

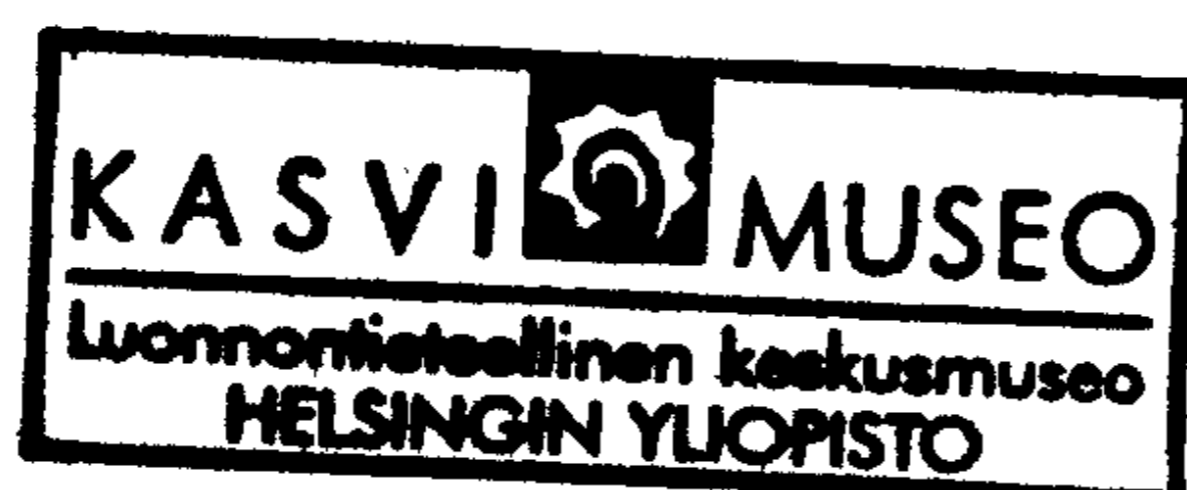
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POLYTRICHACEAE

Jaakko Hyvönen¹

[*Dawsonia* by Bernard O. van Zanten]

Polytrichaceae Schwägr., in C.L. von Willdenow, *Sp. Pl.* 5(2): 1 (1830).

Type: *Polytrichum* Hedw.

Dioicous or monoicous. Stems erect, rigid, simple or branched, with a polytrichoid (solid hydrome cylinder) or dawsonioid (hydroids and sclerenchyma) central strand. Rhizoids hyaline. Lower leaves small, often scale-like, appressed, remote; upper leaves larger, often crowded, with a broad pale unistratose sheathing base and a narrow lamina that is often bi- to multistratose almost to the margin. Lamina with isodiametric ±smooth abaxial cells; cuticle sometimes longitudinally striate; margin mostly entire to distinctly serrate, sometimes with specialised elongated marginal cells; sheath cells mostly rectangular to linear, narrower towards margin; costa single, prominent, percurrent to slightly excurrent, usually broad and ill-defined in lamina; lamellae on adaxial side of costa and lamina. Perichaetium terminal; perichaetial leaves scarcely differentiated, usually with a longer sheathing base. Perigonium rosulate, generally producing an annual innovation from the centre, with uni- to multiseriate paraphyses among antheridia; perigonal leaves with a wide-sheathing base and a rudimentary lamina. Calyptra small or large, mitrate or cucullate, rarely glabrous or apically serrate, often densely hairy. Setae terminal or pseudolateral by subperichaetial innovation, elongate, mostly single, smooth. Capsules erect, becoming slightly inclined to horizontal, symmetrical or asymmetrical, terete and cylindrical or angled; neck short and weakly differentiated or hemispherical, sometimes abruptly constricted from the urn as a hypophysis; stomata lacking or only on basal part of capsule; annulus absent or a single row of cells; operculum acute or rostellate. Peristome single; teeth 16–64, short, lingulate or triangular, curved inwards, attached at or near the rounded tips to a discoid expansion of the columella apex (epiphragm; lacking in *Dawsonia*), with a low or high basal membrane; in *Dawsonia* elongated with a bristle-like upper part. Peristome teeth consisting of whole elongated cells following the tooth shape in several concurrent rows, mostly pale except for a coloured midline. Spores globose, isomorphic, echinate, granulose or smooth (in *Dawsonia*).

The Polytrichaceae comprises 19 genera and c. 150–200 species. The family is widely distributed throughout the world, and diversity is highest in SE Asia and South America. Represented in Australia (except for W.A. and N.T.) by seven genera and 14 species; two are endemic. Plants grow in tufts, scattered or gregarious, on soil, humus or peat, rarely on rock. The family is an important component of the pioneer plant communities of disturbed soil, and many of the species are light-tolerant and xerophytic. Chromosome numbers are based on $x = 7$, with most Australian representatives having $n = 7$ chromosomes. Polyploidy to $n = 14$ is known in one taxon in Australia, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 213–226 (1997).

The genus *Dawsonia* was formerly segregated in the monotypic Dawsoniaceae, but it was transferred to the Polytrichaceae by Smith (1971). Some authors (Zanten, 1973; Beever *et al.*, 1992; Streimann & Klazenga, 2002) agree with this move, while others (Scott & Stone, 1976; Catcheside, 1980; Walther, 1983; Jarman & Fuhrer, 1995; Ramsay, 1997) maintain the Dawsoniaceae as a separate family.

G.L.Smith, A conspectus of the genera of Polytrichaceae, *Mem. New York Bot. Gard.* 21: 1–83 (1971); B.O. van Zanten, A taxonomic revision of the genus *Dawsonia* R.Brown, *Lindbergia* 2: 1–48 (1973); G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 79–80 (1976); D.G.Catcheside, *Mosses of South Australia* 47, 65 (1980); K.Walther, *A.Engler's Syllabus der Pflanzenfamilien, V, 2, Bryophytina, Laubmoose* 27 (1983); J.Beever, K.W.Allison & J.Child, *The Mosses of New Zealand*, 2nd edn 21–22 (1992); S.J.Jarman & B.A.Fuhrer,

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Mosses and Liverworts of Rainforest in Tasmania and South-eastern Australia 31, 52, 119 (1995); H.P.Ramsay, Cytotaxonomic studies on some Polytrichales from Australia, New Zealand, Papua New Guinea and Vanuatu, *J. Hattori Bot. Lab.* 82: 213–226 (1997); J.Hyvönen *et al.*, On phylogeny of the Polytrichales, *Bryologist* 101: 489–504 (1998).

KEY TO SPECIES

This key is based on gametophytic characters to facilitate the identification of all specimens: sporophyte attributes, although they are characteristic for genera, are ignored in this context. Consequently, a key is provided only for species because gametophyte characters are usually not diagnostic for individual genera.

Atrichum can be distinguished from other genera by lacking or having only sparse lamellae on the adaxial side of the narrow costa and by its narrow, slightly curved capsules with long, membranous calyptrae; *Notholigotrichum* by the triangular shape of the peristome teeth; *Pogonatum* by the deep reddish brown pigmentation of the peristome; *Polytrichastrum* by the cylindrical, terete to faintly plicate capsules with stomata on the basal hypophysis; *Polytrichum* by its leaves having a sheathing base and a narrow, lanceolate limb and box-like capsules with four distinct angles; *Polytrichadelphus* by the calyptra which is glabrous except for a few terminal erect bristles, the long-beaked operculum, and the asymmetrical, concave-convex capsule that is almost crescent-shaped in transverse section; and *Dawsonia* by its concave-convex capsules and bristle-like peristome.

- 1 Adaxial lamellae absent or fewer than 5, restricted to the costa..... **Atrichum androgynum**
- 1: Adaxial lamellae numerous, more than 25, covering almost the entire lamina 2
 - 2 Apical cells of adaxial lamellae with distinct papillae (1:) 3
 - 2: Apical cells of adaxial lamellae \pm smooth or very slightly papillose to granulose..... 4
- 3 Plants small; stems less than 2 cm tall; leaves short, with a triangular lamina and entire or slightly denticulate margins (2) **Notholigotrichum australe**
- 3: Plants rather large; stems often more than 2 cm tall; leaves rather long, with a linear-lanceolate lamina and distinctly serrate margins..... **Polytrichastrum alpinum**
 - 4 Margin of lamina widened, partly covering the adaxial lamellae (2:)..... **Polytrichum juniperinum**
 - 4: Margin of lamina upcurved or flat, never covering the adaxial lamellae 5
- 5 Apical cells of at least the central adaxial lamellae retuse (cross-section) (4:)..... 6
- 5: Apical cells of the adaxial lamellae rounded or bottle-shaped 7
 - 6 Lamellae distinctly crenate by the upper margin (side view); leaf margin serrate with multicellular teeth; lamina erect-spreading to slightly squarrose when moist (5) **Pogonatum neesii**
 - 6: Lamellae straight or only slightly crenate by the upper margin (side view); leaf margin serrate with unicellular teeth; lamina distinctly squarrose when moist..... **Polytrichum commune**
- 7 Lamellae very irregularly crenate by the upper margin (side view) (5:)..... **Pogonatum tubulosum**
- 7: Lamellae regularly crenate or straight 8
 - 8 Apical cells of adaxial lamellae with a distinctly thickened outer wall (7:)..... 9
 - 8: Apical cells of adaxial lamellae with an outer wall as thin as other walls or only slightly thicker..... 10
- 9 Adaxial lamellae 4–5 (–6) cells high; dorsal laminal cells short-rectangular (1.4–2.5: 1) (8)..... **Dawsonia longiseta**
- 9: Adaxial lamellae 5–9 cells high; dorsal laminal cells (sub)quadrate..... **Polytrichadelphus magellanicus**
 - 10 Stems with a dawsonioid central strand (hydroids and sclerenchyma) (8:)..... **Dawsonia superba** var. **pulchra**
 - 10: Stems with a polytrichoid central strand (solid hydrome cylinder) 11
- 11 Adaxial lamellae \pm straight to evenly rounded-crenate by the upper margin (side view) (10:) 12
- 11: Adaxial lamellae unevenly (obliquely) crenate by the upper margin (side view) 13
 - 12 Unistratose leaf margin 5–13 cells wide, entire or only slightly denticulate apically; adaxial lamellae crenate by the upper margin (side view), with sparsely papillose apical cells (11)..... **Notholigotrichum crispulum**

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- 12: Unistratose leaf margin 2–6 cells wide, regularly serrate; adaxial lamellae indistinctly crenate or straight by the upper margin (side view), with smooth apical cells..... **Pogonatum subulatum**
- 13 Unistratose leaf margin 1 or 2 cells wide; leaves crowded, to 15 mm long (11:) **Dawsonia polytrichoides**
- 13: Unistratose leaf margin 3–10 cells wide; leaves rather remote, to 12 mm long..... **Polytrichastrum formosum**

1. ATRICHUM

*Jaakko Hyvönen*¹

Atrichum P.Beauv., *Mag. Encycl.* 5: 329 (1804), *nom. cons.*; from the Greek *a-* (without) and *trichos* (a hair), in reference to the calyptra lacking the thick covering of hairs typical of many genera of Polytrichaceae.

Type: *A. undulatum* (Hedw.) P.Beauv.

Catharinea Ehrh. ex F.Weber & D.Mohr, *Index Mus. Pl. Crypt.* 2 (1803). T: *C. undulata* (Hedw.) F.Weber & D.Mohr [= *Atrichum undulatum* (Hedw.) P.Beauv.]

Dioicous or monoicous. Plants loosely caespitose, pale green to brown. Stems erect, unbranched. Rhizoids restricted to the stem base and the bases of the lowermost scale-like leaves. Leaves crisped when dry, erect-spreading when moist; lamina linear-lanceolate, gradually narrowing to a sharp apex, with ovate to subquadrate dorsal cells; margin serrate with duplicate teeth, bistratose, with differentiated elongated marginal cells; sheathing base poorly differentiated, the cells subquadrate to rectangular with firm walls, sometimes with cuticular papillae; costa percurrent to excurrent, apically sharply serrate with numerous abaxial teeth, these often also present in oblique rows on abaxial laminal surface; lamellae sparse or absent on adaxial surface of costa, to 5 cells high, ±straight or crenate by margin, with subquadrate to ovate cells. Calyptra apically smooth to rough, with a few short hairs. Setae solitary or several in each perichaetium. Capsules erect or slightly inclined, pale to dark brown; urn cylindrical, terete; exothecial cells subquadrate to elongate, with firm walls; stomata absent; operculum rostellate. Peristome with a low or high basal membrane; teeth 32, with a darker median part; epiphragm attached to apices of peristome teeth. Spores with a granulose surface.

A genus of c. 15–20 species predominantly in temperate regions of both hemispheres. Represented in Australia by one non-endemic species, *Atrichum* is a pioneer plant of open soil and, unlike most other genera of the family, it is not xerophytic but restricted to shady and moist habitats.

E.Nyholm, *Studies in the genus Atrichum* P.Beauv., *Lindbergia* 1: 1–33 (1971).

Atrichum androgynum (Müll.Hal.) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 241 (1875)

Catharinea androgyna Müll.Hal., *Syn. Musc. Frond.* 1: 193 (1848). T: Swellendam, South Africa, *Ecklon*; *n.v.*

Catharinea muelleri Müll.Hal. & Hampe, *Linnaea* 26: 500 (1855); *Atrichum muelleri* (Müll.Hal. & Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 243 (*Gen. Sp. Musc.* 1: 705) (1875), *nom. illeg.* (later homonym). T: Bunip [Bunyip] Ck and Dandenong Ra., Vic., Jan. 1853, *F. Mueller*; *n.v.*

Polytrichum ligulatum Mitt., *Hooker's J. Bot. Kew Gard. Misc.* 8: 262 (1859); *Atrichum ligulatum* (Mitt.) Mitt., *J. Proc. Linn. Soc.* 4: 97 (1860); *Catharinea ligulata* (Mitt.) Müll.Hal., *Genera Musc. Frond.* 165 (1900). T: Bornip [Bunyip] Ck, Vic., *F. Mueller* 8; syn: BM, MEL; *F. Mueller* 12; syn: BM; Tarwin, Vic., *F. Mueller* 121; syn: BM.

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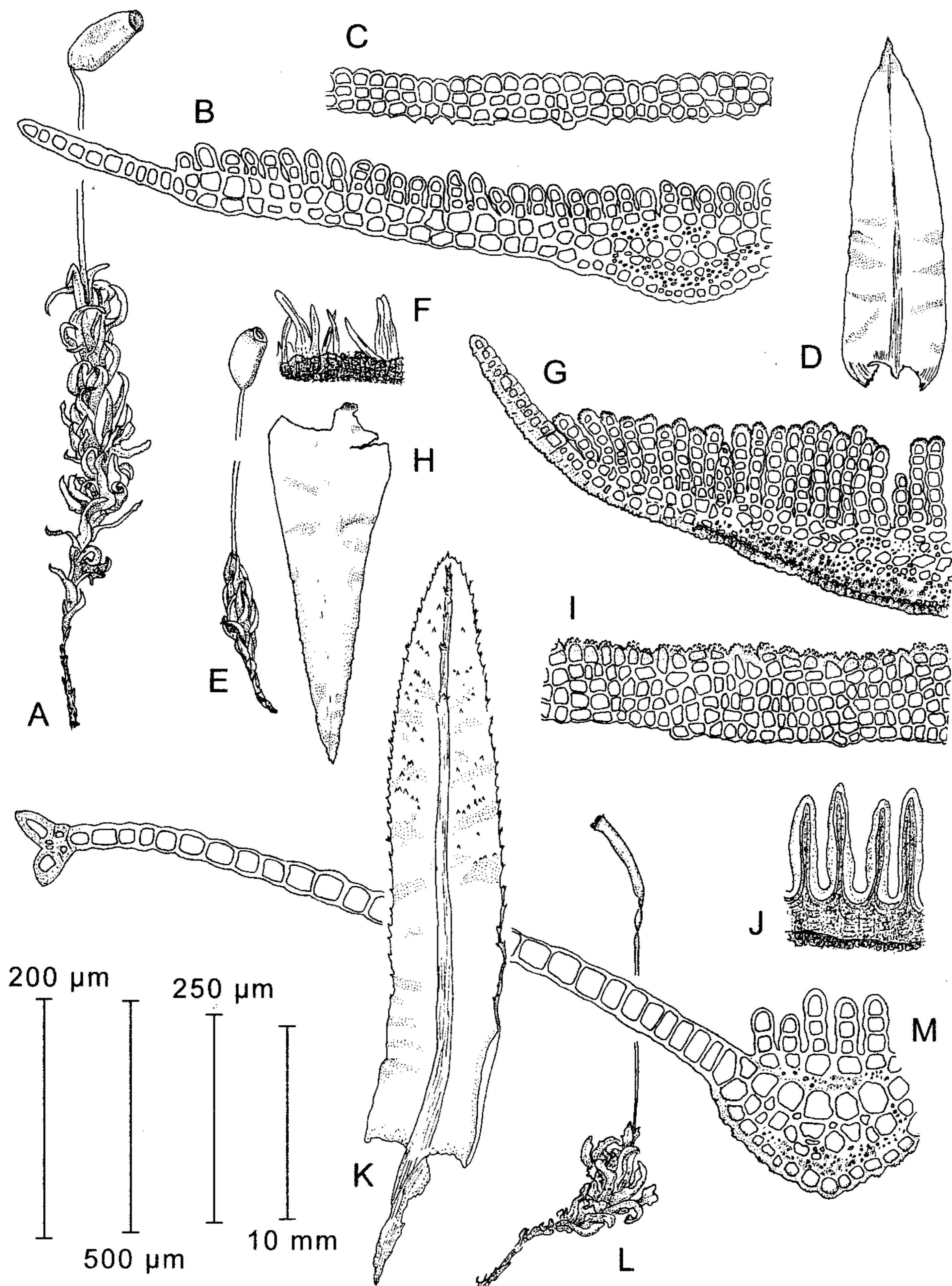


Figure 12. *Atrichum* and *Notoligotrichum*. **A–D,** *N. crispulum*. **A,** Habit (dry specimen); **B,** T.S. of mid-leaf; **C,** Lamella in side view; **D,** Leaf (*R.D.Seppelt* 4478, HO). **E–I,** *N. australe*. **E,** Habit (dry specimen); **F,** Peristome; **G,** T.S. of mid-leaf; **H,** Leaf; **I,** Lamella in side view (**E–F** and **H–I,** *A.Ratkowsky* H374, HO; **G,** *A.Moscal* 24647, HO). **J–M,** *A. androgynum*. **J,** Peristome; **K,** Leaf; **L,** Habit (dry specimen); **M,** T.S. of mid-leaf (**J–M,** *A.Moscal* 20037, HO). Use 200 μm scale for **B, C, G, I** and **M**; 500 μm scale for **F** and **J**; 250 μm scale for **D, H** and **K**; and 10 mm scale for **A, E** and **L**. Drawn by I.Ahonen.

Atrichum angustatum (Brid.) Bruch & Schimp. var. *polysetum* Wilson, in J.D.Hooker, *Fl. Tasman.* 2: 200 (1859); *Atrichum angustatum* (Brid.) Bruch & Schimp. var. *polysetum* Watts & Whitel., *Proc. Linn. Soc. New South Wales* 27 (Suppl.): 15 (1902), *nom. inval.* (basionym not cited). T: South Port Narrows, Tas., *A.F.Oldfield* 66b; syn: BM; Creek Town, Tas., *A.F.Oldfield* 68; syn: BM.

Catharinea minuta Müll.Hal., *Hedwigia* 36: 336 (1897); *Atrichum minutum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 17 (1900); *Oligotrichum minutum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 17 (1900). T: Mt Wellington, Tas., *D.Kayser*; *n.v.*

Catharinea sideroloma Müll.Hal., *Hedwigia* 36: 337 (1897); *Atrichum sideroloma* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 257 (1900). T: Moe R., Gippsland, Vic., 1881, *Luehmann*; *n.v.*

Catharinea pusilla Müll.Hal., *Hedwigia* 36: 338 (1897); *Atrichum pusillum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 17 (1900). T: Marydale, Tas., 5 Dec. 1890, *W.A.Weymouth*; iso: H.

Catharinea leptocylindrica Müll.Hal., *Hedwigia* 36: 338 (1897); *Atrichum leptocylindricum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 17 (1900). T: Fishen Bush, Oxford, North Canterbury, North Island, New Zealand, 1892, *T.W.Naylor Beckett*; syn: H; Genoa River, Vic., 1885, *W.Baeuerlen*; syn: Delegate, N.S.W., *W.Baeuerlen*.

Illustrations: E.Nyholm, *Lindbergia* 1: 27, fig. 15 (1971); G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 72, pl. 4 (1976); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 24, fig. 9a-e; 56, pl. 4 (1992).

Stems to 6 cm tall. Leaves 5.7–9.5 mm long; lamina 0.9–1.5 mm wide, with teeth usually in oblique rows on abaxial surface; laminal cells of sheathing base sometimes with cuticular papillae; costa percurrent, with 3 or 4 lamellae on adaxial surface; lamellae \pm straight or slightly crenate by upper margin, 2–5 cells high. Setae 1–5 in each perichaetium. Urn 3.2–7.4 mm long, 0.5–0.9 mm wide. Spores 11–17 μ m diam. $n = 14$, *vide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 215 (1997). Fig. 12J–M.

Occurs in N.S.W., A.C.T., Vic. and Tas.; also in New Zealand, Lord Howe Is., Central and South America and southern Africa. Grows on shaded soil in moist habitats. Map 23.

N.S.W.: Tallaganda State Forest, *H.Streimann* 37840 (HO). A.C.T.: Cotter Valley, *N.T.Burbidge* 6992 (CANB). Vic.: Kallista, *I.G.Stone* 527 (MEL). Tas.: Marakoopa Cave State Reserve, *A.Moscal* 24377 (HO); Fern Glade, *A.V.Ratkowsky* H98 (HO).

The species is readily distinguished from all other Australian Polytrichaceae by its long, narrow urn and leaves with only 3 or 4 low lamellae. Leaves are also typically crisped when dry.

3. NOTOLIGOTRICHUM

Jaakko Hyvönen¹

Notoligotrichum G.L.Sm., *Mem. New York Bot. Gard.* 21(3): 50 (1971); from the Greek *nothos* (false), *oligos* (few) and *trichos* (a hair), originally in reference to the sparsely hairy calyptra, here indicating resemblance to the genus *Oligotrichum* DC.

Type: *N. australe* (Hook.f. & Wilson) G.L.Sm.

Dioicous. Plants in cushions or loosely caespitose, olivaceous to brown. Stems usually simple, very rarely branched. Rhizoids restricted to the stem base. Leaves contorted or incurved when dry, erect-spreading to slightly recurved when moist; lamina triangular or linear-lanceolate, shorter or only slightly longer than the sheathing base, gradually narrowing to an acute often cucullate apex; abaxial cells with incrassate walls; margin denticulate or entire, flat or upcurved, unistratose; sheathing base ovate, gradually narrowing (without shoulders) to blade; cells with firm walls; costa percurrent to slightly excurrent, reddish brown, with a few abaxial teeth at apex; lamellae adaxial, almost completely covering the lamina, with subquadrate to ovate cells having incrassate to firm walls. Perigonia terminal. Calyptra apically smooth to rough, with a few short hairs. Setae usually solitary. Capsules inclined, pale to dark brown; urn slightly gibbous dorsally, constricted at mouth; exothecial cells subquadrate to elongate, with firm walls; stomata present on basal part; operculum rostellate. Peristome teeth 16 or 32, elongate-triangular, hyaline. Spores with a granulose surface.

A Southern Hemisphere genus of about ten species. Represented in Australia by two non-endemic species, *Notoligotrichum* is a pioneer plant of open soil in rather mesic habitats.

1. *Notoligotrichum australe* (Hook.f. & Wilson) G.L.Sm., *Mem. New York Bot. Gard.* 21(3): 51 (1971)

Polytrichum australe Hook.f. & Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 87, fig. 6, 95 ('1855') [1854]; *Psilopilum australe* (Hook.f. & Wilson) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 97 (1860). T: Ruahine Mtns, North Island, New Zealand, *W. Colenso; n.v.*

Illustrations: J.Hyvönen, *Acta. Bot. Fenn.* 133: 139, fig. 18 (1986); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12c (1992), as *Psilopilum australe*; R.D.Seppelt, *The Moss Flora of Macquarie Island* 220, fig. 87 (2004).

Stems to 18 mm tall. Leaves incurved when dry, erect-spreading to slightly incurved when moist, 2.8–5.4 mm long; lamina triangular, 0.4–0.8 mm wide; margin entire or slightly denticulate, flat, unistratose, 4–9 cells wide; sheathing base distinctly widened; costa percurrent to slightly excurrent; lamellae 30–48, crenate and coarsely papillose by upper margin, 5–8 cells high. Setae 1 (rarely 2) in each perichaetium. Urn 2.4–4.9 mm long, 1.6–2.7 mm wide. Peristome teeth 16. Spores 14–30 µm diam. $n = 7$, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 215 (1997). Fig. 12E–I.

Occurs in N.S.W., Vic. and Tas.; also in New Guinea, New Zealand, Macquarie Is., Heard Is. and southern Africa. A species of exposed habitats, usually confined to heaths above the tree-line. Map 27.

N.S.W.: Mt Kosciuszko, *I.G.Stone* 11263 (MEL). Vic.: Mt Bogong, Feb. 1923, *A.J.Tadgell* (MEL). Tas.: Mt Wellington, *A.V.Ratkowsky* B336 (MEL); Mt Barrow State Reserve, *A.Moscal* 24586 (HO); Collins Bonnet, *A.V.Ratkowsky* H376 (HO).

Notoligotrichum australe is distinguished from *N. crispulum* by its short-stemmed, stout habit and erect-spreading to incurved leaves. Sainsbury (*Bull. Roy. Soc. New Zealand* 5: 37, 1955) listed the hyaline leaf margins as a diagnostic character, but they are not present in all

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specimens. The leaf lamina is also typically triangular, whereas in *N. crispulum* it is lanceolate.

2. *Notoligotrichum crispulum* (Hook.f. & Wilson) G.L.Sm., *Mem. New York Bot. Gard.* 21(3): 51 (1971)

Polytrichum crispulum Hook.f. & Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 87, fig. 3, 95 ('1855') [1854]; *Psilopilum crispulum* (Hook.f. & Wilson) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 97 (1860); *Catharinea crispula* (Hook.f. & Wilson) Hampe, *Linnaea* 37: 517 (1872). T: Huiarau, North Island, New Zealand, *W.Colenso*; n.v.

Catharinea pyriformis Hampe, *Linnaea* 37: 517 (1872); *Atrichum pyriforme* (Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873-74: 244 (1875); *Psilopilum pyriforme* (Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1877-78: 452 (1879). T: Blue Mtns, N.S.W., *F.Mueller*; iso: BM, MEL.

Illustrations: G.O.K.Sainsbury, *Bull. Roy. Soc. New Zealand* 5: 38, pl. 4, fig. 2 (1955); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12d (1992), as *Psilopilum crispulum*.

Stems to 45 mm tall. Leaves contorted or incurved when dry, erect-spreading to slightly recurved when moist, 4.1-7.6 mm long; lamina broadly lanceolate, 1.0-1.6 mm wide; margin denticulate apically, flat, unistratose, 5-13 cells wide; sheathing base very slightly widened; costa percurrent; lamellae 42-68, on adaxial surface of lamina, straight to regularly crenate and sparsely papillose by upper margin, 1-4 cells high, with rounded or bottle-shaped apical cells; outer wall the same thickness or slightly thicker than other walls. Urn 3.7-5.8 mm long, 2.0-3.4 mm wide. Peristome teeth 32. Spores 20-23 µm diam. Fig. 12A-D, Plate 6.

Occurs in N.S.W., Vic. and Tas.; also in New Zealand. Grows on soil in rather shaded habitats. Map 28.

N.S.W.: Blue Mtns, *F.Mueller* (MEL). Vic.: Falls Creek, *R.D.Seppelt* 4478 (HO); Bogong High Plains, *I.G.Stone* 9410 (MEL). Tas.: Wanderer R., *A.M.Buchanan* 6251 (HO); Cradle Mtn, *A.V.Ratkowsky* H379 (HO).

As indicated by the specific epithet, the contorted, rather distant leaves are a distinctive feature of this moss. Small specimens of *N. crispulum* can be difficult to identify when dry, but when moistened, the lanceolate shape of the lamina is readily seen. The sheathing base is about the same width as the lamina, and the lower lamellae, with their sparsely papillose apical cells, are also diagnostic.

4. POGONATUM

*Jaakko Hyvönen*¹

Pogonatum P.Beauv., *Mag. Encycl.* 5: 329 (1804); from the Greek *pogon* (a beard), in reference to the hairy calyptra.

Type: *P. aloides* (Hedw.) P.Beauv.

Dioicous. Plants loosely caespitose, whitish green to brown. Stems erect, simple, rarely branched. Rhizoids restricted to stem base and bases of lowermost scale-like leaves. Leaves contorted to incurved when dry, erect-spreading to slightly squarrose when moist; lamina linear-lanceolate, gradually narrowing to a sharp apex, with dorsal cells ovate to subquadrate; margin serrate with multicellular teeth, flat to slightly upcurved, unistratose; sheathing base ovate, gradually narrowing or almost as wide as lamina, with subquadrate to rectangular cells with firm walls; costa percurrent to very slightly excurrent, reddish brown, apically sharply serrate with numerous dorsal teeth; lamellae covering almost the entire lamina. Calyptra hairy. Setae usually solitary. Capsules erect or slightly inclined, pale to dark brown; urn cylindrical, terete to faintly plicate; exothecial cells mammillose, subquadrate to elongate, with firm walls; stomata absent; operculum rostellate. Peristome

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teeth 32, compound, reddish brown; epiphragm attached to peristome teeth apices. Spores with a granulose surface.

A genus of c. 50 species in both hemispheres. Represented in Australia by three non-endemic species, *Pogonatum* is a pioneer plant of open, fine-grained soil.

J.Hyvönen, A synopsis of genus *Pogonatum* (Polytrichaceae, Musci), *Acta Bot. Fenn.* 138: 1–87 (1989).

1. *Pogonatum neesii* (Müll.Hal.) Dozy, *Bryol. Jav.* 1: 36, 40 (1856), *Ned. Kruidk. Arch.* 4(1): 75 (1856)

Polytrichum neesii Müll.Hal., *Syn. Musc. Frond.* 2: 563 (1851). T: Java, [Indonesia], Blume; holo: B *n.v.* (probably destroyed).

Polytrichum australasicum Müll.Hal. & Hampe, *Linnaea* 26: 500 (1855); *Pogonatum australasicum* (Müll.Hal. & Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 256 (*Gen. Sp. Musc.* 1: 718) (1875). T: along the wood road over the Blackspur, Vic., F.Mueller; iso: BM.

Polytrichum brachypodium Müll.Hal., *Hedwigia* 36: 342 (1897); *Pogonatum brachypodium* (Müll.Hal.) Watts & Whitel., *Proc. Linn. Soc. New South Wales* 27 (Suppl.): 18 (1902). T: Fitzroy Falls, Moss Vale, N.S.W., Nov. 1884, T.Whitelegge; iso: H.

Polytrichum camarae Müll.Hal., *Hedwigia* 36: 341 (1897); *Pogonatum camarae* (Müll.Hal.) Paris, *Index Bryol.* 978 (1897); *Pogonatum baileyi* Broth ex Müll.Hal., *Hedwigia* 36: 342 (1897), *nom. inval.* (in synonym.). T: Clarence R., N.S.W., Nov. 1875, Wilcox; syn: JE; White Cap Mtns, *De la Camara*; syn: H, JE.

Polytrichum gippslandiae Müll.Hal., *Hedwigia* 36: 341 (1897); *Pogonatum gippslandiae* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 278 (1900). T: Tyers R., Gippsland, Vic., 1881, H.Tysdale; iso: H.

Polytrichum nanocarpum Müll.Hal., *Hedwigia* 36: 340 (1897); *Pogonatum nanocarpum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 278 (1900). T: Walhalla, Gippsland, Vic., 1884, H.Tysdale; *n.v.*

Illustrations: T.Osada, *J. Hattori Bot. Lab.* 28: 199, fig. 11 (1965), as *Pogonatum akitense*; J.Hyvönen, *Acta Bot. Fenn.* 133: 128, fig. 12 (1986); A.Noguchi, *Moss Flora Japan* 1: 41, fig. 13b (1987), as *Pogonatum akitense*.

Stems to 5.5 cm tall. Leaves incurved to contorted when dry, erect-spreading to slightly squarrose when moist, 3.7–7.9 mm long; lamina narrowly lanceolate, 0.5–1.0 mm wide; margin serrate with multicellular teeth, flat to upcurved, unistratose, 2–5 cells wide; sheathing base widened; costa percurrent to excurrent, with numerous abaxial teeth apically; lamellae 26–48, on adaxial surface of lamina, crenate by upper margin, 3–6 cells high, with apical cells retuse (in cross-section), smooth or very slightly papillose. Urn 3.5–6.1 mm long, 1.1–1.7 mm wide. Spores 7–11 µm diam. $n = 7$, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 217 (1997). Fig. 13A–D.

Occurs in Qld, N.S.W. and Vic.; also widely distributed in temperate and tropical Asia and the western Pacific; a plant of bare loamy soil and sand on stream banks and roadsides. Map 29.

Qld: Springbrook, I.G.Stone 4956 (MEL); Binna Burra, I.G.Stone 12961 (MEL). N.S.W.: Bourkes Ck, H.Streimann 15317 (HO); Clyde Mtn, R.Filson 10930 (MEL). Vic.: Yarra State Forest, K.R.Thiele 6 (MEL).

Pogonatum neesii has adaxial lamellae with retuse apical cells which are distinctly crenate when seen in side view.

2. *Pogonatum subulatum* (Brid.) Brid., *Bryol. Univ.* 2: 122 (1827)

Polytrichum subulatum Brid., *J. Bot. (Schrader)* 1800(1): 287 (1801). T: New Zealand, Nelson; holo: E.

Polytrichum nanournigerum Müll.Hal., *Hedwigia* 36: 340 (1897); *Pogonatum nanournigerum* (Müll.Hal.) Paris, *Index Bryol. Suppl.* 1: 278 (1900). T: North Island, New Zealand, 1882, F.M.Reader, "misit 1892 ex Dimboola Victoriae"; *n.v.*

Illustrations: G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 75, pl. 5 (1976); J.Hyvönen, *Acta Bot. Fenn.* 138: 57, fig. 18 (1989); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12e (1992).

Stems to 4.5 cm tall. Leaves incurved to contorted when dry, recurved when moist, 3.6–6.5 mm long; lamina linear-lanceolate, 0.8–1.2 mm wide; margin regularly serrate, flat, unistratose, 2–6 cells wide; sheathing base slightly widened; costa percurrent to excurrent, with apical

abaxial teeth; lamellae 36–54 on adaxial surface of lamina, 2–4 cells high, straight to slightly crenate by upper margin, with apical cells rounded (in cross-section), the outer wall as thin as or only slightly thicker than other cell walls. Urn 3.2–4.5 mm long, 1.0–1.8 mm wide. Spores 7–11 μm diam. $n = 7$, *vide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 219 (1997). Fig. 13G–J, Plates 5, 7.

Occurs in N.S.W., A.C.T., Vic. and Tas.; also in New Zealand. A plant of bare ground, especially on roadside banks. Map 30.

N.S.W.: Toomumbar State Forest, *R.Coveny* 4435 (NSW). A.C.T. Brindabella Ra., *H.Streimann* 5265 (H). Vic.: Dandenong Ra., *D.G.Catcheside* 54.98 (CANB). Tas.: Mt Wellington, *A.V.Ratkowsky* H342 (HO); Liffey Falls State Reserve, *A.Moscal* 17653 (HO).

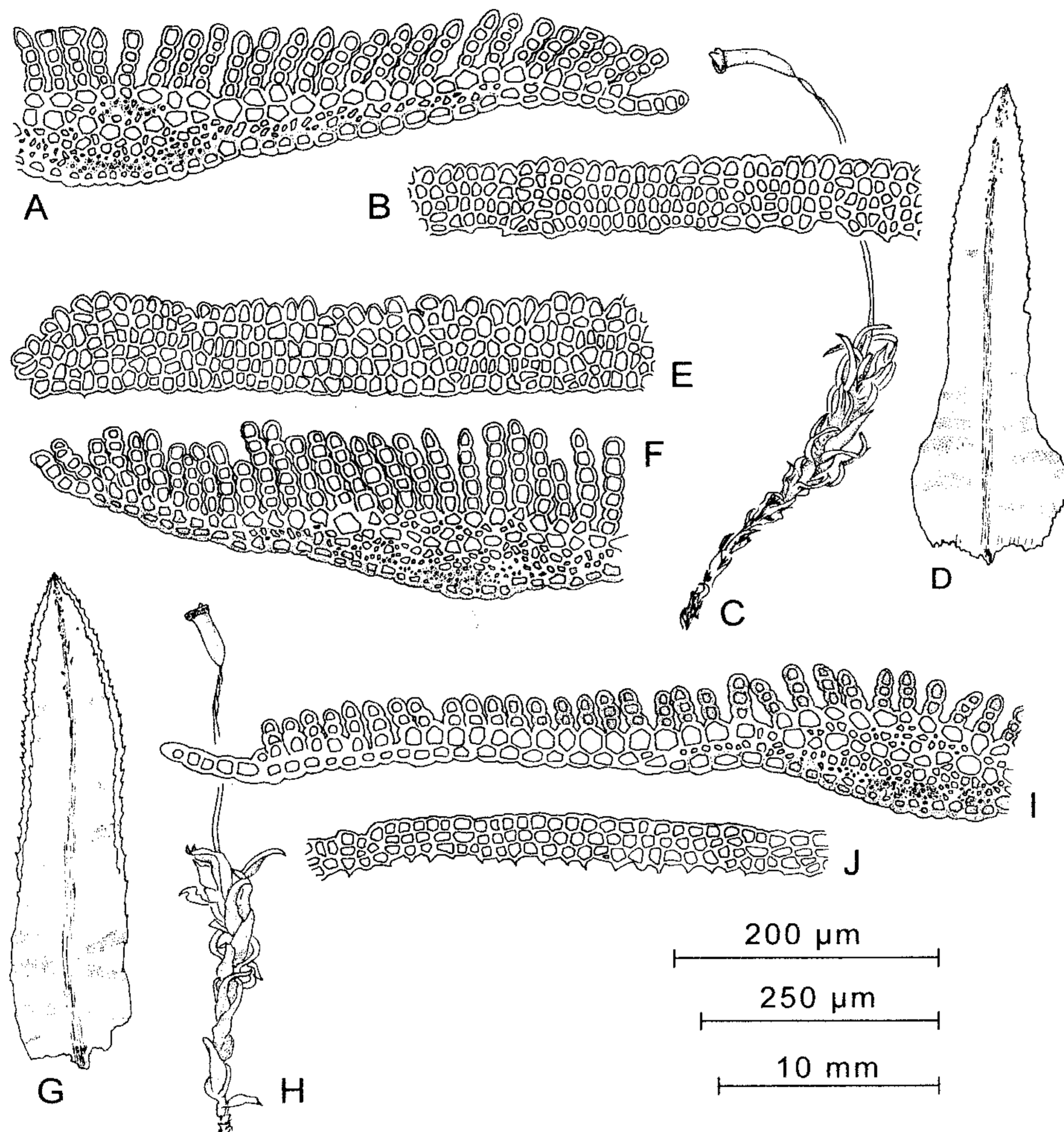


Figure 13. *Pogonatum*. A–D, *P. neesii*. A, T.S. of mid-leaf; B, Lamella in side view; C, Habit (dry specimen); D, Leaf (A–D, *R.Hoogland* 8583, CANB). E–F, *P. tubulosum*. E, Lamella in side view; F, T.S. of mid-leaf (E–F, *I.Stone* 8571, MEL). G–J, *P. subulatum*. G, Leaf; H, Habit (dry specimen); I, T.S. of mid-leaf; J, Lamella in side view (G–J, *A.Moscal* 24411, HO). Use 200 μm scale for A, B, E, F, I and J; 250 μm scale for D and G; and the 10 mm scale for C and H. Drawn by I.Ahonen.

Pogonatum subulatum is the most common of the three *Pogonatum* species in Australia. It is readily distinguished by the narrow sheath and rather remote adaxial lamellae.

3. *Pogonatum tubulosum* Dixon, *J. Bot.* 80: 34 (1942)

T: above Port Moresby, Uniri R., Central Province, [Papua] New Guinea, *Carr 15194*; holo: BM.

Illustrations: J. Hyvönen, *Acta Bot. Fenn.* 133: 126, fig. 11 (1986); J. Hyvönen, *Acta Bot. Fenn.* 138: 55, fig. 17 (1989).

Stems to 2.3 cm tall. Leaves incurved to contorted when dry, slightly recurved to erect-spreading when moist, 3.7–7.9 mm long; lamina narrowly lanceolate, 0.4–1.1 mm wide; margin serrate with multicellular teeth, flat or upcurved, unistratose, 3–5 cells wide; sheathing base widened; costa percurrent to excurrent, with apical abaxial teeth small or absent; lamellae 28–50, on adaxial surface of lamina, 4–6 cells high, irregularly crenate by the upper margin, with apical cells rounded to rarely retuse (in cross-section). Urn 3.2–4.1 mm long, 1.3–1.5 mm wide. Spores 10–13 µm diam. Fig. 13E–F.

Occurs in north-eastern Qld; also in New Guinea. This is a plant of loamy stream banks and roadsides. Map 31.

Qld: Main Coast Ra., 18 km NNW of Mt Molloy, *H. Streimann 30351* (CANB, L, NICH, NY); Mt Lewis, *B.O. van Zanten 681179* (CANB, L, MEL, NY); Mt Fisher, Atherton Tableland, *I.G. Stone 15730, 15736* (MEL); Palmerston Natl Park, *I.G. Stone 25113* (MEL); Lamins Hill, near Malanda, *G.H. Bell 641* (AD).

Only one of the six known Australian specimens includes sporophytes, and the description of these characters is based on comparatively few measurements. *Pogonatum tubulosum* is easily distinguished from other species by the irregularly crenate apical cells of the lamellae.

5. POLYTRICHADELPHUS

*Jaakko Hyvönen*¹

Polytrichadelphus (Müll.Hal.) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 97 (1860); from the Greek *poly* (many), *trichos* (a hair) and the Greek *adelphos* (a brother), in reference to the close relationship to the genus *Polytrichum*.

Type: *P. magellanicus* (Hedw.) Mitt.

Dioicous. Plants loosely caespitose, dark green to brown. Stems erect, simple (rarely branched). Rhizoids restricted to subterranean part of stem. Leaves appressed when dry, recurved when moist; lamina linear-lanceolate, gradually narrowing to an acute apex, with ovate to subquadrate dorsal cells; margin serrate with unicellular teeth, distinctly upcurved, unistratose; costa slightly excurrent, reddish brown, apically sharply serrate with abaxial teeth; sheathing base ovate, gradually or abruptly narrowing to lamina, with subquadrate to rectangular cells with firm walls; lamellae almost covering the lamina. Calyptra sparsely hairy. Setae usually solitary, terminal or pseudolateral by subperichaetial innovation. Capsules inclined, pale to dark brown; urn with 2 distinct angles (crescent-shaped in cross-section); exothecial cells subquadrate, with firm walls; stomata restricted to basal third of capsule; operculum rostellate. Peristome teeth 64, pale brown; epiphragm thin, attached to peristome teeth apices. Spores with a granulose surface.

A genus of about ten species in Australia, New Zealand, New Guinea, South America and Tristan da Cunha. Represented in Australia by one non-endemic species, *Polytrichadelphus* is a pioneer plant of soil in open habitats.

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***Polytrichadelphus magellanicus* (Hedw.) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 97 (1860)**

Polytrichum magellanicum Hedw., *Sp. Musc. Frond.* 101, pl. 20, figs 1, 2 (1801). T: Fretum Magellanicum, *P. Commerson*; lecto: PC *n.v.*

Catharinea arnoldii Hampe, *Linnaea* 38: 664 (1874); *Polytrichadelphus arnoldii* (Hampe) A. Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 246 (1875); *Oligotrichum arnoldii* (Hampe) Kindb., *Enum. Bryin. Exot.* 68 (1888). T: Mt Arnold, Australian Alps, *coll. unknown*; iso: H-BR.

Catharinea innovans Müll. Hal., *Bot. Zeitung (Berlin)* 9: 548 (1851); *Polytrichadelphus innovans* (Müll. Hal.) A. Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 245 (1875); *Oligotrichum innovans* (Müll. Hal.) Kindb., *Enum. Bryin. Exot.* 69 (1888). T: Mt Wellington, Tas., *S. Mossman 752*; iso: JE.

Catharinea australasica Hampe, *Linnaea* 40: 315 (1876); *Polytrichadelphus australasicus* (Hampe) A. Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1877–78: 453 (1879); *Oligotrichum australasicum* (Hampe) Kindb., *Enum. Bryin. Exot.* 68 (1888). T: "subtropical eastern Australia", *Eaves; n.v.*

Catharinea lagenacea Müll. Hal., *Hedwigia* 36: 338 (1897); *Polytrichadelphus lagenaceus* (Müll. Hal.) Paris, *Index Bryol. Suppl.* 1: 279 (1900). T: Marydale, Tas., 5 Dec. 1891, *W.A. Weymouth*; iso: H-BR.

Catharinea profilicans Müll. Hal., *Hedwigia* 36: 339 (1897); *Polytrichadelphus prolificans* (Müll. Hal.) Paris, *Index Bryol. Suppl.* 1: 279 (1900). T: Mt Wellington, Tas., *J. & B. Gullwer*; iso: H-BR.

Illustrations: G.O.K. Sainsbury, *Bull. Roy. Soc. New Zealand* 5: 32, pl. 2, fig. 1 (1955); J. Beever, K.W. Allison & J. Child, *Mosses of New Zealand*, 2nd edn 25, fig. 10a–h (1992); M.M. Schiavone, *Fl. Criptogámica de Tierra del Fuego XIV* (12): 19, pl. IV (1993).

Stems to 14.5 cm tall. Leaves appressed when dry, recurved when moist, 5.8–9.6 mm long; lamina 0.5–1.0 mm wide; abaxial cells with incrassate outer walls; margin flat to distinctly upcurved, unistratose, 2 or 3 cells wide; sheathing base rather abruptly widened; costa with apical abaxial teeth; lamellae 34–50, on adaxial surface of lamina, 5–9 cells high, distinctly crenate by upper margin, with apical cells pyriform (in cross-section) with a distinctly incrassate outer wall. Urn 4.1–6.8 mm long, 2.2–3.9 mm wide. Spores 10–15 µm diam. *n* = 7, *fide* H.P. Ramsay, *J. Hattori Bot. Lab.* 82: 221 (1997). Fig. 151–M, Plates 8, 9.

Occurs in Vic. and Tas.; also in New Zealand and South America. This coloniser of open soil is often locally abundant. Map 32.

Vic.: Acheron Way, *H. Streimann 50814* (CANB, KRAM, MAHU, NY, TBA); Bogong High Plains, *I.G. Stone 9408* (MEL); Mt Donna Buang State Forest, *A.W. Thies FN1468H* (MEL). Tas.: Fern Glade, *D.A. & A.V. Ratkovsky B339* (MEL); Lachland Rd, *A.V. Ratkovsky H356* (HO).

Polytrichadelphus magellanicus is distinguished from other large species of Polytrichaceae by its capsules having two distinct angles giving them a crescent shape in cross-section. Plants occurring in Australia and New Zealand have been treated as a distinct species, *P. innovans*. However, I am inclined to treat all specimens from both sides of the Pacific Ocean as belonging to *P. magellanicus*.

6. POLYTRICHASTRUM

*Jaakko Hyvönen*¹

Polytrichastrum G.L. Sm., *Mem. New York Bot. Gard.* 21(3): 35 (1971); from the Greek *poly* (many), *trichos* (a hair) and the Latin *-astrum* (indicating likeness or inferiority), in reference to the relationship to *Polytrichum*.

Type: *P. alpinum* (Hedw.) G.L. Sm.

Dioicous. Plants loosely caespitose, bright green to brown. Stems erect, simple or branched. Rhizoids restricted to stem base and bases of lowermost scale-like leaves. Leaves appressed, erect-spreading when dry, erect-spreading to distinctly recurved when moist; lamina linear-

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lanceolate, gradually narrowing to a sharp apex, with ovate to subquadrate abaxial cells; margin serrate with large teeth, distinctly upcurved to flat, unistratose; sheathing base ovate, abruptly or gradually narrowing to lamina, with subquadrate to rectangular cells with firm walls; costa slightly excurrent, reddish brown, apically sharply serrate with abaxial teeth; lamellae almost covering the lamina. Calyptra hairy. Setae usually solitary, terminal or pseudolateral by subperichaetial innovation, smooth. Capsules erect or slightly inclined, pale to dark brown; urn cylindrical, terete to faintly plicate; exothecial cells smooth, subquadrate to elongate, with firm walls; stomata restricted to basal hypophysis; operculum rostellate. Peristome teeth c. 64, pale brown; epiphragm thick. Spores with a granulose surface.

A genus of approximately 15 species in both hemispheres. Represented in Australia by two non-endemic species, *Polytrichastrum* is a pioneer plant of open soil and peat.

1. *Polytrichastrum alpinum* (Hedw.) G.L.Sm., *Mem. New York Bot. Gard.* 21(3): 37 (1971)

Polytrichum alpinum Hedw., *Sp. Musc. Frond.* 92 (1801); *Pogonatum alpinum* (Hedw.) Röhl., *Ann. Wetterausischen Ges. Gesamte Naturk.* 3(2): 226 (1814). T: Europe; *n.v.*

Polytrichum pseudoalpinum Müll.Hal., *Bot. Zeitung (Berlin)* 13: 750 (1855); *Pogonatum pseudoalpinum* (Müll.Hal.) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873-74: 262 (1875). T: "Australia Felix, in subalpinis"; *n.v.*

Polytrichum austroalpinum F.Muell. ex Hampe, *Linnaea* 28: 211 (1856), *nom. inval.* (in synon.). T: "In monte Cobboras", [Vic.], *F. Mueller*; *n.v.*

Polytrichum austroalpinum Müll.Hal., *Bot. Jahrb. Syst.* 5: 77 (1883); *Pogonatum austroalpinum* (Müll.Hal.) Paris, *Index Bryol.* 971 (1898). T: Kerguelen Island, *F.C.Naumann*; *n.v.*

Polytrichum obliquirostre Müll.Hal., *Hedwigia* 36: 342 (1897). T: Mt William, Vic., Oct. 1878, *D.Sullivan*; iso: JE.

Illustrations: H.A.Crum & L.E.Anderson, *Mosses of Eastern North America* 2: 1267, fig. 629 (1981), as *Pogonatum alpinum*; D.G.Long, *Bioscience* 17: 28, fig. 8 (1985); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12f (1992).

Stems to 13 cm tall. Leaves appressed to erect-spreading when dry, recurved when moist, 4.8-11.0 mm long; lamina 0.4-0.8 mm wide, with abaxial cells having a distinctly incrassate outer wall; margin serrate, upcurved, unistratose, 3-6 cells wide; sheathing base rather abruptly widened; costa with apical abaxial teeth; lamellae 26-44, on adaxial surface of lamina, 5-8 (-9) cells high, \pm straight by upper margin, with apical cells pyriform in cross-section and with an extremely incrassate and \pm papillose outer wall. Urn terete, 3.7-5.9 mm long, 1.7-2.7 mm wide. Spores 13-23 μ m diam. $n = 7$, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 219 (1997). Fig. 14D-G.

Occurs in N.S.W., A.C.T., Vic. and Tas.; also in the Antarctic, Subantarctic islands, New Zealand and South America; widespread in the temperate and boreal parts of the Northern Hemisphere. This is a plant of various open habitats, most commonly found near non-calcareous boulders and rocks. Map 33.

N.S.W.: Mt Kosciuszko, *H.Streimann* 5313 (AD, H, L, MO, NICH). A.C.T.: Brindabella Ra., *D.Verdon* 1014 (CANB, HO, L). Vic.: Bogong High Plains, *I.G.Stone* 10614 (MEL); Langford Gap, *I.G.Stone* 14347 (MEL). Tas.: Mt Field, *A.Moscal* 23341 (HO).

Polytrichastrum alpinum is distinguished from all other large Australian Polytrichaceae by its terete capsules and the extremely incrassate and papillose outer wall of the apical cells of the adaxial lamellae.

2. *Polytrichastrum formosum* (Hedw.) G.L.Sm., *Mem. New York Bot. Gard.* 21(3): 37 (1971)

Polytrichum formosum Hedw., *Sp. Musc. Frond.* 92 (1801). T: Die Vogelsteine, Sudetes; *n.v.*

Illustrations: A.J.E.Smith, *Moss Flora of Britain and Ireland* 93, fig. 354 (1978); H.A.Crum & L.E.Anderson, *Mosses of Eastern North America* 2: 1273, fig. 632 (1981); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12a (1992).

Stems to 18 cm tall. Leaves appressed to erect-spreading when dry, distinctly recurved when moist, 6.0–12.3 mm long; lamina 0.7–1.2 mm wide, abaxial cells with distinctly incrassate outer walls; margin flat to upcurved, unistratose, 3–10 cells wide; sheathing base gradually widened; costa with apical abaxial teeth; lamellae 42–66, on adaxial surface of lamina, 3–7 cells high, \pm straight to obliquely crenate by upper margin; apical cells rounded to very slightly pyriform in cross-section. Urn 4.5–6.2 mm long, 1.9–2.4 mm wide, with 4 rounded angles. Spores 15–20 μ m diam. Fig. 14A–C.

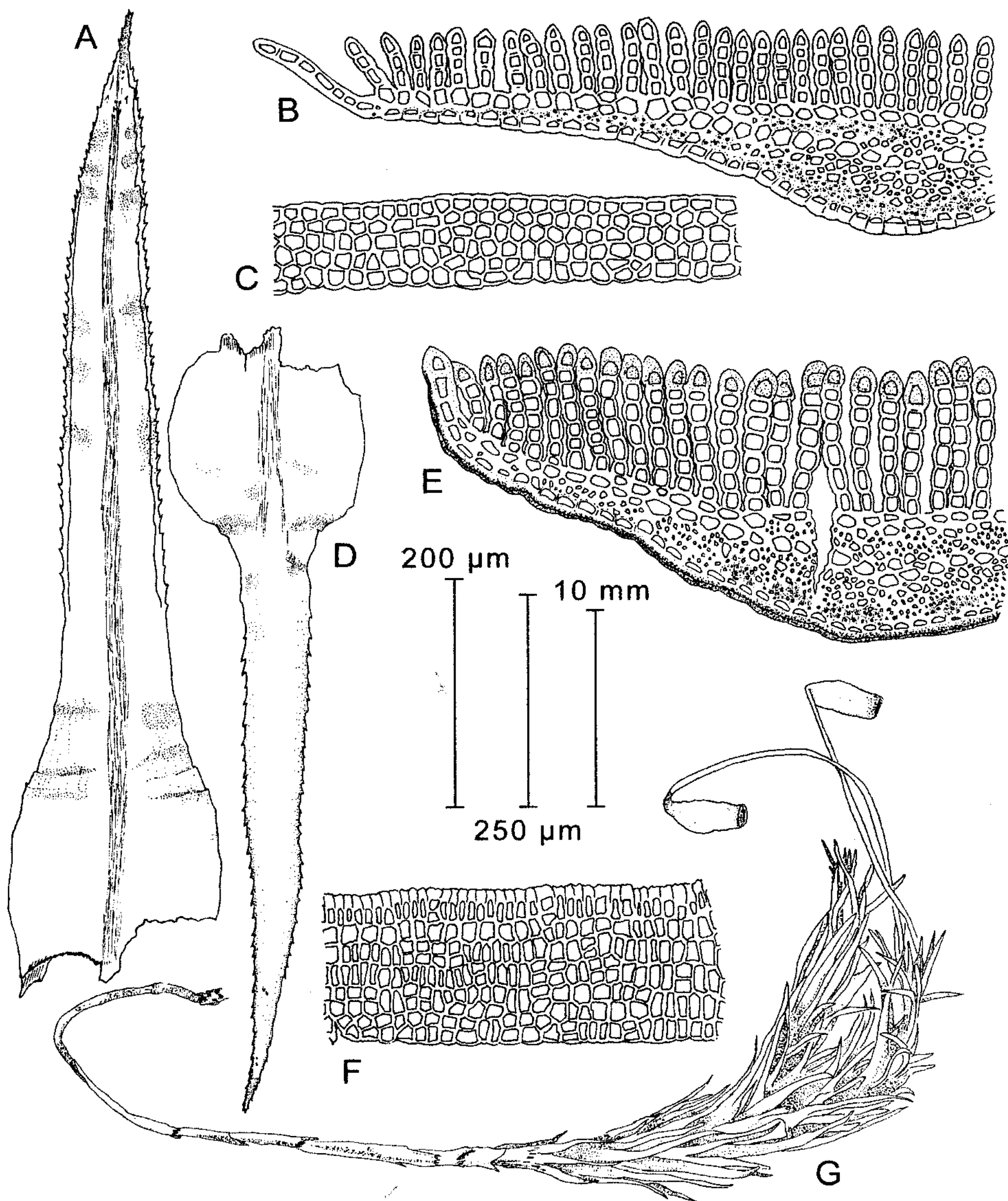


Figure 14. *Polytrichastrum*. A–C, *P. formosum*. A, Leaf; B, T.S. of mid-leaf; C, Lamella in side view (A–C, L.Rodway, Dec. 1917, HO). D–G. *P. alpinum*. D, Leaf; E, T.S. of mid-leaf; F, Lamella in side view; G, Habit (dry specimen) (D–G, A.Moscal 23341, HO). Use 200 μ m scale for B, C, and F; 250 μ m scale for A and D; and the 10 mm scale for G. Drawn by I.Ahonen.

Occurs in N.S.W. and Tas.; also in New Zealand, southern South America and widespread in the Northern Hemisphere. Grows in various open habitats, also in rather moist sites. Map 34.

N.S.W.: path to Wentworth Falls, Blue Mtns, *D.G.Catcheside* 81.23 (AD). Tas.: Mt Rufus, *A.V.Ratkowsky* 78/182 (HO); Middlesex Plains, *A.Moscal* 1089 (HO); Adamson Peak, Dec. 1913, *L.Rodway* (HO); Cradle Mtn, Dec. 1971, *G.A.M.Scott* (MEL).

The Australian specimens are identical to those collected in New Zealand and Patagonia. Most of the plants I have studied from these areas closely resemble *P. formosum* from Japan and Taiwan, but the habitats in Australia (moist to wet peaty sites) resemble those preferred by *P. longisetum* Sw. ex Brid. The ranges of these two species overlap in the Northern Hemisphere, and *P. longisetum* has been recorded for South America and New Zealand. However, based on the present material, only *P. formosum* is tentatively accepted for Australia.

Polytrichastrum formosum has essentially unspecialised apical cells on its adaxial lamellae. The outer walls of these cells are neither incrassate nor papillose, and they have no special form and are quite peculiarly obliquely crenate when seen in side view. The only other large Australian species of Polytrichaceae with similar cells is *Dawsonia polytrichoides*, but that species is not present in Tasmania. Moreover, when capsules are present they are easily distinguished because of the extremely long and narrow peristome teeth of *Dawsonia*.

7. POLYTRICHUM

*Jaakko Hyvönen*¹

Polytrichum Hedw., *Sp. Musc. Frond.* 88 (1801); from the Greek *poly* (many) and *trichos* (a hair), in reference to the hairy calyptra.

Type: *P. commune* Hedw.

Dioicous. Plants tightly to loosely caespitose, whitish green to brown. Stems erect, simple or branched. Rhizoids restricted to the stem base and the bases of the lowermost scale-like leaves. Leaves tightly appressed when dry, erect-spreading to distinctly recurved when moist; lamina linear-lanceolate, gradually narrowing to a sharp apex, with ovate to subquadrate abaxial cells; margin distinctly upcurved, unistratose; sheathing base ovate, gradually or abruptly narrowing to lamina, the sheath cells subquadrate to rectangular with firm walls; costa slightly excurrent, reddish brown, apically sharply serrate with abaxial teeth; lamellae covering almost the entire lamina. Calyptra hairy. Setae usually solitary, terminal or pseudolateral by subperichaetial innovation, smooth. Capsules inclined, pale to dark brown; urn box-like with 4 distinct angles; exothecial cells distinctly pitted, subquadrate, with firm walls; stomata restricted to the markedly swollen hypophysis; operculum rostellate. Peristome teeth 64, pale brown; epiphragm thin, attached to peristome teeth apices. Spores echinate.

While the number of described species of *Polytrichum* is close to 80, the actual number is certainly much lower. The genus is distributed in of both hemispheres. Represented in Australia by two non-endemic taxa, *Polytrichum* is a pioneer plant of open soil and peat.

1. *Polytrichum commune* Hedw., *Sp. Musc. Frond.* 88 (1801)

T: Europe; *n.v.*

Polytrichum perigoniale Michx., *Fl. Bor.-Amer.* 2: 293 (1803); *Polytrichum commune* Hedw. var. *perigoniale* (Michx.) Hampe, *Linnaea* 13: 44 (1839). T: Carolina, U.S.A.; holo: *n.v.*

Polytrichum brachypelma Müll.Hal., *Hedwigia* 36: 346 (1897). T: Sydney, N.S.W., *D.Kayser*; *n.v.*; Blue Mountains, N.S.W., 1884, *T.Whitelegge*; syn: H-BR.

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POLYTRICHACEAE

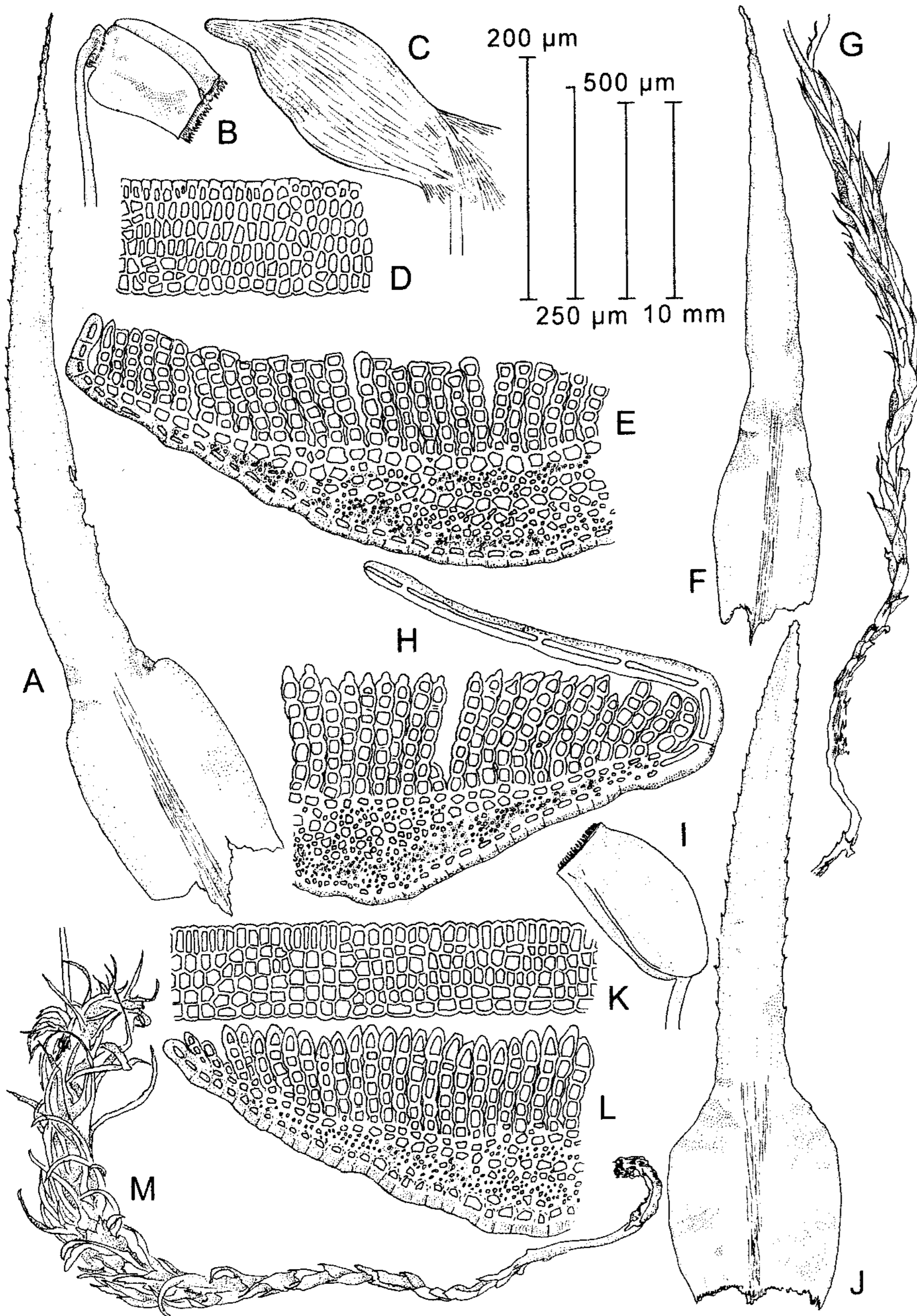


Figure 15. *Polytrichum* and *Polytrichadelphus*. **A–E**, *Polytrichum commune*. **A**, Leaf; **B**, Capsule; **C**, Immature capsule enclosed in hairy calyptra; **D**, Lamella in side view; **E**, T.S. of mid-leaf (**A** and **C–E**, *R. Hoogland* 10022, CANB; **B**, *N. Burbidge* 3827, CANB). **F–H**, *P. juniperinum*. **F**, Leaf; **G**, Habit (dry specimen); **H**, T.S. of mid-leaf (**F–H**, *A. Moscal* 17323, HO). **I–M**, *Polytrichadelphus magellanicus*. **I**, Capsule; **J**, Leaf; **K**, Lamella in side view; **L**, T.S. of mid-leaf; **M**, Habit (dry specimen) (**I**, *D. Norris* 27339, HO; **J–M**, *I. Stone* 3071, MEL). Use 200 μm scale for **D**, **E**, **H**, **K** and **L**; 250 μm scale for **A**, **F** and **J**; 500 μm scale for **B**, **C** and **I**; and 10 mm scale for **G** and **M**. Drawn by I. Ahonen.

Polytrichum cataractarum Müll.Hal., *Hedwigia* 36: 347 (1897). T: Fitzroy Falls, N.S.W., Nov. 1884, T.Whitelegge; iso: NSW.

Illustrations: H.A.Crum & L.E.Anderson, *Mosses of Eastern North America* 2: 1282, fig. 637 (1981); D.G.Long, *Bioscience* 17: 38, fig. 12 (1985); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 12b (1992).

Stems to 18 cm tall. Leaves appressed when dry, distinctly squarrose when moist, 6.1–10.2 mm long; lamina 0.5–0.8 mm wide, abaxial cells with distinctly incrassate outer walls; margin serrate with large sharp unicellular teeth, tightly upcurved, unistratose, 4–8 cells wide; sheathing base gradually widened; costa excurrent, with apical abaxial teeth; lamellae 34–52, on adaxial surface of blade, 5–10 cells high, ±straight to slightly crenate by upper margin, with apical cells retuse in cross-section and with an incrassate outer wall. Urn 3.1–6.2 mm long, 1.6–3.5 mm wide. Spores 6–11 µm diam. $n = 7$, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 220 (1997). Fig. 15A–E.

Occurs in Qld, N.S.W., A.C.T., Vic. and Tas. Almost a cosmopolitan species with a distribution that includes New Zealand, the Pacific islands, Africa and South America. *Polytrichum commune* is a plant of diverse open habitats; it is commonly found on peat. Map 35.

Qld: S of Bald Rock, I.G.Stone 13435 (MEL). N.S.W.: Sams Ck, H.Streimann 49176 (CANB, H). A.C.T.: Bimberi Ra., P.Darbyshire 80 (MEL). Vic.: Gorae West, A.C.Beauglehole 1462 (MEL). Tas.: Mt Wellington, A.V.Ratkowsky H363 (HO).

Polytrichum commune usually has rather distant leaves with glossy sheathing parts covering the stem. However, this is true only of specimens growing in moist habitats. The typical, retuse, apical cells of the adaxial lamellae are a reliable and readily seen diagnostic character that is present in all specimens. Two varieties (var. *commune* and var. *perigoniale*) have been distinguished in Australia, but their status is still in dispute, and they are not recognised here.

2. *Polytrichum juniperinum* Willd. ex Hedw., *Sp. Musc. Frond.* 90 (1801)

T: Switzerland; *n.v.*

Polytrichum juniperinum Willd. ex Hedw. var. *australe* Müll.Hal., in J.E.Zetterstedt, *Oefvers. Förh. Kongl. Svenska Vetensk.-Akad.* 24: 573 (1868). T: near Melbourne, Vic., F.Mueller; *n.v.*

Polytrichum densifolium Hampe, *Linnaea* 30: 635 (1860), *nom. illeg.* (later homonym); *Polytrichum novae-hollandiae* A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 270 (1875). T: Mt Wellington, Tas., F.Mueller; *n.v.*

Polytrichum sullivanii Hampe, *Linnaea* 40: 316 (1876). T: between Mt Ararat and Mt William, Vic., D.Sullivan; lecto: H-BR, *fide* J.Hyvönen, *Fl. Australia* 51: 409 (2006); isolecto: BM, MEL.

Polytrichum tasmaniae Müll.Hal., *Hedwigia* 36: 343 (1897). T: Marydale, Tas., Dec. 1890, O.Burchard; *n.v.*

Polytrichum cypellomitrium Müll.Hal., *Hedwigia* 36: 343 (1897). T: Kangaroo Valley, near Moss Vale, N.S.W., Dec. 1885, T.Whitelegge; lecto: H-BR, *fide* J.Hyvönen, *Fl. Australia* 51: 409 (2006); Moss Vale, Fitzroy Falls, N.S.W., Nov. 1884, coll. unknown; syn: H, MEL, NSW, S;

Polytrichum ryparomitrium Müll.Hal., *Hedwigia* 36: 344 (1897). T: Liverpool, 20 miles [c. 32 km] S of Sydney, N.S.W., Nov. 1884, T.Whitelegge; iso: HBG, H-BR, NSW, S.

Polytrichum longipilum Müll.Hal., *Hedwigia* 36: 344 (1897). T: Studley Park, near Melbourne, Vic., 2 Aug. 1883, F.M.Reader; syn: S; outside Dimboola, Vic., 1892, F.M.Reader; *n.v.*; upper Ovens R., Vic., 1882, McCann; syn: JE; Grampians, Vic.; syn: *n.v.*; Daylesford, Vic., 1877, R.Wallace; syn: JE; Fowlers Bay, Vic., coll. unknown; syn: HBG, JE.

Polytrichum beccarii Müll.Hal., *Hedwigia* 36: 345 (1897). T: Mt Wellington, Tas., 19 Feb. 1878, O.Beccari; iso: H-BR.

Polytrichum nodicoma Müll.Hal., *Hedwigia* 36: 346 (1897). T: Oakleigh, Vic., 14 Sept. 1886, F.M.Reader; syn: HBG, S; outside Dimboola, Vic.; syn: H-BR.

Polytrichum tysdalei Müll.Hal., *Hedwigia* 36: 346 (1897). T: Gippsland, Vic., 1884, H.Tysdale; lecto: H-BR, *fide* J.Hyvönen, *Fl. Australia* 51: 409 (2006); isolecto: JE.

Polytrichum lycopodioides Müll.Hal., *Hedwigia* 36: 347 (1897). T: Tas.; *n.v.*

Polytrichum juniperum var. *australe* K.H.Walther, *Ann. Bryol.* 7: 149, fig. 8g–i (1934) *nom. illeg.* (later homonym), *non* Müll.Hal. (1868). T: Mt Wellington, Tas., 23 Dec. 1895, W.A.Weymouth; syn: H-BR.

Illustrations: H.A.Crum & L.E.Anderson, *Mosses of Eastern North America* 2: 1271, fig. 631 (1981); D.G.Long, *Bioscience* 17: 51, fig. 17 (1985); J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 27, fig. 11a-h; 56, pl. 5; 59, pl. 13 (1992).

Stems to 15.5 cm tall. Leaves tightly appressed when dry, erect-spreading when moist, 4.2–8.5 mm long; lamina 0.4–0.6 mm wide; abaxial cells with distinctly incrassate outer walls; margin entire, tightly incurved, partly covering adaxial lamellae, unistratose, 5–11 cells wide, with short broad cells; sheathing base gradually widened; costa forming a brown to hyaline arista with apical abaxial teeth; lamellae 32–52, on adaxial surface of lamina, 5–8 cells high, distinctly crenate by upper margin, with apical cells of central lamellae pyriform in cross-section and with the incrassate outer wall forming a distinct knob. Urn 3.7–6.6 mm long, 2.0–3.6 mm wide. Spores 9–14 μm diam. $n = 7$, *fide* H.P.Ramsay, *J. Hattori Bot. Lab.* 82: 220 (1997). Fig. 15F–G, Plates 10, 12.

Occurs in S.A., N.S.W., A.C.T., Vic. and Tas. An almost cosmopolitan species, *P. juniperinum* is a hardy plant of open habitats, and it can survive at very dry sites such as the tops of dry peat hummocks in mires. Map 36.

S.A.: Williamstown, southern Lofty Ra., *L.D.Williams* 10381 (AD). A.C.T.: Mt Coronet, *N.T.Burbidge* 6737 (CANB). Vic.: Bogong High Plains, *I.G.Stone* 11314 (MEL). Tas.: Mt Wellington, *D.A. & A.V.Ratkowsky* B78 (HO); Ben Lomond Natl Park, *A.V.Ratkowsky* H369 (HO).

Polytrichum juniperinum is easily identified by the tightly appressed leaves with entire leaf margins that cover the adaxial lamellae. This makes the adaxial surface of the leaves glossy, a unique feature among Australian Polytrichaceae.

Doubtful and Excluded Names

Polytrichum piliferum Schreb. ex Hedw., *Sp. Musc. Frond.* 90 (1801)

Detailed study of Australian material did not reveal any specimens belonging to this taxon. Obviously, earlier records of the species for Australia are based on misidentification of stunted specimens of *Polytrichum juniperinum*.

Polytrichum recurvipilum Müll.Hal., *Hedwigia* 36: 343 (1897)

T: Braidwood district, N.S.W., Nov. 1884, *W.Baeuerlen*; *n.v.*

The type material of this species was not available for study, and it is impossible to identify the species from the original description. However, the name is likely to be superfluous, and if the type material can be located, this will probably fall into synonymy under *Polytrichum commune* or *Polytrichastrum longisetum*.