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Allium triquetrum *	Northern end only
Aloe ?arborescens * pl	x1, northern end
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Arthropodium cirratum	Northern end only
Asparagus scandens *	Northern end only
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Cordyline australis pl?	x1, northern end, possibly planted
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A biodiversity survey of Waikereru Ecosanctuary, Waimatā, Gisborne

Marley Ford, Mark Smale & Kelly Gilbride

Introduction

Waikereru Ecosanctuary is located 6.5 km north of Gisborne, on Riverside Road (Fig. 1). The Waimatā River runs past the east side of the property. Waikereru forms part of an extensive tract of hill country and lies within the Waiapu Ecological District (McEwen 1987). The riverside bush and the hills are protected by QEII National Trust covenants, with several other large QEII covenanted blocks nearby on neighbouring properties beyond the western ridge. The Gisborne area has been surveyed relatively little but supports a wide range of biodiversity (McEwen 1987; Smale et al. 2013).

Geology

The Waiapu Ecological District consists mostly of late Cenozoic (Miocene-Pliocene) mudstone-sandstone hill country with unstable Eocene, Palaeocene and late Cretaceous indurated siltstone (McEwen 1987). Waikereru comprises mostly moderately steeply dissected hill country on undifferentiated, fossiliferous mudstone (papa) and tuffaceous sandstone (Smale et al. 2013) and on the valley floor, Quaternary fan gravels and alluvium with some tephra coverbeds on the more elevated and older surfaces that have not been inundated by flood deposits since European settlement (Mazengarb & Speden 2000; Smale et al. 2013;). The altitude of the Ecosanctuary ranges from 40 m to 420m asl.

History

Waikereru is named for the flocks of kereru (*Hemiphaga novaeseelandiae*) that live in the local forests. In pre-European times a small unfortified

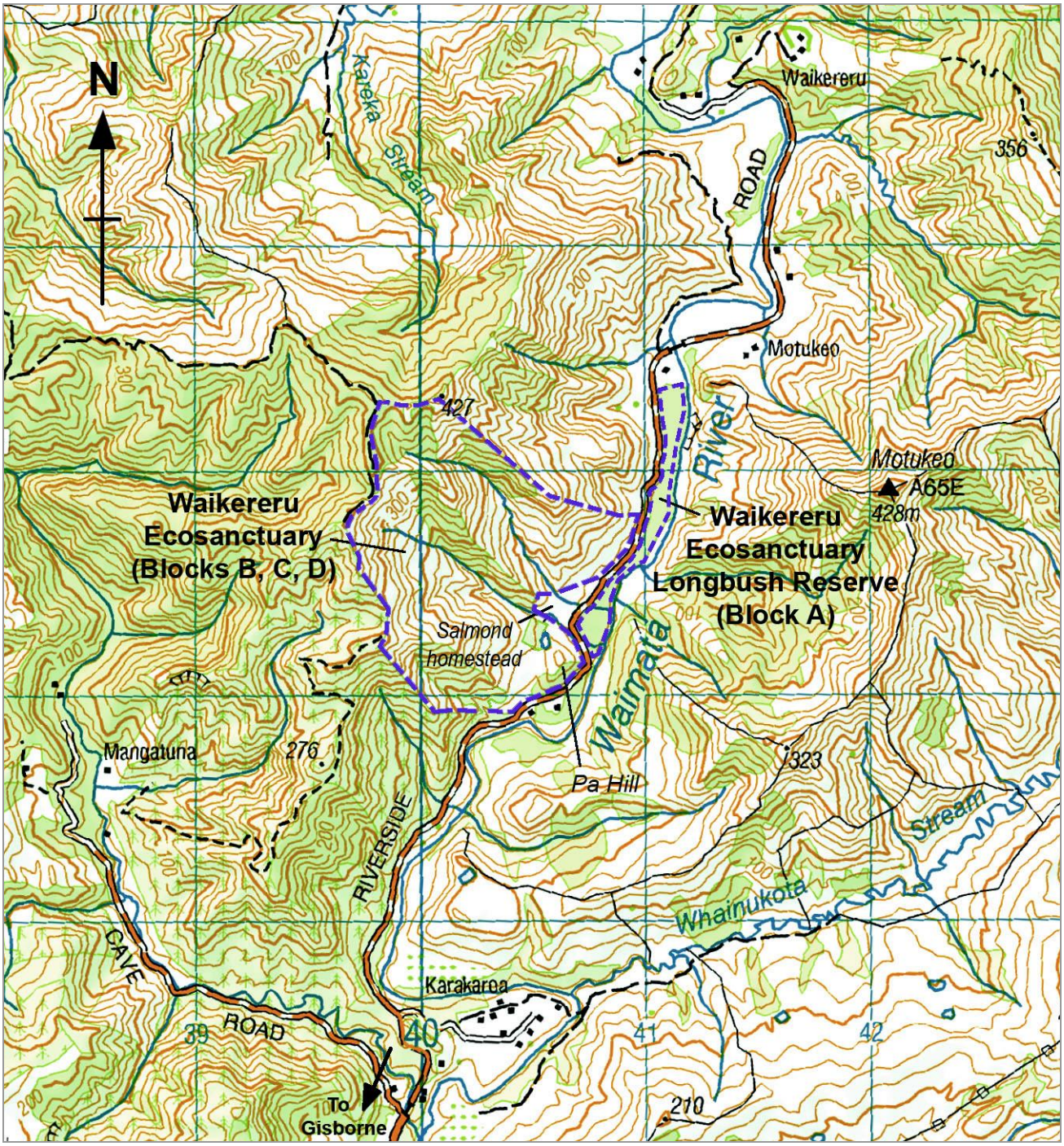


Fig. 1. Location of Waikereru Ecosanctuary on both sides of Riverside Road, north of Gisborne. Boundaries outlined with purple dashed lines. Topomap modified by Joshua Salter. Scale: Grid of 1 km squares.

Fig. 2. The sacred mountain Motukeo, seen from the west, 25 Jan 2022. All photographs taken by the lead author from within Waikereru Ecosanctuary, on the dates stated.

village once stood on the low hill near the Waikereru homestead called Pā Hill. Waikereru is encircled by a ring of steep hills, a local landmark being Motukeo (Fig. 2) in the east – a sacred mountain for local iwi, a fishing mark out at sea and a leaping-off place for spirits. In the 1860s European settlers ran Waikereru Station as part of a larger block as a sheep farm. The land passed from iwi through the New Zealand Native Land Settlement Company to European settlers in 1885 and was worked as a pastoral farm. In 2000 when Jeremy and Anne Salmond purchased the property, the land was in a degraded state of slipping slopes and unfenced waterways. In 2001 Longbush Reserve, the riverside bush, was fenced

and placed under a QEII covenant and this, together with the rest of the Salmond's Waikereru property, is known as Waikereru Ecosanctuary. For more information on Waikereru's history see their website: https://www.waikereru.org/history/

Methods

A vegetation and floristic survey was carried out by the lead author at Waikereru Station over the period 24–28 January 2022. The site was traversed on foot, the plants and fingi recorded, a species list compiled (see Appendix), and vegetation types mapped. The surveys were divided into four sections, A (Longbush Reserve), B, C and D (Fig. 3), each related to a sub-catchment of the ecosanctuary and also for ease of reporting. Following this, in April 2022 plotting was undertaken by the lead author and Kelly Gilbride, setting out 25 circular permanent plots placed in forest and grassland vegetation associations (Smale & Ford 2022). The aim of the plotting was to quantify the vegetation structure of Waikereru Ecosanctuary which includes Longbush Reserve.

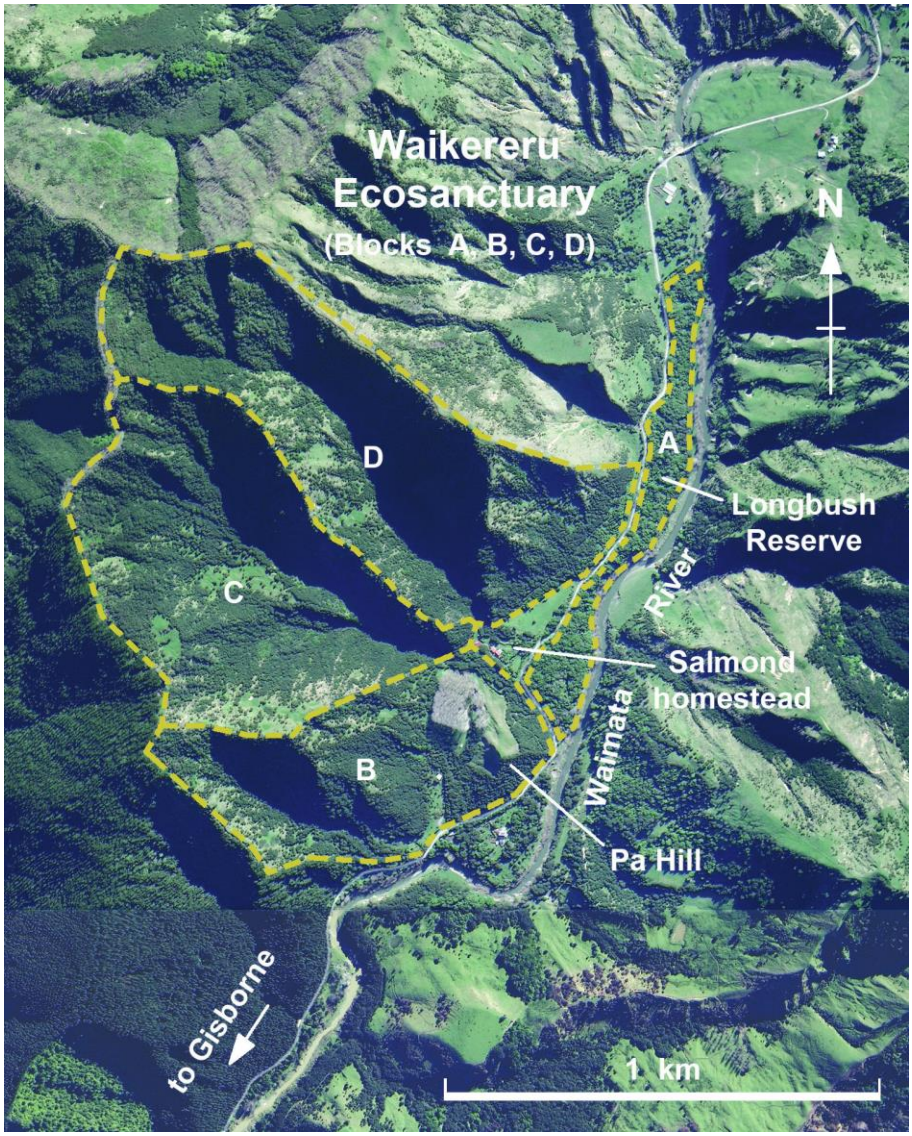


Fig. 3. Vegetation map of Waikereru Ecosanctuary. with the alluvium catchment (A) Long Bush running along the west side of the Waimata river, and separated from the three other hillside catchments (B-D) by the Waimata road (Google maps, 2022, modified by Joshua Salter). Scalebar = 1 km.

Survey findings

Vegetation

Before European settlement, most of Waiapu Ecological District comprised hill country forest, mainly podocarp/broadleaved forest, with red beech (*Fuscospora fusca*) and silver beech (*Lophozonia menziesii*) forest on higher land and local black beech (*Fuscospora solandri*) at lower altitudes. Kahikatea (*Dacrycarpus dacrydioides*)-dominated podocarp forest was widespread on alluvial flats and semi-coastal and coastal forest towards the coast (McEwen 1987). The ecological district has been highly modified, much of it now farmed (rough farming of sheep and cattle) with increasing exotic forestry plantations on severely eroded country; indigenous forest remnants are rare.

Waikereru hosts a few remnant podocarp trees, a relatively large alluvial forest remnant and inland forest remnants in sheltered gullies. Other dominant vegetation types include exotic pasture, regenerating kānuka (*Kunzea robusta*) forest and inland semi-coastal broadleaved remnants of ngaio (*Myoporum laetum*) and puriri (*Vitex lucens*) in gullies sheltered from frosts.

Waikereru Ecosanctuary has been retired from farming since 2000 and left to regenerate in natural vegetation, supplemented by some native plantings. As a result of mammalian browse, especially by feral goats (*Capra hircus*), some palatable native species including karamū (*Coprosma robusta*), hebes (*Hebe* spp.) and whauwhaupaku/five finger (*Pseudopanax arboreus*) are largely confined to cliffs out of reach of browsers.

In total 237 wild vascular plant taxa have been reported from Waikereru Ecosanctuary, comprising

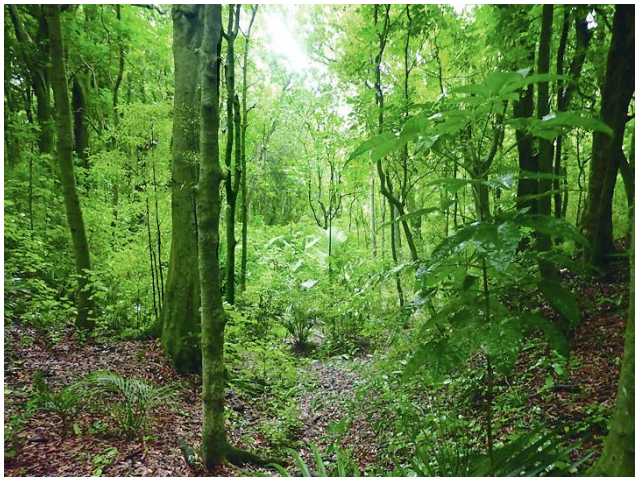


Fig. 4. Forest structure (dominated by tawa (*Beilschmiedia tawa*)) seen through a light well. 24 Jan 2022.

154 native or endemic species (46 native and 108 endemic to New Zealand) and 83 exotic species (see Appendix). Sampling showed that kānuka was the most dominant plant in all forest plots. Mahoe (*Melicytus ramiflorus)* and putaputawētā (*Carpodetus serratus*) were widespread and common in subcanopies and understories. Twiggy coprosma (*Coprosma rhamnoides*), hangehange (*Geniostoma ligustrifolium*), kawakawa (*Piper excelsum*) and kohuhu (*Pittosporum tenuifolium*) were widespread and common in understories. Ground layers were dominated by adventive herbs, especially Mexican daisy (*Erigeron karvinskianus*), sedges including/especially adventive grey sedge (*Carex divulsa*) and grasses, especially adventive cocksfoot (*Dactylis glomerata*).

Although many other native species were widespread, only one – the fern shaking brake (*Pteris tremula*) – made a significant contribution to ground cover across all plots. Seedlings of 14 tree species typical of old-growth forest in the district were present in understories although only two – long-leaved lacebark (*Hoheria sexstylosa*) and kohekohe (*Didymocheton spectabile*) – were consistently present, i.e., in half or more of the plots. Kaikomako (*Pennantia corymbosa*) and titoki (*Alectryon excelsus*) seedlings were also reasonably widespread, pigeonwood (*Hedycarya arborea*), karaka (*Corynocarpus laevigatus*), tawa (*Beilschmiedia tawa*) and rewarewa (*Knightia excelsa*) seedlings less so.

Over three-quarters of plots had at least one species of later successional tree species. Their widespread presence foreshadows succession back to forest and indicates that reversion to tall forest similar to the original vegetation cover is already underway in most of the regenerating kānuka forest and scrub on the Waikereru hills. Over time, seedlings of these and other species are likely to become more common and widespread and the pace

Fig. 5. Large patch of the fern *Parapolystichum microsorum* subsp. *pentangulare* on the forest floor. 28 Jan 2022.

Fig. 6. Kānuka regeneration dominating ridges. View from B looking west. 26 Jan 2022.

Fig. 7. Thick riparian understorey. 26 Jan 2022.

Fig. 8. Understorey of kānuka forest in sheltered gullies. 26 Jan 2022.

Fig. 9. South-facing slope in the middle catchment (C) covered in regenerating native broadleaved scrub. 25 Jan 2022.

Fig. 10. View south from middle ridge showing exotic grassland amongst kānuka regeneration and a pine plantation on the ridgetop. 25 Jan 2022.

of succession to accelerate as populations of later successional species reach reproductive maturity and begin seeding. Replanting lost species like northern rata (*Metrosideros robusta*) will also help accelerate the transition to tall forest.

Waikereru Ecosanctuary Alluvial Forest – Longbush Reserve (A)

The alluvial forest of Longbush Reserve is a regionally significant remnant (polygon A of Fig. 3), as similar forest has been mostly cleared in the district. The forest consists of a narrow strip of remnant forest for 1.16 km along the Waimatā River. The broadleaved species tawa dominates most of the forest canopy (Fig. 4) with occasionally kohekohe. The understorey is thick with kawakawa, indicative of regrowth after the removal of cattle grazing. The forest floor has localized patches of the fern *Parapolystichum microsorum* subsp. *pentangulare* (Fig. 5), mokimoki (*Dendroconche scandens*), the occasional patch of the multi-formed *Asplenium hookerianum* and the low climber jointed fern (*Arthropteris tenella*). The larger climber *Parsonsia capsularis* in seen on the forest margins. In light wells less common plants occur including the herb *Hydrocotyle elongata* and the forest grass *Microlaena polynoda*.

The northern end of the forest hosts a podocarp forest remnant of kahikatea with a ground cover of both the adventive grey sedge and native *Carex lambertiana*. A very large potentially record-breaking cabbage tree (*Cordyline australis*) is present in the alluvial forest, estimated to be around 17.5 m tall. A large hinau (*Elaeocarpus dentatus* var. *dentatus*) occurs beside the fenceline.

There are a few small invasive weed infestations in the forest including sycamore (*Acer pseudoplatanus*) and large-leaved cotoneaster (*Cotoneaster glaucophyllus*) along the margin. Horsetail (*Equisetum arvense*) was noted on a neighbouring property and a large infestation of tradescantia *(Tradescantia fluminensis*) on the stream banks at the southern end of the block where Waikereru Ecosanctuary meets the neighbouring unfenced forest remnants.

Waikereru Ecosanctuary southern catchment (B)

The southern catchment of Waikereru Ecosanctuary (B in Fig. 3) consists mostly of kānuka regeneration with some kohekohe, tawa and tītoki forest remnants. Kānuka is common on faces (Fig. 6) where it is outcompeting rank pasture. On drier ridges, the introduced grass *Rytidosperma racemosum* dominates the understorey with the native weeping bush grass/patiti (*Microlaena stipoides*) in more shaded areas. Also covering the ground are the mosses *Acrocladium*

chlamydophyllum, *Breutelia pendula*, *Hypnum cupressiforme* and *Ptychomnion aciculare*. In more sheltered gullies, kānuka forest has an understorey of māhoe (*Melicytus ramiflorus*), hangehange and kawakawa, with occasional kohekohe seedlings (Figs. 7, 8).

Remnant forest stands include titoki and tawa with kohuhu on the margins. Small stands of kohekohe are present with a sparse understorey, and some large trees. Nīkau (*Rhopalostylis sapida*) and miro (*Pectinopitys ferruginea*) are also present in some of the deeper gullies.

Some infestations of invasive weeds are present. Patches of old man's beard (*Clematis vitalba*) were noted in flower on the upper slopes, patches of blackberry (*Rubus armeniacus* and *R. ulmifolius*) are present in the rank pasture, and occasional pine (*Pinus radiata*) seedlings are present along the southern fence line.

Waikereru Ecosanctuary
middle catchment (C)

The middle catchment (C in Fig. 3) is dominated by kānuka on north-facing slopes and native broadleaved scrub on south-facing ones (Fig. 9). Lower slopes are covered by a canopy of kānuka with an understorey of kawakawa. Native ferns line the stream edge with the moss *Achrophyllum dentatum* and *Hypopterygium* sp. Occasional mature titoki occur along the stream edge, remnants of broadleaved riparian forest. The kānuka forest ground layer grades into weeping bush grass up the slopes. A variety of nitrogen-fixing cyanobacteria lichens such as *Peltigera* sp. carpet the ground. The shrubby gullies are mostly made up of tree tutu (*Coriaria arborea*) and mahoe with a kawakawa understorey.

Ridges are covered in grassland (Fig. 10) dominated by plume grass (*Dichelachne crinita*), *Rytidosperma* sp. and sweet vernal (*Anthoxanthum odoratum*) with the weedy herbs Mexican daisy and yellow flax (*Linum trigynum*). The moss *Hypnum cupressiforme*, apple moss (*Philonotis tenuis*), *Cladia* aff. *inflata* and multiple *Cladonia* spp. cover exposed ground (Fig. 11). Other slopes host rank pasture dominated by browntop (*Agrostis capillaris*), cocksfoot, Yorkshire fog (*Holcus lanatus*) and creeping buttercup (*Ranunculus repens*), with lotus (*Lotus pedunculatus*) abundant on damper sites.

The upper reaches of the middle catchment are dominated by broadleaved shrubs with forest remnants of kohekohe, horoeka (*Pseudopanax crassifolius*) and kohuhu, horoeka being prominent on the forest margins. Occasional titoki occurs in the canopy with an understorey of kawakawa and black shieldfern (*Polystichum neozelandicum*) and

Fig. 11. Dry ridges covered in *Cladia* aff. *inflata* and moss species. 25 Jan 2022.

Fig. 12. View looking east, cottonwood (*Ozothamnus leptophyllus*) in foreground, mataī (dark green, in the centre) in gully. 27 Jan 2022.

Fig. 13. Sandstone stream with ferns. 27 Jan 2022.

Fig. 14. Sparse understorey of kānuka forest looking down into gully. 27 Jan 2022.

Fig. 15. Wairoa koromiko growing on steep face, mostly finished flowering. 27 Jan 2022.

Fig. 16. A patch of *Jovellana sinclairii* being overtaken by Mexican daisy. 25 Jan 2022.

maidenhair (*Adiantum cunninghamii*) on the ground. A large ngaio tree is also present. Upper ridge kānuka forest has an understorey of putaputawētā and *Coprosma rhamnoides* with patches of tree tutu in full sun. Patches of blackberry are present throughout.

Waikereru Ecosanctuary northern catchment (D)

The south-facing slopes of the northern catchment of Waikereru Ecosanctuary (D in Fig. 3) host broadleaved shrubland. Two large mataī (*Prumnopitys taxifolia*) were noted in the gully (Fig. 12) as well as a small tawa remnant with a sandstone fern-lined stream (Fig. 13). The upper area is dominated by kānuka with an understorey of ponga (*Cyathea dealbata*) and mamaku (*Cyathea medullaris*) in gullies and sparser on ridges (Fig. 14). Mānuka (*Leptospermum scoparium* agg.) is very rare across the reserve but a few plants were seen on the upper slopes of this block.

There are local weed infestations in the lower reaches of the northern catchment, including a large patch of old man's beard, scattered blackberry and isolated patches of Japanese honeysuckle (*Lonicera japonica*). Tutsan (*Hypericum androsaemum*) is local along the stream and a few plants of pampas (*Cortaderia* sp.) were noted in the gullies.

Indigenous plants of interest

Waikereru Ecosanctuary holds a surprising diversity of native vascular plant species, 154 in total. This is most likely due to diversity of habitat and forest relics. Plant threat statuses in this report are from the Conservation Status assessment (de Lange et al. 2018a) The threat status categorises plants as, for instance, 'Threatened-Nationally Endangered'; or 'At Risk-Declining' or 'Data Deficient'. Data Deficient means a species may be Threatened or At Risk but there is a lack of current information about its distribution and abundance (de Lange et al 2018a). A large population of the At Risk – Naturally Uncommon species, Wairoa koromiko (*Hebe tairawhiti*), was found in the north-western corner (Area D) of the ecosanctuary. Some plants were exposed on cliffs (Fig. 15), growing with *Jovellana sinclairii*; others were mostly seen as seedlings under a sparse kānuka canopy. Wairoa koromiko is a local endemic of the East Cape region. The At Risk – Declining native herb *Jovellana sinclair*ii was locally common, forming large patches on slopes, competing against the aggressive Mexican daisy (*Erigeron karvinskianus*) (Fig. 16). This species is indicative of limestone, which was exposed in a few steep stream banks where this plant was often seen. A few late flowers were noted (Fig. 17). The At Risk – Naturally Uncommon fennel-leaved pondweed *Stuckenia pectinata* was a common water weed submerged in the Waimata River (Fig. 18). One

patch of *Epilobium alsinoides* subsp. *alsinoides* was seen in rank pasture of a shaded gully (Fig. 19). This plant is scarce on the East Coast of the North Island, with a paucity of herbarium records in this area (Australasian Virtual Herbarium, accessed 2022).

Exotic environmental weed species

In total, 83 exotic species were reported from Waikereru Ecosanctuary. Most weed infestations are not serious and should not hinder natural regeneration but would be easily removed. A few patches of old man's beard were scattered on the slopes. A few small patches of pampas (*Cortaderia selloana*) were seen on slips streamside. Mexican daisy was abundant on the dry slopes throughout Waikereru Ecosanctuary. Field horsetail (*Equisetum arvense*) was local along the Waimatā River edge. The occasional *Pinus radiata* seedling was seen on the slopes, spreading from neighbouring plantations. Two blackberry species formed thickets, *Rubus armeniacus* and *Rubus ulmifolius* while one patch of Japanese wineberry (*Rubus phoenicolasius*) was seen on the roadside.

Bryophytes

An effort was made to sample the bryophytes of Waikereru Ecosanctuary with help from John Braggins on liverwort identification and Jessica Beever on mosses. Waikereru hosts many kinds of habitats including damp remnant gully forest, damp banks under a kānuka canopy and more cloud-forest-type vegetation towards the top of the ridges. Bryophytes have an important role in the retention of water in natural systems; they also provide a moist nursery for seeds to germinate on otherwise dry soil. The forest types of Waikereru Ecosanctuary are still young as most of the hills are regenerating farmland in which common earlier colonizer species are abundant. However, the forested gullies hold a 'seed source' of spores for forest bryophyte species able to handle the darker conditions of the future successions.

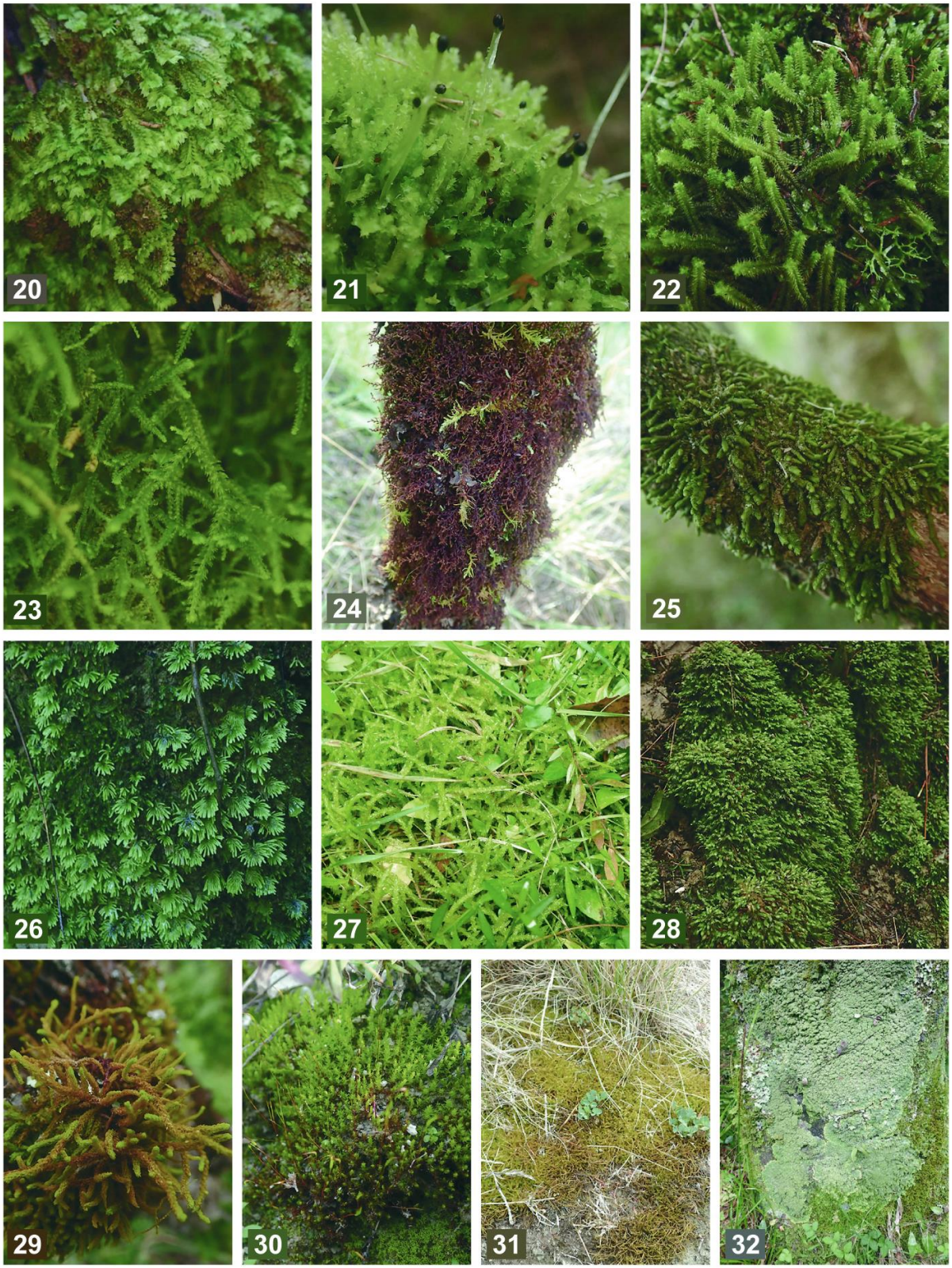
<u>Liverworts</u>

In total, 25 species of liverworts have been recorded from Waikereru Ecosanctuary, collection focussing on the more conspicuous species. Under the kānuka forest, the bare forest floor hosts many common species, including *Balantiopsis diplophylla* var. *hockenii* (Fig. 20), *Lepidolaena taylorii*, *Lobatiriccardia* sp., *Heteroscyphus coalitus* var. *coalitus* (Fig. 21), *Heteroscyphus supinus*, *Pallavicinia innovans*, *Trichocolea rigida* and a species of *Riccardia*. More localised were the species *Reboulia hemisphaerica* subsp. *australis* noted close to streams on dry banks; a few patches of *Schistochila balfouriana* in dark forest; one patch of *Symphyogyna hymenophyllum* noted close to the northern summit of Waikereru; and one large patch of the large liverwort *Chandonanthus squarrosus*

Fig. 17. A few late flowers of *Jovellana sinclairii*. 25 Jan 2022.

Fig. 18. *Stuckenia pectinata* growing submerged in a quiet part of the Waimatā River. 24 Jan 2022.

Fig. 19. *Epilobium alsinoides* subsp. *alsinoides* with old capsules in rank pasture. 18 Apr 2022.



Figs. 20–32: **20.** *Balantiopsis diplophylla* var. *hockenii* (each shoot 0.5 cm wide). 21 Apr 2022. **21.** *Heteroscyphus coalitus* var. *coalitus* with sporophytes (2 cm tall). 18 Apr 2022. **22.** *Chandonanthus squarrosus* growing terrestrially (shoots 3–4 mm wide). 27 Apr 2022. **23.** A patch of *Lepidozia procera* on the ground (each leafy stem 0.1 mm wide. The tiny leaves are toothed. 25 Apr 2022. **24.** A red-pigmented *Frullania squarrosula*, corticolous on a kānuka branch 5 cm diam. 21 Apr 2022. **25.** *Thysananthus anguiformis* corticolous on kānuka (branch 4 cm diam.). 25 Apr 2022. **26.** Patch of *Hypopterygium tamarisci* streamside (each frond approx. 2cm across). 19 Apr 2022. **27.** Patch of *Acrocladium chlamydophyllum* competing with Mexican daisy under kānuka (patch 12 cm across). 25 Apr 2022. **28.** Patch of *Fissidens asplenioides* on dirt under kānuka canopy (patch 40 cm tall). 19 Apr 2022. **29.** *Papillaria flavolimbata* growing on kānuka (6 cm across). 25 Apr 2022. **30.** *Gertruidiella torquata* with capsules growing on dry earth (patch 7 cm across). 21 Apr 2022. **31.** A patch of the brown dry form of the moss *Triquetrella papillata* on dry dirt bank (patch 20 cm across). 25 Apr 2022. **32.** *Pannaria* aff. *minutiphylla* corticolous on tawa trunk in alluvial forest (patch 30 cm tall). 24 Jan 2022.

(Fig. 22) growing terrestrially. An interesting record was *Lepidozia procera* (Fig. 23), a fine-foliaged species growing on the bank under kānuka; this is one of a handful of records of this species in the North Island and a first for the East Cape (specimen lodged in AK; see Appendix). Grassy banks also hosted larger liverwort species including *Acrobolbus tenellus* var*. tenellus* and *Plagiochila intertexta*, the latter forming large swards. In the steams the large thalloid species *Monoclea forsteri* was common, and an interesting semi aquatic form of *Chiloscyphus aperticaulis* was noted in a rocky stream. Liverworts were common on kānuka branches, especially on the cloudier ridges, species including the red-pigmented *Frullania squarrosula* (Fig. 24), *Lepidolaena taylorii* again, *Porella elegantula,* the very common *Metzgeria* aff. *furcata* and the locally common *Thysananthus anguiformis* (Fig. 25). Two adventive species were present, *Lunularia cruciata* weedy on tracks, and a large patch of *Marchantia polymorpha* was seen along the gravel road edge.

Mosses

Waikereru Ecosanctuary hosts a diversity of mosses, 43 in total. Close to or submerged in streams, certain species are common, including *Achrophyllum dentatum*, *Cyathophorum bulbosum*, *Hypopterygium tamarisci* (Fig. 26), *Tridontium tasmanicum* and *Thuidium laeviusculum*. Under the kānuka forest many species are common on the ground some forming large patches including *Achrophyllum quadrifarium*, *Acrocladium chlamydophyllum* (Fig. 27), *Breutelia pendula*, *Dicranoloma billarderei*, *Fissidens asplenioides* (Fig. 28), *Leucobryum javense* and *Racopilum robustum*. Corticolous mosses are less common but include *Cladomnion ericoides*, *Leptostomum macrocarpum*, *Macrocoma tenuis*, *Macromitrium gracile*, *Papillaria crocea*, *Papillaria flavolimbata* (Fig. 29) and *Rhaphidorrhynchium amoenum*. On the sparsely vegetated dry soils of Waikereru's ridges mosses and lichens dominate. The common moss species include *Campylopus clavatus*, *Campylopus introflexus*, *Gertruidiella torquata* (Fig. 30), *Hypnum cupressiforme*, *Philonotis tenuis*, *Pseudoscleropodium purum* (adventive), *Ptychomnion aciculare*, *Thuidiopsis furfurosa* and *Triquetrella papillata* (Fig. 31).

Lichens

Waikereru Ecosanctuary hosts a diversity of habitats for lichens with 97 lichen species recorded in total, many being new records for the East Cape. The three main communities present are forest lichens of the older remnants, the forest lichens of the younger kānuka on the slopes and the terricolous (ground-dwelling) lichens.

Older forest remnants

The broadleaf forest remnants host many forest species tolerant of heavy shade, the best examples of these at Waikereru being the alluvial and gully forests. Foliose species are the most conspicuous, often covering trunks, specially on forest margins or high light areas. The most common foliose species include *Heterodermia casarettiana*, *Pannaria* aff. *minutiphylla* (Fig. 32), *Parmotrema subtinctorium*, *Pseudocyphellaria carpoloma*, *Pseudocyphellaria chloroleuca*, and *Sticta babingtonii*. The 'Data Deficient' crustose species *Cresponea plurilocularis* (Fig. 33) is abundant on the trunks of tawa with other crustose species *Bacidia laurocerasi*, *Porina exocha* and *Phyllopsora* sp. The 'Data Deficient' *Haematomma sorediatum* (Fig. 34) was seen in one spot corticolous (bark-dwelling) on tītoki. The foliicolous (leaf-dwelling) genus *Strigula* was common on leaves of tawa, the two species seen being *Strigula novae-zelandiae* and *S. prasina*.

Regenerating kānuka

Despite its flaky bark, kānuka hosts a range of species, most cyanobacterial, providing nitrogen in this early succession of the forest (Fig. 35). Common cyanobacterial species include the jelly lichen *Collema leucocarpum* (Fig. 36), and *Physma chilense* (Fig. 37) the most conspicuous. A range of foliose species including *Pseudocyphellaria bartlettii*, *Pseudocyphellaria haywardiorum*, *Pseudocyphellaria intricata*, all known as 'Naturally Uncommon' species. Other less 'At Risk' cyanobacterial species include *Pannaria fulvescens* (Fig. 35), *Parmeliella nigrocincta*, *Sticta limbata* (Fig. 38) and *Sticta fuliginosa* (Fig. 39). Other lichens with common algal species include the strikingly yellow species *Crocodia poculifera*, a species of *Hypogymnia* often seen as a windfall, and the blue green *Pannaria leproloma*. The white *Pertusaria sorodes* (Fig. 40) was noted in one spot on the edge of Longbush's riparian forest. On the ground under kānuka the miniature tree-like species *Cladonia darwinii* (Fig. 41) is seen with the variable *Micarea prasina* (Fig. 42), and large patches of the cyanobacterial *Peltigera dolichorrhiza* (Fig. 43) often dominate the ground.

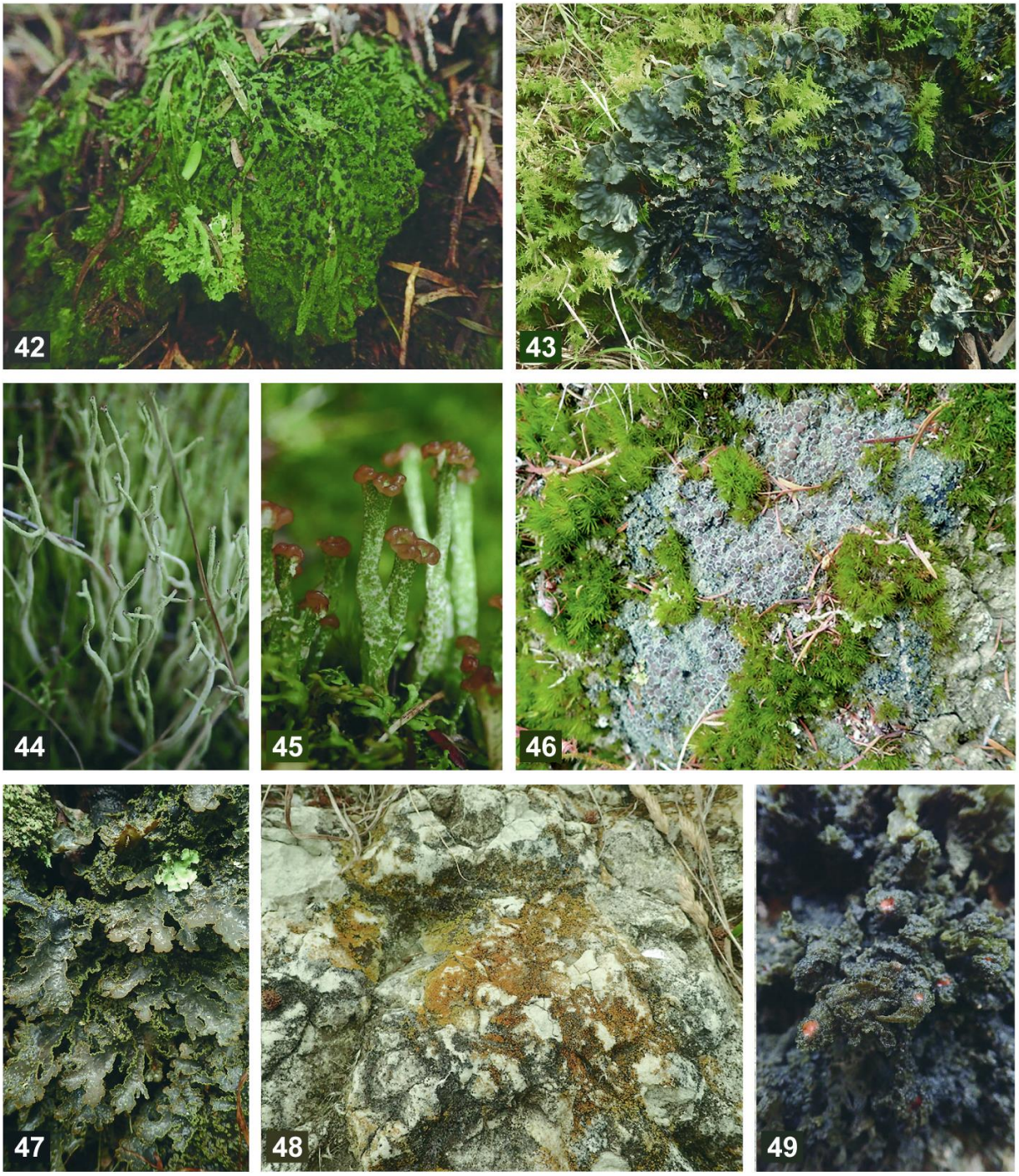
Terricolous communities

Lichens are common on the dry summits of Waikereru ridges, sometimes with partial shade from kānuka. *Cladia* aff*. inflata* (Fig. 11) dominates with many species of *Cladonia* including: the antler-like *Cladonia corniculata* (Fig. 44), the cupped *Cladonia chlorophaea*, the divided *Cladonia furcata*, small patches of red-fruited *Cladonia pleurota* and larger patches of peg-lichen *Cladonia subcariosa* (Fig. 45). The grey squamulose lichen *Fuscopannaria subimmixta* (Fig. 46) forms patches on the earth with the candy-like *Dibaeis arcuata*. The large dark grey foliose lichen *Pseudocyphellaria neglecta* (Fig. 47) is a common terricolous and low corticolous lichen on Waikereru's slopes. Two other terricolous lichens were noted: a species

Figs. 33–41: 33. *Cresponea plurilocularis* corticolous on a tawa trunk (largest apothecium 0.75 mm diam.). 24 Jan 2022. **34.** *Haematomma sorediatum* with whitish soredia and occasional red apothecia (0.75 mm across) on titoki. 18 Apr 2022. **35.** A range of cyanolichens including *Gabura fascicularis* (dark black) and *Pannaria fulvescens* (bluish grey) on a kānuka trunk approx. 15 cm diam. 25 Jan 2022. **36.** The jelly lichen *Collema leucocarpum* on a kānuka branch 9 cm diam. 25 Jan 2022. **37.** The jelly lichen *Physma chilense* (9 cm wide, purplish black) on lancewood. 21 Apr 2022. **38.** A large specimen of *Sticta limbata* on putaputawētā (patch 25 cm tall). 25 Apr 2022. **39.** *Sticta fuliginosa* dominating the stems of cottonwood, in a sea of Mexican daisy. 15 Jan 2022. **40.** *Pertusaria sorodes* on a kanuka? with pork-bun-like verrucae dotted with up to 10 black ostioles, each approx. 0.5 mm across. 24 Jan 2022. **41.** *Cladonia darwinii* amongst bryophytes under kānuka canopy (6 cm wide patch). 24 Apr 2022.

of *Placopsis*, and *Austrocaloplaca cirrochrooides* (Fig. 48), the latter previously unrecorded from the North Island (Galloway 2007).

Many 'At Risk' species were recorded from Waikereru (de Lange et al. 2018b). These include: the five 'Data Deficient' species: *Chrysothrix xanthina*, *Cladonia subcariosa* (as *Cladonia polycarpoides)*, *Gabura fascicularis*, *Haematomma sorediatum* and *Lecanora novaehollandiae*; and eleven Naturally Uncommon species: *Coccocarpia pellita*, *Crocodia poculifera*, *Dictyonema sericeum*, *Heterodermia casarettiana*, *Leptogium coralloideum* (a fertile specimen was noted from Waikereru, a first for New Zealand Fig. 49), *Parmotrema subtinctorium*, *Pseudocyphellaria bartlettii*, *Pseudocyphellaria haywardiorum*, *Pseudocyphellaria intricata*, *Sticta babingtonii* and *Strigula novae-zelandiae*.



Figs. 42–49: **42.** *Micarea prasina* with numerous black apothecia (6 cm wide patch). 18 Apr 2022. **43.** *Peltigera dolichorrhiza* (20 cm across) competing with the moss *Thuidiopsis furfurosa*. 21 Apr 2022. **44.** Antler-like podetia of *Cladonia corniculata* (5 cm tall). 24 Apr 2022. **45.** Peg-like podetia of *Cladonia subcariosa* (1.5 cm tall). 19 Apr 2022. **46.** The grey squamulose lichen *Fuscopannaria subimmixta* (patch 10 cm across) amongst the moss *Campylopus clavatus*. 21 Jan 2022. **47.** *Pseudocyphellaria neglecta* on a titoki trunk. (lobes 1-2 cm wide). 18 Apr 2022. **48.** *Austrocaloplaca cirrochrooides* (patch 10 cm across) on sandstone. 27 Jan 2022. **49.** *Leptogium coralloideum* with brownish red apothecia (0.5 cm across), on cabbage tree. 25 Apr 2022.

Other fungal communities

Three different mycorrhizal communities are prominent at Waikereru Ecosanctuary, the first being the arbuscular mycorrhizal community of the exotic pasture. This is being outcompeted by the natural succession into the kānuka forest which hosts ectomycorrhizal relationships, grading into the expanding native podocarp/broadleaved forest remnants which host arbuscular mycorrhiza relations, which historically would have been the most common mycorrhizal community in the North Island. Several of the ectomycorrhizae were seen fruiting under the kānuka including coral fungi (*Clavulina* sp.), *Cortinarius*, the large

head-sized *Hebeloma victoriense*, *Laccaria*, the milk-cap *Lactifluus clarkeae*, earth balls (*Scleroderma* sp.) and multiple *Russula* species; the introduced 'toadstool' *Amanita muscaria* was common under *Pinus radiata*. Many saprotropic fungi were also seen, including the ear fungus *Auricularia cornea* common on the stems of dead shrubs throughout the reserve, the indroduced orange pore fungus (*Favolaschia claudopus*), the witch cap (*Hygrocybe conica* complex), basket fungi (*Ileodictyon cibarium*), inkcap (*Coprinopsis*), the puff ball *Lycoperdon*, graceful parasol (*Macrolepiota clelandii*) and the scarlet truffle (*Paurocotylis pila*). Two species of entomopathogenic fungi (fungi that are insect pathogens) were seen at Waikereru: *Beauveria* was seen on a host beetle and *Cordyceps sinclairii* was very common, its white fruiting bodies erupting from the ground from within the host, a dead cicada (*Amphipsalta zelandica)* grub. The introduced myrtle rust (*Austropuccinia psidii*) was seen on young foliage of a planted rōhutu (*Lophomyrtus obcordata)* and the native rust *Hamaspora australis* was seen on the leaves of *Rubus schmidelioides*. The polypore *Ganoderma* was seen on older trees such as titoki.

Fauna

During the fieldwork a number of native bird species were seen. They included the following New Zealand endemic species:

- Kereru (*Hemiphaga novaeseelandiae*)
- Korimako/bellbird (*Anthornis melanura*).
- Miromiro/ North Island tomtit (*Petroica macrocephala* subsp. *toitoi*).
- Piwakawaka/North Island fantail (*Rhipidura fuliginosa* subsp. *placabilis*).
- Pūtangitangi/paradise shelduck (*Tadorna variegata*).
- Tūī /kōkō (*Prosthemadera novaeseelandiae*).

Native bird species:

- Kāhu/swamp harrier (*Circus approximans*)
- Karoro/southern black-backed gull (*Larus dominicanus* subsp. *dominicanus*).
- Ruru/morepork (*Ninox novaeseelandiae*).
- Tauhou/silvereye/waxeye (*Zosterops lateralis*).
- Warou/welcome swallow (*Hirundo neoxena*).

Other fauna seen:

- The endemic chorus cicada (*Amphipsalta zelandica*) was calling loudly throughout the forest.
- The endemic stick insect (*Clitarchus hookeri*) was noted in riparian forest.
- The endemic tiger beetle (*Neocicindela tuberculata*) was local on steep banks.
- The native locust (*Locusta migratoria*) was occasionally seen in grassland.

Extensive pest animal control is being undertaken at Waikereru. Pest species noted:

- Mobs of feral goats were seen during both visits to Waikereru.
- Feral pig (*Sus scrofa*) sign was local.
- Possum (*Trichosurus vulpecula*) sign (browsing and scat) was seen throughout.
- Rabbit (*Orytolagus cuniculus*) sign was local throughout.

Acknowledgements

We would like to thank Dame Anne and Jeremy Salmond for permission to visit the property, for funding and for the great work they put into restoring Waikereru Ecosanctuary. Dr Rhys Gardner aided in the identification of many plants requiring detailed determination, Dr Jessica Beever and Dr John Braggins gave bryophyte identification assistance and Allison Knight, Andrew Marshall, Jennifer Bannister and Ulrik Sochting gave help in lichen identification.

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Appendix. Lists of plants, fungi and lichens recorded at Waikereru Ecosanctuary
*= exotic taxa
= taxa also recorded by the author in iNaturalist https://inaturalist.nz/; a project was also made for Waikereru Ecosanctuary https://inaturalist.nz/projects/biodiversity-of-waikereru
Accession numbers are shown for specimens lodged in the Auckland Museum Herbarium (AK) or, if currently being processed by the Museum, the lead author's person collection number is given instead.

Vascular plants:

Ferns & Lycopods

Adiantum cunninghamii
Adiantum diaphanum
Adiantum fulvum
Adiantum hispidulum
Adiantum raddianum *
Arthropteris tenella
Asplenium bulbiferum
Asplenium flaccidum
Asplenium gracillimum
Asplenium hookerianum # AK384331
Asplenium oblongifolium
Asplenium polyodon
Austroblechnum lanceolatum
Cranfillia fluviatilis
Cyathea dealbata
Cyathea medullaris
Cyathea smithii
Dendroconche scandens
Dicksonia fibrosa
Diplazium australe
Doodia australis
Equisetum arvense * #
Histiopteris incisa
Hymenophyllum demissum
Hymenophyllum multifidum
Hymenophyllum sanguinolentum
Hymenophyllum scabrum
Hypolepis ambigua
Icarus filiformis
Lastreopsis hispida
Lomaria discolor
Paesia scaberula
Parablechnum minus # (M.Ford 1153, AK)
Parablechnum novae-zelandiae
Parablechnum triangularifolium # AK384329
Parapolystichum glabellum
Parapolystichum microsorum subsp. *pentangulare*
Pellaea rotundifolia
Pakau pennigera (Syn. *Pneumatopteris pennigera*)
Polystichum neozelandicum
Polystichum wawranum
Pseudodiphasium volubile
Pteridium esculentum
Pteris macilenta
Pteris tremula
Pyrrosia elaeagnifolia
Zealandia pustulata subsp. *pustulata*

Gymnosperms

Agathis australis (planted)
Dacrycarpus dacrydioides
Dacrydium cupressinum
Pectinopitys ferruginea
Pinus radiata *
Prumnopitys taxifolia
Podocarpus totara var. *totara*

Dicotyledons

Acaena anserinifolia
Acaena novae-zelandiae
Acer pseudoplatanus *
Alectryon excelsus subsp. *excelsus*
Alnus glutinosa *
Amaranthus blitum *
Amaranthus deflexus *
Arabidopsis thaliana *
Aristotelia serrata
Beilschmiedia tawa
Berberis glaucocarpa *
Brachyglottis repanda
Callitriche stagnalis *
Calystegia silvatica subsp. *disjuncta* *
Calystegia tuguriorum
Capsella bursa-pastoris *
Cardamine forsteri # AK384337
Carpodetus serratus
Cerastium glomeratum *
Chamaemelum nobile *
Cirsium arvense *
Cirsium vulgare *
Clematis cunninghamii
Clematis paniculata
Clematis vitalba *
Coprosma lucida
Coprosma rhamnoides
Coprosma robusta
Cotoneaster glaucophyllus * #
Coriaria arborea var. *arborea*
Corynocarpus laevigatus
Crassula decumbens *
Daucus carota *
Delairea odorata *
Dichondra brevifolia# AK384339
Dichondra repens
Didymocheton spectabilis (syn. *Dysoxylum spectabile*)
Digitalis purpurea *
Dipsacus fullonum *
Drosera auriculata
Dysphania ambrosioides *
Dysphania pumilio *
Elaeocarpus dentatus var. dentatus
Entelea arborescens
Epilobium alsinoides # (M.Ford 1156, AK).
Epilobium cinereum
Epilobium nerteroides
Epilobium nummulariifolium
Epilobium pedunculare
Epilobium rotundifolium
Erechtites hieraciifolius *
Erigeron karvinskianus *
Erigeron sumatrensis *
Euchiton japonicus
Euphorbia peplus *
Ficus carica *
Foeniculum vulgare *
Fuchsia excorticata
Galium divaricatum *
Geniostoma ligustrifolium var. *ligustrifolium*

Geranium dissectum *
Geranium gardneri *
Gernaium homanum
Geranium molle *
Geranium potentilloides # AK384333
Geranium robertianum *
Jovellana sinclairii # AK384335
Haloragis erecta subsp*. erecta*
Hebe stricta var. *stricta*
Hebe tairawhiti # AK384340
Helichrysum lanceolatum
Helichrysum luteoalbum * #
Helminthotheca echioides *
Hydrocotyle elongata # AK384332
Hydrocotyle moschata var. *moschata*
Hydrocotyle moschata var. *parvifolia*
Hypericum androsaemum *
Hypericum humifusum *
Hedycarya arborea
Hoheria sexstylosa
Kunzea robusta
Lapsana communis *
Laurelia novae-zelandiae
Lepidium didymium *
Lepidium sp. *
Leptospermum scoparium agg.
Leucanthemum vulgare *
Leucopogon fasciculatus
Linum bienne *
Linum trigynum *
Lonicera japonica *
Lophomyrtus obcordata
Lotus pedunculatus *
Melicope ×mantellii
Medicago arabica *
Medicago lupulina *
Melicope ternata planted
Melicytus ramiflorus subsp. *ramiflorus*
Mentha sp. *
Metrosideros colensoi
Metrosideros diffusa
Metrosideros perforata
Modiola caroliniana *
Muehlenbeckia australis
Muehlenbeckia complexa var. *grandifolia* # AK384336
Myoporum laetum
Myrsine australis
Nasturtium officinale *
Nestegis lanceolata
Nertera depressa
Olearia rani var. *colorata*
Orobanche minor *
Oxalis corniculata *
Oxalis exilis
Oxalis incarnata *
Ozothamnus leptophyllus
Passiflora tetrandra
Parsonsia capsularis
Pennantia corymbosa
Persicaria decipiens # (M.Ford 1233, AK)
Persicaria hydropiper *
Persicaria maculosa *
Phytolacca octandra *
Pilosella officinarum *
Piper excelsum subsp*. excelsum*
Pittosporum eugenioides
Pittosporum tenuifolium
Plantago lanceolata *
Plantago major *
Polygonum aviculare *
Populus alba *
Populus tremula *
Potentilla indica *
Pseudopanax arboreus
Pseudopanax crassifolius
Prunella vulgaris *
Prunus sp. *
Ranunculus reflexus
Ranunculus repens *
Rosa rubiginosa *
Rubus armeniacus * #
Rubus cissoides
Rubus phoenicolasius * #
Rubus schmidelioides var. schmidelioides
Rubus squarrosus
Rubus ulmifolius * #
Rumex acetosella *
Rumex conglomeratus *
Salix sp. *
Schefflera digitata
Scrophularia auriculata *
Senecio bipinnatisectus *
Senecio glastifolius *
Senecio minimus
Senecio vulgaris *
Sherardia arvensis *
Sison amomum *
Sisymbrium officinale *
Solanum americanum
Solanum chenopodioides *
Solanum nigrum *
Solanum opacum # (M.Ford 1154, AK)
Solanum pseudocapsicum *
Sonchus asper *
Sonchus oleraceus *
Sophora chathamica
Sophora microphylla # (M.Ford 1155, AK)
Sophora tetraptera
Stachys sylvatica *
Stellaria parviflora
Streblus heterophyllus
Symphyotrichum subulatum *
Taraxacum officinale agg. *
Torilis arvensis *
Trifolium arvense *
Trifolium dubium *
Trifolium glomeratum *
Trifolium repens *
Verbascum thapsus *
Verbena incompta *
Verbena officinalis *
Veronica anagallis-aquatica *
Veronica serpyllifolia *
Veronica persica *
Vicia sativa * #
Vitex lucens

Monocotyledons

Acianthus sinclairii
Agrostis capillaris *
Agrostis stolonifera *
Anthoxanthum odoratum *
Arrhenatherum elatius *
Bromus catharticus *
Carex divulsa *
Carex forsteri
Carex geminata
Carex lambertiana
Carex solandri
Carex ochrosaccus # AK384353
Carex uncinata
Carex virgata

Catapodium rigidum *
Cordyline australis
Cortaderia selloana *
Corybas cheesemanii
Crocosmia x*crocosmiiflora* *
Cynodon dactylon *
Cynosurus cristatus *
Dactylis glomerata *
Drymoanthus adversus
Echinochloa crus-galli *
Eleocharis acuta
Festuca rubra subsp. *rubra* *
Gastrodia cunninghamii
Holcus lanatus *
Isolepis prolifera
Isolepis reticularis
Juncus articulatus *
Juncus australis
Juncus edgariae
Landoltia punctata *
Lemna disperma
Libertia grandiflora
Lolium arundinaceum subsp. *arundinaceum* *
Lolium perenne *
Microlaena avenacea
Microlaena polynoda #
Microlaena stipoides
Microtis unifolia
Oplismenus hirtellus subsp. *imbecillis*
Panicum dichotomiflorum *
Paspalum dilatatum *
Paspalum distichum *
Pentapogon crinitus # AK384354
Phormium cookianum subsp. *hookeri*
Phormium tenax
Potamogeton crispus *
Pterostylis alobula
Pterostylis banksii
Rhopalostylis sapida
Ripogonum scandens
Rytidosperma biannulare # AK384355
Rytidosperma gracile
Rytidosperma racemosum * # (M.Ford 1152, AK)
Schoenoplectus tabernaemontani
Setaria gracilis * # AK384352
Setaria parviflora * #
Setaria pumila * # AK384351
Setaria verticillata * #
Sporobolus africanus *
Stuckenia pectinata # AK384350
Tradescantia fluminensis *

Non-vascular plants:

Mosses

Acrocladium chlamydophyllum
Achrophyllum dentatum
Achrophyllum quadrifarium
Breutelia pendula
Bryum argenteum *
Calliergonella cuspidata *
Camptochaete deflexa#
Campylopus clavatus
Campylopus introflexus
Cladomnion ericoides
Cyathophorum bulbosum
Dicranoloma billarderei
Distichophyllum pulchellum # (M.Ford 1143, AK)
Ditrichum difficile
Echinodiopsis hispida # (M.Ford 1145, AK)
Fissidens asplenioides # (M.Ford 1141, AK)
Gertruidiella torquata # (M.Ford 1140, AK)
Hypnum cupressiforme
Hypopterygium didictyon
Hypopterygium tamarisci # (M.Ford 1267, AK)
Hymenostomum sullivanii #
Leptodontium interruptum
Leptostomum macrocarpum
Leucobryum javense
Lopidium concinnum #
Macrocoma tenuis
Macromitrium gracile # (M.Ford 1142, AK)
Papillaria crocea
Papillaria flavolimbata # (M.Ford 1139, AK)
Philonotis tenuis
Polytrichum juniperinum
Pseudoscleropodium purum
Ptychomnion aciculare
Racopilum cuspidigerum var.*convolutaceum*
Racopilum robustum #
Rhaphidorrhynchium amoenum # (M.Ford 1144, AK)
Syntrichia antarctica
Thuidiopsis furfurosa
Thuidium laeviusculum
Trachyloma diversinerve
Tridontium tasmanicum
Triquetrella papillata
Weissia controversa var*. controversa*

Liverworts

Acrobolbus tenellus var. *tenellus* # (M.Ford 1050, AK)
Balantiopsis diplophylla var. *hockenii* # (M.Ford 1056, AK)
Chandonanthus squarrosus #
Chiloscyphus aperticaulis #
Chiloscyphus longiciliatus
Frullania squarrosula # (M.Ford 1051, AK)
Heteroscyphus coalitus var. coalitus
Heteroscyphus supinus # (M.Ford 1049, AK)
Lepidozia procera # (M.Ford 1055, AK)
Lepidolaena taylorii # (M.Ford 1047,1316, AK)
Lobatiriccardia sp.
Lunularia cruciata * #
Marchantia polymorpha * # (M.Ford 1048, AK)
Metzgeria aff. *furcata* # (M.Ford 1053, AK)

Microlejeunea latitans
Monoclea forsteri
Pallavicinia innovans #
Plagiochila intertexta # (M.Ford 1260, AK)
Porella elegantula # (M.Ford 1261, AK)
Reboulia hemisphaerica subsp. *australis* (M.Ford 1052, AK)
Riccardia sp. # (M.Ford 1251, AK)
Schistochila balfouriana #
Symphyogyna hymenophyllum # (M.Ford 1262, AK)
Thysananthus anguiformis # (M.Ford 1054, AK)
Trichocolea rigida # (M.Ford 1046, AK)

Fungi and Lichens:

Fungi

Amanita muscaria #
Austropuccinia psidii
Auricularia cornea
Beauveria sp. #
Clavulina sp. #
Coprinopsis sect. *Lanatulae* #
Cordyceps sinclairii #
Cortinarius sp.
Favolaschia claudopus
Ganoderma sp. #
Hamaspora australis #
Hebeloma victoriense #
Hygrocybe conica complex #
Ileodictyon cibarium
Laccaria sp. #
Lactifluus clarkeae #
Lycoperdon sp. #
Macrolepiota clelandii #
Paurocotylis pila #
Russula sp.1 #
Russula sp. 2 #
Scleroderma sp. #

Lichens

Austroplaca cirrochrooides # AK384423
Austromelanelixia glabratuloides # (MF1265)
Bacidia laurocerasi # (M.Ford 1271, AK)
Biatoropsis usnearum
Brigantiaea chrysosticta
Chrysothrix xanthina
Cladia aff. *inflata* # (M.Ford 977, AK)
Cladonia confusa
Cladonia corniculata # (M.Ford 1137, AK)
Cladonia chlorophaea # AK384411
Cladonia darwinii # AK384388
Cladonia furcata # (M.Ford 1146, AK)
Cladonia neozelandica var. *neozelandica* (M.Ford 1209, AK)
Cladonia neozelandica var. *wilsonii* (M.Ford 1138, 1210, AK)
Cladonia pleurota # AK384385
Cladonia subcariosa # (M.Ford 1211, AK)
Coccocarpia palmicola
Coccocarpia pellita # (M.Ford 1135, AK)
Coccotrema cucurbitula
Coenogonium implexum
Collema laeve
Collema leucocarpum (M.Ford 1263, AK)
Collema subconveniens
Cresponea plurilocularis # (MF1272; M.Ford 1150, AK)
Crocodia poculifera # AK384418
Dibaeis arcuata
Dictyonema sericeum
Dirinaria picta
Flavoparmelia haywardiana (M.Ford 1266, AK)
Fuscopannaria subimmixta
Gabura fascicularis var. *fascicularis*
Haematomma sorediatum # (M.Ford 1133, AK)
Heterodermia casarettiana # AK384386
Hypogymnia turgidula # AK384410
Hypogymnia subphysodes
Lecanora flavopallida # (M.Ford 1252, AK)
Lecanora novaehollandiae # (M.Ford 1247, AK)
Lecanora polytropa # (M.Ford 1250, AK)
Lecanora queenslandica # (M.Ford 1264, AK)
Leioderma sorediatum # (M.Ford 1268, AK)
Leparia ulrikii
Leptogium coralloideum # (M.Ford 1268, AK)
Leptogium cyanescens
Leptogium oceanianum
Lobarina scrobiculata # AK384420
Menegazzia neozelandica
Micarea prasina # (M.Ford 1253,1270, AK)
Notoparmelia erumpens
Normandina pulchella #
Pannaria elixi
Pannaria fulvescens # AK384408
Pannaria leproloma
Pannaria aff. *minutiphylla* # (M.Ford 1150, AK)
Parmeliella nigrocincta # AK384413
Parmotrema subtinctorium # AK384415
Parmotrema reticulatum
Peltigera nana
Peltigera dolichorrhiza

Pertusaria sorodes # (M.Ford 1188, AK)
Pertusaria thiospoda # (M.Ford 1189, AK)
Phaeophyscia hispidula # (M.Ford 1132, AK)
Phlyctis sordida # (M.Ford 1136, AK).
Phyllopsora sp.
Physcia jackii
Physcia poncinsii
Physma chilense # AK384409
Peltigera dolichorhiza #
Placopsis sp. #
Pseudocyphellaria bartlettii # AK384419
Pseudocyphellaria carpoloma
Pseudocyphellaria chloroleuca
Pseudocyphellaria coriacea
Pseudocyphellaria crocata agg. # (M.Ford 984, Unitec).
Pseudocyphellaria dissimilis
Pseudocyphellaria episticta
Pseudocyphellaria haywardiorum #
Pseudocyphellaria intricata
Pseudocyphellaria neglecta # AK384417
Podostictina pickeringii
Porina exocha #
Punctelia borreri
Punctelia subrudecta # (M.Ford 1148, AK; M.Ford 1149, AK)
Pyrenula nitidula # (M.Ford 889, Unitec).
Pyxine subcinerea
Ramalina celastri
Scytinium kauaiense
Stereocaulon ramulosum
Sticta babingtonii # AK384387
Sticta fuliginosa #
Sticta latifrons
Sticta limbata # AK384412
Sticta martinii
Strigula novae-zelandiae
Strigula prasina
Usnea angulata
Usnea dasaea# AK384416
Usnea rubicunda

Veronica cymbalaria, a new record for New Zealand

Frances Duff

Fig. 1. *Veronica cymbalaria* plants among grasses and agapanthus, Tamaki Drive, Auckland. Scalebar = 5 cm. All photos taken on 21 Aug 2021 by the author.

Reduced during Covid lockdown last year to daily walks around the city, I came across an interesting weed. On 21 August 2021 what had begun as a windy, damp and dreary walk along Tamaki Drive, Auckland's waterfront, turned into an exciting one - if you get excited by finding new naturalised plants. There, beside the path above the railway line, I spotted the pretty white flowers and hairy rounded capsules of what I took to be *Veronica cymbalaria* (cymbalaria-leaved speedwell) (Fig. 1). I felt familiar with this species from trips I'd made in Europe. Many of the plants were small (<10 cm tall) and unbranched but already flowering and fruiting, and they occurred only in a few patches that were not dominated by agapanthus (*Agapanthus praecox*).

I collected some plants (Fig. 2), took photos of what seemed to be key characters (Figs. 3–6), and lodged a specimen at Auckland Museum herbarium (AK 383373).

But confidence in my attribution waned, as the taxon was not in the NZ Flora Vol. 4 (Webb et al. 1988), or the recent adventive additions to the Floras of New Zealand (Ogle 2021); nor could I