

Mosses of D'Urville Island, Marlborough Sounds, New Zealand

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SUMMARY

A total of 138 species and 2 varieties of mosses is recorded for D'Urville Island (Rangitoto ki te tonga), Marlborough Sounds, New Zealand. Seven principal vegetation types in the southern half of the island were investigated and the mosses found in each habitat are listed.

INTRODUCTION

D'Urville Island, or Rangitoto ki te tonga (Fig. 1), is a large island of 40,466 ha lying to the north-west of the Marlborough Sounds at the northern extremity of New Zealand's South Island at latitude 40° 50' S, longitude 173° 50' E. It is bounded to the west by Tasman Bay and to the east by Cook Strait. To the south-east it is separated from the South Island by a mere 500 m, albeit of treacherous water, across the notorious French Pass. The island is rugged throughout, rising to 729 m on Attempt Hill. Much of the coastline is exposed but there are some sheltered bays and inlets particularly around the deeply indented Greville Harbour and Port Hardy. The climate is typical of the Cook Strait region with plentiful rainfall and frequent strong winds. In contrast to much of the area, the island is geographically complex and, in addition to the characteristic greywacke rocks, includes the immense serpentine intrusion of the Nelson Ultramafic Belt, otherwise known as the "mineral belt", which extends more or less throughout the length of the island along its eastern side. In addition, there are smaller outcrops of sandstones, limestones, argillites and other volcanic and metamorphosed rocks, the details of which have been summarised by Keyes (1983a,b). Much of the island is farmed, particularly in the north and east, but substantial bush and scrub cover remains.

The vegetation and vascular plant flora have been described in some detail by Oliver (1944) who visited the island several times in 1922, 1942 and 1943. He listed 345 native and 67 introduced vascular plants for D'Urville and the neighbouring Stephens Island. More recent accounts have been published by Walls (1983) and by Ogle (1983), the latter author incorporating the results of trips to the islands by several botanists and extending Oliver's list to over 450 native species and 140 adventives. Recent additions to the vascular flora are provided by Beaver et al. (1989).

No previous study of the mosses of D'Urville Island has been published, and, apart from a very few collections by Oliver and J H McMahon (of unknown date), almost no attention has been paid to them. The present account is based on collections and observations made during 10 "bryologist-days" in the field with the Offshore Islands Research Group between 16 and 24 January, 1988. Most of the time was spent in the area south and west of a line drawn from Smylies Arm to Kapowai, with visits to Attempt Hill and to the small islets and stacks lying off the western side of the island.

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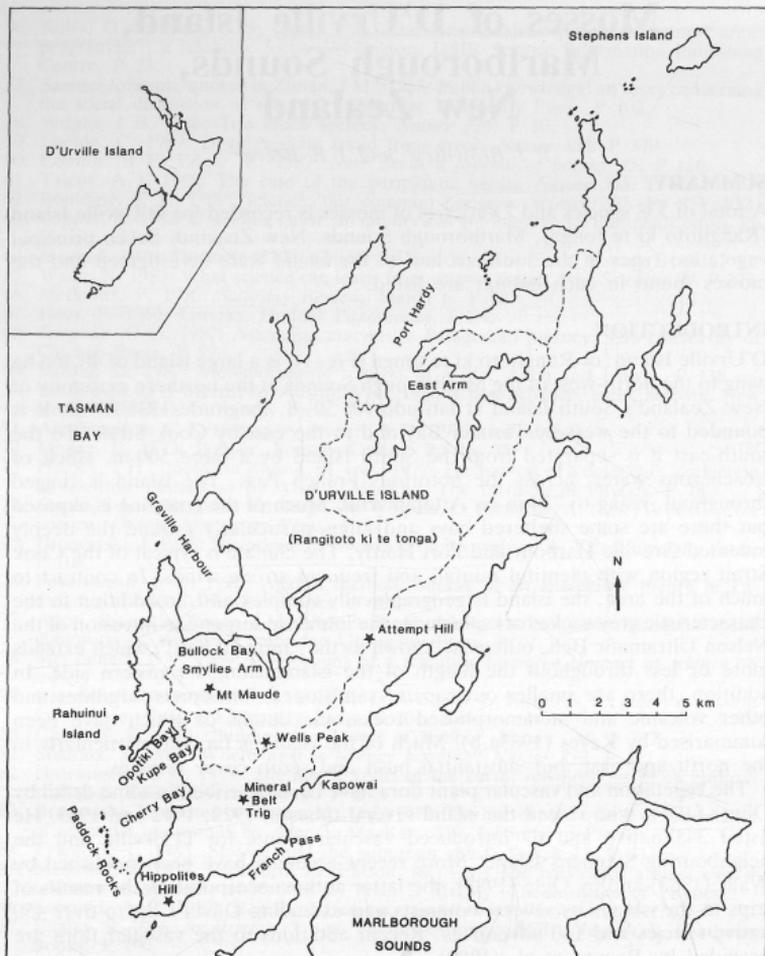


Fig. 1. Map of D'Urville Island showing localities mentioned in the text, and principal farm roads. Inset shows locality of the island with respect to the major islands of New Zealand.

Seven main vegetation types were identified in the southern part of the island:-

1. Open cliff and stack vegetation
2. Rough pasture
3. Kanuka/manuka scrub
4. Coastal kohekohe forest
5. Beech forest
6. Mixed broadleaf forest
7. Stunted kanuka/manuka scrub on the "mineral belt".

All of these vegetation types were investigated bryologically and each is discussed briefly below. A list of the mosses found in each habitat is provided (Appendix 1). Voucher specimens to support all the records have been deposited in the herbarium of the National Museum of New Zealand (WELT).

RESULTS

1. Open cliff and stack vegetation

Coastal cliffs support an open vegetation including scattered grasses, wild rape (*Brassica napus*) and rauhuia (*Linum monogynum*), occasionally overhung by akiraho (*Olearia paniculata*) and tauhinu (*Cassinia leptophylla*). In the cliff area surveyed, between Cherry Bay and Opotiki Bay, only three species of moss were recorded, namely *Triquetrella papillata*, *Trichostomum brachydontium* and *Bryum campylotheicum*.

On the more exposed offshore coastal stacks along the western side of the island, a few mosses were found in taupata (*Coprosma repens*) scrub, in *Poa anceps* grassland and in New Zealand ice plant (*Disphyma australe*) herbfield. These included *Ischyrodon lepturus* and two species of *Bryum*, *B. dichotomum* and *B. billardierei*.

2. Rough pasture

Considerable areas of rough pasture occur in the southern part of D'Urville Island. Sites surrounding Opotiki, Kupe and Cherry Bays, from sea level to about 500 m, were investigated for mosses. Numerous species characteristic of open habitats were found on soil amongst the grasses including *Polytrichum juniperinum*, *Thuidium furfurosum*, *Breuetelia pendula*, *Leptodontium interruptum* and *Hypnum cupressiforme*. Others were found on outcropping rock in the pasture, for example *Trichostomiopsis australasiae*, *Bryoerythrophyllum jamesonii*, *Tortula muralis*, *T. princeps* and *Bryum argenteum*. The three last-named species are common colonisers of concrete in cities (and, indeed, *T. muralis* was found in abundance on a concrete path beside a homestead in Kupe Bay), but unusually, they were recorded here on a natural substrate. Species such as *Campylopus clavatus*, *Polytrichadelphus magellanicus*, *Polytrichum juniperinum*, *Triquetrella papillata* and *Trichostomum brachydontium* formed a characteristic assemblage on road cuttings, tracksides and slips. Other uncommon species in this vegetation type were *Desmatodon lingulatus* (in a seepage on a roadside cutting) and *Rhynchostegium laxatum* on a damp stone in an area of swampy pasture.

3. Kanuka/manuka scrub

Kanuka/manuka scrub is primarily a coastal association bordering farmland and kohekohe forest. While it is dominated by kanuka (*Kunzea ericoides*) and manuka (*Leptospermum scoparium*), there are other shrubs including five-finger (*Pseudopanax arboreus*) and akiraho, as well as several species of *Coprosma*. It is very different in composition to the stunted scrub found on the "mineral belt" (discussed below). Examples of kanuka/manuka scrub were investigated on the east flank of Kupe Bay (0-160 m) and along the road to Wells Peak from Kupe Bay (200-250 m).

The main species of ground moss in this vegetation type were *Campylopus clavatus*, *Hypnum chrysogaster*, *H. cupressiforme*, *Trichostomum brachydontium*, *Bryum billardierei*, *Thuidium furfurosum* and, near the sea, *Triquetrella papillata*. No epiphytes were found except at the bases of tree trunks. Of

particular interest was a tiny patch of *Ischyrodon lepturus* on humic soil, lightly shaded under a 5 m canopy of kanuka, manuka and *Pseudopanax arboreus*, a habitat very different to its characteristic home on exposed rock stacks.

4. Coastal kohekohe forest

This community is generally found in valleys near the coast and is almost totally dominated by kohekohe (*Dysoxylum spectabile*), with few other tree species. It is characterised by a large number of lianes of supplejack (*Ripogonum scandens*), *Parsonsia* spp. and native passionfruit (*Passiflora tetrandra*), as well as climbers (e.g. *Blechnum filiforme*). The forest is dry and rather open with little in the way of a sub-canopy but it supports a few tree ferns and a typical dry coastal forest assemblage of ground ferns. Two major sites were investigated, one on the east side of Kupe Bay (0-160 m) and the other in a gully on the south face of Mt Maude (300-320 m).

The dominant mosses in this habitat were *Racopilum convolutaceum*, *Camp-tochaete arbuscula* and *C. pulvinata* on rocks and roots, *Echinodium* and *Homalia* species on smaller stones, several species of *Fissidens* (including *F. dealbatus*) on damp soil faces, and *Orthorrhynchium elegans* on dry rock faces. *Pterygophyllum distichophylloides*, with its characteristic clusters of gemmae at the stem apices, was found on soil at the side of a dry creek bed in one locality near the coast at Kupe Bay. Epiphytes were not common, but numerous plants of the rarely fruiting *Leptodon smithii* were found with capsules on the trunk of a large kohekohe on the roadside above Kupe Bay.

5. Beech forest

Large areas of the island are still dominated by *Nothofagus*, with silver beech (*N. menziesii*) common at the higher altitudes and red beech (*N. fusca*) and hard beech (*N. truncata*) at the lower levels. The forest is fairly open due, in part, to deer and pig damage. Areas investigated included the south face of Mt Maude (mostly *N. fusca*, 260-360 m), the track to Bullock Bay from Wells Peak (also mostly *N. fusca*, 300-400 m) and the east flank and summit of Attempt Hill (*N. fusca* and *N. truncata* on the east flank, *N. menziesii* on the summit).

On the summit of Attempt Hill in silver beech forest, one of the damper terrestrial habitats on the island, there was a relatively small number of moss species, but all grew in great abundance. They included *Cladomnion ericoides*, *Dicnemon calycinum* and several species of *Macromitrium* occurring as high epiphytes, *Lopidium concinnum* and *Dicranoloma menziesii* on tree trunks, *Weymouthia mollis* and *W. cochlearifolia* pendent on a number of the smaller shrubs, *Rhizogonium distichum* and *Wijkia extenuata* present on fallen or rotten trunks, and *Leucobryum candidum* on the ground. In the wettest spots on the ground there were patches of three *Hypnodendron* species, *H. arcuatum*, *H. kerrii* and *H. comatum*, as well as several members of the Hookeriaceae, *Distichophyllum rotundifolium*, *D. pulchellum*, *Achrophyllum quadrifarium* and *A. dentatum*. *Thamnobryum pandum* was found in running water.

In lower altitude beech forest a greater range of species was found. More common here were the characteristic clumps of *Dicranoloma* (6 species in all), and of *Ptychomnion aciculare*. Rocks on the forest floor provided a substrate for a wide variety of mosses: two species of *Echinodium*, *Hyprnum chrysogaster*, *Homalia pulchella*, *Sematophyllum amoenum*, *S. contiguum*, *Camp-tochaete arbuscula* and *C. pulvinata*. Among the epiphytes were *Orthorrhynchium elegans* and several species of *Macromitrium*. Bare, sloping soil was colonised by

Fissidens tenellus and *F. pallidus*, as well as by *Rhyncostegium tenuifolium*.

On roadsides in the beech forest some species were regularly found on soil banks. These included *Pogonatum subulatum*, *Ditrichum cylindricarpum*, *D. difficile*, *Campylopus clavatus*, *C. introflexus* and *Atrichum androgynum* on drier soil, with handsome stands of *Dawsonia superba* and *Breutelia elongata* occurring on the southern flank of Mt Maude. Several species of *Fissidens* occurred under overhanging banks, and, where seepages provided moister sites, *Breutelia pendula*, *Dicranella cardotii*, *D. jamesonii* and *Philonotis tenuis* were found. Other uncommon mosses in this vegetation type were *Mesotus celatus* recorded on Attempt Hill, and *Leptodon smithii* on Mt Maude.

6. Mixed broadleaf forest

Relatively small areas of forest are dominated by broadleaf species other than beech, and these contain occasional podocarps such as rimu (*Dacrydium cupressinum*) and miro (*Prumnopitys ferruginea*). There is a wide range of broadleaf species, including kamahi (*Weinmannia racemosa*), tawa (*Beilschmiedia tawa*), tree fuchsia (*Fuchsia excorticata*), mahoe (*Melicytus ramiflorus*), pigeonwood (*Hedycarya arborea*), titoki (*Alectryon excelsus*) and heketara (*Olearia rani*), with kohekohe and pukatea (*Laurelia novae-zelandiae*) at lower altitudes grading into the coastal kohekohe forest. Mixed broadleaf forest is generally rather open, although thickets of supplejack are common, and tree nettle (*Urtica ferox*) is abundant at forest margins and in light gaps. Examples of this type of forest were examined on the south-east side of the ridge running south from Wells Peak, near the end of the track to Bullock Bay, and in the gully above Smyllies Arm.

The principal mosses in this forest type were *Racopilum convolutaceum*, *Lopidium concinnum* and species of *Camptochaete*, *Echinodium* and *Trachyloma*. Some particularly luxuriant plants of *Echinodium hispidum* were seen in the forest near Wells Peak, with stems 100 mm long. Likewise, the two species of *Trachyloma*, *T. planifolium* and *T. diversinerve*, were here luxuriant in habit. Only recently recognised as two separate taxa (Miller & Manuel 1982), at this site they could be individually identified in the field, not only because of the exposed gemmae on the branch tips of *T. diversinerve*, but because of the less crowded, more complanate leaves of the latter species, the longer fronds (to 120 mm, compared to a maximum length of 70 mm for *T. planifolium*) and the somewhat darker colour. Capsules were common on the plants of *T. diversinerve*, but were not seen on *T. planifolium*, either at this site or elsewhere on the island. *Papillaria crocea*, *Cryphaea dilatata*, *Tetraphidopsis pusilla* and *Neckera pennata* were common epiphytes on twigs of tree nettle and on supplejack lianes, whilst *Zygodon intermedius* and several species of *Macromitrium* were found on tree fuchsia trunks. Rotting wood was plentiful in this forest, and colonised by mosses such as *Sematophyllum amoenum* and *Calyptrochaeta brownii*. In wet gullies *Thamnobryum pandum* and *Fissidens rigidulus* were found in running water, with *Distichophyllum microcarpum* and *Achrophyllum dentatum* on rocks on the banks of streams.

Less common species found in the broadleaf forest included *Braithwaitea sulcata* (once) on the trunk of a pukatea and *Pyrrobryum bifarium* which, though common on moist forest elsewhere in New Zealand, is apparently rare on D'Urville Island. *Pogonatum subulatum* and *Ditrichum difficile* were also noted growing here in their natural habitat on soil at the base of wind-thrown trees.

7. Stunted kanuka/manuka scrub on the "mineral belt"

The vegetation of the area is very distinctive, dominated by stunted plants of kanuka, manuka and southern rata (*Metrosideros umbellata*) often no more than 1 m high. Common shrubs include inaka (*Dracophyllum longifolium*), mountain tauhinu (*Cassinia vauvilliersii*), taranga (*Pimelea longifolia*), *Olearia serpentina*, porcupine shrub (*Meliccytus alpinus*), *Hebe urvilleana* and the introduced Spanish heath (*Erica lusitanica*). *Lycopodium volubile* and *L. scariosum* sprawl here and there amongst the shrubs. Herbs present include *Celmisia gracilentia*, *Brachyglottis lagopus* and an unnamed species of *Craspedia*. Sedges, including the square-stemmed sedge (*Lepidosperma australe*), are common. The vegetation is often rather open with bare, stony soil between the shrubs, and in places has been severely disturbed by pigs. Areas investigated were those to the south and east of Mineral Belt trig (340-400 m), the north face of Attempt Hill (700 m) and the track from Wells Peak to Kapowai (100-480 m).

Two very different bryofloras were found in the "mineral belt", one amongst the scrub vegetation on the thin serpentine soil, and the other associated with the large outcropping boulders. The most abundant mosses on the serpentine soil were *Bryum billardierei*, *Campylopus clavatus*, *Thuidium furfurosum*, *Trichostomum brachydontium* and *Weissia controversa*. *Racomitrium lanuginosum* was sporadically common in more open or disturbed areas, and *Dicranella cardotii* was often in seepages on tracksides. Apart from these common species, the mosses were sparse and mostly of stunted form. All are well-known species of open habitats, and, with the exception of *Racomitrium lanuginosum* and *Ditricum punctulatum*, were also recorded elsewhere on D'Urville Island on non-serpentine soils.

By contrast, the mosses associated with the large boulders, particularly around their bases or in deeply shaded crevices, were more diverse and well-grown. On a single argillite boulder 1 km north east of Mineral Belt trig, 15 moss taxa were recorded. A few of the "mineral belt" species, such as *Grimmia pulvinata*, *Isopterygium limatum*, *Macromitrium retusum*, *Racomitrium crispulum* and *Schlotheimia brownii* were found nowhere else on the island. Apart from these, the most common species included *Dicnemon calycinum*, *Holomitrium perichaetiale*, *Lembophyllum divulgum*, *Macromitrium gracile*, and *M. prorepens*, all of which are more typical of epiphytic habitats in forest environments.

DISCUSSION

The present survey of mosses on D'Urville Island encompassed only a small part of the terrain of this large island, but the total of 138 species indicates a relatively rich flora. The number will no doubt be augmented by further exploration, particularly of the northern part of the island, and on rock types not examined in the present study, such as the volcanics and sandstones on the eastern side of the island, and the limestone pockets to the south. Sand-dunes, saltmarshes and swamps are vegetation types not examined in the present study which might be expected to provide additional records.

The finding of *Ischyrodon lepturus* (Fig. 2) on D'Urville Island, as well as on Rahuinui Island and one of the Paddock Rocks off the west coast of D'Urville Island, is of interest. Until recently known in New Zealand only from the northern offshore islands, *I. lepturus* would appear to be common in the Cook Strait region. Recorded from the Chetwode Islands to the east of D'Urville Island, and from the South Island mainland near Puponga to the west (see

Beever et al. 1986), it has also been recorded on Stephens Island to the north by B H Macmillan (CHR 163467, 163468, 163478, 163508). However, the southernmost finding is that made by T C Moss at Island Bay, Wellington (WELT M8877), which at latitude 41° 21' S, lies south of all the present South Island records.



Fig. 2. *Ischyrodon lepturus*, from Rahuinui Island, off the west coast of D'Urville Island. Photo: R E Beever.

Some 32 of the mosses recorded in this study are terrestrial mosses of open sites, farming activities having increased greatly the available habitats for mosses which would previously have been confined to exposed cliff sites and bare areas among the sparse vegetation of the "mineral belt".

Another feature of the moss flora is the large number of species indicative of moist conditions, including four species in the family Hypnodendraceae, five in the Hypopterygiaceae and nine in the Hookeriaceae. This is a much greater diversity than has been recorded on several of the northern off-shore islands (Beever 1984, 1986). While in many cases these mosses were found in sites of apparently permanent moisture, in other cases, moisture-loving species, or an unusual luxuriance of moss growth, were observed in sites which were dry at the time of observation. For example *Thamnobryum pandum*, which is typically aquatic, and *Pterygophyllum distichophylloides* and *Hypopterygium filiculaeforme*, which are mosses of damp sites, were found in or beside dry creek beds. Other apparently dry sites supporting a luxuriant moss growth included exposed rock outcrops in the "mineral belt", and roots, tree trunks, twigs and lianes in mixed broadleaf forest. D'Urville Island lies on the 1200 mm isohyet (Newman et al. 1978) and thus experiences a similar rainfall to the northern off-shore islands, which receive 1040-1500 mm per annum (Atkinson &

Bell 1973). Whilst both regions are also exposed to similar annual sunshine hours, 2000-2200 hours in both cases (Atkinson & Bell 1973), the spread of rainfall throughout the year differs. The northern off-shore islands lie in a zone with maximum rainfall in winter, while on D'Urville Island rainfall is "reliable and evenly distributed throughout the year" (Coulter 1975). Hence the vegetation on D'Urville Island is unlikely to be subjected to prolonged summer drought and has developed under conditions of short-term drying only. This seems to be reflected in the floristics and ecology of its mosses.

Another important mitigating effect on the microclimate of the mosses (which also operates on the higher peaks of the northern off-shore islands) is the frequent formation of fog, even in the summer months (Fig. 3). This reduces the rate of evapotranspiration, and no doubt lengthens the time available for net photosynthesis in these poikilohydric plants.



Fig. 3. Fog rolling over the summit of Mt Maude, viewed from Kupe Bay. Photo: R E Beaver, 23 January 1988.

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APPENDIX 1: SPECIES LIST

This list includes all the species of mosses that were found on the island, the habitats in which they were found, and the registration numbers of the voucher specimens held in WELT (herbarium of the National Museum, Wellington).

Species	1. Open cliff and stock	2. Rough pasture	3. Kanuka/manuka scrub	4. Coastal kohekohe forest	5. Beech forest	6. Mixed broadleaf forest	7. Mineral belt scrub	WELT registration number
<i>Achrophyllum dentatum</i> (Hook.f. et Wils.) Vitt et Crosby				4	5	6		M10201, M10561, M10562, M10563
<i>Achrophyllum quadrifarium</i> (Hook.) Vitt et Crosby					5			M10145
<i>Atrichum androgynum</i> (C.Muell.) Jaeg.					5			M10564
<i>Brachythecium rutabulum</i> (Hedw.) BSG					5			M10173
<i>Braithwaitea sulcata</i> (Hook.) Lindb.						6		M10565
<i>Breutelia elongata</i> (Hook.f. et Wils.) Mitt.					5			M10146, M10245,
<i>Breutelia pendula</i> (Hook.) Mitt.				2	4	5	6	M10566, M10567
<i>Bryoerythrophyllum jamesonii</i> (Tayl.) Crum				2				M10568
<i>Bryum argenteum</i> Hedw.				2				M10569
<i>Bryum billardierei</i> Schwaegr. var. <i>platyloma</i> Mohamed	1	2	3		5		7	M10186, M10251, M10570-M10572
<i>Bryum campylothecium</i> Tayl.	1	2						M10226, M10227, M10573
<i>Bryum dichotomum</i> Hedw.	1							M10574
<i>Bryum erythrocarpoides</i> C.Muell. et Hampe						5	7	M10250
<i>Bryum laevigatum</i> Hook.f. et Wils.						5		M10575
<i>Bryum sauteri</i> BSG		2	4					M10224, M10225, M10576, M10577
<i>Calomnion complanatum</i> (Hook.f. et Wils.) Lindb.			4	6				M10233, M10578
<i>Calyptopogon mnioides</i> (Schwaegr.) Broth.				6				M10579
<i>Calyptrochaeta brownii</i> (Dixon) Bartlett						6		M10580
<i>Calyptrochaeta flexicollis</i> (Mitt.) Vitt					5			M10581
<i>Camptochaete angustata</i> (Mitt.) Jaeg.				4				M10712
<i>Camptochaete arbuscula</i> (Hook.) Jaeg.				4	5	6		M10202, M10234, M10713
<i>Camptochaete gracilis</i> (Hook.f. et Wils.) Par.					5			M10714
<i>Camptochaete pulvinata</i> (Hook.f. et Wils.) Jaeg.		2	3	4	6			M10203, M10235, M10715, M10716, M10717
<i>Camptochaete ramulosa</i> (Mitt.) Jaeg.					5			M10895
<i>Campylopus clavatus</i> (R.Br.) Hook.f. et Wils.		2	3	4	5		7	M10180, M10187, M10221, M10252, M10253, M10582
<i>Campylopus introflexus</i> (Hedw.) Brid.		2	3	4	5		7	M10181, M10228, M10254, M10583, M10584

Species				WELT Registration number	
<i>Catagonium politum</i> (Hook.f. et Wils.) Dus.		5	7	M10257,	M10585
<i>Ceratodon purpureus</i> (Hedw.) Brid.	2	5	7	M10255,	M10586,
				M10587	
<i>Cladomnion ericoides</i> (Hook.) Hook.f. et Wils.		5	6	M10147,	M10588
<i>Cratoneurosis relaxa</i> (Hook.f. et Wils.) Fleisch.	4			M10589	
<i>Cryphaea dilatata</i> Hook.f. et Wils.		6		M10236,	M10244
<i>Cyathophorum bulbosum</i> (Hedw.) C.Muell.	4	5	6	M10204,	M10590,
				M10591	
<i>Cyrtopus setosus</i> (Hedw.) Hook.f.		4	6	M10174,	M10592
<i>Dawsonia superba</i> Grev.		5		M10593	
<i>Desmatodon lingulatus</i> (Hook.f. et Wils.) Sainsb.	2			M10594	
<i>Dicnemon calycinum</i> (Hook.) Schwaegr.		6	7	M10258,	M10595
<i>Dicranella cardotii</i> (R.Br. ter.) Dixon		5	7	M10148,	M10256,
				M10259	
<i>Dicranella jamesonii</i> (Mitt.) Broth.	4			M10596	
<i>Dicranoloma billardierei</i> (Brid. ex anon.) Par.		5	6	7	M1263,
					M10149,
					M10902,
					M10903,
					M10904,
					M10905
<i>Dicranoloma cylindropyxis/grossialare</i> aggregate		5		M10150	
<i>Dicranoloma menziesii</i> (Hook.f. et Wils.) Par.	4	5	6	7	M10260,
					M10597,
					M10598,
					M10599
<i>Dicranoloma platycaulon</i> (C.Muell.) Dixon		5		M10600	
<i>Dicranoloma plurisetum</i> (C.Muell.) Dixon		5		M10151	
<i>Dicranoloma robustum</i> (Hook.f. et Wils.) Par.	3		7	M10188,	M10906
<i>Distichophyllum crispulum</i> (Hook.f. et Wils.) Mitt.		6		M10601	
<i>Distichophyllum microcarpum</i> (Hedw.) Mitt.	4	6		M10175,	M10205
<i>Distichophyllum pulchellum</i> (Hook.f. et Wils.) Mitt.		5	7	M10152,	M10261
<i>Distichophyllum rotundifolium</i> (Hook.f. et Wils.) Broth.		5		M10153	
<i>Ditrichum cylindricarpum</i> (C.Muell.) F.Muell.		5		M10154	
<i>Ditrichum difficile</i> (Dub.) Fleisch.	2	4	5	6	M10206,
					M10602,
					M10603,
					M10604
<i>Ditrichum punctulatum</i> Mitt.		7		M10605	
<i>Echinodium hispidum</i> (Hook.f. et Wils.) Jaeg.	4	5	6	M10207,	M10606,
					M10607
<i>Echinodium umbrosum</i> (Mitt.) Jaeg.	4	5	6	M10208,	M10608,
					M10718
<i>Eurhynchium muriculatum</i> (Hook.f. et Wils.) Jaeg.	4	6		M10609,	M10610
<i>Fissidens anisophyllus</i> Dixon		6		M10611	
<i>Fissidens asplenioides</i> Hedw.	2	3	4	5	7
					M10155,
					M10229,
					M10262,
					M10612,
					M10613
<i>Fissidens dealbatus</i> Hook.f. et Wils.	4	5	6	M10156,	M10614,
					M10615
<i>Fissidens humilis</i> Dixon et Watts var. <i>angustifolius</i> Dixon		6		M10616	
<i>Fissidens leptocladus</i> C.Muell. et Rodw.	4			M10617,	M10618
<i>Fissidens pallidus</i> Hook.f. et Wils.		5	6	M10182,	M10619
<i>Fissidens pungens</i> C.Muell. et Hampe		5	6	M10157,	M10620
<i>Fissidens rigidulus</i> Hook.f. et Wils.	4	6		M10176,	M10621
<i>Fissidens tenellus</i> Hook.f. et Wils.	4	5	6	M10157,	M10622,
					M10623,
					M10624
<i>Glyphothecium sciuroides</i> (Hook.) Hampe		5		M10158	
<i>Grimmia pulvinata</i> (Hedw.) J.Sm.		7		M10263	
<i>Holomitrium perichaetiale</i> (Hook.) Brid.	5	6	7	M10247,	M10264,
					M10265,
					M10625
<i>Homalia auriculata</i> Hook.f. et Wils.	4			M10211	
<i>Homalia falcifolia</i> (Hook.f. et Wils.) Hook.f. et Wils.	4	6		M10209,	M10626

Species			WELT Registration number	
<i>Homalia punctata</i> (Hook.f. et Wils.) Wijk et Marg.	4	5 6	M10210, M10627, M10628	
<i>Hymenodon pilifer</i> Hook.f. et Wils.	4	6 7	M10248, M10266, M10629	
<i>Hypnodendron arcuatum</i> (Hedw.) Lind. ex Mitt.	4	5 6	M10159, M10630, M10631	
<i>Hypnodendron comatum</i> (C.Muell.) Touw		5	M10632	
<i>Hypnodendron kerrii</i> (Mitt.) Par.		5	M10160, M10560	
<i>Hypnum chrysogaster</i> C.Muell.	3	5 6	M10634, M10635, M10636	
<i>Hypnum cupressiforme</i> Hedw. var. <i>cupressiforme</i>	2	3 7	M10189, M10190, M10267, M10637	
<i>Hypnum cupressiforme</i> var. <i>mossmanianum</i> (C.Muell.) Ando		7	M10638	
<i>Hypopterygium commutatum</i> C.Muell.	4	6	M10178, M10639	
<i>Hypopterygium filiculaeforme</i> (Hedw.) Brid.	4		M10640	
<i>Hypopterygium rotulatum</i> (Hedw.) Brid.	4	5 6	M10212, M10641, M10642	
<i>Ischyrodon lepturus</i> (Tayl.) Schelpe	1	3	M10643, M10644, M10645	
<i>Isopterygium limatum</i> (Hook.f. et Wils.) Broth.		7	M10268	
<i>Lembophyllum divulsum</i> (Hook.f. et Wils.) Par.	3	7	M10191, M10269	
<i>Leptodon smithii</i> (Hedw.) Mohr	4	5 6	M10646, M10647, M10648	
<i>Leptodontium interruptum</i> (Mitt.) Broth.	2	7	M10270, M10649	
<i>Leptostomum inclinans</i> (Hedw.) R.Br.		5	M10161	
<i>Leptostomum macrocarpum</i> (Hedw.) Pyl.	1	3 6 7	M10192, M10650, M10651, M10652	
<i>Leptothea gaudichaudii</i> Schwaegr.		5 6 7	M10162, M10653, M10654	
<i>Leucobryum candidum</i> (P.Beauv.) Hook.f. et Wils.		5 6	M10656, M10658	
<i>Lopidium concinnum</i> Hook.f. et Wils.	4	5 6	M10163, M10237, M10655	
<i>Macromitrium gracile</i> (Hook.) Schwaegr.	3	4 5 6 7	M10164, M10213, M10230, M10238, M10271, M10272	
<i>Macromitrium helmsii</i> Par.		6 7	M10239, M10659	
<i>Macromitrium ligulare</i> Par.	3	6 7	M10657, M10660, M10661	
<i>Macromitrium longipes</i> (Hook.) Schwaegr.		5 6	M10249, M10662	
<i>Macromitrium microstomum</i> (Hook. et Grev.) Schwaegr.		5	M10663	
<i>Macromitrium prorepens</i> (Hook.) Schwaegr.		5 7	M10165, M10273, M10720, M10721, M10722	
<i>Macromitrium retusum</i> Hook.f. et Wils.		7	M10274	
<i>Macromitrium submucronifolium</i> C.Muell. et Hampe		5	M10166, M10719	
<i>Mesotus celatus</i> Mitt.		5	M10167	
<i>Neckera pennata</i> Hedw.		6	M10240	
<i>Orthorrhynchium elegans</i> (Hook.f. et Wils.) Reichdt.	4	5 6 7	M10214, M10275, M10668, M10669 M10241, M10276	
<i>Papillaria crocea</i> (Hampe) Jaeg.		6 7	M10168	
<i>Papillaria flavo-limbata</i> (C.Muell. et Hampe) Jaeg.		5	M10670	
<i>Papillaria flexicaulis</i> (Wils.) Jaeg.		6	M10277, M10671	
<i>Philonotis tenuis</i> (Tayl.) Jaeg.	4	7	M10169, M10183,	
<i>Pogonatum subulatum</i> (Brid.) Brid.	2	4 5 6	M10215, M10672, M10673 M10674	

Species			WELT registration number
<i>Pohlia wahlenbergii</i> (Web. et Mohr) Andrews		5	M10184, M10231,
<i>Polytrichadelphus magellanicus</i> (Hedw.) Mitt.	2	4 5	M10675 M10232, M10278
<i>Polytrichum juniperinum</i> Hedw.	2		M10216
<i>Pterygophyllum distichophylloides</i> Broth. et Dixon		4	M10193, M10217,
<i>Ptychomnion aciculare</i> (Brid.) Mitt.	3	4 5 7	M10279, M10676 M10677
<i>Pyrrhobryum bifarium</i> (Hook.) Manuel		6	
<i>Racomitrium crispulum</i> (Hook.f. et Wils.) Hook.f. et Wils.		7	M10280
<i>Racomitrium lanuginosum</i> (Hedw.) Brid.		7	M3558, M10281 M10218, M10242
<i>Racopilum convolvuaceum</i> (C.Muell.) Reichdt.	4		M10678, M10679
<i>Rhizogonium distichum</i> (Sw.) Brid.		5 6	M10680
<i>Rhizogonium novae-hollandiae</i> (Brid.) Brid.		5	M10681
<i>Rhyncostegium laxatum</i> (Mitt.) Par.	2		M10633, M10682,
<i>Rhyncostegium tenuifolium</i> (Hedw.) Jaeg.	1	4 5 6	M10683, M10684 M10282
<i>Schlotheimia brownii</i> Brid.		7	M10219, M10685,
<i>Sematophyllum amoenum</i> (Hedw.) Mitt.		4 5 6	M10686 M10687
<i>Sematophyllum contiguum</i> (Mitt.) Mitt.		5	M10246
<i>Stokesiella praelonga</i> (Hedw.) Robinson		6	M10688
<i>Tetraphidopsis pusilla</i> (Hook.f. et Wils.) Dixon		6	
<i>Thamnobryum pandum</i> (Hook.f. et Wils.) Stone et Scott		4 5 6	M10170, M10179, M10689
<i>Thuidium furfurosus</i> (Hook.f. et Wils.) Reichdt.	2	3 6 7	M10194, M10283, M10690, M10691 M10692
<i>Thuidium laeviusculum</i> (Mitt.) Jaeg.		4	M10171, M10195,
<i>Thuidium sparsum</i> (Hook.f. et Wils.) Jaeg.	3	4 5 7	M10284, M10693 M10694, M10695, M10696
<i>Tortula muralis</i> Hedw.	2		M10697, M10698 M10699, M10700
<i>Tortula princeps</i> de Not	1	2	M10701, M10702
<i>Trachyloma diversinerve</i> Hampe		4 6	
<i>Trachyloma planifolium</i> (Hedw.) Brid.		5 6	
<i>Trichostomiopsis australasiae</i> (Hook. et Grev.) Robinson		2	M10703
<i>Trichostomum brachydontium</i> Bruch	1	2 3 4 6 7	M10185, M10196, M10197, M10220, M10222, M10285, M10286, M10287, M10704 M10198, M10223, M10705
<i>Triquetrella papillata</i> (Hook.f. et Wils.) Broth.	1	2 3	M10288, M10289, M10706, M10707 M10199, M10708, M10709, M10710 M10172
<i>Weissia controversa</i> Hedw.		6 7	M10711
<i>Weymouthia cochlearifolia</i> (Schwaegr.) Dixon	3	5 6 7	M10200, M10243, M10290
<i>Weymouthia mollis</i> (Hedw.) Broth.		5	
<i>Wijkia extenuata</i> (Brid.) Crum		5	
<i>Zygodon intermedius</i> BSG	3	6 7	

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***Hebe matthewsii* Rediscovered**

*Tony Druce (Pinehaven) and
Shannel Courtney (Nelson)*

Hebe matthewsii was described by T F Cheeseman in the "Manual of the New Zealand Flora" in 1906, and the distribution given as "Canterbury – Southern Alps, Haast! Armstrong! Otago – Milford Sound, Enys! Humboldt Mountains, H J Matthews!" He remarked that it was "a handsome plant, often cultivated in gardens in the South Island". A plate drawn by Matilda Smith was included in the "Illustrations of the New Zealand Flora" edited by Cheeseman and published in 1914. Cheeseman states that the specimen figured in the plate came from plants cultivated in Mr Matthews' garden. No new localities were given for the species, either in the "Illustrations" or in the second edition of the "Manual of the New Zealand Flora" published in 1925. L B Moore, writing in the "Flora of New Zealand, Volume 1", published in 1961, gave the distribution as "Otago; Canterbury Alps?", implying that no further specimens had been seen and that the Canterbury Alps locality was in doubt. She "retained [the species] because it shows several characters not easily attributed to hybridism between any two [species] growing in the same areas". And that's how things remained until February of this year (1989).