

TRICHOSTELEUM

Helen P. Ramsay¹

Trichosteleum Mitt., *J. Linn. Soc., Bot.* 10: 181 (1868); from the Greek *trichos* (hair) and *steleon* (a handle), possibly in reference to the long, slender seta.

Sematophyllum sect. *Trichosteleum* (Mitt.) Mitt., *J. Linn. Soc. Bot.* 12: 476, 492 (1869).

Lecto: *T. fissum* Mitt.

Hypnum sect. *Sigmatophylla* subsect. *Papillidium* Müll.Hal., *Linnaea* 39: 466 (1875); *Trichosteleum* sect. *Papillidium* (Müll.Hal.) Broth., *Nat. Pflanzenfam.* I, 3: 1117 (1908). Lecto: *Hypnum papillosum* Hornsch. [= *T. papillosum* (Hornsch.) A.Jaeger].

Autoicous. Plants slender to moderately robust, forming extensive tufts or mats, these mostly dull, rarely glossy, yellow-green to brownish green. Stems creeping, irregularly branched; branches simple or with scattered branchlets, occasionally obscurely complanate-foliate. Pseudoparaphyllia foliose. Rhizoids red, short, smooth, forming tufts on the main stem. Leaves erect-spreading to slightly falcate-secund, ovate-lanceolate to lanceolate, acute to gradually or abruptly acuminate-subulate, ecostate; margins subentire or, more often, serrulate above, occasionally recurved. Upper laminal cells linear, occasionally shorter in the extreme apex, unipapillose over the lumina at least in the upper 65–75% of the leaf, usually thick-walled and porose, especially towards the insertion; alar region with a basal row of greatly inflated, oblong, thin- to thick-walled and frequently pigmented cells; supra-alar cells absent or sparse.

Perichaetia on stems; perichaetial leaves erect, mostly lanceolate, acuminate, ecostate; margins often serrate, especially near the apex; laminal cells linear above, loosely rectangular below, mostly papillose; alar region well developed, the basal cells enlarged and inflated. Calyptra cucullate, naked, smooth or roughened above. Seta slender, short, curved and often papillose above, occasionally smooth. Capsule rather small, horizontal to pendant, asymmetrical; exothecial cells strongly collenchymatous, often mammillose; annulus absent; operculum slenderly long-rostrate. Peristome double; exostome teeth 16, with a zig-zag centre line or a median furrow on the adaxial surface, cross-striolate below, coarsely papillose above, projecting trabeculae on the abaxial surface; endostome segments 16, with a high basal membrane, papillose; segments keeled, perforate; cilia usually single. Spores small, smooth or papillose. Chromosome numbers not known.

The predominantly tropical *Trichosteleum*, with more than 100 species, occurs in the Neotropics, Africa, India, East Asia, Japan, China, Malesia (including Papua New Guinea) and Oceania. Four species occur in eastern Australia.

According to Buck & Tan (1989), *Trichosteleum* includes species with erect, flexuose leaves, linear laminal cells that are unipapillose over the lumen, inflated but rather thin-walled alar cells and collenchymatous exothecial cells that are often strongly mammillose. Importantly, the cells of both vegetative and perichaetial leaves are unipapillose.

Although leaf shape in *Trichosteleum* is similar to that of *Sematophyllum*, the laminal cells of the latter are smooth rather than unipapillose. A few species of *Acroporium* can also have unipapillose leaf cells, but in that genus the papillae tend to express themselves weakly in the upper third of the leaf, and the alar cells curve distinctly inwards towards the stem. However, in most *Trichosteleum* species, the leaf cell papillae are well developed, and the alar cells are invariably straight. Furthermore, although *Trichosteleum* and *Taxithelium*

¹ c/- National Herbarium of New South Wales, Mrs Macquaries Road, Sydney, New South Wales 2000.

(Pylaisiadelphaceae) can share a complanate-spreading habit, the latter has seriatly papillose cells, a short-apiculate operculum, and it often has binate teeth on the leaf margin.

References

- Buck, W.R. & Tan, B.C. ('1989') [1990], The Asiatic genera of Sematophyllaceae associated with *Trichosteleum*, *Acta Bryolichenol. Asiatica* 1: 5–19.
- Ramsay, H.P., Schofield, W.B. & Tan, B.C. (2004), The family Sematophyllaceae (Bryopsida) in Australia. Part 2. *Acroporium*, *Clastobryum*, *Macrohymenium*, *Meiotheciella*, *Meiothecium*, *Papillidiopsis*, *Radulina*, *Rhaphidorrhynchium*, *Trichosteleum*, *Warburgiella*, *J. Hattori Bot. Lab.* 95: 1–69.
- Tan, B.C. (1991), Miscellaneous notes on Asiatic mosses, especially Malesian Sematophyllaceae (Musci) and others, *J. Hattori Bot. Lab.* 70: 91–106.
- Tan, B.C., Schofield, W.B. & Ramsay, H.P. (1998), Miscellanies of Australian Sematophyllaceae with a new genus *Meiotheciella*, *Nova Hedwigia* 67: 213–223.
- Tan, B.C., Koponen, T. & Norris, D.H. (2007), Bryophyte flora of the Huon Peninsula, Papua New Guinea LXX. Sematophyllaceae (Musci) 1. *Acanthorrhynchium*, *Acroporium*, *Clastobryophilum*, *Pseudpilothecium*, *Radulina* and *Trichosteleum*, *Ann. Bot. Fennici* 44: Suppl. A: 35–78.

Key

- 1 Laminar cells strongly papillose.....2
1: Laminar cells weakly papillose3
 2 Leaf margins markedly serrulate to serrate throughout; leaves flat; L:W of laminal cells 12–14:1
 **2. T. ruficaule**
2: Leaf margins weakly serrate or serrulate in the upper half; leaves concave; L:W of laminal cells 15–20:1..... **1. T. boschii**
3 Leaves mostly falcate to falcate-secund, especially the perichaetial and distal branch leaves; apex of perichaetial leaf serrulate.....**3. T. subfalcatum**
3: Leaves mostly erect-ascending to weakly secund, not falcate; distal branch leaves and perichaetial leaves very rarely flexuose; apex of perichaetial leaf entire**4. T. wattsii**

1. *Trichosteleum boschii* (Dozy & Molck.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 421 (1878)

Hypnum boschii Dozy & Molck., *Ann. Sci. Nat., Bot.*, sér. 3, 2: 306 (1844). T: Borneo, [Malaysia], Korthals; holo: L.

Illustrations: E.B.Bartram, *Philipp. J. Sci.* 68: pl. 26, fig. 440 (1939); H.C.Gangulee, *Mosses of Eastern India and Adjacent Regions* 3: 1910, fig. 977 (1980); H.P.Ramsay, W.B.Schofield & B.C.Tan, *op. cit.* 44, fig. 18.

Plants in loose tufts, yellowish green, slightly glossy. Main stems elongate, dark red-brown; branches laxly ascending, erect, 5–20 mm long, complanate. Leaves ovate-lanceolate, concave, gradually or often abruptly short- to long-acuminate, 1.3–2.0 mm long, c. 0.5 mm wide, ecostate; margins ±reflexed and slightly undulate above, serrulate in the distal half. Laminal cells linear to rhomboidal, thin-walled, 40–50 × 0.3–0.4 µm, unipapillose with a large conical papilla over the lumen on the dorsal side; cells smooth towards the base; alar region with 2 or 3 large basal inflated pigmented cells; supra-alar cells few.

Perichaetial leaves oblong-lanceolate, long-acuminate to filiform, serrate above. Seta 8–14 mm long. Capsule small, c. 1 mm long (including the long rostrum); exothecial cells smooth to mammillose, collenchymatous; operculum conical, the rostrum 2–3 times as long as the urn. Peristome red-brown; exostome teeth gradually finely acuminate, inflexed above, c. 0.3 mm long, mid-line distinct; endostome segments yellowish, broadly ovate, folded down the middle; basal half keeled; apex pointed, perforate; cilium single, shorter than the segments. Spores c. 18 µm diam., smooth.

Rare in north-eastern Qld; grows on bark and on dead wood. Also in S and SE Asia, Japan, China, Malesia and Melanesia.

Qld: track to Kennedy Falls, *W.B.Schofield 90362, I.G.Stone & M.I.Schofield* (NSW, UBC); Mossman Gorge *W.B.Schofield 90077, I.G.Stone & M.I.Schofield* (NSW, UBC); Woopen Ck, *I.G.Stone 15055* (MELU); *loc. id.*, *H.Streimann 57010, 57370* (CANB); Stoney Ck, Cardwell, *I.G.Stone 18718, 18745* (MEL).

Trichosteleum boschii is the only Australian species with a combination of strongly papillose laminal cells and concave leaves. The leaf apex is abruptly short- to long-acuminate, distinguishing it from *T. ruficaule*, with broadly acute leaves, and *T. subfalcatulum* and *T. Wattsii*, with more slender acuminate to filiform leaves.

2. *Trichosteleum ruficaule* (Thwaites & Mitt.) B.C.Tan, *J. Hattori Bot. Lab.* 70: 101 (1991)

Sematophyllum ruficaule Thwaites & Mitt., *J. Linn. Soc., Bot.* 13: 319 (1873). T: Ceylon [Sri Lanka], *G.H.K.Thwaites 226*; holio: NY.

Trichosteleum elegantulum Broth. & Watts, *Proc. Linn. Soc. New South Wales* 43: 566 (1918). T: Frenchmans Creek, Cairns District, Qld, 19 July 1913, *W.W.Watts Q382*; holo: H-BR; iso: MEL, NSW.

Illustrations: B.C.Tan, *op. cit.* 102, figs 19–23; H.P.Ramsay, *W.B.Schofield & B.C.Tan, op. cit.* 46, fig. 19.

Plants dull to somewhat glossy, spreading, closely pinnately branched, forming complanately foliate greenish mats, occasionally slightly secund at the tapering apices. Branches \pm evenly spaced, 3–5 mm long. Leaves erect-spreading, oblong-elliptic to lanceolate or narrowly ovate, subulate, constricted at the base, ecostate; margins entire at the base, narrowly recurved, sharply serrate to the apex. Laminal cells linear, c. $40 \times 3 \mu\text{m}$, thick-walled, markedly unipapillose over the lumina, especially cells of the distal 50–75%; alar region well developed; basal row comprising 2 or 3 large cells that are pigmented, thin-walled, inflated and c. $90 \times 15 \mu\text{m}$; supra-alar cells 2, distorted-subquadrate; cells across the insertion pigmented, thick-walled. Gemmae occasionally in leaf axils, filamentous, unbranched.

Perichaetia on main stems; perigonia on side branches; perichaetial leaves unipapillose, with densely serrulate margins. Seta 7–8 mm long, straight, smooth. Capsules rare in Australian collections; narrowly obovate, constricted around the mouth, c. 1 mm long and 0.5 mm wide; neck cells mammillate; operculum conical, long-rostrate. Peristome as for the genus. Spores 10–15 μm diam.

Known from north-eastern Qld. Also in S and SE Asia, Malesia and the western Pacific.

Qld: Cooro L.A., near Innisfail, *H.Streimann 29988* (CANB); Windsor Tableland, *P.Hynes 8B* (BRI); Mossman Gorge, *B.C.Tan 94-703, E.A.Brown & R.G.Coveny* (FH, NSW); Old Leo Creek Mine, Mowbray R., *Mrs Sparvell s.n. (H.Flecker 4948)* (BRI); Cape Tribulation, *I.G.Stone 18015* (MEL); Hinchinbrook Is., *I.G.Stone 14914* (MEL).

Dwarf male plants have been reported from the Sri Lankan type specimens and in a collection from Borneo (B.C.Tan & Z.Iwatsuki, *Harvard Pap. Bot.* 3: 1–64, 1991). The strongly serrate leaf margins, combined with unipapillose leaf cells and collenchymatous exothelial cells are diagnostic.

3. *Trichosteleum subfalcatulum* (Broth. & Watts) B.C.Tan, *W.B.Schofield & H.P.Ramsay, Nova Hedwigia* 67: 220 (1998)

Rhaphidostegium subfalcatulum Broth. & Watts, *Proc. Linn. Soc. New South Wales* 40: 381 (1915); *Rhaphidorrhynchium subfalcatulum* (Broth. & Watts) Broth., *Nat. Pflanzenfam.*, 2nd edn, 11: 427 (1925). T: creek above Johnson's, Lord Howe Island, 8 July 1911, *W.W.Watts 122*; lecto: H-BR, *fide* Ramsay *et al.* (2004: 45); isolecto: NSW; syn: Intermediate Hill, Lord Howe Island, 10 July 1911, *W.W.Watts 135* (NSW); gully back of Henderson's, Lord Howe Island, 10 July 1911, *W.W.Watts 131* (NSW); Mt Gower, Lord Howe Island, Aug. 1911, *W.W.Watts 364a, 370, 400* (NSW).

Trichosteleum pallidum Dixon, *Proc. Roy. Soc. Queensland* 53(2): 38 (1942). T: Duma Creek, Ravenshoe, Qld, 1922, *T.V.Sherrin*; holo: E n.v.

Acanthocladium sericeum Broth. *nom. nud. in synonym.* Based on: Kurrajong Heights, N.S.W., *C.T.Musson 4534* (NSW).

[*Sematophyllum saproxylophilum auct. non* (Müll.Hal.) M.Fleisch.: E.B.Bartram, *Farlowia* 4: 244 (1952)]

Illustration: H.P.Ramsay, *W.B.Schofield & B.C.Tan, op. cit.* 47, fig. 20.

Plants small to robust, forming pale yellow-green mats. Stems irregularly pinnately branched, the branches 3–5 mm long. Leaves falcate to falcate-secund, narrowly lanceolate to oblong, slightly narrowed to the base, c. 2.0–2.5 mm long (including the apex) and 0.25–0.30 mm wide, gradually narrowed to a long-attenuate filiform point; margin ±entire, plane, serrulate distally, with a few widely spaced short teeth near the apex. Laminal cells with pointed ends; upper laminal cells papillose 25–30 × 2–4 µm; midleaf cells smooth or with a low papilla over the lumen, 45–50 × 4–6 µm; alar region with a basal row of 4 or 5 rectangular, pigmented, swollen, thick-walled cells; supra-alar cells indistinct.

Perichaetial leaves falcate, oblong-lanceolate, with narrowly filiform serrulate apices. Seta smooth, to 10 mm long. Capsule suberect to nodding, ovate, c. 0.6 mm long and 0.5 mm wide, mammillate, striate. Exostome teeth with a median longitudinal groove; cilia not seen. Spores 10–15 µm diam.

Occurs in eastern Qld and N.S.W.; also on Lord Howe Island and Norfolk Island in the south-western Pacific Ocean.

Qld: Dallachy Ck, Cardwell, *I.G.Stone 16431* (MEL); Cape York Penin., *L.J.Brass 19873, 20152* (FH); Malbon Thompson Ra., 10 km NE of Gordonvale, *H.Streimann 27517, 27523, 27529* (CANB). N.S.W.: Blue Mtns, *W.B.Schofield 81158* (UBC); Lawson, *B.C.Tan 94-825, 94-826, A.E.Brown & R.G.Coveny* (FH, NSW).

The oblong-lanceolate leaves of *T. subfalcatulum* are falcate, occasionally flexuose, but never strongly falcate-secund as in *Rhaphidorrhynchium*. This moss is similar to *T. watsii* in leaf shape and cell shape, but the leaves themselves are larger in *T. subfalcatulum*. By contrast, the perichaetial leaves of *T. subfalcatulum* are strongly falcate, whereas those of *T. watsii* more upright.

4. *Trichosteleum watsii* (Paris) B.C.Tan, W.B.Schofield & H.P.Ramsay, *Nova Hedwigia* 67: 221 (1998)

Rhaphidostegium micropyxis Broth., *Öfvers. Förh. Finska Vetensk.-Soc.* 42: 116 (1900), *nom. illeg.*; *Rhaphidostegium watsii* Paris, *Index Bryol., Suppl.* 298 (1900); *Sematophyllum watsii* (Paris) Broth., *Nat. Pflanzenfam.*, 2nd edn, 11: 432 (1925). T: Marshalls Falls Track, Richmond River, N.S.W., 22 June 1896, *W.W.Watts 617*; holo: H-BR; iso: MEL, NSW.

Hypnum glaucoviride Hampe, *Linnaea* 40: 325 (1876), *nom. illeg. non Mitt.*, in J.D.Hooker, *Handb. New Zealand Fl.* 473 (1867); *Rhaphidostegium glaucoviride* (Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 406 (1878); *Sematophyllum glaucoviride* Hampe ex Broth., *Nat. Pflanzenfam.*, 2nd edn, 11: 432 (1925). T: on trees, Rockinghams Bay, Qld, *J.Dallachy s.n.*; holo: BM-Hampe; iso: MEL 32743.

Acroporium kerianum Broth., *Nat. Pflanzenfam.*, 2nd edn, 11: 435 (1925), *nom. nud.* Based on: Frenchman's Ck, Qld, 19 July 1913, *W.W.Watts Q400a* (NSW).

Illustrations: H.P.Ramsay, W.B.Schofield & B.C.Tan, *op. cit.* 51, figs 22, 23.

Plants sparsely pinnate. Stems pale orange; branches to 7 mm long, often complanate. Leaves weakly secund or erect-ascending, ovate-lanceolate to narrowly lanceolate, 1.0–1.5 mm long, c. 0.2–0.3 mm wide near the base; apex acuminate, weakly toothed above; margin entire, weakly recurved. Median laminal cells faintly unipapillose, linear, 60–80 × c. 0.6 µm; apical cells much shorter; alar region with 1–3 subquadrate inflated thin-walled basal cells, supra-alar cells 1–4, irregular shaped; gemmae occasionally arising from stems, filiform, branching, papillose.

Perichaetia on stems; outer perichaetial leaves short-acuminate; inner leaves long-acuminate, with smooth margins. Seta 16–18 mm long, smooth. Capsule ovoid to rectangular, suberect to inclined, c. 0.6 mm long, mammillose, constricted below the mouth. Peristome with exostome teeth to 300 µm long, with a long acuminate apex; endostome lightly papillose; cilium single, shorter than segments. Spores 18–20 µm diam.

This Australian endemic occurs on fallen logs in coastal heath and along riverine forest in Qld, N.S.W. and Vic., where it is rare.

Qld: Upper Mowbray R., *Mrs Sparvell s.n. (H.Flecker 4949)* (CANB); Tozers Gap, Iron Range Natl Park, 30 km SW of Cape Weymouth, *H.Streimann 56424* (CANB); Scraggy Ck., Hinchinbrook Is., 29 Nov. 1945,

E. Stephens (BRI); Dunk Is., *D.G. Catcheside* 76.112 (AD). N.S.W.: Double Bay, Sydney, 1884, *T. Whitelegge* (NSW); Myocum, Brunswick R., *W.W. Watts* 1525 (MEL, NSW). Vic.: Mt Drummer, 17 Feb. 1965, *J.H. Willis* (MEL); Boobyalla, *R.B. Filson* 7041 (MEL).

Trichosteleum watsii is a rather small moss with erect, narrowly lanceolate leaves to 2 mm long. The type of *Hypnum glaucoviride* represents plants with longer leaves, while smaller plants can occasionally be mistaken for *Sematophyllum subhumile*, but that species has ovate-lanceolate to oblong-lanceolate leaves with smooth laminal cells. *Trichosteleum subfalcatulum* has somewhat falcate to flexuose leaves; *T. watsii* has smaller, less acuminate leaves, quadrate rather than irregular exothecial cells, the perichaetial leaves have smooth margins, and filiform gemmae are occasionally seen on stems.

In the late 19th century, W.W. Watts collected numerous specimens of *T. watsii* on fallen logs in scrub and coastal heath in the Richmond and Brunswick River areas of N.S.W. However, recent attempts to find it in its former range have been not been successful.