Appendix 2: Additions to the Mt Eden Rock-Forest Species List of Cameron (1999a).

c = common; l = local; o = occasional; s = scarce (< 5 plants seen) AF = Almorah Forest; WT = Withiel Thomas Reserve

Plant name	Plant group	Almorah (Goodfellow) & Rannoch	Withiel Thomas	Govt. House	AK voucher	Date of observation
Hymenophyllum flexuosum	fern	S ¹			295473 371040	May 1954 Jun 2018
Pellaea falcata	fern	S			353466	17 Aug 2014
Clerodendrum trichotomum *	dicot	S			357121	Mar 2015
<i>Cyphomandra betacea</i> (tamarillo) *	dicot		S			19 Jul 2014
Griselinia lucida	dicot	S				2000
<i>Mackaya bella</i> (forest bell bush) *	dicot		I		353873	19 Jul 2014
Archontophoenix cunninghamiana (Bangalow palm) *	monocot	1	S			Jul 2001 (AF) 19 Jul 2014 (WT)
<i>Clivia miniata</i> (clivia)	monocot	lc			353609	1 Aug 2014
Fissidens taxifolius *	moss			0		19 Jul 2014
Leptostomum macrocarpon	moss			I	355532	19 Jul 2014
Plagiomnium novae-zelandiae	moss	lc			353468	1 Aug 2014
Thuidium sparsum	moss	I			353468	1 Aug 2014
Rhynchostegium tenuifolium	moss	I			353468	1 Aug 2014
Frullania fugax	liv erw ort	0			353470	1 Aug 2014
Frullania spinifex	liv erw ort	lc			353467	1 Aug 2014
<i>Lejeunea</i> cf. <i>flava</i>	liv erw ort	0			353469	1 Aug 2014
Porina exocha	lichen	lc				1 Aug 2014

 1 = confirms the earlier literature record of Wall & Cranwell (1936)

A northern range extension for *Hymenophyllum bivalve*, Kaiwaka, Northland

Jack Warden

On the 14 May 2018 the Auckland Botanical Society (ABS) descended on the Worsfold and Wright Farm just outside of the village of Kaiwaka, Northland. It was an amazing day with a great turn-out of people. Heath Worsfold, one of the landowners, gave us an in-depth history of the local area and his family.

The day was spent exploring the bush remnants known under the Natural Areas of Rodney Ecological District (Northland Conservancy) as the Kaiwaka – Mangawhai Road bush remnants (Goldwater, et al. 2012). A full detailed list of the flora of the bush remnants is currently being updated and will be published later, to capture some of the species that will appear as the seasons change. The bush area is significant because the Worsfold and Wright families had the foresight to protect patches of bush from the ever-hungry herds of cattle they run. Compared to many of the identified Natural Areas in the district, it is always a bonus to have a bush area with an undisturbed array of ground tier species.

Although the bush area has been fenced for some time, the signs of past activities from Maori excavations, shell midden, old felled kauri (*Agathis australis*) stumps and old decaying fence lines cannot be overlooked. The bush area in a generalised sense consists of kauri – podocarp – broadleaved forest with kauri and associated podocarps dominating the

upper ridgelines, and broadleaved species such as taraire (*Beilschmiedia tarairi*), tawa (*Beilschmiedia tawa*), kohekohe (*Dysoxylum spectabile*) and titoki (*Alectryon excelsus*) dominating the lower areas around the streams.

The dense bush with its associated streams provides a great array of habitats for filmy ferns (*Hymenopyllum* spp.). During the initial reconnoitre, and later during the actual ABS field trip, a total of seven filmy ferns were recorded from the bush area.

The new northern record of *Hymenophyllum bivalve* was not as simple as it appears. During the ABS field trip the small filmy fern with toothed pinnae growing on an old decaying kauri stump was deemed to be *Hymenophyllum multifidum*. This being a new species for me and others, several photos were taken. In the days following the field trip, the observation was put up on iNaturalist NZ to be scrutinised by the wider online botanical community. Jacqui Geux had some great photos and it was first brought to our attention by David Hutchinson that we may need to take a closer look. Further comments came from some of New Zealand's leading fern authorities, Leon Perrie and Pat Brownsey, including from Leon:

"Pat agrees that it is *Hymenophyllum bivalve*. With regard to getting a specimen, he says 'It would be a significant new record, putting the species north of Auckland for the first time.'"

With the new-found information and the thought of a new northern record, on 24 June 2018 Maureen Young and I set out to verify the initial identification. Luckily, finding the exact location of the old kauri stump wasn't too much trouble and on closer inspection we were able to put all the small pieces of filmy fern anatomy together.

The filmy fern, *Hymenophyllum bivalve* (Figs. 1, 2, 3) is indigenous to New Zealand, found in the North, South, Chatham and Auckland Islands. The prior northern-most record was from Centennial Park at Campbells Bay (Auckland) (AK 293291, *EK Cameron 13161 & S Jones*, 21 Sep 2005) with the species scarce north of Waikato. It also occurs in Australia (Queensland to New South Wales) (Brownsey & Perrie 2016). This discovery of it at Kaiwaka extends its northern New Zealand range by approximately 70 km.

The fern is found from coastal to montane forest, either terrestrial or as a low epiphyte on tree trunks and roots (Brownsey & Perrie 2016). The location (Kaiwaka) and habitat in which the new specimen (AK 371013) was collected is approximately 1 km from the upper reaches of the Kaipara Harbour and approximately 6 km from the upper reaches of the Mangawhai estuary, 60 m above sea level.



Fig. 1. *Hymenophyllum bivalve* on an old kauri stump. Photo: J. Geux, 14 May 2018.



Fig. 2. A full view of *Hymenophyllum bivalve* fronds and growth habit at Kaiwaka. Photo: J. Warden, 24 June 2018.



Fig. 3. *Hymenophyllum bivalve* at Kaiwaka with sori in the plane of the frond. Photo: J. Geux, 14 May 2018.



Fig. 4. *Hymenophyllum multifidum* at Windy Canyon, Great Barrier Island with upwards-bent sori. Photo: J. Warden, 15 September 2018.

After a lot of searching, the fern appeared to be isolated to a single old moss-covered kauri stump from a tree felled 100-150 years ago (Fig. 1). The general canopy consisted of kauri, tanekaha (Phyllocladus trichomanoides) and rewarewa (Knightia excelsa). Understory species of note included white maire (Nestegis lanceolata), mamangi arborea), Coprosma spathulata and (*Coprosma* lancewood (*Pseudopanax* crassifolius), and Alseuosmia spp. were common as small shrubs.

As indicated above, H. bivalve could be confused with H. multifidum. However, H. bivalve can be distinguished by its larger size, brighter green fronds (Fig. 2) and more shallowly toothed margins. The most distinguishing feature is when the sori are fertile. In H. bivalve the sori are smaller, protected bv two separate indusial flaps (bivalved), and lie in the plane of the frond (Fig. 3). In H. multifidum the two indusia are fused into a tapered cylinder, and the sori are typically bent upwards at 90 degrees to the plane of the frond (Fig. 4) (Brownsey and Perrie 2016).

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Frugivory and seed dispersal in the Auckland region

Pigeons are essential worldwide for seed dispersal, especially for tree species that have large fruit and seeds. In New Zealand, the endemic pigeon (Hemiphaga novaeseelandiae, Columbidae) is almost the sole volant canopy-based disperser of fruits of some indigenous tree species.¹ This is because canopy tree species in New Zealand manv produce large fruit with minimum dimension >15 mm and H. novaeseelandiae is the only widespread frugivore capable avian of swallowing and dispersing such fruits and seeds due to its distensible beak gape.

Two recent papers complement each other to show how factors on both local and landscape levels interact

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to affect the outcomes of seed dispersal processes: In the first paper, Pegman et al. (2017) found that actively dispersed seeds were significantly longer than seeds from passively dispersed fruit, suggesting frugivore preference for larger fruit in two large-fruited canopy tree species (*Vitex lucens* and *Prumnopitys ferruginea*) located in the Waitakere and Hunua Ranges and Wenderholm Regional Park, as shown in Figure 1. This is important because the nonrandom selection of fruits by frugivores can affect plant demography by changing the probability of seedling recruitment. For example, larger fruits usually contain bigger seeds, which often have higher seedling survivorship during establishment than small seeds (Moles & Westoby 2004).

In the second paper, which explored the interaction of frugivory by *H. novaeseelandiae* and tree spatial heterogeneity and its effect on seed

¹ In contrast, weka (*Gallirallus australis*) conducts flightless ground-based dispersal of seeds from large-fruited tree species, such as *Elaeocarpus dentatus* (Carpenter et al. 2018).