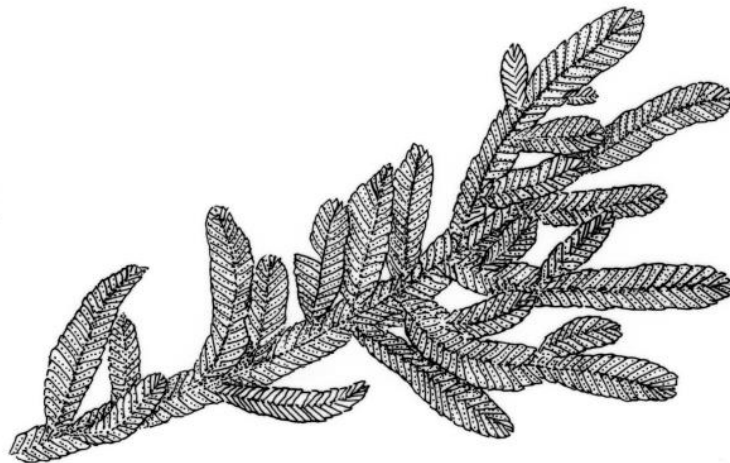




FLORA OF NEW ZEALAND
MOSSES

ORTHORRHYNCHIACEAE



A.J. FIFE

Fascicle 20 – AUGUST 2015

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Cover image: *Orthorrhynchium elegans*, habit. Drawn by Rebecca Wagstaff from A.J. Fife 11157, CHR 515061.

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Introduction

The Orthorrhynchiaceae are a monogeneric family that include one or two species, depending on taxonomic interpretation. In a New Zealand context the sole representative, *Orthorrhynchium elegans*, is easily recognised by its highly lustrous, strongly distichous, and strongly folded (“conduplicate”) leaves, and its broadly obtuse shoot apex, combined with its epiphytic substrate. It is found from the Kermadec Is south to Stewart I., and east to the Chathams and also occurs outside of N.Z. The conduplicate leaves overlap so strongly that the leaves cohere even after they have been stripped from the stem and cannot be flattened without damage. The plants are almost certainly dioicous and the small, obovoid capsules on short setae are rarely observed.

Orthorrhynchiaceae

Taxonomy: The family Orthorrhynchiaceae was erected by Lin (1983) following a numerical morphological analysis of taxa traditionally placed in the Phyllogoniaceae. Goffinet et al. (2009) accepted Lin's monogeneric family, citing its lack of differentiated alar cells as a feature distinguishing it from the Phyllogoniaceae. The family is accepted here but since it includes only one genus and one or two species, no family or generic description is provided here.

***Orthorrhynchium* Reichardt, *Verh. K. K. Zool.-Bot. Ges. Wien* 18: 116 (1868)**

as "Orthorhynchium"

Type taxon: *Orthorrhynchium elegans* (Hook.f. & Wilson) Reichardt

Taxonomy: Lin's (1983) synopsis of *Orthorrhynchium* included two species: *O. elegans* and *O. balansaeaeum*, with the latter restricted to New Caledonia. The synopsis was appended to Lin's revision of the Phyllogoniaceae, from which he excluded the present genus. Lin's intra-specific treatment of *O. elegans* distinguished four subspecies, largely on the basis of overlapping quantitative characters. Lin's proposed subspecies (summarised in his table 7) are not convincing and they are not accepted here, given the degree of continuous variation of *O. elegans* in the N.Z. portion of its range. Material of *O. balansaeaeum* has not been available for study.

Lin (1984) excluded from *Orthorrhynchium* a widespread tropical Pacific species which has been termed *O. cylindricum* (Lindb.) Broth. This is a species of both obscure family relationships and confusing nomenclature, which was discussed by both Whittier (1976, p. 253) and Norris & Koponen (1987, p. 211). Norris and Koponen followed Isoviiita (1986) and named this species *Cryptogonium phyllogonioides* (Sull.) Isov.

I concur with Lin (1984) and Norris & Koponen (1987) that *C. phyllogonioides* (Sull.) Isov. is not closely allied to *O. elegans*. Material of *C. phyllogonioides* differs from *O. elegans* by many features including: leaves inserted in four rather than two ranks (but still appearing distichous) and with unequal conduplicate portions, undifferentiated median cells in the leaf apex, differentiated alar cells, and by the presence of numerous, filamentous, and easily observed pseudoparaphyllia.

Cryptogonium phyllogonioides has been found at two localities in the Kermadec Is by P. de Lange who described it (*in herb.* AK 325647!) as having an "upright growth habit" in contrast to the prostrate growth form of *O. elegans*. The Kermadec collections were growing on wind-thrown *Metrosideros* and around tree roots over a large boulder in an ephemeral stream bed. This predominantly Polynesian and Melanesian species is at the southern fringe of its distribution in the Kermadec Is, and its occurrence on the main islands of N.Z. is considered unlikely. It is neither illustrated nor discussed further here; descriptions and illustrations can be found in the publications mentioned above.

Etymology: The generic *Orthorrhynchium* name alludes to the straight beak of the operculum.

Excluded Taxa: *Orthorrhynchium elegans* subsp. *tumidum* Lin is based on a single N.Z. collection of dubious locality, collector, and date (but Lin (1983) suggested it is probably a Berggren collection). Lin's selection of a holotype of dubious provenance complicates the status of this taxon, which is neither accepted nor placed in synonymy here.

***Orthorrhynchium elegans* (Hook.f. & Wilson) Reichardt, *Verh. K. K. Zool.-Bot. Ges. Wien* 18: 116 (1868)**

≡ *Phyllogonium elegans* Hook.f. & Wilson, *London J. Bot.* 3: 548 (1844)

Type: Bay of Islands, *Sinclair* (BM, not seen).

Plants small to medium-sized, strongly lustrous fresh or dry, yellow-green (rarely becoming brown or chestnut), strongly flattened, forming flat mats on bark or rock. **Stems** mostly to 25(–40) mm, irregularly to subpinnately branched, with scattered fascicles of pale brown, smooth rhizoids, in cross-section lacking a central strand and with the cells gradually becoming smaller at the periphery. **Shoots** c. 1.5–2.0 mm wide, broadly obtuse at apex. **Branches** mostly simple and c. 3–5 mm long, often denuded below due to deciduous leaves. **Stem and branch leaves** similar, distichous, closely imbricate, with an internal angle between the stem and the leaf of c. 60 degrees, becoming more nearly parallel to the stem near apex to form a broadly obtuse shoot apex, often deciduous below, symmetrically conduplicate, lingulate (under cover slip) with nearly parallel margins, rounded or truncate distally, strongly cucullate above, entire, mostly 0.85–1.1 × 0.3–0.35 mm (under cover slip); **upper laminal cells** linear, thin-walled, c. 60–72 × 4 μm, smooth; **median cells of the cucullate leaf**

apex differentiated and forming a band c. 4–8 cells wide and extending to apex, quadrate or irregular, 9–15 µm in greater dimension (but appearing as a marginal band due to leaf folding); **basal laminal cells** shorter and more irregular; **alar cells** not differentiated. **Costa** absent. **Axillary hairs** concolourous with leaf, apparently one per leaf corner, composed of c. 5 uniformly oblong and smooth cells, c. 140 µm long. **Pseudoparaphyllia** absent.

Reportedly dioicous. Perichaetia in axils of vegetative leaves; **perichaetial leaves** clasping, concave to ± conduplicate, irregularly lacinate at margins, apparently enlarging and sheathing the lower ¼ to ½ of the seta, enclosing c. 10 archegonia and several very long paraphyses which extend beyond the leaf apices. **Perigonia** not seen. **Setae** stout, red, straight, and smooth, 2–4 mm; **capsules** campanulate to cupulate, widest at mouth, with columella persistent and extending beyond the mouth, pale red-brown, 0.85–1.0 × c. 0.9 mm, lacking a differentiated neck; **exothecial cells** ± isodiametric, collenchymatous, mostly c. 20–25 µm diam.; **stomata** apparently absent; **annulus** not differentiated; **operculum** conic with an elongate and erect rostrum, ± equal the capsule in length. **Peristome** present, single in N.Z. material; **exostome teeth** widely spreading when dry, pale brown, smooth or nearly so, c. 325–375(–450) × 100–120 µm (but often shorter and irregular in outline), inserted c. 60–75 µm below rim, with a nearly straight divisural line, often irregularly perforate; **endostome** absent in N.Z. material; **preperistome** well-developed and obscuring the base of the teeth. **Calyptra** mitrate, deeply lacinate at base, hairy, enclosing the entire capsule and clasping at base. **Spores** 24–30 µm, smooth.

Illustrations: Plate 1. Lin 1983, pl. 5; Norris & Koponen 1987, figs. 7 e–i; Beever et al. 1992 fig. 60.

Distribution: K; NI: N Auckland, including offshore islands (HC, LB, GB), S Auckland, Gisborne (Raukokore River, Whinray Scenic Reserve, Rākauroa Scenic Reserve, Mangapōike Falls), Hawke's Bay (Kapokaponui, Sentry Box Scenic Reserve, Mohi Bush Scenic Reserve), Wellington; SI: Nelson, Marlborough, Canterbury (Wainui), Westland (Greymouth), Otago (eastern regions, including near Dunedin), Southland; St; Ch. *Orthorrhynchium elegans* is a frequent species in much of the northern NI and it is often collected through most of Gisborne and Wellington L.D. Herbarium holdings of this species are inexplicably uneven in distribution and it seems genuinely uncommon in many regions including Hawke's Bay, Taranaki (no confirmed localities), Canterbury, and Westland L.D. and all but the eastern portions of Otago L.D. In her checklist of Banks Peninsula mosses, Macmillan (1996) recorded one early R. Brown collection from Wainui, and this remains the sole confirmed Canterbury L.D. record.

Anomalous. Mainland Australia* (N.S.W., Qld), Norfolk I.*. Sri Lanka*, and New Guinea* (confirmed from P.N.G.; reported from West Irian). Lin (1983, p. 78) recorded *O. elegans* s.l. also from India and Lord Howe I.

Habitat: Epiphytic on a very wide range of dicotyledonous trees including *Ascarina lucida*, *Beilschmiedia tawa*, *Carpodetus serratus*, *Coprosma* spp., *Corynocarpus laevigatus*, *Dysoxylum spectabile*, *Elaeocarpus hookerianus*, *Fuscospora solandri*, *Geniostoma* sp., *Knightia excelsa*, *Laurelia novae-zelandiae*, *Lophomyrtus bullata*, *Melicactus ramiflorus*, *Myrsine* spp., *Pennantia corymbosa*, *Pseudopanax* spp., *Syzygium maire*, *Vitex lucens*, *Weinmannia racemosa*, and *W. silvicola*; the native conifers *Agathis australis*, *Dacrycarpus dacrydioides*, *Dacrydium cupressinum*, and *Prumnopitys ferruginea*; as well as the introduced *Cupressus macrocarpa*. *Vitex lucens* is the most frequent host tree species in N Auckland L.D. (Jessica Beever, pers. comm.). Also occurring on dry, shaded limestone. One collection from D'Urville I. (Marlborough L.D.; *P.J. Brownsey s.n.*, WELT M010275) was made from ultramafic rock. This species most often forms pure or near pure mats, although *Cyrtopus setosus* is an occasional associate. On North I. occurring from near sea level to at least 750 m (Erua, Wellington L.D.) and on South I. to at least 620 m (Mt Burnett, Nelson L.D.).

Notes: In a N.Z. context *O. elegans* is recognisable at a glance by its epiphytic habit and very lustrous, strongly distichous, and conduplicate leaves. The leaves diverge from both the stem and branches with an internal angle of c. 60 degrees. The tightly imbricate and uniformly-sized leaves form what Streimann (2002, p. 121) aptly described as "a continuous neat straight edge." At the shoot apices the internal angle becomes smaller (the leaves becoming more nearly parallel to the axis of the branch), which produces a characteristic broadly obtuse shoot apex. In some populations, the leaves of the lower portion of the shoots are deciduous and only leaves at the shoot apex persist. The leaves are so strongly imbricate that the leaves cohere even after they have been stripped from their stem or branch and the conduplicate leaves cannot be flattened without tearing. The conduplicate portions of the leaf are equal in width, which helps distinguish *O. elegans* from some superficially similar species (e.g., *Pseudotaxiphyllum falcifolium* and the tropical Pacific *Cryptogonium phyllogonioides*, discussed above). The differentiated band of median cells in the leaf apex (the "cucullus" *sensu* Lin 1983, p. 80) is visible under the compound microscope.

Despite repeated efforts, I have been unable to locate perigonia in this species and have relied on Lin's (1983) statement that the species is dioicous. The rarely-seen campanulate or obovoid capsules are on short setae and the lacerate and clasping calyptrae give this species further distinction. I have never seen an endostome here, although Norris & Koponen (1987) suggested that it can be present and "reduced to few remnants of cilia."

Recognition: *Orthorrhynchium elegans* is most likely to be confused with *Pseudotaxiphyllum falcifolium*. By contrast *P. falcifolium* has leaves inserted in four rows and very strongly complanate. The individual leaves of *P. falcifolium* have markedly unequal conduplicate portions with the basal margin strongly inflexed (with the inflexed portion c. $\frac{1}{3}$ the width of the remainder of the leaf and extending c. $\frac{2}{3}$ the leaf length). In outline the leaves are oblong, but have a strongly asymmetric apex which is recurved and tapers rapidly to an obtuse apex; the leaf length is c. 1.7–1.8 mm (compared to c. 1.0 mm in *O. elegans*); the shoots are typically c. 2.8–3.0 mm wide (compared to c. 1.5–2.0 mm in *O. elegans*). The elongate setae (c. 14–20 mm) and the nodding, ovoid to oblong-ovoid capsules with a double peristome of *P. falcifolium* further distinguish it from *O. elegans*. *Pseudotaxiphyllum falcifolium* is predominantly a terrestrial species whereas *O. elegans* is predominantly epiphytic, although both species can occur on limestone.

Etymology: The epithet means elegant and is apt for this highly attractive plant.

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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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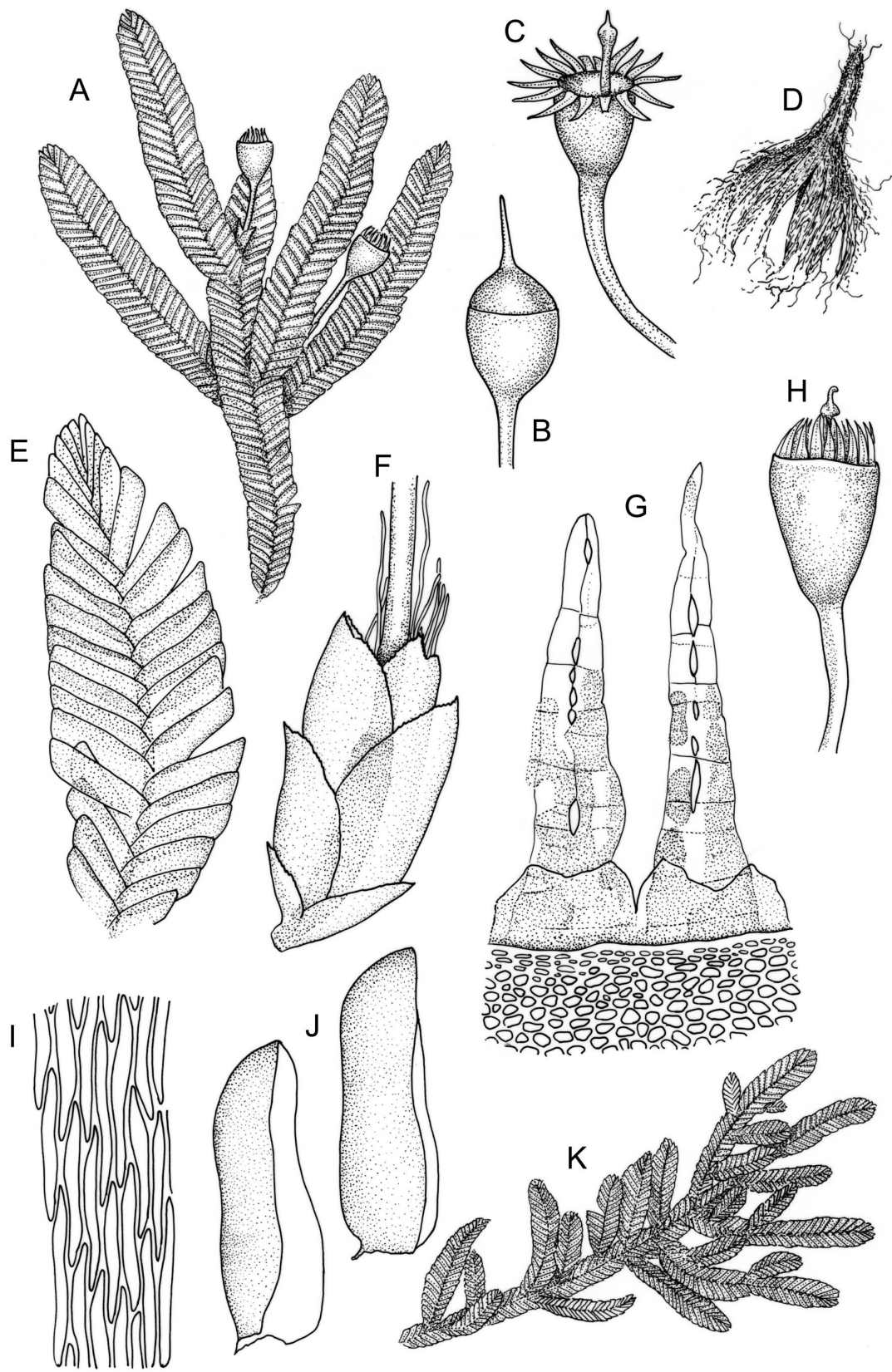
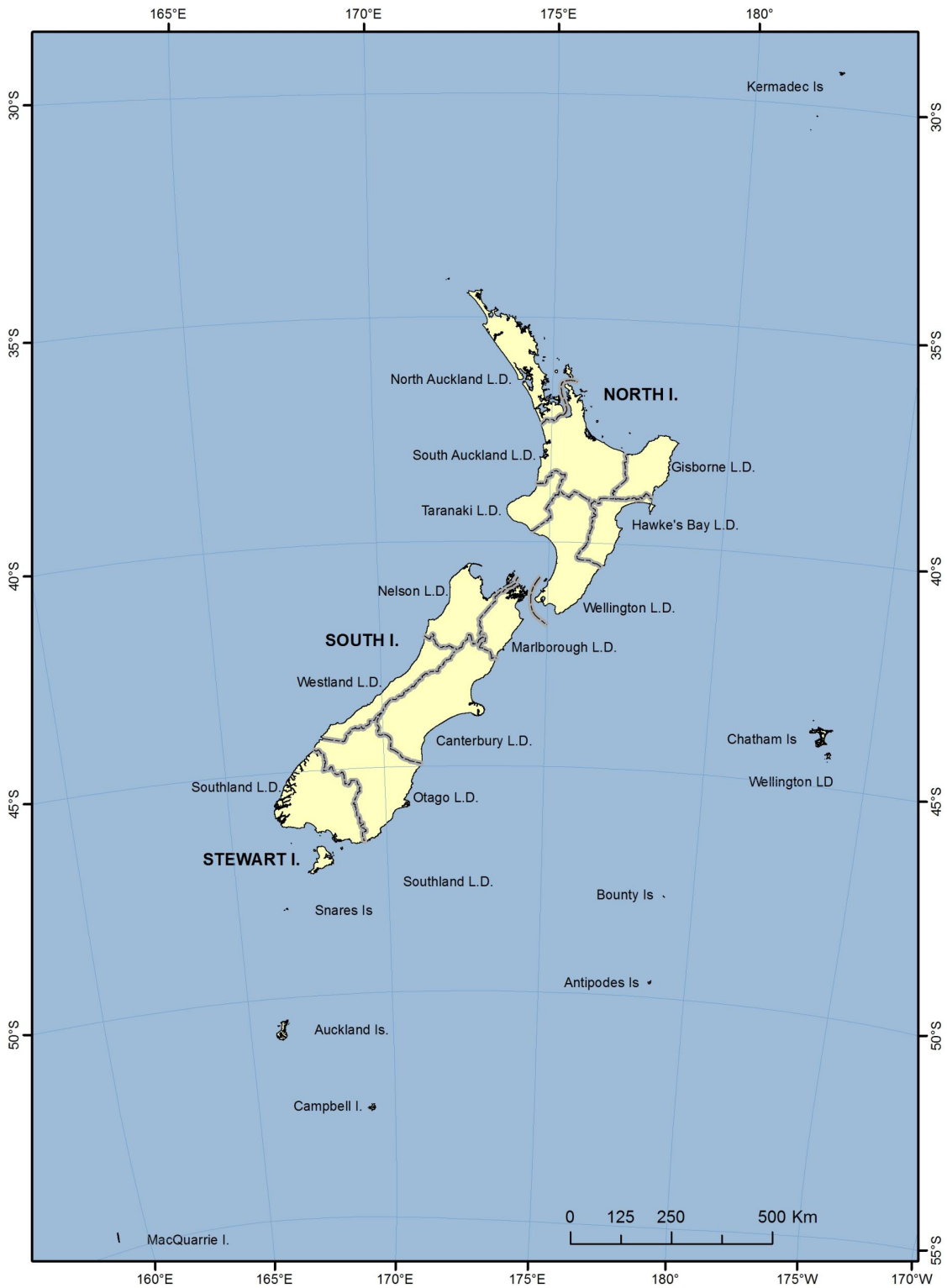
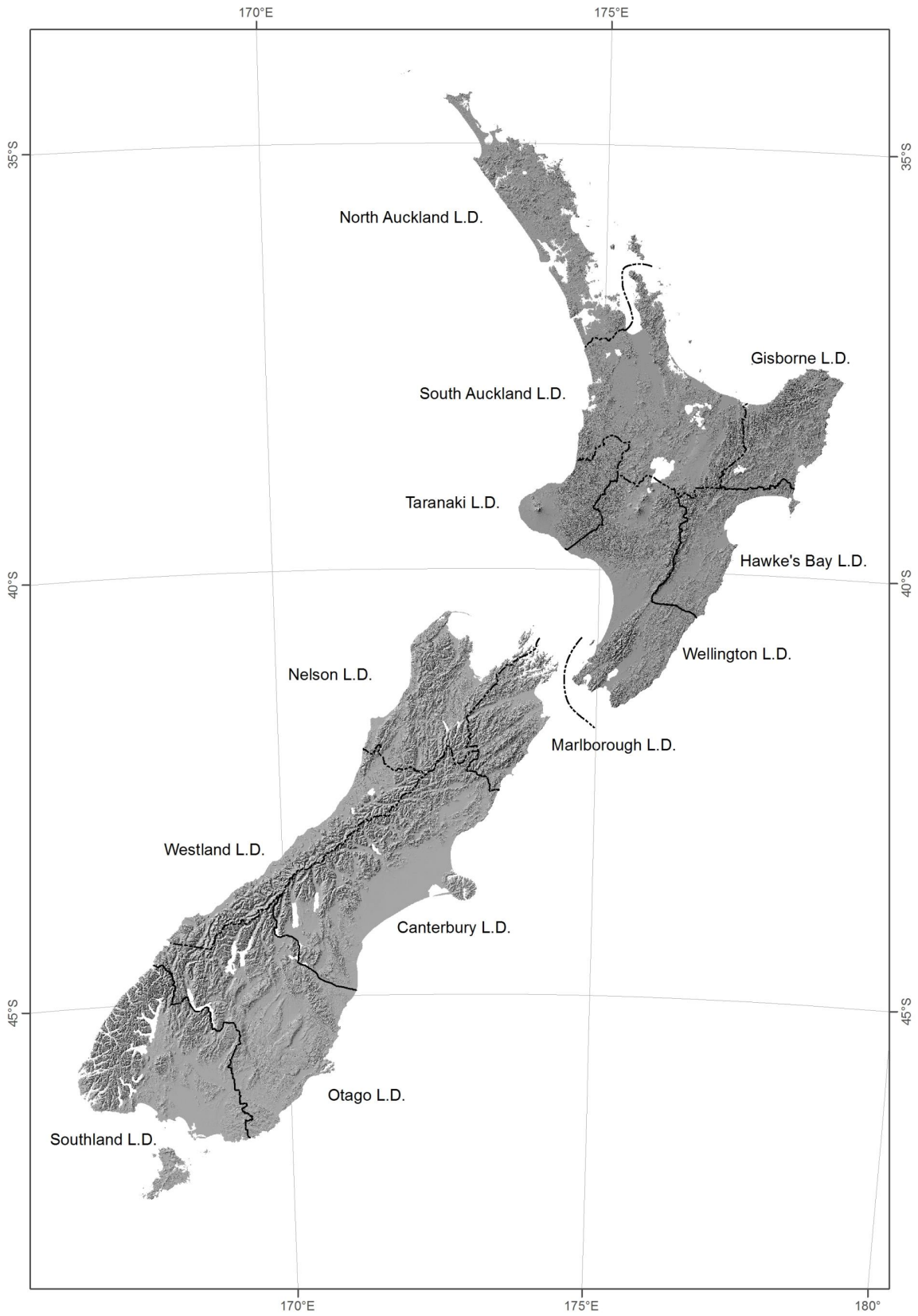


Plate 1: *Orthorrhynchium*. A–K: *O. elegans*. A, portion of plant with capsules. B, capsule. C, capsule, dry. D, calyptra. E, branch detail. F, perichaetium. G, peristome detail with preperistome. H, capsule. I, upper mid laminal cells. J, leaves. K, habit. A, F drawn from *K.W. Allison 3030*, CHR 535829; B–D, H, drawn from *K.W. Allison 170*, CHR 535830; E, I–K drawn from *A.J. Fife 11157*, CHR 515061; G drawn from both *K.W. Allison 3030*, CHR 535829, and *K.W. Allison 170*, CHR 535830.



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

Index

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

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Orthorrhynchium Reichardt **2**

Orthorrhynchium elegans (Hook.f. & Wilson)

Reichardt **2, 2**

Phyllogonium elegans Hook.f. & Wilson **2**

Image Information

Image
Plate 1
Map 1
Map 2

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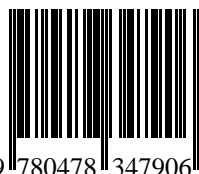
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