

FLORA OF NEW ZEALAND
MOSSES

LESKEACEAE



A.J. FIFE

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Cover image: *Pseudoleskea imbricata*, habit, moist. Drawn by Rebecca Wagstaff from *B.H. Macmillan 80/40*, CHR 267654.

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Introduction

The Leskeaceae are a large family mostly distributed in the northern hemisphere and allied to the Thuidiaceae. Erect capsules and reduced endostomes are features of the family, of which two genera, *Lindbergia* and *Pseudoleskea*, are recorded from New Zealand. *Lindbergia* is a modest-sized genus of predominantly bark-inhabiting species. Its N.Z. representative, *L. maritima*, occurs on coastal rock, an anomalous substrate for a member of the genus. It is a critically threatened endemic species known only from the Waitakere Ranges coast in North Auckland L.D. The small but carefully documented population of this species is subject to damage from storm wave action and may be on the verge of extinction. The second genus, *Pseudoleskea*, is also represented by a single species. *Pseudoleskea imbricata* is an elegant species, widespread in N.Z. and Australia, which occurs mostly on calcareous or cation-rich rocks.

Leskeaceae

Plants rather small to medium-sized, forming dull and dark mats. **Stems** freely and irregularly branched. **Stem and branch leaves** similar, usually erect when dry and erect-spreading or spreading when moist, mostly ovate to ovate-lanceolate, or rarely oblong-lanceolate, acute, acuminate, or rarely rounded at apex, entire or rarely toothed to spinose, plane or reflexed at margins; **mid laminal cells** isodiametric or occasionally elongate, firm-walled, smooth, mammillose or variably papillose. **Costa** single and well-developed or rarely short and double. **Paraphyllia** sometimes present, rarely numerous.

Sexuality variable. Inflorescences lateral. **Perichaetial leaves** differentiated. **Setae** elongate, smooth; **capsules** erect or rarely \pm curved, cylindrical or oblong-cylindrical, smooth; **annulus** sometimes differentiated; **operculum** conic and blunt to rostrate. **Peristome** double; **exostome teeth** lanceolate to linear-lanceolate, variably ornamented or smooth; **endostome** usually reduced, usually with a basal membrane, segments present but irregular and cilia none or rudimentary. **Calyptra** cucullate, usually smooth, naked. **Spores** spherical, smooth or papillose.

Taxonomy: The distinctions between the Leskeaceae and the Thuidiaceae are discussed by Buck & Crum (1990), and their conclusions are reflected in their treatment of the family for Mexico (Crum & Buck 1994). In turn this treatment largely accords with the concept of the Leskeaceae presented by Goffinet et al. (2009). As most of the genera are predominantly distributed in the northern hemisphere and unfamiliar to me, I have used Crum & Buck (1994) in preparing the family description presented above.

Goffinet et al. (2009) recognised 21 genera in the Leskeaceae; of these only *Lindbergia* and *Pseudoleskea* are found in N.Z. A strong tendency for erect capsules and reduced endostomes is a feature of this family.

When fruiting, additional features (e.g., ornamentation of exostome teeth and degree of endostome development) should separate these genera, but the regional species of *Lindbergia* is not known with capsules.

- | | | |
|----|--|---------------------|
| 1 | Laminal cells strongly and centrally mammillose on both surfaces in N.Z. species; leaves ovate to ovate-lanceolate in N.Z. species; propagula (branchlets) present in axils of upper leaves; plants not on limestone, coastal and known only from N Auckland L.D. | <i>Lindbergia</i> |
| 1' | Laminal cells obscurely bulging at upper end (prorate); leaves broadly ovate and decurrent in N.Z. species; propagula (branchlets) absent; plants usually on limestone, widespread in N.Z. | <i>Pseudoleskea</i> |

Lindbergia Kindb., Gen. Eur. N. Amer. Bryin. 15 (1897)

Type taxon: *Lindbergia brachyptera* (Mitt.) Kindb.

The following generic description draws on that of Crum & Anderson (1981).

Plants small and slender, forming dull mats, mostly on bark. **Stems** irregularly branched. **Stem and branch leaves** similar, crowded, erect and imbricate when dry, spreading to squarrose when moist, broadly ovate to ovate-lanceolate, acute or acuminate, not plicate, usually weakly decurrent, entire or weakly toothed, plane at margins, concave or broadly V-shaped; **mid laminal cells** rounded-hexagonal or rounded-quadrate, smooth or mammillose, often oblate at basal margins but not forming a distinct alar group. **Costa** rather stout, ending below leaf apex. **Paraphyllia** lacking or few and foliose. **Pseudoparaphyllia** lacking. **Propagulae** (branchlets) often present in axils of upper leaves.

Autoicous. Perichaetial leaves pale, acuminate from a sheathing base. **Setae** elongate; **capsules** erect or weakly curved, oblong-cylindrical, narrowed at mouth; **annulus** sometimes differentiated; **operculum** conic, blunt. **Peristome** inserted below mouth; **exostome teeth** lanceolate, blunt, fused at base, pale or yellow, \pm papillose, not striolate, with low trabeculae on inner surface at base; **endostome** a low, finely papillose membrane. **Calyptra** smooth, naked. **Spores** small, smooth or roughened.

Taxonomy: *Lindbergia* is a genus of between 10 and 20 species distributed in temperate and tropical regions. One species is accepted from N.Z., and a second very poorly documented taxon may also be referable here.

Etymology: The genus is named after the Swedish bryologist Sextus Otto Lindberg (1835–1899), who was Professor of Botany at the Helsingfors (Helsinki) University.

Excluded Taxa: A single sterile specimen from Canterbury (Hunters Hills, Blue Cliffs Station, Homestead, on soil in podocarp-broadleaf remnant in gully, 800 ft. elev., *B.H. Macmillan 76/288*, CHR 351347) has been tentatively referred to *Lindbergia*. The mid laminal cells here are more angular and less incrassate and the alar cells are quadrate in a rather small group compared to those of *L. brachyptera*. The apparently dioicous sexuality and the soil substrate are also anomalous for the genus *Lindbergia*. It may represent an undescribed species; a draft description follows.

Plants irregularly to subpinnately branched, ascendant, possibly stoloniferous. **Stems** mostly c. 10 mm; branches mostly simple, 5–10 mm. **Stem and branch leaves** differentiated by size and degree of cell papillae development. **Stem leaves** ovate-lanceolate, serrulate near apex, neither constricted nor decurrent at base, narrowly recurved, c. 1.2 mm; **mid laminal cells** oblong-hexagonal, mostly 1–2:1 and 9–15 µm long and a single strong papillae over the central lumen; **alar cells** quadrate in a small and ill-defined group; **costa** strong, percurrent or shortly excurrent. **Branch leaves** arranged in 4–5 rows, loosely and rather untidily complanate, mostly 0.6–0.8 × c. 0.25 mm; **mid laminal cells** with a single high (c. 6–10 µm) central papilla on each surface; **costa** strong, c. 25 µm wide in lower leaf, not flexuose, ending in the leaf apex, strongly papillose abaxially. **Paraphyllia** absent.

Apparently dioicous. **Perichaetia** terminal on stem, the leaves differentiated, linear-lanceolate, c. 3.5 mm, costate, with cells weakly and single papillose. **Perigonia** and **capsules** not seen.

***Lindbergia maritima* Lewinsky, *New Zealand J. Bot.* 15: 193 (1977)**

Isotypes: N.Z., North Auckland Land District, west of Auckland, 25 Sept. 1974, *J. Lewinsky 74-431*, CHR 449026! 431092! AK 288243! Holotype in C not seen.

Plants small and slender, dull, rigid, green or brown-green, forming loose mats on coastal rocks. **Stems** short, mostly 5–8 mm, irregularly branched, in cross-section of thick-walled cells throughout, lacking both a hyaloderm and a central strand. **Stem and branch leaves** not differentiated, crowded, evenly spaced in spiral ranks, erect and imbricate when dry, spreading when moist, broadly ovate, mostly 0.45–0.55 × 0.2–0.25 mm, broadly acute or obtuse, neither decurrent nor fragile, entire or weakly crenulate, plane at margins, in cross-section broadly V-shaped; **mid laminal cells** rounded-quadrate, 7–9(–12) µm, firm-walled, strongly mammillose on both surfaces; **juxtacostal cells** not differentiated; **basal marginal cells** ± oblate in few to several rows, not forming a distinct alar group. **Costa** stout, ending below the leaf apex but the terminus often ill-defined, protruding weakly on abaxial surface, both the abaxial and adaxial cells elongate, in cross-section composed of uniform, stereid-like cells. **Paraphyllia** and **pseudoparaphyllia** lacking. **Propagula** (branchlets) present in axils of upper leaves.

Sex organs and **sporophytes** not known.

Illustrations: Plate 1. Lewinsky 1977, fig. 1.

Distribution: NI: N Auckland (Waitakere Ranges coast).

Endemic.

Notes: Known only from the type locality on coastal andesite pebble breccia outcrops and boulders. This species has not been found at any other locality since it was collected and described by the visiting Danish bryologist Jette Lewinsky in 1977.

Shore-line searches of accessible parts of the Waitakere coast from Whatipū to Anawhata, including the seaward side of Lion Rock, have been made. In 2007 a targeted search (totalling 16 people-hours) was made by Auckland Regional Council staff, trained to recognise the moss, and using abseiling gear to access suitable outcrops at or near the type locality. This also failed to locate any additional populations of *L. maritima*.

The moss has been periodically monitored at the type locality, where it is vulnerable to intensive storm wave action. The best evidence available suggests that this species is in danger of extinction, and is listed as a “nationally critical” threatened species by Rolfe et al. (2016).

While noting that *Lindbergia* is a genus of epiphytes in other parts of its range, no alternative generic placement for *L. maritima* can be suggested here.

Recognition: *Lindbergia maritima* is most likely to be confused with the regionally widespread *Pseudoleskea imbricata*, which it resembles in some macroscopic features. However, *L. maritima* is more irregularly branched (especially in the terminal branches) than *P. imbricata* and the latter also

lacks axillary propagula. The strongly and centrally mammillose rounded-quadrate mid laminal cells of *Lindbergia maritima* differ strikingly from the more elongate and inconspicuously prorate cells that are a feature of *P. imbricata*.

Lindbergia maritima could also be confused with the more widespread (and also coastal) *Haplohymenium pseudotriste* (placed here in the Anomodontaceae), but a number of features differentiate these taxa: *Lindbergia maritima* is a more robust plant with leaves more ovate than the ± lingulate leaves of *H. pseudotriste*. The costa in *L. maritima* is less obscure and longer and the laminal cells are mammillose (vs pluripapillose in *H. pseudotriste*). Also, the axillary propagula seen in *L. maritima* are not found in *Haplohymenium*. *Lindbergia maritima* also lacks ventral fascicles of rhizoids, which are a feature of *H. pseudotriste*. *Lindbergia* is epilithic in N.Z. while *Haplohymenium* is almost exclusively epiphytic.

***Pseudoleskea* Schimp. in Bruch et al., *Bryol. Eur.* 5, 147 (1852)**

Type taxon: *Pseudoleskea atrovirens* (Brid.) Schimp.

Plants small and slender to rather robust, forming loose or dense, dull mats. **Stems** creeping, irregularly or subpinnately branched, the branches often curved. **Stem** and **branch leaves** similar (or with stem leaves ± larger), crowded, erect and imbricate when dry, spreading when moist, broadly ovate to ovate-lanceolate, acute or acuminate, mostly twice plicate at base, weakly decurrent, mostly serrulate near apex, often weakly recurved below; **mid laminal cells** ± isodiametric or short-rhomboid (as in N.Z. species), firm-walled, bulging at upper end (prorate) or smooth, those at basal margins mostly oblate in several rows; **alar cells** not differentiated. **Costa** stout, ending below the leaf apex, toothed abaxially above. **Paraphyllia** usually present and conspicuous (but apparently absent in N.Z. species). **Pseudoparaphyllia** absent. **Propagula** (branchlets) absent.

Dioicous or **rarely autoicous** (as in N.Z. species). **Perichaetial leaves** oblong-lanceolate or acuminate, costate. **Setae** elongate, smooth, red-brown; **capsules** erect or weakly inclined, oblong-cylindric and curved; **annulus** absent or weakly differentiated; **operculum** conic, blunt. **Peristome** double, ± hypnoid; **endostome** segments arising from a basal membrane, lanceolate, nearly equal the teeth, with **cilia** rudimentary or lacking. **Calyptra** naked, cucullate. **Spores** small, finely papillose.

Taxonomy: *Pseudoleskea* is a modest-sized genus. Brotherus (1925) considered it to include 38 species. *Pseudoleskea* is distributed mostly at high elevations in temperate and tropical regions. It is in need of taxonomic revision in conjunction with the allied *Pseudoleskeopsis* Broth. and *Lescuraea* Schimp.

Etymology: The generic name highlights a resemblance to the northern hemisphere genus *Leskea*, named in honour of Nathanael Gottfried Leske (1751–1786), a professor at the University of Leipzig who was best known for his interest in mineralogy.

***Pseudoleskea imbricata* (Hook.f. & Wilson) Broth., *Nat. Pflanzenfam.* [Engler & Prantl] 1(3), 1000 (1907)**

≡ *Leskea imbricata* Hook.f. & Wilson in Wilson, *Bot. Antarct. Voy. III. (Fl. Tasman.) Part II*, 202 (1859)

≡ *Pseudoleskeopsis imbricata* (Hook.f. & Wilson) Thér., *Ann. Cryptog. Exot.* 2: 20 (1929)

Type: Tasmania (not seen).

Plants small and slender, forming loose or dense, dull, olive-green, golden, or red-brown mats. **Stems** creeping, subpinnately branched, the branches distinctly curved. **Shoots** terete and often broadened near their apices. **Stem** and **branch leaves** crowded, erect and imbricate when dry, spreading when moist, broadly ovate and acute or obtuse, 0.5–0.75 × 0.25–0.4 mm, obscurely twice plicate, weakly decurrent, weakly serrulate above, weakly recurved below; **mid laminal cells** short-rhomboid, obscurely bulging at upper ends (prorate), mostly c. 15–18 × 3–5 µm; **cells at basal margins** oblate in several rows that may extend ¼ or more up the leaf. **Costa** stout, ending below the leaf apex, toothed abaxially above. **Paraphyllia** absent. **Propagula** (branchlets) absent.

Autoicous. **Perichaetia** scattered on stem, c. 2 mm; **perichaetial leaves** oblong-lanceolate, costate, 1.5–2 mm long, with cells irregularly elongate. **Perigonia** gemmiform, scattered on stems, the leaves broadly ovate and ecostate. **Setae** 8–14 mm, flexuose; **capsules** erect or weakly inclined, oblong-cylindric and curved, narrowed at the mouth when dry, c. 2 mm; **annulus** apparently absent; **operculum** conic, blunt. **Peristome** double, inserted close to mouth, ± hypnoid; **exostome teeth** lanceolate, yellow-brown, c. 380 µm long, cross-striolate in bottom half or more, bordered, with numerous trabeculae on inner surface; **endostome** with a nearly smooth (and sometimes irregularly

perforate) basal membrane, **segments** lanceolate, nearly equal the teeth, usually perforate, baculate distally; **cilia** lacking. **Calyptra** naked, presumably cucullate. **Spores** mostly 14–18 µm, papillose.

Illustrations: Plate 2. Brotherus 1925, fig. 655; Scott & Stone 1976, pl. 78.

Distribution: NI: N Auckland including offshore islands (HC), S Auckland (Taupō), Hawke's Bay (Tāhaenui Valley, Māhia Peninsula, Taradale), Wellington (Ōwāhanga River); SI: Nelson (Golden Bay, Woodpecker Bay, Punakaikī), Marlborough (Spray Point, Marble Point), Canterbury (Lowry Peaks Range, Mt Grey, Waipara, Peel Forest Village, Raincliff, Pareora River), Otago (numerous localities); Ch.

Australasian. Mainland Australia (Qld*, N.S.W.*, A.C.T.*), Norfolk I. Reported from South Australia and Victoria by Scott & Stone (1976). They, together with Dalton et al. (1991) and Streimann & Klazenga (2002), have all doubted its occurrence in Tasmania. This is despite its Mt Wellington type locality, from whence the protologue (published in 1859) states it was collected by Oldfield. Images of type material of *Leskea imbricata* are not available on JSTOR (accessed 8 November 2017). Lyn Cave (pers. comm., 23 April 2018) informs me that there is a single Tasmanian collection in HO: a 1999 specimen collected from limestone in the vicinity of Mole Creek.

Habitat: Mainly on limestone, in both coastal and inland sites and often in highly insolated situations. One J.T. Linzey collection from Buckland's Crossing (Otago L.D.) is purportedly from "damp sheltered schist by stream side". B.H. Macmillan has collections from the "base of *Cordyline australis* trunk under [a] limestone bluff" at the Pareora River. Fruiting material from Peel Forest Village grew on a small stone (basalt) bridge and the plants grew on the basalt rather than the mortar, although some influence of the mortar could not be excluded. It is commonly collected in Otago L.D., but there are few records from the North I. Fruit is surprisingly rare (and usually sparse) given that this species is clearly autoicous; all the fruiting specimens seen are from Otago or Canterbury L.D. Often associated with *Tortula* and *Syntrichia* spp., *Leptodon smithii*, and *Thuidiopsis* spp., incl. *T. sparsum*. Ranging from sea level to c. 400 m (Lowry Peaks Range) on the South I.

Notes: Scott & Stone's (1976, p. 407) description of the branches is apt and worth quoting here. The branches are "parallel and almost unbranched so that mats of shoots have an elegant, combed-out neatness which they share with almost no other moss. This effect is enhanced when dry by the leaves which are tightly overlapping and closely pressed to the stem, giving a very smooth julaceous shoot." The decurrent leaf bases remain attached to the branches when the leaves are removed, and they are often suggestive of paraphyllia under the microscope. While paraphyllia are often present in other species of *Pseudoleskea*, they are absent in *P. imbricata*.

The short-rhomboid (and often somewhat irregular) mid laminal cells and its autoicous sexuality make this species anomalous in the genus *Pseudoleskea*, and these features could be used to argue for placement in the predominantly Asian genus *Pseudoleskeopsis* Broth., as was proposed by Thériot (1929, not seen). However, little material of *Pseudoleskeopsis* has been available for comparison. Also, Brotherus's (1925, p. 307) concept of *Pseudoleskeopsis* is based, in part, on well-developed endostomal cilia, and our species lacks cilia. The decision on the generic affinities of *Pseudoleskea imbricata* is best made in a monographic context. I consider it advantageous to agree with Sainsbury (1955) and Scott & Stone (1976) until such time as the generic limits in the Leskeaceae can be thoroughly evaluated.

The name *Pseudoleskea calochlora* was applied to some N.Z. material by Brotherus. This name is a *nom. nud.* coined by Brotherus & Watts and apparently based on N.S.W. material.

Recognition: Confusion is most likely with *Hedwigidium integrifolia*, but *P. imbricata* is a more delicate and more elegant plant with the "combed-out neatness" mentioned above. The leaves here are also much smaller (up to c. 0.75 mm vs mostly 1.4–1.8 mm), obviously costate, and with laminal cells obscurely prorate as opposed to the ecostate leaves with sinuose and densely pluripapillose laminal cells in the *Hedwigidium*. *Pseudoleskea imbricata* occurs primarily on limestone, a substrate avoided by *H. integrifolium*.

When thoroughly dry and dark red-brown in colour, *Pseudoleskea imbricata* can resemble species of *Andreaea*, but no species of the latter genus occur on limestone. In the presence of capsules, such confusion would not be possible.

Etymology: The species epithet refers to the imbricate nature of the leaves.

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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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Jessica Beever generously supplied much of the information concerning the habitat of *Lindbergia maritima* and commented on a draft manuscript. I wish to acknowledge my late colleague and friend Jette Lewinsky, who discovered and described this endemic species. Her illustration of it is reproduced here with permission from the Royal Society of New Zealand. Rod Seppelt read a draft manuscript and provided suggestions for improvement. Lyn Cave provided information about Tasmanian collections. Bryony Macmillan allowed me to study her unpublished collections. Rebecca Wagstaff skilfully executed the line drawings of *Pseudoleskea imbricata*. Ilse Breitwieser encouraged me to submit this manuscript to the eFlora of New Zealand series and editorial advice was provided by Rob Smissen. I thank Sue Gibb for her meticulous checking of literature and nomenclatural citations, and Aaron Wilton, Katarina Tawiri, and Kate Boardman for converting the manuscript into a format suitable for electronic publication. Ray Prebble provided skilled editing.

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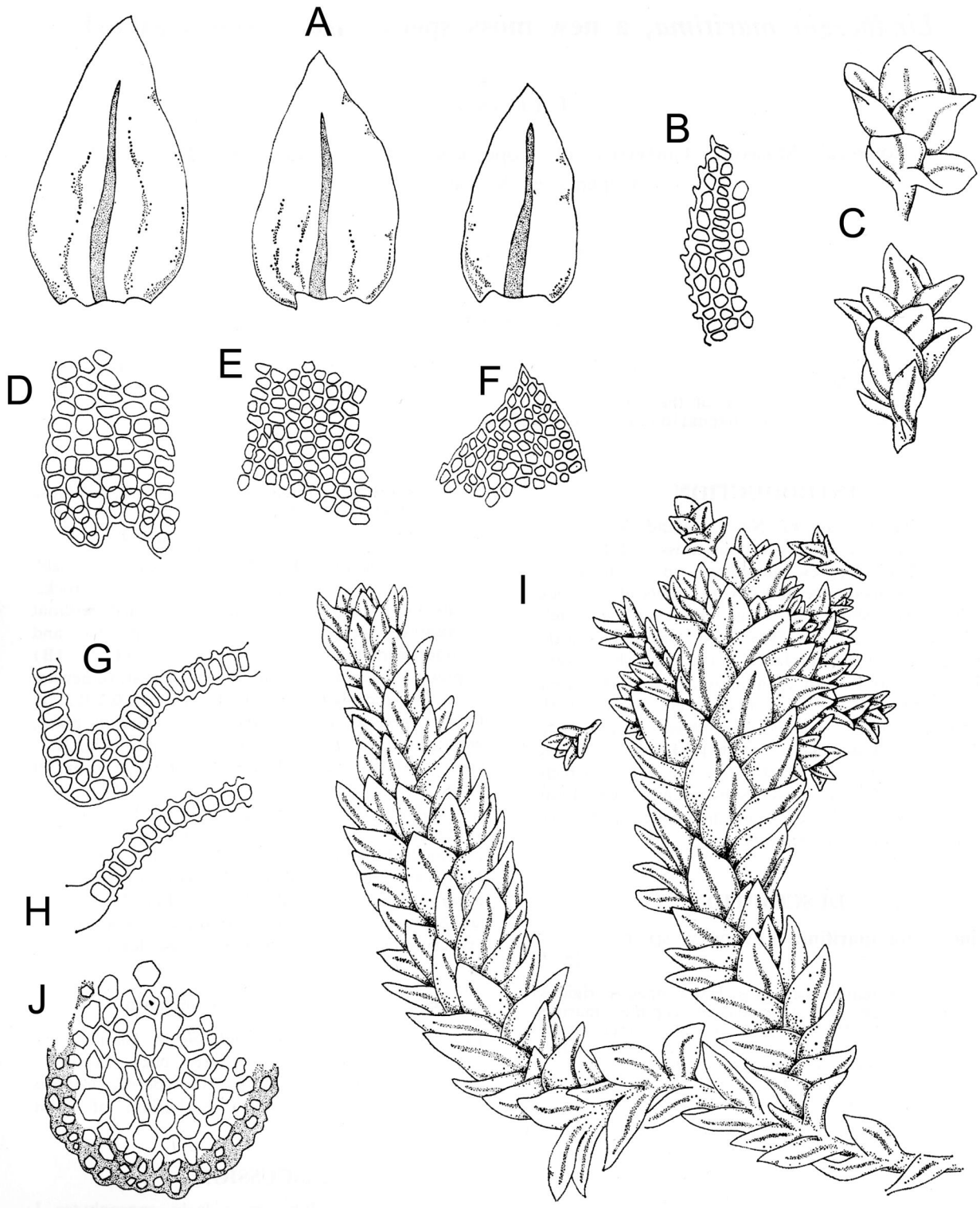


Plate 1: *Lindbergia*. A–J: *L. maritima*. A, three stem leaves. B, margin of propagulum leaf. C, propagula. D, basal laminal cells at margin. E, mid laminal cells. F, leaf apex. G, cross-section of laminal cells, including costa. H, cross-section of laminal cells. I, habit with propagula. J, stem cross-section. From Lewinsky (1977).

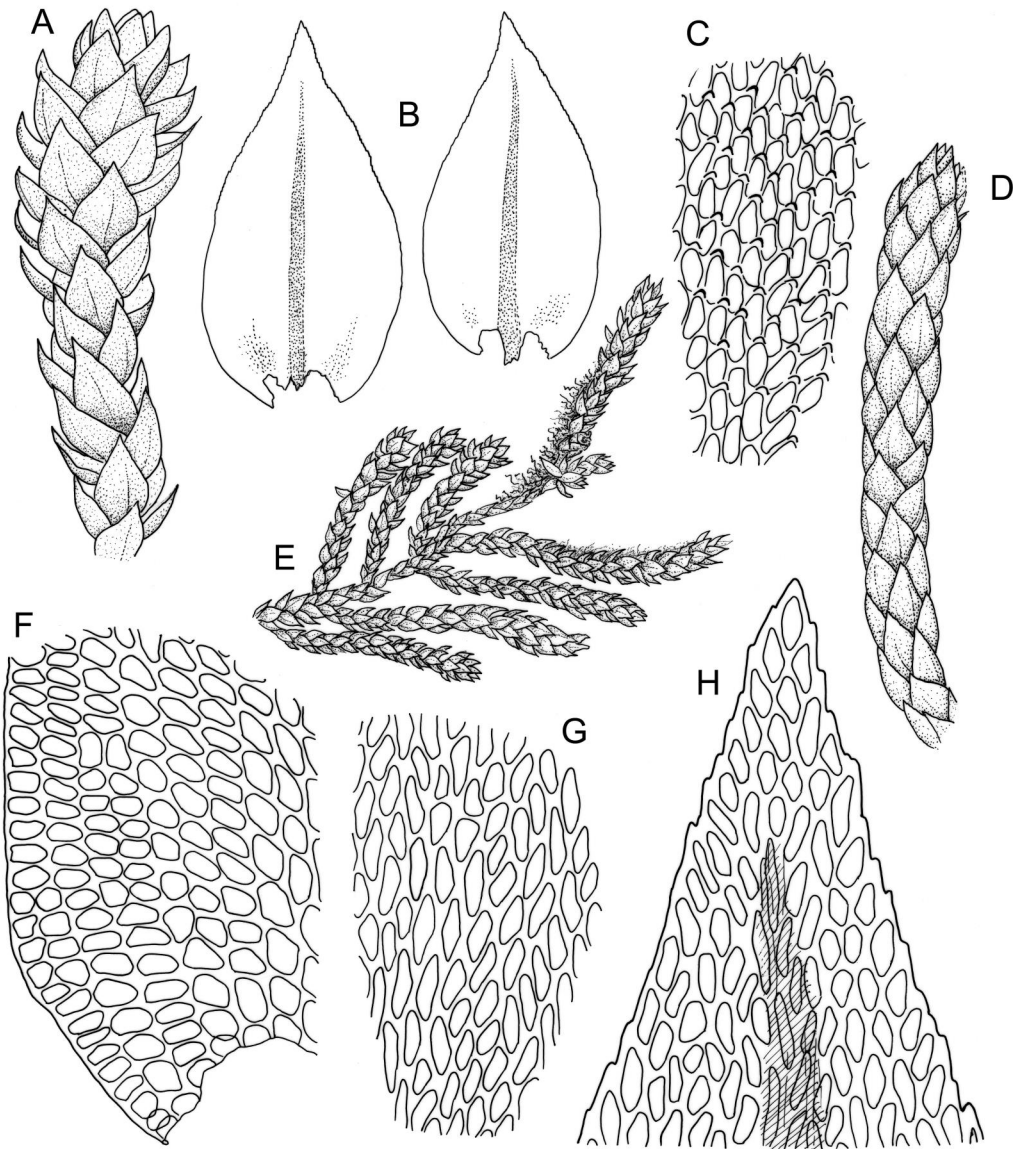
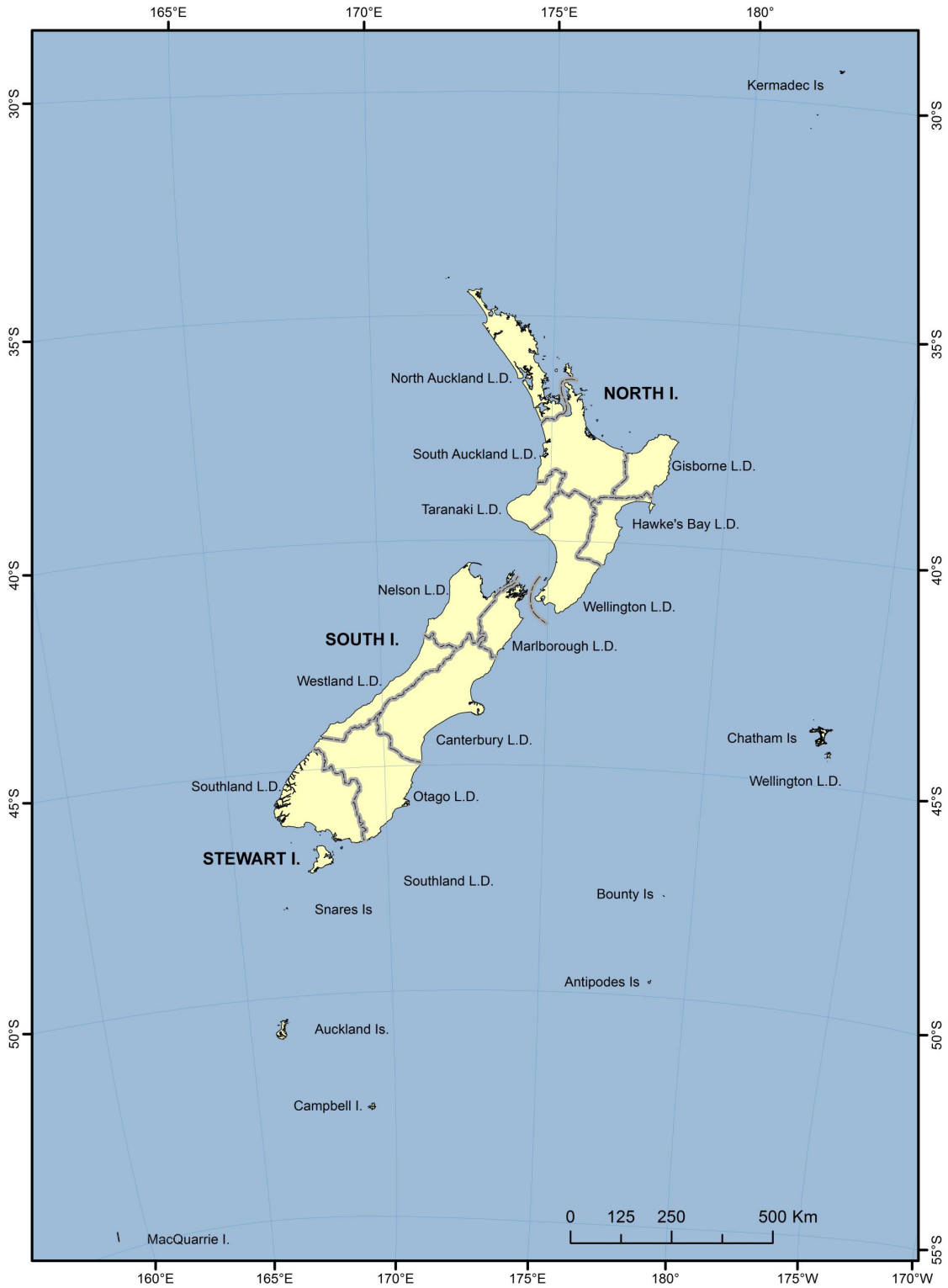
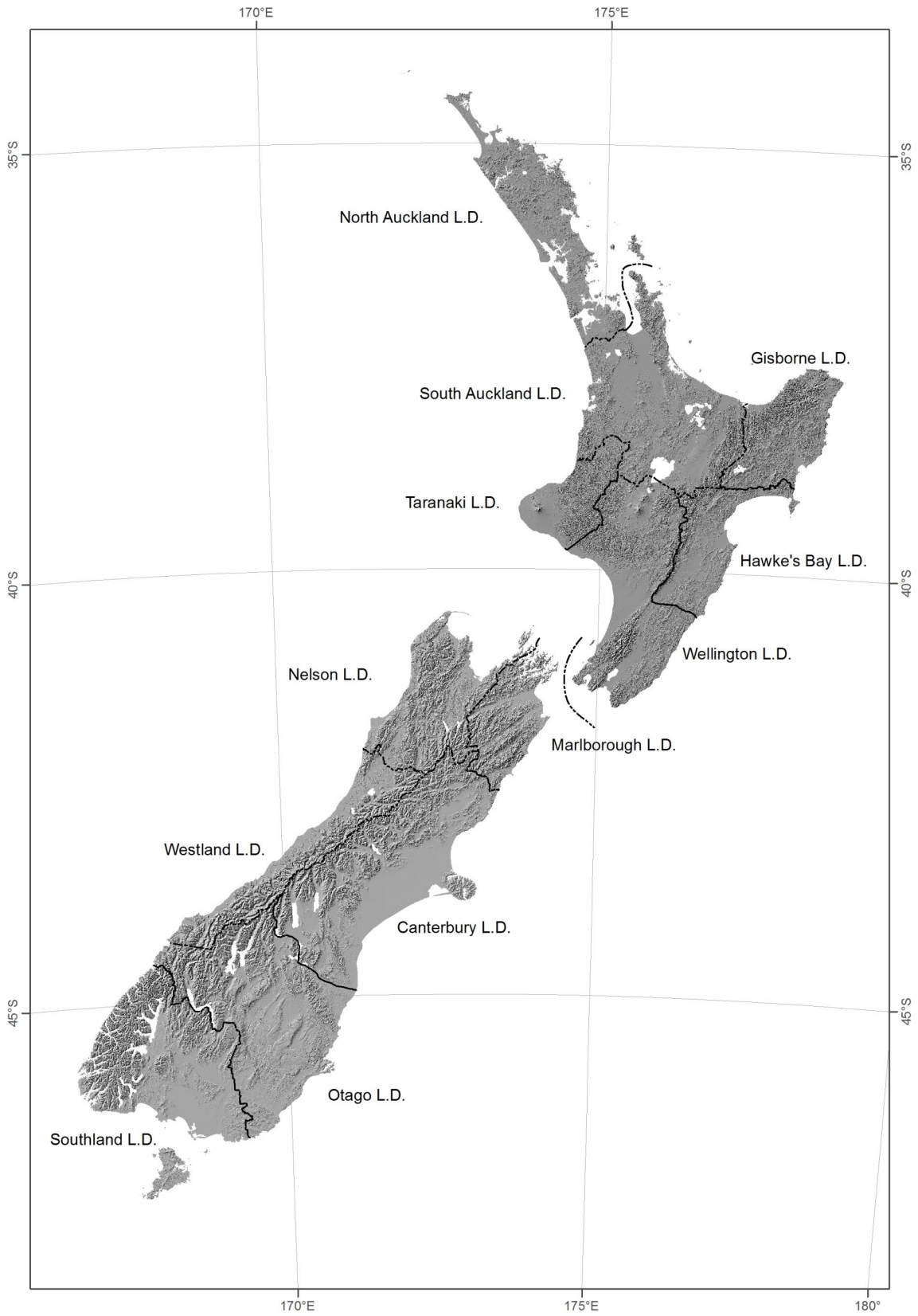


Plate 2: *Pseudoleskea*. A–H: *P. imbricata*. A, branch detail, moist. B, branch leaves. C, mid laminal cells. D, branch detail, dry. E, habit, moist. F, alar cells. G, mid laminal cells. H, leaf apex. A–B, D–H drawn from *B.H. Macmillan 80/40*, CHR 267654; C drawn from *B.H. Macmillan 73/632*, CHR 263028.



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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