Lapsana communis \* (H) Rorippa nasturtium-aquaticum\* (L) Leontodon saxatilis \* Rumex crispus \* Leucanthemum vulgare \* Rumex obtusifolius \* Lobelia anceps (F, H, HE, L, M, T, W) Rumex pulcher\* Lobelia erinus\* (W) Rumex sagittatus \* (W) Lotus pedunculatus \* (L) Sagina procumbens \* (F) Lotus suaveolens \* Samolus repens (HE, M) Lysimachia arvensis (syn. Anagallis arvensis) \* Sarcocornia quinqueflora (F, HE) *Lythrum hyssopifolia* \* (L, M) Selliera radicans (M) Mentha pulegium \* (L, M) Senecio bipinnatisectus (M) Myosotis discolor \* (M) Senecio esleri (M, W) Myosotis sylvatica \* (W) Senecio hispidulus (H, M) Oenanthe pimpinelloides \* (L) Senecio skirrhodon \* (M) Oxalis corniculata \* (H, M) Senecio sylvaticus \* (M) Oxalis purpurea \* (M) Sherardia arvensis \* Parentucellia viscosa \* (M) Solanum americanum (incl. S. nodiflorum) (L) Persicaria capitata \* (F, on basalt sea wall) Solanum nigrum \* (L, M) Physalis peruviana \* (L) Sonchus oleraceus \* Phytolacca octandra \* (L, W) Stachys arvensis \* (M) Plantago lanceolata \* Taraxacum officinale \* Plantago major \* Tetragonia tetragonioides (M) Plectranthus ciliatus \* (F) Trifolium dubium \* *Portulaca oleracea* \* (H) Trifolium pratense \* Potentilla reptans \* (L) Trifolium repens\* Prunella vulgaris \* (L) Verbena bonariensis \* Pseudognaphalium luteoalbum Veronica arvensis \* Ranunculus parviflorus \* (M) Veronica persica \* Ranunculus repens \* Vicia tetrasperma \* Ranunculus sardous \* Wahlenbergia violacea (H, M) Raphanus raphanistrum\* (HE, M)

# Fern flora of Maungakiekie (One Tree Hill) and Cornwall Park

## Anthony E. Wright

Given their combined area of 220 ha of plant-filled, big-city recreational space, it is remarkable that only seven articles with substantive mention of the plants of Maungakiekie (One Tree Hill) and the surrounding Cornwall Park have appeared in the Society's Journal. Laurie Millener (1985) noted the various hilltop trees together with some of Sir John Logan Campbell's plantings in his article on Historic Trees of Auckland; Rhys Gardner (1983) writes of the two species of Ficus in his account of Australian Ficus wild in Auckland; Anne Grace (1995) wrote up a Bot Soc field trip to look at the mostly planted tree flora of the combined reserve; Mike Wilcox and Doug Rogan include mentions of One Tree Hill and Cornwall Park plants in their account of Auckland's wall flora (Wilcox & Rogan 1999); Doug Rogan (2000) described the epiphytic flora comprising pohutukawa and 11 species of lichen on the former One Tree Hill summit pine tree; Mike Wilcox (2013) described the rush invading the pastures of Cornwall Park and One Tree Hill; and last year I wrote of finding the fern *Arthropteris tenella* surviving 97 years since the previous collection on Maungakiekie (Wright 2016), the precursor to this full treatment of the ferns. In this account, I use the term maunga (mountain) to describe the combined extent of Cornwall Park and the One Tree Hill Domain (Fig. 1).

When our family moved from Onehunga to Korokino Road in One Tree Hill in 1967, Cornwall Park and Maungakiekie became a frequent afterschool and weekend playground. Collecting ferns – both specimens for my own herbarium (presented to the Auckland War Memorial Museum Herbarium [AK] in 1993) and living plants for a fernery on the shaded, south side of our house – was one of my pastimes.

In Wright (2016) I noted that between 1970 and 1973 I collected specimens of 23 species of wild ferns for my own herbarium, and that I had written up a brief account of the ferns of One Tree Hill which was discarded – or so I thought. Searching through the offprint boxes in the AK herbarium library this year for an early article on Rakitu (Arid) Island, I came across a foolscap typescript which had been filed under 'One Tree Hill ferns' by Miss J.H. Goulding (variously a volunteer, part-time herbarium assistant, Associate Botanist, Assistant Botanist, Acting Botanist, and finally Museum Botanist and Curator over the period 1960-1980). With apologies for the somewhat florid style - which I can only attribute to many evenings poring over Miss Crookes' and Mr Dobbie's similarly colourful and enthusiastic descriptions of our incomparable fern flora (Crookes & Dobbie 1963), I reproduce it here in full [with additional material and today's names in square brackets1:

# Maungakiekie (One Tree Hill)

Growing in the rich volcanic soil on the steep southern hillside of Maungakiekie are many of our native ferns, which, unfortunately rarely grow above eight to ten inches [20–25 cm] high – due to the ravages of either sheep and cattle or desiccation. In spring great myriads of these sporelings appear beneath the great trees which offer permanent shade. These trees include Puriri, Gums, a fine [Queensland] Kauri, and various other exotic species.

The genus *Asplenium* is represented by the species *lucidum* [*oblongifolium*], *bulbiferum* [*gracillimum*], *hookerianum* and *colensoi* in varied terrestrial habitats with *Aspleniums flaccidum* and *falcatum* [*polyodon*] growing pendulous in the older trees. Further down the hillside spraying out from crevices in the huge volcanic rocks can be seen the beautiful necklace fern or fan-leaved fern *Asplenium flabellifolium*. Crowning the stone fences, trees and rocks in many places can be seen the two common polypodys, *Pyrrosia serpens* [*elaeagnifolia*] and *Phymatodes diversifolium* [*Microsorum pustulatum*].

Returning once more to the tree shaded areas *Pteris tremula* (turawera) and *Pteris macilenta* var. *pendula* [*P. macilenta*] can be seen trembling in the eddies of air – beneath them the less robust type of *Hypolepis tenuifolia* [*H. ambigua* as opposed to what we now know as *H. dicksonioides*].

The maidenhairs are represented by *Adiantum hispidulum*, which seems more at home tucked in rock crevices than growing on the fertile slopes. Many sporelings of *Cyatheas dealbata* and *medullaris* can be found in the damper places, attributable to the adult ponga and mamaku trees found in the native groves. Further round the mountain in the old quarry are fullgrown plants of huruhuruwhenua (*Asplenium lucidum [oblongifolium*]) with its fronds up to three feet [1m] long, and makawe-o-raukatauri, (*Asplenium flaccidum*).

Once only *Athyrium japonicum* [*Deparia petersenii*] was found, and though the plant was healthy and spreading rapidly, it was trampled out by cattle, leaving only herbarium specimens to show. More surprisingly, the genus *Blechnum* is represented by only two species *filiforme* and *capense* [*novae-zelandiae*]. Even then, *Blechnum capense* – perhaps our most common fern – has only been encountered once, and *B. filiforme* never exceeds patches of the terrestrial form amongst other plants.

Finally we have the species of the sun-baked hillsides. The common examples are *Doodia media* [*Blechnum parrisiae*], large plants of *Polystichum richardii* [subsequent re-identification of the specimens has shown two taxa present within this complex: *P. neozelandicum* and *P. wawranum*], and quantities of *Pellaea rotundifolia*. In slightly more shade can be found the entrancing *Doodia caudata* [a mis-identification of *D. mollis*, now *Blechnum zeelandicum*] (mokimoki); this fern often showing the peculiarity of forked tips – both in fertile and barren plants.

In summary, there are 23 species of New Zealand ferns that have been found on Maungakiekie – quite astounding considering the habitats offered.

A.E.Wright 19:8:[19]71



Fig. 1. Information map from Cornwall Park website with localities A-J (as referred to in the text) superimposed.

When Ewen Cameron kindly printed me off a listing of all the fern specimens from the maunga in AK in early 2016, it turns out that there were vouchers for 23 taxa collected by me between 1969 and 1974. Despite my saying 23 species of fern had been found, I only mention 22 taxa by name in the typescript. To further confuse matters, the voucher specimens include four taxa not named in the typescript (Cheilanthes sieberi, Lastreopsis velutina, Pellaea falcata and the second taxon of Polystichum), while three taxa that were mentioned were not vouchered (Cyathea dealbata, C. medullaris, and *Hypolepis tenuifolia* [now ambigua]). So my explorations 50 years ago found a total of 26 different ferns.

The only other fern collections in AK from One Tree Hill were two made by H.B. Matthews which are cited in the list below.

Over half a dozen days during 2016 and early 2017 I revisited pretty well all my earlier fern haunts on Maungakiekie and the surrounding Cornwall Park lands. I added one further fern record (the adventive tuber ladder fern, *Nephrolepis cordifolia*, which was present in the 1970s, but not specifically noted or collected by me then since it wasn't native, and collected specimens of those of the currently extant

species still not vouchered, as well as confirming the continuing presence of 17 of the species historically known by me.

Then, at the end of October 2017, I returned to collect a voucher of wild ponga (Cyathea dealbata). A deeply buried memory saw me visit the statue of Sir John Logan Campbell in Campbell Crescent at the Epsom (Manukau Road) extremity of Cornwall Park to check whether the naturalised maidenhair fern Adiantum raddianum grew there. Sure enough it was still there. The Crescent was in the midst of a major redevelopment [not a virtuous action in itself in my view - a large number of well-established trees, including the magnificent Lombardy poplars (Populus nigra 'Italica') I'd biked past twice a day en route to Auckland Grammar, have been bulldozed out and replaced by a far-spaced curve of 1.5 m hiah kohekohe (Dysoxylum spectabile) saplings - which, while I applaud their native status, are unlikely to attain a handsome stature in this open, exposed location]. By virtue of the redevelopment, the fountains playing from the base of the statue were turned off for the duration. Thus I was able to wade out through the somewhat fetid circular pond to investigate the crevices of the artful jumble of giant basalt boulders on which the statue is perched. As well as luxuriant thickets of pendent A. *raddianum* (up to 80cm long) there were two further new fern records for the maunga, *Diplazium australe* and *Polystichum polybletharum* (see cover illustration).

To further demonstrate that such a study as this is never complete, on this day I also visited a fencedoff area (Locality J, Fig. 1) where a variety of native species have been planted in and around a clearedout rocky area south-south-east of the Archery Club parking area. When I was a boy this was an overgrown thicket of tree privet (Ligustrum lucidum), mahoe (Melicytus ramiflorus) and blackberry (Rubus fruticosus) over a jumble of basalt boulders - a collapsed lava tunnel - amongst which was the entrance to a lava cave. It is much modified and 'cleaned up' now (there is no sign of the cave or weeds), and a path wends down through the rocks to Grand Drive. Where the path nears its lowest point (and is below the tallest canopy) a small fernery has been established. The following ferns have been planted there: Arachniodes aristata, Asplenium bulbiferum (at least three cultivars, all with bulbils), Blechnum discolor, B. minus, B. parrisiae (astounding, given that it's the most common - almost ubiquitous - naturally occurring fern on the maunga), Cyathea dealbata (now fertile), C. medullaris (juvenile), Dicksonia fibrosa (juvenile), D. squarrosa (juvenile), Lastreopsis microsora, and Ptisana salicina. None of the planted taxa have been vouchered, though I do hold photographs of them in situ. The following ferns have spontaneously colonised this same rocky area, adding to the fernery: Asplenium flaccidum, A. oblongifolium, Blechnum parrisiae, Cyathea dealbata, Microsorum pustulatum, Nephrolepis cordifolia, Pteris tremula and Pyrrosia elaeagnifolia.

Walking back to the car parked outside Sorrento, I cut through part of their grounds and found the tallest (over 2m high fronds), most robust ponga on the maunga in an area of long grass, and then yet another new fern record! Just inside the entrance to the Sorrento carpark is a large puriri (*Vitex lucens*) in a planter box with well-established tussocks of Poor Knights lily (*Xeronema callistemon*) around its base. In a crook of its branching trunk is a thriving young plant of the staghorn fern (*Platycerium bifurcatum*).

After this paper was completed, I returned to the Sir John Logan Campbell statue on 9 February 2018 to wade out and check on the single plant of the new fern record *Polystichum polybletharum*. The fountains were once again playing, so my visit to it was somewhat quicker and wetter. Imagine my surprise in finding very new plantings of clumps of parataniwha (*Elatostema rugosum*) and *Blechnum penna-marina* in the interstices of the basalt boulders. Fern record number 41! (see Appendix). So I have no doubt that there will be more ferns to be found on the maunga, and that further spontaneous as well as planted additions to the flora will occur.

# Discussion

The east-facing earth banks beneath the mixed large-tree canopy on the east-facing terraced slopes at Locality G (Fig. 1) are undoubtedly the fern biodiversity 'hotspot' for Maungakiekie/Cornwall Park. While I was regularly monitoring this site from the late 1960s to c. 1975 there were regular flushes of young fern plants in spring. Although cattle were used to graze the maunga at this time (since replaced by sheep, on the basis that they would do less physical damage to the extensive and outstanding archaeological features) I contend that they were, overall, less damaging than sheep for the survival of undergrowth, including ferns, on the steep earth banks. While cattle physically trampled out several species no longer present that once grew on the basal parts of the banks, they grazed the ferns far less than sheep do, often allowing plants to grow to maturity. Sheep by contrast are stocked in higher numbers, and being smaller and more agile, negotiate and hence graze a far greater proportion of the steep banks. I estimate the groundcover at this site (a combination of ferns and two native grasses, meadow rice grass (Microlaena stipoides) and Oplismenus hirtellus subsp. imbecillis) to be consistently less than 50% of that generally present 50 years ago under a cattle-grazing regime.

Given the flourishing fern growth and the remarkable regeneration of native flowering plants in the current three stock exclosure areas (C, D and F on Fig. 1) I think there is a good case for fencing off the upper three sides of the Locality G tree grove. Not only would the resulting fern recruitment be fascinating to monitor, but native trees would establish naturally in the best spots for them, and provide for eventual replacement of the aging mature trees already present. Since this article was drafted, Ewen Cameron kindly provided me with a front page newspaper article (Fitzgerald 2017) with the headline "Maunga livestock phased out". Despite the headline, the body of the article suggests that while a decision to remove livestock from Auckland's volcanic cones has been made, the plan for enacting the decision is yet to be announced. In the case of Maungakiekie, this decision would apply to the One Tree Hill Domain, administered by Auckland Council, and not the surrounding Cornwall Park which is administered by an independent trust board.

The other outstanding habitat for ferns – mostly occurring in Cornwall Park – are the basalt stone walls. Many are now fenced off from stock and in damper and partially shaded areas can support a luxuriant fern cover – particularly *Asplenium flabellifolium*, *A. flaccidum*, *A. oblongifolium*, *Microsorum pustulatum, Pellaea rotundifolia* and *Pyrrosia elaeagnifolia.* 

The number of fern taxa known to have grown on the combined estate of One Tree Hill Domain (Maungakiekie) and Cornwall Park over the past 50 years is 41 (37 native, 4 adventive, and 11 planted) of which 31 could still be found in 2017–18.

#### Acknowledgements

Mei Nee Lee, Josh Salter and Ewen Cameron for useful comments that improved this note. Patrick Brownsey for confirming the identification of *Polystichum polybletharum*. Ewen Cameron and Dhahara Ranatunga for checking and arranging photographs of fern specimens in AK. Josh Salter for editing and arranging the figures, including creating Fig. 1.

#### References

- Brownsey, P.J.; Smith-Dodsworth, J. 2000: New Zealand ferns and allied plants. Bateman, Auckland.
- Cameron, E.K.; Haines, L. 2006: Botany of Mangemangeroa Reserve, south-east Auckland, 20/05/06. *Auckland Botanical Society Journal* 61(2): 92–95.
- Crookes, M.W.; Dobbie, H.B. 1963: New Zealand ferns. Whitcombe & Tombs, Christchurch.
- Fitzgerald, M. 2017: Maunga livestock phased out. East & Bays Courier Wednesday, January 11, 2017: 1.
- Gardner, R.O. 1983: Australian Ficus wild in Auckland. Auckland Botanical Society Journal 38(2): 7.
- Grace, A.B. 1995: Botanical Society Trip Cornwall Park and One Tree Hill Domain. Auckland Botanical Society Journal 50(2): 80-82.
- Millener, L.H. 1955: Historic Trees of Auckland. Auckland Botanical Society Journal 13(1): 1–3.
- Perrie, L.R.; Brownsey, P.J.; Lockhart, P.J.; Large, M.F. 2003: Evidence for an allopolyploid complex in New Zealand *Polystichum* (Dryopteridaceae). *New Zealand Journal of Botany* 41: 189–215.
- Rogan, D.B. 2000: The epiphytic flora of the One Tree Hill (Maungakiekie) pine. Auckland Botanical Society Journal 55(2): 97.
- Wilcox, M.D. 2013: Juncus imbricatus: a tenacious South American rush infesting pastures in Cornwall Park and One Tree Hill Domain, Auckland. Auckland Botanical Society Journal 68(1): 97–98.
- Wilcox, M.D.; Rogan, D.B. 1999: The Mural Flora of Auckland. Auckland Botanical Society Journal 54(2): 35-46.
- Wright, A.E. 2016: Arthropteris tenella hangs in there for 97 years on Maungakiekie (One Tree Hill) in Auckland City. Auckland Botanical Society Journal 71(2): 98–101.

# Appendix. Consolidated annotated list of ferns found on Maungakiekiekie and Cornwall Park

\* adventive; ^ present 2017-18; + planted

#### Adiantum hispidulum ^ rosy maidenhair AK 126267 (Fig. 2)

Common, around and in crevices of basalt and scoria boulders, on scoria quarry faces, occasional on shaded soil banks amongst much more common *Blechnum parrisiae*.

A. raddianum \* ^ delta maidenhair fern AK 370130 (Fig. 3)

Common pendent fern, fronds to 70cm long, in crevices of basalt boulder pile forming the base of Sir John Logan Campbell sculpture, at the Campbell Crescent extremity of Cornwall Park.

Arachniodes aristata ^+

Rare, single planted specimen in fernery at Locality J, Fig. 1. Very unlikely to have ever been a natural component of Auckland lava field or volcanic cone forest. Intrusive in a semi-natural setting.

Arthropteris tenella ^ jointed fern AK 136482 (H.B. Matthews, 5 June 1919), AK 361170 (2016).

Rare survivor around base of half a dozen basalt boulders in rough pasture (Locality A, Fig. 1.), described in more detail by Wright (2016). Likely to have been a reasonably common fern in the pre-human lava field and scoria cone forest of the Auckland isthmus.

Asplenium bulbiferum ^+ mouku, hen and chickens fern

Rare, a few plants of at least three different bulbiliferous cultivars planted in the fernery at Locality J, Fig. 1. Intrusive.

<sup>Figs. 2–10: 2. Adiantum hispidulum, 2017. All field photos taken by the author. 3. Adiantum raddianum with Diplazium australe at top, 2017. 4. Asplenium colensoi. Detail from AK 214704. Scalebar = 5 cm. 5. Asplenium flabellifolium on rock wall alongside Green Lane, 2016. 6. Asplenium flaccidum (pendent) and A. oblongifolium (erect) growing in guttering of shearing shed, 2017. 7. Asplenium hookerianum with larger juvenile Blechnum parrisiae behind, 2017. 8. Asplenium oblongifolium surrounded by Nephrolepis cordifolia, with sterile Pyrrosia elaeagnifolia lower left, 2017. 9. Blechnum parrisiae, 2016. 10. Blechnum zeelandicum, 2016.</sup> 





A. colensoi Colenso's spleenwort AK 214704 (filed under A. hookerianum)

Rare amongst *A. hookerianum* in the late 1960s and early 1970s on steep, shaded, east-facing soil bank amongst *Blechnum parrisiae* beneath tall canopy of a grove of planted puriri (*Vitex lucens*), mangeao (*Litsea calicaris*), Queensland kauri (*Agathis robusta*), brown barrel (*Eucalyptus fastigiata*), holly oak (*Quercus ilex*), a declining tulip tree (*Liriodendron giganteum*), Norfolk Island hibiscus (*Lagunaria patersonia* subsp. *patersonia*), monkey apple (*Syzygium smithil*), and rimu (*Dacrydium cupressinum*) (Locality G, Fig. 1). These plants (Fig. 4) were quite distinct from the similarly sized plants of *A. hookerianum* which still persist at the site; I maintain that they represent a distinct taxon. Brownsey & Smith-Dodsworth (2000, p.111) discuss the taxonomic situation having synonymised *A. colensoi* under *A. hookerianum*. See Cameron and Haines (2006, p.94) for an illustration of the two taxa side by side from another Auckland locality, Mangemangeroa.

A. flabellifolium ^ necklace fern, fan-leaved fern AK 214722 (Fig. 5)

Locally abundant, around and in crevices of basalt and scoria boulders on the western, southern and eastern sides of the maunga. Most common on the south side of the stone wall lining the southern side of Green Lane from Pohutukawa Drive to the Cornwall Cricket Club entrance. Often spreading vegetatively by rooting at the elongated tips of fronds.

A. flaccidum ^ makawe-o-raukatauri, hanging spleenwort AK 126266

Common, epiphytic on trees, hanging from rock crevices; most common on south side of the stone wall lining the southern side of Green Lane from Pohutukawa Drive towards Maungakiekie Avenue, under the shade of a double row of mature taraire (*Beilschmiedia tarairi*). In 2016–17 a plant was photographed (Fig. 6) growing out of the base of a mature *A. oblongifolium* established in the guttering of the small shearing shed in the stockyards just to the north-west of the junction of Bollard, Grand, Kenneth Myers and Twin Oak Drives (Locality F, Fig. 1).

- *A. gracillimum* graceful hen and chickens fern AK 128441 Rare, a few small plants appeared in the late 1960s and early 1970s on the steep, shaded soil bank described under *A. colensoi* above (Locality G, Fig. 1).
- *A. hookerianum* ^ Hooker's spleenwort AK 214938 Rare, in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. Small population of five plants persisting over 1 sq m in 2016–17 (Fig. 7). Fifty years ago, the population was larger (c. 50 plants) and more extensive (covering c. 5sqm). See discussion below for possible reasons for this decline.

A. oblongifolium ^ huruhuruwhenua, shining spleenwort AK 214833-4 (Figs. 6, 8)

Common, on shaded soil amongst tree roots, in rock crevices and on basalt walls and gate parapets. A large plant flourished in 2016–18 on the basalt gate parapet of the Pohutukawa Drive entrance to Cornwall Park from Green Lane.

A. polyodon ^ sickle spleenwort AK 126429

Rare, only known from a few plants amongst the roots of mature pohutukawa (*Metrosideros* excelsa) lining the upper rim of the southern side of the former scoria pit to the north-west of the start of the Summit Drive (Locality B, Fig. 1) and a single plant in a similar habitat in the smaller scoria pit on the western flank of the Horseshoe Crater (Locality D, Fig. 1).

*Blechnum discolor* ^+ kiokio, crown fern Rare, a few planted specimens in fernery at Locality J, Fig. 1. Not a local species; intrusive.

B. filiforme thread fern, climbing hard fern AK126430

Rare, occasional small terrestrial juvenile colonies in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. Trampled out by cattle.

*B. minus* ^+ swamp kiokio

Rare, a few planted specimens in fernery at Locality J, Fig. 1. Not natural in this setting; intrusive.

**Figs. 11–19: 11.** *Deparia petersenii*, 2017. **12.** *Hypolepis ambigua*, 2017. **13.** *Lastreopsis velutina*. Detail from AK 223332. Scalebar = 5 cm. **14.** *Microsorum pustulatum*, 2016. **15.** *Pellaea rotundifolia*, 2017. **16.** *Polystichum neozelandicum* subsp. *neozelandicum*. Detail from AK 223126. Scalebar = 5 cm. **17.** *Polystichum wawranum*. Detail from AK 223116. Scalebar = 5 cm. **18.** *Pteris tremula*, 2016. **19.** *Pyrrosia elaeagnifolia*, 2016.

*B. novae-zelandiae* kiokio, palm leaf fern AK 214992

Rare, juvenile plants in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. Eaten and trampled out by cattle.

B. parrisiae ^ pukupuku, rasp fern AK 223033

Abundant, the most widespread and common fern in the combined reserve. Survives sheep grazing around the base of basalt boulders in rough pasture. At its most luxuriant on soil banks (Fig. 9) and around the margins of the tree-canopied stock exclosures at localities C and F, Fig. 1. Very variable in size depending on grazing pressure and light levels. Young growth notably pink.

## *B. penna-marina* ^+ alpine hard fern

Uncommon. Several recently planted small clumps found amongst the basalt crevices during a visit to the Sir John Logan Campbell statue and fountain in Campbell Crescent on 6 February 2018.

*B. zeelandicum* ^ AK 126268 (August 1970), AK223051 (27 September 1970), (both of which were misidentified as *Doodia mollis* = *B. spinulosum*, hence the reference in my 1971 manuscript above) (Fig. 10) Occasional, in rough pasture at the base of basalt blocks and scoria outcrops, including at Locality E, Fig. 1. Fronds erect, glossy, mid green at maturity, with prominently elongated terminal pinnae which can be one third to half the total length of the frond.

# *Cheilanthes sieberi* rock fern AK 115413 (H.B. Matthews, October 1918), AK220041 (24 October 1973) Rare, on and around rocks in rough pasture on the maunga, and on well-lit scoria faces in former quarry pits. Not found during 2016-17 field work. Given the abundance of the related woolly rock fern (*C. distans*) in rough pasture and on scoria outcrops on Mount Richmond in Penrose (and other volcanic cones such as Mount Roskill and the Otuataua Stonefields), it is difficult to explain its apparent absence on the maunga.

## Cyathea dealbata ^ ponga, silver tree fern AK 370129

Occasional young plants used to regularly appear in spring in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. None seen here in recent years. Three almost mature plants currently growing amongst regenerating native trees on the margins of the exclosure grove (Locality C, Fig. 1), amongst the roots of mature pohutukawa lining the upper rim of the southern side of the former scoria pit just north of the start of the Summit Drive (Locality B, Fig. 1), and in a similar habitat in the smaller scoria pit on the flank of the Horseshoe Crater (Locality D, Fig. 1). Three examples have been planted in the small fernery at Locality J, Fig. 1, one of which is now fertile. I am undecided as to whether the largest example in the grounds of Sorrento is naturally occurring or planted, but tend towards the former.

## C. medullaris ^+ mamaku, black tree fern

Occasional young plants used to regularly appear in spring in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. None seen there in recent years. The death and disappearance of fertile adult tree ferns of both *Cyathea* species in the Cornwall Park native plantations has presumably lowered the wind-borne spore load which would drive sporeling establishment. Two juvenile specimens, neither thriving, have been planted in the small fernery (Locality J, Fig. 1) mentioned above.

## Deparia petersenii subsp. congrua^ AK 214916

Rare, known from two localities, at one of which it persists. Voucher specimen from a rapidly expanding colony observed in the early 1970s at the same locality (G, Fig. 1) and habitat described above under *A. colensoi*. This colony was destroyed by cattle-trampling one winter. Another very small colony (Fig. 11) has persisted for 50 years on the eastern extremity of a small area of basalt boulders just below the junction of the summit road loop (Locality H, Fig. 1).

## Dicksonia fibrosa ^+ wheki-ponga

Rare, a single planted juvenile in fernery at Locality J, Fig. 1. Not natural in this setting; intrusive.

## *D. squarrosa* ^+ wheki, rough treefern

Rare, a few planted juveniles in fernery at Locality J, Fig. 1. Not thrifty or natural in this setting; intrusive.

# Diplazium australe ^ AK 370131 (Fig. 3)

Rare, a single rather small fertile plant growing at top of cascade of *Adiantum raddianum*<sup>\*</sup> in rock crevice at base of John Logan Campbell statue. New record in 2017.

# Hypolepis ambigua ^ AK 369211

Rare, small colony with creeping rhizome (Fig. 12) growing amongst large basalt boulders mixed with tufted *Pteris tremula* under a dense canopy of pohutukawa, totara (*Podocarpus totara*), puriri, and karaka (*Corynocarpus laevigatus*) at the upper margin of the tree grove in the exclosure fencing at Locality C, Fig. 1. A small colony established in the early 1970s in the same locality (G, Fig. 1) and habitat described above under *A. colensoi*, but was trampled out by cattle.

# Lastreopsis microsora ^+ creeping shield fern

Rare, three small clumps planted in fernery at Locality J, Fig. 1. Likely to have been naturally present in rock forest in pre-human times.

# Lastreopsis velutina velvet fern AK 223332 (Fig. 13)

Rare, single plant known from Locality E (Fig. 1) growing from tufted rhizome in soil 25cm under a south-south-east facing narrow rock overhang in rough pasture. Observed from 1970–74 when it disappeared.

# Microsorum pustulatum^ kowaowao, hound's tongue fern AK 126625

Common, on rocks, scoria faces, trees and particularly basalt stone walls (Fig. 14) where it is frequently fertile. Juvenile plants with simple fronds rarely found growing directly on volcanic soil banks.

# Nephrolepis cordifolia \* ^ tuber ladder fern, tuber sword fern AK 368330 (Fig. 8)

Occasional, forming dense long-lived colonies when allowed. A lush colony can be found in rank grassland on the opening lip of the fenced-off former scoria pit on the west flank of Horseshoe Crater (Locality D, Fig. 1). Covering an area of 2.5 x 1.2 metres, rhizomes are actively spreading into the surrounding grassland. Another colony is well-established around large basalt boulders at the western end of a fenced-off group of old man pines (*Pinus radiata*) immediately below Kenneth Myers Drive. Elsewhere in Cornwall Park this fern grows conspicuously on basalt stone walls.

# Pellaea falcata AK 220448

Rare, small plants forming a single small colony in crevices of exposed basalt boulders. Not seen since 1972.

# *P. rotundifolia* ^ tarawera, button fern AK 220424 (Fig. 15)

Common, in crevices of and soil around the bases of basalt blocks and outcrops and large pohutukawa trees; also scoria faces in disused scoria pits. From small yellowish fronds no more than 5 cm long in exposed dry situations to lush, shiny dark green fronds to 35 or more cm long on rich soil in shade.

## *Platycerium bifurcatum* \*^+ staghorn fern

Rare, single cultivated plant on trunk of puriri in Sorrento carpark.

Polystichum neozelandicum subsp. neozelandicum AK 214097 (1970), AK 223136 (1976), (Fig. 16)

Rare, but a dense thicket of plants once grew in crevices and around a large basalt face on the steep hillside at Locality D, Fig. 1. Persisted from the late 1960s through to 1976; despite extensive searching of all known basalt and scoria outcrops in 2016-17 no plants found.

## *Polystichum polybletharum* \*^ Japanese tassel fern, AK 370132 (see cover illustration)

Rare, a single small, tufted, fertile plant growing with *Adiantum raddianum* \* in rock crevice at base of Sir John Logan Campbell statue, Campbell Crescent. New record in 2017, though this may be the same species as the white-hairy juvenile plant mentioned under *P. wawranum* below. This is a deciduous species occasionally cultivated, and there are five separate records in AK of it spreading in Auckland. Emerging fronds with extremely hairy and scaly growing tips, prominently drooping. See notes under *P. wawranum* below for a probable second incidence of Japanese tassel fern.

## P. wawranum black shield fern AK 223116 (Fig. 17)

Rare, a few plants growing in partial shade on margins of disused scoria pit at Locality B, Fig. 1. Extensive searching in 2016–17 failed to find any extant plants at this site.

I initially thought a single juvenile plant of a *Polystichum* exhibiting densely white-hairy young fronds and stipes which was found in the basal crevices of a large old olive (*Olea europaea* subsp. *europaea*) – located just above the circled number 15 on Fig. 1 – might be referable to this species, since Perrie et al. (2003) note that the species' filiform scales, appearing hair-like to the naked eye, are "often densely fimbriate around the base, so much so that in young fronds the stipe and rachis scales appear to be underlain by a dense white tomentum". However, I now think it more likely that this juvenile plant is *P. polybletharum* \*.

# Ptisana salicina ^+ para, king fern

Rare, a few planted specimens in fernery at Locality J, Fig. 1. Possibly cultivated on the Auckland isthmus by Maori in pre-European times for its starchy rootstock. These plants thriving, as the species does in other rock forest where it has been planted on the isthmus, e.g. Rarotonga (Mt Smart) and Mt Eden (Withiel Thomas Reserve and Government House grounds). Consequently, these plants did not appear intrusive to me in this setting.

## Pteris macilenta AK 128446

Rare, two small tufted plants in the same locality (G, Fig. 1) and habitat described above under *A. colensoi* from 1969–70. Trampled out by cattle.

# P. tremula ^ turawera, shaking brake AK 126431

Common to abundant, scattered plants on rocks and soil throughout. Occurring both under trees in shade where fronds are larger, drooping, more diaphanous and lettuce-green in colour (e.g. in localities C, D and F, Fig. 1) (Fig. 18) and on rocks and rock walls in the open where fronds are smaller, erect, firmer in texture and yellowish.

## Pyrrosia elaeagnifolia ^ leather-leaf fern AK 129150

Abundant, on rocks and bark, most prolifically and most often fertile on stone walls (Fig. 19) where it can form large colonies.

# Historical notes on northern New Zealand's grasses

## **Rhys Gardner**

# Introduction

Our grass Flora (Edgar & Connor 2000; hereafter "FINZ 5") excels in describing its taxa but seldom mentions how, when or where these were discovered in New Zealand. To partially remedy this I have re-examined the earliest botanical accounts for the northern part of the country, with respect to both native and adventive species.

It has not been possible to make this re-evaluation a fully specimen-based one — generally, just the published records have been relied on. However, a number of crucial specimens, including some from Cook's First Voyage, can be checked on the Web.

Ι show here that several species lona accepted as natives (but significantly, shared with Australia) turn out to have guite unconvincing 'passports'. Any controversy, though, will probably only be settled by the future discoveries of plant-archaeologists. Perhaps some of the information here will be useful in directing their investigations.

The study area takes in the mainland north from the Manukau and Waitemata Harbours at c. lat. 37°, and includes the Three Kings Is. and the offshore islands. It does not include the Kermadec Islands, nor the Coromandel Peninsula.

# Grasses in the pre-European landscape

In prehistoric times the natural vegetation of our area, away from its coast, rivers and swamps was forest of various types, and in them bryophytes, Astelia spp. and sedges would have ferns, predominated on the ground. But the shade-tolerant Oplismenus hirtellus would have been arass widespread, as would have been Microlaena avenacea (streamsides and higher-altitude clearings) and *Poa anceps* (banks and rocky outcrops). Several other grasses would have been able to grow along streamsides, in 'tree-gap' clearings, and by perching on the trunks and root-plates of overthrown trees; examples would be Deveuxia and Dichelachne spp., ovatus, Microlaena Echinopogon carsei, Rytidosperma gracile and Stenostachys gracilis. Two large tussock grasses, Chionochloa conspicua subsp. cunninghamii and Cortaderia fulvida, require cool conditions but might have been somewhat more common in the unfragmented landscape than they are today.

Coastal places would have had a greater diversity of grasses. Slopes nearest the sea would have had *Anthosachne* (formerly *Elymus*) sp. or spp., *Chionochloa bromoides*, *Lachnagrostis littoralis* and *Zoysia* spp. Inland these would have been joined by *Deyeuxia* spp., *Dichelachne* spp., *Echinopogon ovatus*, *Microlaena polynoda*, *Poa pusilla*, and