



FLORA OF NEW ZEALAND
MOSSES

AULACOMNIACEAE



A.J. FIFE

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Cover image: *Aulacomnium palustre*, habit, dry. Drawn by Rebecca Wagstaff from A.J. Fife 5108, CHR 104267.

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Introduction

The Aulacomniaceae include the single genus *Aulacomnium*, which, in turn, includes five or six species widely distributed in the northern hemisphere. One species, *A. palustre*, also occurs in New Zealand, and other scattered localities in the southern hemisphere. In the South I. it is often conspicuous in montane wetlands, but it has not been recorded from the North I. *Aulacomnium palustre* is characterised, in part, by its frequent production of brown gemmae at the shoot apices and its dioicous sexuality. Considering that it is a large, conspicuous species, the collection history of *A. palustre* in N.Z. is unusual, with the earliest confirmed specimens collected from near Lake Wakatipu in about 1896 and from near Mt Cook in 1907. After a gap of at least 35 years, these early collections were followed by a few gatherings from Marlborough and Otago L.D. Subsequently, *A. palustre* has been collected numerous times throughout much of the South I. In part because of its peculiar collection history, and because neither male plants nor sporophytes have been seen in N. Z., *A. palustre* is interpreted as an adventive species here.

The southern hemisphere genus *Leptotheca* has historically been placed in the Aulacomniaceae. Both morphological and molecular studies have indicated it does not belong in the family and it is excluded from this family treatment.

Aulacomniaceae

Taxonomy: A monotypic family with features of *Aulacomnium*.

Excluded Taxa: *Leptotheca* Schwägr. This southern hemisphere genus, treated in the Aulacomniaceae by both Brotherus (1924) and Sainsbury (1955), was later placed using morphological, cytological, and phytogeographic criteria in the Rhizogoniaceae by Churchill & Buck (1982). More recently Bell et al. (2007) have performed a large-scale molecular phylogenetic analysis using mitochondrial and chloroplast markers from genera placed in several families, including the Aulacomniaceae and Rhizogoniaceae. Their strict consensus tree placed *Leptotheca* in a strongly supported clade including the genus *Orthodontium*, and they proposed its transfer to the Orthodontiaceae. Goffinet et al. (2009) have accepted this placement, which we follow here.

***Aulacomnium* Schwägr., *Sp. Musc. Frond. Suppl.* 3 (1), 215 (1827) nom. cons.**

Type taxon: *Aulacomnium androgynum* (Hedw.) Schwägr.

Elements in the following description are taken from Crum (1994).

Plants small to robust, erect, growing on soil and rotten wood. **Stems** erect, simple or sparsely branched (and reportedly branching by innovation), tomentose, in cross-section with a strong central strand. **Leaves** erect to erect-spreading, crowded, often somewhat larger near stem apex, contorted when dry in N.Z. species, oblong-lanceolate to elliptic, acute to broadly rounded at apex, concave or keeled above, mostly revolute at margins; **laminal cells** mostly short or ± isodiametric, incrassate and sometimes collenchymatous, strongly singly papillose-mammillate on both surfaces (in N.Z. species) or smooth; **basal cells** sometimes swollen and coloured; **alar cells** not differentiated. **Costa** stout, usually sinuose above, failing below the apex, often lustrous and projecting abaxially in dry material, in cross-section with two stereid bands. **Gemmae** sometimes present on pseudopodia at stem apices.

Dioicous (in N.Z. species) or rarely autoicous. **Setae** terminal, elongate, erect, smooth; **capsules** suberect to inclined to horizontal, symmetric or curved, oblong-ovoid to cylindrical, short-necked, furrowed; **exothecial cells** firm-walled; **stomata** superficial; **annulus** well developed and revolvable; **operculum** conic to short-rostrate. **Peristome** double, bryoid. **Calyptra** cucullate, smooth, and naked. **Spores** spherical.

Taxonomy: A genus of five to six species occurring on soil or rotten wood. The genus is widely distributed in the northern hemisphere. Only one species, *A. palustre*, occurs in the southern hemisphere, where it is probably adventive.

Etymology: The generic name is derived from *aulacos* (furrow) and *mnion* (moss), and alludes to the furrowing of the capsule when mature (Meagher, 2011).

***Aulacomnium palustre* (Hedw.) Schwägr., *Sp. Musc. Frond. Suppl.* 3 (1), 216 (1827)**

≡ *Mnium palustre* Hedw., *Sp. Musc. Frond.*, 188 (1801)

Type: Europe. Not seen.

= *Aulacomnium stolonaceum* Müll.Hal. in Müller & Brotherus, *Abh. Naturwiss. Vereins Bremen* 16: 503 (1900)

Type: N.Z., Otago, Ben Lommond (sic), *H. Schauinsland* 200, 1896/97, H-Brotherus 196007!

Plants medium to robust, yellow- or brown-green, forming dense turves. **Stems** erect, simple or sparsely branched (and reportedly branching by innovation), from c. 40 to >150 mm, occasionally terminated by gemmiferous pseudopodia, densely beset with red-brown, smooth rhizoids, in cross-section with a strong central strand. **Leaves** erect-spreading when moist, contorted and in well-defined spiral ranks when dry, oblong-lanceolate, broadly acute, obtuse or rounded, entire or serrulate near apex, oblong-lanceolate, slightly auriculate in alar angles, recurved on both margins nearly to apex, not or very weakly decurrent in N.Z. material, mostly 1.8–3.0 × 0.6–0.9 mm; **laminal cells** collenchymatous nearly throughout, irregular and ± stellate in outline, but mostly ± isodiametric, mostly 12–15 µm diam., but some ± elongate and larger, strongly once papillose-mammillate on both surfaces; **basal cells** pigmented and slightly enlarged in several (c. 6–10) rows, incrassate but not collenchymatous. **Costa** stout, c. 45–60 µm wide at mid leaf, sinuose above, failing several cells

below apex, lustrous and projecting strongly abaxially in dry leaves, with elongate to linear cells exposed on both surfaces, in cross-section with a central layer of guide cells, two small groups of stereids, and larger abaxial and adaxial surface cells. **Gemmae** often borne on apical pseudopodia, brown, fusiform, composed of many (>100) cells, and c. 200–300 µm long.

Dioicous. **Perichaetia** terminal, subtended by innovative branches; **perichaetial leaves** somewhat more spreading but otherwise not differentiated. **Perigonia** and **sporophytes** not known in N.Z.

Illustrations: Plate 1. Crum & Anderson 1981, fig. 291; Crum 1994, fig. 406, d–i; Smith 2004, fig. 211, 1–6.

Distribution: SI: Nelson, Marlborough (Molesworth, Branch River), Canterbury, Westland (near Ross), Otago, Southland; M.

Adventive. Australia*, Argentina*, North America*, Europe*, and Asia*. Reported from Mexico, Dominican Republic, and northern South America by Crum (1994) and from Tasmania by Dalton et al. 1991; see also Seppelt et al. 2013). Bell & Catcheside (2006) detailed its distribution in Australia and cited it from “southern South America” without further information.

Given the relatively large number of South I. collections (c. 50 in CHR) and the range of habitats this species occupies, the absence of confirmed records from high elevation localities on North I. is remarkable, and corroborates the hypothesis that this species is adventive in N.Z.

Habitat: Occurring in a variety of montane to alpine wetlands, including cushion and *Sphagnum cristatum*-dominated bogs, tarn margins, flushes, *Carex*-dominated marshes, and *Chionochoa rubra*-dominated grassland. Often forming extensive turves square metres in extent. Occurring c. 500–1800 m. Often associated with *Climacium dendroides* and *Sphagnum cristatum*; less frequently associated with *Breutelia pendula*, *Drepanocladus aduncus*, *Philonotis pyriformis*, and *Sanionia uncinatus*. A J.K. Bartlett collection seen from “near Ross” in Westland L.D. suggests that it may occur at lower elevations than recorded above.

First record: The first confirmed N.Z. specimens were collected at “Ben Lommond” [sic], near Lake Wakatipu in 1896/97 by H. Schauinsland and in the “Mt. Cook District” in 1907 by James Murray. These early collections were followed by a very few collections made in Marlborough and Otago in the 1940s. The apparent failure of earlier South I. collectors to gather what is now a relatively conspicuous species suggests this species is an introduction to the N.Z. flora. There is, for example, no material in the Beckett herbarium. While the mid to high elevation palustral plant communities commonly occupied by *A. palustre* do not immediately suggest adventive status, such sites have been formerly extensively grazed by both sheep and cattle. With its commonly-produced gemmae, this species seems a likely candidate for dispersal by either livestock or aquatic birds. *Aulacomnium palustre* is considered here to be an introduction to the N.Z. flora.

A less likely hypothesis is that *A. palustre* may have been a rare native species that expanded its range following grazing-induced modification of montane wetland plant communities. There are a number of striking similarities between the N.Z. distribution and collection history of *A. palustre* and those of *Climacium dendroides*.

Notes: B.H. Macmillan (pers. comm., 15 Aug. 2008) informed me that she collected *A. palustre* from containers of cultivated plants at the Christchurch Botanical Garden. She speculated that gemmae or plants may have been introduced to the Garden with *Sphagnum* used for horticultural plant propagation.

It is difficult to definitively state that a species is indigenous or adventive, and it is sometimes considered a precept of plant geography that the absence of collections does not indicate a plant species is absent from a given region. However, in the instance of *A. palustre*, which is now (2014) a very widespread and conspicuous component of the montane to alpine vegetation, the failure of discerning and widely travelled 19th century collectors (e.g. Beckett, Berggren, Brown, and others) to collect it provides strong, albeit circumstantial, evidence that this species was either absent or very rare in South I. montane wetlands at the time these collectors were active. Collectively, the capable late 19th to early 20th century South I. collectors were exceedingly unlikely to have failed to collect such a distinctive, [currently] widespread, and [currently] sometimes abundant species. The sudden burgeoning of *A. palustre* collections in the years since 1896 (and particularly since the 1940s) suggests introduction and subsequent rapid range expansion, although indigenous status (and analogous range expansion) cannot wholly be ruled out. The possibility of repeated introductions, possibly with horticultural materials from the northern hemisphere, also cannot be discounted. Neither Dixon (1926), Sainsbury (1955), Beever et al. (1992), nor Fife (1995) has previously questioned the indigenous status of *A. palustre*.

A synopsis of the current, very sparse, knowledge of this species in mainland Australia, Tasmania, and Macquarie I. is appropriate here. The oldest documented mainland Australian collections of *A. palustre* appear to be specimens (in herb. NSW) from the Australian Alps in N.S.W. and confirmed by G. Bell (pers. comm., 21 Aug. 2013). The collections were made in 1901 and 1904 by W. Forsyth and W.W. Watts, respectively. Bell & Catcheside (2006) reviewed the occurrence of *A. palustre* in mainland Australia, and recorded it from four localities “in open grassy swamps amid subalpine sclerophyll woodland” in N.S.W., Vic., and A.C.T.

The few published reports of this species from Tasmania are confusing. By far the oldest Tasmanian report is Wilson’s (1859, p. 192), based on a Gunn collection from “Formosa” near Campbell Town (L. Cave, pers. comm., 20 Aug. 2013). Bell & Catcheside were unable to locate the Gunn collection in any Australian herbarium, but it seems unlikely that Wilson (who noted the Gunn collection had the highly characteristic pseudopodia) would have incorrectly named such a distinctive plant. Bell & Catcheside also considered “the only recent [Tasmanian] specimen at HO [to be] misidentified”. The genus *Aulacomnium* was accepted from Tasmania by both Dalton et al. (1991) and Seppelt et al. (2013) but they neither saw material nor provided significant further information. The status of this species in the Tasmanian flora thus remains unsettled and beyond the scope of this Flora.

The modern occurrence of *A. palustre* on Macquarie I. was documented by Seppelt (2004). Although Seppelt did not consider *A. palustre* adventive there, a reconsideration of its status there, seems warranted.

Recognition: The sparsely branched, erect stems with dense light-brown tomentum, together with leaf shape, the lustrous, abaxially protruding costa and recurved leaf margins make this wetland species distinctive. The abaxially protruding costa and recurved vegetative leaf margins are more conspicuous when dry. Terminal gemmiferous pseudopodia are relatively uncommon in N.Z. material, but when present are highly diagnostic; the pseudopodia are variable in length but often c. 2–3 mm. Occasionally a few highly reduced and modified broadly ovate leaves occur on the pseudopodia below the apical cluster of fusiform gemmae. Under the microscope the collenchymatous and strongly mammillate laminal cells and sinuose nature of the costa provide further distinction. In dried herbarium specimens the gemmae are often fallen leaving the pseudopodia to appear naked. When well developed, *A. palustre* is unlikely to be confused with any other N.Z. species.

Etymology: The epithet refers to this species’ occurrence in swampy or marshy habitats.

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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 |
| x | 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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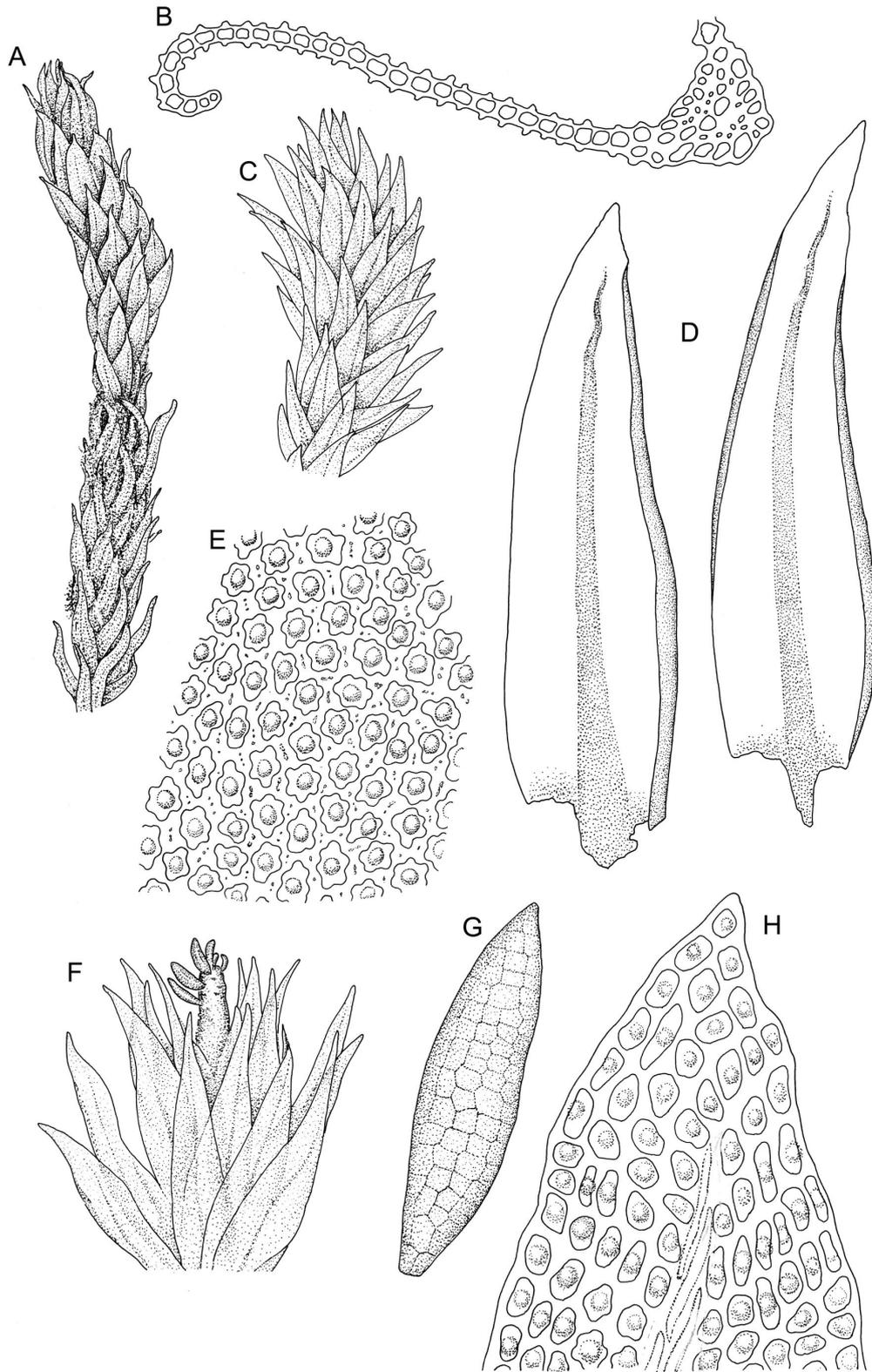
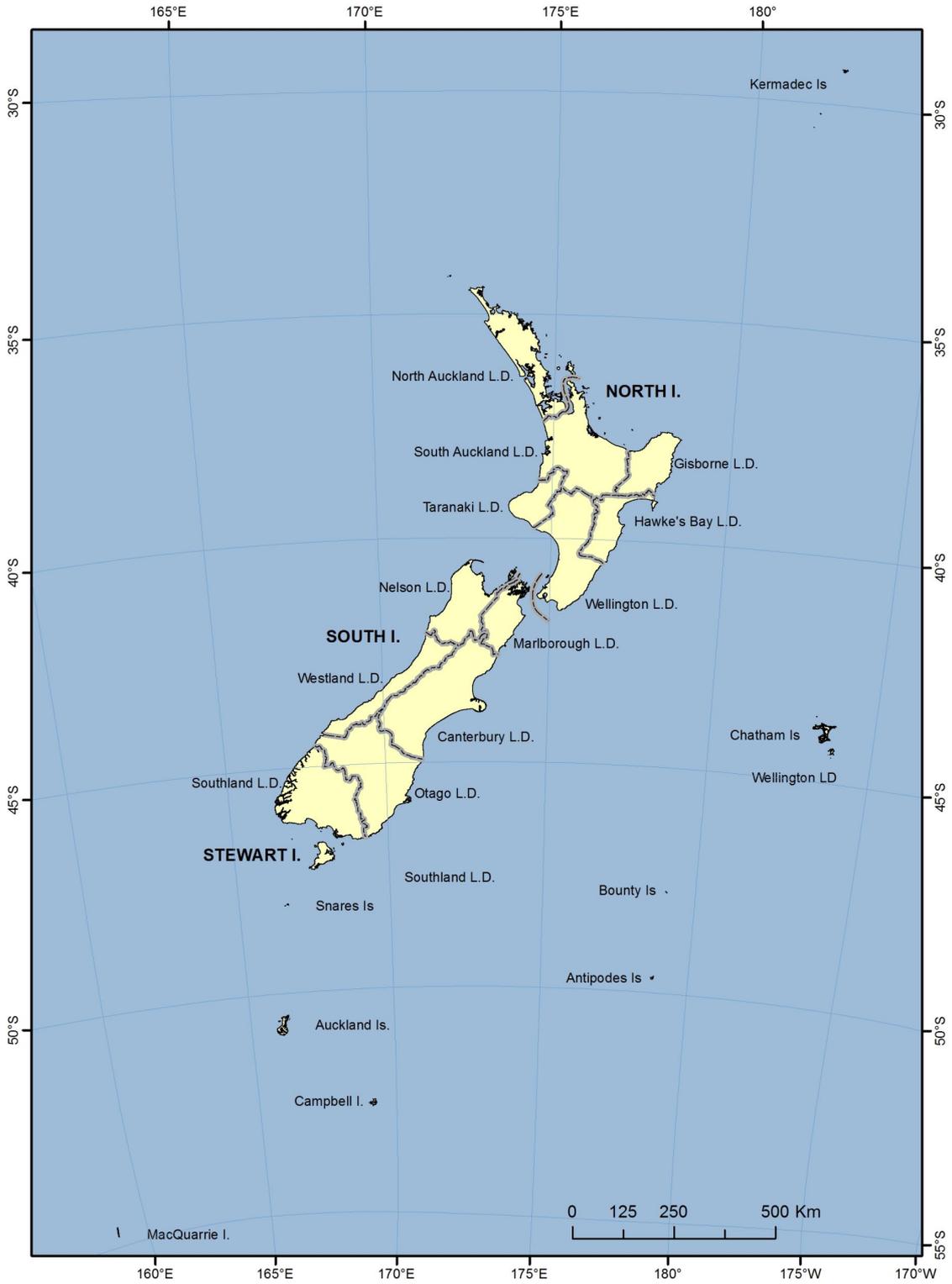
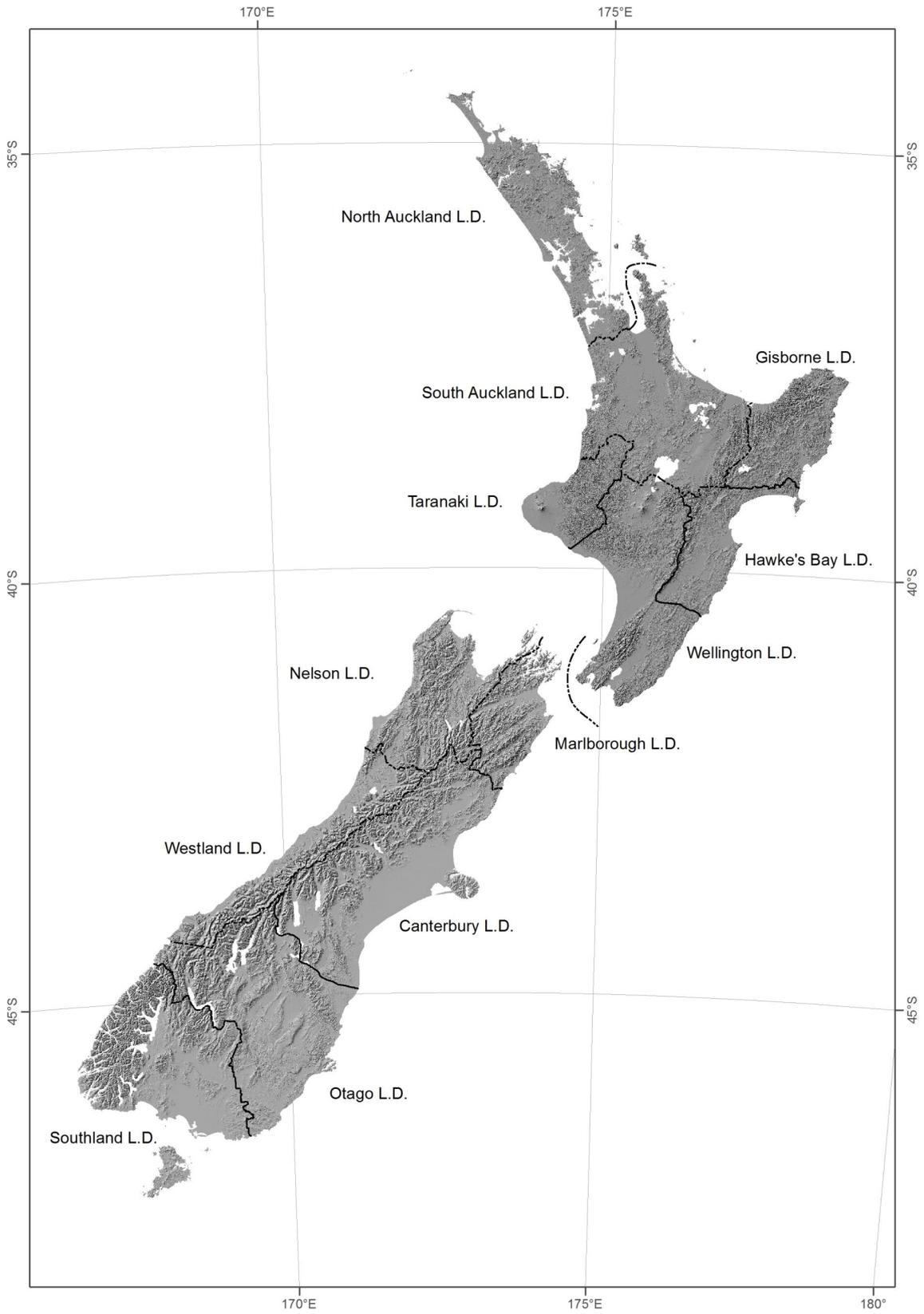


Plate 1: *Aulacomnium*. A–H: *A. palustre*. A, habit, dry. B, cross-section of laminal cells including costa. C, portion of shoot. D, leaves. E, mid laminal cells. F, shoot apex showing pseudopodium and gemmae. G, gemma. H, leaf apex. Drawn from A.J. Fife 5108, CHR 104267.



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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Aulacomnium Schwägr. 1, **2**

Aulacomnium palustre (Hedw.) Schwägr. 1, **2**

Aulacomnium stolonaceum Müll.Hal. 2

Mnium palustre Hedw. 2

Image Information

Image
Plate 1
Map 1
Map 2

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

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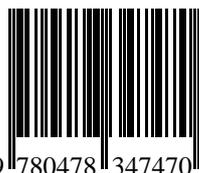
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