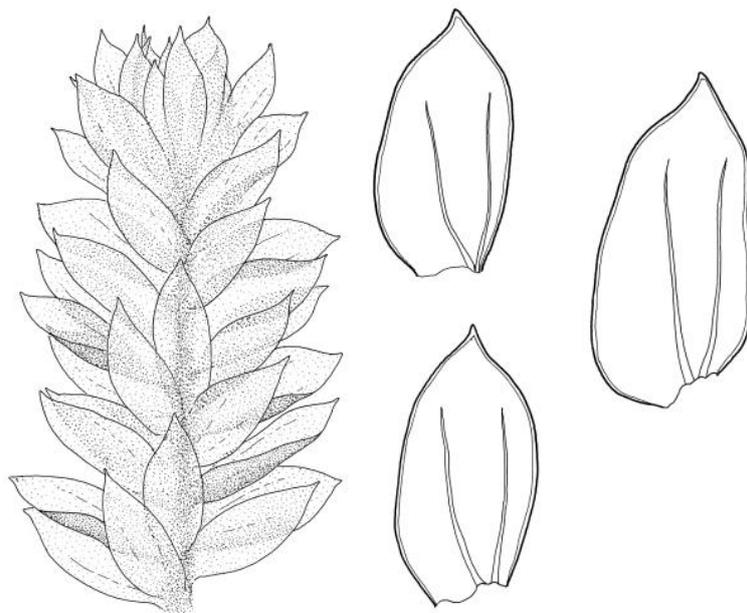




FLORA OF NEW ZEALAND

MOSSES

PILOTRICHACEAE



A.J. FIFE

Fascicle 30 – OCTOBER 2016

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Cover image: *Cyclodictyon blumeanum*, portion of shoot, moist and leaves. Drawn by Rebecca Wagstaff from C.J. West 2/4, CHR 548139.

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Introduction

The Pilotrichaceae are traditionally placed in the order Hookeriales. Historically the Pilotrichaceae have been treated as a small family with a type genus speciose in the Neotropics and predominantly epiphytic. The family concept has been broadened considerably in recent decades to include up to 21 genera. The family remains richest in the Neotropics, with fewer taxa occurring in western Africa, and fewer still occurring as outliers in Asia and the Pacific.

Only *Cyclodictyon blumeanum* is recorded in the New Zealand Botanical Region, having been relatively recently discovered on the Region's northernmost outpost, the Kermadecs archipelago. On Raoul I. it forms waterlogged pendent curtains on shaded and dripping rock outcrops, or is submerged in springs. This species is unusual in the N.Z. regional flora by having well-developed double costae. No sporophytes have been recorded here. *Cyclodictyon blumeanum* is also known from a few localities in eastern mainland Australia, Pacific Is, and eastern Asia.

Pilotrichaceae Kindb.

Taxonomy: The Pilotrichaceae are a diverse and predominantly neotropical family traditionally placed in the order Hookeriales. Historically it has been treated as a small family with members mainly occurring on tree trunks (Brotherus 1925). In recent decades the family concept has been expanded considerably, in part by Buck (1998), to include as many as 21 genera (Goffinet et al. 2009) that are distributed mainly in the Neotropics, with fewer taxa in West Africa, and fewer still in Asia and the Pacific (the last being mostly outlying members of large genera). The best known genera are arguably *Cyclodictyon*, *Callicostella*, and *Pilotrichum*.

Only one species, *Cyclodictyon blumeinum*, is recorded the N.Z. Botanical Region from the Kermadecs archipelago, where it forms waterlogged pendent curtains on deeply shaded, irrigated rock outcrops and in springs. It is unusual in our flora by having well-developed double costae; no sporophytes have been found here.

An additional single species of the widespread genus *Callicostella*, *C. papillata*, occurs widely in Asia and the Pacific and could conceivably be found in the Kermadec Is or in the extreme north of the North I.

No attempt is made here to provide a description of this diverse family. According to Goffinet et al. (2009) the family is characterised by strong double costae, usually unbordered leaves, and fringed calyptrae. Buck (1998) provided a treatment of the 16 genera occurring in the West Indies.

The eponymous *Pilotrichum* is predominantly and probably exclusively neotropical.

***Cyclodictyon* Mitt., J. Proc. Linn. Soc., Bot. 7: 163 (1863)**

Type taxon: *Cyclodictyon laetevirens* (Hook. & Taylor) Mitt.

Elements in the following generic description are taken from Buck (1998).

Plants small to medium-sized, soft, forming whitish-, bluish-, or yellow-green (seldom brown) glossy or dull mats. **Stems** creeping, irregularly branched, lacking a central strand, with sparse, smooth rhizoids. **Shoots** complanate. **Leaves** in 5–8 ranks, usually crisped when dry, asymmetric, those in dorsal and ventral ranks shorter than those in lateral ranks, broadly ovate or ± oblong, rarely lanceolate, abruptly narrowed to an acute, slenderly acuminate or cuspidate apex, bordered, toothed or entire. **Upper laminal cells** smooth, thin- or occasionally firm-walled, usually ± lax, hexagonal or oblong-hexagonal, becoming somewhat larger towards base; **marginal cells** elongate in one to several rows to form a distinct border; **alar cells** not differentiated. **Costae** double, slender or strong, extending more than half-way up leaf. **Asexual propagulae** lacking.

Sexuality various. **Perichaetia** with small, ovate or lanceolate, acuminate leaves. **Setae** lateral, erect, smooth, red-brown. **Capsules** inclined to horizontal, oblong-cylindric, with a short neck, constricted below the mouth when dry; **exothecial cells** not or weakly collenchymatous; **annulus** of a single row of cells; **operculum** long-rostrate from a conic base. **Peristome** double; **exostome teeth** purple or red-brown, linear-lanceolate, strongly furrowed, cross-striate below, papillose above, bordered, with lamellae that project laterally as trabeculae; **endostome** orange, papillose, with a high basal membrane with **segments** well-developed, nearly as long as the teeth, keeled and perforate; **cilia** absent. **Calyptra** mitrate-rostrate, scarcely longer than the operculum, naked, fringed at base. **Spores** small.

Taxonomy: A large genus of up to 100 species distributed in tropical regions, mostly in the Neotropics. *Cyclodictyon* is anomalous in the family by having bordered leaves. Only one species occurs in the N.Z. Botanical Region.

Etymology: The generic name refers to the rounded and net-like outlines of the laminal cells.

***Cyclodictyon blumeinum* (Müll.Hal.) Kuntze, Revis. Gen. Pl. 2, 835 (1891)**

≡ *Hookeria blumeana* Müll.Hal., *Syn. Musc. Frond.* 2, 676 (1851)

Type: Java. Not seen.

Plants bright green, iridescent when fresh and when dry, forming mats or “hanging curtains” in irrigated situations. **Stems** green, to at least 35 mm, in cross-section lacking a central strand and differentiated cortical cells; rhizoids absent or nearly so. **Shoots** moderately complanate, c. 3 mm wide. **Leaves** inserted in 6 ranks, crisped when dry, broadly ovate, tapered to a broadly acute or

weakly cuspidate apex, nearly plane, weakly denticulate above, bordered throughout by 2–3 rows of narrow and thin-walled cells, 1.6–2 × c. 1 mm. **Upper laminal cells** laxly hexagonal, moderately thin-walled, 45–60(–90) × 24–30(–39) μm, becoming more oblong, laxer, and longer towards insertion; **marginal cells** thin-walled, c. 125–150 μm at mid leaf; **alar cells** not differentiated. **Costae** double, slender, extending c. ¾ the length of the leaf, with or without terminal spicules. **Pseudoparaphyllia** foliose, lanceolate, to c. 0.4 mm.

Synoicous or **monoicous** *fide* Streimann (1997). **Perigonia** scattered on main stems, with bracts ovate-lanceolate, to c. 0.75 mm, weakly costate and bordered. **Perichaetia** and **sporophytes** not seen in N.Z. material.

Illustrations: Plate 1. Brotherus 1925, fig. 602; Whittier 1976, fig. 77; Streimann 1997, fig. 8.

Distribution: K (Ravine 8, Western Spring, and Lava Point Spring).

Western Pacific, also in tropical Asia. Reported from eastern mainland Australia, southeast Asia (widespread there) and the Pacific Islands (Streimann 1997; Tan & Robinson 1990, p. 11).

Habitat: In permanently wet conditions in seepages on Raoul I., where it was first collected by Carol West in June 1993. P. de Lange (pers. comm., June 2009) describes the Western Spring population as abundant “on basaltic breccia in a permanently dripping seepage and amongst *Alocasia brisbanensis* roots. Also covering chicken mesh, plastic pipes, and a plastic bucket. When fresh [it is] dark black-green, [in] sodden curtains across rock face and hanging free at ends. New growth [is] bright, iridescent emerald green; each curtain once clear of silt supports numerous other bryophytes and algal material. [The] most common associates are Lejeuneaceae, *Heteroscyphus allodontus*, *H. argutus*, *Radula* sp., and *Fissidens rigidulus* var. *rigidulus*.” Material from Ravine 8 apparently came from a similar dripping wet, dark, breccia wall where it was associated with roots of *Metrosideros kermadecensis*, *Adiantum cunninghamii*, and plants currently referred to *Blechnum norfolkianum*, as well as the bryophytes *Distichophyllum microcarpum*, *Achrophyllum dentatum*, *Fissidens ?rigidulus*, *Riccardia vitiensis*, and *Heteroscyphus argutus*. The one collection from Lava Point Spring was associated with “taro roots”.

Notes: The combination of iridescent plants, lax leaf cells, and the well-developed double costae make this species unmistakable in a N.Z. context.

Cyclodictyon blumeinum is rated “nationally critical” in the 2010 review of threatened bryophytes by the N.Z. Department of Conservation (Glenny et al. 2011). Peter de Lange (pers. comm., June 2009) considers this species to be merely a naturally uncommon component of the Raoul I. flora. De Lange also considers that the Western Spring populations could be threatened in the long-term by *Alocasia* growth. The species is widely distributed outside N.Z.

The Australian *C. lepidum* (Mitt.) Broth. & Watts has been placed in synonymy here (Streimann 1997). At least some Australian material (in CHR) differs from Kermadec Is material by having more strongly toothed upper leaf margins, larger and more numerous costal abaxial spicules, and a stouter acumen. Streimann (1997) also synonymised *C. karstenianum* (Broth. & Geh.) Broth. Both these names have types from the Bellenden Ker Range in Queensland.

Etymology: The species epithets commemorates the German-born Dutch botanist Carl Ludwig Blume (1796–1862) who collected widely in Java, was Deputy Director of Agriculture at the botanic garden in Bogor (Buitenzorg), and later the director of the Rijksherbarium at Leiden, The Netherlands. The composite genus *Blumea* and the journal *Blumea* are also named after him.

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Conventions

Abbreviations and Latin terms

Abbreviations	Meaning
A	Auckland Islands
A.C.T.	Australian Capital Territory
<i>aff.</i>	allied to (<i>affinis</i>)
agg.	aggregate
Ant	Antipodes Islands
a.s.l.	above sea level
<i>auct.</i>	of authors (<i>auctorum</i>)
B	Bounty Islands
C	Campbell Island
c.	about (<i>circa</i>)
cf.	compare with, possibly the species named (<i>confer</i>)
<i>c.fr.</i>	with fruit (<i>cum fructibus</i>)
Ch	Chatham Islands
<i>comb. nov.</i>	new combination (<i>combinatio nova</i>)
D'U	D'Urville Island
et al.	and others (<i>et alia</i>)
et seq.	and following pages (<i>et sequentia</i>)
ex	from
fasc.	fascicle
<i>fide</i>	according to
GB	Great Barrier Island
HC	Hen and Chicken Islands
Herb.	Herbarium
hom. illeg.	illegitimate homonym
I.	Island
ibid.	in the same place (<i>ibidem</i>)
incl.	including
<i>in herb.</i>	in herbarium (<i>in herbario</i>)
<i>in litt.</i>	in a letter (<i>in litteris</i>)
<i>inter alia</i>	among other things (<i>inter alia</i>)
Is	Islands
K	Kermadec Islands
KA	Kapiti Island
LB	Little Barrier Island
L.D.	Land District or Districts
<i>leg.</i>	collected by (<i>legit</i>)
loc. cit.	in the same place (<i>loco citato</i>)
l:w	length:width ratio
M	Macquarie Island
Mt	Mount
<i>nec</i>	nor
NI	North Island
no.	number
nom. cons.	conserved name (<i>nomen conservandum</i>)
nom. dub.	name of doubtful application (<i>nomen dubium</i>)
nom. illeg.	name contrary to the rules of nomenclature (<i>nomen illegitimum</i>)
nom. inval.	invalid name (<i>nomen invalidum</i>)
nom. nud.	name published without a description (<i>nomen nudum</i>)
<i>non</i>	not
N.P.	National Park
N.S.W.	New South Wales
N.T.	Northern Territory (Australia)
N.Z.	New Zealand
op. cit.	in the work cited (<i>opere citato</i>)
pers. comm.	personal communication

PK	Poor Knights Islands
P.N.G.	Papua New Guinea
<i>pro parte</i>	in part
Qld	Queensland
q.v.	which see (<i>quod vide</i>)
RT	Rangitoto Island
S.A.	South Australia
<i>s.coll.</i>	without collector (<i>sine collectore</i>)
<i>s.d.</i>	without date (<i>sine die</i>)
sect.	section
SEM	scanning electron microscope/microscopy
<i>sensu</i>	in the taxonomic sense of
SI	South Island
<i>sic</i>	as written
<i>s.l.</i>	in a broad taxonomic sense (<i>sensu lato</i>)
<i>s.loc.</i>	without location (<i>sine locus</i>)
Sn	Snares Islands
<i>s.n.</i>	without a collection number (<i>sine numero</i>)
Sol	Solander Island
sp.	species (singular)
spp.	species (plural)
<i>s.s.</i>	in a narrow taxonomic sense (<i>sensu stricto</i>)
St	Stewart Island
<i>stat. nov.</i>	new status (<i>status novus</i>)
subg.	subgenus
subsect.	subsection
subsp.	subspecies (singular)
subsp.	subspecies (plural)
Tas.	Tasmania
TK	Three Kings Islands
U.S.A.	United States of America
var.	variety
vars	varieties
Vic.	Victoria
viz.	that is to say (<i>videlicet</i>)
vs	versus
W.A.	Western Australia

Symbols

Symbol	Meaning
µm	micrometre
♂	male
♀	female
±	more or less, somewhat
×	times; dimensions connected by × refer to length times width
>	greater than
<	less than
≥	greater than or equal to
≤	less than or equal to
=	heterotypic synonym of the preceding name
≡	homotypic synonym of the preceding name
!	confirmed by the author
*	in distribution statements, indicates non-N.Z. localities from which material has been confirmed by the author

Technical terms conform to Malcolm, B.; Malcolm, N. 2006: *Mosses and other Bryophytes: an Illustrated Glossary*. Edition 2. Micro-Optics Press, Nelson.

Abbreviations for Herbaria follow the standard abbreviations listed in *Index Herbariorum*.

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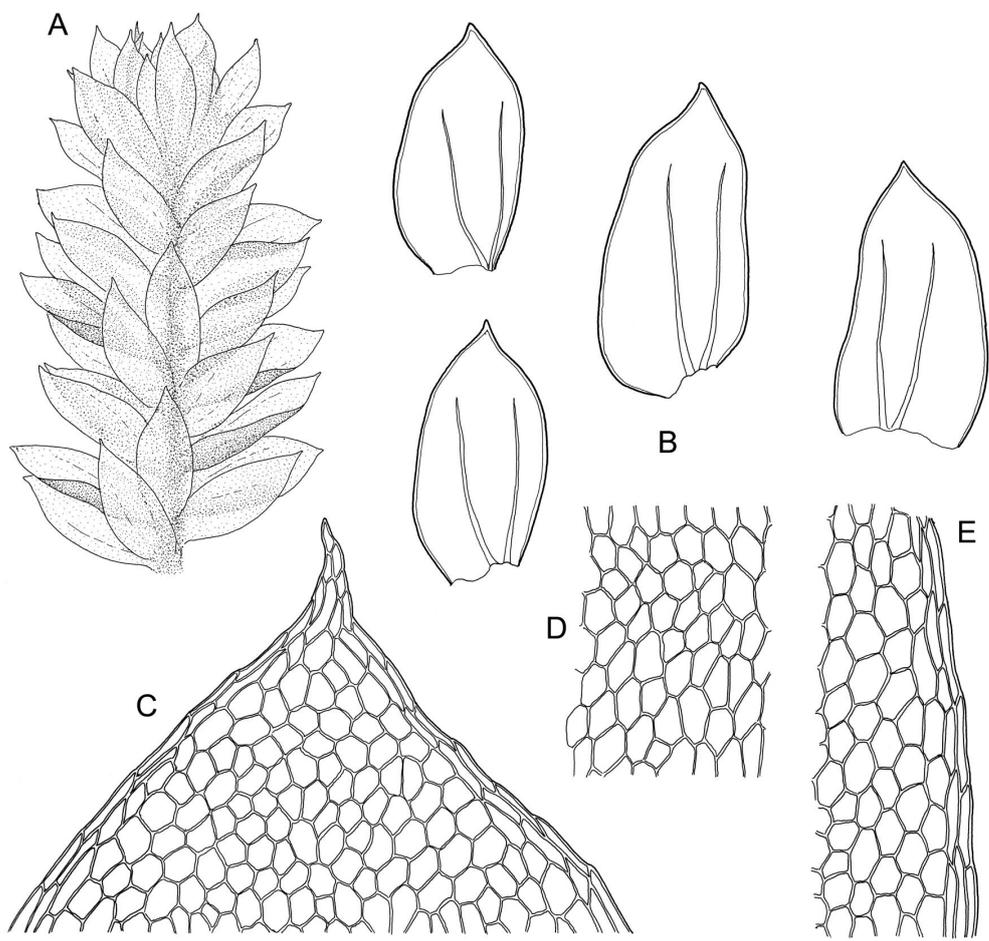
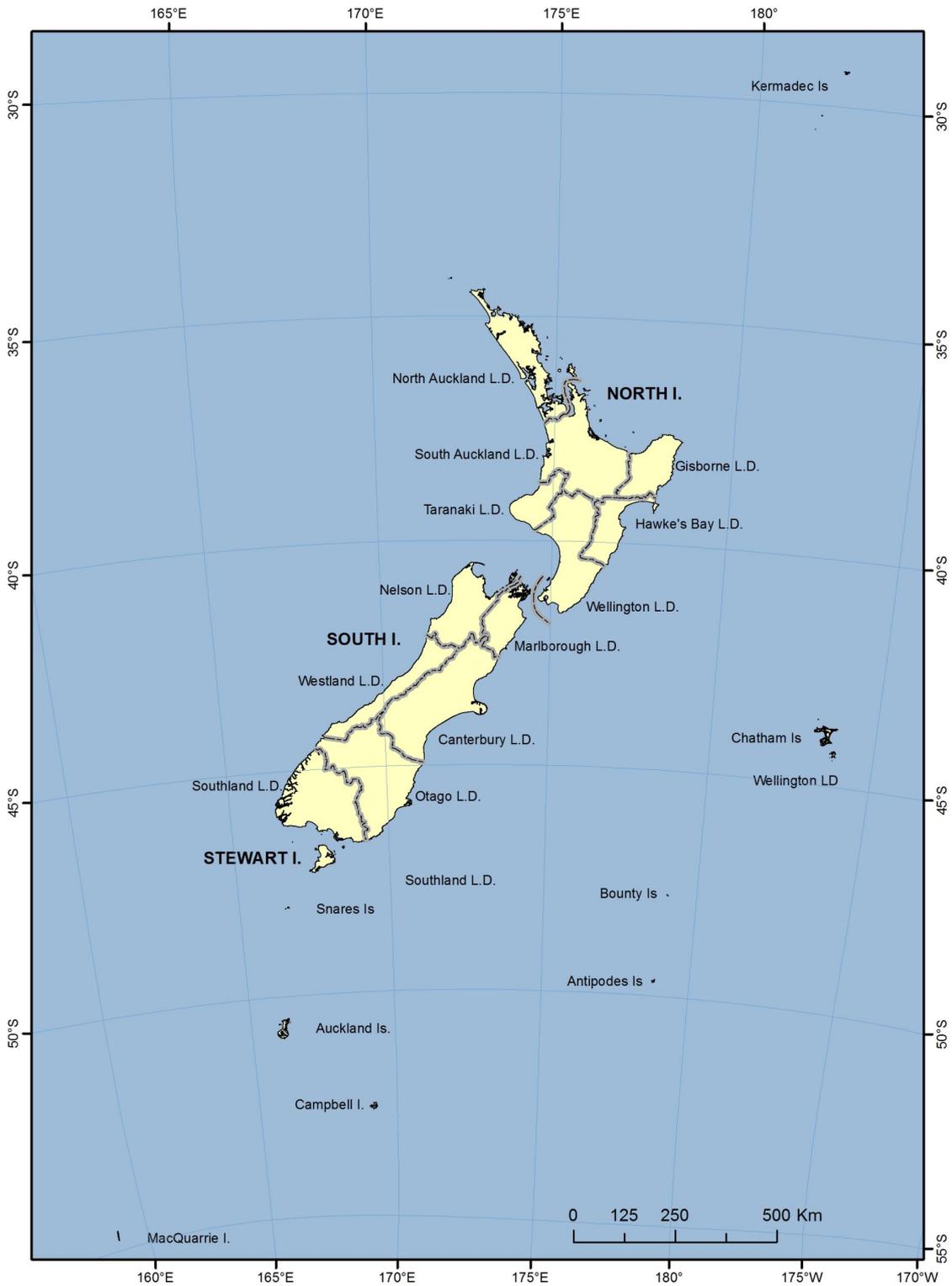
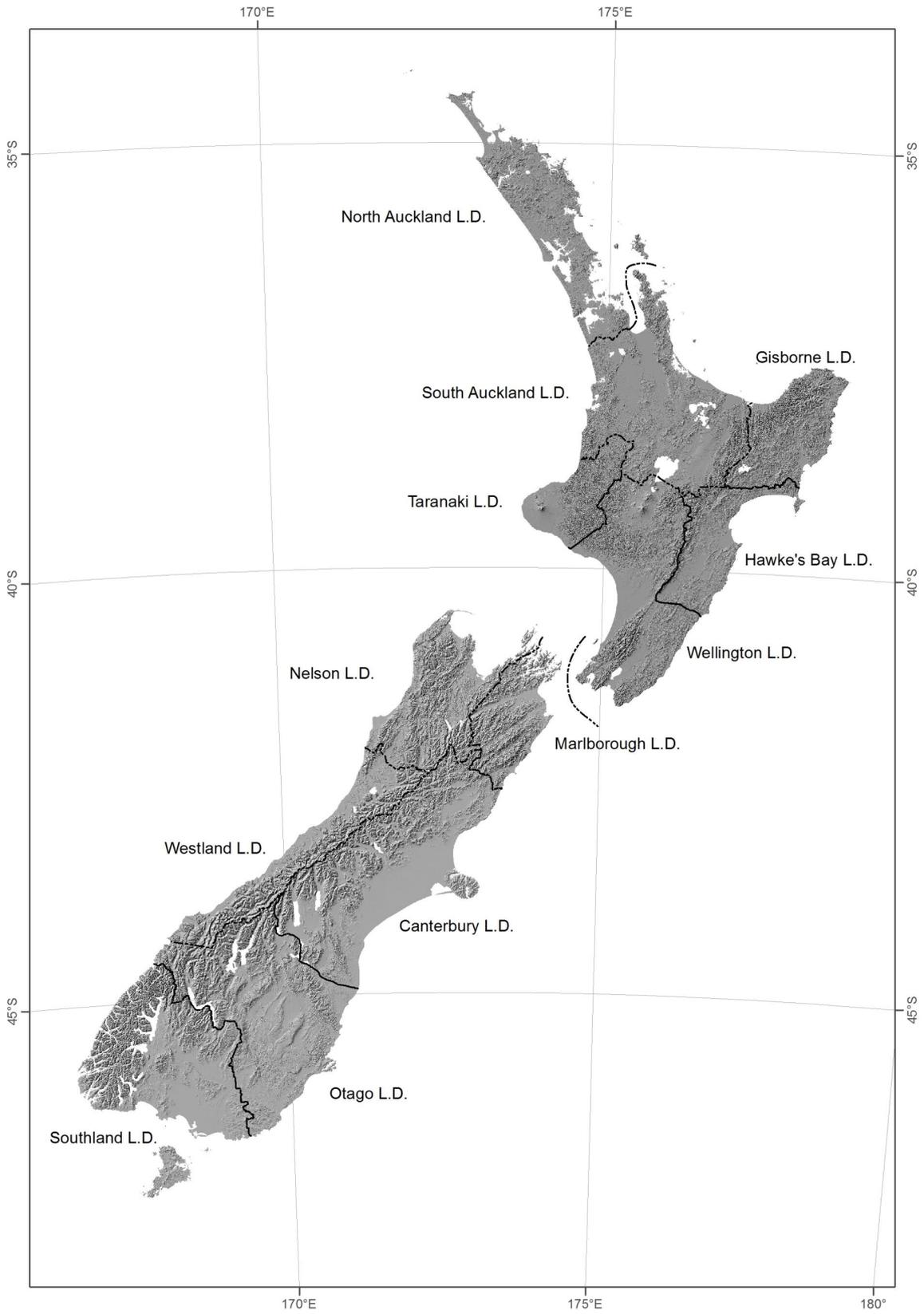


Plate 1: *Cyclodictyon*. A–E: *C. blumeinum*. A, portion of shoot, moist. B, four leaves. C, leaf apex. D, upper laminal cells. E, upper laminal cells at shoulder margin. Drawn from *C.J. West 2/4*, CHR 548139.



Map 1: Map of New Zealand and offshore islands showing Land District boundaries



Map 2: Map of main islands of New Zealand showing Land District boundaries

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Page numbers are in **bold** for the main entry,
and *italic* for synonyms.

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2

Hookeria blumeana Müll.Hal. 2

Pilotrichaceae Kindb. **2**

Image Information

Image
Plate 1
Map 1
Map 2

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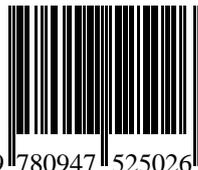
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