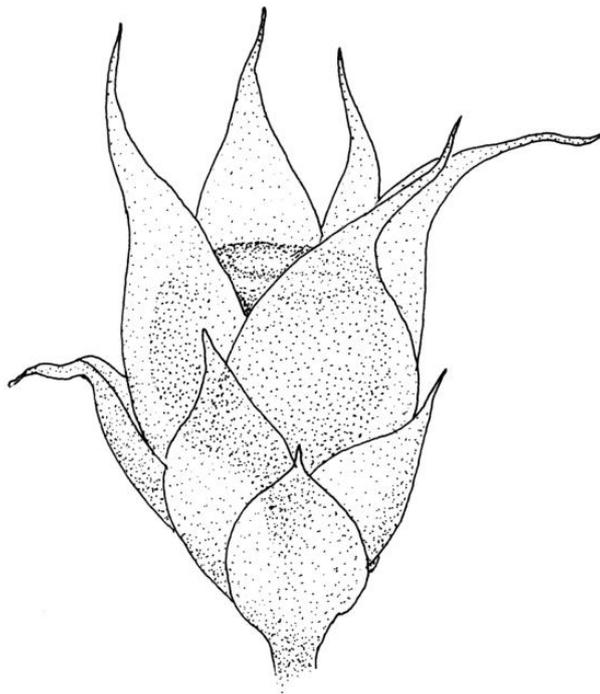




FLORA OF NEW ZEALAND
MOSSES

GIGASPERMACEAE



A.J. FIFE

Fascicle 21 – AUGUST 2015

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Cover image: *Gigaspermum repens*, perichaetium with capsule. Drawn by Rebecca Wagstaff from *W. Martin s.n.*, 24 Aug. 1955, CHR 566139A.

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Introduction

The Gigaspermaceae are a family of five monotypic or ditypic genera. Only one species, *Gigaspermum repens* (Hook.) Lindb., has been recorded from New Zealand. The plants of *G. repens* are perennial, and occur mostly on calcareous soils. They have subterranean rhizomes that give rise to pale, budlike female and male shoots. The female shoots bear immersed, pale, wide-mouthed, globose, and gymnostomous capsules that, as implied by the generic name, produce exceptionally large spores. The documented distribution of *G. repens* in N.Z. is very patchy.

Gigaspermaceae

Plants small or minute, with pale, fleshy subterranean primary stems and short, erect shoots. **Leaves** on shoots small below, gradually larger and more crowded above, broadly ovate, elliptic, or obovate, obtuse, acute, or piliferous at apex, concave; **margins** plane and ± entire; **laminal cells** oblong, oblong-rhombic, or oblong-hexagonal throughout, mostly thin-walled, smooth, often ± thickened at corners, not differentiated at margins. **Costa** single or none.

Sexuality variable. **Perichaetia** terminal, with paraphyses (if present) filiform. **Setae** very short (in N.Z. species) to moderate in length; **capsules** immersed or exerted, operculate or inoperculate, gymnostomous, globose or hemispheric, usually spongy and wrinkled when dry; **stomata** restricted to capsule base, with 2 guard cells or imperfectly divided, resulting in a single cell with a central slit. **Operculum** plano-convex or absent. **Spores** moderately to very large. **Calyptra** small, mitrate or cucullate, fugacious.

Taxonomy: The family consists of five monotypic or ditypic genera occurring predominantly in the southern hemisphere, but with some extensions northward to the Mediterranean, Mexico and Texas. Only *Gigaspermum* occurs in N.Z.

The family is traditionally placed near the Funariaceae, owing to occurrence in weedy habitats on mineral soil, often lax areolation of leaves, which are usually few and crowded in comal clusters, and stomata sometimes a mere slit in imperfectly formed guard cells. The subterranean and rhizome-like stem, laminal cell walls often wavy and thickened at corners, commonly reduced costae, filiform paraphyses, and spongy capsules give meaning to the family. Goffinet et al. (2009) placed the family in the subclass Funariidae, but in its own order, the Gigaspermales. Additional information on the family is provided by Fife (1980) and Magill (1987). Goffinet et al. removed the poorly-known Latin American genus *Neosharpiella* from this family and placed it in the Bartramiaceae.

***Gigaspermum* Lindb., Öfvers. Kongl. Vetensk.-Akad. Förh. 21: 599 (1865)**

Type taxon: *Gigaspermum repens* (Hook.) Lindb.

Plants gregarious, pale, yellow-, white-, or dark green, occasionally silvery. **Primary stems** subterranean and hyaline, freely and irregularly branched, leafless, with pale, smooth rhizoids; **shoots** erect, budlike or ± elongate (to at least 5 mm), densely foliate, in cross-section with an indistinct central strand surrounded by undifferentiated parenchyma cells. **Leaves** erect, small below, larger above, to 2.5(–3.5) × c. 1.0 mm, broadly ovate, gradually subulate-acuminate at apex, yellow- or dark green, occasionally hyaline in upper portions; **margins** entire or nearly so; **laminal cells** rectangular to oblong-rhombic, moderately thin-walled, neither undulate nor thickened at corners. **Costa** lacking.

Autoicous (antheridia variably distributed but not synoicous). **Perichaetial leaves** much enlarged and enclosing the sessile capsule. **Perigonia** usually terminal on well-developed, erect, male branches; antheridia small, mixed with filiform paraphyses. **Setae** extremely short, pale; **capsules** immersed, pale yellow-brown, ± globose, wide-mouthed, spongy and strongly wrinkled when dry; **exothecial cells** oblong-hexagonal; **stomata** 2-celled; **operculum** broad and flat, minutely and obscurely apiculate. **Calyptra** minute, conic-mitrate. **Spores** extremely large, brown, sometimes appearing angular, densely papillose.

Taxonomy: A small genus of probably only two species. It is distributed in Australasia, northern and southern Africa, the Mediterranean and Macaronesian regions, and Mexico. *Gigaspermum repens* occurs in N.Z.

Etymology: The generic name refers to the very large spores.

***Gigaspermum repens* (Hook.) Lindb., Öfvers. Kongl. Vetensk.-Akad. Förh. 21: 599 (1865)**

≡ *Anictangium repens* Hook., *Musci Exot.* 2, 106 (1819)

≡ *Leptangium repens* (Hook.) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 79 (1859)

Western Australia: King George's Sound, *A. Menzies s.n.*, 1791, BM!

As per the genus. Laminal cells mostly 90–115 × 18–24 µm in N.Z. material.

Setae c. 0.2 mm. **Spores** 150–190 µm in N.Z. material.

Illustrations: Plate 1. Scott & Stone 1976, pl. 47; Fife 1994, fig. 316; Meagher & Fuhrer 2003, p. 100–101; Seppelt et al. (2012), fig. 1, 4–6 (Fig. 1 is reproduced in Seppelt et al. (2013), pl. 6).

Distribution: NI: Hawke's Bay (Raukawa Range, Maraetōtara River); Wellington ("Ruahine Limestone Plateau"); SI: Canterbury (Marble Point, Napenape, Ōtāhuna Valley), Otago (Ōamaru, Duntroon, Roxburgh); Ch (near Maunganui Bluff).

Anomalous. Tasmania*, Australia*, South Africa*, Mexico*.

Habitat: On mineral soil, usually over limestone or marble bedrock; also on base-rich clays (presumably derived from volcanic rock). The plants are perennial with fleshy subterranean rhizomes. Occurring from near sea level (Napenape) to at least 360 m (Duntroon). On Chatham I. it grew on "bare, very hard, desiccated basaltic clay under a huge over-hanging, north-facing basalt boulder" (P.J. de Lange, pers. comm., 11 Oct. 2007).

Notes: The first N.Z. collection of *G. repens* in N.Z. was made by *Colenso* in 1850 (*W. Colenso 1439*, BM!). This ample collection was not cited by *Wilson* (1854), but formed the basis of the report of this species (as *Leptangium repens*) from the Raukawa Range in *Hooker* (1867, p. 424). Antheridia can be surprisingly difficult to detect, given that the species fruits abundantly. Although there is some disagreement in the literature as to sexuality of *G. repens*, N.Z. material is unquestionably autoicous, as is at least some foreign material. Antheridia have been observed in material from Roxburgh (*W. Martin s.n.*, CHR 566139 A). Autoicous plants have been seen also from Western Australia and South Africa. Most commonly, the perigonia are terminal on erect male shoots that are connected to female shoots via the rhizome. However, antheridia can also occur on short lateral branches (c. 2–3 mm below a perichaetium), among sessile whorls of unmodified leaves, or in the axils of vegetative leaves on perichaetial shoots.

Scott & Stone's (1976, p. 252) statement implying that Australian material is dioicous is probably based on incorrect observations. My earlier (*Fife 1994*, p. 423) statement that Mexican material of *G. repens* is "apparently dioicous" is likely incorrect but I have been unable to re-examine the Mexican collection.

Seppelt et al. (2012) discussed the ecology and phenology of *G. repens* in Tasmania. They detailed both its Tasmanian and mainland Australian distribution and discussed these in relation to rainfall patterns, geology, and collection history. They postulated a perennial habit with summer die-back of above-ground shoots and also speculated that long-standing agricultural practices including fertilizer application have likely reduced the range of *G. repens* in central Tasmania.

Etymology: The species epithet refers to the creeping habit.

References

- Fife, A.J. 1980: The affinities of *Costesia* and *Neosharpiella* and notes on the Gigaspermaceae (Musci). *Bryologist* 83: 466–476.
- Fife, A.J. 1994: Gigaspermaceae. In: Sharp, A.J.; Crum, H.A.; Eckel, P.M. (ed). The Moss Flora of Mexico. *Memoirs of the New York Botanical Garden* 69: 423–426.
- Goffinet, B.; Buck, W.R.; Shaw, A.J. 2009: Morphology, anatomy, and classification of the Bryophyta. In: Goffinet, B.; Shaw, A.J. (ed.) *Bryophyte Biology*. Edition 2. Cambridge University Press, Cambridge. 55–138.
- Hooker, J.D. 1867: *Handbook of the New Zealand Flora: a systematic description of the native plants of New Zealand and the Chatham, Kermadec's, Lord Auckland's, Campbell's, and Macquarrie's Islands*. Part II. Reeve, London.
- Hooker, W.J. 1819–1820: *Musci Exotici, containing figures and descriptions of new or little known foreign mosses and other cryptogamic subjects*. Vol. 2. Longman, Hurst, Rees, Orme and Brown, London.
- Lindberg, S.O. 1865 ("1864"): Uppställning af familjen Funariaceae. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar* 21: 589–608.
- Magill, R.E. 1987: *Bryophyta, Part 1 Mosses, Fascicle 2, Gigaspermaceae-Bartramiaceae*. Leistner, O.A. (ed.) *Flora of Southern Africa*. Botanical Research Institute, Pretoria.
- Meagher, D.; Fuhrer, B.A. 2003: *A Field Guide to the Mosses & Allied Plants of Southern Australia. Flora of Australia Supplementary Series*. Vol. 20. ABRS, Canberra.
- Mitten, W. 1859 ("1860"): Description of some new species of Musci from New Zealand and other parts of the southern hemisphere, together with an enumeration of the species collected in Tasmania by William Archer Esq.; arranged upon the plan proposed in the "Musci Indiae Orientalis". *Journal of the Proceedings of the Linnean Society. Botany*. 4: 64–100.
- Scott, G.A.M.; Stone, I.G. 1976: *The Mosses of Southern Australia*. Academic Press, London.
- Seppelt, R.D.; Cave, L.H.; Tng, D. 2012: Here today, gone tomorrow: The moss *Gigaspermum repens* in Tasmania. *Kanunnah* 5: 141–149.
- Seppelt, R.D.; Jarman, S.J.; Cave, L.H.; Dalton, P.J. 2013: *An Illustrated Catalogue of Tasmanian Mosses. Part 1*. Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Hobart.
- Wilson, W. 1854 ("1855"): Musci. In: Hooker, J.D. *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror, in the years 1839–1843, under the command of Captain Sir James Clark Ross*. II. Flora Novae-Zelandiae. Part II. Flowerless plants. Lovell Reeve, London. 57–125.

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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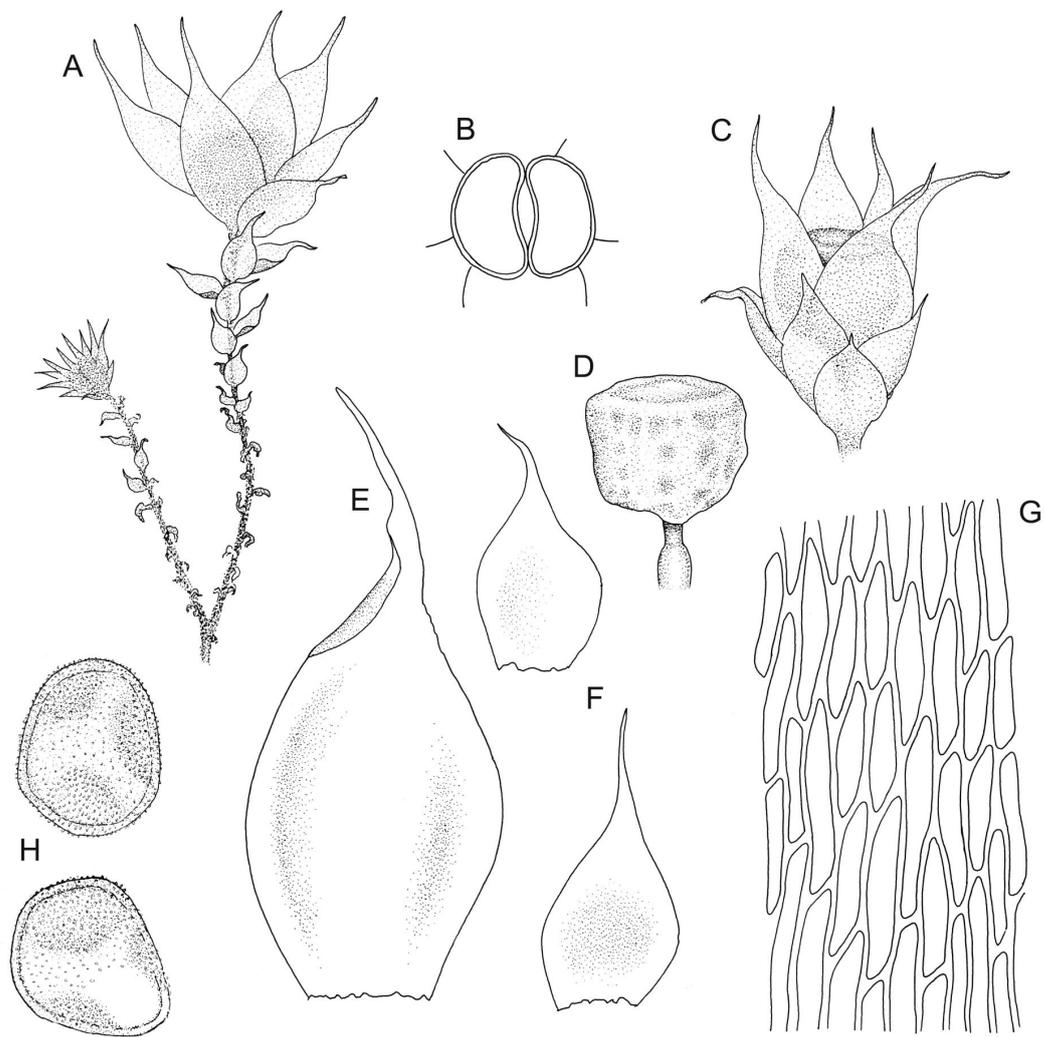
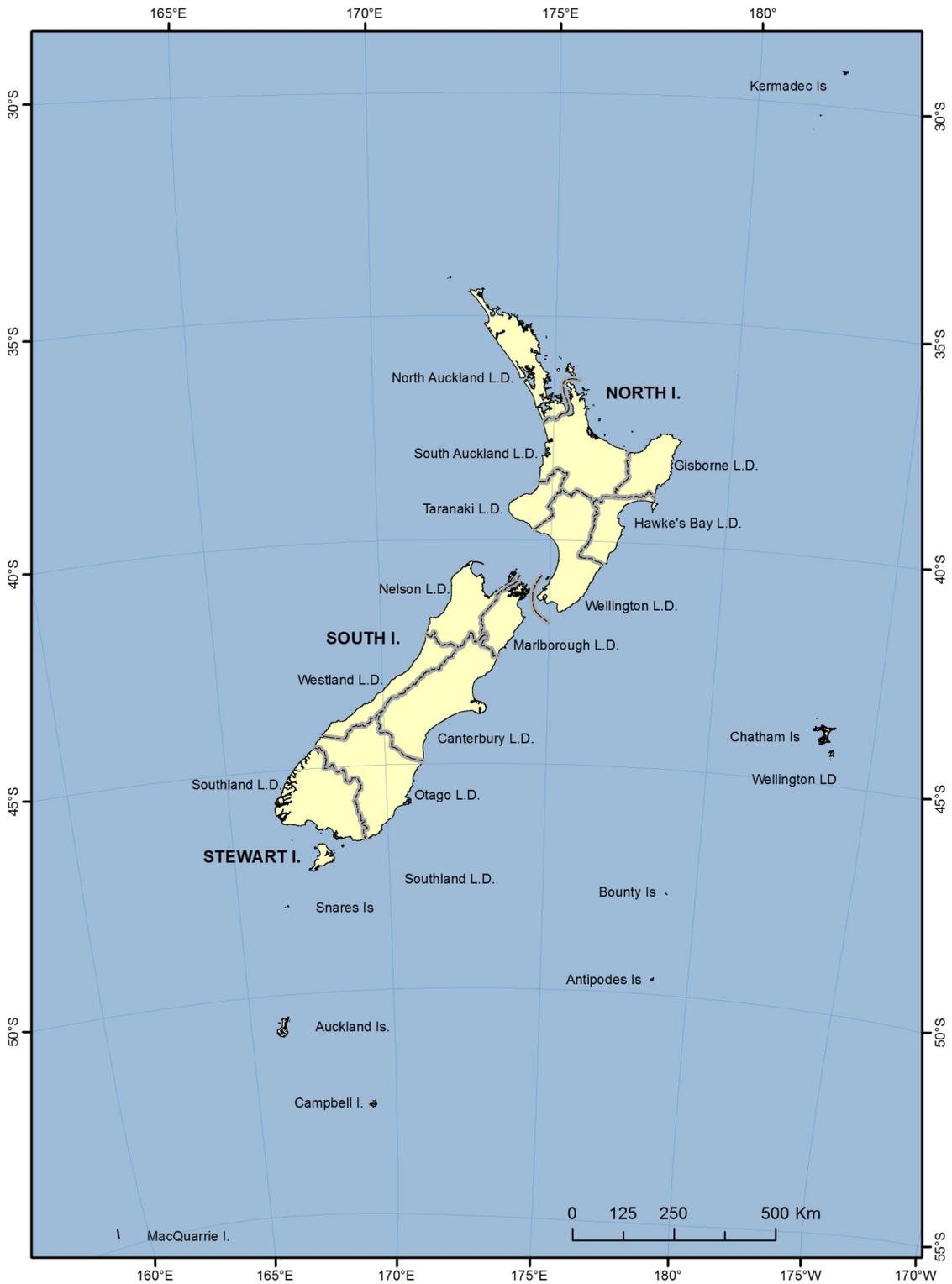
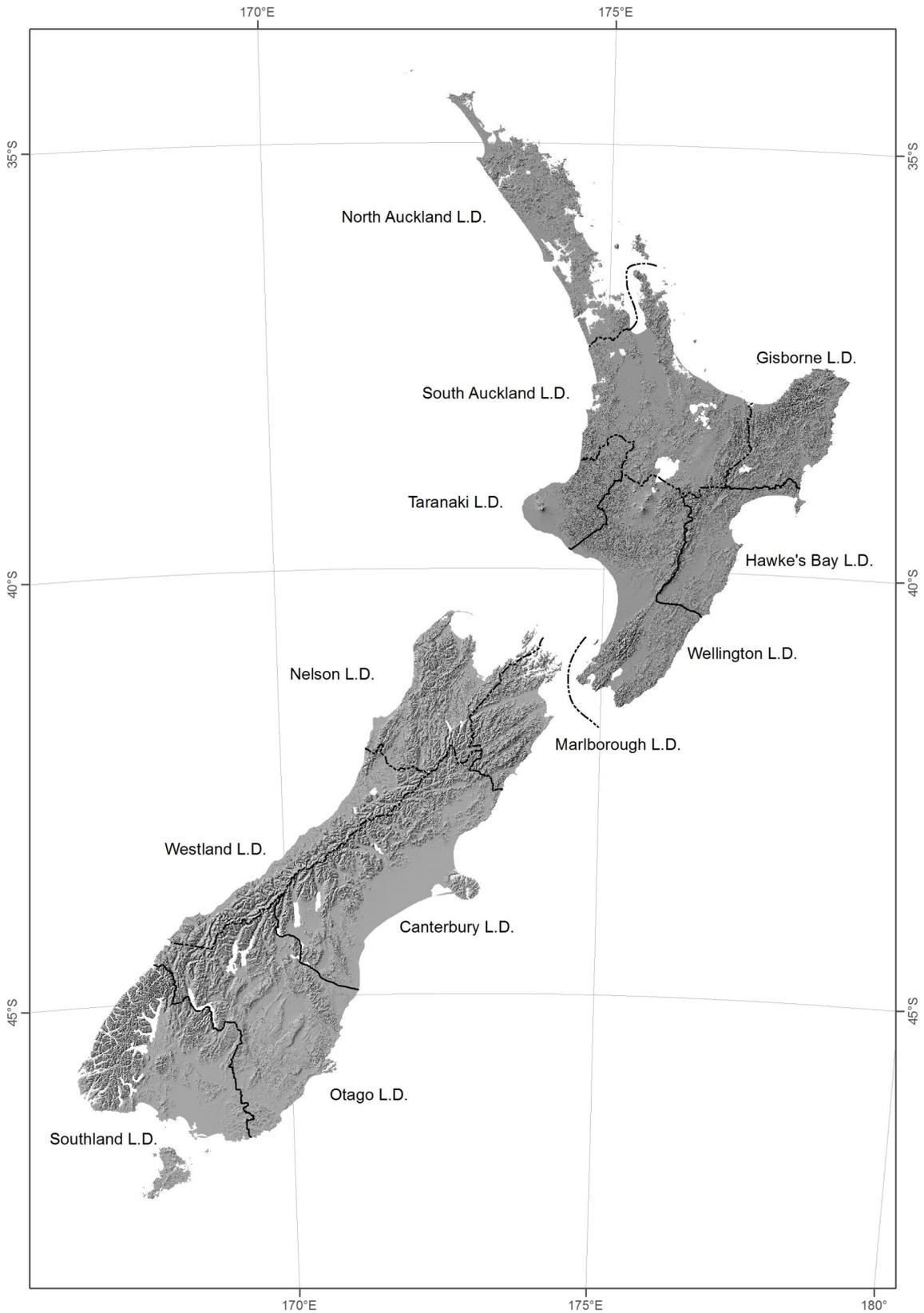


Plate 1: *Gigaspermum*. A–H: *G. repens*. A, habit with obscured capsule. B, stoma. C, perichaetium with capsule. D, capsule. E, perichaetial leaf. F, leaves. G, mid laminal cells from ♀ leaf. H, spores. Drawn from *W. Martin s.n.*, 24 Aug. 1955, CHR 566139A.



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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Image Information

Image
Plate 1
Map 1
Map 2

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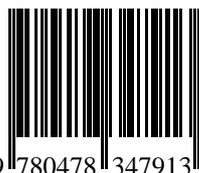
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