

Appendix. Moss list for Te Haupa (Saddle I.)

Moss names follow updated versions of the Checklist of the Mosses of New Zealand (Fife 1995). These may be obtained on request from Allan Fife at Manaaki Whenua Landcare Research (FifeA@landcareresearch.co.nz).

Key:

1 = recorded also by Tennyson & Taylor (1999) (all collected 30 Aug. 1997 by A.J.D. Tennyson and identified by J.E. Beever Sep. 1997)

Taxon	Family	AK Voucher Number
<i>Bryum billardierei</i> var. <i>platyloma</i>	Bryaceae	AK 355242
<i>Bryum campylothecium</i>	Bryaceae	AK 355237
<i>Bryum clavatum</i>	Bryaceae	AK 355238; AK 355254
<i>Codonoblepharon minutum</i>	Orthotrichaceae	AK 355246
<i>Didymodon australasiae</i>	Pottiaceae	AK 355240
<i>Didymodon torquatus</i> 1	Pottiaceae	AK 234796; AK 355256
<i>Didymodon weymouthii</i> 1	Pottiaceae	AK 234795 (as <i>Desmatodon lingulatus</i>); AK 355260; AK 355275
<i>Fissidens leptocladus</i>	Fissidentaceae	AK 355255
<i>Gymnostomum calcareum</i>	Pottiaceae	AK 355247
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i> 1	Hypnaceae	AK 234790; AK 355251
<i>Ptychomnion aciculare</i> 1	Ptychomniaceae	AK 233756; AK 234792; AK 355241; AK 355257
<i>Racopilum</i> sp.	Racopilaceae	AK 355248
<i>Racopilum robustum</i>	Racopilaceae	AK 355370
<i>Rhaphidorrhynchium amoenum</i>	Sematophyllaceae	AK 355259
<i>Rhynchostegium tenuifolium</i>	Brachytheciaceae	AK 355243
<i>Syntrichia antarctica</i> 1	Pottiaceae	AK 234794 (as <i>Tortula princeps</i>); AK 355239
<i>Thuidiopsis furfurosa</i>	Thuidiaceae	AK 355252
<i>Tortella flavovirens</i> 1	Pottiaceae	AK 234793 (as <i>Tortella rubripes</i>); AK 355236; AK 355244; AK 355253
<i>Tortella knightii</i>	Pottiaceae	AK 355250
<i>Weissia controversa</i>	Pottiaceae	AK 355141
<i>Weissia/Trichostomum</i>	Pottiaceae	AK 355249; AK 355261
<i>Zygodon intermedius</i>	Orthotrichaceae	AK 355245

The Roy Thornton Fernery, Mt Smart (Rarotonga) Domain, Auckland

Nick Goldwater and Bec Stanley

We (NG and RS) decided to write this article after both becoming interested in the origins of the vegetation of Mt Smart at different times. Nick is an ecologist at Wildland Consultants Ltd, which was commissioned by Auckland Council to undertake a threatened plant survey of 14 volcanic cones (maunga) in June 2014 (Wildland Consultants Ltd 2014). Bec, as botanist at Auckland Regional Council, was responsible for advising on vegetation management for regional parks (2007-2010).

History

Mt Smart was named by early European settlers after Henry Daltan Smart, a lieutenant in the New Zealand Mounted Police in the 1840s. It has at least two

Maori names – Te Ipu kura a Maki, meaning the 'red bowl of Maki', a warrior, and Rarotonga, meaning 'the lower south' (a name brought from the ancestral homeland, Hawaiki, and placed on the mountain as a reminder). Mt Smart erupted through the south-east edge of the One Tree Hill lava flow field. Lava flowed out from the base of the cone and spread east and south forming a small lava flow field covering 300 ha. The toe of some of the flows now forms the foreshore of the Mangere arm of the Manukau Harbour (Hayward *et al.* 2011). There is no reliable eruption date for Mt Smart, but it is likely to be younger than One Tree Hill/Maungakiekie and Mangere Mountain, but older than Mt Wellington/Maungarei (Lindsay *et al.* 2011).

Prior to the arrival of Europeans, Mt Smart scoria cone was extensively terraced and used as a defensive pa for local Maori (Hayward *et al.* 2014). Presumably before human settlement, Mt Smart was clothed in native forest akin to the Mt Eden rock forest (refer to Cameron 1991). The earliest quarrying of the scoria commenced in 1865 to obtain ballast for some of Auckland's first railway lines (Hayward *et al.* 2011), and continued until 1982. What was once a low volcano is now largely a sports stadium, with only the remnants of the lower slopes present on the south and eastern sides of the site. In July 2014, Mt Smart was vested in the Tāmaki Collective (Ngā Mana Whenua o Tāmaki Makaurau Collective Redress Act 2014).

Vegetation of Mt Smart Domain

It is possible to be tricked today into thinking the forested vegetation at Mt Smart is natural. The mature pohutukawa (*Metrosideros excelsa*) forest with karaka (*Corynocarpus laevigatus*), mangeao (*Litsea calicaris*), tawapou (*Pouteria costata*), titoki (*Alectryon excelsus*), and puriri (*Vitex lucens*) mimics typical lava forest of Auckland. There is even a large hinau (*Elaeocarpus dentata*) (Fig. 1). Whether this signifies an ecological approach to the planting at the time, or not, cannot be known. Roy Thornton planted this forest over 30 years, starting sometime in the 1940s (Ottaway 1969). We cannot find exact planting dates; from aerial photos it can be seen that the area was still an active quarry in 1940 (no plantings) but in a 1959 aerial photo a well-established young forest is visible.

Ottaway (1969) describes the almost complete lack of soil in the quarry before the planting, and states that hardy pohutukawa were used as a nurse crop to shelter less hardy trees to start the forest (the trees were also irrigated). Ottaway (1969) also explains that Thornton "realised this would take many years to achieve and that there would be many setbacks and frustrations, but he resolutely continued planting and replanting, working long hours, determined to see the completion of a stadium of which Auckland could be justifiably proud". The plants for the project were sourced from "far and wide" including obtaining *Asplenium* ferns from Karewa Island (Ottaway 1969).

Roy Leslie Thornton (1893-1969)

Roy Thornton started his career as a propagator at Hay and Sons nursery, Parnell, where later he became a manager (Anon. 1962). He landscaped some private gardens (in Epsom and Remuera) as well as several public places, including Musick Point (1942), notable for its use of native species in design (Felgate *et al.* 2010). In 1934 Thornton became head horticulturalist of the NZ Railways Department. The Domain Board, which managed Mt Smart, was chaired by a Mr Beazley who was an engineer from the NZ Railways Department and enlisted the

Table 1. Herbarium specimens (AK) of ferns collected by Anthony Wright from the Roy Thornton Fernery.

Fern taxon	Herbarium voucher
<i>Adiantum hispidulum</i>	AK 214747
<i>Lastreopsis microsora</i>	AK 223321
<i>Deparia petersenii</i> subsp. <i>congrua</i>	AK 214914
<i>Blechnum penna-marina</i> subsp. <i>alpina</i>	AK 219937
<i>Sticherus flabellatus</i>	AK 220415
<i>Lastreopsis microsora</i>	AK 223318
<i>Hymenophyllum demissum</i>	AK 223622
<i>Adiantum formosum</i>	AK 214780
<i>Todea barbara</i>	AK 220420
<i>Asplenium lamprophyllum</i>	AK 214926
<i>Polystichum vestitum</i>	AK 223145
<i>Diplazium australe</i>	AK 214902
<i>Adiantum aethiopicum</i>	AK 214783

services of Thornton as an advisor (Ottaway 1969). Later Thornton became the horticultural supervisor for the Mt Smart Domain Board.

Thornton was a public gardener: Running public courses on vegetable gardening and composting (in the "Dig for Victory" campaign during World War II); hosting a radio show for thirty years on 1YA; and being a "constant lecturer" (Anon. 1962) for adult education classes. This passion for plants and gardening was recognised in 1962 when Roy was awarded the Associate of Honour of the Royal New Zealand Institute of Horticulture, given to those of distinguished service to horticulture (Anon. 1962); and in 1969 when he was awarded an MBE in the New Year's Honour's list for services to horticulture.

The Roy Thornton Fernery, Mt Smart

As well as establishing the forest on the southern flanks of the remnant volcano, Thornton established a small fernery. Although it is no longer maintained a few interesting ferns remain, including king fern (*Ptisana salicina*) and *Adiantum formosum*. Anthony Wright collected 13 ferns from the Fernery from 1969 – 1994 (Table 1). Interesting ferns naturally present at Mt Smart before it was quarried are *Anogramma leptophylla* (Cheeseman 1925) and *Pellaea falcata*, last collected at this site in 1917 (AK 115406) and 1947 (AK 115341) respectively, but now likely to be extinct.

During the survey by Wildlands Consultants, six king fern/para (*Ptisana salicina*) – presumably planted – were recorded at the base of an exposed scoria ledge that has been undercut by both natural and man-made processes (Fig. 2). All plants were growing within a dense layer of tradescantia



Fig. 1. A large hinau (planted) in the forest north of the fernery. All photos: N. Goldwater, 19 June 2014.

(*Tradescantia fluminensis*) under a canopy of puriri, titoki and pohutukawa (Fig. 3). The habitat is well-shaded, damp and well-vegetated. Despite the presence of tradescantia, seedlings of karaka and kawakawa (*Piper excelsum*) were common (Fig. 3). The site is fenced to prevent people from entering the forest.

Future Management

The most serious threat to king fern comes from ungulates such as feral pigs (*Sus scrofa*), deer (*Cervus* spp.) and goats (*Capra hircus*), none of which are present at the site. The dense mat of tradescantia is likely to impede regeneration of the king fern and other indigenous plants. This weed is widespread throughout the entire forested area of Mt Smart and its control is warranted. Interestingly, this forest is one of the release sites for the tradescantia leaf beetle (*Neolema ogloblini*) (M. Harrison, Auckland Council, pers. comm., 2014), a species that is showing promise as a biocontrol agent for tradescantia.

References

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Fig. 2. Excavated scoria ledge fringed by overhanging tuber ladder fern (*Nephrolepis cordifolia*).



Fig. 3. King fern growing with karaka and kawakawa seedlings amongst dense tradescantia.

There is also an opportunity to reintroduce both *Anogramma leptophylla* and *Pellaea falcate*, given the abundance of suitable habitat, e.g. damp rock faces and basalt rocks. The site is also free of troublesome pest plants such as Mexican daisy (*Erigeron karvinskianus*) and herb Robert (*Geranium robertianum*) – common on other maunga – and it is too shaded for exotic grasses such as kikuyu (*Cenchrus clandestinus*) and cocksfoot (*Dactylis glomeratus*) to grow.

Only a small proportion of the rock forest is accessible due to the presence of steel fences and locked gates. We recommend a repeat survey, with access to the entire site, be undertaken to survey for other threatened species (natural or planted) which may be present.

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