumped.

Plants of damp places

There are several small creeks and ditches (open drains) in the area. Plants frequenting these damp

places are starwort (*Callitriche stagnalis*), water cress (*Rorippa nasturtium-aquatica*), alligator weed (*Alternanthera philoxeroides*), *Hydrocotyle tripartita*, buttercup (*Ranunculus repens*), native willow weed (*Persicaria decipiens*), water bent (*Polypogon viridis*), penny royal (*Mentha pulegium*), *Isolepis sepulcralis*, *I. reticularis*, *Schoenus maschalinus* and *Juncus articulatus*. More locally can be found nahui (*Alternanthera nahui*), creeping cinquefoil (*Potentilla reptans*) and sweet grass (*Glyceria declinata*). The native starwort *Callitriche muelleri* forms conspicuous patches in dampish places beside the main track to Captains Bush, and the native bush buttercup, *Ranunculus reflexus*, occurs in a few places beside the Waikōwhai Road. *Lobelia anceps* is not confined to the coastal cliff bases but occurs commonly throughout Waikōwhai Park in damp places along the more open track margins. *Hydrocotyle moschata* grows in damp spots along the bush track through Kingswood Reserve. *Epilobium ciliatum* is particularly common along the open margins of ditches, thriving where there has been weed spraying to control grass growth. *Epilobium tetragonum* is also present (e.g. in wet area at Faulkner Bay at bottom of Waikōwhai Rd), and is generally taller and flowers later than *E. ciliatum*. *Epilobium nummulariifolium* can be found in some damp spots beside the Faulkner Bay road, and another native willow herb, the somewhat weedy *E. cinereum*, favours drier verges. The native *Senecio hispidulus* occurs along several of the tracks, but it is particularly noticeable beside the stepway down from Cape Horn Road.

Carex sedges are common throughout Waikōwhai Park, particularly beside the tracks. As well as *C. uncinata* can be found *C. solandri*, *C. ochrosaccus*, *C. lambertiana* and *C. dissita*, and with a few colonies of *C. lessoniana* in swampy spots. On damp ground beside the steps leading down to the western end of Waikōwhai Beach there is a patch of the introduced *C. divisa*, otherwise usually found in Auckland on the margins of salt marsh.

Lower plants

We come now to the intimate flora of damp soil, clay banks, rocks, dead wood and tree trunks – the habitat of lichens, mosses and liverworts, and also fungi and a few algae. While we have paid reasonable attention to the more prominent species during our year-long survey, our lists will be by no means complete.

Lichens: Starting with lichens, a very prominent one at Waikōwhai is fluffy dust lichen (*Lepraria finkii*). It is a greenish-grey leprose (powdery) species abundant on the trunks of silver tree fern. It can be seen throughout the park in all seasons, and also forms a fine, crumbly coating on the vertical cliffs at Aldersgate Point. Another tree-trunk dweller, this time on cabbage trees, is *Collema kauaiense* – the so-called jelly lichen. It is dark-coloured and soft

(with the cyanobacterium *Nostoc* as the photobiont), and particularly noticeable during wet weather. And mention should be made of the curious lichen *Phaeographis mucronata*, found on the bark of kahikatea trees. It is a crustose species with prominent squiggly apothecia. *Porina exocha* can be found on the same host. Another crustose species, *Thelotrema lepadinum*, is also found on smooth tree bark. Pohutukawa trees have several bark-dwelling lichens of which *Parmotrema reticulatum*, yellow specklebelly (*Pseudocyphellaria crocata*) and old man's beard (*Usnea rubicunda*) are particularly common, and with *Ramalina celastri* and *Usnea cornuta* also often present. Terrestrial lichens are **very limited at Waikōwhai**, but *Stereocaulon corticulatum* can be found on clay banks, *Stereocaulon ramulosum* and *Heterodermia speciosa* on rocks at the Cape Horn carpark, and *Xanthoparmelia scabrosa* on the tar-sealed **Waikōwhai Road**. Large rocks near the main carpark have the conspicuous foliose lichens *Flavoparmelia soredians* and *Parmotrema reticulatum*, while the bright yellow maritime lichen *Defourea ligulata* occurs very sparsely on the basaltic seawall at Faulkner Bay.

Hornworts: In winter and spring fine colonies of the hornwort *Phaeoceros carolinianus* occupy bare ground near the playground area (harbour lookout platforms and bush edge) on dampish sites that have been sprayed to eliminate weeds. The horn-like sporophytes first appear on the green thalloid gametophytes in July, with the distinctive yellow spores ripening in spring (Fig. 11).

Liverworts: The thallose liverwort *Lunularia cruciata* often grows in this same habitat as *Phaeoceros carolinianus*. *Metzgeria furcata* is abundant on the bark of karaka, kohekohe and mahoe. Within the darkest and dampest parts of the forest the thallose species *Lobatiriccardia alterniloba* is fairly common on the ground, *Pallavicinia lyelli* occurs more locally, while on steep, wet coastal cliffs can be found *Marchantia foliacea* (Fig. 12). A very common leafy liverwort on tree trunks (e.g. kohekohe, mahoe, milk tree) is *Spruceanthus olivaceus*. Two leafy liverworts form yellowish-green carpets on soil on roadside banks and rather dry steep forest slopes, these being *Chiloscyphus semiteres* and *Heteroscyphus supinus*. A colony of *Balantiopsis diplophylla* var. *hockenii* with abundant sporophytes was found beside the track in Captains Bush during the ABS visit on 16 Sep 2017.

Mosses: The forest at Waikōwhai is not damp and humid enough year-round to support many epiphytic mosses, but there are good numbers of terrestrial species in damp, shady forest, hardy species frequenting banks and rock faces, and several are found in marginal open habitats and damp drains. Species occurring on the ground or on



Fig. 10. *Fatsia japonica* (Araliaceae), Waikōwhai Park, 5 Nov 2016. Seedlings and small saplings of this exotic shrub are found sparsely within dense forest.



Fig. 11. *Phaeoceros carolinianus*, Waikōwhai Park, 12 Oct 2016. This rather weedy hornwort favours bare ground following herbicide spraying.



Fig. 12. *Marchantia foliacea*, Waikōwhai Park, 11 Nov 2016. This large thallose liverwort can be found on wet seeps on coastal cliffs.

exposed tree roots in dark, damp kohekohe forest gullies are *Distichophyllum microcarpum*, *Echinodium hispidum*, *Fissidens leptocladus*, *Hypnodendron arcuatum*, *Pseudotaxiphyllum falcifolium* and *Thamnobryum pandum*. One of the commonest mosses to be seen along the various forest tracks is the introduced *Fissidens taxifolius*, forming attractive carpets. Roadsides provided a habitat for several terrestrial mosses, notably *Racopilum cuspidigerum* var. *convolutaceum* and *Weissia controversa*. Open bush margins and ditches support several large mosses such as *Calliergonella cuspidata*, *Kindbergia praelonga*, *Pseudoscleropodium purum*, *Thuidium furfurosum* and *T. sparsum*. In coastal freshwater seeps and on damp cliffs can commonly be found *Bryum clavatum*, *Gymnostomum calcareum*, *Philonotis tenuis*, *Rosulabryum campylothecium* and *Tridontium tasmanicum* (Fig. 13). *Bryum clavatum* also thrives in autumn and winter in spectacular colonies lining the edge of flowing drains beside the Faulkner Bay road. Milk moss (*Leucobryum javense*) has been found on the spongy bark at the base of large *Eucalyptus botryoides* trees.



Fig. 13. *Tridontium tasmanicum*, Waikōwhai, 16 Sep 2017. This semi-aquatic moss grows in profusion beside a small waterfall on the coastal cliffs between Faulkner Bay and Wesley Bay.

Algae: Two species of subaerial algae have been recorded from the Park. These are *Cephaleuros lagerheimii* which commonly grows on the leaves of mahoe as an obvious yellow-brown blotch, and another unusual green alga, *Trentepohlia abietina*, forming golden-brown colonies on the stems of silver tree fern. The yellow-green alga *Vaucheria canalicularis* has been recorded from freshwater flushes in Captains Bush, growing there in association with the moss *Philonotis tenuis*.

Marine algae occur on the damp, shaded upper shore of the Manukau Coast, and are a prominent feature. Green algae are particularly common, and those present are *Pseudorhizoclonium* cf. *africanum*, *Rhizoclonium riparium*, *Ulva compressa*, *U. intestinalis*, *U. procera*, and *Wittrockiella salina*. In addition, *Chaetomorpha linum* grows in Faulkner Bay at the base of the seawall. There are no brown algae present, but several red algae can be found there at all seasons. *Capreolia implexa* is the commonest, forming dark tangled cushions, and *Bostrychia intricata* and *B. harveyi* occur at the uppermost tidal level. The broad intertidal rock platforms are devoid of alga, the typical *Hormosira banksii*-*Corallina officinalis* associations of Auckland's eastern shores being absent from the inner Manukau Harbour, though present westwards from Cornwallis. Shallow rock pools may support growth of *Gracilaria chilensis* and *Caulacanthus ustulatus*, and several other red algae wash up on the shore as drift (e.g. *Solieria* cf. *chordalis*).

Some noteworthy botanical features

- Abundance of large trees of kōwhai (*Sophora chathamica*) and kohekohe (*Dysoxylum spectabile*) throughout the mature broadleaved forest.
- Abundance of the terrestrial ferns *Asplenium lamprophyllum* and *Lastreopsis microsora* in kohekohe forest.
- Presence of several mature trees and numerous seedlings of milk tree (*Streblus heterophyllus*).
- Sparse presence of hinau, titoki and mangeao
- Presence of *Fuchsia excorticata*, a rarity in **Auckland's urban native bush**.
- Occurrence of *Rhabdothamnus solandri* in Captains Bush and **parts of Waikōwhai Park**.
- Complete lack of filmy ferns, and of epiphytes on the large trees (puriri, kahikatea, karaka, kowhai, kohekohe, rewarewa).
- Presence of three naturalised ferns, *Adiantum raddianum*, *Nephrolepis cordifolia* and *Pteris cretica*.
- Presence of several native herbs, for example *Alternanthera nahui*, *Callitriche muelleri*, *Epilobium nummulariifolium*, *Hydrocotyle moschata*, *Ranunculus reflexus* and *Senecio hispidulus*.

A list of species recorded is provided in the Appendix. The vascular plant tally including cultivated ones is 480 species: 195 (41%) native and 285 (59%) introduced. Exotic herbs are a very significant component of the flora, with 145 species recorded.

Acknowledgements

We are grateful to Dan Blanchon (lichens), Jessica Beever (mosses) and John Braggins (liverworts) for assistance with identifications.

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Appendix: Species list for Waikōwhai Park, Captains Bush, Hibiscus Reserve, Hillsdale Reserve and Kingswood Reserves, Hillsborough, Auckland. Compiled by Mike Wilcox & Jack Warden.

* = introduced species; cult. = cultivated. The list is based on field observations by the authors (Oct 2016 to August 2017), ABS visit on 16 Sep 2017, and herbarium records of the Auckland Museum, especially the extensive collections made by P. Hynes, 1951–1953, and Cameron & Beever 2017.

NON-VASCULAR SPECIES

FUNGI

<i>Amanita muscaria</i> *	Fly agaric. Near <i>Pinus pinaster</i> , 8 May 2017.
<i>Auricularia cornea</i>	Wood ear fungus. On dead tree, 5 Nov 2016; on dead branch, 7 Nov 2016; on dead mahoe, 8 Nov 2016.
<i>Calocera</i> sp.	Growing out of dead stump, 13 May 2017.
<i>Clavulinopsis</i> sp.	Trackside banks, 13 May 2017.
<i>Coprinus comatus</i>	Shaggy mane, Track through Captains Bush, 8 May 2017.
<i>Favolaschia calocera</i> *	Orange pore fungus. WA kowhai Road edge on standing decaying trunk of kowhai, 12 May 2017.
<i>Ganoderma applanatum</i>	Bracket fungus. On a big tree in bush below Cape Horn Rd, 1 Nov 2016; on living kanuka tree, 8 Nov 2016.
<i>Ileodictyon cibarium</i>	White basket fungus. In mulch around planted trees, 17 Jul 2001. Captains Bush, 8 May 2017; Waikowhai Park, Cape Horn end, 11 July 2017.
<i>Pleurotus</i> sp.	Oyster mushroom. On decaying log, 12 May 2017.
<i>Trametes</i> sp.	Growing on old decaying kowhai stem, 13 May 2017.

LICHENS

<i>Chrysothrix candelaris</i>	On pohutukawa bark, Faulkner Bay, 11 Nov 2016.
<i>Collema kauaiense</i>	On bark of cabbage tree, near lookout platform, Waikowhai Park, 12 Oct 2016.
<i>Cladonia darwinii</i>	On open trackside bank, Kingswood Reserve, 20 Mar 2017.

<i>Dufourea ligulata</i> (<i>Jackelixia ligulata</i> ; <i>Xanthoria ligulata</i>)	On basalt sea-wall and rock near boat launch, 5 Oct 2017.
<i>Flavoparmelia soredians</i>	On large rocks beside the road below the main carpark, 19 July 2017.
<i>Heterodermia obscurata</i>	On basalt rocks, Cape Horn entrance, 11 July 2017.
<i>Heterodermia speciosa</i>	On the bark of a lacebark tree, bush bordering Cape Horn Road, 2 Aug 2017.
<i>Lepraria finkii</i>	Abundant greenish grey leprose lichen on the trunks of <i>Cyathea dealbata</i> , in shade, 8 Nov 2016; forming a grey leprose coating on vertical sea cliffs at Aldersgate Point, 20 March 2017. On bark of pohutukawa tree, 4 July 2017.
<i>Parmotrema perlatum</i>	On wooden rails, Wesley Bay, 13 Jul 1998.
<i>Parmotrema reticulatum</i>	On bark on branches of pohutukawa tree overhanging the shore, Waikowhai Bay, 29 Oct 2016; on wood of old eucalypt stump, stepway from Cape Horn Road, 22 Feb 2017.
<i>Phaeographis mucronata</i>	Crustose lichen on bark of kahikatea, 9 May 2017; on bark of <i>Pittosporum umbellatum</i> , 1 June 2017.
<i>Porina exocha</i>	Loosely-attached crustose lichen on bark of kahikatea, 9 May 2017; bark of kohekohe tree, Captains Bush, 4 July 2017.
<i>Pseudocyphellaria crocata</i>	On large branch of a pohutukawa tree in open, 9 Dec 2016.
<i>Ramalina celastri</i>	On pohutukawa bark, in open, 14 Nov 2016; 20 Mar 2017.
<i>Stereocaulon ramulosum</i>	On basalt rocks, Cape Horn entrance, 22 Feb 2017, 11 July 2017.
<i>Stereocaulon corticulatum</i>	On clay bank (AK 192531).
<i>Thelotrema lepadinum</i>	Crustose lichen on bark of <i>Myrsine australis</i> , Captains Bush, 4 Jul 2017.
<i>Usnea cornuta</i>	On bark of <i>Hedycarya arborea</i> , 5 Nov 2016; on pohutukawa bark, 14 Nov 2016.
<i>Usnea rubicunda</i>	On branches of pohutukawa, 17 Oct 2016; on ground in forest, fallen from trees, 14 Nov 2016;
<i>Xanthoparmelia australasica</i>	On basalt rocks at carpark, end of Cape Horn Rd, 22 Feb 2017.
<i>Xanthoparmelia scabrosa</i>	On tar seal, Waikowhai Rd, near playground, 12 Oct 2016; on tar seal, end of Aldersgate Rd, 4 Jan 2017; on basalt rocks at carpark, Cape Horn Rd entrance, 22 Feb 2017.
<i>Xanthoria parietina</i>	On basalt rocks at carpark, end of Cape Horn Rd, 5 Oct 2017.

SUBAERIAL & TERRESTRIAL ALGAE

<i>Cephaleuros lagerheimii</i>	Yellowish spots on mahoe leaves, 26 Oct 2016.
<i>Nostoc</i> sp.	Faulkner bay, on damp rock face with mosses, 7 Nov 2016.
<i>Trentepohlia abietina</i>	On trunk of <i>Cyathea dealbata</i> , 13 Dec 2016.
<i>Vaucheria canalicularis</i>	With the moss <i>Philonotis tenuis</i> in freshwater flush, Captains Bush, 20 Nov 2016, 9 May 2017.

MARINE ALGAE

<i>Bostrychia harveyi</i>	<i>Polysiphonia isogona</i>
<i>Bostrychia intricata</i>	<i>Pseudorhizoclonium</i> cf. <i>africanum</i>
<i>Capreolia implexa</i>	<i>Pyropia suborbiculata</i>
<i>Caulacanthus ustulatus</i>	<i>Rhizoclonium riparium</i>
<i>Ceramium lenticulare</i> (drift)	<i>Schizoseris dichotoma</i> (drift)
<i>Erythrogloussum undulatisimum</i> (drift)	<i>Solieria</i> cf. <i>chordalis</i> (drift)
<i>Gelidium caulacanthum</i>	<i>Stenogramma interruptum</i> (drift)
<i>Gracilaria chilensis</i>	<i>Ulva compressa</i>
<i>Haraldiophyllum crispatum</i> (drift)	<i>Ulva intestinalis</i>
<i>Neosiphonia sertularioides</i>	<i>Ulva procera</i>

HORNWORTS

<i>Phaeoceros carolinianus</i> (Fig. 11)	Abundant on bare ground on edge of bush. Extensive colony below lookout platform, Waikowhai Park, ripe spores 12 Oct 2016, 8 Nov 2016; vegetative thalli with emerging sporophytes ("horns"), 19 July 2017.
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LIVERWORTS

<i>Balantiopsis diplophylla</i> var. <i>hockenii</i>	Beside track, Captains Bush, abundant sporophytes, 16 Sep 2017.
<i>Chiloscyphus semiteres</i> (<i>Lophocolea semiteres</i>)	Rock faces in shade, cliffs, Waikowhai Bay, abundant, 11 Nov 2016; trackside banks in bush, stepway from Cape Horn Rd, 18 Nov 2016.
<i>Chiloscyphus subporosus</i>	On bark of a pohutukawa tree in open, 9 Dec 2016.
<i>Fossombronia pusilla</i> or <i>F. wondraczeckii</i>	Damp clay banks, crispy rosettes, prominent capsules, 10 Aug 2001; Captains Bush beside track, 16 Sep 2017.
<i>Heteroscyphus supinus</i>	A common yellowish liverwort on dry banks beside track, Kingswood Reserve, 2 Nov 2016; Kingswood Reserve, dry trackside, 5 Dec 2016.

<i>Lobatirricardia alterniloba</i> (<i>Aneura orbiculata</i>)	Abundant on damp ground in dense bush below Cape Horn Rd, 1 Nov 2016; on damp rock face, 5 Nov 2016.
<i>Lunularia cruciata</i> *	Abundant on open, bare banks on forest edge, Waikowhai Park, 12 Oct 2016; bare ground under planted pohutukawa tree, Faulkner Bay, 7 Nov 2016; beside road down to Watercare pump, 2 Aug 2017.
<i>Marchantia foliacea</i> (Fig. 12)	Wet rock face, Waikowhai Bay, 11 Nov 2016.
<i>Metzgeria furcata</i>	Damp clay banks, 10 Aug 2001. On bark of kohekohe trunk, 13 Dec 2016; on bark of mahoe, karaka, kohekohe, and kowhai, 15 June 2017.
<i>Metzgeria leptoneura</i>	Track-side bank, mixed with <i>Heteroscyphus supinus</i> , Kingswood Reserve, 5 Dec 2016.
<i>Pallavicinia lyelli</i>	On damp ground in shaded bush by creek, Waikowhai Park, 15 Feb 2017.
<i>Spruceanthus olivaceus</i> (<i>Archilejeunea olivacea</i>)	On the bark of <i>Streblus heterophyllus</i> , 5 Nov 2016; on bark of mahoe tree, 9 Dec 2016; on kohekohe bark, 4 July 2017.

MOSSES

<i>Bryum clavatum</i>	Coastal seeps, Faulkner Bay, 19 Oct 2016; road to Faulkner Bay, abundant in drains on edge of road, 2 May 2017.
<i>Calliergonella cuspidata</i> (<i>Acrocladium cuspidatum</i>)	Ditch above playground, Waikowhai Park, 8 Nov 2016.
<i>Campochaete</i> sp.	On bark of <i>Myrsine australis</i> in bush, Cape Horn Rd stepway, 18 Nov 2016; on bark of <i>Myrsine australis</i> in bush, Cape Horn stepway, 9 Dec 2016.
<i>Cyathophorum bulbosum</i>	Beside track in kohekohe forest, Waikowhai Park, 16 Sep 2017.
<i>Ditrichum difficile</i>	Waikowhai Park, beside path towards Faulkner Bay, 11 Nov 2016; Captains Bush, 9 May 2017.
<i>Distichophyllum microcarpum</i>	On damp ground in forest, creek head, 5 Nov 2016; flush, Captains Bush, 20 Nov 2016.
<i>Echinodium hispidum</i>	On exposed tree roots, damp, shaded creek banks in kohekohe forest, 1 Nov 2016.
<i>Fissidens leptocladus</i>	On damp soil in dark, shaded creek bed in bush, 14 Nov 2016.
<i>Fissidens taxifolius</i> *	Common in forest on track margins, 24 Oct 2016; in native bush, 14 Nov 2016, 9 May 2017.
<i>Gymnostomum calcareum</i>	Faulkner Bay, on damp rock face, 7 Nov 2016; Faulkner Bay, 11 Nov 2016.
<i>Hypnodendron arcuatum</i>	Damp bank, in bush, 14 Nov 2016.
<i>Hypnum cupressiforme</i>	Covering a large rock in semi-shade alongside the road to Faulkner Bay, 7 Nov 2016.
<i>Hypopterygium rotulatum</i>	On ground in scrubby forest ex pine plantation, 8 Nov 2016.
<i>Kindbergia praelonga</i> * (<i>Stokesiella praelonga</i>)	Extensive patches on bare ground on grassy margins, 12 Oct 2016.
<i>Leptostomum inclinans</i>	On the trunk of a mahoe tree, 9 Dec 2016.
<i>Leucobryum javense</i>	On spongy bark of <i>Eucalyptus botryoides</i> , Waikowhai Park, Cape Horn Road end, 11 July 2017.
<i>Philonotis tenuis</i>	Kingswood Reserve, damp seepage, semi-aquatic, prominent globular capsules, 5 Dec 2001; Captains bush, damp flush, 20 Nov 2016.
<i>Pseudoscleropodium purum</i> *	Forms extensive patches on bare ground on grassy margins, 17 Oct 2016.
<i>Pseudotaxiphyllum falcifolium</i>	Mats on the ground and on raised roots of kohekohe, 13 Dec 2016.
<i>Ptychomnion aciculare</i>	Beside path to first pylon from parking area, 10 Nov 2016.
<i>Racopilum cuspidigerum</i> var. <i>convolutaceum</i>	Roadside bank, Waikowhai Rd, 5 Nov 2016; edge of tar-seal road to Faulkner Bay, 7 Nov 2016; trackside banks in bush, stepway from Cape Horn Rd, 18 Nov 2016; on wooden joists of stepway, 18 Nov 2016; wooden bridge in bush, 3 Feb 2017; beside road down to Watercare pump, 2 Aug 2017.
<i>Racopilum robustum</i>	Edge of Waikowhai Rd, 3 Feb 2017.
<i>Rhynchostegium tenuifolium</i>	Captains Bush, base of a <i>Cyathea dealbata</i> , 4 July 2017.
<i>Rosulabryum campylothecium</i>	Faulkner Bay, on damp rock face, 7 Nov 2016.
<i>Sematophyllum homomallum</i>	J.K. Bartlett collection, AK 188946 [1975–85].
<i>Thamnobryum pandum</i>	Terrestrial, damp, dark creek banks in kohekohe forest, 1 Nov 2016.
<i>Thuidium furfurosum</i>	On ground at edge of grass under a planted pohutukawa tree, 7 Nov 2016.
<i>Thuidium sparsum</i> (<i>Thuidiopsis sparsa</i>)	Growing on concrete curbing on Waikowhai Rd, 22 Nov 2016; mixed with <i>Phaeoceros</i> and <i>Lunularia</i> , 18 July 2017.
<i>Tridontium tasmanicum</i> (Fig. 13)	Forming brownish turf on steep rock face with seepage, between Faulkner Bay and Wesley Bay, 29 Oct 2016.
<i>Weissia controversa</i>	Dense green hummocky cushions on bare ground beside first pylon above main parking area, Waikowhai Park, 10 Nov 2016; trackside banks in bush, stepway from Cape Horn Rd, 18 Nov 2016; trackside, above Wesley Bay, 9 May 2017.

Appendix cont.

VASCULAR SPECIES

LYCOPHYTES

Selaginella kraussiana *

FERNS

Adiantum cunninghamii

Adiantum fulvum

Adiantum hispidulum

Adiantum raddianum *

Adiantum viridescens

Asplenium bulbiferum

Asplenium flaccidum

Asplenium gracillimum

Asplenium hookerianum

Asplenium lamprophyllum (Fig. 8)

Asplenium lamprophyllum
bifurcate mutant

Asplenium oblongifolium

Asplenium polyodon

Austroblechnum lanceolatum
(*Blechnum chambersii*)

Austroblechnum membranaceum
(*Blechnum membranaceum*)

Cyathea dealbata

Cyathea medullaris

Deparia petersenii

Dicksonia squarrosa

Doodia australis (*Blechnum parrisiae*)

Doodia squarrosa
(*Blechnum zeelandicum*)

Hymenophyllum flabellatum

Icarus filliformis (*Blechnum filliforme*)

Lastreopsis glabella

Lastreopsis microsora
subsp. *pentangularis*

Lastreopsis velutina

Microsorium pustulatum

Microsorium scandens

Nephrolepis cordifolia *

Paesia scaberula (Cameron &
Beever 2017)

Parablechnum novae-zelandiae
(*Blechnum novae-zelandiae*)

Pellaea rotundifolia

Pneumatopteris pennigera

Polystichum neozelandicum

Pteridium esculentum

Pteris cretica *

Pteris macilentia

Pteris saxatilis

Pteris tremula

Ptisana salicina (Fig. 9)

Pyrrosia eleagnifolia

Rumohra adiantiformis

Tmesipteris elongata (Cameron &
Beever 2017)

Tmesipteris lanceolata

CONIFERS

Agathis australis (cult.)

Dacrycarpus dacrydioides (Fig. 7)

Dacrydium cupressinum
(wild & cult.)

Pinus pinaster * (cult.)

Pinus radiata * (cult.)

Podocarpus macrophyllus * (cult.)

Podocarpus totara (wild & cult.)

MONOCOTS

Grasses

Agrostis capillaris *

Agrostis stolonifera *

Aira caryophylla *

Anthoxanthum odoratum *

Arrhenatherum elatius *

Austroderia fulvida (R.O. Gardner,
15 Feb 1981, AK 153358, Wesley
Bay, & cult.)

Avena barbata *

Axonopus fissifolius *

Bambusa oldhamii * (cult.)

Briza minor *

Bromus catharticus var. *elatius* *

Bromus diandrus *

Bromus hordeaceus *

Bromus willdenowii *

Cenchrus clandestinus *

Cortaderia selloana subsp. *jubata* *

Cortaderia selloana subsp.
selloana *

Cynodon dactylon *

Dactylis glomerata *

Deyeuxia quadriseta

Dichelachne crinita (Cameron &
Beever 2017)

Digitaria ciliaris *

Digitaria sanguinalis *

Echinochloa crus-galli *

Echinochloa crus-pavonis *

Ehrharta erecta *

Eleusine indica *

Glyceria declinata *

Holcus lanatus *

Lachnagrostis billardierei

Lachnagrostis filliformis

Lachnagrostis littoralis
(R.O. Gardner, 15 Feb 1981,
AK 153374, Wesley Bay)

Lagurus ovatus *

Lolium multiflorum *

Lolium perenne *

Lolium rigidum *

Microlaena stipoides

Oplismenus hirtellus
subsp. *hirtellus*

Oplismenus hirtellus
subsp. *imbecillis*

Panicum dichotomiflorum *

Paspalum dilatatum *

Paspalum urvillei *

Phalaris minor *

Poa anceps

Poa annua *

Poa trivialis *

Polypogon fugax *

Polypogon viridis *

Rytidosperma gracile

Rytidosperma racemosum *

Rytidosperma unarede (Cameron &
Beever 2017)

Schedonorus arundinaceus *

Setaria gracilis *

Setaria palmifolia *

Setaria pumila *

Sporobolus africanus *

Vulpia bromoides *

Vulpia myuros *

Sedges and rushes

Carex dissita

Carex divisa *

Carex divulsa *

Carex flagellifera

Carex geminata

Carex inversa

Carex lambertiana

Carex lessoniana

Carex ochrosaccus

Carex secta (cult.)

Carex solandri

Carex spinirostris

Carex testacea

Carex uncinata

Carex virgata

Cyperus albostrigatus *
Cyperus congestus *
Cyperus eragrostis *
Cyperus ustulatus
Ficinia nodosa
Gahnia lacera
Gahnia setifolia
Isolepis cernua
Isolepis levynsiana *
Isolepis reticularis
Isolepis sepulcralis *
Juncus articulatus *
Juncus australis
Juncus bufonius *
Juncus dichotomus *
Juncus edgariae
Juncus effusus *
Juncus planifolius
Juncus tenuis *
Juncus usitatus
Lepidosperma australe
Luzula congesta * (A.E. Esler,
 31 Oct 1972, AK 363045)
Schoenus apogon
Schoenus maschalinus

Other monocots

Agapanthus praecox subsp.
orientalis *
Agave attenuata * (garden discard)
Allium triquetrum *
Archontophoenix cunninghamiana *
 (seedling)
Arthropodium bifurcatum (cult.)
Arthropodium cirratum (cult.)
Asparagus aethiopicus *
Asparagus scandens *
Astelia banksii
Astelia chathamica (cult. track to
 easternmost pylon)
Canna indica *
Cordyline australis (cult.)
Cordyline banksii
Cordyline pumilio
Cordyline rubra *
Crocsmia × *crocsmiiflora* *
Dianella nigra
Gladiolus undulatus *
Hedychium gardnerianum *
Lemna minor (R.O. Gardner,
 15 Feb 1981, AK 153372,
 Wesley Bay)
Leucojum aestivum *

Libertia grandiflora (P. Hynes,
 6 Nov 1951, AK 144204; Jack
 Warden, 28 May 2016)
Microtis unifolia
Monstera deliciosa * (cult. by
 easternmost pylon).
Phormium cookianum
Phormium tenax
Pterostylis banksii (Cape Horn
 stepway, fl. Oct)
Rhopalostylis sapida
Ripogonum scandens
Tradescantia fluminensis *
Tradescantia zebrina * (cult. by
 informal shrine, Waikowhai Bay)
Triglochin striata
Zantedeschia aethiopicum *

DICOT TREES, SHRUBS & WOODY CLIMBERS

Native

Alectryon excelsus
Beilschmiedia tarairi (seedlings)
Beilschmiedia tawa (seedling)
Brachyglottis repanda
Calystegia sepium
Calystegia tuguriorum
Carmichaelia australis
Clematis paniculata
Coprosma arborea (seedling)
Coprosma lucida
Coprosma macrocarpa
Coprosma repens (cult.)
Coprosma rhamnoides
Coprosma robusta
Coriaria arborea
Corynocarpus laevigatus
Dodonaea viscosa (cult.)
Dracophyllum sinclairii (A.E. Esler,
 coastal cliffs, 27 Mar 1970,
 AK 215715)
Dysoxylum spectabile (Fig. 5)
Elaeocarpus dentatus
Entelea arborescens (cult. and wild)
Fuchsia excorticata
Geniostoma ligustrifolia
Griselinia littoralis (cult.)
Fuscospora solandri (cult.)
Hedycarya arborea
Hoheria populnea
Knightia excelsa
Kunzea robusta
Leptospermum scoparium
Leucopogon fasciculatus
Leucopogon fraseri

Litsea callicaris
Lophomyrtus bullata (P. Hynes,
 20 Mar 1951, AK 144215)
Melicope ternata (Fig. 6)
Melicytus ramiflorus
Meryta sinclairii (cult.)
Metrosideros carminea (P. Hynes
 AK 144210, 1953; Millener 1979;
 Cranwell 1981)
Metrosideros excelsa
Metrosideros fulgens
Metrosideros kermadecensis (cult.)
Metrosideros perforata
Metrosideros robusta (Cameron &
 Beaver 2017)
Muehlenbeckia australis
Muehlenbeckia complexa
Myoporum laetum
Myrsine australis
Olearia furfuracea
Olearia solandri (cult.)
Ozothamnus leptophyllus
Parsonsia heterophylla
Piper excelsum
Pittosporum crassifolium
Pittosporum eugenioides (cult.)
Pittosporum tenuifolium
Pittosporum umbellatum (cult.)
Planchonella costata (cult.)
Pomaderris amoena
Pomaderris apetala (cult.)
Pseudopanax arboreus
Pseudopanax crassifolius ×
P. lessonii (Cameron &
 Beaver 2017)
Pseudopanax lessonii
Rhabdothamnus solandri
Rubus cissoides
Schefflera digitata
Sophora chathamica (Fig. 4)
Sophora microphylla
Sophora tetraptera (cult.)
Streblus heterophyllus
Veronica macrocarpa
Veronica parviflora (cult.)
Veronica stricta
Vitex lucens

Exotic

Acacia floribunda *
Acacia mearnsii * (seedling)
Araujia hortorum *
Arbutus unedo * (cult.)
Calystegia silvatica *

Cestrum nocturnum *
Cotoneaster glaucophyllus *
Crataegus monogyna *
Delairea odorata *
Erica lusitanica * (P. Hynes,
 29 Jul 1952, AK 145620)
Eriobotrya japonica *
Erythrina × *sykesii* * (cult.)
Eucalyptus botryoides * (cult.)
Eucalyptus saligna * (cult.)
Euonymus japonicus *
Euryops chrysanthemoides *
Fatsia japonica * (Fig. 10)
Ficus carica *
Fuchsia arborescens *
Fuchsia × *hybrida* cultivar *
Gomphocarpus fruticosus *
Hedera helix *
Hypericum androsaemum *
Ipomoea indica *
Jasminum polyanthum *
Lagunaria patersonii * (cult.)
Leptospermum morrisonii *
 (cult., Cape Horn Rd margin)
Ligustrum lucidum *
Ligustrum sinense *
Lonicera japonica *
Lophostemon confertus * (cult.)
Metrosideros collina * (cult.)
Nerium oleander * (cult.)
Paraserianthes lophantha *
Passiflora caerulea *
Passiflora tarminiana *
Phytolacca octandra *
Podranea ricasoliana * (E.K.
 Cameron, 16 Jun 1985, AK 172911,
 end of Aldersgate Road)
Populus × *canadensis* * (cult.)
Prunus × *domestica* *
Prunus persica *
Prunus serrulata *
Psidium cattleianum *
Rosa rubiginosa *
Rubus ulmifolius *
Salix alba *
Salix × *fragilis* *
Solanum mauritianum *
Sophora cassioides * (cult.)
Syzygium smithii *
Taxandria juniperina (*Agonis*
juniperina) * (cult., Cranwell 1981)
Tecoma capensis *
Ulex europaeus *

DICOT HERBS

Native

Acaena anserinifolia
Alternanthera nahui
Apium prostratum
Callitriche muelleri
Centella uniflora
Cotula coronopifolia
Dichondra repens
Epilobium cinereum
Epilobium nummulariifolium
Epilobium rotundifolium (P.Hynes,
 AK 145621)
Euchiton sphaericus
Geranium homeanum
Gonocarpus incanus
Haloragis erecta
Hydrocotyle moschata
Lobelia anceps
Oxalis exilis
Peperomia urvilleana
Persicaria decipiens
Pseudognaphalium luteoalbum
Ranunculus reflexus
Sarcocornia quinqueflora
Selliera radicans
Senecio glomeratus
Senecio hispidulus
Solanum nodiflorum
Tetragonia tetragonioides
Wahlenbergia vernicosa

Exotic

Ageratina riparia *
Alternanthera philoxeroides *
Amaranthus lividus *
Amaranthus powellii *
Anthemis cotula *
Aphanes inexpectata *
Arctotheca calendula *
Atriplex prostrata *
Bellis perennis *
Brassica oleracea *
Callitriche stagnalis *
Cannabis sativa * (cult. plot)
Capsella bursa-pastoris *
Cardamine flexuosa *
Cardamine hirsuta *
Carduus pycnocephalus *
Centaureum erythraea *
Cerastium glomeratum *

Chamaesyce maculata
 (*Euphorbia maculata*) *
Chrysanthemum segetum *
Ciclospermum leptophyllum *
Cirsium arvense *
Cirsium vulgare *
Conium maculatum *
Crepis capillaris *
Cymbalaria muralis *
Daucus carota *
Dipsacus fullonum *
Epilobium ciliatum *
Epilobium tetragonum *
Erigeron karvinskianus *
Erigeron sumatrensis *
Erechtites valerianifolia *
Erodium cicutarium *
Euphorbia peplus *
Foeniculum vulgare *
Fumaria capreolata *
Fumaria muralis *
Galinsoga parviflora *
Galium aparine *
Galium divaricatum *
Gamochaeta calviceps *
Gamochaeta coarctata *
Gamochaeta simplicicaulis *
Geranium dissectum *
Geranium molle *
Geranium purpureum *
Geranium robertianum *
Helminthotheca echioides *
Hydrocotyle tripartita *
Hypochaeris radicata *
Lactuca serriola *
Lamium purpureum *
Lapsana communis *
Lathyrus odoratus *
Leontodon saxatilis *
Lepidium coronopus *
Lepidium didymum *
Leucanthemum vulgare *
Linum bienne *
Linum trigynum *
Lobelia erinus *
Lotus pedunculatus *
Lotus suaveolens *
Ludwigia palustris *
Lysimachia arvensis
 (*Anagallis arvensis*) *
Lysimachia nummularia *
Lythrum hyssopifolia *

Malva pseudolavatera *
 (*Lavatera cretica*)
Matricaria discoidea *
Medicago lupulina *
Medicago nigra *
Mentha pulegium *
Modiola caroliniana *
Myosotis arvensis *
Myosotis sylvatica *
Oenanthe pimpinelloides *
Orobanche minor *
Oxalis corniculata *
Oxalis incarnata *
Parentucella viscosa *
Pericallis × hybrida *
Persicaria capitata *
Persicaria maculosa *
Physalis peruviana *
Plantago australis *
Plantago coronopus *
Plantago lanceolata *
Plantago major *
Plectranthus ciliatus *
Polycarpon tetraphyllum *
Portulaca oleracea *
Potentilla indica *

Potentilla reptans *
Prunella vulgaris *
Ranunculus parviflorus *
Ranunculus repens *
Ranunculus sardous *
Raphanus raphanistrum *
Rorippa nasturtium-aquaticum *
Rumex acetosella *
Rumex brownii *
Rumex conglomeratus *
Rumex crispus *
Rumex obtusifolius *
Rumex pulcher *
Rumex sagittatus *
Sagina procumbens *
Senecio bipinnatisectus *
Senecio esleri *
Senecio skirrhodon *
Senecio vulgaris *
Sherardia arvensis *
Silene gallica *
Sison amomum *
Sisymbrium officinale *
Solanum chenopodioides *
Solanum nigrum *
Sonchus asper *

Sonchus oleraceus *
Stachys arvensis *
Stellaria media *
Symphotrichum subulatum *
Taraxacum officinale *
Tolpis barbata * (P.Hynes,
 7 Nov 1951, AK 144334)
Torilis arvensis *
Trifolium campestre *
Trifolium dubium *
Trifolium perenne *
Trifolium repens *
Trifolium subterraneum *
Tropaeolum majus *
Valerianella carinata *
Verbascum virgatum *
Verbena incompta *
Veronica arvensis *
Veronica filiformis *
Veronica persica *
Veronica serpyllifolia *
Vicia disperma *
Vicia sativa *
Vicia tetrasperma *

Occurrence of *Crassula helmsii* in Auckland

Mike Wilcox

Introduction

Crassula helmsii is a perennial herb native to both New Zealand and Australia. In New Zealand it is mainly confined to the west coast of the South Island, while in Australia it is widespread in the eastern states (e.g. Toelken et al. 1996). Its main claim to fame is that it has become a serious aquatic weed in Britain. Known there as New Zealand pygmyweed or Australian swamp-stonecrop, *Crassula helmsii* arrived in the UK in 1911. It was introduced as an oxygenating plant for ponds and was not recognised as a serious threat until the 1970s (Laundon 1961; Dawson 2014; Stace & Crawley 2016). It reproduces from tiny stem fragments and can be submerged, emergent (at the edges of water bodies) or terrestrial, growing in and around ponds, lakes and slow moving water courses. Left to its own devices, it forms an impenetrable green mat, pushing out plant and animal species and damaging wetland



Fig. 1. Habitat of *Crassula helmsii* on a gravel access road beside treated effluent outflow lagoon, Puketutu Island, Manukau Harbour, Auckland, 5 Dec 2016.