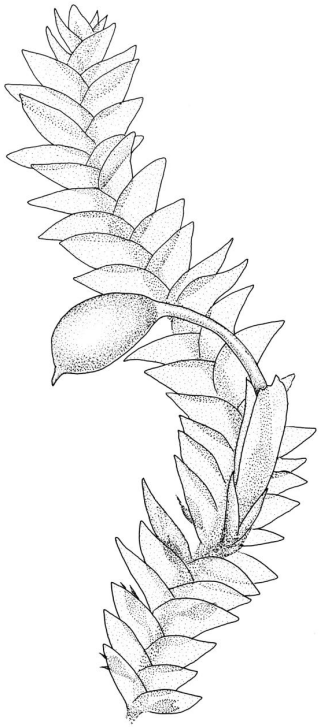
FLORA OF NEW ZEALAND

MOSSES

ERPODIACEAE



A.J. FIFE

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Cover image: *Erpodium glaucum*, habit with immature capsule and partly obscured perigonia. Drawn by Rebecca Wagstaff from *G.M. O'Malley s.n.*, CHR 545820.

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Contents

Introduction

The Erpodiaceae are considered here to be monogeneric, and to include c. 24 species from tropical and warm-temperate regions. The great rarity and geographically widely scattered occurrences of many species of *Erpodium*, including the one N.Z. species, suggest that this is an ancient genus of relictual distributions. Accordingly, *E. glaucum* is among the rarest and least documented moss species in the N.Z. flora. It is known from only three North I. (and one inshore island) localities, including a poorly documented pre-1848 type collection by W. Colenso. It is also recorded from Qld, N.S.W., Argentina, Brazil, Mexico, and Sri Lanka. Such widely scattered distributions occur in many species of *Erpodium*. The plants of *E. glaucum* form loosely interwoven glaucous mats on bark and have ranked, dimorphic, and complanate leaves. This combination of features probably causes it to be overlooked as an hepatic when capsules are absent.

Erpodiaceae

Taxonomy: The family is considered here to be monotypic, with features of the genus *Erpodium*.

Erpodium (Brid.) Müll.Hal., *Bot. Zeitung (Berlin)* 1: 774 (1843)

= *Aulacopilum* Wilson

Type taxon: *Erpodium domingense* (Spreng.) Müll.Hal.

The generic description takes elements from several literature sources, including Stone (1997, p. 486), Crum (1973), and Brotherus (1925).

Plants small and slender, complanate or terete, forming loose or dense mats on bark or rocks. **Stems** creeping, irregularly branched, bearing smooth, usually sparse, rhizoids in clusters on lower surface, in cross-section with or without a central strand. **Branches** horizontal or ascendant, often very short. **Leaves** similar on stems and branches, ecostate, either uniform and terete or dimorphic, complanate, and in two dorsal rows that obscure two small ventral rows, oblong-lanceolate to oblong-ovate or elliptic, rounded to acuminate at apex and sometimes with a hair-point, unbordered, entire or crenulate at margins. **Laminal cells** hexagonal, subquadrate, or rhombic, sometimes bulging, pluripapillose or smooth, usually oblate in lower leaf and/or at margins; **alar cells** not differentiated.

Autoicous. **Perichaetia** terminal on short branches; **perichaetial leaves** erect and sheathing. **Perigonia** often gemmiform, scattered on stems and branches. **Setae** short and ± straight; **capsules** erect, symmetric, immersed to exserted, oblong- to ovoid-cylindric or obovoid, often with a prominent columella, pale and rather thin-walled, scarcely wrinkled when dry; **exothecial cells** mostly thin-walled; **stomata** usually present and superficial (absent in N.Z. taxon); **annulus** present or none; **operculum** low conic or nearly flat, apiculate or rostrate. **Peristome** mostly absent or, if present, consisting of 16 lanceolate or rudimentary papillose teeth. **Calyptra** mitrate or sometimes becoming split on one side, long or short, usually plicate, sometimes twisted, smooth or papillose. **Spores** green, variable in size, papillose or rarely nearly smooth.

Taxonomy: The nomenclatural history of the generic name *Erpodium* is complex and beyond the scope of this Flora. I have elected to follow the nomenclature employed by Stone (1997) who, in turn, accepted the nomenclatural interpretation and the detailed supporting arguments presented by Crum & Anderson (1981, p. 674). Stone cited the generic authorship as *Erpodium* (Brid.) Müll.Hal. Her interpretation contrasts with that presented by Missouri Botanical Garden (2013, accessed 10 Dec. 2013).

Stone's (1997) arguments in favour of placing all the Australian species (including the single N.Z. species) of Erpodiaceae in *Erpodium* (rather than some in segregate genera) are also accepted here. Stone provided descriptions, illustrations and a key to the six species of *Erpodium* recognised from Australia; this provided the basis for the unillustrated account of the family in the Flora of Australia (Stone 2006). Stone (1997, p. 486) suggested that the genus, as circumscribed by her, could be divided into two groups based on gametophytic characters. The characters she used are primarily the presence of dimorphic 4-ranked leaves and complanate stems vs uniform, unranked leaves and terete stems; the presence/absence of a central strand, and the nature of laminal cell ornamentation. The one species occurring in N.Z. has dimorphic and 4-ranked leaves.

Crum (1973) presented an alternative interpretation of the genera in this family, based on a worldwide review. He treated the single N.Z. representative in *Aulacopilum*, as was done by Brotherus (1925, p. 5), Sainsbury (1955) and Fife (1995). Crum (p. 205) distinguished *Erpodium s.s.* from *Aulacopilum* on the basis of calyptra form, size, and degree of twisting. Goffinet et al. (2009) also recognised five genera in the family (all of which were considered to be synonyms of *Erpodium* by Stone (1997)). The late Ron Pursell was working on a monograph of the Erpodiaceae at the time of his death in March 2014.

Distribution: A genus of c. 24 species occurring in tropical and warm-temperate regions worldwide. Occurring mainly on tree trunks but also on rock.

Notes: The great rarity and widely scattered occurrence of many species of *Erpodium*, and the genus as a whole, suggest this is an ancient genus and that the current species distributions are relictual.

Etymology: According to Crum & Anderson (1981) the generic name is derived "from the Greek *erpo*, a word meaning creeping" (related to the Latin *serpens* and to the word herpetology). They stated that "it seems appropriately chosen, in the context of the original publication, as a subgeneric division of *Anoectangium*."

Erpodium glaucum (Wilson) I.G.Stone, *J. Bryol.* 19: 487 (1997)

≡ *Aulacopilum glaucum* Wilson, *London J. Bot.* 7: 90 (1848)

Probable isolectotype: N.Z., from a valley between Whakawhitirā and the sea, *W. Colenso, s.n.*, WELT M31113! Lectotype: N.Z., *W. Colenso 3668a*, BM. Designated by Stone (1997). Not seen.

Plants pale grey- or blue-green, glaucous, forming loosely interwoven mats on bark; **shoots** c. 4–7 × c. 0.5 mm, with ± complanate, lateral branches of unequal length. **Stems** creeping, irregularly branched, fragile, sparsely beset with long, smooth, and red-brown rhizoids that arise in fascicles on the lower surface, in cross-section with 2 layers of incrassate cells surrounding c. 6 inner parenchyma cell layers. **Branches** simple or forked, mostly c. 2(–3) mm long. **Stem and branch leaves** similar, ecostate, in four ranks and ± complanate; **leaves of the two dorsal ranks** loosely spreading, asymmetrically ovate and acute to apiculate apically, mostly 0.4–0.6 × 0.2 mm, crenulate at margins due to strongly bulging cells, inrolled on lower margin, the apiculate apex often pale; **leaves of the ventral ranks** shorter and narrower. **Upper lamina cells** ± isodiametric-hexagonal, thin-walled, strongly bulging, non-collenchymatous, mostly 9–15 µm diam., with several (c. 4–9) flat-topped papillae on each surface; **apical cells** often pale and opaque, papillose and mostly c. 21–30 µm long; **cells of lower lamina** and **lower margins** weakly oblate but otherwise similar to those above; **basal** and **alar cells** not differentiated.

Autoicous. **Perichaetia** terminal on stem and branches, sheathing c. ½ the seta, with leaves ovate-acuminate and c. 0.8 mm long. **Perigonia** numerous, gemmiform, yellow-brown, c. 0.3 mm long, scattered on stem and branches, with bracts similar to vegetative leaves except for more rhombic cells. **Setae** pale, smooth, straight, twisted weakly to the right, c. 0.7–1.0 mm; **capsules** erect, turbinate, pale brown, gymnostomous, with a prominent columella that sometimes protrudes slightly after dehiscence, c. 0.3 × 0.2 mm; **exothecial cells** irregular, firm-walled; **annulus** not differentiated; **peristome** and **stomata** absent; **operculum** conic, short rostrate. **Calyptra** clasping at base, completely enclosing the immature capsule, with longitudinal, often twisted pleats, becoming split on one side with maturity, falling late. **Spores** broadly ellipsoid, thick-walled, finely papillose, 32–35(–38) µm diam.

Illustrations: Plate 1. Stone 1997, fig. 2, a–g.

Distribution: NI: N Auckland (Unuwhao), S Auckland (Mayor I.), Gisborne (Raukokore River, near Whakawhitirā).

Anomalous. Stone (1997) recorded occurrences in Australia (in Qld and N.S.W.) and Argentina, Brazil, Mexico, and Sri Lanka.

Habitat: The species has been confirmed from four lowland N.Z. localities. It could easily be overlooked as an hepatic if found in a sterile condition. The Unuwhao material (*J.K. Bartlett 1476c*, WELT M8353!) was collected from bark of *Beilschmiedia tawa* and was growing in part as a super-epiphyte on *Frullania* sp. A few stems of *Fabronia australis* are also present in the collection. This collection was reported by Bartlett (1985). Unuwhao is a hill overlooking Spirits Bay. The Raukokore River collection is from an unspecified tree species and includes a few stems of *Haplohymenium pseudotriste*. The Whakawhitirā collection by Colenso bears no habitat data but includes plants of *Fabronia australis*. The Mayor I. collection (*P.J. de Lange 10376*, AK 330305!) was collected from the bark of *Vitex lucens* with several species of hepatic. Stone (1997) noted that *E. glaucum* is often associated with *Haplohymenium pseudotriste* and *Papillaria flexicaulis* in Australia and that it occurs both on tree trunks and rock in warm temperate forests. She gave no indication of the number of Australian localities from which it was recorded.

Notes: Stone (1997, pp. 487 & 493) proposed that the South African *Aulacopilum trichophyllum* Müll.Hal. and the Japanese *A. piliferum* Noguchi should both be treated as a single variety of the present species: *Erpodium glaucum* var. *trichophyllum* (Müll.Hal.) I.G.Stone. She added (Stone 1997) that the Himalayan *A. abbreviatum* Mitt. and *A. japonicum* Cardot are likely to “prove to be closely related to *Erpodium glaucum*”.

Stone (1997, p. 487) designated as the lectotype *W. Colenso 3668a*, an 1843 collection from an unspecified N.Z. locality, noting the type contained *Fabronia secunda*. The *Fabronia* mentioned by Stone can confidently be assumed to be *F. australis*, the only representative of that genus in N.Z. There is a single ample, undated, and unnumbered *Colenso* collection (WELT M31113!) from near Whakawhitirā that is also a mixture of *E. glaucum* and *Fabronia australis*. The presence of the *Fabronia* provides strong but circumstantial evidence that WELT M31113 is an isolectotype and that Whakawhitirā is the type locality.

A 1943 collection by G.M. O'Malley was made at the mouth of the Raukokore River, Gisborne L.D., which is c. 50 km west of the presumed type locality at Whakawhitirā. A search of the Raukokore River mouth and nearby inland forest in 1996 by A.J. Fife and D. Glenny failed to re-locate the species. The forest at the river mouth is now highly modified, and it is unlikely that the species survives there.

Erpodium glaucum is accorded Nationally Critical threat classification (Glenny et al. 2011), but efforts to protect populations are hampered by the lack of recent and precisely documented records. More exact information about populations of this species is required; Unuwhao is perhaps the most likely site where this species might be re-located and more precisely documented. Its re-location would be a first step towards its conservation management.

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Conventions

Abbreviations and Latin terms

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

PK	Poor Knights Islands
P.N.G.	Papua New Guinea
pro parte	in part
Qld	Queensland
q.v.	which see (*quod vide*)
RT	Rangitoto Island
S.A.	South Australia
s.coll.	without collector (*sine collectore*)
s.d.	without date (*sine die*)
sect.	section
SEM	scanning electron microscope/microsopy
sensu	in the taxonomic sense of
SI	South Island
sic	as written
s.l.	in a broad taxonomic sense (*sensu lato*)
s.loc.	without location (*sine locus*)
Sn	Snares Islands
s.n.	without a collection number (*sine numero*)
Sol	Solander Island
sp.	species (singular)
spp.	species (plural)
s.s.	in a narrow taxonomic sense (*sensu stricto*)
St	Stewart Island
stat. nov.	new status (*status novus*)
subg.	subgenus
subsect.	subsection
subsp.	subspecies (singular)
subspp.	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 (*videlicet*)
vs	versus
W.A.	Western Australia

Symbols

Symbol	**Meaning**
µm	micrometre
♂	male
♀	female
±	more or less, somewhat
×	times
>	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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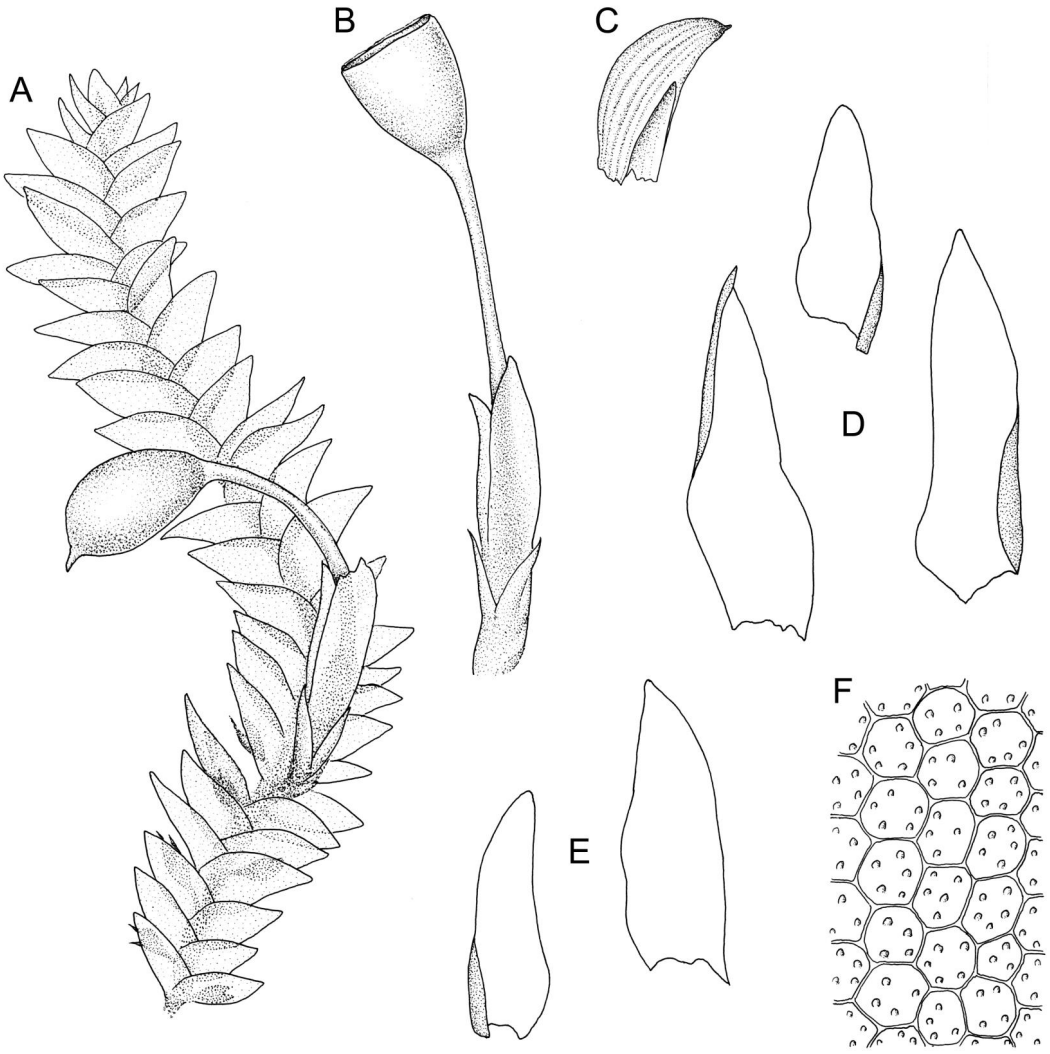
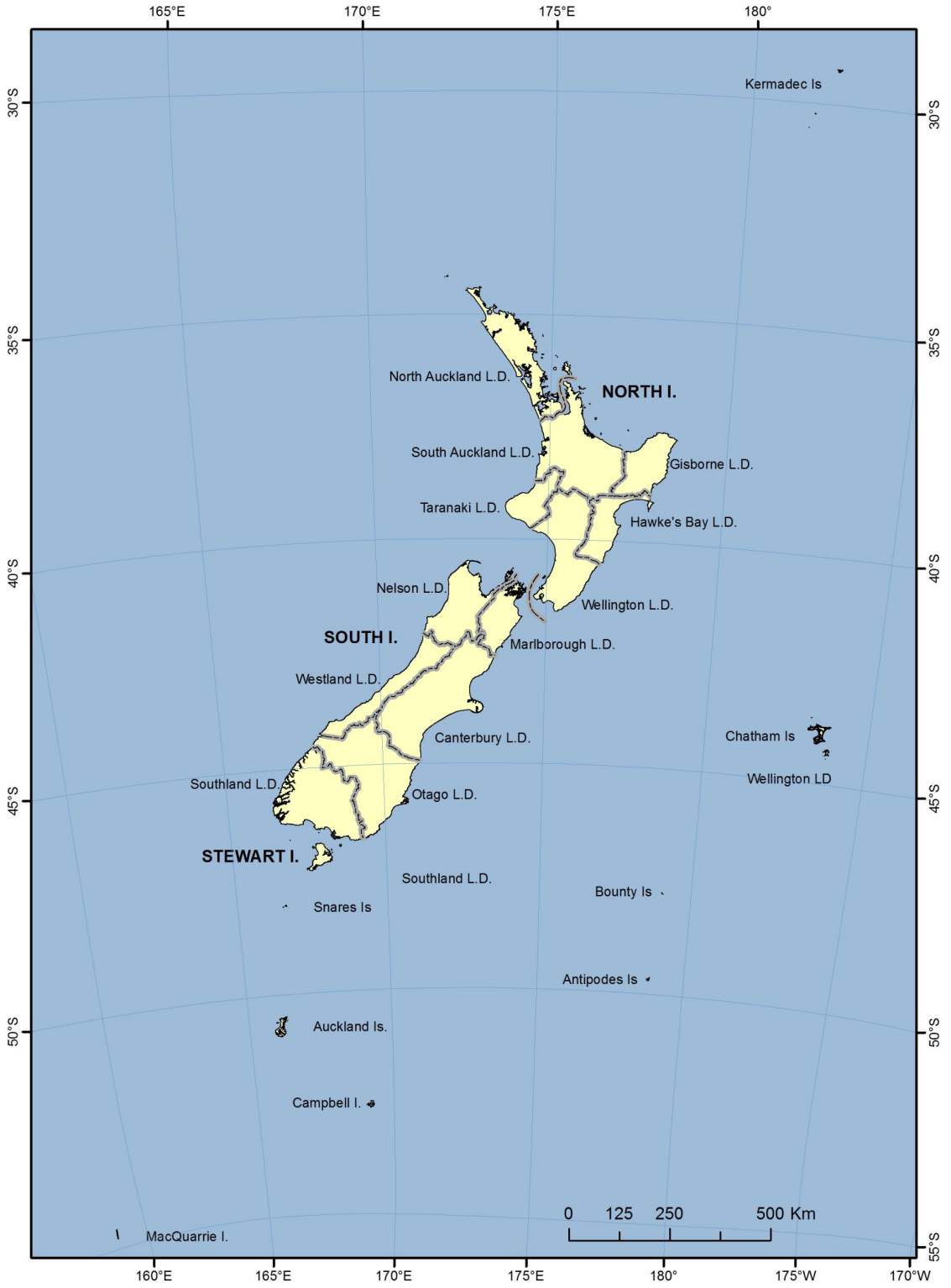
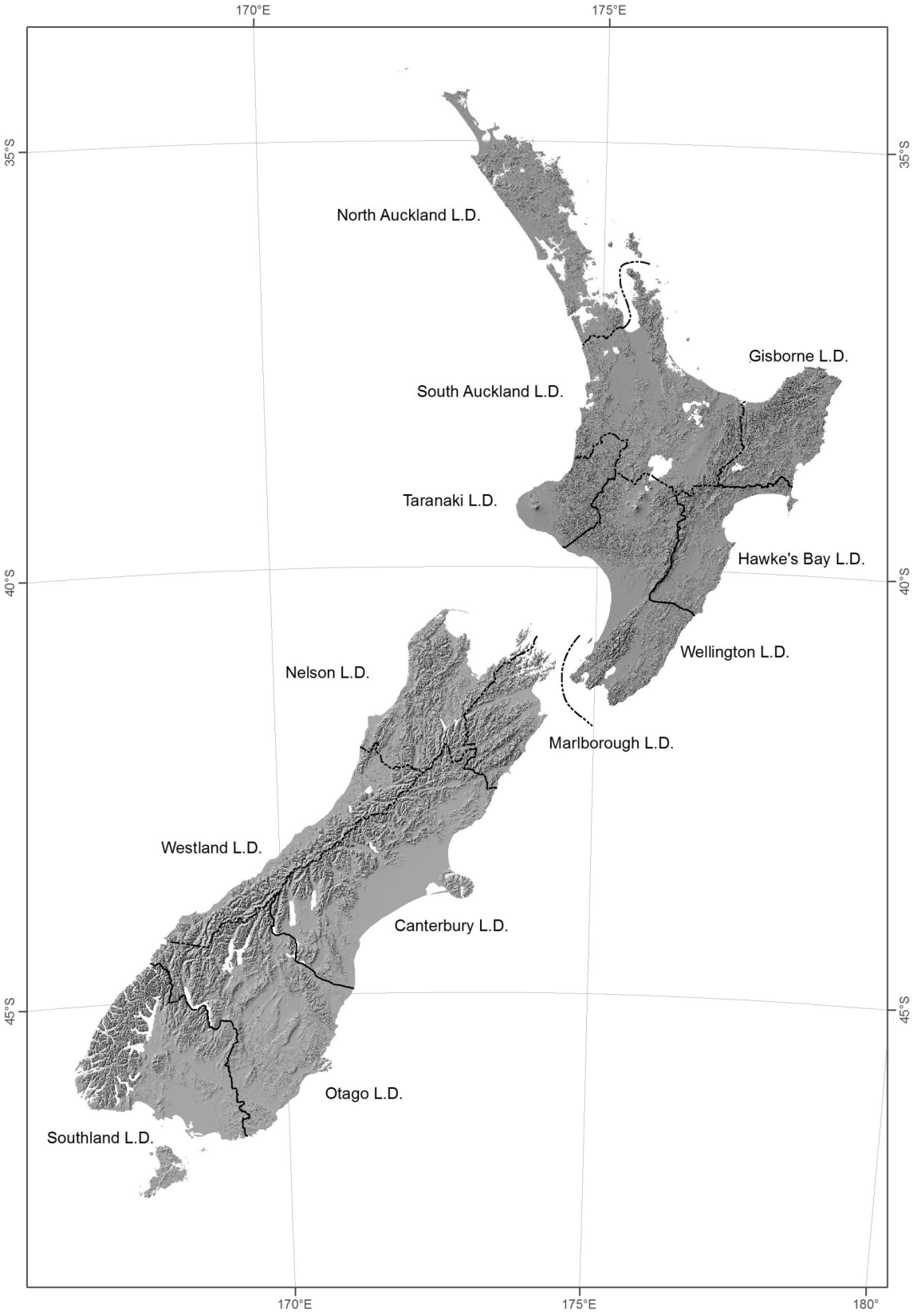


Plate 1: ***Erpodium*. A–F: *E. glaucum.*** A, habit with immature capsule and partly obscured perigonia. B, perichaetium with capsule. C, calyptra. D, leaves of dorsal ranks. E, leaves of ventral ranks. F, upper laminal cells. Drawn from *G.M. O'Malley s.n.*, CHR 545820.



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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Flora of New Zealand: PDF publications

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The Moss Set covers indigenous and exotic mosses within the New Zealand Botanical Region.

Authors Allan Fife and Jessica Beever intend to publish *Flora of New Zealand Mosses* as a book. However, in advance of publication of the hardcopy, they decided to make completed family treatments available for immediate use through the eFloraNZ project.

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