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A journey southwards to the subantarctic islands: finding New Zealand's flora in the middle of the Southern Ocean. *Adrienne Markey*

"*Considering how many beautiful plants different from those of New Zealand these islands contain, it is obvious that they deserve a very close and careful botanical scrutiny*"

Hooker 1864

Why did I go there?

The flora of the subantarctic islands, and its affinities to the flora of New Zealand has always held the interest of botanists, starting from Joseph Dalton Hooker on the Antarctic voyages of the H.M. Discovery Ships *Erebus* and *Terror* (1839 – 1843), to recent research using molecular markers to track the dispersal and evolution of plants in these regions. So, with great boldness, I found myself able to make a direct comparison of these regions. Yes, the origins and evolution of the subantarctic plants fascinate me, and fall neatly within my interests in plant systematics, ecology, biogeography and phylogeography. Plus, it offered a chance to collect both *Coprosma perpusilla* ssp *subantarctica* and *Nertera depressa* from their southernmost distributions and to complement current studies that I, and fellow researchers, had in progress.

Strangely enough, because of the very high level of floristic affinities between these particular subantarctic islands and the montane – alpine regions of New Zealand, I expected to see a scene somewhat like that on Swampy Summit or Maungatua (now Maakatua) – except with copious quantities of megaherbs, an absence of pungent *Aciphylla*, a far greater abundance of seabirds and a different species of *Chionochloa*. Not that there is anything wrong with the montane - alpine tussock grasslands flanking Dunedin, but it may be sacrilegious to some to compare these iconic southern islands with the greater Dunedin metropolitan area! Therefore, when I received the chance to head south and compare the two regions, it was a dream come true! Opportunities to visit the subantarctic islands are, for botanists and botanical enthusiasts, certainly very rare. But two Otago BotSoc members made the journey last year; both me (searching for *Coprosma* and *Nertera*; and Alex Fergus (who was collecting insects).

Getting there ….

The journey southwards by sea to the subantarctic islands has a reputation for being one of the most wind-swept, wave-heaved, tumultuous journeys that could be undertaken. However, and to say with gloating pride, my voyage was greeted with mirror-calm seas, clear blue skies and absolutely balmy weather that put Dunedin's rare sunny summer days to shame. We left a grey and mist-laden Bluff and flooded South Island to sail to Campbell Island over two sunny days of bliss. We were flanked at all times by an entourage of black browed mollymawks, southern Royal Albatross and cape pigeons. At the end of the second day, we caught sight of the distinctive profile of Campbell Island. At dusk (which was after 11pm), we motored into Perseverance Harbour, to be surrounded by the silhouetted basaltic columns and ridges of Mt Col and Mt Lyall. The sky by now had been reduced to pale golden glow, punctuated by wisps of faint, grey mist, which licked the highest ridges. The still waters of the harbour were occasionally broken by the wake of sea lions as they porpoised out to challenge the boat. The boat weighed anchor near the old meteorological station, to sleep for the night, dwarfed by the size of the harbour and dark shadows.

Campbell Island …

Meteorological Station - Col Saddle

Boated to the station, and started the climb to the saddle. I was met by familiar vegetation in the form of a 3 m high thicket (or dwarf forest *c.f.* Meurk *et. al*. 1994) consisting primarily of *Dracophyllum longifolium* var. *cockayneanum* and *Myrsine divaricata*, together with *Coprosma ciliata* and *C. cuneata*. In the understorey were familiar ferns, *Polystichum vestitum* and *Blechnum montanum*, the giant bog lily, *Bulbinella rossii* and the club mosses, *Lycopodium australianum* and *L. varium*. Some enormous species of *Pseudocyphellaria*, a foliose lichen, formed flowing, green, gelatinous lobes on *Dracophyllum* trunks. Many of these shrubs and ferns were not greatly dissimilar to their mainland counterparts, which surprised me considering how far isolated and far south they were. Then again, it should not be so surprising since they were relatively recent arrivals following the retreat of glaciers following the Pleistocene. However, other conspecifics, such as *Geranium microphyllum*, *Lycopodium varium* and *Anaphalioides bellidioides*, looked considerably more robust than mainland New Zealand forms.

Here I encountered my first Stag daisies, a magnificent *Pleurophyllum criniferum* and *P. hookerii*. This encounter was brief and I could not stand around and enjoy the flowers as large, male Hooker Sea Lions were charging all and sundry who passed by. Moving promptly along, we walked around Beeman Hill, and were greeted with a strange, wailing cry, like a strangled inhalation, coming from a pair of light-mantled sooty albatross. They were nesting, as they had for years, in the craggy basalt outcrops of this landmark.

We passed the *Dracophyllum longifolium* thicket into a mosaic of more open, low shrubland of *D. scoparium*, herbfield and cushion bog in the damp, peaty depressions in

the landscape. The most common cushion bog species here was *Phyllachne colensoi,* although cushions of *Centrolepis ciliata* and *Oreobolus pectinatus* were not uncommon. Among these cushions were colourful gentians, forget-me-nots, *Coprosma perpusilla* and the orchids, *Aporostylis bifolia* and *Caladenia carnea*. Surrounding the bogs and ranging up the interfluves of the mountainside were tussock grasslands of *Poa litorosa* and *Chionochloa antarctica.* These supported rich and colourful intertussock megaherbs, low shrubs of *Hebe benthamii* and the inconspicuous plants like *Coprosma perpusilla* and *Lycopodium scariosum*. This grassland was, itself, interspersed with rich megaherbfields of *Anisotome latifolia*, *Stilbocarpa polaris*, *Bulbinella rossii* and *Pleurophyllum hookerii*. Since sheep were eradicated between 1970 and 1990, these areas have been steadily recovering from grazing (Meurk *et al*. 1994). *Dracophyllum* and *Coprosma* shrubs dominated the valleys and gullies, and were best kept away from.

From a distance, and if you ignored the megaherbs, the landscape did resemble Maakatua or Swampy Summit! However, familiar genera here were magnificently enlarged, megaphyllous versions of mainland genera. The bog lily, *Bulbinella rossii,* had developed to comparatively monstrous proportions, possessing strapping leaves 5 cm wide and 50 cm long! Its inflorescence consisted of a dense spike of yellow flowers more of the dimensions of an African *Kniphofia* than a diminutive New Zealand congeneric. Similarly, *Anisotome antipoda* had not only relatively massive, plumose leaves, but the inflorescence was also greatly enlarged and succulent. As a departure from the New Zealand mainland standard of white flowers, its flowers were pink, from the perianth and mericarps down to the fleshy peduncle and umbel. Even more ridiculous an example of insular gigantism was *Anisotome latifolia*, where garish, celery-like foliage nourished several flower heads, each the approximate shape and size of a cauliflower. A strange cauliflower, which ranged in colour from ivory - white to rose to deep pink. These grew alongside *Stilbocarpa polaris*, looking all the world like an overgrown rhubarb plant upon which yellow broccoli had been stuck!

The other notable feature of subantarctic plants is that, compared to their close relatives on mainland New Zealand, the flower colours have diverged from white to deep, cyanic hues. I did manage to see the blue-flowered *Myosotis antarctica*, but the plants that I saw were in bud. This was a shame really, as Cockayne (1919) decreed this to be "the most beautiful plant in the New Zealand flora". None the less, I was privileged to see other floral displays which were much brighter than the mainland NZ counterparts. This included the purple-blue petals of *Hebe benthamii*, pinks and purples of *Epilobium confertifolium* and *Gentianella antarctica*, and the deep blue disc florets of *Damnamenia varicosa* (formerly *Celmisia*). Cockyane (1919) described the leaves of this species as "like polished greenstone", and these leaves framed beautifully the stunning concentric discs of white ray and blue disc florets. Among these megaherbs, the most colourful floral displays were from the overgrown daisies in the subantarctic endemic genus, *Pleurophyllum*. Lush, hot pink capitula of *P. speciosum* and *P. hookerii*, matched by the dark black velvet of *P. criniferum,* were draped across the landscape like the garish furnishings in a *boudoir* of ill repute. The spectacular inflorescences of these plants were nicely counterbalanced by their remarkable foliage.

P. hookerii and *P. criniferum* both possessed tightly bunched, soft, silky-smooth, grey leaves. Those of *P. speciosum* were comparatively quite different, in that they were villous, strangely concertinaed, pea green and considerably larger.

I travelled with Alex, keen on placing his invertebrate pitfall traps, the anti-freeze contents of bottles sloshing about in my pack. We climbed from Col-Lyall saddle up a ridge to Mt Lyall, scrambling among southern royal albatross. Once up high on the ridge, covered in tall tussocks of *Chionochloa antarctica* and laced with the fern, *Polystichum cystostegia*, we could view the solifluction terraces around Northeast Harbour, which lined the bottom of a glacial cirque. From a distance the pattern of vegetation was dictated by these terraces, and this patterning is no doubt an interesting story warranting further investigation. As an interesting feature which betrayed the volcanic history of the island, the bare tops of massive doleritic ridges protruded from the hillsides to form fissured, lichen-encrusted walls. Strangely, these resembled the old farm rocks walls which line paddocks on the Otago Peninsula.

Once insect collecting was done at this spectacular viewpoint, we progressed to the Col-Lyall saddle and upwards to Mt Col. This ramble was met with encroaching fog and rain. As the day aged and the weather closed in (as it also does on Maakatua and Swampy Summit), we abandoned the fieldwork and unceremoniously departed Campbell Island for the day.

Ramp Point to Penguin Point

The next day, overcast but otherwise fine, calm weather granted us the privilege of visiting Penguin Point via Ramp Point, on the far south-western coastline. For me, this was the dense garden of lush *Stilbocarpa polaris*, *Anisotome latifolia*, *Poa litorosa* and, in more sheltered embankments, *P. foliosa*. Both grasses were flowering *en masse*. Inter- tussock herbs, such as the magnificent *Leptinella plumosa*, were absolutely huge by New Zealand standards, being 2 – 3 times larger than mainland conspecifics. Such lush growth lined brilliantly white limestone cliffs, and this complemented a stunningly azure, calm sea. From our vantage point, we could look down upon a leopard seal resting on a bed of *Durvillaea antarctica*, Campbell Island shags and nesting pairs of light-mantled sooty albatross. Furthermore, we could also look across the gap to Folly Island – a spectacular island that escaped the introduction of sheep, and Dent Island – the last refuge of the Campbell Island teal. Such vistas of wild, windswept, subantarctic coastline were spectacular; a truly wonderful and majestic landscape!

Around the corner to Penguin Point was a noisy colony of Rockhopper penguins (a colony which has been in decline since the 1940's), which grabbed our attention for most of the day. Despite their comical antics, I was still entranced by the plants. The site was a magnificent garden of megaherbs, cliffs dripping with *Poa ramosissima*, and massive tussocks of *Poa foliosa* and *Poa litorosa.*

From around the moored boat, the Auckland Islands appeared to be a series of smoothed ridges, dark green at lower altitudes from rata forest, grading into lighter ochres of the higher altitude tussock grasslands. It was short work to jump into NAIADS and land at Sandy Bay. From there, we headed through dwarf forest of *Metrosideros umbellata*. These were the 'goblin forests', as Cockayne (1919) described them, 'weird and grotesque'. Although flowering of the rata had yet to commence, the stunted canopy (one metre from the ground) still had put forth a vermillion flush of new growth as colourful as full bloom. Fortunately for me, having had no luck in locating *Nertera depressa* on Campbell Island (bah, it was probably introduced to Tucker Cove anyway!), I found a dense carpet of this herbaceous species both on the forest floor and meandering among the shrubs, *Ozothamnus vauvilliersii* and *Dracophyllum longifolium*. There was also a good growth of the most beautifully thick and shiny leaved *Asplenium obtusatum*.

This stunted forest gave way to thick shrubland, which became progressively more stunted to give way to cushion bog, low sedges and herbfield. The boardwalked track continued westward over this expanse until it reached the western coastline. Again, there were plenty of familiar kiwi plants such as *Coprosma perpusilla*, *Cyathodes empetrifolia Phyllachne colensoi* and *Oreobolus pectinatus* – the dominant cushion plant in this spot. Along the north-western coastline of Enderby Island, grazing and burning practices had obliterated the rata forest, leaving only stunted, burnt, wind-etched trunks. Dense, succulent herbfield had occupied the coastal margin, punctuated only by the lichen-coated bones of long-dead cattle, shot out by DoC rangers some 15 years previously.

Subantarctic gentians are widespread on bogs, herbfields and fellfields (Wardle 1991). Here, along this section of Enderby Island, the gentians were conspicuously widespread within the upland cushion bog and coastal herbfields and turfs. Remarkable as the *G. cerina* was, it was more remarkable to me to notice the variation in colour, as had also been noticed on Campbell Island for *Anisotome latifolia*. In this instance, the entire plant body of purple-flowered variants was more richly pigmented, not just the petals. This suggested a systematic up-regulation of pigment synthesis. Another remarkable feature of these coastal turfs was the thick mats of *Plantago triandra*. With thick, fleshy leaves, this was a most remarkable looking plantain. Closer inspection of these turfs also revealed a bounty of other delights; including *Epilobium pedunculare* and *Rumex neglectus*. Such coastal turfs were grazed intensively by a chattering flock of red crowned parakeets – a sight not seen on mainland New Zealand.

Moving to the northern tip, we passed through tall and handsome tussocks of *Poa litorosa* and *Poa foliosa*. The latter species was in full flower, although a few individuals of *P. litorosa* carried infloresences. Considering how sensitive these plants are to grazing, this area was, by all appearances, doing very well. On the more inland margins, there were stands of *Hebe elliptica*, all in full flower. We made our way back to Sandy Bay, at a brisk walking pace, but still with a detour through the tangled maze of rata goblin forest. Here we were privileged to view a yellow-eyed penguin and two

chicks. Unlike the mainland counterparts on the marram-infested shores of the Otago Peninsula, these birds were able to nest freely in the peaceful, sheltered forest. Which they did, with minimalist flair! I was so surprised to find that the shaded lee of a bent rata trunk would suffice, and the chicks lay on bare earth. This really emphasized the need of predator-free forest for penguins, and keenly illustrated why they are so vulnerable on mainland New Zealand.

And.. oh the rata forest, it was beautiful. It breathed! Neighbouring branches swayed in unison. Its floors were either a green velvet carpet of *Acaena minor*, or vermillion rata leaf litter, or swards of leafy *Stilbocarpa polaris*. And there were the other shrubs like *Myrsine divaricata*, *Coprosma foetidissima* and *Raukaua simplex*, all very familiar species but transported here to a remote and magical location. The still, peaceful rata forest. Wonderful, interlaced, 'goblin' forest! Full of warbling bellbirds, and even Auckland Island teal. With reluctance, we left this forest, to sail onto our final destination.

Snares Islands / Tini Heke

Our final day around a subantarctic island was at the Snares, which proved to be a pleasant boating trip around the north part of the island. This outcrop of granite and gneiss juts out from the depths of the Southern Ocean, and is a magnet for sea birds – especially titi, Snares crested penguins and Buller's mollymawks. Again, the weather was wonderful and calm. Although we were not to land on this reserve, seeing the island from the NAIADS was an excellent way to view both aquatic and terrestrial delights. The lower rocky parts of the islands are fringed by the massive, sweeping fronds of *Durvillaea antarctica*. The succulent megaherb, *Stilbocarpa robusta* poured out from under a dense, tangled low forest of the tree daisies, *Brachyglottis stewartii* and *Olearia lyallii*. The former species was still in flower, the yellow ray florets disclosing the identity of this genus.

At the end of the day….

The subantarctic islands that we were privileged to visit struck me with both their similarity and strangeness. There has been an obvious influx of New Zealand montane – alpine species. Given the high level of floristic similarity between these regions, I can further appreciate the treasures found on mainland New Zealand, and to appreciate how far they have roamed into the high latitudes. And, as I had imagined, Campbell Island looked a little bit like Swampy Summit or Maakatua, because there were many familiar species and structural vegetation communities. However, these regions were set apart because of the incredible novelties which characterise the subantarctic islands; including the distinctive megaherbs, colourful gentians and stunning subantarctic tussock grasses such as *Chionochloa antarctica*, *Poa foliosa* and *Poa litorosa*.

And what is most remarkable is that, floristically, these islands are relatively untouched in comparison to the ravaged mainland New Zealand. As commercial ventures, hunting and grazing have long since ceased on the islands. Feral mammals have now been, with some unfortunate exceptions, largely eradicated from these islands. Not only is there

reduced herbivory but, as a flow-on effect, indirect effects on the plants from these recovery and restoration efforts. For example, a high abundance of seals and seabirds leads to high nutrient inputs into the soil – a situation which may once have been the case on mainland New Zealand (Cockayne 1919, Ogle 1987, Meurk & Foggo 1988, Wardle 1991, Norton *et al.* 1997). Therefore, these subantarctic regions are of high significance because they are not as perturbed as mainland New Zealand.

To conclude; these subantarctic islands warrant far more botanical research (and I would be the first among many to volunteer my services). Firstly, they offer a valuable comparison to mainland New Zealand. Furthermore, the impact of feral pest eradiation campaigns on the flora needs to be continually monitored to document the recovery of vegetation (i.e. Meurk 1982). Introduced weeds may also need to be documented to elucidate their distribution following the cessation of grazing. Additionally, given the potential impacts of global warming on the Southern Ocean, these regions are likely to be sensitive to climate change. However, considering the intensive research being conducted on Australia's Heard and Macquarie Islands, the effects of climate change on vegetation appears to be going relatively unmonitored on New Zealand's subantarctic heritage.

Finally, the unique flora contributed to the status of this region as a World Heritage Area (Ell 1998, Peat 2003). Consequently, research should be driven by this fact alone, as these islands offer fascinating models for botanical studies on evolution, ecophysiology and reproductive ecology. Already, research is being undertaken by institutes to investigate the evolutionary history of the subantarctic flora, including Massey University, Landcare Research (Lincoln) and Victoria University. The scope for future subantarctic research is limitless, but the ability to conduct such research is (as always) constrained by limited finances.

Finally, Dunedin Botanical Society members should appreciate how fortunate they are to be in such close proximity to such amazing landscapes as Swampy Summit, Maakatua, the Otago Peninsula, the Waituna wetlands and the Catlins coastline, where they can catch so much more than a glimpse of what New Zealand's subantarctic has to offer.

Thanks

The author is in deep gratitude to the Heritage Expeditions (www.heritage-expeditions.com) and the Enderby Trust for this enviable and remarkable opportunity to visit these islands and to be able to collect plant material for evolutionary and systematic research.

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Mt Lyall daisies. Formerly known as *Celmisia*, the flowers of *Damnamenia varicosa* have intensely blue central discs surrounded by white ray ligules. Found growing among *Bulbinella rossii*, *Coprosma ciliata* and various mosses and lichens on Campbell Island. - *Adrienne Markey*

Goblin forest on Enderby Island: a canopy of *Metrosideros umbellata* rises over a dense carpet of biddi-bids (*Acaena minor*). – *Adrienne Markey*

Original Art Feature

Coprinus stercoreus Fr. *Jinty Mactavish*

Jinty won second prize in the 2005 BSO Audrey Eagle Botanical Drawing Competition

Collected in the field:- as basidiospores on deer dung, Rock & Pillar Range, Otago, April 2004
Cultured in the laboratory:- on dung & damp filter paper, in a petri dish at room temperature. Culture began 22/06/05. Immature basidioma was present & drawn 12/07/05. Mature basidioma was present, drawn & identified 15/07/05.
Additional botanical notes:- Four basidiospores appear to be produced on each basidia, but this was observed only with immature spores. Coprinus is the most common basidiomycete dung fungi genus. This species was separated from other Coprinus species mainly on the basis of its large, hyaline, regularly warted cap cells. Stipe has a long, wavy habit in mature basidiomata.