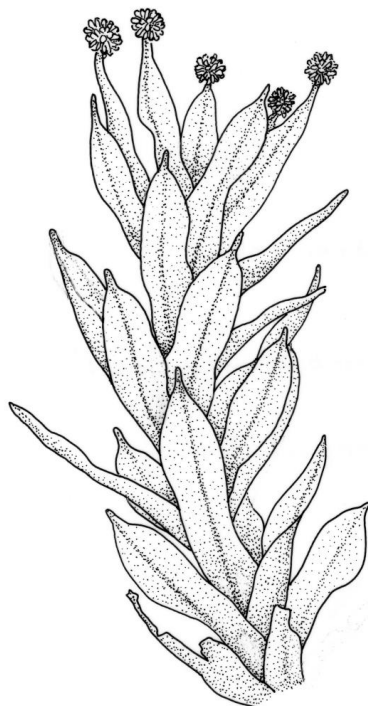


**FLORA OF NEW ZEALAND**  
**MOSSES**

**CALYMPERACEAE**



---

**A.J. FIFE**

Fascicle 12 – SEPTEMBER 2014

© Landcare Research New Zealand Limited 2014.

This copyright work is licensed under the Creative Commons Attribution 3.0 New Zealand license



Attribution if redistributing to the public without adaptation: "Source: Landcare Research"

Attribution if making an adaptation or derivative work: "Sourced from Landcare Research"

#### CATALOGUING IN PUBLICATION

Fife, Allan J. (Allan James), 1951-

Flora of New Zealand [electronic resource] : mosses. Fascicle 12, Calymperaceae / Allan J. Fife. -- Lincoln, N.Z. : Manaaki Whenua Press, 2014.

1 online resource

ISBN 978-0-478-34768-5 (pdf)

ISBN 978-0-478-34747-0 (set)

1. Mosses -- New Zealand -- Identification. I. Title. II. Manaaki Whenua-Landcare Research New Zealand Ltd.

DOI: 10.7931/J25Q4T1F

This work should be cited as:

Fife, A.J. 2014: Calymperaceae. *In*: Heenan, P.B.; Breitwieser, I.; Wilton, A.D. *Flora of New Zealand - Mosses*. Fascicle 12. Manaaki Whenua Press, Lincoln. <http://dx.doi.org/10.7931/J25Q4T1F>

Cover image: *Calymperes tenerum*, habit. Drawn by Rebecca Wagstaff from P.J. de Lange & P.B. Heenan CH1893, CHR 604750.

# Contents

Introduction.....	1
Taxa	
<i>Calymperaceae</i> .....	2
<i>Calymperes</i> Sw. ....	3
<i>Calymperes tahitense</i> (Sull.) Mitt. ....	3
<i>Calymperes tenerum</i> Müll.Hal. ....	4
<i>Syrrhopodon</i> Schwägr. ....	5
<i>Syrrhopodon armatus</i> Mitt. ....	6
References .....	7
Conventions .....	8
Acknowledgements .....	10
Plates .....	11
Maps .....	13
Index .....	15
Image Information .....	16



---

## Introduction

The Calymperaceae are a pantropical family that are taxonomically difficult in most parts of their range. Members of the family grow erect or weakly creeping on tree trunks or rock and often bear spherical clusters of multi-cellular gemmae near the costa apex. The gemma clusters give most of the family members a distinctive and very attractive appearance under a hand-lens or microscope. The abundance of the family, and particularly of its two largest genera, *Calymperes* and *Syrrhopodon*, is a conspicuous feature of the floras of many tropical Pacific islands. New Zealand sits near the family's extreme southern distributional limit and this is reflected in its scant representation here. Only two species of *Calymperes* and one of *Syrrhopodon* occur in N.Z. *Calymperes tenerum* is widespread in the Pacific, south-east Asia, and northern Australia and is reported from scattered sites in the neotropics. In N.Z. it occurs in the Kermadec Is, the Chatham Is, and the extreme northern North I. *Syrrhopodon armatus* is also widespread in the Pacific, including the Kermadec Is, Chatham Is, and northern North I., where it grows as far south as the Coromandel Peninsula. The third N.Z. representative of the Calymperaceae, *Calymperes tahitense*, is widespread in the palaeotropics, including the tropical Pacific islands, and has been collected only once in the Kermadec Is.

---

---

## Calymperaceae

Elements in the following description are taken from Crum & Anderson (1981), Eddy (1990) and Reese & Stone (1995).

**Plants** small to robust, extremely variable in habit, mostly forming tufts or sometimes dense cushions, usually on tree trunks or rocks. **Stems** erect or sometimes creeping (in *Mitthyridium*), often forked. **Leaves** mostly ligulate or lingulate from an erect and pale base, often distinctly shouldered and sometimes dimorphic (with gemmiferous leaves differing in shape from non-gemmiferous leaves), with conspicuous areas of enlarged, thin-walled and pale cells (cancellinae) in the base, usually bordered by either thickened concolourous cells or linear and pellucid cells, and these often intramarginal (teniolae, as in *Calymperes*), usually bearing septate and fusiform or cylindrical gemmae on the lamina or near the tip of the costa; **upper laminal cells** small, firm-walled, mostly round or round-quadrate, often mammillose or papillose on one or both sides; **interior basal cells** sharply differentiated in conspicuous groups (cancellinae) of inflated, empty, hyaline, and often porose cells; **alar cells** not differentiated. **Costa** strong, subpercurrent to excurrent, in cross-section with two stereid bands, often with a generative area at the apex bearing conspicuous clusters of multicellular gemmae. **Gemmae** fusiform or linear, transversely septate.

**Dioicous** (rarely monoicous). **Setae** smooth, mostly elongate; **capsules** erect and cylindrical; **annulus** lacking; **operculum** rostrate. **Peristome** single, of 16 narrow, ± papillose teeth, or absent (in all *Calymperes* and some *Syrrhopodon*). **Calyptra** either cucullate or mitrate and clasping at base, sometimes rough near apex.

**Taxonomy:** The Calymperaceae are a pantropical family occurring predominantly on tree trunks or rock, and only rarely on soil. Goffinet et al. (2009) included eight genera in the family, including several “leucobryoid” genera (such as *Octoblepharum*) in which costa and leaf lamina are composed primarily of dead leucocysts. The relationships to the Leucobryaceae (*sensu* Brotherus 1924) have never been satisfactorily resolved. Reese & Stone (1995) argued for a more restricted concept of the family, including only three genera: *Syrrhopodon*, *Calymperes*, and *Mitthyridium*. The family description above applies to the family in this restricted and traditional sense. The controversy concerning the limits of the family is of little consequence in a N.Z. context, since only two species occur on the main islands and one additional species occurs on the Kermadec Is. Reese et al. (1986) provided a summary of the controversy surrounding family delimitation. Both *Calymperes* and *Syrrhopodon* are large, pantropical genera.

The family and its component genera are taxonomically difficult in all parts of its tropical range. All members of the family have two large and conspicuous areas of thin-walled, enlarged and often porose cells (“cancellinae”) in the leaf base. The cells of the cancellinae contrast sharply in size to the smaller, chlorophyllose cells of the upper lamina. Species very often bear clusters of multi-cellular gemmae near the costal apex, often on its adaxial surface.

No attempt is made either to present here a key that will separate non-N.Z. *Calymperes* from *Syrrhopodon* or to present descriptions of these highly diverse genera. Interested students might wish to consult keys for other regions where the family is more diverse, such as those for Australia (Reese & Stone 1987, 1995), Malesia (Eddy 1990), or the Huon Peninsula, P.N.G. (Reese et al. 1986).

The genus *Mitthyridium* is not documented from N.Z.; it can usually be recognised by conspicuous cancellinae, broad borders of elongate cells that extend far up the leaf margins, a creeping habit, and cucullate, deciduous calyptrae. It is a genus of c. 15–20 species predominantly distributed in palaeotropical regions, including the Pacific islands (Reese & Stone 1995).

- |    |   |                    |
|----|---|--------------------|
| 1  | <b>Leaf margin</b> bearing long, unicellular and patent or retorse spines near base; <b>costa</b> c. 60 µm wide near top of the cancellinae, armed with single-celled spines abaxially, subpercurrent; <b>stems</b> beset below with brick-red rhizoids ..... | <i>Syrrhopodon</i> |
| 1' | <b>Leaf margin</b> lacking spines; <b>costa</b> stouter, c. 100–120 µm wide near top of the cancellinae, lacking abaxial spines, excurrent; <b>stems</b> without conspicuous red rhizoids .....   | <i>Calymperes</i>  |

---

## ***Calymperes* Sw. in Weber, *Tab. Calyptr. Operc.*, 2 (1813)**

**Type taxon:** *Calymperes lonchophyllum* Schwägr.

**Taxonomy:** The genus *Calymperes* can generally be distinguished from *Syrrhopodon* by the presence of an intra-marginal border of elongate cells ("teniola") in the shoulder region of the leaf. The teniolae often extend downwards to the base or nearly so. Unfortunately this feature is absent or nearly so in N.Z. material of *C. tenerum*. The upper leaf margins in this genus may be thickened, but lack elongate cells. If fruit is present, the calyptra is persistent, completely encloses the capsule, and clasps the seta. There is no peristome. Because of the high degree of variability in this large genus, no detailed generic description is given here.

Reese & Stone (1995) considered *Calymperes* to include c. 40 mostly tropical species worldwide and treated 14 species from northern Australia. Reese et al. (1986) treated 21 species from the Huon Peninsula of P.N.G. Only two species occur in the N.Z. Botanical Region and only one of these is documented from the main islands. Neither produce capsules here.

**Etymology:** According to Reese & Stone (1995) the generic name is "from the Greek *calymma*, a covering and *peiro* to pierce through, evidently in reference to the calyptra entirely and permanently covering the capsule and developing fissures through which the spores escape".

- 1       **Stems** c. 7–10 mm; **gemmae** forming a globose cluster at the leaf apex, surrounding the costal tip; **hyaline cells at the distal end of the cancellinae** not forming interdigitating files with chlorophyllose cells; **leaf margins** lacking teniolae, bistratose but not strongly thickened; known from N Auckland, Chatham I., and the Kermadec Is ..... *Calymperes tenerum*
- 1'       **Stems** longer, to at least 35 mm; **gemmae** restricted to the adaxial surface of the leaf tip; **hyaline cells at the distal end of the cancellinae** forming files interdigitating with chlorophyllose cells; **leaf margins** with well-developed teniolae below, very strongly thickened throughout; known only from the Kermadec Is ..... *Calymperes tahitense*

**Excluded Taxa:** *Calymperes graeffeanum* Müll.Hal. was recorded from the Kermadec Is (Raoul I.) by Sykes 1977, as *C. australe* Besch.). The purported 1868 collector, Sallé, is not known to have made any other plant collections from the Kermadec Is. *Calymperes graeffeanum* is widespread in the Indian Ocean, Queensland and Polynesia. Beever et al. (1996) discussed the record and saw the holotype of *C. australe* in BM. They stated: "...it is not surprising that an otherwise obscure collector should have gathered cryptogamic material there [and] the presence of *C. graeffeanum* in the Kermadecs makes phytogeographic sense." It is worth noting that Reese & Stone (1995) state: "*C. graeffeanum* may not be easily distinguishable from *C. tenerum* if gemmiferous leaves are lacking. However, the cancellinae of *C. graeffeanum* are broader and rounded to scalariform distally, rather than truncate as in *C. tenerum*." If gemmiferous leaves are present, *C. graeffeanum* bears gemmae only on the adaxial surface of the leaf tips, in contrast to *C. tenerum*. Miller et al. (1978) attributed *C. hyophilaceum* Besch. to the Kermadec Is; this name was subsequently placed in the synonymy of *C. graeffeanum* by Eddy (1990). Reese & Bartlett (1982) indicated that they were unable to locate the material on which the Miller record was based. No further collections of this species from the Kermadec Is have been made since 1868 and the record must be viewed with doubt.

## ***Calymperes tahitense* (Sull.) Mitt., *J. Linn. Soc., Bot.* 10: 172 (1868)**

as "taitense"

≡ *Syrrhopodon tahitensis* Sull., U.S. Expl. Exped., Musci 6 (1860)

Type: Tahiti *vide* Reese & Stone 1995. Not seen.

**Plants** robust, apparently yellow-green when fresh, terrestrial. **Stems** c. 10–35 mm, with moderately conspicuous, brown, smooth rhizoids in lower portions. **Leaves** loosely contorted when dry, erect-spreading when moist, linear from a slightly broader base, tubulose, the lamina abruptly tapered at apex to a well-developed proboscis, coarsely toothed at apex by multi-cellular teeth, unistratose except at the thickened margins, 6–7 × 1 mm; **cancellinae** extending ¼ to nearly ½ the leaf length, rounded distally, with files of hyaline cells interdigitating among the green cells of the upper lamina, with cells rectangular and mostly c. 45–75(–90) × 25 µm; **leaf margins** very strongly thickened and winged (in cross-section) throughout, with well-developed teniolae extending ⅓ or more the leaf length; **upper laminal cells** ± isodiametric, somewhat irregular, dark green, mostly 3–5 µm diam., appearing smooth in surface view, in cross-section bulging on adaxial surface. **Costa** stout, mostly

---

---

short-excurrent (nearly filling the proboscis and usually extending slightly beyond the “lamina” of the proboscis), not tapered and somewhat swollen at apex, bearing clusters of gemmae on the adaxial apical surface, in cross-section protruding strongly and rounded abaxially, with median guide cells and 2 stereid bands. **Gemmae** not forming spherical clusters, the individual morphology not clearly seen in N.Z. material.

**Presumably dioicous**; male plants only (with numerous perigonia) seen in N.Z. material.

**Illustrations**: Not illustrated here; Whittier 1976, fig. 41; Reese et al. 1986, fig. 21.

**Distribution**: K (Ravine 8).

Palaeotropical. According to Reese & Stone (1995) occurring in northern Queensland, the Comoros, Seychelles, Madagascar, Andamans, Asia, Malesia, Philippines, P.N.G., and Oceania. Whittier (1976, p. 145) provided greater detail concerning its distribution in Oceania. This is a poorly-known species occurring at the limit of its range in the Kermadec Is.

**Habitat**: The sole Kermadec Is collection was made by P. de Lange and D. Havell in May 2009. According to their field notes it grew “on humus and leaf litter overlying hard breccia rock in [a] deep gorge”. According to Reese & Stone (1995) this species grows on “tree trunks and boulders in rainforest along streams” in northern Queensland. They also describe it as “dark green to blackish”; this does not accord with the Kermadec Is collection.

**Notes**: Reese & Stone (1995) briefly discussed an intergradation between this species and the pantropical *C. afzeli*.

**Recognition**: In a N.Z. context, *C. tahitense* is remarkably distinct. The cancellinae and gemmae are obvious even with a hand-lens and clearly distinguish it as belonging to the Calymperaceae. It is a more robust species than *C. tenerum*. The restriction of the gemmae to the adaxial surface of the costal apex, the well-developed teniolae, and the highly distinctive interdigitated files of hyaline and chlorophyllose cells at the distal margin of the cancellinae distinguish this poorly documented (in N.Z.) species.

**Etymology**: The epithet *tahitense* refers to the provenance of the original collection. In some publications (e.g. Reese et al. 1986) the epithet is given as “*taitense*”.

## ***Calymperes tenerum* Müll.Hal., *Linnaea* 37: 174 (1872)**

Holotype: India, *vide* Reese & Stone 1995. Not seen.

**Plants** bright yellow-green below, bright green above when fresh, forming small, dense cushions on trunks. **Stems** c. (3–)7–10 mm; rhizoids inconspicuous. **Leaves** strongly curved inwardly when dry, erect-spreading when moist, monomorphic, scarcely differentiated into a base and upper lamina (“limb”), oblong or panduriform, broadly obtuse or rounded at apex, with a strong and stout mucro bearing a spherical cluster of gemmae, to 2.7 × c. 0.5–0.65 mm (under cover slip); **cancellinae** extending c. ¼ the leaf length, forming a rounded junction distally with chlorophyllose cells, with hyaline cells rectangular and mostly c. 60–75 × c. 30 µm; **leaf margins** lacking both marginal and intra-marginal borders, entire throughout, bistratose above; **upper laminal cells** isodiametric to shortly rounded-rectangular, firm-walled, dark green, mostly c. 6–8 µm in greater diam., appearing mammillose in surface view, in cross-section strongly bulging on adaxial surface. **Costa** stout, shortly excurrent, protruding strongly abaxially and bright yellow in fresh material, in cross-section with median guide cells and two stereid bands, scarcely tapered, swollen at apex, smooth adaxially, strongly mammillose above abaxially, bearing spherical apical clusters of gemmae surrounding the costal apex. **Gemmae** narrowly fusiform, transversely septate, 6–9-celled and c. 150–200 µm long.

**Sexuality** unknown. **Sporophytes** not present in N.Z. material.

**Illustrations**: Plate 1. Whittier 1976, fig. 31, h–k; Eddy 1990, fig. 249; Reese 1994, fig. 154.

**Distribution**: K (Fishing Rock Road, Ring Buster Bluff); NI: N Auckland (Te Paki); Ch (Southern Tablelands, Ocean Mail Scenic Reserve, and Pitt I.).

Pantropical. Widespread in the Pacific, south-east Asia, west to India, and in northern Australia; reported from several scattered western hemisphere localities by Reese (1994).



---

**Habitat:** One Chatham collection (*P.J. de Lange CH713*, AK 297863) was made from “sheltered, shady conditions” on the bark near the base of *Coprosma chathamica* on a ridge at the Sweetwater Covenant on the Southern Tablelands, at 247 m elev., a second from rotting *Corynocarpus* near sea level at Ocean Mail (*P.J. de Lange & P.B. Heenan CH2282*, CHR 604759) and a third (*P.J. de Lange & P.B. Heenan CH1443*, CHR 593694) from a nīkau palm (*Rhopalostylis sapida*) trunk at Waipāua, Pitt I., at 40 m elevation. One Te Pahi collection grew on rotten bark of pōhutukawa (*Metrosideros excelsa*) in association with *Acrolejeunea securifolia* and *Macromitrium brevicaulis*; a second Te Pahi collection grew between pōhutukawa roots overlying a serpentine boulder in an ephemeral stream bed.

**Notes:** One of the Kermadec Is collections (Ring Buster Bluff) is unusual by its general lack of terminal clusters of gemmae. However, in a few stems of this collection the terminal “generative areas” at the end of the costae can be seen and the collection is in other respects representative of *C. tenerum*. Fife & de Lange (2009) speculated that shearwater-mediated transport of gemmae may have led to the establishment of *C. tenerum* on the Chatham Is.

**Recognition:** Peter de Lange (pers. comm., 7 Oct. 2008), who has made all the N.Z. gatherings, considers this species to be “a distinctive honey-brown or bright yellow colour” when dry; in Fiji the fresh plants are usually dark green when dry and only the costae and/or the lower portions of the shoots are yellow-tinged.

The distinctive cancellinae, which are obvious even with a hand-lens, and the apical cluster of gemmae on most leaves will place this species as a member of the family Calymperaceae. Compared with its congener *C. tahitense*, this is a much smaller plant with gemmae surrounding the terminus of the costa. The leaves of *C. tenerum* lack teniolae and their cancellinae lack the interdigitated files of green and hyaline cells that characterise *C. tahitense*.

*Calymperes tenerum* is likewise very distinct from our one species of *Syrrhopodon* by its lack of both a leaf border and basal marginal spines, as well as the nature of its terminal gemmae clusters. *Calymperes tenerum* could be taken for a small epiphytic species of *Syntrichia*, such as *S. papillosa* or *S. laevipila*. The widespread *S. papillosa* has irregularly shaped gemmae scattered on the abaxial costal surface and a long-excurrent costa. *Syntrichia laevipila* likewise has a long-excurrent costa, but its gemmae occur in a cluster at the apex of the stem. Neither of these two species has cancellinae in the leaf base.

**Etymology:** The epithet *tenerum* means delicate or soft.

## ***Syrrhopodon* Schwägr., Sp. Musc. Frond. Suppl. 2 (1), 110 (1824)**

**Type taxon:** *Syrrhopodon gardneri* (Hook.) Schwägr.

**Taxonomy:** Species of *Syrrhopodon*, in contrast to *Calymperes*, usually lack teniolae in the shoulder region. The upper margin of the leaf is mostly thickened, often conspicuously toothed, and bordered by either elongate cells (as in the N.Z. species) or by thick-walled and short cells. If fruit is present the calyptra is cucullate and deciduous; a single peristome may be present or absent. Because of the high degree of variability in this genus, no detailed description is given here.

Reese & Stone (1995) considered *Syrrhopodon* to include approximately 80–90 species and treated 19 species from Australia. Reese et al. (1986) treated 25 species from the Huon Peninsula of P.N.G. In N.Z. only a single species occurs, in coastal situations in the north.

**Etymology:** According to Reese & Stone (1995) the generic name is “from the Greek *syrrrepo* (to close the eye) and *donti* (tooth), in reference to the narrow, connivent, horizontal peristome teeth of some species that ‘close’ the mouth of the capsule when dry”.

---

***Syrrhopodon armatus* Mitt., *J. Proc. Linn. Soc., Bot. 7: 151 (1863)***

Type: Africa (Cameroon). Not seen.

= *Syrrhopodon fimbriatulus* Müll.Hal., *J. Mus. Godeffroy 3: 52 (1874)*

Type: Queensland. Not seen

**Plants** small, pale white- or brown-green, forming tufts or sparse turves. **Stems** simple or sparsely forked, <2–10 mm, beset below with strongly papillose, brick-red rhizoids, in cross-section lacking a central strand. **Leaves** strongly curved when dry, straight and ± erect when moist, with a moderately distinct oblong, pale, and sheathing base and a distinct upper lamina (or limb) most obvious when dry, usually appearing swollen at apex because of yellow-green adaxial masses of gemmae, c. 2.5–3.0 × 0.25–0.4 mm, with base c. 1/3 the total length; **cancellinae** reaching 1/4 to nearly 1/3 the leaf length, with hyaline cells oblong, thin-walled, and mostly 45–60 × c. 25–30 µm; **margin of the leaf base** with 1–3 rows of elongate cells, the outermost bearing many (commonly 10–12) unicellular, patent or sometimes retrorse spines (c. 60–75 µm long), these reduced or lacking in some leaves; **the upper lamina** (limb) ligulate to narrowly linear, rounded and broadly acute at apex, entire except for a few small crenulations above, often with a small mucro, involute at margin throughout or ± plane in patches, with a narrow and pellucid border c. 8–10 µm and c. 2 cells wide; **upper laminal cells** (of limb) oblong, firm-walled, unipapillose on both surfaces with tall and conspicuous papillae, mostly c. 10–15 × 6–8 µm, somewhat shorter near apex. **Costa** strong, subpercurrent, c. 45–60 µm wide at base of limb, scarcely tapered, usually ending in a few pellucid cells to form a small mucro, with conspicuous single-celled abaxial spines. **Gemmae** borne in yellow-green masses at leaf tip, mostly 4–6-celled and c. 75 × 25 µm.

**Presumably dioicous. Sporophytes** unknown from N.Z.

**Illustrations:** Plate 2. Reese & Bartlett 1982, fig. 1, pl. 1 (as *S. fimbriatulus*); Reese et al. 1986, fig. 67 (as *S. fimbriatulus*); Eddy 1990, fig. 213, b (as *S. fimbriatulus*).

**Distribution:** K (track to Dripping Wells Terraces, Moumoukai Track); NI: N Auckland (Surville Cliffs, Whangaruru North Head) including offshore islands (PK, GB), S Auckland (Hot Water Beach, Pāuanui); Ch (Wairarapa Creek, Rabbit I.).

Palaeotropical. According to Reese & Stone (1995) widespread in northern and eastern Australia (south to Jervis Bay); they also indicate it to be “widespread in the paleotropics”.

**Habitat:** Fewer than 10 N.Z. specimens have been seen. Three of them occurred on the caudices of tree ferns (two from *Cyathea dealbata*; one unspecified), and a fourth from decaying “stump of *Astelia banksii*”. The Kermadec Is collections are from trunks of *Metrosideros kermadecensis*. Collections from Rabbit I. in the Chatham Is and from Aorangi I. in the Poor Knights Is were both associated with petrel burrows, the latter from “bare, compacted humusy soil, sloping in heavily burrowed petrel area; under high, medium dense canopy of pōhutukawa forest”. A 2008 collection from Pāuanui, *P.J. de Lange 7361* (AK 302195), came from “very dry, coarse, rhyolitic soil, colluvium and rock amongst *Picris burbridgeae*, *Fissidens leptocladus* and *Trichostomum cf. brachydontium*.” All known collections are from coastal areas, from sea level to c. 180 m.

**First record:** The species was first discovered in N.Z. by J.K. Bartlett at Hot Water Beach on the Coromandel Peninsula (S Auckland L.D.).

**Notes:** Reese & Stone (1995) characterised this as “the most common and widespread member of the genus *Syrrhopodon* in Australia” and noted that “the pale green, glaucous appearance, uncinately-curved leaves mostly with conspicuous cilia on the shoulder, often spinose costae, and unipapillose cells are diagnostic”.

**Recognition:** Although the dry plants of *S. armatus* bear some resemblance to species of *Tortella*, the strongly ciliate basal margins and the well-developed cancellinae make this species unmistakable among N.Z. mosses.

**Etymology:** The epithet *armatus* means equipped or armed and refers to the ciliate shoulders of the leaves.

---

## References

- Beever, J.E.; Fife, A.J.; West, C.J. 1996: Mosses of the Kermadec Islands, northern New Zealand. *New Zealand Journal of Botany* 34: 463–471.
- Brotherus, V.F. 1924: Musci (Laubmoose). II. Spezieller Teil. In: Engler, A. (ed.) *Die natürlichen Pflanzenfamilien*. Edition 2. Bd 10. Engelmann, Leipzig. 143–478.
- Crum, H.A.; Anderson, L.E. 1981: *Mosses of Eastern North America*. Columbia University Press, New York.
- Eddy, A. 1990: *A Handbook of Malesian Mosses*. Vol. 2. Leucobryaceae to Buxbaumiaceae. Natural History Museum Publications, London.
- Fife, A.J.; de Lange, P.J. 2009: *Calymperes tenerum* Müll.Hal. (Calymperaceae) on the Chatham Islands, New Zealand. *Australasian Bryological Newsletter* 57: 14–16.
- 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.
- Miller, H.A.; Whittier, H.O.; Whittier, B.A. 1978: Prodrum florae muscorum Polynesiae: with a key to genera. *Bryophytorum Bibliotheca* 16: 1–334.
- Mitten, W. 1863: On the Musci and the Hepaticae from the Cameroons Mountain and from the river Niger. *Journal of the Proceedings of the Linnean Society. Botany*. 7: 147–169.
- Mitten, W. 1868 ("1869"): A list of the Musci collected by the Rev. Thomas Powell in the Samoa or Navigator's Islands. *Journal of the Linnean Society. Botany*. 10: 166–195.
- Müller, C. 1872: Musci Indici Novi abjectis nonnullis aliis exoticis. *Linnaea* 37: 163–182.
- Müller, C. 1874: Musci Polynesiaci praesertim Vitiani et Samoani Graeffeani. *Journal des Museums Godeffroy* 3(6): 51–90.
- Reese, W.D. 1994: Calymperaceae. In: Sharp, A.J.; Crum, H.A.; Eckel, P.M. (ed). The Moss Flora of Mexico. *Memoirs of the New York Botanical Garden* 69: 187–210.
- Reese, W.D.; Bartlett, J.K. 1982: *Syrrhopodon fimbriatulus* C. Müll., and the family Calymperaceae (Musci), new to New Zealand; and notes on Calymperaceae from the New Zealand island territories. *Journal of Bryology* 12: 209–214.
- Reese, W.D.; Koponen, T.; Norris, D.H. 1986: Bryophyte flora of the Huon Peninsula, Papua New Guinea. XIX. *Calymperes*, *Syrrhopodon*, and *Mitthyridium* (Calymperaceae, Musci). *Acta Botanica Fennica* 133: 151–202.
- Reese, W.D.; Stone, I.G. 1987: New records of Australian Calymperaceae and keys to Australian species of *Calymperes*, *Mitthyridium*, and *Syrrhopodon*. *Journal of Bryology* 14: 487–493.
- Reese, W.D.; Stone, I.G. 1995: The Calymperaceae of Australia. *Journal of the Hattori Botanical Laboratory* 78: 1–40.
- Schwägrichen, C.F. 1823–1824: *Species Muscorum Frondosorum, Supplementum Secundum*. Vol. 1. Barth, Leipzig.
- Sullivant, W.S. 1860: Musci. In: *United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes U.S.N.* Vol. 17. Botany 1. Cryptogamia ii. Phanerogamia of the Pacific Coast of North America. C. Sherman, Philadelphia. [1]–32.
- Sykes, W. R. 1977: Kermadec Islands Flora: An annotated check list. *Bulletin, New Zealand Department of Scientific and Industrial Research* 219: [1]–216.
- Weber, F. 1813: *Tabula Exhibens Calyptratarum Operculatarum sive muscorum frondosorum genera auctore Friderico Weber*. C. F. Mohr, Kiel.
- Whittier, H.O. 1976: *Mosses of the Society Islands*. University Presses of Florida, Gainesville.

---

# 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*.

---

## Acknowledgements

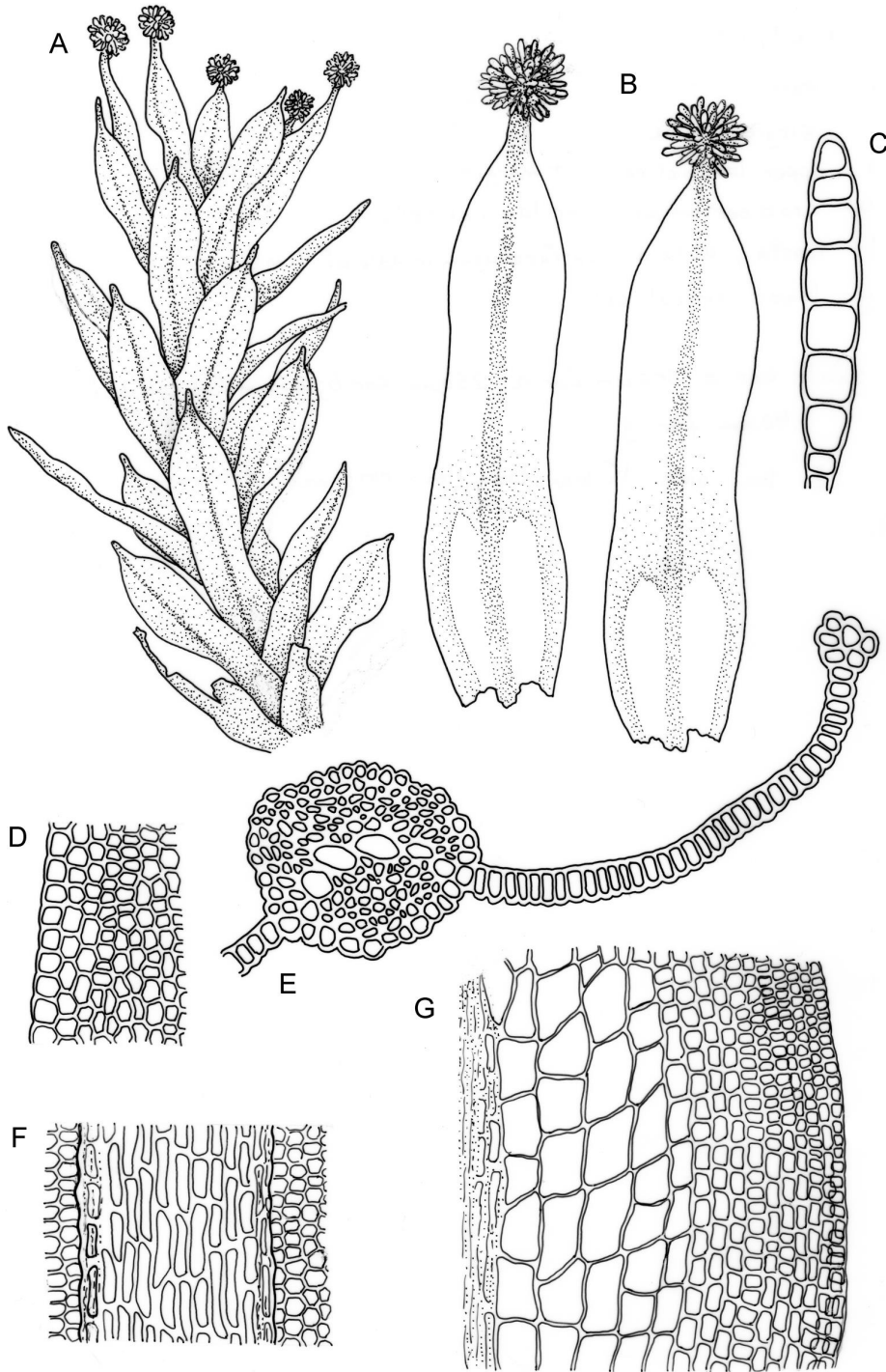
Jessica Beever provided advice during the preparation of this treatment. Rod Seppelt read the manuscript and suggested many worthwhile improvements. Rebecca Wagstaff prepared the line drawings with patience and skill. Peter de Lange of the Department of Conservation allowed the study of his many critical collections of this family, and deserves special thanks. Peter Heenan and Ilse Breitwieser encouraged me to submit this manuscript to the eFlora of New Zealand series. Sue Gibb, Aaron Wilton, and Katarina Tawiri converted the manuscript into a format suitable for electronic publication, and Christine Bezar provided skilled editing.

I thank the participants, over many years, of the John Child Bryological and Lichenological Workshops and the curators of AK and WELT for allowing me to study their specimen holdings. The preparation of this revision was supported by Core funding for Crown Research Institutes from the Ministry of Business, Innovation and Employment's Science and Innovation Group.

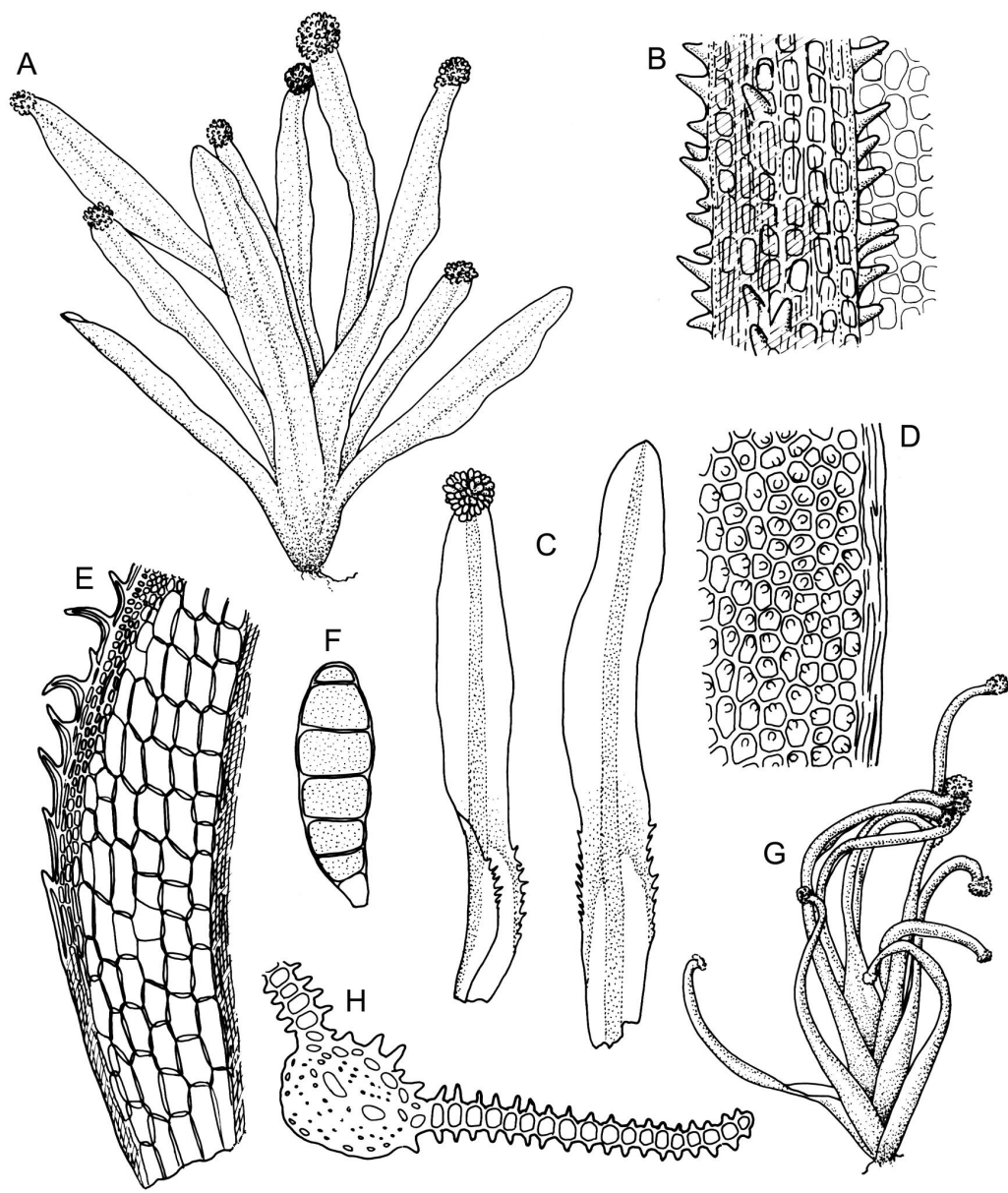
### **A.J. Fife**

Landcare Research, PO Box 69040, Lincoln 7640, New Zealand

FifeA@landcareresearch.co.nz

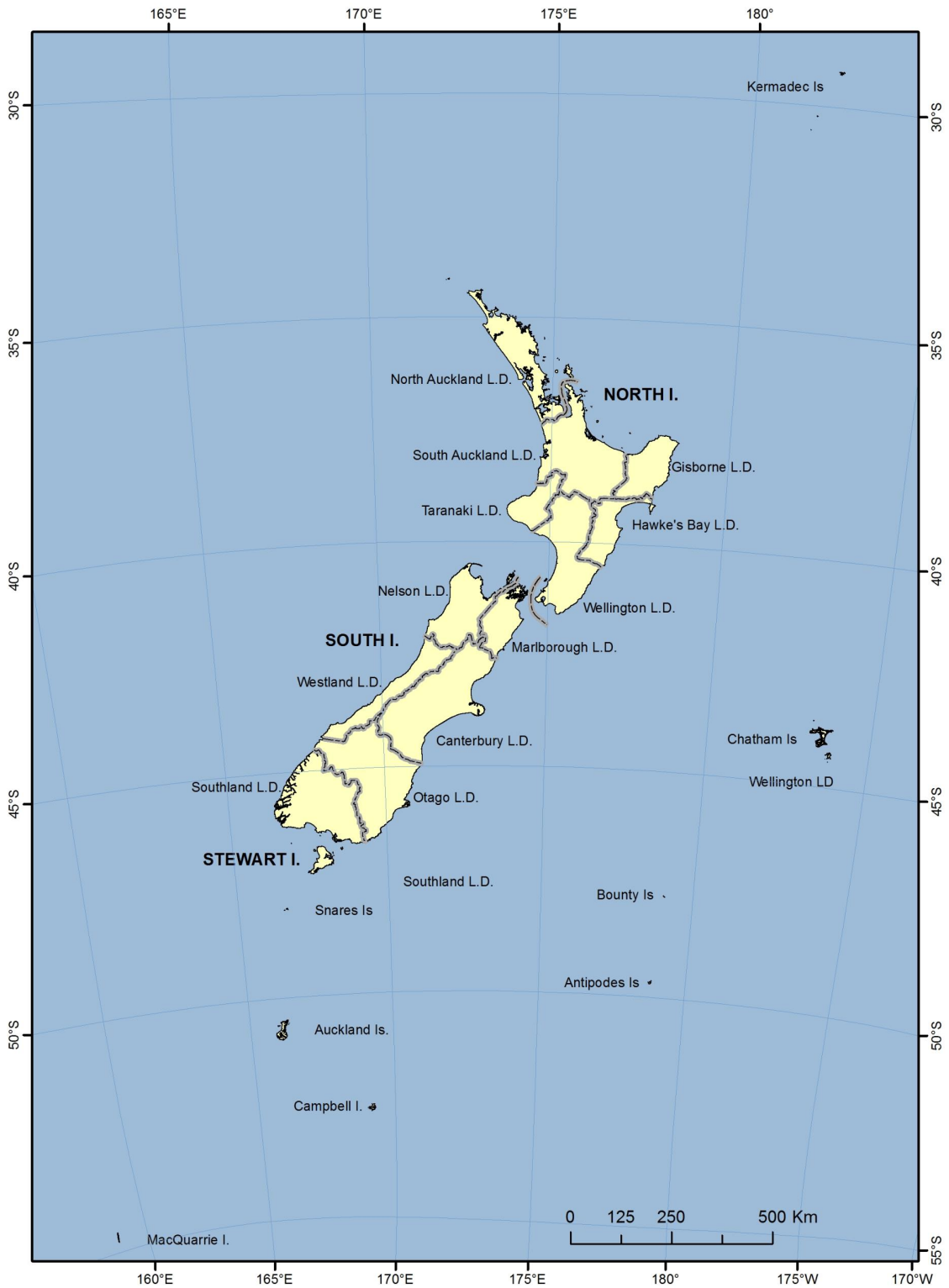


**Plate 1: *Calymperes*. A–G: *C. tenerum*.** A, habit. B, leaves. C, gemma. D, upper laminal cells at margin. E, cross-section of upper laminal cells including costa. F, costa, abaxial surface from middle of limb. G, lower laminal cells from costa to margin, including cells of cancellina. Drawn from *P.J. de Lange & P.B. Heenan CH1893, CHR 604750*.

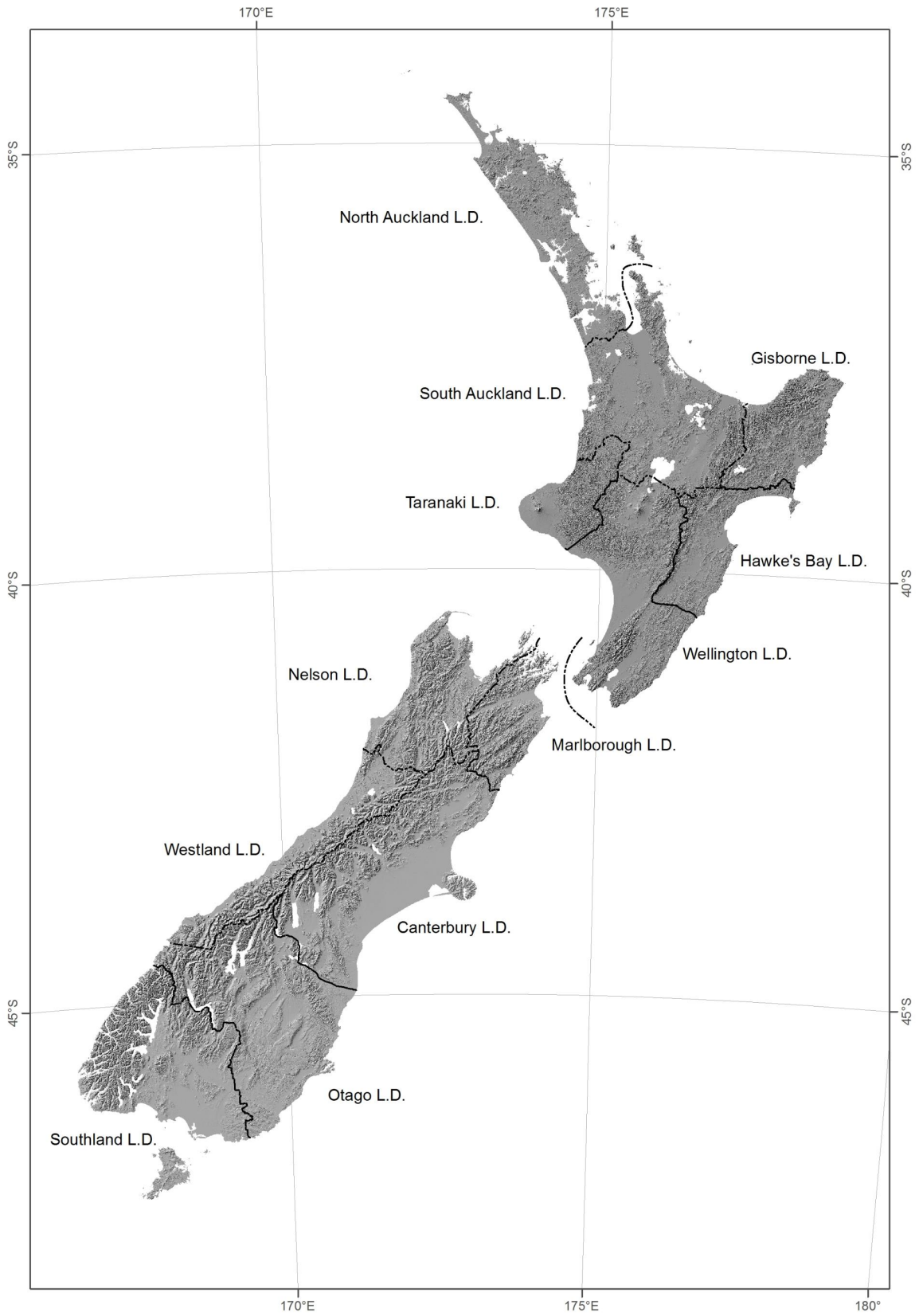


**Plate 2: *Syrrhopodon*. A–H: *S. armatus*.** A, habit. B, costa, abaxial surface. C, leaves. D, upper laminal cells at margin. E, lower laminal cells from costa to margin, including cells of cancellina. F, gemma. G, habit, dry. H, cross-section of upper laminal cells including costa. Drawn from *J.E. Beever* 32-25, CHR 406130.





**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.

*Calymperaceae* 1, **2**, 5

*Calymperes* Sw. 1, **3**, 5

*Calymperes tahitense* (Sull.) Mitt. 1, **3**, 5

*Calymperes tenerum* Müll.Hal. 1, 3, **4**

*Syrrhopodon* Schwägr. 1, 5, **5**, 6

*Syrrhopodon armatus* Mitt. 1, **6**

*Syrrhopodon fimbriatulus* Müll.Hal. 6

*Syrrhopodon tahitensis* Sull. 3

---

## Image Information

<b>Image</b>	<b>Creator</b>	<b>Copyright</b>
Plate 1	R.C. Wagstaff	© Landcare Research 2014
Plate 2	R.C. Wagstaff	© Landcare Research 2014
Map 1	A.D. Wilton	© Landcare Research 2014
Map 2	A.D. Wilton	© Landcare Research 2014

---

## Flora of New Zealand: PDF publications

The electronic Flora of New Zealand (**eFloraNZ**) project provides dynamic, continually updated, online taxonomic information about the New Zealand flora. Collaborators in the project are Landcare Research, the Museum of New Zealand Te Papa Tongarewa, and the National Institute of Water and Atmospheric Research (NIWA).

The eFloraNZ presents new systematic research and brings together information from the Landcare Research network of databases and online resources. New taxonomic treatments are published as fascicles in PDF format and provide the basis for other eFloraNZ products, including the web profiles.

eFloraNZ will have separate sets of PDF publications for algae, lichens, liverworts and hornworts, mosses, ferns and lycophytes, and seed plants.

For each eFloraNZ set, the PDF files are made available as dated and numbered fascicles. With the advent of new discoveries and research, the fascicles may be revised, with the new fascicle being treated as a separate version under the same number. However, superseded accounts will remain available on the eFlora website.

### **Moss Set (ISBN 978-0-478-34747-0)**

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

Authors Allan Fife and Jessica Beever intend to publish *Flora of New Zealand Mosses* as a book. However, they decided to make completed family treatments available through the eFloraNZ project in advance of being published in hardcopy, to enable immediate use.

**Editor-in-Chief:** Ilse Breitwieser

**Series Editors:** Peter Heenan (Principal), Ilse Breitwieser, Aaron Wilton

**Steering Committee:** Ilse Breitwieser, Pat Brownsey, Peter Heenan, Wendy Nelson, Aaron Wilton

**Technical production:** Aaron Wilton with Kate Boardman, Bavo de Pauw, Sue Gibb, Ines Schönberger, Katarina Tawiri, Margaret Watts

**Copy Editor:** Christine Bezar



ISBN 978-0-478-34747-0



9 780478 347470