What's up with *Bulbinella* on Banks Peninsula?

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An unexpected find on Hinewai Reserve by my sharp-eyed assistant, Paul Newport, has added one more native species to the upper cool-temperate/subalpine florula of Banks Peninsula – and raised a few questions.

The presence of mountain plants on the Peninsula's highest tops is intriguing. Nowhere are the summits high enough to lie above the timberline – the natural upper altitudinal limit of trees (and the boundary between the subalpine and alpine zones). Before Polynesian explorers discovered and settled Aotearoa some 800 years ago, the Peninsula was more or less entirely clothed in closedcanopy forest, from bottom to top and side to side. Māori settlement cleared about a third of this cover, creating extensive open habitats. European colonisation, centuries later, pretty much erased the rest. Much of the region is now open grassland.

Despite its forested past, Banks Peninsula's native flora does include some upper cool-temperate and subalpine species characteristic of open non-forest habitats. Most of these species have undoubtedly been on the Peninsula for a long time. There are relatively few species compared with the rich high mountain flora far to the west. Those that *are* present occupy very restricted areas, which must have been even more restricted before human clearance of forest. We know, for example, that fescue tussock and snow tussock spread out across formerly forested summits and ridges from the few steep high sites where trees could not shade them out. At lower altitudes silver tussock and bracken spread similarly across thousands of hectares of formerly forested land after Māori burning. Some trees, rare in the millennia of extensive old-growth forest, would have increased hugely; kānuka is the prime example.

Further back in time, ice-age climates had greatly reduced forest cover and lowered altitudinal zonation so that there was truly alpine vegetation above a temperature-determined timberline. The last glacial maximum peaked about 18,000 years ago. Climatic warming set in around 14,000 years ago. Forest expanded to cover the whole of Banks Peninsula. Alpine and subalpine species became restricted to high bluffs; many must have been eliminated, including all of the obligate alpines.

The present subalpine element of Banks Peninsula's flora is thus only a remnant of much cooler times, although a roll call of genera hints strongly of the distant Alps: *Chionochloa*, *Dracophyllum*, *Celmisia*, *Forstera*, *Gaultheria*, *Acaena*, *Dolichoglottis*, *Geum*, *Epilobium*, *Aciphylla*, *Anisotome*, *Gingidia*, *Raoulia*, *Kelleria*, *Wahlenbergia* – and more. When I say "remnant" I am suggesting that most of these taxa have been on the Peninsula since the last ice-age, although we don't know that for sure. Some hint by their sporadic distribution and rarity that they might be more recent waifs and strays that have managed to arrive by chancey long-range dispersal across the plains from the mountains, their establishment aided by forest clearance, their place in the present vegetation tenuous and perhaps temporary. Some might have come and gone repeatedly. *Raoulia tenuicaulis* and *R. hookeri* are likely examples. Two other *Raoulia* species, *glabra* and *subsericea*, are much commoner and almost certainly long-established. Two more, *R. australis* and *R. monroi*, are common (*monroi*).

The plant that Paul Newport discovered is a *Bulbinella*. He found one tuft growing in a turf of sweet vernal and snowberry between big tussocks of *Chionochloa rigida* and shrubs, mostly *Coprosma dumosa* and *Dracophyllum acerosum*, at an altitude of 695 m.

It was a fine sunny day at the end of November 2019, and Paul was diligently removing scattered gorse from the beautiful snow tussock shrublands of North and South Hīoi, near Stony Bay Saddle. When he and I met up at the end of the day he led me to see it. He had already correctly identified it as a *Bulbinella*. It bore three fat inflorescence buds (in full flower a couple of weeks later). Four old stalks showed that it had flowered last year, and a perusal of the surrounding turf soon revealed several establishing young plants, all within a metre of the parent, obviously from last year's seed (Figs. 1-5).



Figure 1. *Bulbinella hookeri* with flower buds, Hinewai Reserve, 29 November 2019. Photo: Paul Newport

Figure 2. *Bulbinella hookeri* coming into flower, Hinewai Reserve, early December 2019. Photo: Paul Newport



Figure 3. *Bulbinella hookeri* in flower, Hinewai Reserve, 13 December 2019. Photo: Paul Newport



Figure 4. *Bulbinella hookeri* with capsules, Hinewai Reserve, 22 January 2020. Photo: Paul Newport



Figure 5. "Paul's clump" of *Bulbinella hookeri* with Hugh *in situ*, 13 December 2019. Photo: Paul Newport

The genus *Bulbinella* was already long-known from Banks Peninsula. The Armstrongs (1870, 1880) had recorded it, apparently without locations and under a different name (*Anthericum*). Margaret Simpson (later Bulfin) collected a specimen (CHR 274 130) from Mount Sinclair in late December 1974 from a "damp ledge SE of summit". There is an earlier specimen (CHR 329 331) collected in December 1933 by Henning from "Head of Le Bons Bay"; it was identified by Arnold Wall. Wall (1953) mentions that the species formerly grew on Mount Herbert but can no longer be found there.

On my botanical survey of Banks Peninsula in the 1980s I failed to locate *Bulbinella* on Sinclair or Herbert but, directed by local farmer, Gerard ten Hove, I found a population of about 100 plants in flower by the Summit Road above Le Bons Bay, a little to the NE of Trig R (640 m) in December 1987. This population still existed when I checked in mid-December 2012, but I noted only about 20 flower heads. More recently when I biked past I couldn't see any. So *Bulbinella* appears to be vanishingly rare on Banks Peninsula, perhaps a bit of a stray itself from extensive populations in mountains to the west.

Although these few records appear under different names they all seem to be what is now known as *Bulbinella angustifolia*. This taxon was named *Bulbinella hookeri* var. *angustifolia* by Cockayne and Laing in 1911 but raised to species rank as *B. angustifolia* by Lucy Moore in 1964.

I have *Bulbinella angustifolia*, grown from Le Bons Bay seed, in a pot on my doorstep, as well as in my overgrown rock garden (trees and ferns are taking over). So I see it every day. When Paul Newport led me to his *Bulbinella* near North Hīoi I was expecting to see *B. angustifolia*. That would have been exciting enough – a new record for Hinewai though not for the Peninsula. A first glance at Paul's plant took in the broad, rather glaucous, more or less erect leaves, and my immediate exclamation was "Good Heavens! This is not *angustifolia*. This is *hookeri*". Besides the colour, width and set of the leaves, another good diagnostic feature lies in the shape of the capsules. *B. angustifolia* has broadbased capsules. On *B. hookeri* the capsule narrows to a distinct stalk, obvious as the tepals shrivel and turn down. On 22 January 2020 I revisited Paul's clump to peek at the ripening capsules. They were distinctively stalked, confirming that the North Hīoi plant is indeed *hookeri*.

The genus *Bulbinella* was erected by the German botanist, K.S. Kunth, in 1843 for some African plants. When European botanists first met the golden-flowered New Zealanders in the 1840s they placed them in *Chrysobactron* but Joseph Hooker in 1864 placed the two then-recognised species in *Anthericum*, a genus with African and European members. It was Cheeseman (1906) who transferred them to Kunth's *Bulbinella*. Lucy Moore revised the New Zealanders in 1964, recognising six species, one of them (*gibbsii*) with two varieties. *Bulbinella* as currently understood has the unusual distinction of having six species in New Zealand and all the rest (maybe 20 or more) in South Africa. Lucy Moore

commented that "no clear reasons have emerged for dissociating the New Zealand plants from *Bulbinella*. It remains an anomaly in plant geography that two so closely related groups of plants should occur only in South Africa and New Zealand".

Bulbinella is currently placed in the family Asphodelaceae along with *Asphodelus, Kniphofia* (red hot pokers), *Aloe, Eremurus, Bulbine* and others, but not *Anthericum*, which is placed by some botanists in the family Anthericaceae but more generally included in Asparagaceae. Family limits in the Asparagales and Liliales continue to be much debated.

Bulbinella angustifolia is common in the mountains east of the Main Divide from about the Hurunui River southwards into Otago and Southland. *Bulbinella hookeri*, on the other hand, grows on North Island mountains and southwards through Nelson, Marlborough and North Canterbury to about the Waiau River, which lies a little to the north of the Hurunui.

One could imagine that *B. angustifolia* could possibly be an ice-age relict on Banks Peninsula, but its rarity and its few transient sites make it seem more likely that it has been somehow making its way (back?) across the plains in more recent times. It is harder to believe that *B. hookeri* has persisted on the Peninsula for thousands of years but has escaped detection by sharp-eyed plantspeople during the last century or two. Even so, it's not easy to comprehend how it could have jumped from North Canterbury to the Peninsula. The seeds have no obvious means of dispersing across such a gap; they are not winged, and not so tiny as to be blown thus far by wind, and they are shed from dry capsules that are not obviously attractive to birds.

Did a seed arrive on some tramper's boot or sock or pack? It doesn't seem likely. The *Bulbinella hookeri* on North Hīoi is close to Hinewai's Tara Track, but not beside it; the plant is several metres up the steep hillside. Did someone actually plant it? That can't be ruled out. Decades ago during my botanical survey of Mount Cook National Park my field assistant, Alex Buchanan, managed to plant in one of my survey plots on the Sealy Range a species so unlikely to be there that it was almost, but not quite, outside the realms of possibility. Fortunately he was unable to keep a straight face when he watched, a bit too intently, the astonished expression on my own.

Even so, don't forget that long ago a *Bulbinella* ancestor must somehow have made the leap from Africa to Aotearoa, or vice versa. In comparison the gap between Waiau and North Hīoi is laughably inconsequential.

Some other mysteries come to mind. In 2016 David Norton alerted me to a fullsized red tussock (*Chionochloa rubra*) close to the track (Te Ara Pātaka) on the southeast side of Te Ahu Pātiki (Mount Herbert). There was no doubt as to its identity but the species had never been recorded before from anywhere on Banks Peninsula. Its location made it more believable that it got there with the unknowing assistance of a tramper or, less likely, was purposely planted. (If anyone reading this knows more than I do, I would love you to own up. Alex did.)

In the Flea Bay Gully, Banks Track walkers pass a lone silver beech, another species never recorded as a natural part of Banks Peninsula's vegetation. When I first saw it, decades ago, I immediately interrogated the local farmer. "We have means to make you talk!" I said. Steve confessed at once. (How our love of planting things can blur the intricate stories behind natural biogeography.)

Scattered very rarely across Banks Peninsula are shrubs that are evidently hybrids between thin-bark totara and snow totara. The former is abundant on the Peninsula, but snow totara has never been recorded here. One can almost bet that snow totara would have been abundant on the Peninsula during ice-age climates but eliminated by Holocene warming. I am prepared to wager my mountain bike that no-one planted the apparent hybrids. So how can they be explained? Three possibilities come to mind:

1) Enough of the snow tōtara genome remains in the local tōtara population to throw up rare progeny of hybrid-like morphology.

2) Birds very rarely manage to carry hybrid seeds right across the plains – highly constipated blackbirds or kererū perhaps.

3) Snow tōtara pollen blows across the plains, very occasionally landing on a receptive ovule of a thin-bark tōtara tree to produce a hybrid seed.

I won't risk my mountain bike by opting for any one of those three.

Tōtara is not the only example of hybridisation on Banks Peninsula where one of the putative parents is not known to be present. Three more instances are: *Acaena anserinifolia* x *inermis*^{*}, *Gaultheria antipoda* x *macrostigma*^{*}, and *Gunnera monoica* x *prorepens*^{*} (* = not present).

I keep one eye on a hybrid totara bush beside Hinewai's boundary fence below Brocheries Road. We will also keep a close watch on the single patch of *Bulbinella hookeri* near Stony Bay Saddle to see whether it expands or disappears. And we wonder what the next exciting discovery will be!

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Orchids in unexpected places

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In January 2003 my wife's observant eyes noted what she thought might be a group of orchids growing in the leaf litter in the flower beds at Mona Vale Gardens, Christchurch. I was a little dismissive at first, but on closer examination agreed that they were indeed native orchids, which I subsequently identified as *Gastrodia* "long column". Over the years since then we have regularly checked the same spot in the gardens, but have never seen them there again. In January of this year (2020), we were delighted to find another clump of these interesting orchids growing at a different site in the gardens, about 100 metres from the original location. Since our original observation, this plant has been named *Gastrodia molloyi* (Lehnebach et al. 2016). Both clumps of *Gastrodia* were growing in semi-shaded areas, the 2003 specimen under a mature *Podocarpus totara*, this year's specimen under a large *Quercus palustris* tree, with a paeony, roses, and box hedging nearby (Figs. 1-3, pp. 13 & 14).

Gastrodia species are non-photosynthetic plants that obtain energy and nutrients from mycorrhizal and other fungi, with which they form a symbiotic relationship. They are known to like growing in leaf litter and wood mulch, presumably because this encourages the right type of decomposer mycorrhizal fungus (Lehnebach CA, personal communication). They have potato-like tubers, hence their vernacular appellation "potato orchid". *Gastrodia* species colonise pine plantations and urban areas such as cemeteries, gardens and traffic islands (Lehnebach et al. 2016).