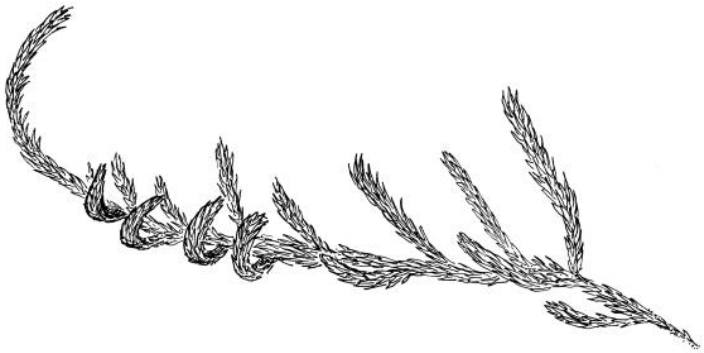
FLORA OF NEW ZEALAND

MOSSES

FABRONIACEAE



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Cover image: *Ischyrodon lepturus*, habit. Drawn by Rebecca Wagstaff from *B.H. Macmillan 71/279*, CHR 163468.

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Contents

Introduction

The Fabroniaceae are a modest-sized family, with representatives occurring on tree trunks and rock in tropical and warm-temperate regions. The pleurocarpous plants are very small, with singly- sometimes weakly-costate leaves, mostly short and smooth laminal cells, and quadrate or oblate cells forming opaque alar groups. The capsules are erect with a non-hypnaceous and mostly single peristome with paired teeth and no endostome. *Fabronia* is the largest and best-known genus, although estimates of its size vary. Two genera occur in New Zealand: *Fabronia* and *Ischyrodon*, each represented here by a single species. *Fabronia australis* is epiphytic, relatively common, autoicous, and nearly always fruiting. Populations of *F. australis* with more or less entire leaf margins predominate on the North I. and these tend to have larger spores and wider leaves than more strongly toothed populations. Entire-margined populations are rare on the South I. Such features have been used to delimit infra-specific taxa (or even species) of *Fabronia* in other parts of its range, but no taxonomic segregates are proposed here. *Ischyrodon*, a genus restricted to Australasia and South Africa, is a rarer plant in N.Z.; *I. lepturus* occurs on coastal rocks, is dioicous, and not known to fruit here.

Fabroniaceae

The following family description uses elements from Crum & Anderson (1981).

Plants small, green or yellow-green, mat-forming. **Stems** creeping, much-branched, with scattered fascicles of rhizoids. **Branches** ascendant. **Stem** and **branch leaves** not differentiated, crowded, appressed when dry, spreading or rarely ± secund when moist, ovate to lanceolate and often acuminate, ± concave, usually not decurrent, unbordered, not or rarely weakly plicate; **laminal cells** rhombic, rhombic-hexagonal or rarely linear, smooth, thin- or firm-walled; **alar cells** quadrate or oblate, mostly forming large and opaque groups. **Costa** single, often weak, rarely absent. **Paraphyllia** mostly absent.

Mostly autoicous. **Perichaetia** and **perigonia** lateral, scattered on stem and branches, the perichaetial leaves rarely sheathing. **Setae** elongate, mostly pale; **capsules** erect and symmetric, with a short neck, wrinkled and often constricted below the transverse mouth when dry; **exothecial cells** thin-walled, often sinuose; **stomata** present in neck; **annulus** inconspicuous or absent, if present usually persistent; **operculum** umbonate or conic, sometimes rostrate. **Peristome** single and exostomal or rarely with a rudimentary endostome; **exostome teeth** often paired, lacking trabeculae; **endostome** absent in N.Z. taxa. **Calyptra** cucullate and naked.

Taxonomy: The Fabroniaceae were treated by Brotherus (1925) as a family of 16 genera in four subfamilies, with species mostly distributed in tropical and subtropical regions. The family was reviewed by Buck & Crum (1978) who removed many of the genera with well-developed endostomes to the family Myriniaceae. The Fabroniaceae were further refined by Buck (1980, 1981). Goffinet et al. (2009) recognised only five genera in the Fabroniaceae, including the two occurring in N.Z., while maintaining separately the Myriniaceae. Their diagnoses of these two families contain few features that could distinguish them. Buck (1994) described the Fabroniaceae in greater detail in a treatment for Mexico and characterised it as consisting of “unusually small pleurocarps with non-hypnoid peristomes” while the Myriniaceae he considered to have fundamentally hypnoid but variably reduced peristomes. Buck (1998) further elaborated the differences between the two families in his treatment for the West Indies.

1	**Dioicous**, not known to fruit in N.Z.; **stem leaves** >1.2 mm, entire or with a few weak teeth; **upper laminal cells** linear, mostly 60–75 µm; **costa** broad at base, obscured on adaxial surface by an extension of the alar group, mostly extending >½ the leaf length; **lower margins** reflexed on one or both sides; **alar cell group** ± concave	*Ischyrodon*
1'	**Autoicous**, nearly always fruiting in N.Z.; **stem leaves** <l mm, irregularly spinose-toothed or occasionally entire; **upper laminal cells** rhombic-hexagonal, mostly 24–45 µm; **costa** faint even at base, not obscured on adaxial surface, mostly ⅓ –½ the leaf length; **lower margins** plane; **alar cell group** plane	*Fabronia*

Excluded Taxa: Sainsbury (1955, p. 453) discussed in detail a plant collected by K.W. Allison at Queenstown on 25 Sep. 1947 (CHR 413841) that he [GOKS] considered to be “perhaps referable to this family”. Buck (1981), in a paper largely devoted to the Fabroniaceae, described *Bryobartlettia costata* W.R.Buck, a new genus and species that he placed in the Leskeaceae. The holotype of *B. costata* is a specimen collected by J.K. Bartlett on 2 Jan. 1979 in the Cobb Valley (Nelson L.D.) and housed at NY; Buck cited the Allison Queenstown collection as a paratype. Beever (1992) examined the holotype of *B. costata*, a presumed isotype in the herbarium of J.K. Bartlett, and a paratype in CHR (413841), and redetermined all three as *Cryphaea tenella*. She noted that the presumed isotype and the paratype in CHR included both appressed stems (as described by Buck) and “typical stems of *Cryphaea tenella* bearing capsules”.

Fabronia Raddi, *Atti Accad. Sci. Siena* 9: 231 (1808)

Type taxon: *Fabronia pusilla* Raddi

Plants small, silky, pale or dark green, forming loosely interwoven mats. **Stems** appressed or weakly ascending from the substrate, irregularly branched, fragile, with fascicles of smooth, pale brown rhizoids arising at leaf bases. **Stem** and **branch leaves** not differentiated, spreading when moist, erect and ± secund when dry, ovate to lanceolate, often acuminate, lacking plications, plane, spinose, ciliate, or sometimes entire; **upper laminal cells** usually rhombic-hexagonal, smooth; **alar cells** quadrate or oblate in several rows at the margins. **Costa** single and weak. **Paraphyllia** absent.

Mostly monoicous. **Perichaetia** and **perigonia** scattered on stems. **Setae** pale, smooth; **capsules** erect, ± obovoid, usually ± constricted below the mouth when dry; **mouth** transverse; **exothecial cells** thin-walled and sinuose; **stomata** few and superficial, restricted to neck; **operculum** mammillate, convex or short-rostrate. **Peristome** single, exostomal, rarely lacking; **exostome teeth** paired, reflexed or erect when dry and incurved when moist, variably ornamented. **Calyptra** cucullate. **Spores** spherical to ellipsoid, smooth or ornamented.

Taxonomy: *Fabronia* is widely distributed in tropical to warm temperate regions, occurring primarily on tree trunks. While Brotherus (1925) recognised 88 species, a modern treatment for South America (Buck 1983) reduced some 53 described entities to merely 5 recognised taxa. A single variable species occurs in N.Z.

Etymology: Crum & Anderson (1981, p. 832) describe the derivation of the generic name thus: "named for Fabbroni, once director the the mint in Florence; the name was chosen partly as a derivation from the Latin *faber*, meaning ingenious."

Fabronia australis Hook., *Musci Exot. 2,* 160 (1819)

Isotype: Australia, New Holland, King George's Sound, 1791, *A. Menzies 105*, NY!

= *Fabronia octoblepharis* C.Knight, *Trans. & Proc. New Zealand Inst.* 8: 312 (1876) nom. illeg.
≡ *Fabronia antarctica* Paris, *Index Bryol. Suppl.,* 154 (1900) nom. nov. pro *Fabronia octoblepharis* C.Knight 1876 (non Schwägr. 1816)
Holotype: N.Z., *s.loc.*, "17.3.72", *C. Knight s.n.*, WELT M032918! Isotypes: WELT!

Plants bright green when fresh. **Stems** very fine, (5–)10–15 mm, in cross-section with a small central strand and 2 layers of firm-walled cortical cells. **Branches** variable in length, curved (especially when dry). **Leaves** secund when dry, ovate-lanceolate, gradually tapered to a slender and ± hyaline acumen or occasionally merely acute, 0.45–0.7 × 0.17–0.25 mm (to 0.9 × 0.45 mm in entire-leaved populations), variably spinose-toothed or entire, the teeth, if present, unicellular, to 45(–75) µm long, acute, and spreading at various angles in a single leaf; **upper laminal cells** rhombic-hexagonal, mostly 24–30(–45) × c. 9 µm (but longer in acumen); **alar cells** differentiated in a large ± triangular group, quadrate or oblate, extending to costa base and (7–)10–15 or more cells up the margin. **Costa** often indistinct, extending ⅓ –½ the leaf length.

Autoicous. Perichaetia clasping the seta base, the inner leaves c. 0.8 mm. **Perigonia** scattered on stems, c. 0.4 mm, the perigonial leaves little differentiated from vegetative leaves in shape, apparently ecostate. **Setae** straight, 2.5–6 mm, twisted to the right; **capsules** obovoid-cylindric, 0.6–0.8 mm, pale brown at maturity; **mouth** equal to the capsule diameter; **exothecial cells** highly irregular and sinuose; **operculum** low-mammillate. **Exostome teeth** inserted at mouth, fused to form 8 broadly triangular pairs, irregular at apex, dark brown, striate on outer surface, coarsely papillose on inner surface, lacking trabeculae. **Spores** spherical to ellipsoid, bright green, (13–)15–21(–26) µm in greater diameter, rather thick-walled and coarsely low-insulate.

Illustrations: Plate 1. Knight 1876, p. 11; Scott & Stone 1976, pl. 84; Catcheside 1980, fig. 202.

Distribution: NI: K; N Auckland, S Auckland (Rotorua), Gisborne (Te Kaha, Poverty Bay), Hawke's Bay (Wairoa, Wakarara Range, Pētane), Wellington (Masterton, Mt Bruce, Turakirae Head); SI: Nelson (Stoke, Nelson Botanical Garden, Upper Wairau Valley), Marlborough, Canterbury, Otago, Southland; St.

Australasian. Mainland Australia*. Recorded from Tasmania by both Scott & Stone (1976, p. 434) and Dalton et al. (1991).

Habitat: On tree trunks, rock (including basalt and limestone), and rarely soil. The species is largely restricted to drier regions and on the South I. occurs mostly east of the Main Divide. Host species include a wide range of both indigenous trees (including *Cordyline australis*, *Corynocarpus laevigatus*, *Griselinia littoralis*, *Metrosideros excelsa*, *M. kermadecensis*, *Myoporum laetum*, *Pennantia corymbosa*, *Pseudopanax arborea*, *Sophora* spp., and *Podocarpus totara*) and adventive trees (including *Populus* and *Salix* spp., *Sambucus nigra*, *Cupressus macrocarpa*, and *Pseudotsuga menziesii*). Ranging from near sea level to c. 800 m.

Notes: Populations with entire or very nearly entire leaf margins predominate on North I. and tend to have larger spores (mostly 18–24 µm, rarely to 26 µm) and wider leaves (occasionally to 0.45 mm) than toothed populations. Entire-margined populations are exceedingly rare on South I. Populations with spinose-toothed leaf margins occur throughout the N.Z. range and plants in single populations (as at Turakirae Head, Wellington L.D., CHR 477491 and 477492) can have both entire and distinctly toothed leaf margins. Such variable populations suggest it would be an oversimplification to taxonomically recognise entire-leaved, large-spored populations in N.Z., even at the varietal level.

In the South American *F. ciliaris*, Buck (1983, p. 252) noted a weak correlation between entire margins and relatively large spore sizes; he chose to emphasise such variation by the recognition of varieties. Buck termed entire-margined material *F. ciliaris* var. *polycarpa* “the most common *Fabronia* in South America”. He also suggested that South American species of *Fabronia* develop marginal teeth more strongly when growing in well-lit situations, while plants from shaded sites have weakly developed teeth or entire margins.

Isotype material of *F. australis* has leaf margins toothed with individual teeth short (9–18 µm). The marginal teeth of N.Z. populations are rarely greater than 45 µm from their acute basal angle to their apices. However, a small number of collections, including the non-localised holotype of *F. octoblepharis* and material from the Lyttelton Hills (Canterbury L.D., CHR 527737), have marginal teeth to c. 75 µm. Such material is interpreted here as merely an environmental variant unworthy of taxonomic recognition.

The suggestion that *F. australis* might be conspecific with the widespread northern hemisphere *F. ciliaris* (Brid.) Brid. (or *F. octoblepharis* Schwägr.) was first made by Dixon (1927, p. 278). More recently, Scott & Stone (1976, p. 434) suggested that Australasian material might be “only a facies” of *F. ciliaris*. However, the spores of N.Z. material of *F. australis* are larger than those recorded for *F. ciliaris* from either Europe (Limpricht 1890–1895) or North America (Crum & Anderson, 1981, p. 832) and it is therefore preferable to retain the name *F. australis* for Australian and N.Z. material. A monographic study could well produce a different conclusion.

Recognition: When the leaf margins are toothed, *F. australis* could hardly be confused with anything else in the N.Z. flora. The teeth spread from the leaf axis at various angles with a few spreading at c. 90° (usually on the lower margins). The silky appearance, very small (well under 1 mm) leaves, weak costa and the characteristic large group of quadrate alar cells are highly distinctive, as are the nearly constantly present capsules. *Ischyrodon lepturus* is a larger plant with linear laminal cells; it is dioicous and not known to fruit in N.Z. *Fabronia australis* is primarily epiphytic and occurs mostly in inland sites, while *I. lepturus* is terrestrial and restricted to coastal sites. Confusion between entire-leaved forms and *Brachythecium velutinum* is possible, but the present species has generally smaller leaves, rhombic-hexagonal laminal cells, less-developed costae lacking terminal spines, and completely different capsules. The weakly developed costae, the larger alar group (often extending nearly to the costa), secund leaves, silky appearance, and a different habitat distinguish *F. australis* from *Amblystegium serpens*, q.v.

Etymology: The species epithet means southern.

Ischyrodon Müll.Hal., *Linnaea* 39: 443 (1875)

Type taxon: *Ischyrodon seriolus* (Müll.Hal.) Müll.Hal.

The description of *I. lepturus* is given here to apply to the genus.

Taxonomy: A monotypic or doubtfully ditypic genus occurring in Australasia and South Africa. *Ischyrodon* is separated from *Fabronia* by differences in sexuality, by having longer ± entire leaves with reflexed margins and linear upper laminal cells, and, reportedly, by having larger peristome teeth. The two genera occupy quite different habitats in N.Z.

Etymology: The generic name, from the Greek, means robust tooth, and refers to the exostome teeth (which are larger than in *Fabronia*).

Ischyrodon lepturus (Taylor) Schelpe, *Contr. Bolus Herb.* 2: 49 (1970)

≡ *Hypnum lepturum* Taylor, *London J. Bot.* 5: 64 (1846)
≡ *Fabronia leptura* (Taylor) Broth., Nat. Pflanzenfam. [Engler & Prantl] 1 (3) 905 (1907)
≡ *Juratzkaea leptura* (Taylor) W.R.Buck, *Rev. Bryol. Lichenol., n.s.* 43: 319 (1977)
Type: Western Australia, Swan River, 1843, *J. Drummond s.n.*, NY-Mitten!

Plants small or medium-sized, lustrous, pale or dark green, forming loosely interwoven mats. **Stems** c. 10–30 mm, creeping and curving upwards from the substrate, subpinnately or irregularly branched, with fascicles of smooth, pale brown rhizoids at leaf bases, in cross-section with an ill-defined central strand and c. 3 layers of firm-walled, irregular cortical cells. **Branches** variable in length, mostly c. 3–8 mm but sometimes longer (to c. 20 mm), erect-ascendant and mostly strongly curved. **Stem leaves** erect-spreading or occasionally weakly complanate, (1.2–)1.5–2.0 × (0.45–)0.6–0.8 mm (excluding the smaller leaves near the stem apex), differing from branch leaves only by size. **Branch leaves** erect-spreading, ovate or ovate-lanceolate, gradually narrowed to a concolorous acuminate apex, concave and narrowed at base, often with one weak basal plication extending c. ⅓ –½ the leaf length, 0.8–1.4 × 0.4–0.5 mm; **margins** entire or less often weakly crenulate or with a few weak teeth, weakly reflexed at base on one or both sides, plane above; **upper laminal cells** linear, pointed at both ends, smooth, c. (45–)60–75(–90) × 6–7 µm; **alar cells** strongly differentiated, quadrate or oblate, mostly 9–13 µm wide, not porose, forming a large, opaque, and strongly concave group extending to and covering (on the adaxial surface) the costal base and (17–)20–30 cells up the margin. **Costa** stout and well-defined at base, strongly tapered, extending ½(–¾) the leaf length. **Paraphyllia** absent.

Dioicous. Perichaetia not seen. **Perigonia** scattered on ventral surface of stems, gemmiform, the perigonial leaves shorter (c. 0.5 mm) than vegetative and scarcely costate. **Capsules** not seen.

Illustrations: Plate 2. Catcheside 1980, fig. 203; Catcheside & Stone 1980, pls 1–2.

Distribution: NI: N Auckland (only from offshore islands: HC, LB, GB), Wellington (Tītahi Bay, Island Bay, Kapiti I.); SI: Nelson (Stephens I., D'Urville I., Pūponga), Marlborough (Chetwode Is, Motuara I.); Ch.

Australasian? Mainland Australia*. Recorded from Tasmania by Dalton et al. (1991). Probably also in South Africa. Curiously, on the main islands of N.Z. there are two distinct centres of distribution: in the Hauraki Gulf and Cook Strait/Nelson regions. Detailed comparison of material from these two regions could be worthwhile.

Habitat: Occurring on rock in coastal situations; apparently restricted to very low elevations and tolerant of some degree of salt spray. In South Australia Catcheside (1980) recorded it as usually occurring in sheltered gorges, presumably away from coastal influences.

Notes: Catcheside & Stone (1980), using South Australian material, published SEM micrographs and a detailed description of the peristome of *Ischyrodon lepturus* and confirmed Schelpe's generic placement.

The relationship between the Australasian *I. lepturus* and the South African *I. seriolus* remains unresolved. Catcheside & Stone (1980) noted that material from South Africa has been annotated by J.H. Willis as "identical with *Fabronia leptura* (Taylor) Broth." Although they did not express a firm opinion as to the distinctness of the Australian from the South African species, Catcheside & Stone (1980, p. 100) noted minor ways in which they differ, primarily details of the peristome teeth insertion, degree of costal development in perichaetial leaves, and the length of upper laminal cells. These differences are not impressive and most evidence suggests that material from the two regions is conspecific, although no South African material has been available for comparison. *Ischyrodon lepturus*, described from Western Australia, has the earlier basionym of the two.

Recognition: The lustrous appearance, the curved, short branches, and the creeping stems are distinctive. The slight suggestion, under a hand lens or stereoscope, of a glistening leaf margin (although why the plane margins should appear this way is not apparent) further facilitates recognition. Microscopically, the large, opaque, and weakly convex group of quadrate alar cells that extend over the base of the costa are diagnostic and the ± entire margins clearly distinguish it from *Fabronia australis*.

Ischyrodon lepturus is sometimes confused with the adventive *Brachythecium albicans*, a species that usually grows among introduced grasses, mostly on the South I. In *I. lepturus* the plants are less ascendant and have smaller, markedly less plicate, and broader, less acuminate leaf apices than in *B. albicans*. The stem leaves are not decurrent, while those of *B. albicans* are distinctly decurrent. Also, the alar cells of *I. lepturus* extend over the adaxial surface of the base of the costa (visible under the compound microscope) in a highly characteristic manner (but which is not illustrated here).

Etymology: The epithet *lepturus* means "slender-tailed" and apparently refers to the leaf tips. Taylor (1846) aptly described the "leaves near the tops of the shoots" as having "elongated, almost piliferous summits."

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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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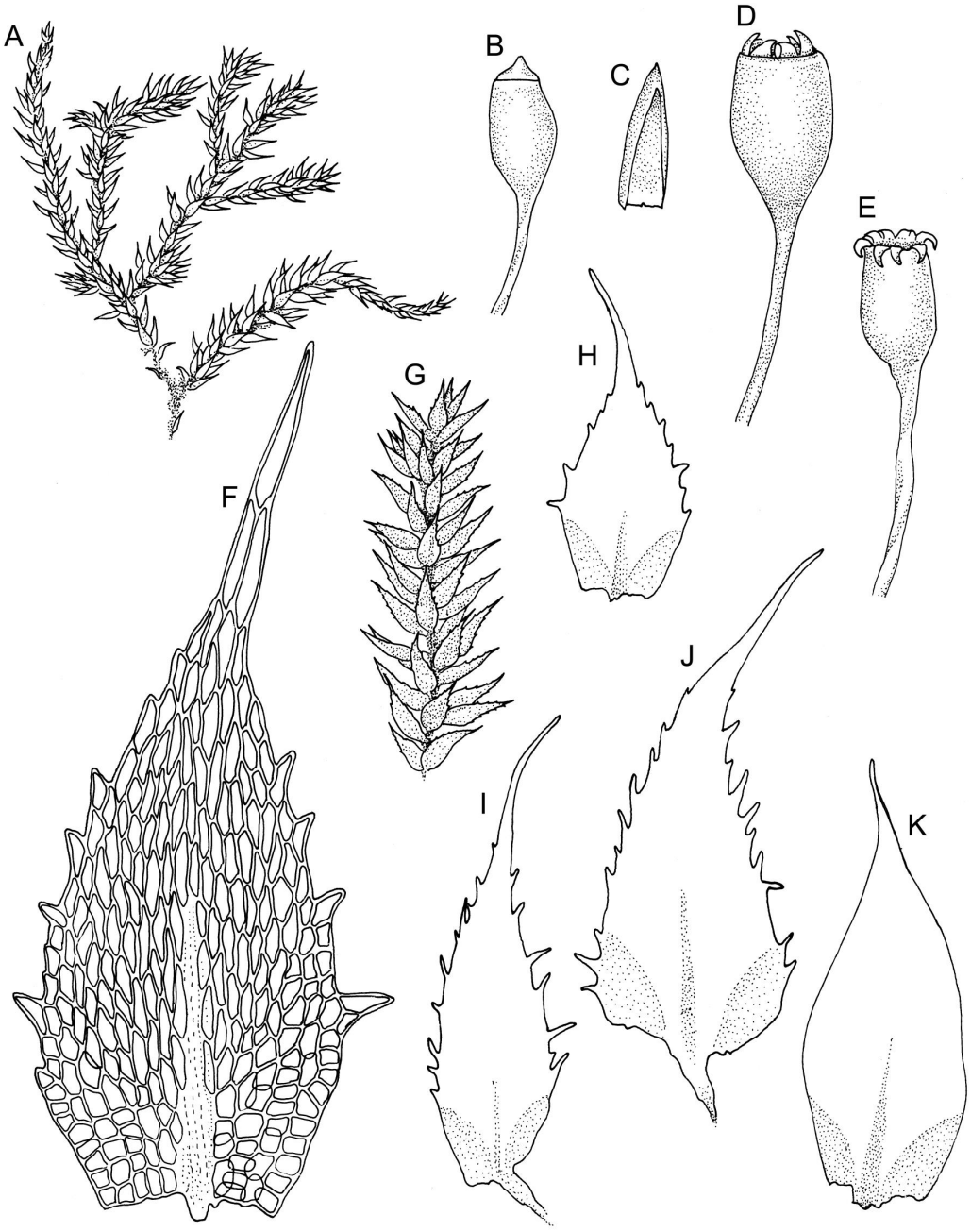


Plate 1: ***Fabronia*. A–K: *F. australis***. A, habit. B, capsule, dry. C, calyptra. D, capsule. E, capsule, dry. F, leaf. G, branch detail. H–K, leaves. A–H drawn from *A.J. Fife 5025*, CHR 349487; I drawn from *R. Brown s.n.*, Herb. T.W.N. Beckett, CHR 527737; J drawn from *J. Child s.n.*, 25 Aug. 1970, CHR 430656; K drawn from *W. Martin 213.4*, CHR 491588.

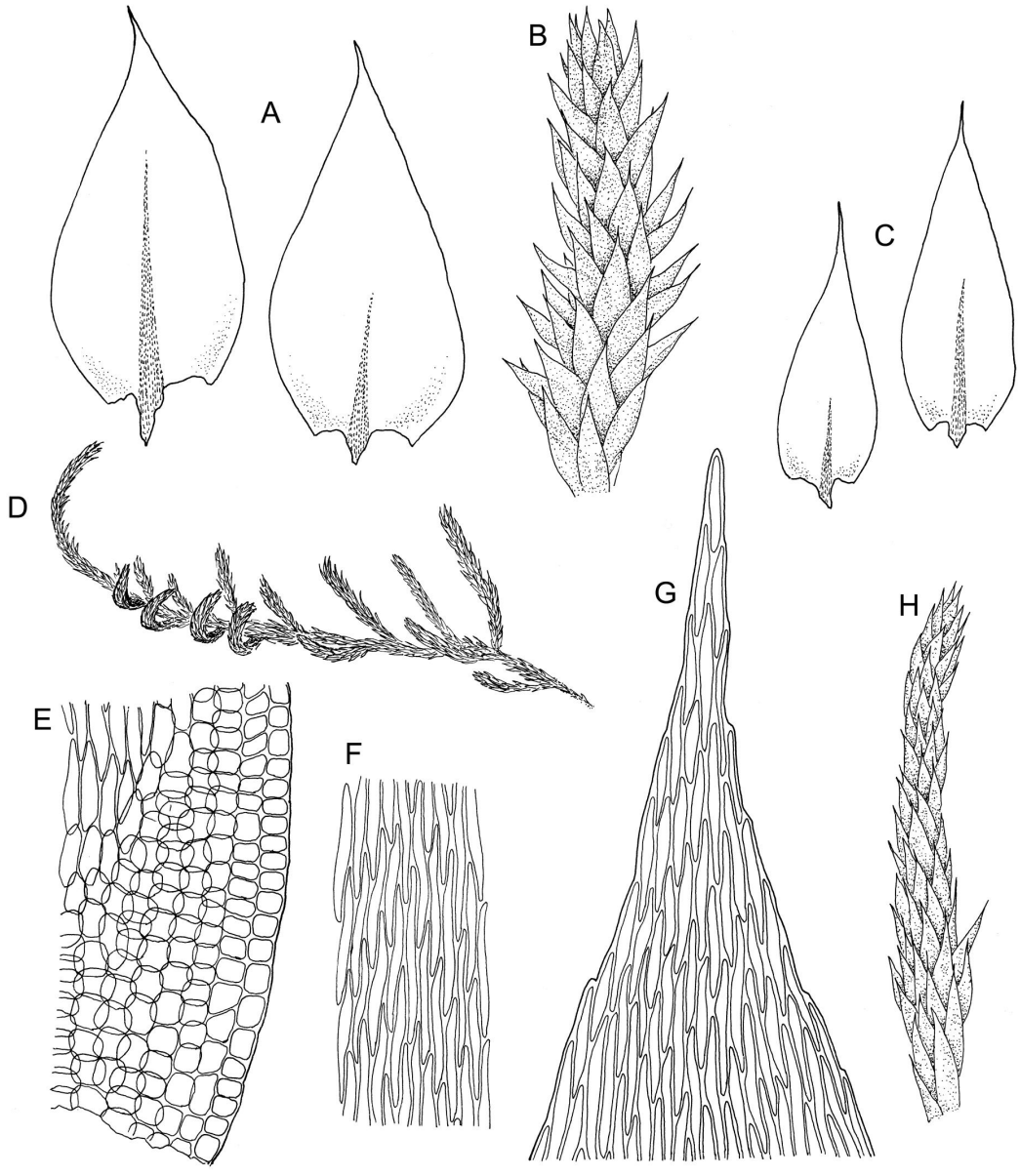
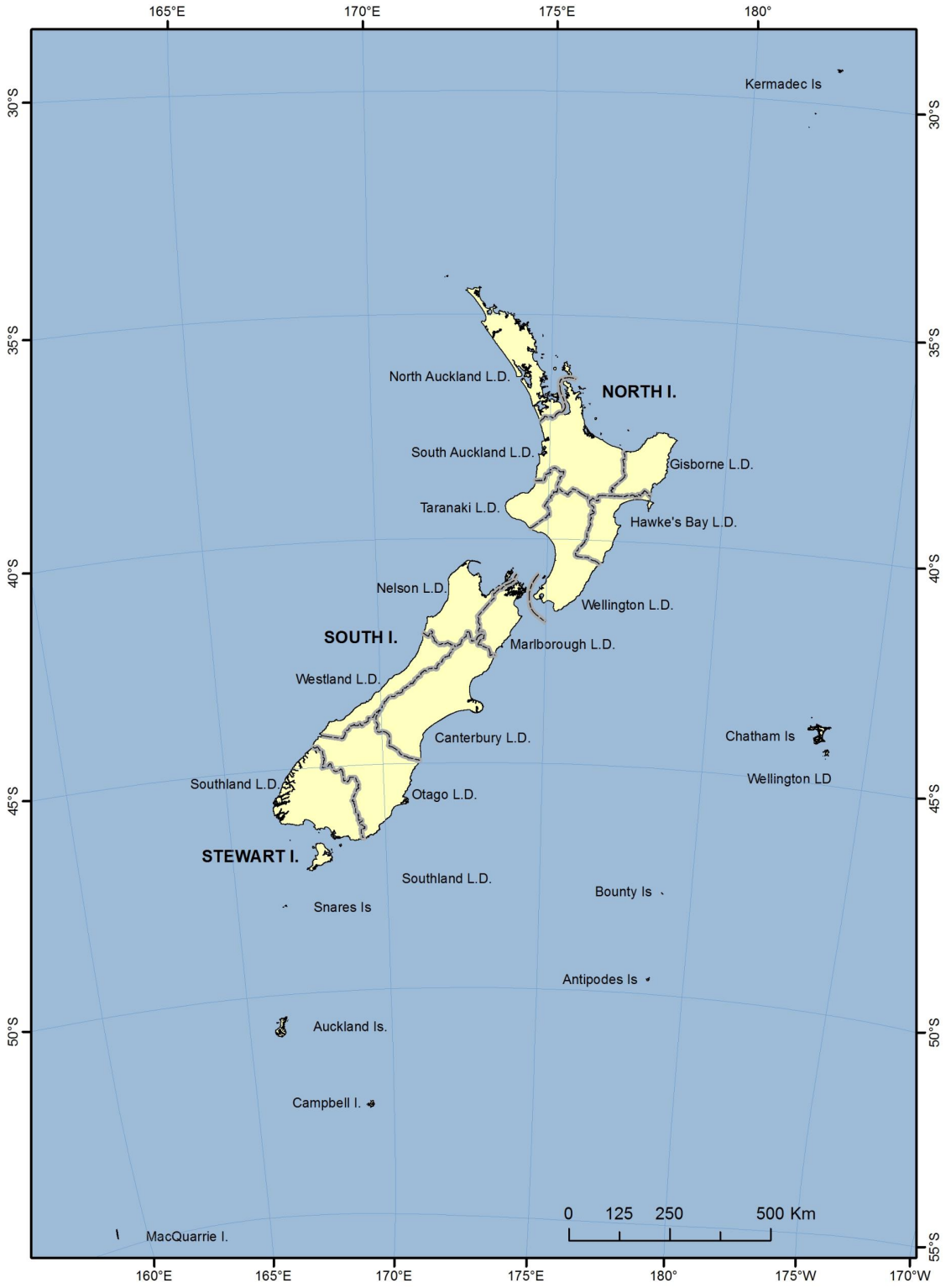
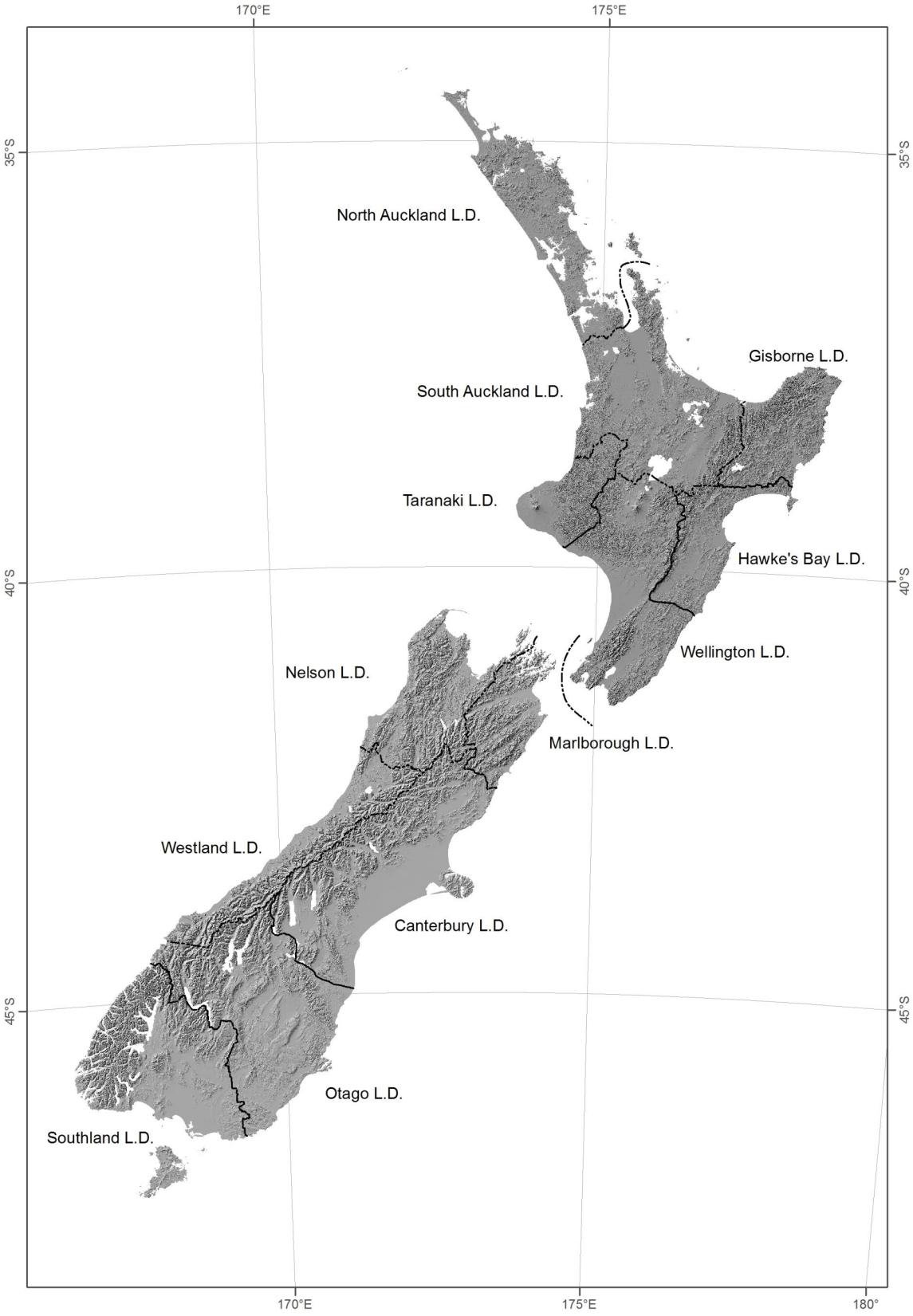


Plate 2: ***Ischyrodon*. A–H: *I. lepturus***. A, stem leaves. B, branch detail. C, branch leaves. D, habit. E, alar cells. F, mid laminal cells. G, leaf apex. H, branch detail, dry. Drawn from *B.H. Macmillan 71/279*, CHR 163468.



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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