Solanum nigrum *	black nightshade. Rare, beach
Sonchus oleraceus *	sow thistle. Rare, beach
Ulex europaeus *	gorse. Occasional, interior and cliffs
Veronica ligustrifolia (syn. *Hebe ligustrifolium*)	Locally common, cliffs and interior
Veronica plebeia	creeping speedwell. Coast, rare
Monocotyledons	
Acianthus sinclairii	pixie cap orchid. Locally common, interior
*Allium triquetrum**	onion weed. Rare, beach
Astelia banksii	Frequent, throughout
Austrostipa stipoides	needlegrass. Rare, on coastal rocks
Carex flagellifera	Occasional, shaded slopes
Cordyline australis	cabbage tree. Rare, shaded slopes, two sizeable specimens
*Cynodon dactylon**	Indian doab. Localised, beach
Dianella nigra	inkberry. Frequent, interior
Oplismenus hirtellus	panic grass. Occasional, interior
Phormium tenax	flax. Rare, low on coastal cliffs
Poa anceps	Localised, steep shaded slopes
Rhytidosperma sp ?*	danthonia. Occasional, coastal cliffs
Mosses	
Leptostomum macrocarpum	Uncommon, on coastal rocks and *Metrosideros*
Ptychomnion aciculare	Abundant, interior

Nukumea and Alice Eaves Scenic Reserves and environs – see p.45

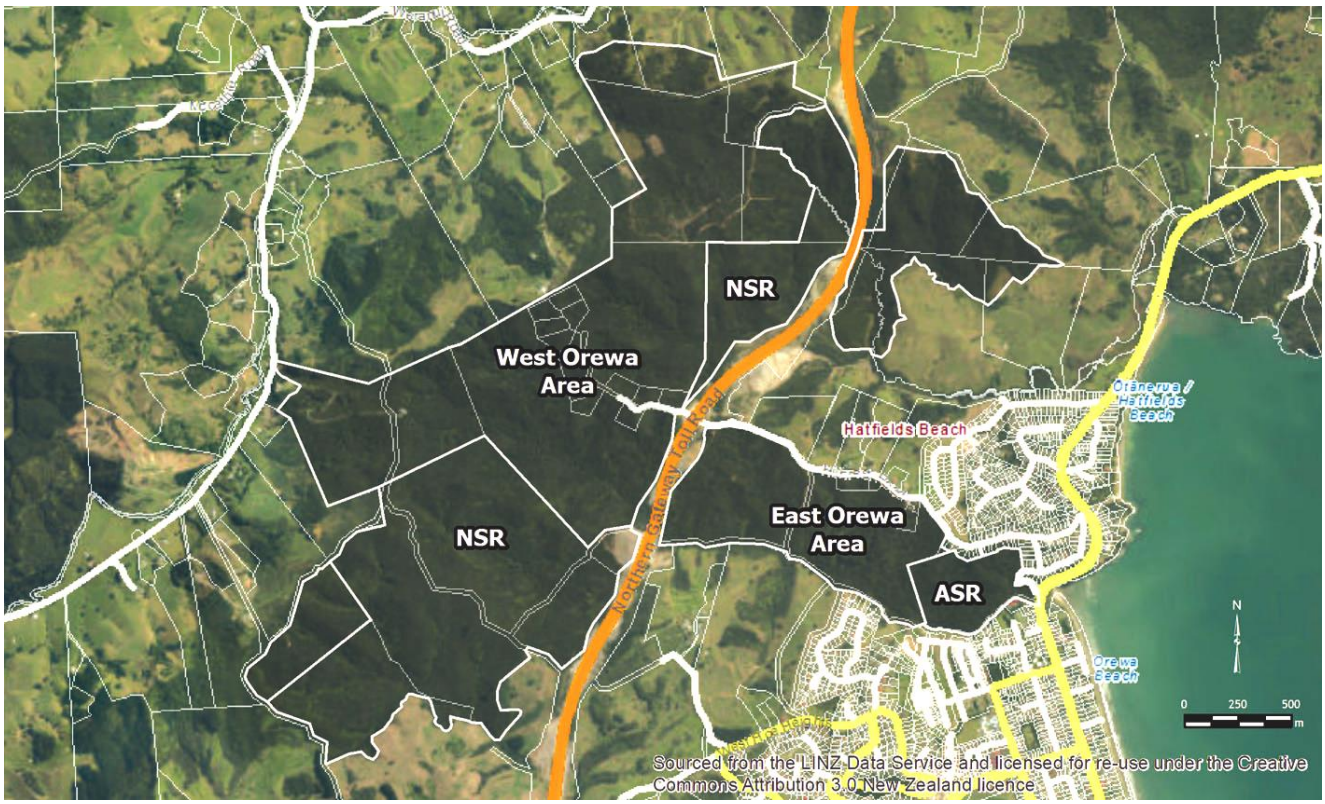

Fig. 1. Location of the study area (delineated by white line). NSR = Nukumea Scenic Reserve; ASR = Alice Eaves Scenic Reserve. Aerial photography sourced from LINZ Data Service, 8 May 2018. Modified by author.

Notes on the vegetation of Nukumea and Alice Eaves Scenic Reserves and environs, Orewa

Nick Goldwater

Introduction

The study site, west of Orewa township, including an area formerly known as 'RAP 21' (Recommended Area for Protection), is part of a large network of semi-contiguous tracts of indigenous forest and scrub that extends from Pine Valley in the south to Hepburn Creek in the north. Nukumea Scenic Reserve (administered by the Department of Conservation (DoC)) is situated on the western side of State Highway 1 and is largely inaccessible to the public, while Alice Eaves Scenic Reserve (administered by Auckland Council) occurs at the easternmost end of the study site and is readily accessed via a good walking track off Old North Road (Fig. 1 – see facing page). The construction of the Silverdale to Puhoi motorway resulted in a re-arrangement of property boundaries to account for portions of private land that had had access to them cut off by the carriageway. This resulted in an enlarged Nukumea Scenic Reserve in two separated parts. Other portions of the forests are privately owned and zoned 'Rural Conservation' under the Auckland Unitary Plan, limiting their development. An exception was Hillcrest Road, which has been sub-divided on the western side of the 'Pūkeko bridge' over the motorway.

Wildland Consultants Ltd was commissioned by Auckland Council to undertake rapid surveys of the vegetation in April 2017, the purpose of which was to map the vegetation types according to the new ecosystem classification system devised by Singers *et al.* (2017). The study site has been identified as a Biodiversity Focus Area (BFA) by Auckland Council, and as such has been prioritised for survey, particularly in light of the imminent pressures of future residential development in adjacent farmland. In this article I will describe the broad vegetation types that occur at the site. For the sake of simplicity I have divided the site into the 'West Orewa Area' (which includes Nukumea Scenic Reserve) and the 'East Orewa Area' (which includes Alice Eaves Scenic Reserve), the two areas separated by SH1.

West Orewa Area

The topography of the West Orewa Area is characterised by rolling hills, ridgelines and broad gully systems which form the catchments for the Otanerua, Nukumea and West Hoe streams. Most of the vegetation is characterised by regenerating tānekaha (*Phyllocladus trichomanoides*)-kānuka (*Kunzea robusta*)-kauri (*Agathis australis*)-forest and scrub up to 12–15 m in height (Fig. 2). Wilding Monterey pine (*Pinus radiata*) is locally frequent on the east-facing slopes of the site close to the motorway, although some of these have recently been poisoned as part of a wider effort by Forest and Bird to control this species. Kauri and tānekaha ricker are locally common in parts, occurring with frequent to occasional kānuka, mānuka (*Leptospermum scoparium*) on open edges, and toru (*Toronia toru*), although, overall, tānekaha is the most abundant coniferous species. More mature stands of kauri occur in the northern part of Nukumea Scenic Reserve, and are visible from the motorway.

Fig. 2. Looking south from Hillcrest Road towards Nukumea Scenic Reserve, West Orewa Area. Photo: Nick Goldwater. All photos taken 27-28 April 2017.

Fig. 3. Young tānekaha and kānuka with *Diploblechnum fraseri* local in the ground tier, West Orewa Area. Photo: Nick Goldwater.

Typical sub-canopy species include white maire (*Nestegis lanceolata*), lancewood (*Pseudopanax crassifolius*), and tānekaha and rimu (*Dacrydium cupressinum*) saplings. Frequent understorey species include kauri grass (*Astelia trinervia*), kūmarahou (*Pomaderris kumeraho*), tanglefern (*Gleichenia dicarpa*), *Lycopodium deuterodensum*, *Gahnia xanthocarpa*, together with occasional tūrutu (*Dianella nigra*), *Schoenus tendo*, *Coprosma lucida, C. rhamnoides*, akepiro (*Olearia furfuracea*), *Gahnia pauciflora*, and local *Diploblechnum fraseri* (Fig. 3).

Fig. 4. Low mānuka shrubland with maritime pine, kanuka and young totara in the background, West Orewa Area. Photo: Sarah Budd.

Fig. 5. Browsed and cattle-trampled understorey in manuka shrubland, West Orewa Area. Photo: Sarah Budd.

Fig. 6. Gully forest: mature taraire with epiphytes of *Astelia hastata*, over a sub-canopy of nīkau and tree ferns, West Orewa Area. Photo: Sarah Budd.

Fig. 7. Regenerating forest with occasional emergent pines on south-facing slopes adjacent to Alice Eaves Scenic Reserve, East Orewa Area. Photo: Nick Goldwater.

Naturalised plant species in the Western Orewa Area are very much localised in their distribution and largely comprise prickly hakea (*Hakea sericea*) and willow-leaved hakea (*H. salicifolia*), the latter more abundant. Both species occur in canopy gaps, often on the margins of gumland-type vegetation characterised by emergent mānuka over a dense layer of *Gleichenia dicarpa* with *Gahnia setifolia* scattered throughout.

The southern part of Nukumea Scenic Reserve comprises areas of regenerating tānekaha-kānuka-kauri forest together with discrete areas dominated by low mānuka scrub and shrubland (Fig. 4). Kānuka is a frequent emergent species, while gorse (*Ulex europaeus*) occurs where the vegetation is more fragmented. The understorey is relatively sparse throughout this vegetation type, most likely a result of browsing ungulates (domestic and feral) and possibly rabbits (Fig. 5). Understorey plant species are largely restricted to less palatable seedlings of totara (*Podocarpus totara*), kahikatea (*Dacrycarpus dacrydioides*), and tānekaha. Patches of panic grass (*Oplismenus hirtellus*), *Centella uniflora*, and *Schoenus tendo* are also present.

In stark contrast to the dry, seral nature of the tānekaha-kānuka-kauri forest are the small areas of mature broadleaf-podocarp forest, which largely occur on the hidden gully floors and also in discrete pockets along the northern boundary. Stock have grazed the understorey in some areas along the northern boundary and no doubt possums are also taking a toll on foliage and fruit. The canopy is characterised by co-dominant taraire (*Beilschmiedia tarairi*) and tōtara (*Podocarpus totara*) with frequent kohekohe (*Dysoxylum spectabile*) and pūriri (*Vitex lucens*) up to 20 m tall, their limbs often festooned with kahakaha (*Astelia hastata*). One exceptionally large pūriri (diameter >1.5 m) garnered some interest, although we could not get too close to it due to the active wasp nest in the base of the trunk. Tall nīkau (*Rhopalostylis sapida*) are common in the sub-canopy (Fig. 6).

East Orewa Area

The south-facing band of indigenous vegetation between SH1 to the west and Alice Eaves Scenic Reserve to the east is similar in composition to the dominant forest cover in the West Orewa Area (i.e. young tānekaha-kānuka-kauri forest and scrub), albeit less advanced and with more mānuka and a mix of dead, dying and live emergent pines (Fig. 7). Lancewood is occasional in the canopy, while the understorey includes ponga (*Cyathea dealbata*), mingimingi (*Leucopogon fasciculatus*), *Coprosma lucida*, hangehange (*Geniostoma ligustrifolium*), māpou (*Myrsine australis*), and young tōwai (*Weinmannia sylvicola*). Intermittent watercourses drain the small gullies, which in turn support riparian vegetation comprising

māhoe (*Melicytus ramiflorus*) and hangehange together with ponga and mamaku (*Cyathea medullaris*).

Discrete areas of gumland-type vegetation occur on the upper slopes near Hillcrest Road. This vegetation is characterised by a sparse canopy of mānuka and occasional gumland grass tree (*Dracophyllum sinclairii*) and toru, with young tānekaha and *Gahnia setifolia* as an occasional emergent species. The understorey layer comprises abundant tangle fern and frequent to occasional kūmarahou, *Schoenus tendo*, *Lycopodium deuterodensum* (Fig. 8). Prickly hakea is the only weed species recorded from this habitat type.

The eastern hill-slope and gully of Alice Eaves Scenic Reserve comprise mature kauri-podocarp-broadleaved species forest on the slopes and younger kauri rickers on the ridge. Emergent species include kauri and occasional rimu over a canopy of broadleaved tree species. Gully floors are characterised by broadleaved species such as kohekohe and taraire, while ponga and mamaku are frequent in the understorey together with māhoe, māpou and hangehange. The ground layer supports ferns including kiokio (*Parablechnum novae-zelandiae*) and pukupuku (*Doodia australis*), and sedges such as *Carex lambertiana* and hook grass (*C. uncinata*). Epiphytes and lianes are present including rātā (*Metrosideros fulgens*), aka (*M. perforata*), kahakaha, and kōwharawhara (*Astelia solandri*).

According to Forest and Bird (Hibiscus Coast Branch), botanical surveys under the auspices of the Wainui Historical Society identified at least 80 different indigenous species of trees or shrubs, five species of orchid, three lycopods, and 33 species of ferns, plus other plant life of mosses and liverworts present in Alice Eaves Scenic Reserve (Forest & Bird 2017).

A very good example of more advanced kauri forest occurs on private property to the north of Hatfields Beach (Fig. 1) and bounded to the west by SH1 (Fig. 9). We were unable to visit this remnant, although it is highly visible from the motorway and most readers would recognise it. Kauri commonly occurs as an emergent species over a canopy of kānuka, while young tānekaha is largely restricted to the edges.

Fig. 8. Mānuka and *Gahnia setifolia* emergent over an understorey of *Gleichenia dicarpa*, West Orewa Area. Photo: Nick Goldwater.

Fig. 9. Looking east towards one of the best examples of kauri forest, on private land, within the study site, East Orewa Area. Photo: Nick Goldwater.

Birds

The usual suite of common forest birds was present, including fantail/pīwakawaka (*Rhipidura fuliginosa*), grey warbler/riroriro (*Gerygone igata*), tūī (*Prosthemadera novaeseelandiae*), and silvereye/tauhou (*Zosterops lateralis*). Tomtit/miromiro (*Petroica macrocephala toitoi*) were seen and heard frequently in the western area, while North Island fernbird (*Bowdleria punctata vealeae*) were heard calling in at least three locations in the western area. This species is classified as At Risk-Declining by Robertson et al. (2016). Fernbird habitat typically comprised gumland-type vegetation characterised by mānuka and tanglefern with frequent *Gahnia setifolia*. Fernbird also occurs throughout the eastern part of the site (Rue Statham, Auckland Council, pers. comm.).

Discussion

One hundred and fourteen species of indigenous plants and 23 species of naturalised plants were recorded from the study area during the survey (see Appendix), and an additional 36 species from voucher records and personal observations are included in the species list (35 indigenous and one naturalised). No nationally or regionally threatened plants, as per de Lange et al. (2013) and Stanley et al. (2005) respectively, were recorded during the survey, although *Pimelea longifolia* (At Risk-Declining) has been recorded by Maureen Young near the subdivision at the end of Hillcrest Road (west side of the motorway); *Astelia grandis*

(Regionally Critical) was recorded from Alice Eaves Scenic Reserve in 2010 (AK 313207); and the diminutive fan fern *Schizaea dichotoma* (At Risk-Naturally Uncommon) has been found in kauri-tānekaha forest (AK151687).

In general, the vegetation is typical of many regenerating forest and scrub remnants that occur on strongly leached ultic or oxidic soils on Auckland's North Shore. Such vegetation is largely characterised by co-dominant kauri and tānekaha rickers, kānuka, and a 'gumland type' understorey that commonly includes *Schoenus tendo*, *Gleichenia* species, *Gahnia* species, and clubmosses. It is evident that most of the study site is on a trajectory towards kauri-podocarp-broadleaved forest with smaller areas of kauri forest – WF11 with smaller areas of WF10 according to the ecosystem classification system devised by Singers et al. (2017).

What makes this site so special – particularly the West Orewa Area – is its size, intactness, and (current) few external pressures. The site as a whole supports good numbers of bird species such as fernbird and tomtit (N. Goldwater and B. Osborne, pers. obs.), and is likely to support At Risk gecko and skink species. The vegetation provides buffering to some high quality streams (Fig. 10), which in turn support freshwater fish species such as giant kōkopu (*Galaxias argenteus*) and banded kōkopu (*G. fasciatus*) together with invertebrates such as kōura (*Paranephrops planifrons*). Within a landscape context, the site forms an integral part of North-West Wildlink for indigenous birds moving across the region.

Fig. 10. Pristine headwaters of the Nukumea Stream, West Orewa Area. Photo: Nick Goldwater.

In the West Orewa Area, *Hakea salicifolia* is the only weed of note. There was evidence of recent attempts to control some infestations, although it seems that little headway has since been made. A concerted effort should be made to eradicate this species at the site, particularly given its potential to completely displace indigenous vegetation following fire. Weeds such as wild ginger (*Hedychium gardnerianum*), pampas (*Cortaderia selloana*), dally pine (*Psoralea pinnata*), and shrub balsam (*Impatiens sodenii*) are more frequent in the East Orewa Area, which is not surprising due to its proximity to Hillcrest Road and residential properties.

From what I gather, there has been no record of kauri dieback disease (*Phytophthera agathidicida*) at the site, and it is the inaccessible nature of the forested areas – particularly to the west of SH1 – that currently provides the best form of protection. The apparent absence of kauri dieback underscores the ecological importance of these forest and shrubland habitats.

Current management and prospects for the future

In 1994, the then Orewa Landcare Group made a submission to the then Rodney District Council which highlighted the ecological values of the study area and the need for adequate measures of protection (Orewa Landcare Group 1994). Interestingly, they mooted the idea of creating a c.100 ha mainland sanctuary protected by a pest-proof fence in the West Orewa Area (part of RAP 21). A similar idea occurred to me during our survey of the site, although I envisaged that the entire West Orewa Area could be fenced given its compact shape, relatively gentle topography, and ease of access around the perimeter.

There is currently an application to develop a 105 lot subdivision at Hall Farm, which abuts the southern boundary of Nukumea Scenic Reserve. In light of this application and the rapid and extensive residential development that is currently occurring closer to Orewa, there is an even greater need to protect such biodiverse and ecologically intact areas from the inevitable incursion of rodents, domestic cats, and dumped garden waste. Large numbers of people living in close proximity to the West Orewa Area also increases the risk of introducing kauri dieback.

In terms of current management, the Hibiscus Coast branch of Forest and Bird has entered into a volunteer agreement with the DoC to undertake pest plant control in Nukumea Scenic Reserve. Until recently, the group was controlling wilding pines in both the West Orewa and East Orewa areas; the frequent brown skeletons of dead pines that can be seen as one drives along SH1 are testament to the good work that this group has done. In Alice Eaves

Scenic Reserve, members of the Orewa Lions and Forest and Bird have an ongoing programme to maintain tracks and signs, and undertake the control of possums and rats. Public volunteer days are regularly held, primarily to manage pest plant infestations. The predator control programme has been extended up the Nukumea catchment to improve control over the reinvasion of pests into the reserve (Forest & Bird 2017).

Acknowledgements

I would like to thank Melinda Rixon (Auckland Council) for giving us the opportunity to wander through this incredible part of Auckland, and Brenda Osborne (Auckland Council) for her assistance in the field, her contribution to the plant species list, and for providing valuable background information on the site. Thanks also to my colleagues Sarah Budd, Joshua Wium and Jarrod Cusens (Wildland Consultants) for their efforts in the field and for contributing to the species list, and to Dhahara Ranatunga (Auckland Museum) for providing herbarium records. Finally, thanks to Rue Statham (Auckland Council) for providing useful background information, to Thelma Wilson (DoC) who provided feedback on an earlier version of this article, and to Ewen Cameron and the rest of the editorial team for reviewing the manuscript.

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Appendix. Vascular plants of Nukumea Scenic Reserve, Alice Eaves Scenic Reserve, and environs.

This list is largely based on records from the survey undertaken between 27-28 April 2017 by Nick Goldwater, Sarah Budd and Joshua Wium (all ecologists from Wildland Consultants Ltd), and Brenda Osborne (Auckland Council ecologist). Additional records were obtained from the Auckland Museum Herbarium (AK), and Maureen Young (MY). * = naturalised species

Lycopods

Lycopodium deuterodensum
Lycopodium scariosum
Tmesipteris elongata (AK151689, 1989)

Ferns and fern allies

Adiantum cunninghamii (AK214794, 1971)
Adiantum fulvum (AK214767, 1971)
Adiantum hispidulum
Asplenium bulbiferum
Asplenium flaccidum
Asplenium gracillimum (AK214712, 1972)
Asplenium lamprophyllum (AK151553, 1980)
Asplenium polyodon
Austroblechnum lanceolatum
Austroblechnum membranaceum (AK219919, 1972)
Cyathea dealbata
Cyathea medullaris
Deparia petersenii
Dicksonia squarrosa
Diplolechnum fraseri
Doodia australis
Gleichenia microphylla
Histiopteris incisa (AK222977, 1971)
Hymenophyllum demissum (AK223621, 1971)
Hymenophyllum dilatatum (AK223644, 1971)
Hymenophyllum flabellatum (AK223650, 1972)
Hymenophyllum flexuosum
Hymenophyllum nephrophyllum (AK220066, 1971)
Hymenophyllum rarum (AK223180, 1971)
Hymenophyllum revolutum (AK128443, 1971)
Hymenophyllum sanguinolentum (AK72339, 1962)
Lastreopsis hispida
Lastreopsis microsora (AK223320, 1971)
Lindsaea linearis
Lindsaea trichomanoides (AK223387, 1971)
Lomaria discolor
Loxogramme dictyopteris (AK214731, 1972)
Lycopodium articulatum
Microsorum pustulatum
Microsorum scandens
Notogrammitis ciliata (AK153150, 1981)
Paesia scaberula
Parablechnum novae-zelandiae
Pneumatopteris pennigera
Pteridium esculentum
Pteris macilenta

Pteris tremula
Pyrrosia elaeagnifolia
Schizaea bifida (AK220340, 1972)
Schizaea dichotoma (AK151687, 1980)
Trichomanes elongatum

Gymnosperms

Agathis australis
Cupressus macrocarpa *
Dacrycarpus dacrydioides
Dacrydium cupressinum
Phyllocladus trichomanoides
*Pinus pinaster**
*Pinus radiate**
Podocarpus totara
Prumnopitys ferruginea

Dicots

Acacia longifolia *
Anredera cordifolia *
Alseuosmia macrophylla
Beilschmiedia tarairi
Carmichaelia australis
Carpodetus serratus
Centella uniflora
Clematis paniculata
Coprosma arborea
Coprosma areolata
Coprosma grandifolia
Coprosma lucida
Coprosma rhamnoides
Coprosma spathulata
Corynocarpus laevigatus
Dracophyllum latifolium
Dracophyllum ?lessonianum
Dracophyllum sinclairii
Drosera auriculata (AK151684, 1980)
Dysoxylum spectabile
Elaeocarpus dentatus
Elatostema rugosum
Epilobium pallidiflorum (AK361874, 2016)
Erigeron sumatrensis *
Eriobotrya japonica *
Geniostoma ligustrifolium
Gonocarpus micranthus
Griselinia lucida
Hakea salicifolia *
Hakea sericea *
Hedycarya arborea
Helminthotheca echioides *
Impatiens sodenii *
Knightia excelsa
Kunzea robusta
Leptospermum scoparium
Leucopogon fasciculatus
Lotus pedunculatus *
Melicytus ramiflorus
Melicytus macrophyllus (AK180598, 1971)
Metrosideros diffusa
Metrosideros fulgens
Metrosideros perforata
Muehlenbeckia australis
Myosotis arvensis * (AK286895, 1980)
Myrsine australis
Nertera dichondrifolia
Nestegis lanceolata
Olearia furfuracea
Olearia rani var. *colorata*
Parsonsia capsularis var. *capsularis*
Parsonsia heterophylla
Pennantia corymbosa
Pimelea longifolia (MY, year unknown)
Piper excelsum
Pittosporum cornifolium (AK180928, 1971)
Plantago australis *
Plantago lanceolata *
Pomaderris amoena
Pomaderris kumeraho
Pseudopanax arboreus
Pseudopanax crassifolius
Pseudopanax lessonii
Psoralea pinnata *
Ranunculus repens *
Rubus cissoides
Schefflera digitata
Senecio minimus (AK369913, 1976)
Sophora microphylla
Streblus heterophylla
Toronia toru
Ulex europaeus *
Vitex lucens
Weinmannia sylvicola

Monocots

Aristea ecklonii *
Astelia fragrans
Astelia grandis (AK313207, 2010)
Astelia hastata
Astelia solandri
Astelia trinervia
Bulbophyllum pygmaeum (AK158814, 1982)
Caladenia chlorostyla (AK151809, 1980)
Carex banksiana
Carex lambertiana
Carex uncinata
Cordyline australis
Cordyline pumilio
Cortaderia selloana *
Corybas oblongus (AK155422, 1981)
Cyperus eragrostis *
Dianella nigra
Dianella haematica
Earina autumnalis
Earina mucronata
Eleocharis acuta

Freycinetia banksii
*Hedychium gardnerianum**
*Juncus tenuis **
Lepidosperma australe
Lepidosperma laterale
Machaerina rubiginosa
Microlaena avenacea
Microlaena stipoides
Morelotia affinis
Oplismenus hirtellus
Phormium tenax
Pterostylis agathicola (AK97372, 1962)
Pterostylis alobula (AK151691, 1980)
Pterostylis banksii (AK151845, 1980)
Pterostylis trullifolia (AK151884, 1980)
Rhopalostylis sapida
Ripogonum scandens
*Schedonorus arundinaceus **
Schoenus maschalinus
Schoenus tendo
Thelymitra longifolia (AK154357, 1980)

Algae recorded from Whatipu, Manukau Heads, Auckland

M.D. Wilcox

The BioBlitz held at Whatipu 27–28 October 2017 provided an opportunity to compile a list of algae recorded from the Whatipu coast, and from the freshwater areas (Fig. 1).

Exposed rocky shores of conglomerate rock are a feature of Whatipu, the sites being Burnett Head (Wonga Wonga Bay) and adjoining Paratūtai Island within the Manukau Harbour entrance (Fig. 2), and Ninepin Rock (Te Toka-Tapu-a-Kupe) with its three associated smaller rocky islets (Fig. 3).

The seaweed flora of this area has been the subject of just a few investigations and collections. The University of Auckland Field Club made a visit in April 1950 with Jane Trevarthen (1952) incorporating some observations on seaweeds. Max H. Hommersand in August 1974 and W. Cole in October 1974 collected at the Manukau Harbour entrance, the specimens being deposited in the herbarium of the University of North Carolina, Chapel Hill, USA. Bruce Hayward and Margaret Morley included Whatipu in their survey of the Waitakere coast (Hayward & Morley 2004) and made some collections, visiting there in January 2000 and September 2001. Mei Nee Lee of the Auckland Museum did some collecting there in April 2008. I have investigated the seaweeds at Whatipu on four occasions: 24 March 2007, 22 March 2008, 2 January 2015, and 28 October 2017. Here are my brief diary notes on these visits.

24 March 2007: Paratūtai Island, Whatipu, 7.30 am to 9.30 am, low tide. The eastern (harbour) side has a fringe of *Ecklonia radiata* and *Carpophyllum maschalocarpum*. The more exposed north side has *Carpophyllum maschalocarpum* as the fringe.

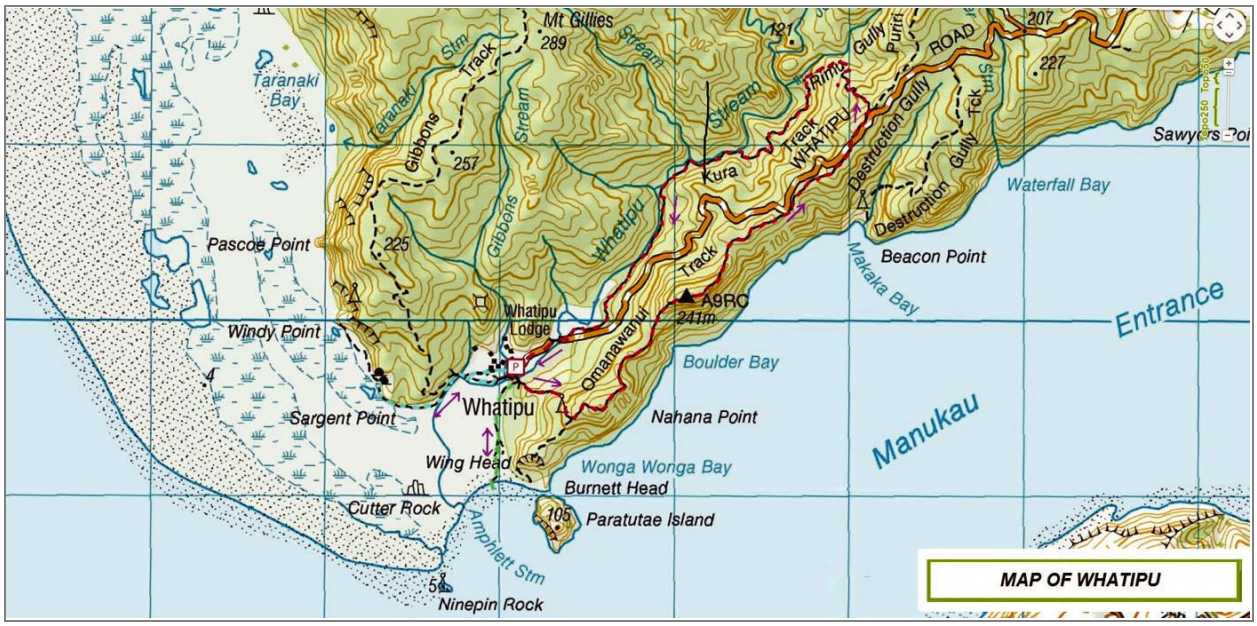

Fig. 1. Whatipu map (from NZ Topo Maps). Scale: grid in 1 km squares.