

The family Calymperaceae (Bryophyta) in Australia. Part 5: The genus *Syrrhopodon*

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Abstract

Twenty species of the moss genus *Syrrhopodon* Sw. ex F.Weber are known from Australia. Each species is described and illustrated in detail, and a key to species and distribution maps are provided.

Introduction

Twenty species of *Syrrhopodon* have been reported from Australia (Reese and Stone 2012), making it the most diverse genus of Calymperaceae on the continent. Two nomenclatural changes are accepted in this updated treatment of *Syrrhopodon* since Reese and Stone (2012):

- *Syrrhopodon katemensis* (Zanten) L.T.Ellis replaces *S. prolifer* var. *mossmansensis* W.D.Reese, now considered as a synonym *vide* Ellis (2003). Distinctive features of *S. katemensis* include the smooth costa and chlorophyllose lamina composed of small, densely papillose cells.
- *Syrrhopodon semperi* Müll.Hal., is added to the Australian flora.

SYRRHOPODON Schwägr., *Spec. Musc. Suppl.* 2(2): 110 (1824).

Type species: *Syrrhopodon gardneri* (Hook.) Schwägr., designated by Britton (1989).

Plants solitary or gregarious, forming tufts or low patches. Stems erect or inclined, simple or branched, thin, dark, central strand absent. Leaves variable, usually narrow, with broader erect sheathing bases and erect to patent limbs; margins usually bordered by elongate hyaline cells, or border lacking; margins mostly pluristratose if border lacking. Costa smooth or papillose, in section with a row of guide cells and typically well-developed adaxial and abaxial stereid bands; reaching leaf apex or nearly so, commonly developing clusters of fusiform, multicellular gemmae at the tips. Chlorophyllose lamina typically unistratose, of \pm isodiametric cells which may be smooth, mammillose or pluripapillose. Leaf base composed mainly of hyaline cells (the hyaline

lamina) of variable extent, usually sharply delimited from chlorophyllose lamina cells and usually bordered by differentiated elongate cells. Gemmae clavate or filamentous, mostly borne at apex of costa; specialised gemma receptacles and highly modified gemmiferous leaves are rare. Dioicous. Male and female plants similar. Capsules borne on slender seta, urn cylindrical, operculum erect, subulate-rostrate. Peristome, when present, simple, of 16 undivided narrow coarsely papillose teeth. Calyptra relatively narrow, cleft at maturity.

Etymology: Greek *syrrhōpos* (close together) + *-odon* from *odous* (tooth), referring to the connivent teeth of the peristome.

Syrrhodon is a widespread, diverse and almost exclusively tropical and subtropical genus of about 80 to 90 species. Most species are found in low to medium altitude rainforests, growing on bark, but some grow on soil or rock and a few are epiphyllic. *Syrrhodon* has a broader ecological range than either of the non-leucobryoid genera *Calymperes* or *Mitthyridium*.

In contrast to all other genera of Calymperaceae, which are monophyletic, phylogenetic analyses (Fisher *et al.* 2007, Pereira *et al.* 2019) demonstrate that *Syrrhodon* is polyphyletic. However, whether this polyphyly affects Australian species is not clear, and we therefore choose to keep all Australian species currently accepted in *Syrrhodon* in that genus.

The differentiated leaf margin found in many species of Calymperaceae is often useful in separating *Calymperes* from *Syrrhodon*. In many species of *Calymperes* there is a narrow strip of elongate, often thick-walled hyaline intramarginal cells in the sheathing leaf base. In *Syrrhodon* the sheathing base is often bordered by elongate cells, but they are never intramarginal.

Syrrhodon differs primarily in habit from *Mitthyridium*, which has a creeping primary stem and leaves with a uniformly unistratose border. *Syrrhodon* has an upright habit, and the hyaline border, if present at all, is typically more than one cell thick.

In the following treatment the descriptions are based on studies of a representative sample of collections held in Australian herbaria, supplemented by our own collections. The symbol !d indicates that a high-resolution digital image has been seen via JSTOR Global Plants 2022 (www.plants.jstor.org). Synonyms cited are of Australian taxa only; for other synonyms, see the literature cited for each species.

Key to the species of *Syrrhodon* in Australia

- 1 Margins at leaf shoulders dentate, serrate or ciliate on at least some leaves (usually most) 2
1. Margins at leaf shoulders entire or nearly so 8
- 2 Leaf margins with delicate cilia from the shoulders almost to the apex *S. ciliatus*
2. Leaf margins toothed or ciliate only at or near shoulders, although limb may be finely dentate by projecting cell ends 3
- 3 Leaf border lacking elongate hyaline cells 4
3. Leaf border composed entirely or in part of elongate hyaline marginal cells 5
- 4 Leaves with margins weakly bordered, sharply dentate-serrate at shoulders; hyaline lamina sharply delimited, in about 8–10 rows either side of costa *S. gardneri*
4. Leaves with margins of limb thickened, with strongly developed but largely concealed marginal stereomes, long-ciliate at shoulders; hyaline lamina occupying almost entire sheath, tapering upwards and ending at base of limb at an acute angle *S. perarmatus*
- 5 Leaves mostly 4–9 mm long with bases usually glossy red-brown, contrasting strongly with limb, hyaline lamina small, mostly eroded *S. croceus*
5. Leaves mostly less than 5 mm long with bases pale to dark green, not red-brown, not contrasting strongly with limb, hyaline lamina conspicuous, intact 6
- 6 Cells of limb unipapillose on both surfaces, the papillae often tall and conspicuous; leaf shoulders with delicate cilia *S. armatus*
6. Cells of limb with multifid papillae; cilia present or lacking on leaf shoulders 7

- 7 Plants pale to olive green to brownish; leaves spreading to patent, little altered wet or dry, 2.5–4.0 mm long; costa hispid on both surfaces in limb; hyaline lamina sharply delimited, occupying almost entire leaf sheath, \pm scalariform, ending at a narrow acute angle to the costa, penetrating quite high into base of limb, bordered by a narrow band of 3–4 rows of thick-walled elongate cells *S. spiculosus*
7. Plants dark green to brownish green or rusty green; leaves involute and uncinately curled when dry, straight to slightly incurved when moist, 1.5–2.5 mm long; costa mostly smooth; lamina cells of limb papillose with multifid or coronate papillae, thick-walled, rounded-quadrate; hyaline lamina of relatively few rows of cells, rounded distally or weakly scalariform, bordered marginally by elongate cells of leaf border *S. semperi* (see also *S. trachyphyllus* 20)
- 8 Hyaline lamina occupying half or more leaf length 9
8. Hyaline lamina occupying less than half leaf length 11
- 9 Plants growing exclusively on *Platycterium* ferns; leaf limb strongly helically twisted above shoulders when dry, straight when moist *S. platycerii*
9. Plants growing on other substrates; leaf limb straight or variously contorted when dry but not helically twisted 10
- 10 Leaf margins conspicuously and evenly serrate in upper half; chlorophyllose lamina cells filling the leaf limb, hyaline lamina reaching $2/5$ – $1/2$ leaf *S. confertus*
10. Leaf margins entire or toothed at apex only, erect, involute or revolute; chlorophyllose cells confined to apical region of leaf, hyaline lamina filling at least $3/4$ of leaf length *S. involutus*
- 11 Leaf margins lacking elongated hyaline cells 12
11. Leaf margins composed at least in part of elongated hyaline cells 13
- 12 Leaves monomorphic, narrowly linear-acuminate from a slightly wider sheathing base, 5–12 mm long *S. aristifolius*
12. Leaves dimorphic, broadly lanceolate, sheathing base no wider than the limb, 2.5–4.0 mm long *S. stoneae*
- 13 Elongate hyaline cells of leaf marginal stereome \pm covered by shorter square to rectangular cells; leaves stiffly erect *S. muelleri*
13. Elongate hyaline cells of leaf margins exposed; leaves variously contorted or straight when dry 14
- 14 Leaf margins distinctly serrate, at least in upper third, margins conspicuously bordered with a pellucid marginal stereome *S. tristichus*
14. Leaf margins entire, or toothed only at extreme apex 15
- 15 Lamina cells of limb smooth, or mostly unipapillose 16
15. Lamina cells of limb pluripapillose 18
- 16 Leaves spreading-patent wet or dry, the limb bent outwards and commonly with a half twist; cells of chlorophyllose lamina mostly unipapillose *S. albovaginatus*
16. Leaves erect to erect-appressed when dry; cells of chlorophyllose lamina mostly smooth or unipapillose, the papillae sometimes bifid or trifid 17
- 17 Cells of chlorophyllose lamina conspicuously spinose-papillose with tall simple or apically divided papillae; gemmae fusiform clavate, adaxial on leaf tips *S. cyrtacanthos*
17. Cells of chlorophyllose lamina smooth or inconspicuously unipapillose with low undivided straight papillae; gemmae filamentous, adaxial at mid leaf *S. parasiticus*
- 18 Plants growing mostly on the dried base of *Platycterium* ferns; leaf limb helically twisted when dry *S. platycerii*
18. Plants not growing on *Platycterium* ferns; leaf limb straight to variously contorted when dry but not helically twisted 19

- 19 Leaves erect to erect-spreading wet or dry, not otherwise contorted *S. spiculosus*
19. Leaves variously contorted when dry, not spreading-patent..... 20
- 20 Plants dark green to brownish green or rusty green; leaves oblong to ligulate from a slightly broader base, 1.5–2.5 mm long..... *S. trachyphyllus*
20. Plants pale green to olive green; leaves narrowly lanceolate, 2–5 mm long..... 21
- 21 Leaves 2–5 mm long; lamina cells at mid limb about 6–8 μm ; cells of limb with low, inconspicuous papillae on both surfaces *S. prolifer*
21. Leaves 1.5–2.0 mm long; lamina cells at mid limb about (6–)8–10(–12) μm ; cells of limb with a single tall, stout multifid papilla on both surfaces *S. katemensis*

1. *Syrrhopodon albovaginatus* Schwägr., *Spec. Musc. Suppl.* 2(2): 112, pl. 131 (1824).

Original material: ‘Ad ligna in insula Radack [Rawack] moluccensi lectum misit cl. Gaudichaud, Freycineti peregrinatoris socius, per manum cl. Gay.’

Type: Indonesia: Maluku Islands, *C. Gaudichaud-Beaupré s.n., s.d.* (before 1824); lectotype: (designated by Ellis 2011) G00042877, not seen; isoelectotypes: G00048221, G00124234, BM000675307, BM000675278, BM000675279, BM000675281, BM000675282, BM000675291, BM000675296 (all designated by Ellis 2011, not seen), PC0100823!d, PC0100824!d.

Illustrations: Fig. 1. Also Ellis and Tan (1999: 30).

Description: Plants small, to 2 cm tall but mostly shorter, occasionally taller; pale glaucous green, forming low mats or tufts. Stems erect, mostly simple, slender; rhizoids red. Leaves \pm patent wet or dry, from an erect colourless sheathing base 2.0–4.0 mm long, narrowed abruptly to a linear-ligulate limb, the limb bent outwards and commonly with a half twist; leaf blade typically less than twice the length of the sheath, \pm parallel-sided, narrowed to an acute to subacute, serrate apex; leaf surface on the limb appearing hispid with conically projecting cells arranged in \pm obliquely transverse rows; margins of limb serrate for about half or more down limb from apex; margins distinctly bordered in blade and sheath. Costa ending below leaf tip, denticulate on both adaxial and abaxial surfaces. Lamina cells variable in size, rounded-quadrate, thick-walled, smooth or with conical projecting surfaces. Hyaline lamina occupying whole of leaf sheath, sharply delimited, scalariform, obliquely narrowing to costa above; lamina narrowly decurrent down sides of the hyaline lamina. Sporophytes apparently uncommon. Calyptra to 2 mm long. Seta 6–12 mm long, reddish-brown; capsule about 1.5 mm long, 0.5 mm wide; operculum slenderly long-rostrate, about 1.0 mm long; peristome teeth yellow, fragile, slenderly pointed, about 120 μm long, papillose, with faint transverse bars. Spores 9–12 μm in diameter, finely granular.

Etymology: Latin *albovaginatus* (with a white sheath), referring to the pale sheathing base of the leaves when dry.

Distribution: North-eastern Queensland, between Iron Range and Bellenden Ker Range (Fig. 21.1). Also known from south-eastern Asia (Thailand), Malesia, North Borneo, Philippines, Papua New Guinea, Oceania (New Caledonia).

Habitat: Rotting logs, stumps, tree roots and bases, and occasionally on humus, in lowland forest from near sea level to about 250 m a.s.l. in Australia, to somewhat higher elevations elsewhere.

Recognition: *Syrrhopodon albovaginatus* seems to be rare in Australia. Plants of *S. spiculosus* and *S. albovaginatus* can appear similar because the leaves of both species are spreading-patent when wet or dry. The margins of the leaf shoulders of *S. albovaginatus* are entire, while in *S. spiculosus* they are usually toothed-spiculose but may also be smooth. The chlorophyllose lamina of *S. spiculosus* lacks the striking obliquely transverse abaxial rows of tooth-like cells that are characteristic of *S. albovaginatus*.

Selected specimens seen: Queensland: Cape Tribulation National Park, about 2 km north of Cape Tribulation, along road to Bloomfield, *W.D. Reese 17365*, 6 June 1989, MEL 2333049A.

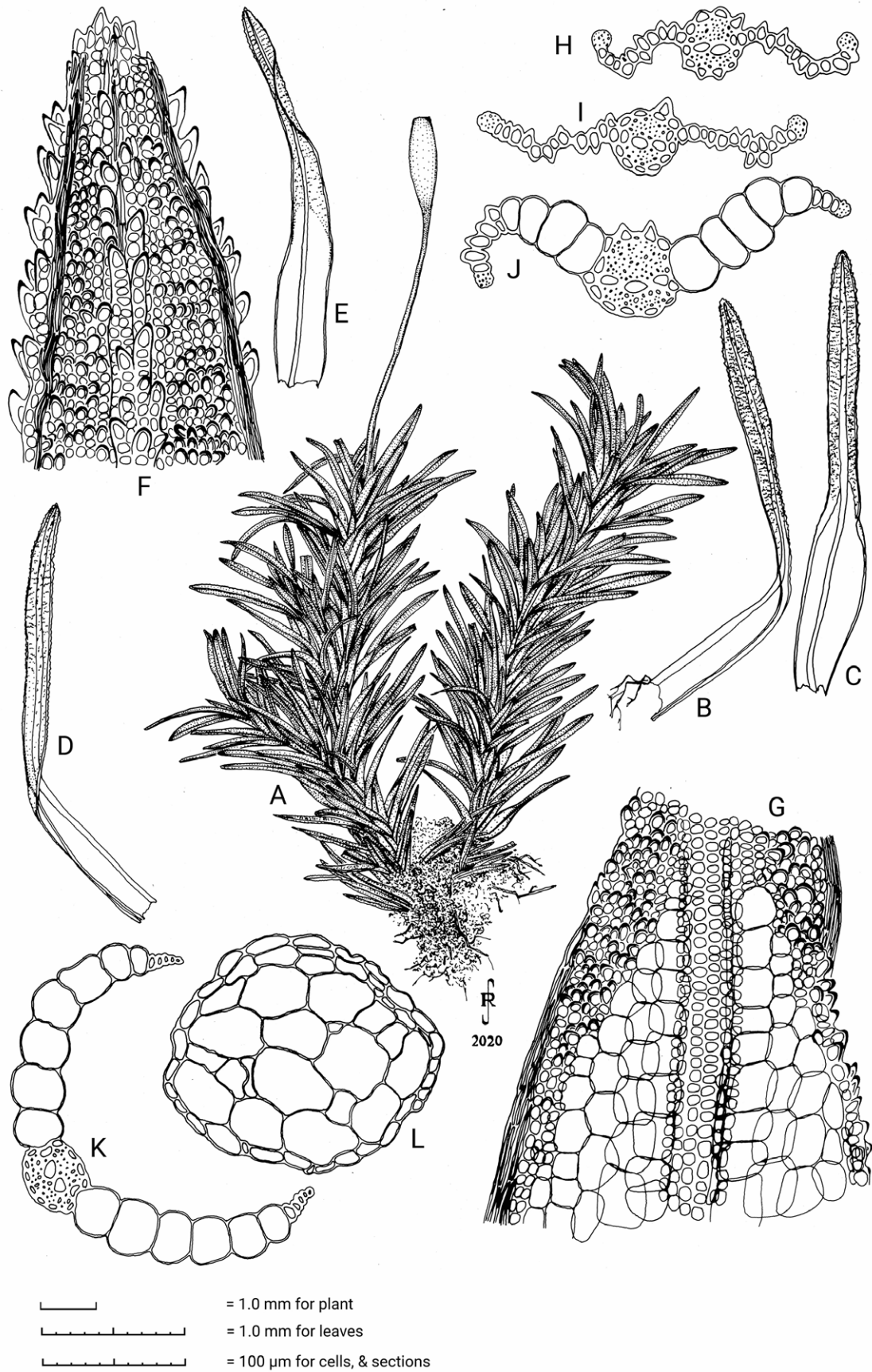


Fig. 1. *Syrrhopodon albogatatus* Schwägr. **A:** Habit of fertile plant, drawn moist. **B–E:** Stem leaves. **F:** Cells of leaf apex, abaxial view. **G:** Cells of distal end of sheathing leaf base. **H, I:** Sections of leaf limb. **J, K:** Sections of sheathing base of leaf. **L:** Stem section. Drawn from *W.D.Reese 17365*.

2. *Syrrhopodon aristifolius* Mitt., *J. Linn. Soc., Bot.* 10: 176 (1868).

Original material: ‘Hab. Upolu, on trees (1000–2000 ft.). No. 89.’

Type: Samoa, Upolu, *T.Powell* 89, Aug 1864, as *aristifolium*; syntypes: NY01114135!d, NY01114136!d, NY01114137!d, MO406828!d, MICH526423!d. Note: The collection date is taken from the NY and MO specimens.

Illustrations: Fig. 2. Also Ellis and Tan (1999: 31).



Fig. 2. *Syrrhopodon aristifolius* Mitt. **A:** Habit of fertile plant, drawn moist. **B:** Detail of capsule and operculum. **C–E:** Stem leaves. **F:** Cells of leaf apex. **G:** Marginal cells of upper limb. **H:** Cells of mid chlorophyllose lamina, abaxial view, with bistratose margin. **I:** Cells of base of limb. **J:** Cells of lower mid limb. **K:** Cells of basal chlorophyllose lamina and distal end of hyaline lamina. **L:** Section of leaf apex. **M–O:** Sections of distal end of leaf limb. **P:** Section of lower leaf limb. **Q, R:** Sections of hyaline lamina. Drawn from *A.Cairns B-304*.

Description: Plants small, often \pm stemless, occasionally up to 10 mm long and fastigiate branched; growing in low loose wiry tufts or mats, dull green to brownish-green; rhizoids dark red-brown. Leaves glossy, loosely curled-contorted when dry, spreading ascending when moist, 5–12 mm long, sheathing base about 0.3–0.4 mm wide, limb 0.15–0.3 mm wide, linear to acuminate-subulate from a slightly wider sheathing base; leaf margins unistratose below base of limb, \pm entire, becoming multistratose in limb and forming a distinct border composed entirely of chlorophyllose cells, marginal stereome lacking; costa strong, smooth, percurrent or excurrent, sometimes gemmiferous, in section biconvex, with 4–6 guide cells, adaxial and abaxial stereid bands, and epidermal layer of lamina-like cells; lamina evanescent in leaf tip, typically only 3–7(–9) cells wide in mid limb; lamina cells rounded quadrate to short rectangular, 6–12 μ m wide, \pm convex on both surfaces, smooth. Hyaline lamina relatively small, often indistinct, eroded in older leaves, typically obliquely truncated distally but not sharply differentiated from chlorophyllose lamina. Gemmae pale, inconspicuous, fusiform-cylindrical, borne adaxially near leaf tips. Sporophytes apparently rare in Australian material.

Etymology: Latin *arista* (awn) + *folius* (leaf), referring to the long, tapering, awn-like leaf apex.

Distribution: North-eastern Queensland, from the Windsor Tableland to the Paluma Range, north-west of Townsville (Fig. 21.2). Also known from tropical Asia, Malesia, Philippines, Papua New Guinea, Western Samoa, and reported from Socotra, an island south-east of Yemen.

Habitat: On tree trunks in notophyll/microphyll vine forest to about 1200 m asl.

Recognition: *Syrrhopodon aristifolius* is easily recognised by its primarily stemless habit, the often petiolate leaves where the limb is somewhat constricted above the shoulder region before expanding into the upper limb, small and inconspicuous and obliquely truncate hyaline lamina, smooth lamina cells and lack of hyaline marginal cells. *Syrrhopodon muelleri* is also \pm stemless, but there the leaf margins are bordered by elongate hyaline cells and the small hyaline lamina is clearly defined and persistent, the leaves are pale yellowish-green and often twisted. Reese and Tan (1983) reviewed the species of Calymperaceae with leaves having petiole-like constrictions between the sheathing leaf base and the proximal end of the green upper lamina.

Selected specimens seen: Queensland: Paluma Dam Road, Paluma, forest adjacent to Birthday Creek. *A. Cairns B-304*, 5 October 2004, BRI AQ0649295; H-Road, Cardstone, *I.G. Stone 25773*, 10 July 1991, MEL 2331846A.

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

Original material: ‘Hab. Bagroo River and banks of the Nunn [Noun River], on dead bark, Mann.’

Type: (syntypes) 1 – Sierra Leone: Bagru River, *G. Mann s.n.* 1861; 2 – Cameroon: banks of the Noun River, *G. Mann s.n.* 1861; 1 – BM000677014!d, BM000677015!d, PC0098980!d, SB179979!d, PC0106434!d, 2 – NY00910808!d, NY00910809!d, NY00910810!d.

Notes: As far as we know, a lectotype has not been selected from the syntypes cited. The collecting date for syntype 1 is taken from BM000677015 and SB179979. Mann collected in Sierra Leone before travelling to Cameroon to collect (Mann 1861).

Australian synonyms: *Syrrhopodon fimbriatus* Müll.Hal., *Linnaea* 37: 151 (1872), non *S. fimbriatus* Mitt., *J. Linn. Soc., Bot.* 12: 122 (1869). = *Syrrhopodon fimbriatulus* Müll.Hal., *J. Mus. Godeffroy* 3(6): 52 (1874), (in footnote), *vide* Reese and Bartlett (1982). **Original material:** ‘Patria. Brisbane River Novae Holl. or. inter Hypnum austro-pusillum vigens: Amalie Dietrich 1864.’ **Type:** Australia, Queensland, Brisbane River, *A. Dietrich s.n.*, 1864, holotype B (destroyed), isotype not seen.

Syrrhopodon cairnensis Broth. & Watts, *Proc. Linn. Soc. New South Wales* 43: 551 (1918), *vide* Reese and Stone (1995). **Original material:** ‘Cairns district, Babinda, on tree-trunks, n. 313a (leg. Watts, July, 1913)’ **Type:** Australia, Queensland, Babinda, *W. Watts 313a*, July 1913, holotype ?HBR not seen, isotype NSW752806!

Illustrations: Fig. 3. Also Reese and Lin (1991: 354), Ellis and Tan (1999: 35).

Description: Plants small, pale green, to 10 mm tall, gregarious, forming thin to dense cushions and turfs. Stems erect, forked, often repeatedly; rhizoids red. Leaves tightly curled-contorted and involute when dry, \pm plane and ascending when moist, apex broadly acute to bluntly rounded, linear-ligulate from a slightly broader base, 2–3(–4) mm long. Costa often conspicuously spinose-papillose adaxially and abaxially, ending in or below the apex. Leaf margins erect-involute, bordered with 2–3 rows of narrow elongate hyaline cells but border sometimes weak and incomplete in upper part of limb; border at leaf shoulders usually with hyaline \pm delicate cilia; cells of upper chlorophyllose lamina rounded-quadrate, thick-walled, stoutly unipapillose on both surfaces, the papillae often tall and conspicuous. Hyaline lamina narrow, acute or sometimes narrowly rounded distally. Gemmae small, cylindrical-clavate, in low dense pads on adaxial surface of leaf tips. Sporophytes uncommon in Australian material. Calyptra about 1.5 mm long. Seta yellow, short, about

4.0 mm long. Capsule urn about 1.0 mm long; operculum 0.8 mm, slenderly rostrate. Peristome teeth orange, slender pointed, irregularly segmented, papillose on both surfaces, to about 120 μm long. Spores 12–15 μm in diameter, yellowish, finely granular.

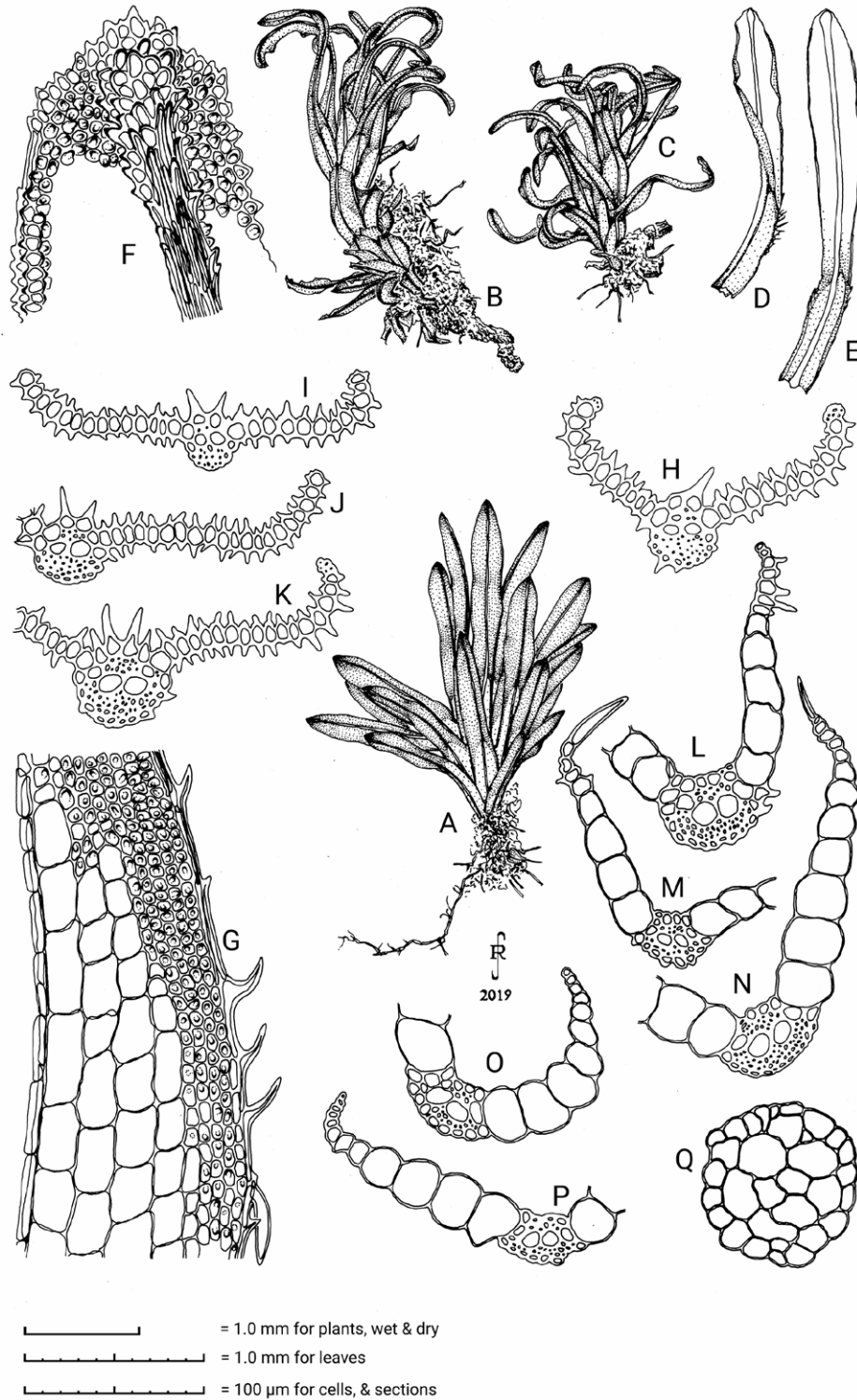


Fig. 3. *Syrrhopodon armatus* Mitt. **A:** Habit of plant, drawn moist. **B, C:** Habit of plants, drawn dry. **D, E:** Stem leaves. **F:** Cells of leaf apex, abaxial view. **G:** Cells of leaf shoulder region. **H–K:** Sections of leaf limb. **L–N:** Sections of leaf shoulder and upper part of sheathing base. **O, P:** Sections of lower part of sheathing leaf base. **Q:** Stem section. Drawn from *W.D.Reese 17370*.

Etymology: Latin *armatus* (armed), referring to the strongly ciliate lower leaf margins.

Distribution: Widespread from northern Northern Territory to eastern Queensland and New South Wales as far south as Batemans Bay (Fig. 21.3). Elsewhere, widely distributed in the palaeotropics, Central and West Africa, Madagascar, China, Malesia, Philippines, Hawaii, and New Zealand (North Island, Kermadec Islands).

Habitat: Tree trunks, rotted wood, logs, stumps, soil and rocks, mostly at low elevations but up to about 1000 m a.s.l.

Recognition: *Syrrhodon armatus* is the most common and widespread *Syrrhodon* in Australia. It is easily recognised by its pale green, almost glaucous appearance, the uncinately-curved leaves when dry, conspicuous cilia on the leaf shoulders, often spinose costa, and unipapillose cells. The spinose papillae of the leaf cells impart to the leaves a roughened or hispid appearance when dry.

Selected specimens seen: Queensland: Cape Tribulation National Park, about 2–4 km north of Cape Tribulation along road to Bloomfield. *W.D.Reese 17370*, 6 June 1989, MEL 2333050A; Tara Vale Road, Paluma, *A.Cairns B-84*, 28 Aug 1999, BRI AQ0649296. New South Wales: Three Mile Scrub, Richmond River, Watts NSW5824, 10 Oct 1902, NSW 752765.

4. *Syrrhodon ciliatus* (Hook.) Schwägr., *Spec. Musc. Suppl.* 2(2): 114, pl. 130 (1823).

Basionym: *Weissia ciliata* Hook., *Musci Exotici* 2: 171 (1820).

Original material: ‘Hab. Ex insula Ternate accepit D. Dicksonus.’

Type: Indonesia, Ternate, *D.Dickson s.n.*, 1813; syntypes: BM000675391!d, ?BM000675396!d, ?BM000675398!d, BM000675395!d, E00011913!d, E00007628!d, E00261221!d.

Note: The collection date is taken from BM000675391, which is annotated as the holotype although there is no evidence that it is so. BM000675396 is ex herb. Wilson, annotated ‘T. 16.a’ and ‘Indian Ocean’.

Illustrations: Fig. 4. Also Ellis and Tan (1999: 30).

Description: Plants to 2 cm tall, rarely more than 1.5 cm, yellowish green, forming loose to dense tufts or turfs. Stems erect, simple or forked; rhizoids red. Leaves strongly dimorphic (gemmiferous leaves sometimes rare); vegetative leaves spreading-recurved when wet or dry, ligulate to linear or oblong, 2–3 mm long, apex broadly acute to rounded-obtuse, often inconspicuously mucronate; margins bordered, the border narrow, pellucid, usually ending well below leaf apex, bearing long delicate unicellular cilia from the shoulders almost to the apex, cilia 150–350 µm long; gemmiferous leaves highly modified, stiff erect, ± tubular by inrolled margins, cilia absent. Costa narrow, smooth except for near apex where densely spiculose, with scattered long delicate cilia abaxially; gemmae fusiform, borne in dense terminal clusters on costa. Costa rounded in section, with 2(-4) guide cells, adaxial and abaxial stereid bands and an epidermal layer of thick-walled pellucid cells. Cells of chlorophyllose lamina smooth, ± quadrate, 8–12 µm wide. Hyaline lamina sharply delimited, occupying most of leaf sheath, scalariform, chlorophyllose cells decurrent down margins of sheath. Sporophytes not seen in Australian material.

Etymology: Latin *ciliatus* (with eyelashes), referring to the cilia on the margins of the leaf lamina and on the costa.

Distribution: In Australia known only from Litchfield National Park in the Northern Territory (Fig. 21.4). Elsewhere known from tropical Asia, Malesia, North Borneo, Philippines, Papua New Guinea, Oceania.

Habitat: Grows in monsoon vine forests, on the ground, on tree roots, and in shaded escarpments on rock wall seepages.

Recognition: *S. ciliatus* is distinguished from other Australian species by its smooth cells, conspicuously ciliate leaves, and the highly modified, more or less tubular, gemmiferous leaves. Although seemingly rare in tropical monsoon areas of northern Australia, it is common and often abundant elsewhere in its range.

Selected specimens seen: Northern Territory: Curtain Falls, ‘Pethericks Rainforest’, 38 km SE of Bachelor, *H.Streimann 48185*, 03 July 1991, CANB 9108230.

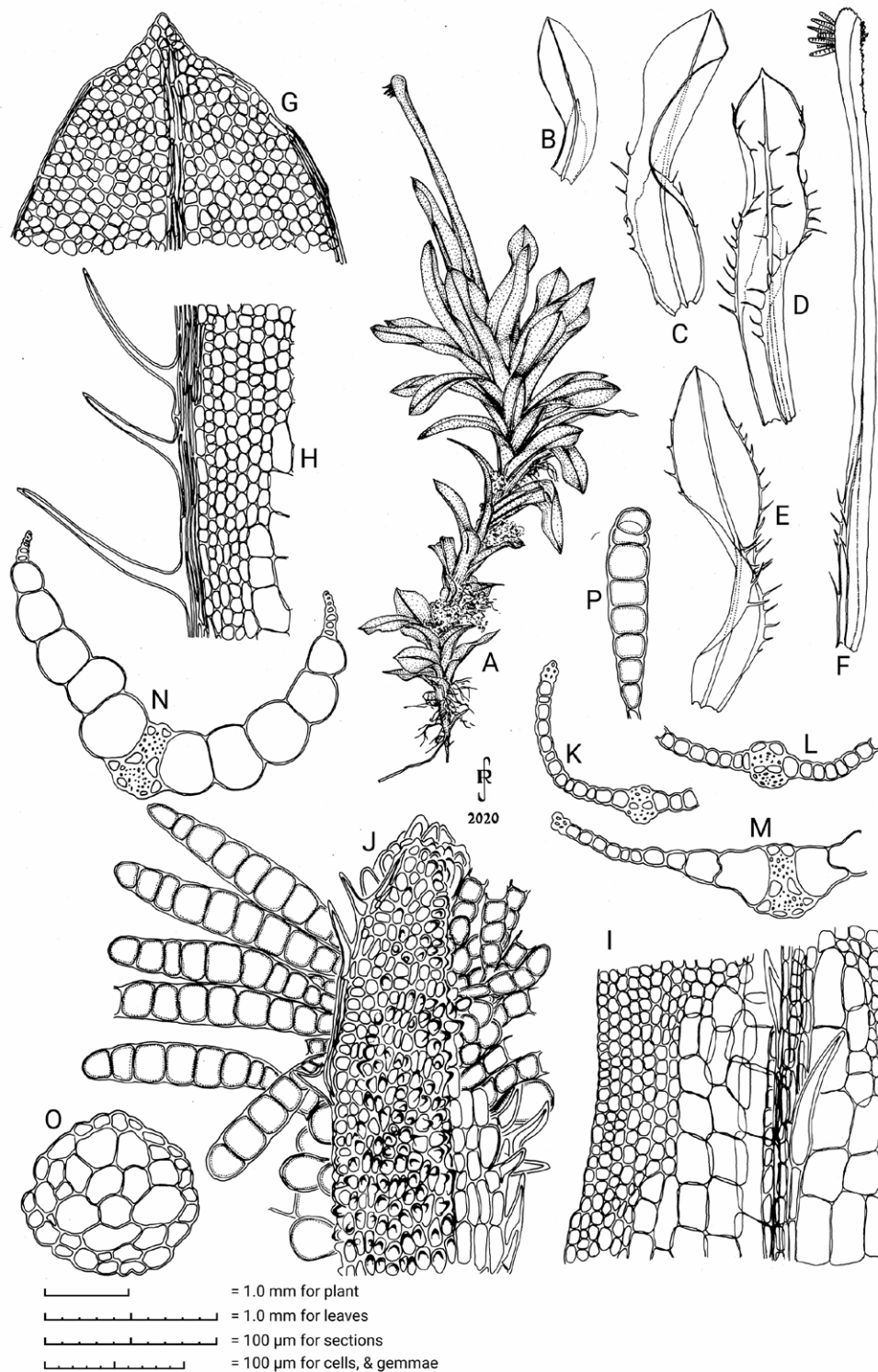


Fig. 4. *Syrrhopodon ciliatus* (Hook.) Schwägr. **A:** Habit of gemmiferous plant, drawn moist. **B–E:** Stem leaves. **F:** Gemmiferous leaf. **G:** Cells from leaf apex. **H:** Marginal cells of leaf sheath. **I:** Cells of hyaline lamina. **J:** Detail of apex of gemmiferous leaf, abaxial view. **K, L:** Sections of leaf limb. **M:** Section of leaf sheath at distal end of hyaline lamina. **N:** Section of leaf sheath. **O:** Stem section. **P:** Gemma. Drawn from *H. Streimann 48185*.

5. *Syrrhopodon confertus* Sande Lac., *Verh. Kon. Akad. Wetensch., Afd. Natuurk.* 13: 4, 2c (1872).

Original material: 'Hab. Sumatra, Korthals; Banca ad arbores inter Klappa et Tjang-tara, Kurz.

Type: Lectotype (first step), designated by Mohamed and Reese (1985): Indonesia: Banca, *S. Kurz* 68, 4 Aug 1858: MO-406869, BC (A:5912376), L0060699, L0060700, *vide* Touw (2013), not seen (second step required to select a single specimen).

Note: The collecting number and date for the lectotype are taken from Touw (2013), who noted that Mohamed and Reese (1985) lectotypified *S. confertus* by the Kurz collection, but did not specify a herbarium specimen.

Illustrations: Figure 5. Also Ellis (1985: 13), Ellis and Tan (1999: 33).

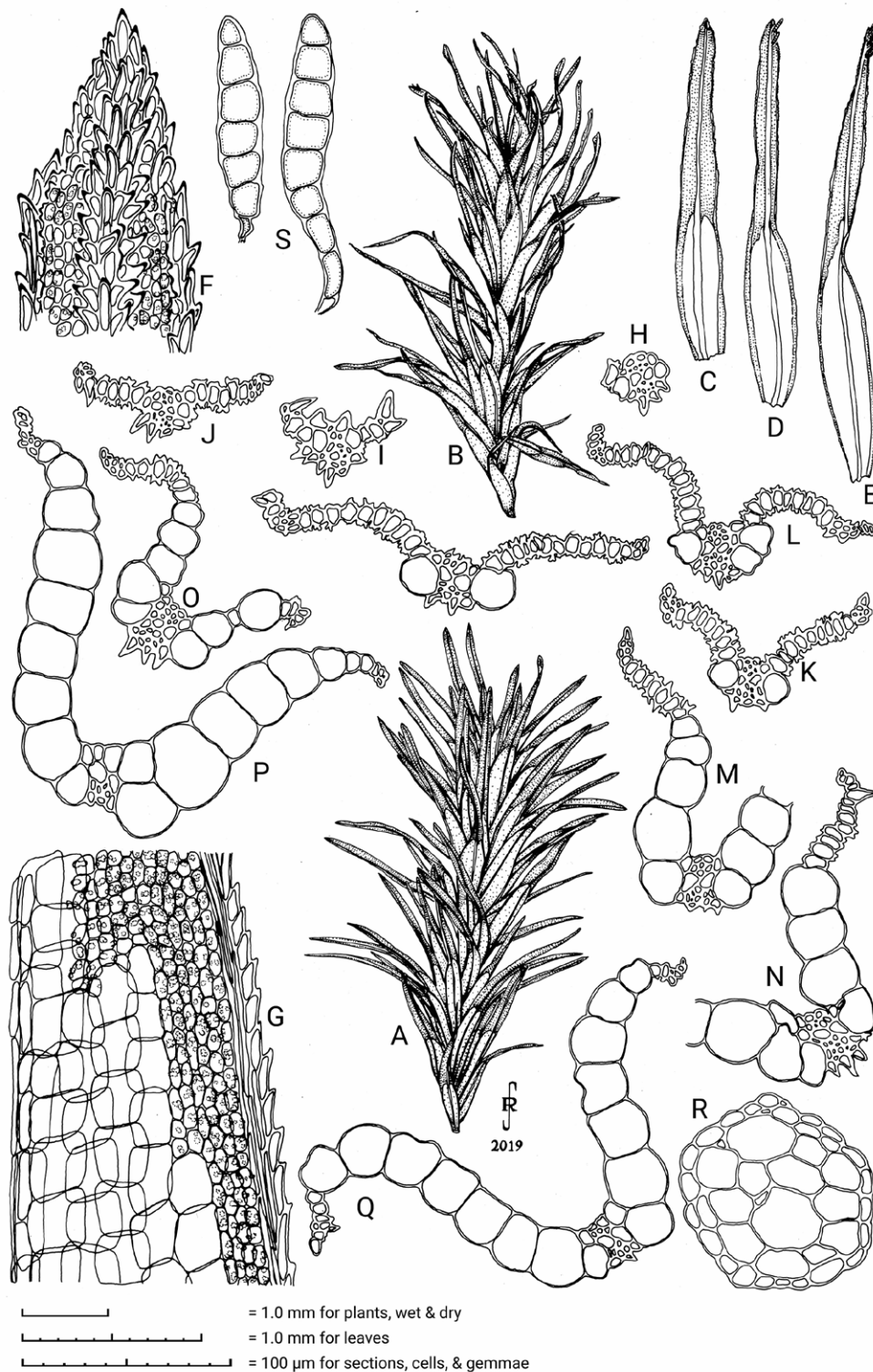


Fig. 5. *Syrrhopodon confertus* Sande Lac. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C:** Stem leaf. **D, E:** Leaves bearing gemmae. **F:** Cells of leaf apex, abaxial view. **G:** Cells of upper hyaline lamina. **H–J:** Sections of leaf apex and upper part of limb. **K–N:** Sections of sheathing leaf base. **P, Q:** Sections of sheathing base from near leaf insertion. **R:** Stem section. **S:** Gemmae. Drawn from A.J.Franks AJF1412004A.

Description: Plants small, pale green to yellowish, in soft compact glossy tufts or turfs, up to 2 cm tall. Stems erect; rhizoids red. Leaves monomorphic, scarcely altered wet or dry, not contorted, 2–3 mm long, narrowly acuminate from a slightly broader base 0.25–0.3 mm wide, limb 0.15–0.3 mm wide in mid leaf, spreading-ascending; margins of limb with a sharply defined border with several layers of elongate hyaline stereid-like cells; denticulate to strongly serrate by projecting cells, the teeth close together, occasionally remote, single or occasionally double near leaf tip; cells of limb papillose, the papillae mostly multifid, cells of chlorophyllose lamina filling the leaf limb, then decurrent down the margins of the hyaline lamina; hyaline lamina conspicuous, reaching 2/5–1/2 leaf, scalariform; costa narrow, ending at or just below the apex, in section with 2–3 guide cells, small adaxial and abaxial stereid bands, without a differentiated epidermal layer but epidermal cells conical spiculose-mammillose, particularly abaxially, to near leaf base. Gemmae scarce, short-fusiform, borne adaxially along costa at leaf tip. Sporophytes not known in Australian material.

Etymology: Latin *confertus* (crowded, thick), referring to densely crowded leaves.

Distribution: North-eastern Queensland from Cape Tribulation to Tully (Fig. 21.5). Also in tropical Asia from Sri Lanka, Thailand, Malesia to Papua New Guinea, and west into the Pacific islands.

Habitat: Usually in wet complex mesophyll vine forests, on tree trunks, stumps, logs, boulders and tree ferns, mostly at low elevations but ranging up to about 1000 m a.s.l.

Recognition: *Syrrhodon confertus* is easily recognised by its compact glossy tufted habit and the small leaves having conspicuous regular marginal serrations. Similar in appearance and habit to *S. involutus*, but there the leaf margins are entire. *Syrrhodon confertus* was formerly recognised in Australia as *S. amoenus* Broth., a synonymous species described from Papua New Guinea with less markedly papillose cells and almost entire leaf margins. Eddy (1990) considered this difference somewhat ‘arbitrary’. Tixier (1978) noted that the ‘*amoenus*’ forms predominated in the southern and eastern parts of Malesia, while the ‘*confertus*’ forms were principally in the northern and western parts, suggesting the possibility of varietal distinction. However, a similar variation occurs in *S. spiculosus* with no suggestion of varietal recognition. Enigmatically, throughout its range, sporophytes have not been seen and gemmae appear to be rarely encountered.

Selected specimens seen: Queensland: Cook District; Golden Hole Reserve, second order tributary of Russell River. A.J.Franks AJF1412004A, 04 December 2014 (BRI AQ0910141).

6. *Syrrhodon croceus* Mitt., *J. Proc. Linn. Soc., Bot. Suppl.* 1: 41 (1859).

Original material: ‘Hab. Singapore, Wallich! Etiam in insula Labuan, Motley!’

Type: (syntypes) (1) Singapore: s.loc., *N. Wallich s.n., s.d.* (1822–1823); (2) Malaysia, Labuan, *J. Motley 17*, 1849–1853; isosyntypes (1) BM000676813!d, BM000676814!d, BM000676815!d, BM000676816!d, BM000676817!d, (2) PC0100332!d PC0100333!d, NY01127570!d, NY01127571!d, NY01127572!d.

Note: As far as we know, a lectotype has not been selected from the syntypes. The date range for syntype 2 is when Motley was in Singapore, and the collection number is from the syntypes in PC.

Illustrations: Fig. 6. Also Ellis and Tan (1999, page 33).

Description: Plants to 2.5 cm tall, mostly shorter, green to yellowish green or brownish to reddish-brown, in bristly tufts and cushions. Stems mostly simple, erect, with copious reddish-brown to purple rhizoids. Leaves usually straight and stiffly erect wet or dry, mostly 4–9 mm long, the bases usually orange-red tinted; apex variable, usually blunt or broadly acute; limb linear to broadly linear; upper margins thickened with an internal stereome surrounded by short chlorophyllose cells, often coarsely and irregularly toothed, the teeth often paired; margin just above leaf shoulders irregularly spinose-serrate (sometimes almost entire) with coarse teeth; gemmiferous leaves slightly narrower, ± tubular and stiffer than vegetative leaves. Costa strong, scabrid abaxially; in section biconvex to ± circular, with 4–6 guide cells, thick adaxial and abaxial stereid bands, and an epidermal layer of conical subspiniform chlorocysts. Cells of upper chlorophyllose lamina small, ± obscure, smooth to bulging abaxially, strongly conical-papillose adaxially; lamina cells adjacent to hyaline lamina typically orange-red, composed of elongate-rectangular cells with thick-walled and strongly pitted or porose walls; hyaline lamina scalariform to rounded distally. Gemmae fusiform-clavate, common. Sporophytes not seen in Australian material and apparently uncommon elsewhere.

Etymology: Latin *croceus* (saffron), referring to the saffron colour that suffuses the basal cells in re-wetted leaves.

Distribution: North-eastern Queensland, from Iron Range south to Cardwell and Hinchinbrook Island (Fig. 21.6). Elsewhere known from the Seychelles, widespread in more oceanic areas of tropical Asia from Sri Lanka and Thailand to Malesia, Borneo, Philippines, Micronesia, Papua New Guinea, Western Samoa, east to Polynesia, New Caledonia.

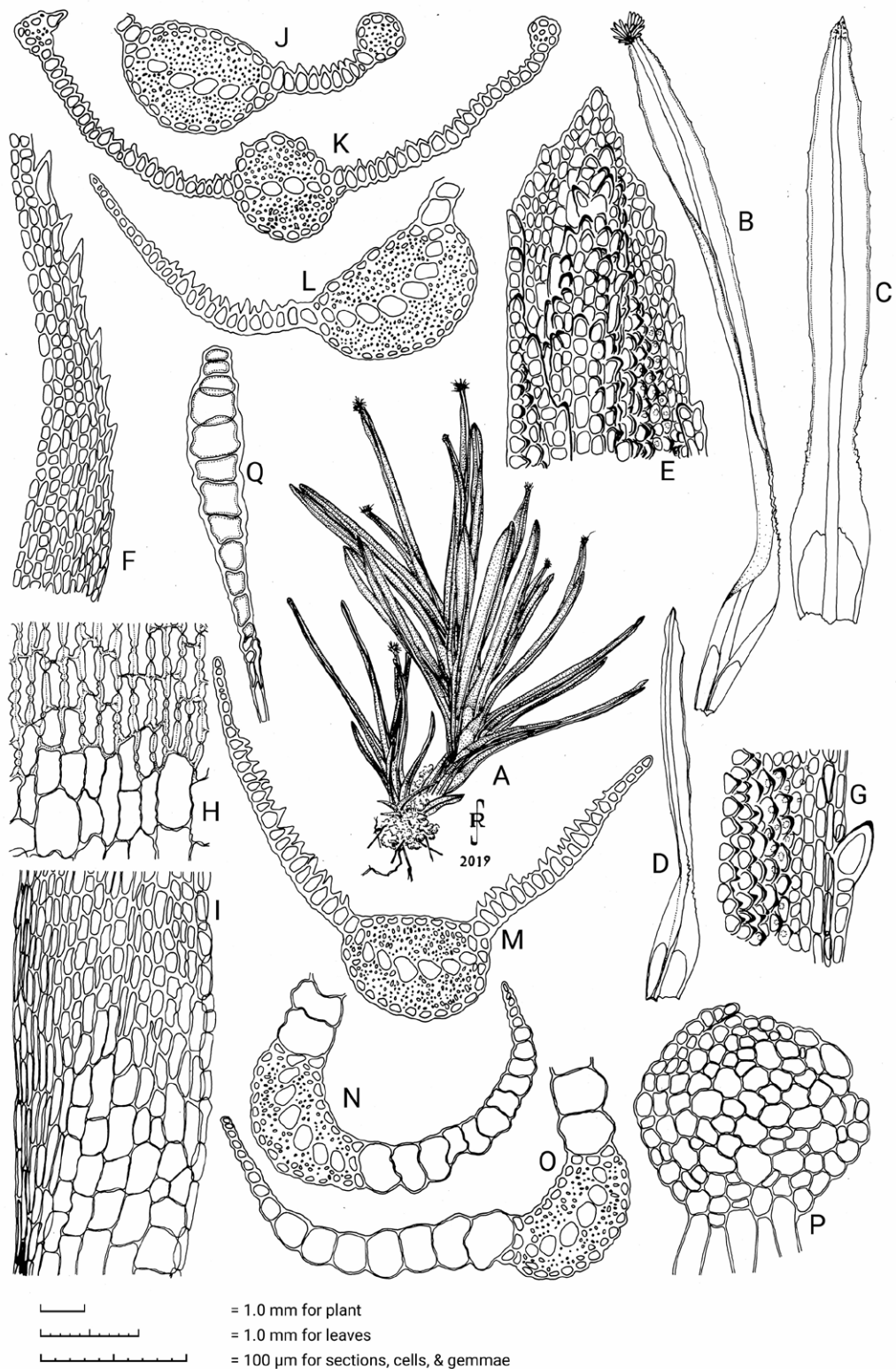


Fig. 6. *Syrrhopodon croceus* Mitt. **A:** Habit of plants, drawn moist. **B–D:** Leaves. **E:** Cells of leaf apex, adaxial view, gemmae removed. **F:** Marginal cells from mid to upper leaf limb. **G:** Marginal cells of lower leaf limb, just above shoulder region. **H:** Cells at the base of the leaf limb and distal end of hyaline lamina. **I:** Cells of hyaline lamina. **J–M:** Sections of leaf limb. **N, O:** Sections of hyaline lamina. **P:** Stem section. **Q:** Gemma. Drawn from: A.J.Franks AJF1411001B.

Habitat: On the trunks of living and dead trees, rarely on boulders, from sea level to about 800 m a.s.l.; occasionally on mangroves.

Recognition: *Syrrhopodon croceus* is easily recognised by its erect bristly habit and the often highly pigmented (orange-red) leaf bases. The hyaline lamina is also often eroded. *Syrrhopodon muelleri* has a similar habit but the leaves are yellowish-green with entire margins and lack the pigmented leaf bases. The stems are also very short, the plants appearing almost stemless, and the leaves are often twisted. Leaves of *S. croceus* may also be almost ‘petiolate’, constricted between the broader sheathing base and the upper limb.

Selected specimens seen: Queensland: Fishery Falls near Gordonvale, A.Cairns B-326, BRI AQ0649297; western side of Mount Tozer, J.R.Clarkson 2912, July 2005, BRI AQ0575987; Bramston Beach Road, 6.3 km from Bramston Beach, A.J.Franks AJF1411001B, 7 November 2014, BRI AQ0910204.

7. *Syrrhopodon cyrtacanthos* W.D.Reese, *Bryologist* 95: 95, figs 1–6 (1992).

Original material: ‘Australia. Queensland: Roaring Meg Creek, on bark (with its accumulated soil) of *Syzygium dyctiophlebium* (weather often cloudy here), about 1,200 ft., 1984, Michael Godwin s.n. in herb. MELU sub I. G. Stone 23001.’

Type: Australia, Queensland, Roaring Meg Creek, M.Godwin s.n., 1984; holotype: MEL2341363!d ex MELU (herb. I.G.Stone 23001); isotypes: MO 406876/A, BC 5912383, *fide* Tropicos [<https://www.tropicos.org/name/35186344>] (not seen).

Illustrations: Fig. 7. Also Reese (1992: 94).

Description: Plants small, glaucous green, to 5 mm tall, gregarious. Stems erect, simple; rhizoids dark red. Leaves ascending, straight or curved, little altered wet or dry, linear-acuminate from a slightly broader sheathing base, 2–3 mm long; apex acute; leaf margins entire, involute distally, bordered from base to apex with multistratose slender, elongate hyaline cells. Costa strong, excurrent into a pale, slender, short subulate apex, spinose abaxially near the tip, mostly smooth below or irregularly spinose adaxially and with occasional spines along abaxial flanks, \pm circular in section, with 2–4 guide cells, strong adaxial and abaxial stereid bands, differentiated epidermal layer smooth or occasionally with cells bearing spiculate papillae. Cells of mid chlorophyllose lamina quadrate to rectangular, thick-walled, about 8–11 μ m, adaxially unispiculate-spinose with tall, acute papillae, abaxially unispiculate or with stout, sharp \pm spiculate or apically divided papillae; in apical part of limb abaxial papillae tall, slightly to strongly curved, pointing distally; hyaline lamina narrow, scalariform, the distal margins \pm convex. Gemmae borne adaxially near leaf tips but well-developed gemmae not seen. Perigonia axillary, gemmiform, of several tiny reddish leaves enclosing a few antheridia. Perichaetia and sporophytes not seen.

Etymology: Greek *kyrtos* (curved) + *akanthos* (a thorny plant), referring to the curved, thorn-like papillae on the leaves.

Distribution: An Australian endemic, known only from the type locality in north-eastern Queensland (Fig. 21.7).

Habitat: The only known specimen was growing on the bark of a *Syzygium dictyophlebium* (with some accompanying soil) at 700 m a.s.l. in upland rainforest.

Recognition: The species was described from a single, rather depauperate specimen (Reese 1992). Reese and Stone (2012) noted that the species is distinctive because of the entire leaf margins and heavily armed cells. *S. prolifer* has uniformly plurispiculate cells with much shorter, non-spinose papillae, and *S. involutus* has a very short limb with the cells smooth or inconspicuously unispiculate.

Bordering the costa, at least distally, the cells of the chlorophyllose lamina are larger and quadrate to short rectangular, often without spiculate papillae, 10–15 μ m long, 8–15 μ m wide.

Selected specimens seen: Queensland: Roaring Meg Creek, Daintree National Park, Cape Tribulation. M.Godwin s.n. 1984, MEL 2341363.

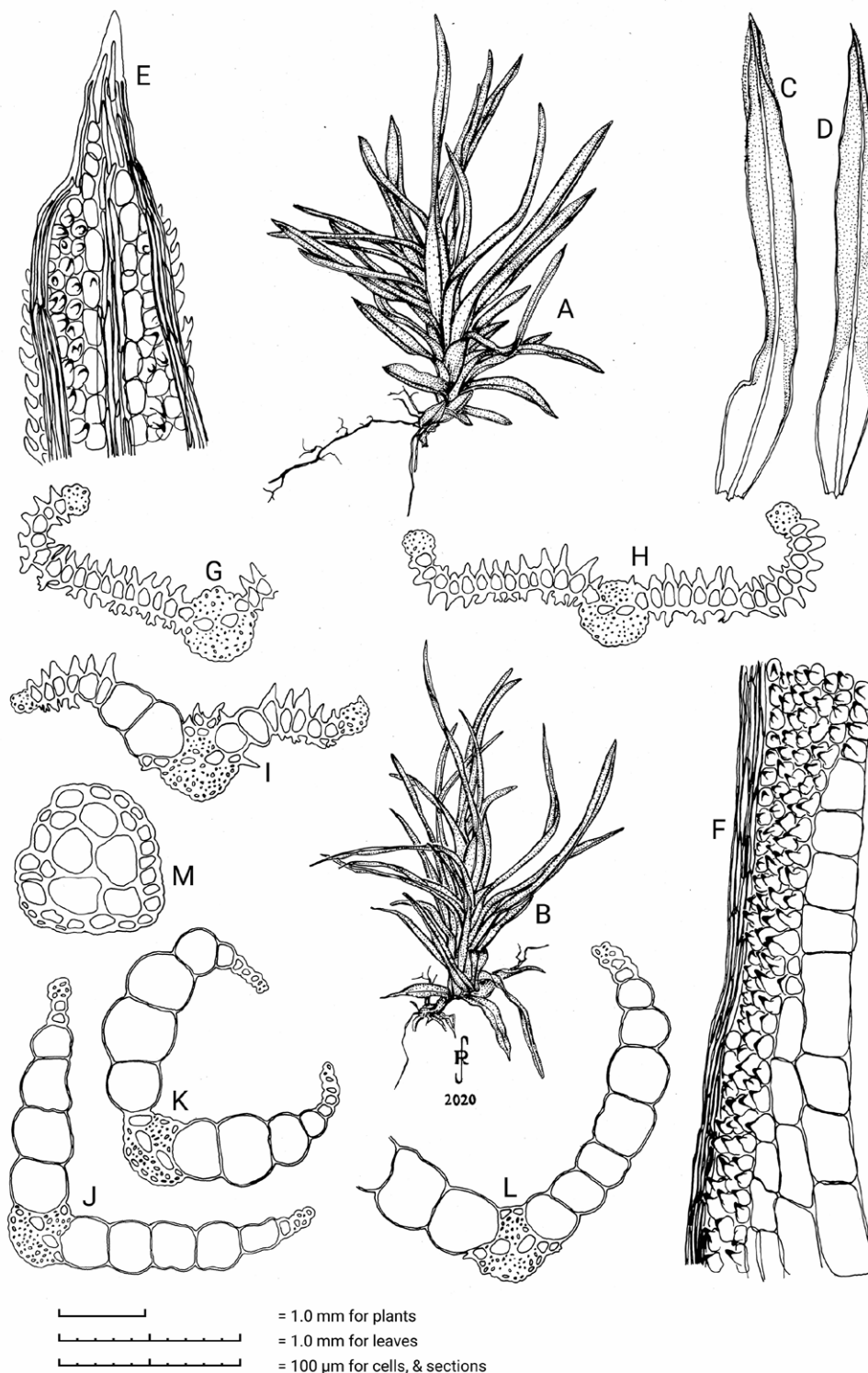


Fig. 7. *Syrrhopodon cyrtacanthos* W.D.Reese. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C, D:** Stem leaves. **E:** Cells of leaf apex, abaxial view. **F:** Cells of hyaline lamina. **G, H:** Sections of leaf limb. **I:** Section of distal end of hyaline lamina. **J–L:** Sections of sheathing leaf base. **M:** Stem section. Drawn from *M.Godwin s.n.* (sub *I.G.Stone 230001*).

8. *Syrrhopodon gardneri* (Hook.) Schwägr., *Spec. Musc. Suppl.* 2(2): 110, pl. 131 (1824).

Basionym: *Calymperes gardneri* Hook., *Musci Exotici* 2: 146 (1819).

Original material: ‘Hab. In Nepal, arboribus. Hon. D. Gardner.’

Type: Nepal, s. loc., *Edward Gardner s.n.*, 1815–1819; sotypes: BM000676896!d, BM000676900!d, BM000676903!d, BM000676904!d, NY 01113938!d.

Note: E00011916!d, E00011917!d, E00261795!d, are annotated as types, attributed to Joseph Hooker as the collector, but Hooker's collections are not specifically cited in the protologue, so they are here excluded from type status, though they are probably original material. It is also possible that they are duplicates of the type from Hooker's herbarium and an assumption was made that he collected them.

Illustrations: Fig. 8. Also Hooker (1819: 146), Reese and Lin (1991: 344), Ellis and Tan (1999: 36).

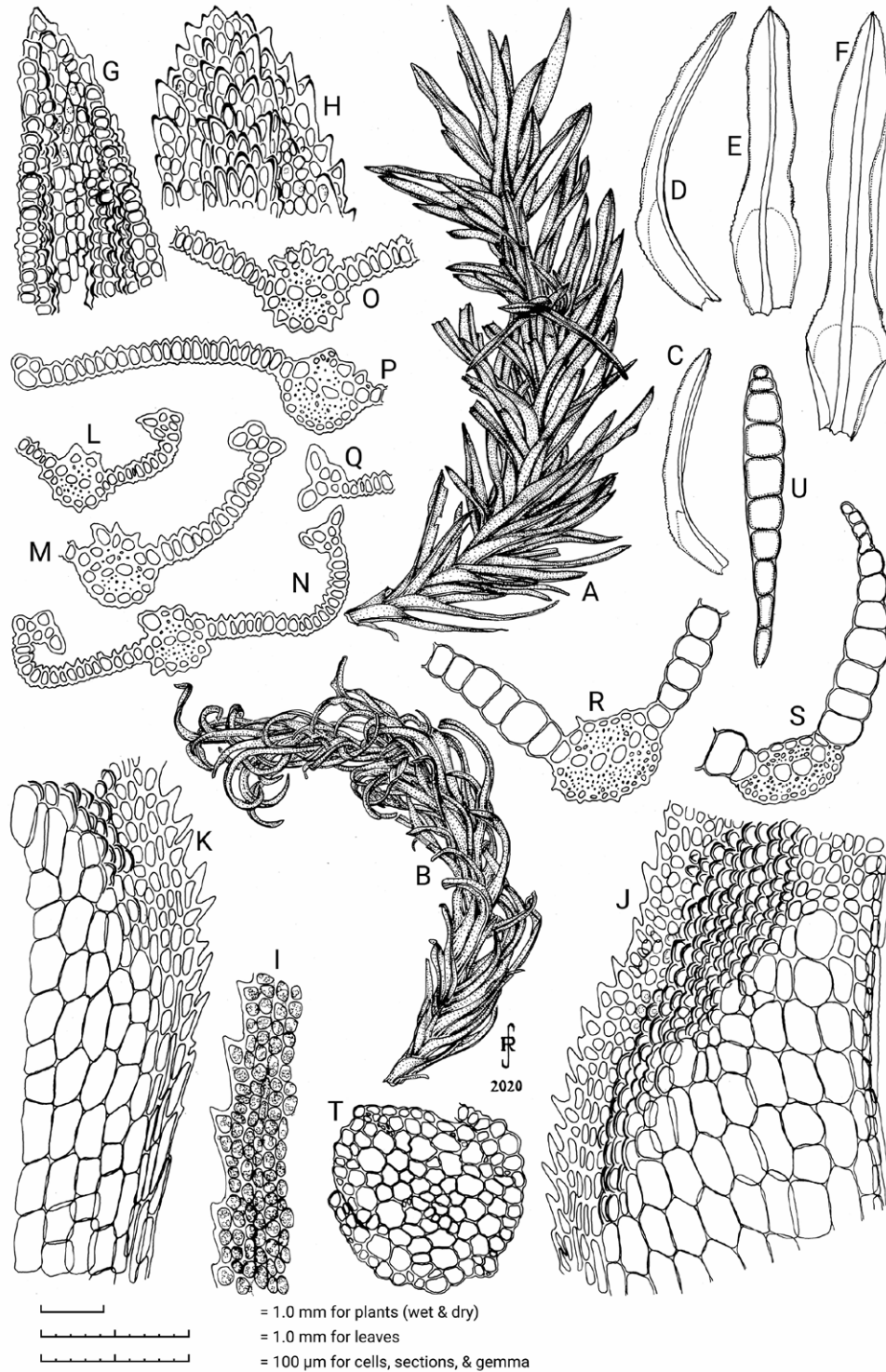


Fig. 8. *Syrrhobodon gardneri* (Hook.) Schwägr. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C–F:** Stem leaves. **G:** Cells of leaf apex, adaxial view. **H:** Cells of leaf apex, abaxial view. **I:** Cells of mid-limb margin. **J, K:** Cells of hyaline lamina and margin of sheathing base. **L–P:** Sections of leaf limb. **Q:** Cells of leaf margin, in section. **R, S:** Sections of sheathing leaf base. **T:** Stem section. **U:** Gemma. Drawn from: *H.Streimann* 42356.

Description: Plants medium-sized, yellowish-green to brownish-green above, brown below, forming loose mats or tufts. Stems to 4 cm tall; rhizoids dark red to purple, often abundant and conspicuous. Leaves rigid or flexuose when moist, variously incurved and contorted when dry, from an appressed and convolute sheathing base abruptly narrowed to a linear spreading limb, 2–4(–5) mm long, c. 0.7 mm wide at shoulders, 0.3 mm wide in limb, linear-lanceolate; apex subacute to obtuse, serrate; margins weakly bordered in shoulders and limb, coarsely toothed, the shoulders with sharp spreading or ascending teeth. Costa prominent, ending shortly below apex, hispid both adaxially and abaxially, with short, strongly projecting cells; in section \pm circular, with about 4 guide cells, adaxial and abaxial stereid bands and differentiated epidermal layer of conically projecting cells. Cells of chlorophyllose lamina rounded-quadrate, 8–12 μ m wide, thick-walled, abaxial surface pluripapillose, adaxial surface partly obscured by tall conical mammillae; chlorophyllose cells adjacent to hyaline lamina typically with forward directed projecting ends. Hyaline lamina sharply delimited, in about 8–10 rows either side of costa, ending in a broad angle on the costa just below shoulders; cells of chlorophyllose lamina decurrent down margins of hyaline lamina. Sporophytes unknown in Australian collections. Gemmae clavate, c. 200 μ m long.

Etymology: After Colonel Edward Gardner (1784–1861), British ambassador and botanical collector in Nepal, who collected the type. His first initial was mistakenly rendered as ‘D’ in the type citation. BM material is annotated ‘Nepal. Hon. Col. (or Col!) Gardner’, but JSTOR Global Plants strangely attributes all the BM collections to George Gardner (a Scottish biologist born in 1810) and cites a collecting number H1205, which was merely a herbarium number.

Distribution: In Australia *Syrrhopodon gardneri* is known only from Arnhem Land in the Northern Territory, where it grows on rock in monsoon forest, and Babinda Boulders in the Queensland Wet Tropics, where it grows on the trunk of an isolated rainforest tree (Fig. 21.8). Elsewhere, a widespread pantropical species, from Central America, Central and Western Central Africa, Madagascar, Réunion, tropical Asia, India, Sri Lanka, China (Guangdong, Hainan, Yunnan), Malesia, Borneo, Sulawesi.

Recognition: It is distinguished from all other Australian *Syrrhopodon* species by its usually abundant and conspicuous dark red rhizoids, sharply dentate-serrate leaf shoulders, and the absence or elongated marginal hyaline cells. It is generally an upland species elsewhere in its range, growing on the bark of forest trees, rotting logs and humus, rather than on rock, from sea level to about 2000 m a.s.l., but rarely below 1000 m (Eddy 1990, Reese *et al.* 1991). *Syrrhopodon gardneri* is similar in growth form to *S. spiculosus* and *S. prolifer*, but readily distinguished from the former by the lack of a marginal stereome and simple papillae on mid-limb chlorophyllose cells, while *S. prolifer* has a smooth, not hispid, costa.

Selected specimens seen: Queensland: *B.O. van Zanten* 681001, 20 July 1968, NSW 896864. Northern Territory: Baroalba Creek, 15 km south-southeast of Jabiru Airfield, *H. Streimann* 42356, 22 April 1989, CANB 8914883.

9. *Syrrhopodon involutus* Schwägr., *Spec. Musc. Suppl.* 2(2): 117, pl. 132 (1824).

Original material: ‘In insula Rauwack Moluccensi legit cl. Gaudichaud socius navarchi Freycinet, ad ligna putrida.’

Type: Indonesia: Rawak, Maluku Islands, *C. Gaudichaud-Beaupré* 11/26, *s.d.* (before 1824); isotypes: BM000672900!d, BM000672901!d, E00261792!d, PC0100937!d, PC0100938!d, PC 0100939!d, PC01009340!d.

Note: The collection number is taken from E00261792.

Illustrations: Fig. 9. Also Reese and Lin (1991: 352), Ellis and Tan (1999: 38).

Description: Plants small, pale green to whitish, often in compact tufts. Stems slender, reddish, frequently branched; rhizoids purplish to brownish red. Leaves small, ascending, straight and little contorted when wet or dry; narrow lanceolate, densely imbricate, 1.5–3.5 mm long, 0.4–0.5 mm wide, tapering quickly above to an acute apex. Leaf margins erect, involute or revolute, entire, bordered by a narrow stereome of elongate hyaline cells. Costa narrow, about 30 μ m wide abaxially, narrower on adaxial side, percurrent or ceasing shortly below leaf tip, or ending in a short mucro; abaxially \pm smooth to somewhat mammillose at apex; in section, with two small guide cells and small adaxial and larger abaxial stereid bands, and typically on adaxial surface with two rows of thick-walled rectangular epidermal cells with a row of larger thin-walled hyalocysts on either side. Chlorophyllose lamina small in area and confined to apical region of leaf but lamina cells decurrent down leaf margin; cells quadrate to rectangular, pellucid, 8–10 μ m wide, to 15–20 μ m long, smooth walled or unipapillose. Hyaline lamina large, comprising much of leaf, sharply defined, cells scalariform in 3–6(–8) rows either side of costa. Gemmae sparse, fusiform-clavate, borne adaxially along costa at leaf tip. Sporophytes not seen in Australian material.

Etymology: Latin *involutus* (rolled), referring to the inrolled leaf margins.

Distribution: North-eastern Queensland, from Mossman Gorge to Cardwell (Fig. 21.9). Also widespread in the tropics and subtropics, from Africa and the East African islands (Madagascar, Réunion), Asia, Malesia, the Philippines, Papua New Guinea and the Pacific islands.

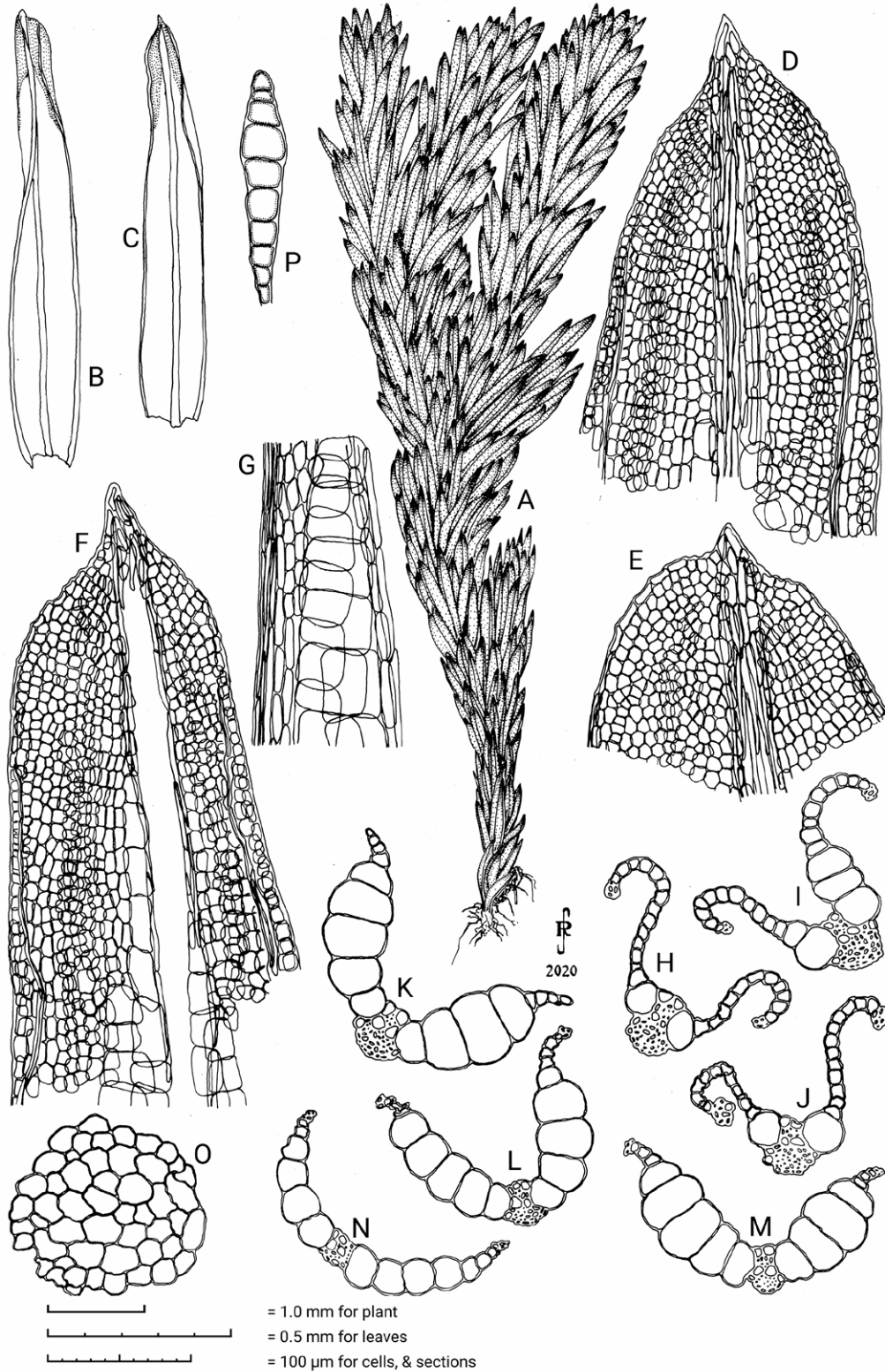


Fig. 9. *Syrrhopodon involutus* Schwägr. **A:** Habit of plant, drawn moist. **B, C:** Stem leaves. **D–F:** Cells of leaf apex. **G:** Cells of distal hyaline lamina. **H–J:** Sections of leaves near leaf apex. **K–M:** Sections of leaf limb. **N:** Section of leaf near insertion. **O:** Stem section. **P:** Gemma. Drawn from *I.G.Stone 24537*.

Habitat: *Acacia* and *Melaleuca* trunks in coastal notophyll vine forest, and in mesophyll vine forests on trees, rotting wood and boulders, mostly at low elevations but up to 1000 m a.s.l.

Recognition: Eddy (1990) remarked on the variability of the prominence of the chlorophyllose lamina and costal cell papillosity, the cells often being \pm smooth, as shown in Fig. 9. Reese *et al.* (1986) remarked that *S. involutus* 'is a wide-ranging and complex assemblage of forms' and that 'the name *S. involutus* should refer to plants with strongly involute margins, and cells conspicuously papillose dorsally and ventrally', but this expression 'apparently intergrades with other forms having the margins plane to revolute and cells smooth to papillose and the upper lamina shorter [less than half the length of the lower lamina]'. In the expression shown in Fig. 9 the chlorophyllose lamina is very much reduced in area (Fig. 9 B, C), the lamina cells are smooth and the leaf margins are clearly revolute.

Syrrhopodon confertus may be confused with *S. involutus*, but in the former species the leaf margin is clearly dentate and the leaves are spreading and ascending.

Selected specimens seen: Queensland: North Kennedy District; Cardwell, Sullivan's Track, *I.G.Stone* 24537, 22 July 1987, MEL 2326285.

10. *Syrrhopodon katemensis* (Zanten) L.T.Ellis, *Syst. Biodivers.* 1: 164 (2003).

Basionym: *Calymperopsis katemensis* Zanten, *Nova Guinea, Bot.* 10(16): 282, pl. 24, fig. 3 (1964).

Original material: Original publication not seen.

Type: Indonesia: Irian Jaya, Katem, 200 m, *B.O. van Zanten* 286a, 17 June 1959; holotype: L0060751, not seen; isotypes: BM000675257!d, GRO not seen.

Australian synonym: *Syrrhopodon prolifer* Schwägr. var. *mossmansensis* W.D.Reese, *Bryologist* 92: 303, figs 4–6. 1989, *fide* Ellis (2003). **Original material:** 'Lower High Falls, N of Mossman, 16°28S, 145°16E, on tree trunk, *W. B. Schofield, I. G. Stone & M. I. Schofield* 90033'. **Type:** Australia: Queensland, Lower High Falls, *W.B.Schofield* 90033, *I.Stone & M.Schofield*, 5 Sep 1987; holotype UBC117879!d, isotypes MO406960!d, LAF not seen, MELU!, NSW not seen.

Illustrations: Fig. 10. Also Reese (1989: 303); Orbán and Reese (1990: 44).

Description: Plants in loose tufts, pale glaucous green, to 10 mm tall. Stems reddish below, erect, simple or branched; rhizoids red. Leaves twisted and contorted when dry, 1.5–3.5 mm long, 0.5–0.75 mm wide in mid limb, the limb 1.5–2 times longer than sheathing base, often bearing low dense tufts of rhizoids at tips; margins entire, bordered all round by elongate hyaline cells. Costa ending in or just beyond apex, in section with 2(–4) median guide cells, adaxial and abaxial stereid bands, epidermal layer not differentiated. Cells of chlorophyllose lamina at mid limb about (6–)8–10(–12) μ m, thick-walled, with stout multifid papillae adaxially and abaxially; hyaline lamina ending acutely distally, chlorophyllose cells shortly decurrent down margins. Gemmae scarce, clavate, 60–100 μ m long, in clusters on adaxial surface of costa at leaf tips, sometimes mixed with leaf-borne rhizoids. Sporophytes not known in Australian material.

Etymology: Katem + *-ensis* (coming from), referring to the locality of the type collection, Katem in Indonesia.

Distribution: North-eastern Queensland, near Mossman and the Paluma Range (Fig. 21.10). Also Indonesia (Irian Jaya).

Habitat: Trunks of large trees in humid sites along streams and rivers, to about 500 m a.s.l.

Recognition: *Syrrhopodon katemensis* (as *S. prolifer* var. *mossmansensis* in Reese and Stone 2012) differs from *S. prolifer* var. *prolifer* by the somewhat shorter leaves, cells of the chlorophyllose lamina being slightly larger and having tall, stout multifid papillae on both surfaces. The specimen used for illustration was collected from 2 m up the trunk of a large tree growing in rainforest along the edge of a swift flowing, rocky, mountain stream.

Originally described as *Calymperopsis katemensis* by van Zanten (1964), the species was synonymised under *S. trachyphyllus* Mont. by Reese *et al.* (1986), Eddy (1990) and Menzel and Schultze-Motel (1990). However, Ellis (2003) noted that '*Calymperopsis katemensis* Zanten (= *Syrrhopodon katemensis* (Zanten) L.T.Ellis) has distinctive features such as a smooth costa and a chlorophyllose lamina composed of tiny, densely papillose cells, and appears sufficiently different from *S. prolifer* Schwägr. and other taxa to justify its status as a species.' We agree with this conclusion.

Selected specimens seen: Queensland: along Whyanbeel Road, north-northwest of Mossman, *W.D.Reese* 17515, 09 June 1989, MEL 2393230A; Mount Lewis, near Mossman, *B.O.van Zanten* 681386, 4 Aug 1968, NSW 896637.

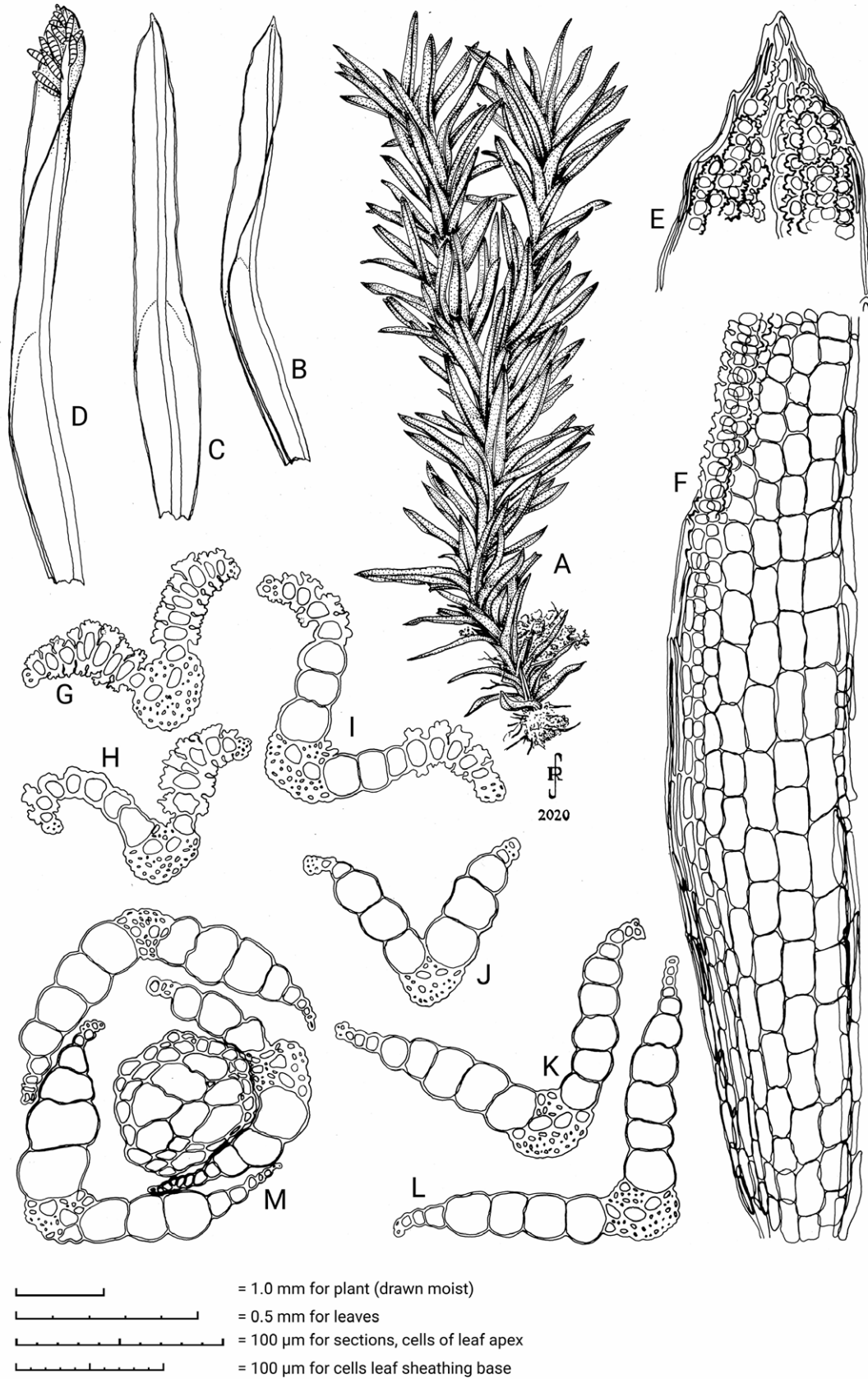


Fig. 10. *Syrrhopodon katemensis* (Zanten) L.T.Ellis. **A:** Habit of plant, drawn moist. **B, C:** Stem leaves. **D:** Gemmiferous leaf. **E:** Cells of leaf apex, adaxial view. **F:** Cells of hyaline lamina. **G, H:** Sections of upper leaf limb. **I:** Section of distal end of hyaline lamina and lower leaf limb. **J–L:** Sections of sheathing leaf base. **M:** Section of stem and sheathing bases of subtending leaves. Drawn from: *W.D.Reese 17515*.

11. *Syrrhopodon muelleri* (Dozy & Molk.) Sande Lac., *Bryol. Jav.* 2: 224 (1870).

Basionym: *Calymperidium muelleri* Dozy & Molk., *Bryol. Jav.* 1: 51, t. 42 (1856).

Original material: ‘Habitat insulam Javae, legit Holle.’

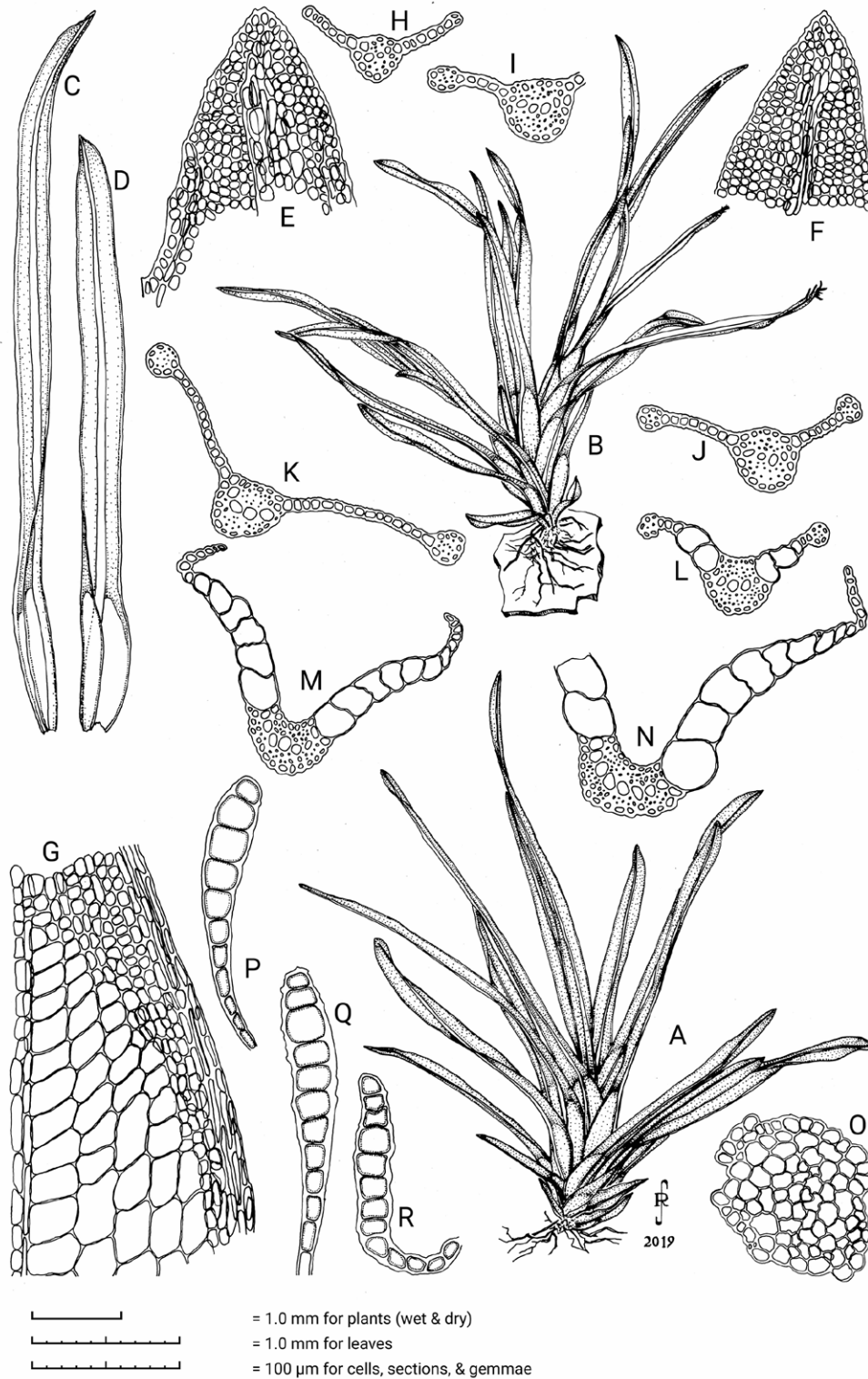


Fig. 11. *Syrrhopodon muelleri* (Dozy & Molk.) Sande Lac. **A, B:** Habit of plants, drawn moist. **C, D:** Stem leaves. **E:** Cells of leaf apex, adaxial view. **F:** Cells of leaf apex, abaxial view. **G:** Cells of hyaline lamina. **H–K:** Sections of leaf limb. **L:** Section of leaf at base of limb and distal hyaline lamina. **M, N:** Sections of leaf sheathing base. **O:** Stem section. **P–R:** Gemmae. Drawn from *W.D.Reese 17102*.

Type: Indonesia: Java, *G.K.von Holle* s.n., s.d. (before 1856); holotype: L0624128 not seen; isotypes: L0060726 not seen, L0060725 not seen, L0624127 not seen; all *vide* Touw (2013).

Note: Two collections in NY (NY01114107!d, NY01114108!d) are annotated by Bill Reese as probable isotypes, but we can see no evidence to support this.

Illustrations: Figure 11. Also Dozy and Molkenboer (1856: 51, t. 42, figs 1–23); Reese and Lin (1991: 364, fig. 131); Ellis and Tan (1999: 40, fig. 22a–f).

Description: Plants reaching 7–12 mm tall, yellowish-green, forming thin tufts. Stems erect, mostly simple, very short, the plants appearing \pm stemless; rhizoids brown to reddish-brown. Leaves long and narrow, stiffly erect when wet or dry, occasionally twisted, narrowly linear, 8–15 mm long, 0.2–0.3 mm wide in limb, sheathing base short, 1.0–1.5 mm long, about 0.4 mm wide; leaf apex broadly acute; margins entire; leaves bordered all round with a colourless to yellowish marginal stereome, continuing to the upper sheathing base where superficial layer of laminal cells is lost. Costa strong, to about 95 μ m wide in mid limb, smooth, ending below leaf tip; in section, \pm plane adaxially, rounded abaxially, with 4–8 guide cells, adaxial and abaxial stereid bands and epidermal layer of lamina cells. Cells of chlorophyllose lamina isodiametric, smooth or very finely pluripapillose, 6–9 μ m wide. Hyaline lamina sharply delimited, narrow, extending into base of limb, chlorophyllose cells decurrent down margins; weakly scalariform. Gemma common, clavate, borne adaxially on leaf tips. Sporophytes not seen in Australian material.

Etymology: After German bryologist Carl Müller (1818–1899) of Halle.

Distribution: North-eastern Queensland, from Cooktown to Tully (Fig. 21.11). Also tropical Asia, India, Sri Lanka, Thailand, China, Malesia, Borneo, Sulawesi, Philippines, Papua New Guinea, Western Samoa, Fiji, Hawaii.

Habitat: Epiphytic on trees, rarely on soil, in complex mesophyll vine forests, to about 800 m a.s.l.

Recognition: The straw colour, \pm stemless habit, erect and entire-margined and often twisted leaves are distinctive characters. *Syrrhopodon aristifolius* is also \pm stemless but there the leaves are often \pm petiolate, constricting above the sheathing base before widening into the limb. The leaf margins are also smooth but not hyaline and in section, angular not rounded, with the leaf apex narrower and tapering to a point. The marginal stereome of *S. aristifolius* also continues down the leaf shoulder margin. *Calymperes serratum* also has ribbon-like flexuose leaves but the leaf shoulders are serrate.

Selected specimens seen: Queensland: Bellenden Ker Range, near Telecom Station at foot of cable car lift, *W.D.Reese* 17102, 19 July 1987, NSW 750952, CBG 9207515.1.

12. *Syrrhopodon parasiticus* (Sw. ex Brid.) Besch., *Ann. Sci. Nat. Bot., Sér.* 8, 1: 298 (1896).

Basionym: *Bryum parasiticum* Sw. ex. Brid., *Muscol. Recent.* 2(3): 54 (1803).

Original material: ‘In Jamaica ad arbores ? habitat.’

Type: Hispaniola (Greater Antilles), s.loc., ?*Swartz s.n.*, 1759; isotypes: BM000664063!d, BM000664065!d, BM000664066!d, E00002338!d.

The collection date is taken from an annotation on E00002338. Bridel-Brideri stated that the species was unknown to him, and that he took the description from Swartz (i.e. Olof Swartz, in *Nova genera et species plantarum* 1788: 139), so the authorship must be Sw. ex Brid., even though Swartz’s publication pre-dates Hedwig (1801). Although most species described by Swartz were from Jamaica, he listed *Bryum parasiticum* from Hispaniola, in the Greater Antilles (annotated as such on E00002338). This should therefore be treated as an error by Bridel-Brideri in the type citation cited above. Since Hispaniola is now shared by Haiti and the Dominican Republic, it is not possible to state the modern country where the type was collected.

Australian synonym: *Syrrhopodon watsii* Broth., *Öfvers. Finska Vetensk.-Soc. Förh.* 43: 93 (1900); *Calymperopsis watsii* (Broth.) M.Fleisch., *Biblioth. Bot.* 80: 5 (1913), *vide* Reese and Stone (2012). **Original material:** ‘New South Wales, Richmond River, Wardell Road, ad truncum arboris parcissime (W. W. Watts n. 2420).’ **Type:** Australia: New South Wales, Pimlico, Richmond River, *W.W.Watts* 2420, 12 Aug 1901; holotype: S (*vide* Reese and Stone 2012), not seen; isotypes: NSW (*vide* Reese and Stone 2012) not seen, MEL 1002944A!, PC 0131479!d.

Notes: The collecting date is taken from a label on the isotype packet in MEL, and agrees with the date stated on the isotype packet in PC (‘Aug 1901’). Watts made numerous collections of plants at Wardell Road in the Richmond River district on 18 August 1901, but the known collecting numbers are in the range 5042 to 5054 (AVH 2022). It is thus possible that the number cited in the protologue was misread from handwriting. However, the year of publication, as stated on the title page of the journal, was 1900, and the article by Brotherus

is dated November 1899, thus preceding the supposed collecting date by almost two years. Unfortunately it was beyond the scope of this study to resolve this disparity.

Illustrations: Fig. 12. Also Reese *et al.* (1986: 175), Eddy (1990: 89), Reese and Lin (1991: 363), Ellis and Tan (1999: 40).

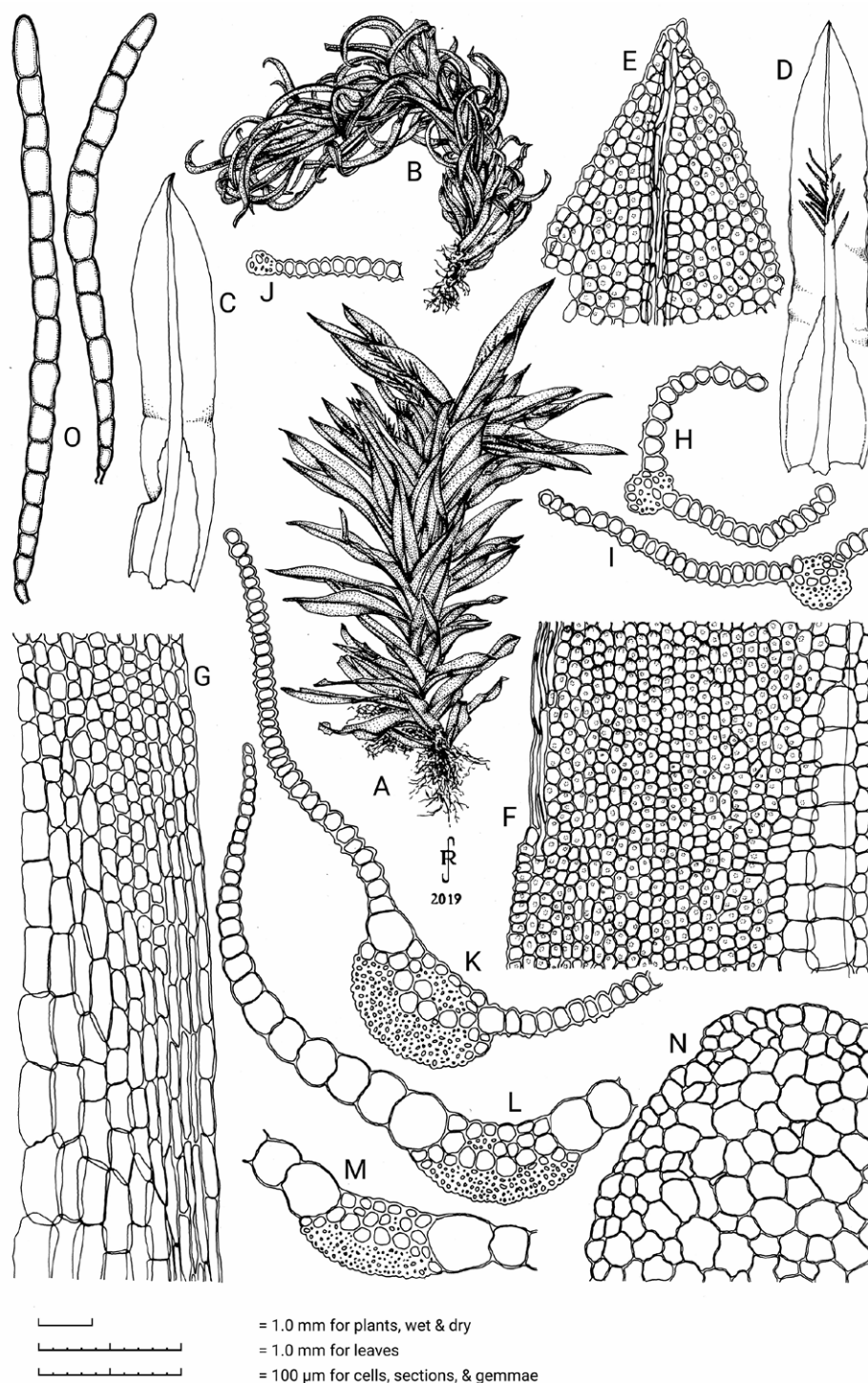


Fig. 12. *Syrrhopodon parasiticus* (Brid.) Besch. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C:** Non-gemmiferous leaf. **D:** Gemmiferous leaf. **E:** Cells of leaf apex, abaxial view. **F:** Cells of distal hyaline lamina and lower leaf limb. **G:** Cells from basal margin of leaf. **H, I:** Leaf sections from upper limb. **J:** Section of margin of leaf limb. **K:** Section of base of limb at distal hyaline lamina. **L, M:** Sections of leaf base. **N:** Part stem section. **O:** Gemmae. Drawn from D.A.Meagher and A.Cairns WT-604B.

Description: Plants small, to 10 mm tall, dark green, in small, open colonies or solitary. Stems erect, mostly simple; rhizoids brown. Leaves 3–4 mm long, 0.6–0.7(–0.85) mm wide at mid limb, the lamina weakly undulate, narrow lanceolate to lingulate; margins entire, bordered in part by hyaline cells, the border ending well below the leaf apex and at the shoulder region, sometimes weak or lacking in some leaves. Costa percurrent, in section with 4–6 median guide cells and often a few additional guide cells adaxially, abaxial stereid band larger than adaxial band, epidermal layer lost abaxially in lower limb, adaxially \pm distinct throughout. Cells of chlorophyllose lamina rounded-polygonal, 5–7 μ m wide, abaxially smooth to unipapillose with simple papillae, convex adaxially. Hyaline lamina sharply defined, narrowing gradually upwards and penetrating well into base of the limb, scalariform. Gemmae often numerous, filamentous, arising from adaxial surface and edges of costa, mainly near mid limb. Sporophytes not seen in Australian material.

Etymology: Latin *parasiticus* (parasitic), presumably referring to the epiphytic habitat.

Distribution: Eastern Queensland, from Mossman southwards, extending into northern New South Wales (Fig. 21.12). A pantropical species recorded from southern USA, Central America, tropical northern South America, west Central Africa, east Central Africa, Madagascar, Réunion, tropical Asia, China, Malesia, Borneo, Philippines, Polynesia, Oceania.

Habitat: Epiphytic on twigs and bark of trees from sea level to about 1000 m.

Recognition: *Syrrhopodon parasiticus* is inconspicuous in the field because it seems to always grow in small, sparse colonies. Reese and Stone (2012) describe the leaves as ‘somewhat dimorphic; vegetative [non-gemmiferous] ones narrow and elongate, linear to lanceolate; gemmiferous ones shorter and broader, often deltoid and forming a terminal coma’. Leaf dimorphism is not mentioned by Eddy (1990). In the plant shown in Fig. 12 there is little difference between gemmiferous and non-gemmiferous leaves and no evidence of deltoid leaves. The intermittently bordered leaves and long filamentous gemmae borne on the costa (mostly around mid-lamina) are distinctive characters.

Selected specimens seen: Queensland: North Kennedy District; South of Tully, track to Cochable Creek camp site from Cardstone Road, *D.A.Meagher and A.Cairns WT-604B*, 25 May 2015, BRI AQ1019801.

13. *Syrrhopodon perarmatus* Broth. in Broth. & Watts, *J. Proc. Roy. Soc. New South Wales* 49: 133 (1915).

Original material: ‘Santo: Bowie, 1909 (Hb. Watts, 89); Aneityum: Gunn, Oct., 1911 (Hb. Watts, 193, Hb. Lillie, 697), May–June, 1913 (Hb. Watts, 410); Futuna: Gunn, Oct. 1912 (Hb. Watts, 292)’

Type: (3 syntypes): (1) *Bowie s.n.*, not seen; (2) *Watts 193*, BM000672396!d; (3) *Gunn s.n.*, BM000672395!d, E00261323!d.

Note: We are uncertain whether a lectotype has been selected. BM000672395 is annotated by Len Ellis ‘This is *Syrrhopodon tristichus*? If that is correct, the protologue may have been based on more than one species, or *Watts 410* may be a mixed collection.

Illustration: Fig. 13.

Description: Plants medium-sized, dull green to brownish-olive, to 3 cm tall, forming loose to dense tufts. Stems stiffly erect to flexuose, simple or forked; rhizoids brown. Leaves spreading from an erect sheathing base, abruptly contracted at shoulder to an elongate linear, narrow parallel-sided limb, 6–10 mm long, 0.5 mm wide at shoulders; apex \pm obtuse, serrate, margins of limb thickened, with strongly developed but largely concealed marginal stereomes exposed, if at all, only on adaxial side but mostly covered by lamina-like chlorophyllose cells many of which are produced into conical teeth; border densely and irregularly toothed throughout, continuing down each side of the sheathing base and at the shoulders long spinose-ciliate. Costa strong, in section with 4–6 guide cells, strongly developed adaxial and abaxial stereid bands, and a well-developed chlorophyllose and often conical-spinose epidermal layer. Cells of upper chlorophyllose lamina smooth, mainly rounded-hexagonal or \pm circular, strongly biconvex, the adaxial and abaxial walls strongly thickened and lenticular. Hyaline lamina occupying almost entire sheath, tapering upwards and ending at base of limb at an acute angle. Gemmae not seen. Sporophytes with seta yellowish, about 6 mm long. Capsule about 1.5 mm long, cylindrical-ovoid, about 0.3–0.4 mm wide in middle; operculum bluntly conical, about 0.3 mm tall.

Etymology: Latin *perarmatus* (well-armed), referring to the strongly dentate-ciliate leaf margins.

Distribution: Known from Vanuatu, Malesia, Papua New Guinea and adjacent islands, Solomon Islands, Polynesia, and Fiji. *Syrrhopodon perarmatus* is presumed to be extinct in Australia, but might never have occurred there. It was reported from New South Wales from specimen in Mitten’s herbarium in NY, which Reese and Stone (2012) attributed to Alexander Collie (1793–1835) and suggested it might be the result of a mislabelling. However, the collector is more likely to have been the Reverend Robert Collie (1839–1892), since

the specimen they cited is labelled ‘Sydney, Bro. Collie’ and Alexander Collie’s Australian collections were all made in south-west Western Australia (AVH 2022; JSTOR Global Plants 2022).

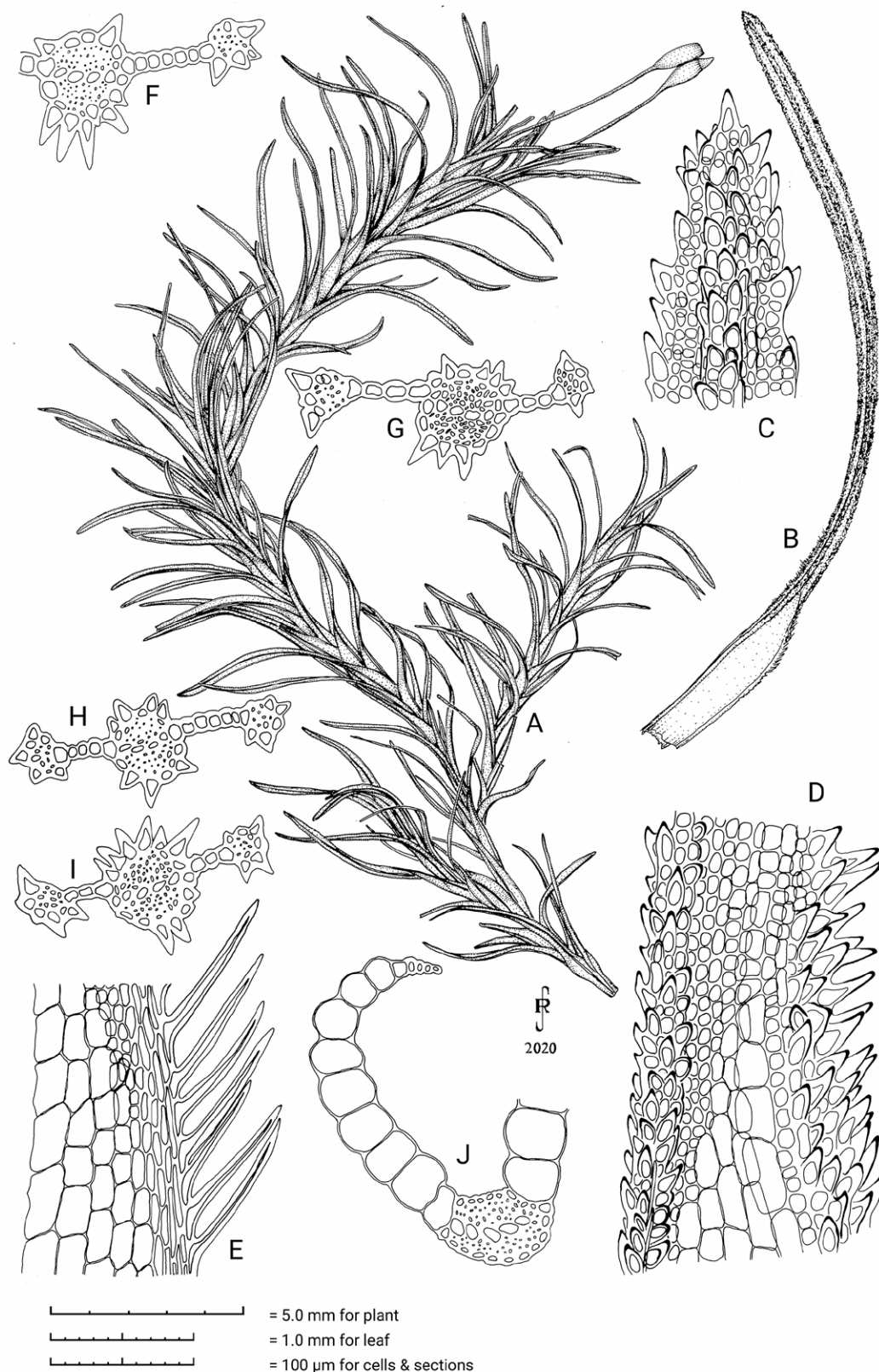


Fig. 13. *Syrrhopodon perarmatus* Broth & Watts. **A:** Habit of plant, drawn moist. **B:** Stem leaf. **C:** Cells of leaf apex, abaxial view. **D:** Cells of distal hyaline lamina from margin (left) to costa (right). **E:** Marginal ciliate spicules of leaf shoulder region. **F–I:** Sections of leaf limb. **J:** Section of sheathing leaf base. Drawn from *H. Streimann 62600*.

Robert Collie lived in Sydney from 1876 to 1892 and collected widely in New South Wales, including the subtropical north-east of the state. There are 14 of his bryophyte collections in Australian herbaria, and several more in overseas herbaria (AVH 2022; JSTOR Global Plants 2022). We are therefore inclined to accept the record as genuine, although noting the possibility of a mix-up of specimens or labels. Alternatively, the specimen may simply be misidentified.

Habitat: Trees and stumps in wet forests up to about 1200 m a.s.l.

Recognition: The description used here is based on Reese *et al.* (1986), Eddy (1990) and the specimen examined. It is noteworthy that the original description gives stems up to 7 cm long and leaves to 5 mm long. The illustrated specimen was collected from Vanuatu, where it formed large continuous colonies on a semi-shaded *Dysoxylum* trunk within tropical forest. Reese *et al.* (1986) noted the range of the species was eastern, from Papua New Guinea to Fiji, Solomon Islands, Vanuatu and reportedly from New South Wales. In Papua New Guinea and the Solomon Islands it grows on trees and stumps in wet forests to about 1000 m a.s.l. Eddy (1990) gave the distribution as ‘widespread in tropical and temperate Australasia, extending northwards to Polynesia and just reaching Malesia in Papua New Guinea and adjacent islands’.

Syrrhopodon perarmatus superficially resembles a robust form of *S. spiculosus* but it is usually taller with longer leaf limbs. The comb-like spiculate margin of the leaf shoulders is more regularly arranged than in most forms of *S. spiculosus* and differs microscopically in the smooth chlorophyllose lamina cells, rather than coronate-papillose lamina cells as in the latter species.

Selected specimens seen: Vanuatu: Espiritu Santo Butmas; Mount Tanakar Plateau, 26 km north west of Luganville, *H. Streimann* 62600, 20 October 1998, CBG 9912195.1.

14. *Syrrhopodon platycerii* Mitt., *Fl. Vit.* 388 (1873).

Original material: ‘Lord Howe’s Island, on *Platycerium* (McGillivray and Milne! Herb. Hooker)’

Type: Australia: New South Wales, Lord Howe Island, *McGillivray & Milne* 43, 1853, isotypes BM000918844!d, BM000918845!d, MO406956!d, NY01127791!d, NY01127792!d, NY01127793!d.

Note: We are uncertain whether a lectotype has been selected. NY01127791 seems to be the best candidate, since it is from Hooker’s herbarium and has Mitten’s sketch in pencil. The collection number is taken from isosyntypes in BM and NY, and the date is when the *Herald* was at Lord Howe Island (David 1995).

Australian synonym: *Syrrhopodon novae-valisiae* Müll. Hal., *Hedwigia* 37: 119 (1898), *vide* Reese *et al.* (1986).

Original material: ‘Habitatio. Australia, New South Wales, Sydney: Domina Kayser in Hb. Geheeb, serius Herriott 1881 in Hb. Melbourne; Richmond River: Fawcett 1881 et Trinity Bay: Sayer 1886 in codem Hb., forma microscopica.’ **Type:** Syntypes: Australia, New South Wales, (1) Sydney, *F. Kayser s.n.* 1875 (date from isosyntypes); Sydney, *Herriott s.n.*, 1881; (2) Richmond River, *Fawcett s.n.*, 1881; (3) Queensland, Trinity Bay, *W. Sayer s.n.*, 1886; syntypes: B (destroyed), isosyntypes: (1) BM000672651!d, BM000672653!d, (2) JE04001452!d, JE04001453!d, JE04001454!d, (3), none seen.

Syrrhopodon novae-valisiae is often referred to incorrectly as *S. novae-valisiae*. The collector as annotated on the isosyntypes was Friedrich Kayser, although ‘Domina Kayser’ in the list of original material translates as ‘Mrs Kayser’. We have not found isosyntypes in Australian herbaria, which is surprising because the Fawcett collection was distributed by Ferdinand von Mueller (ex MEL) and Sayer’s collections are well-represented in MEL.

Illustrations: Fig. 14. Also Mitten in Seemann (1865: fig. 98j), Reese *et al.* (1986).

Description: Plants small, dark green, in soft low turfs and cushions, to 5 mm tall. Stems short, to 2 mm; rhizoids red. Leaves monomorphic, 2.0–3.5 mm long, short pointed from a broader base; when dry, leaves strongly helically twisted above shoulders, straight when moist; margins strongly bordered throughout with hyaline cells, toothed in upper 1/3–1/2 with well-separated teeth; costa 35–50 µm wide in mid leaf, ending in a short mucro; in section with mostly 2 median guide cells in upper leaf, with an additional enlarged hyaline cell either side in hyaline lamina, with small adaxial and larger abaxial stereid bands, epidermal layer not differentiated; cells of chlorophyllose lamina thick-walled, papillose on both surfaces with stout multifid papillae, chlorophyllose cells decurrent down margins of hyaline lamina; hyaline lamina large, conspicuous, scalariform distally. Gemmae scarce, clavate, borne adaxially along costa. Sporophytes with long-rostrate and cucullate calyptra. Seta yellow, about 5 mm long. Capsules cylindrical, 1.0–1.5 mm long; operculum slenderly long-rostrate. Peristome of low, imperfect transversely barred teeth. Spores about 16–18 µm in diameter, ± smooth.

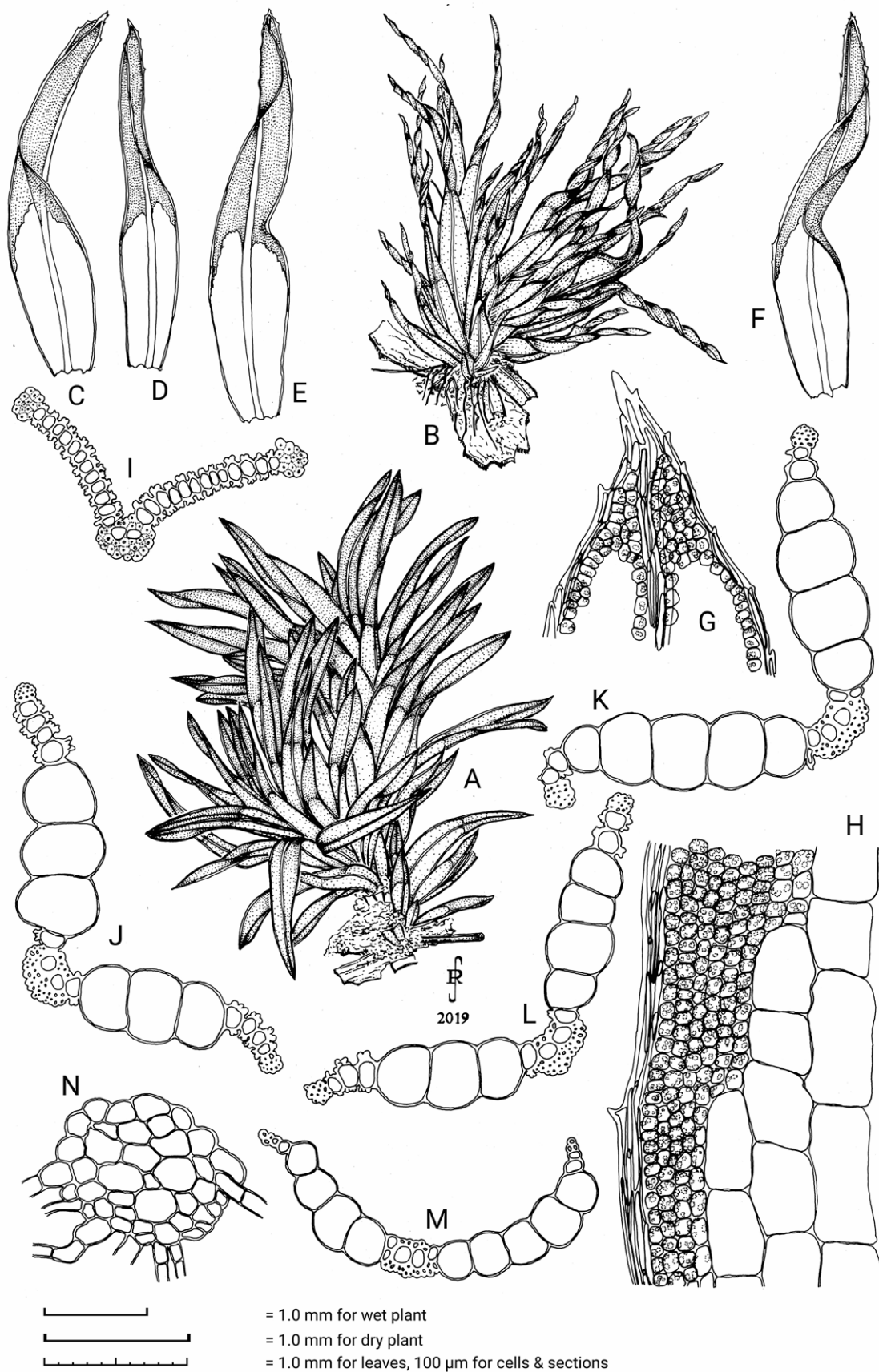


Fig. 14. *Syrrhopodon platycerii* Mitt. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C–F:** Leaves. **G:** Cells of leaf apex. **H:** Cells of distal hyaline lamina. **I:** Section of upper leaf limb. **J–M:** Sections of cancellar region. **N:** Stem section. Drawn from A.J.Franks AJF1406044B.

Etymology: Referring to the fern genus *Platycterium* on which the species grows.

Distribution: Endemic to Australia, along the eastern coast of the Australian mainland, from the Windsor Tableland of Queensland to Port Hacking, south of Sydney, and on Lord Howe Island (Fig. 21.14). Meagher (2002) reported it growing in cultivation on a living *Platycterium* fern in Melbourne, Victoria.

Recognition: When dry, the helically twisted leaf limbs are quite characteristic. It grows exclusively on the bases of *Platycterium* ferns. Reese and Stone (2012) noted that colonies are commonly fertile, unusual for *Syrrhopodon*, but perigonia and antheridia have been elusive, and Rees *et al.* (1986) suggested that the species might be monoicous, based on dissections of fertile material. The specimen used for illustration was collected from the base of a fallen *Platycterium* fern in an upland complex notophyll vine forest.

Selected specimens seen: Queensland: South Kennedy District: Wishing Pool Circuit, Eungella National Park, about 11 km south of Eungella Village, 776 m a.s.l. *A.J.Franks AJF1406044B*, 30 June 2014, BRI AQ0910164. New South Wales: East Ballina, *W.W.Watts NSW 5531*, 31 Mar 1902, NSW 752844!; Lord Howe Island, behind Johnson's, *W.W.Watts LHI 114*, 8 July 1911, NSW 752803!.

15. *Syrrhopodon prolifer* Schwägr. var. *prolifer* Spec. Musc. Suppl. 2(2): 99, pl. 180 (1827).

Original material: 'Ad terram in umbrosis ad pedes montium Sierra dos Orgos in Brasilia legit dilig. Beyrich.'

Type: Brazil: Rio de Janeiro state, at the foot of the Serra dos Órgãos, *H.K.Beyrich s.n.*, 1823; lectotype (designated by Ellis 2011): G 00042872[a], not seen; isolectotypes: G 00040509 not seen, G 00040510 not seen, BM000664154!d (all *vide* Ellis 2011), GOET013644!d.

Illustrations: Fig. 15. Also Schwägrichen (1827: t. CLXXX), Ellis (1985: 13), Reese and Lin (1991: 349), Ellis and Tan (1999: 44), Ellis (2003: 167).

Note: The illustration in Schwägrichen is in table CLXXX, not CLXXXI as stated in the protologue. The date of collection is from an annotation on the packet of the material in GOET.

Description: Plants to 3 cm tall, usually shorter, pale green to olive green, forming loose tufts. Stems erect, simple or forked; rhizoids red to brownish, often copious among the lower leaves. Leaves straight, closely set, straight or variously contorted when dry, erect spreading when moist, narrowly lanceolate, the sheathing base little wider than the limb, 2–5 mm long, about 0.3 mm wide in limb, limb linear to linear-acuminate, apex more or less truncate, rarely acute; bordered all round with a pellucid, multicellular stereome; margins entire except at leaf tip; stereome running down margins of leaf shoulders and into sheathing base. Costa pellucid, smooth almost throughout its length, in section with 2(–4) guide cells, adaxial and abaxial stereid bands, epidermis differentiated in part adaxially in upper limb, lacking abaxially. Cells of chlorophyllose lamina pluripapillose with low papillae on both surfaces, the cells thick-walled with a rounded lumen, 6–8 µm wide. Hyaline lamina occupying almost entire sheathing base, narrowing gradually distally; cells of chlorophyllose lamina decurrent down margins for some distance, not decurrent down costa. Gemmae uncommon, clavate, borne adaxially on leaf tips. Sporophytes not seen in Australian material.

Etymology: Latin *prolifer* (fruitful), presumably referring to the abundant capsules in the type material.

Distribution: North-eastern Queensland, on Thornton Peak and the Bellenden Ker Range (Fig. 21.15). Elsewhere pantropical, occurring in Mexico, South and Central America, Caribbean islands, tropical Africa, Madagascar, Mauritius, Réunion, Seychelles, tropical Asia, India, Sri Lanka, Malesia, Papua New Guinea and Hawaii.

Habitat: On tree trunks and roots.

Recognition: *Syrrhopodon prolifer* is also similar to *S. trachyphyllus*, but in that species the leaves are often incompletely bordered and are usually toothed at the shoulders. It is also similar to *S. muelleri*, but that has the leaves stiffly erect, the plants have a ± stemless habit, and the cells of the chlorophyllose lamina are mostly finely papillose. Orbán and Reese (1990) reviewed the distribution and variation within the *S. prolifer* complex on a worldwide basis.

Reese (1989) and Reese and Stone (2012) recognised *S. prolifer* var. *mossmansensis* W.D.Reese & I.G.Stone, from northern Queensland. However, Ellis (2003) demonstrated that this variety was a synonym of *S. katemensis*, which has much smaller leaves and stout and conspicuous multifid papillae on the cells of the chlorophyllose lamina.

Selected specimens seen: Queensland: Cook District; Bellenden Ker Range, route between Centre Peak and North Peak, *D.A.Meagher and A.Cairns, WT-1120A*, 17 August 2016, BRI AQ1020915.

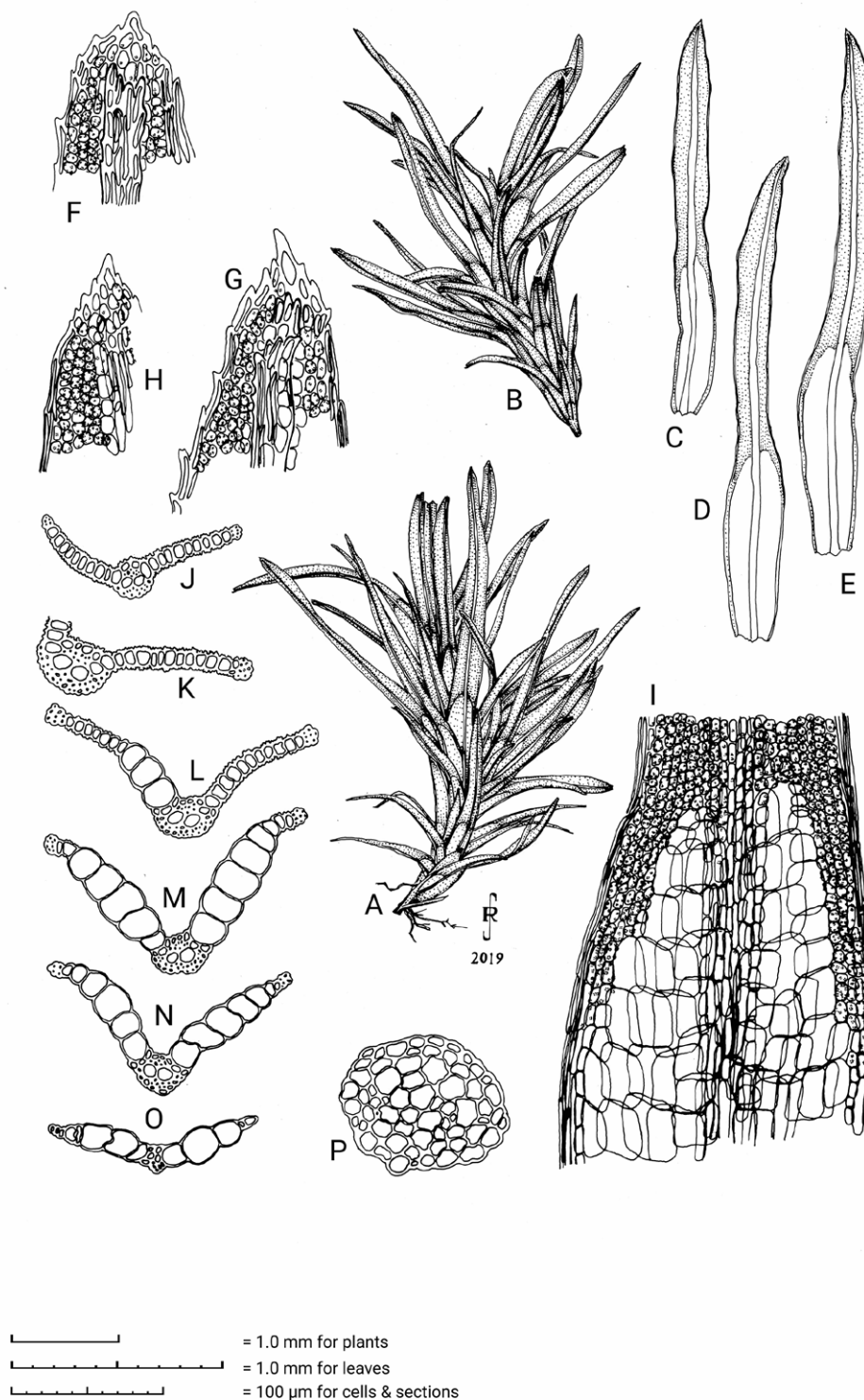


Fig. 15. *Syrrhopodon prolifer* Schwägr. var. *prolifer*. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C–E:** Stem leaves. **F, G:** Cells of leaf apex, abaxial view. **H:** Cells of leaf apex, adaxial view. **I:** Cells of hyaline lamina. **J, K:** Sections of leaf limb. **L:** Section of distal end of hyaline lamina and base of limb. **M–O:** Sections of sheathing base of leaf. **P:** Stem section. Drawn from *D.A.Meagher and A.Cairns, WT-1120A*.

16. *Syrrhopodon semperi* Müll.Hal., *Linnaea* 38: 557 (1874).

Original material: ‘Patria. Insulae Philippinae, Luzon, reg. tropica: Dr. Semper 1861.’

Note: The isotype is from herb. Hampe.

Type: Philippines: Luzon, *C.Semper s.n.*, 1861; holotype: B (destroyed); isotype: BM-000675254!d.

Illustrations: Fig. 16. Ellis (2003: 170).

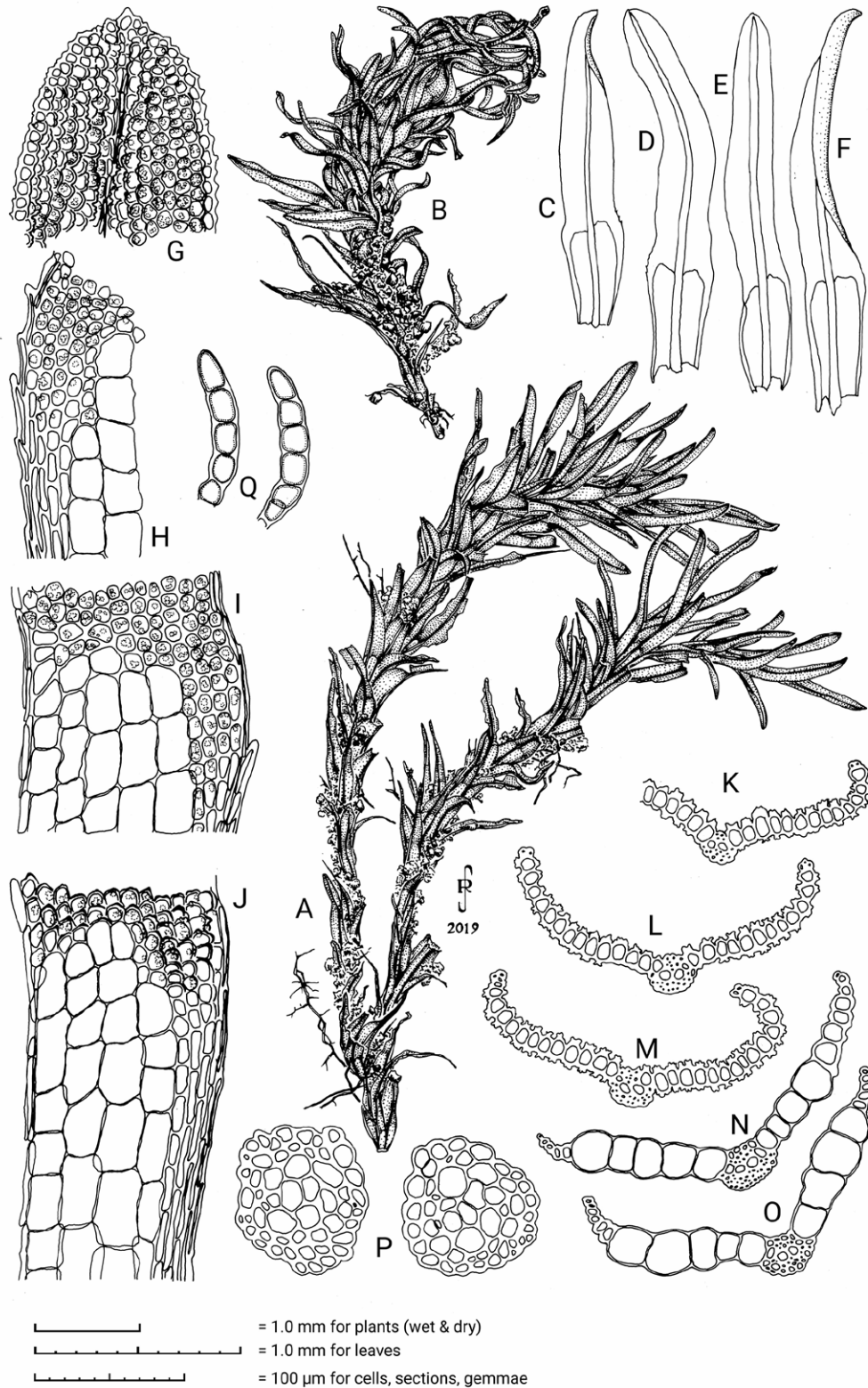


Fig. 16. *Syrrhopodon semperi* Müll. Hal. **A:** Habit of plant, drawn moist. **B:** Habit of plant, drawn dry. **C–F:** Leaves. **G:** Cells of leaf apex, adaxial view. **H, I:** Cells of distal hyaline lamina. **J:** Cells of proximal hyaline lamina. **K–M:** Sections of leaf limb. **N, O:** Sections of sheathing base of leaf. **P:** Stem section. **Q:** Gemmae. Drawn from *M.A.M. Renner 8635*.

Description: Plants small, dark green to brownish green or rusty green, forming low tufts or turfs. Stems simple or occasionally forked, 6–10 mm tall; rhizoids red. Leaves small, oblong to ligulate from a slightly broader base, 1.5–2.5 mm long, about 0.25 mm wide in limb, 0.35 mm wide at leaf shoulders; involute and uncinately curled when dry, straight to slightly incurved when moist; limb ligulate, with a broadly acute to obtuse apex and margins typically involute to inrolled; border relatively weak, 2–3 cells wide, 1–2 cells thick, distinct but often concealed by incurved margins of limb, usually with distant teeth or cilia but sometimes these are low or lacking, the border disappearing some distance below leaf apex, usually distinctly toothed or ciliate at shoulders; costa variable, mostly smooth, pellucid, in section with 2–4 guide cells, adaxial and abaxial stereid bands, epidermal layer not developed or epidermal cells conical-mammillate; cells of chlorophyllose lamina papillose with multifid or coronate papillae, thick-walled, rounded-quadrate, 6–10 µm wide; hyaline lamina of relatively few rows of cells, rounded distally or weakly scalariform, bordered marginally by elongate cells of leaf border. Gemmae small, few, cylindrical clavate, borne adaxially near leaf tip. Sporophytes occasional; calyptra about 1.2 mm long; seta red, 3–4 mm long; capsules brown, obliquely ovoid, about 1 mm long; operculum slenderly rostrate, about 0.5 mm long. Peristome teeth yellowish, slender, imperfect, fragile, papillose, ± jointed, 48–72 µm long. Spores 9–10 µm in diameter, smooth.

Etymology: After German zoologist Carl Semper (1832–1893), who collected the type.

Distribution: Known from Daly River and Katherine Gorge in northern Northern Territory, and in north-eastern Queensland from Cape Tribulation south to the Paluma Range (Fig. 21.16). Also widespread around coastal tropical Asia from India to Cambodia and southern Japan, and the Malay Peninsula, Borneo, Philippines, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia and the Pacific islands.

Habitat: Tree bases, roots, rock and soil from sea level to about 500 m a.s.l., typically in mesophyll vine forest and often in rather open sites.

Recognition: A rather variable species with a wide distribution which is similar to the less spiculate forms of *S. spiculosus*, but distinguished by its adaxially smooth or papillose, not spiculate costa which, close to the apex, tends to be ± hidden below the general adaxial leaf surface. Ellis (2003) states for *S. semperi*: ‘It has ligulate leaves, <2–2.5(–3) mm long. The costa ends immediately short of the leaf apex and has a smooth surface formed by stereids, completely lacking spines or multifid projections. The chlorophyllose lamina is inflexed and composed of cells with similar dimensions and structure to those of *S. trachyphyllus*’. The specimen used for illustrating *S. semperi* was collected from logs on a stream bank in notophyll forest, occurring with *Acanthorrhynchium papillatum* (Sematophyllaceae). The specimen was initially determined as *S. trachyphyllus* but the identify was revised to *S. semperi* by Ellis (L.T.Ellis pers. comm., 17 July 2020).

Selected specimens seen: Queensland: Cook District: Daintree River National Park, trail to summit of Thornton Peak, camp site at Hilda Creek at base of mountain, 161 m a.s.l., *M.A.M.Renner* 8635, 18 August 2017, NSW1061163.

17. *Syrrhopodon spiculosus* Hook. & Grev., *Edinburgh J. Sci.* 3: 326 (1825).

Original material: ‘Hab. Sincapore, Dr Wallich.’

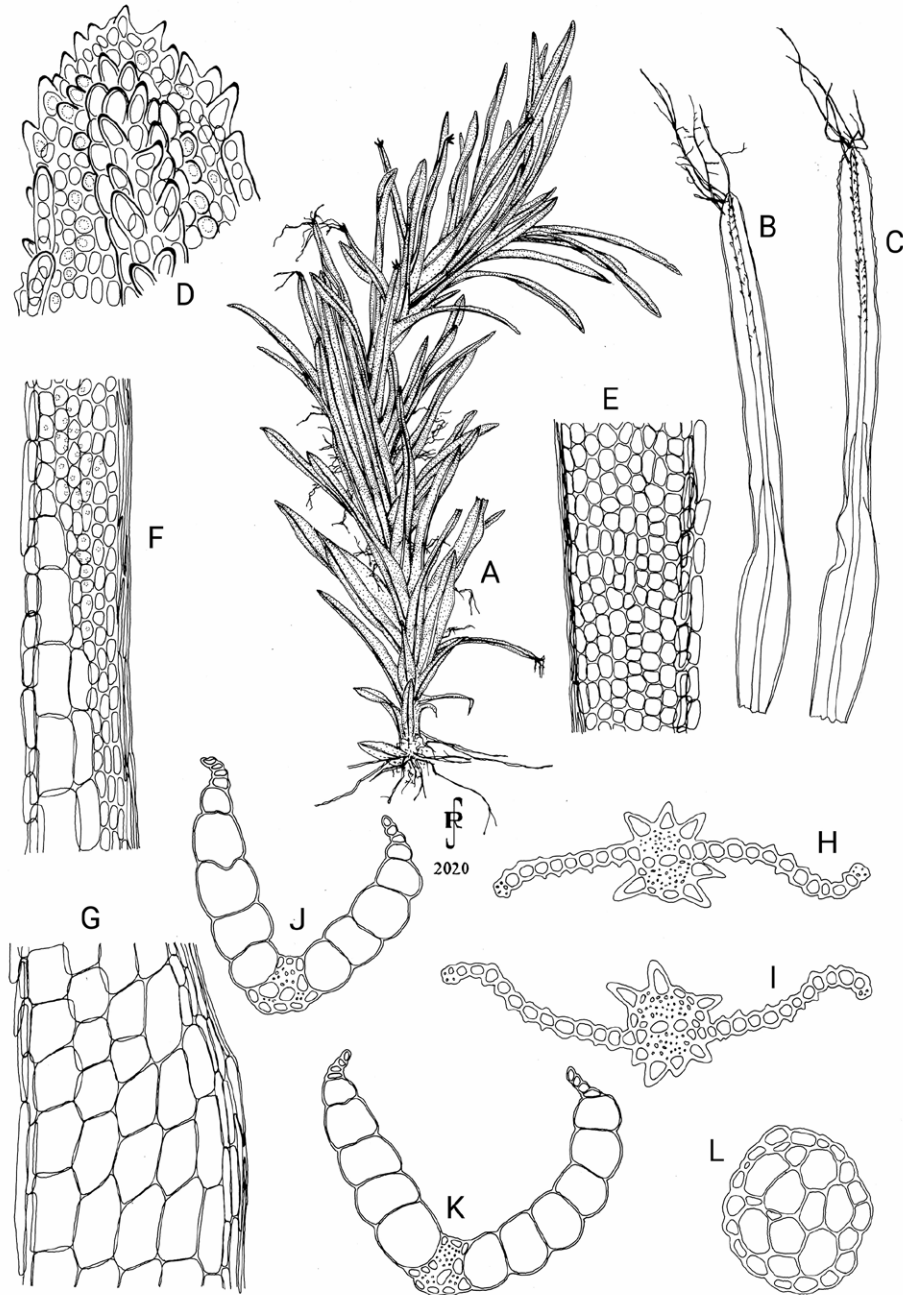
Type: Singapore, *s.loc.*, *N.Wallich s.n.*, 1822; isotypes BM000664503!d, BM000664504!d, BM000664506!d, BM000664510!d, E00256126!d, K001127484!d (lost).

Note: K001127484 is annotated ‘missing 2/iii/54’ and has no specimen in the folder. The collection date is taken from an annotation on the isotype folder in K.

Illustrations: Fig. 17. Also Reese and Lin (1991: 358), Ellis and Tan (1999: 41).

Description: Plants in loose tufts, to 4 cm or taller, olive green to brownish. Stems erect; rhizoids red. Leaves little altered wet or dry, the limb linear to narrowly linear from an erect, colourless sheathing base, erect-spreading to patent, 2.5–4.0 mm long, about 0.25 mm wide in leaf base, 0.15–0.20 mm wide in mid limb; margins of upper limb typically ± involute, minutely hispid; narrowly bordered below, reduced in upper limb or absent, often obscured by involute margins, border of leaf shoulder usually with spines or cilia of varying length, sometimes sparse or absent; leaves sometimes with tufts of rhizoids arising from adaxial surface of leaf tip. Costa strong, about 50 µm wide in limb, ending just below leaf apex, hispid on both adaxial and abaxial surfaces in limb with spines or acute-conical projections; in section with 2–5 guide cells, thick adaxial and abaxial stereid bands and distinct epidermal layer. Cells of chlorophyllose lamina thick-walled, quadrate to short rectangular, 5–11 µm wide, usually obscured by the tall, sometimes compound, coronate papillae on both surfaces, often with some cells having lower simple papillae; hyaline lamina sharply delimited, occupying almost entire leaf sheath, ± scalariform, ending at a narrow acute angle to the costa and penetrating quite high

into base of limb, bordered by a narrow band of 3–4 rows of thick-walled elongate cells. Gemmae uncommon, clavate or fusiform, borne adaxially at tip of costa. Sporophytes not seen in Australian material.



_____ = 1.0 mm for plant
 _____ = 1.0 mm for leaves
 _____ = 100 µm for cells, sections

Fig. 17. *Syrrhopodon spiculosus* Hook. & Grev. **A:** Habit of plant, drawn moist. **B, C:** Leaves with terminal clusters of rhizoids, abaxial view. **D:** Leaf apex, abaxial view. **E:** Cells of leaf limb, mid leaf region, abaxial view. **F:** Cells at distal end of hyaline lamina, from costa (left) to margin (right). **G:** Cells of hyaline lamina, from costa (left) to margin (right). **H, I:** Leaf sections of distal part of limb. **J, K:** Sections of sheathing leaf base. **L:** Stem section. Drawn from *D.Lucas 114*.

Etymology: Latin *spiculosus* (covered in small sharp points), referring to the ‘pellucid denticulated or spiculated unequal processes’ on the leaf margins and on the costa.

Distribution: Northern Territory: Arnhem Land and Melville Island south to Katherine Gorge (Fig. 21.17). Also tropical Asia from India, Sri Lanka, Thailand, throughout Malesia and Polynesia.

Habitat: On shaded rock faces, and sometimes on bark and soil, in monsoon forest, and in protected gorges in seepage areas on shaded rock faces, generally below 300 m a.s.l.

Recognition: Australian material of *S. spiculosus* is somewhat enigmatic because nearly all the specimens seen by Bill Reese have an appended annotation by him referring to the rarity or absence of the marginal spicules. Such forms may be confused with *S. albovaginatus* as both species have spreading-patent leaves when moist or dry, with the latter species also having entire leaf shoulders, as in the specimen of *S. spiculosus* illustrated here. However, the leaf lamina cells of *S. spiculosus* have multifid papillae while those of *S. albovaginatus* are simple. Further, the limbs of leaves of *S. spiculosus* lack the obliquely transverse rows of conical-dentate cells seen in *S. albovaginatus*. *Syrrhopodon spiculosus* is a highly variable taxon, as evidenced by a long list of synonyms. Eddy (1990) summed up the variability: ‘The marginal stereome may be almost entire at times, the cilia or teeth of the leaf shoulders may be reduced to low, remote teeth and the lamina cell papillae may be small and less profusely coronate.’

Selected specimen seen: Northern Territory: Kakadu; Steep Boulder Gorge, 80 m a.s.l., *D.Lucas 114*, 16 June 1988 (CBG 8803892).

18. *Syrrhopodon stoneae* W.D.Reese, *Bryologist* 92: 302, fig. 1–3 (1989).

Original material: ‘Australia. Queensland. Trail up Mt Bartle Frere from Josephine Falls; tropical rainforest; 17°26’S, 145°52’E; fallen tree trunk, *W. B. Schofield & M. I. Schofield 79707* (holotype — UBC, isotypes — LAF, MELU, NSW). Paratype: As above; on fallen tree trunk by stream, *W. B. Schofield & M. I. Schofield 79652* (LAF, MELU, NSW, UBC).’

Type: Australia: Queensland, Josephine Falls, Bartle Frere track, *W.B.Schofield & M.I.Schofield 79707* 25 July 1983; holotype: UBC, not seen; isotypes: LAF, not seen, MELU!, NSW, not seen. Paratype: MELUB3163.

Illustrations: Fig. 18. Also Mohamed and Reese (1992: 89).

Description: Plants dark brownish green to blackish green. Stems 6–8 mm tall; rhizoids dark red. Leaves ± dimorphic, lanceolate, the sheathing base no wider than the limb, vegetative leaves few, 2.5–4.0 mm long, 0.4–0.5 mm wide at mid limb, leaves stiffly secund and involute when dry, stiffly erect spreading when moist; leaf limb narrowing at tip to a broadly acute to obtuse apex; most leaves gemmiferous, larger, to 5 mm long, the apex shortly proboscoid; margins thickened in mid limb, denticulate above, entire or slightly serrulate below; costa strong, with 4–6 guide cells, strong adaxial and abaxial stereid bands, a differentiated epidermal layer, the epidermal cells conical mammillose above, becoming ± smooth in lower limb and sheathing base. Cells of chlorophyllose lamina thick-walled, ± quadrate to short rectangular, 10–12 µm long, adaxially conical mammillose-papillose, abaxially minutely uni- to pluripapillose; hyaline lamina sometimes indistinct, distally not sharply demarcated from chlorophyllose cells of limb. Gemmae clavate, borne adaxially on tips of gemmiferous leaves. Sporophytes unknown.

Etymology: After Australian bryologist Ilma Grace Stone (1913–2001).

Distribution: Known in Australia only from the type locality in north-eastern Queensland (Fig. 21.18). Also reported from Malaysia by Mohamed and Reese (1992), which suggests that it might be more widespread.

Recognition: *Syrrhopodon stoneae* is characterised by its dimorphic leaves, red rhizoids, thickened denticulate leaf margins, rather indistinct hyaline lamina, and absence of elongate hyaline marginal cells. Reese and Stone (2012) note that *S. stoneae* may be better placed in *Calymperes* than in *Syrrhopodon*. However, red rhizoids are rare in *Calymperes* but common in *Syrrhopodon*.

Selected specimen seen: Queensland: Bartle Frere, Josephine Falls. *W.B.Schofield 79652 and M.I.Schofield*, 25 June 1983 (MELU B3163), paratype.

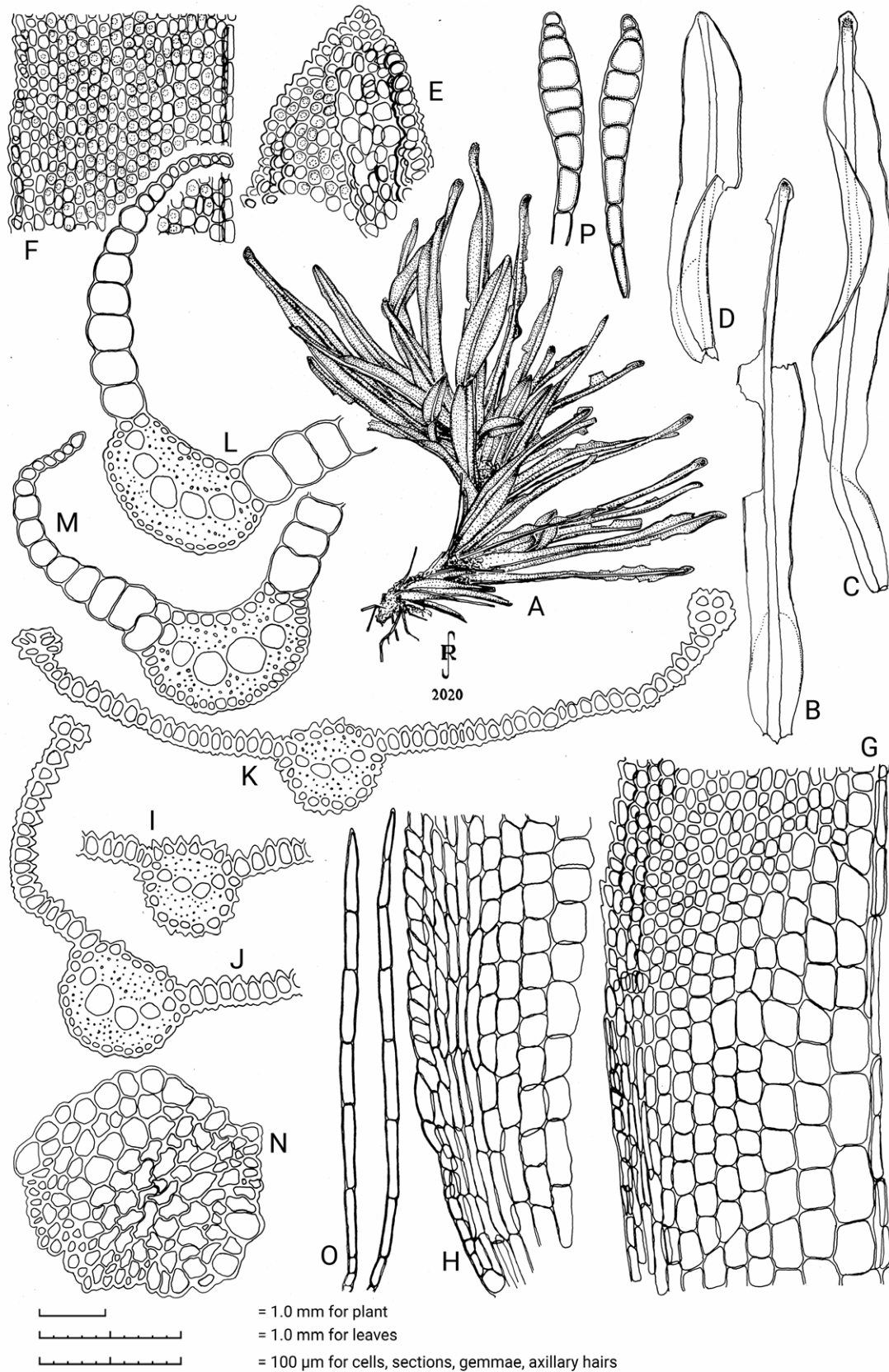


Fig. 18. *Syrrhopodon stoneae* W.D.Reese. **A:** Habit of plant, drawn moist. **B, C:** Gemmiferous leaves. **D:** Non-gemmiferous leaf. **E:** Cells of leaf apex, abaxial view. **F:** Cells of chlorophyllose lamina at mid limb, from margin (left) to costa (right). **G:** Cells from hyaline lamina. **H:** Cells from lower part of sheathing base of leaf, **I–K:** Sections of costa and lamina of limb. **L, M:** Sections of sheathing base of leaf. **N:** Stem section. **O:** Axillary hairs. **P:** Gemmae. Drawn from *W.B.Schofield 79652 and M.I.Schofield*.

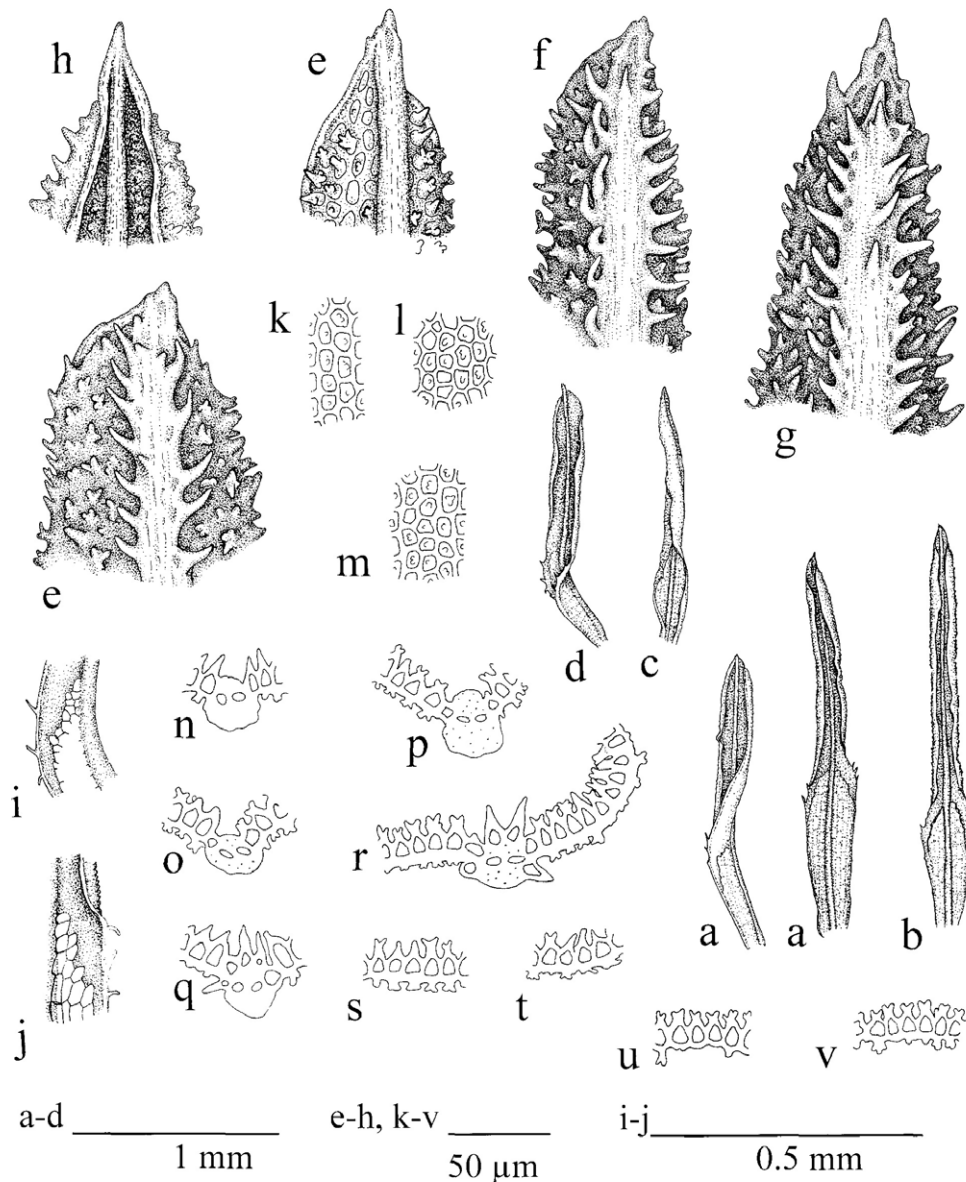
19. *Syrrhopodon trachyphyllus* Mont., Syll. Gen. Sp. Crypt. 47 (1856).**Original material:** 'Hab. In Singapour: cel. Gaudichaud.'**Type:** Singapore, s. loc., *C. Gaudichaud-Beaupré s.n.*, c. 1837; isotypes: BM000672851!d, BM000675255!d, BM000675256!d, BM000866982!d, NY01127882!d, PC0130987!d, PC0130988!d.**Note:** The collection date cited above is the year in which Gaudichaud visited Singapore.**Illustrations:** Fig. 19. Also Eddy (1990: 75, as *S. semperi*), Ellis (2003: 162).

Fig. 19. *Syrrhopodon trachyphyllus*. Mont. **A–D:** Leaf in ventral view. **E–G:** Leaf apex in dorsal view. **H:** Leaf apex in ventral view. **I, J:** Distal hyaline lamina showing marginal spines. **K–M:** Chlorophyllose lamina in surface view. **N–V:** cross-sections of leaf (n–r: costa; s–v: chlorophyllose lamina). a, e, h, k, o, r, v drawn from *Gaudichaud s.n.*, Singapore (BM); b, g, j, n, q, s drawn from *Binstead 30*, Sabah (BM); c, f, m, u drawn from *Griffith s.n.*, Singapore (BM); d, i, l, p, t drawn from *Milne s.n.*, Polynesia (BM). © Trustees of The Natural History Museum, London. Reproduced from Ellis (2003, Fig. 1) with permission.

Description: Plants small, dark green to brownish or rusty green, forming low tufts or turfs. Stems simple or occasionally forked, to 10 mm tall; rhizoids reddish. Leaves small, < 2.5 mm long, about 0.25 mm wide in limb, about 0.3 mm wide at shoulders, involute to uncinata when dry, straight to slightly curved when moist, limb ligulate, apex broadly acute to obtuse, margins typically incurved when moist; border relatively weak, 2–3 cells wide, 1–2 cells thick, often concealed by incurved margins of limb, at shoulders 1–3 cells wide,

unistratose, with or without distant teeth, spines or cilia. Cells of chlorophyllose lamina mostly rectangular to hexagonal or rounded, (6–)7.5–15(–17.5) × (6–)7.5–12.5 µm, papillose with multifid or coronate papillae or often with spinose surface projections. Costa variable, in section mostly more or less smooth, with 2–4 medial guide cells, adaxial and abaxial stereid bands, epidermal layer not developed or adaxially conical-mammillate. Hyaline lamina in relatively few rows, ending at a broad angle to the costa at about shoulder level. Sporophytes occasional. Calyptra about 1.2 mm long; seta reddish, 3–4 mm long; capsules brown, obliquely ovoid, about 1 mm long; operculum slenderly rostrate, about 0.5 mm long. Peristome teeth yellowish, slender, imperfect, fragile, papillose, ± jointed, 48–72 µm long. Spores 9–10 µm diameter, smooth.

Etymology: Greek *trachys* (rough) + *phyllon* (leaf), referring to the papillose leaf surface.

Distribution: Known from two locations in the northern Northern Territory, and in north-east Queensland from Cape Tribulation to Paluma (Fig. 21.19). Elsewhere, ranges from Sri Lanka through Singapore and the South East Asian archipelago to New Caledonia.

Habitat: Epiphytic, usually on tree trunks, from sea level to about 1000 m a.s.l., typically in mesophyll vine forest but often in drier and more open sites.

Recognition: The leaves of *Syrrhopodon trachyphyllus* differ from those of *S. semperi* principally in bearing dorsal-lateral costal spines, spines (rather than small teeth) along the leaf margin, and a continuous marginal stereome that reaches to the leaf apex (Ellis 2003).

Syrrhopodon trachyphyllus is also similar to the less spiculate forms of *S. spiculosus*, but distinguished by its adaxially smooth or papillose, not spiculate costa which, close to the apex, tends to be ± hidden below the general adaxial leaf surface. Other Australian species that might be confused with *S. trachyphyllus* are *S. armatus*, *S. katemensis* and *S. prolifer*.

According to Mohamed and Reese (1985), *Syrrhopodon semperi* Müll.Hal., *S. richardsii* Dixon and *S. lillei* Broth. are synonyms of *S. trachyphyllus*. However, Ellis (2003) studied the type specimens of these species, as well as those of *S. cambodiensis* Tixier and *S. flammeonervis* subsp. *lillei* (Broth.) Tixier, and concluded that they all belong to *S. semperi* (the earliest available name for the cohort) and that *S. trachyphyllus* is a distinct taxon. He also considered that the descriptions and illustrations of *S. trachyphyllus* in Reese and Lin (1991), Reese and Stone (1995) and Ellis and Tan (1999) are referable to *S. semperi*.

Selected specimen seen: Queensland: Hilda Creek at track to Thornton Peak, M.A.M. Renner 8635, 18 Aug 2017, NSW 1061163.

20. *Syrrhopodon tristichus* Nees ex Schwägr., *Spec. Musc. Suppl.* 4: 316b (1842).

Original material: ‘In Java lectum misit Nees von Esenbeck, praeses soc. Leopold.’

Type: Indonesia: Java, *s.loc.*, *s.coll.*, *s.d.*; lectotype (designated by Ellis 2011): G 00042992, not seen; isolectotypes (*vide* Ellis 2011): BM000676720!d, BM000676721, not seen, BM000676723!d, BM000676725!d, ?G 00057757, not seen.

Note: The type citation merely indicates that Nees sent the specimen to Schwägrichen; Nees never travelled outside Europe. The date is taken from BM-000676723, which is annotated ‘Java. Dr Greville 1832’. However, Greville never travelled outside Britain. It is possible that the collector was Nathan Wallich, who supplied many specimens to Greville and Hooker, and no doubt corresponded with Nees.

Illustrations: Fig. 20. Also Eddy (1990: 79, 80); Mohamed and Reese (1985: 230).

Description: Plants slender, to 6 cm or taller, pale green to yellowish or brown, forming loose tufts. Stems branching occasionally, erect to inclined or decumbent; rhizoids red to reddish brown. Leaves intermittently tristichous, closely imbricate, from a visible and conspicuous sheathing base abruptly recurved patent, little altered wet or dry, 5–8 mm long, slenderly long-acuminate from a broader base; sheathing base 0.35–0.40 mm wide, 0.20–0.25 mm wide in mid limb; leaf margins conspicuously bordered with a pellucid marginal stereome that is naked and entire in the sheathing base and base of limb, spinose-dentate in upper limb and there almost covered by a layer of short, pellucid or chlorophyllose cells; border reaching leaf apex or ending some distance below; costa about 35–60 µm wide in mid limb, smooth in lower leaf, usually dentate in acumen, in section ± plane adaxially, strongly convex abaxially, with 5–6 small guide cells, adaxial and abaxial stereid bands and an epidermal layer of thick-walled pellucid cells. Cells of chlorophyllose lamina thick-walled, rounded quadrate to short rectangular, about 7–11 µm wide, varying from ± smooth to densely pluripapillose. Hyaline lamina sharply delimited, mostly rounded distally, ± scalariform, cells of chlorophyllose lamina shortly decurrent down margins. Gemmae sparse, short clavate, ± rugose, borne adaxially and abaxially on leaf tips. Sporophytes not seen in Australian material.

Etymology: Greek *tristichos* (in three rows), referring to the three-ranked leaves.

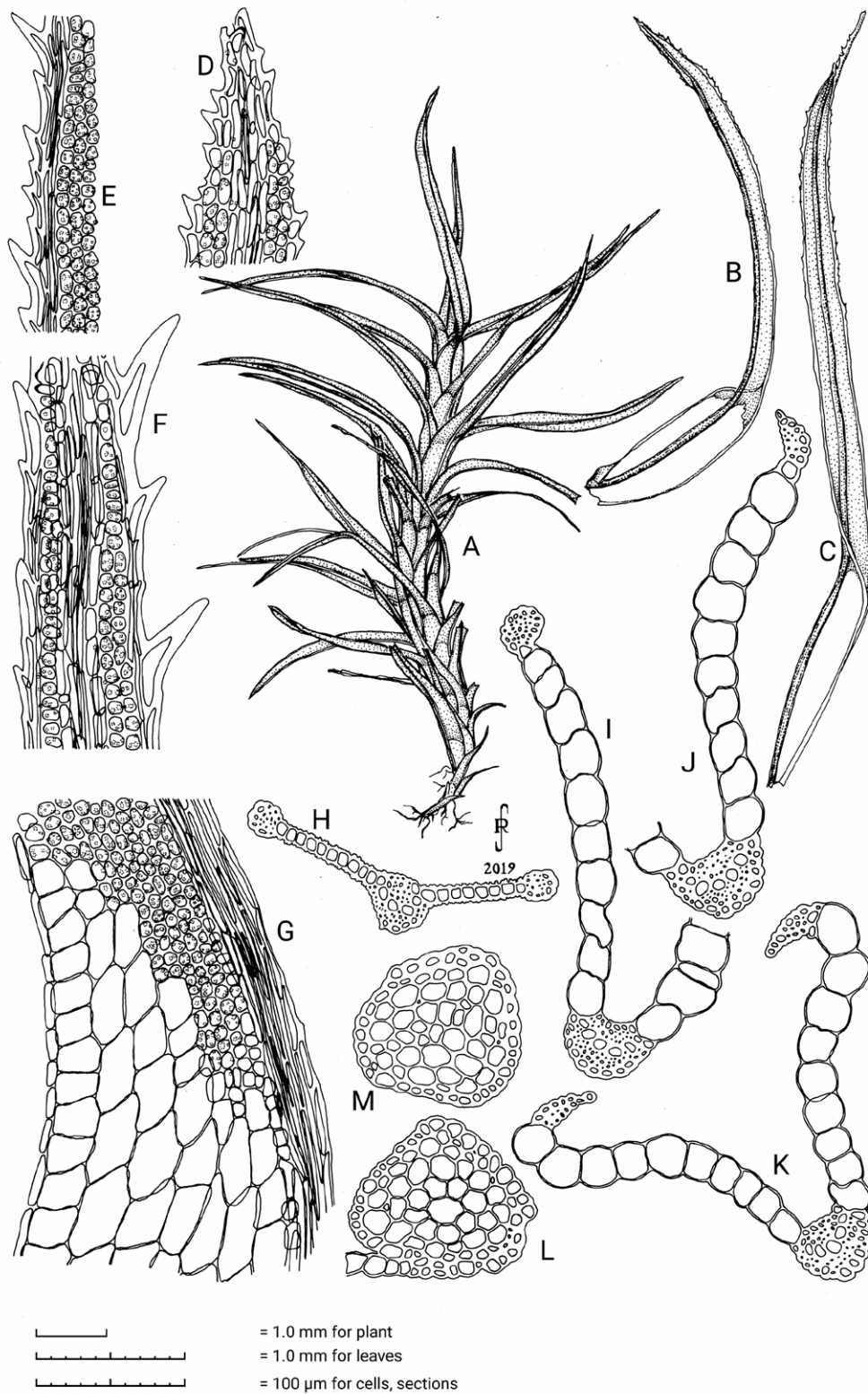


Fig. 20. *Syrrhopodon tristichus* Nees ex Schwägr. **A:** Habit of plant, drawn moist. **B, C:** Stem leaves. **D:** Cells of leaf apex, adaxial view. **E:** Cells of upper leaf margin. **F:** Cells of upper leaf limb, abaxial view. **G:** Cells of distal hyaline lamina. **H:** Section of leaf limb. **I–K:** Sections of sheathing leaf base. **L, M:** Stem sections. Drawn from: *M.A.M. Renner 8432*.

Distribution: High peaks (Bellenden Ker, Thornton Peak, Mount Lewis) in north-eastern Queensland (Fig. 21.20). Widely distributed in tropical Asia from India, Sri Lanka to Malesia, Philippines, Moluccas, Papua New Guinea, Polynesia, Oceania.

Habitat: Grows on trunks of small to medium sized trees in elfin cloud forest.

Recognition: The species can be distinguished by its large size, the \pm tristichous leaf arrangement, widely reflexed leaf limbs, gradually tapering narrow leaves, and sharply defined hyaline lamina.

Selected specimens seen: Queensland: Daintree River National Park, Thornton Peak, summit forest complex, *M.A.M.Renner* 8432, 14 August, 2017, NSW 1060783; Mt Finnigan, *M.A.M.Renner* 8145, 7 June 2017, NSW 1060627.

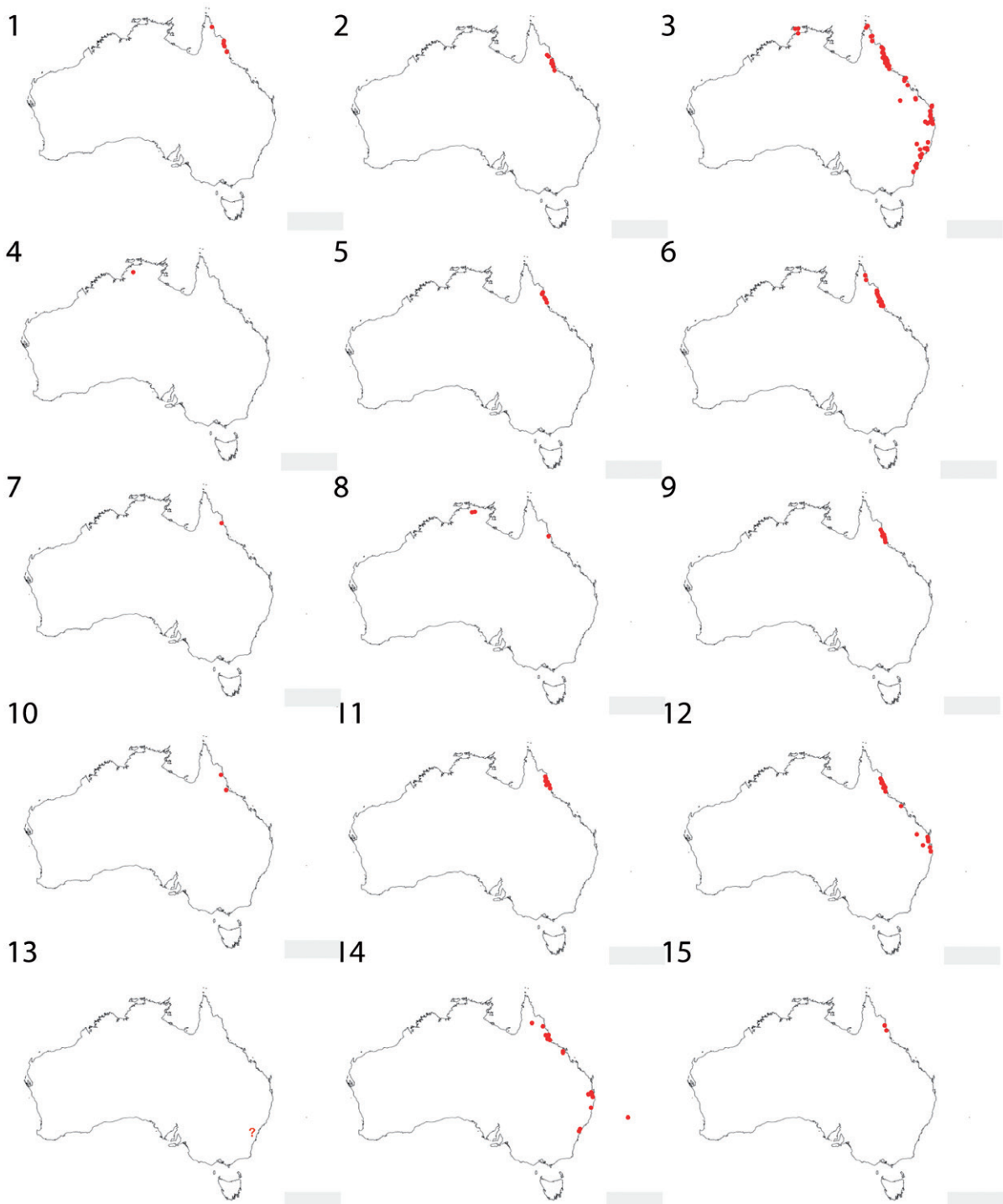




Fig. 21. Distribution of *Syrrhopodon* species in Australia. **1** *Syrrhopodon albovaginatus*. **2** *Syrrhopodon aristifolius*. **3** *Syrrhopodon armatus*. **4** *Syrrhopodon ciliatus*. **5** *Syrrhopodon confertus*. **6** *Syrrhopodon croceus*. **7** *Syrrhopodon cyrtacanthos*. **8** *Syrrhopodon gardneri*. **9** *Syrrhopodon involutus*. **10** *Syrrhopodon katemensis*. **11** *Syrrhopodon muelleri*. **12** *Syrrhopodon parasiticus*. **13** *Syrrhopodon perarmatus*. **14** *Syrrhopodon platycerii*. **15** *Syrrhopodon prolifer*. **16** *Syrrhopodon semperi*. **17** *Syrrhopodon spiculosus*. **18** *Syrrhopodon stoneae*. **19** *Syrrhopodon trachyphyllus*. **20** *Syrrhopodon tristichus*.

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