

BARTRAMIA

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Bartramia Hedw., *Sp. Musc. Frond.* 164 (1801), *nom. cons.*; apparently named after John Bartram (1699–1777), pioneer American botanist.

Lecto: *B. halleriana* Hedw., *typ. cons.*

Glyphocarpa R.Br., *Trans. Linn. Soc. London* 12: 575 (1819). T: *G. capensis* R.Br.

Monoicous or dioicous. Plants small to very robust, caespitose. Stems simple, sparingly branched near the base, or with rare subfloral innovations, variably tomentose. Rhizoids at least lightly papillose. Leaves not ranked, geniculate or spreading to erect on stems, sometimes curled or twisted when dry, linear-lanceolate or narrowed from an obovate hyaline sheathing base; apex acute; margin plane or revolute, at least the upper parts denticulate; costa strong, percurrent or short-excurrent; laminal cells rectangular, more elongate nearer the leaf base, sometimes with rows of quadrate basal marginal cells, papillose from prorate cell ends.

Capsules erect or suberect, globose to ovoid; operculum umbonate. Peristome absent or apparently single, sometimes double with a rudimentary endostome. Spores subglobose or reniform, papillose or verrucose. Chromosome number $n = 8$ (most species), but also records of $n = 6, 12, 16$, *vide* H.P.Ramsay, *Austral. J. Bot.* 22: 317–318 (1974).

The taxonomy of *Bartramia* has been in considerable flux for many years, with confusion surrounding several species groups. While there is a need for a worldwide revision of the genus, recent investigations using various morphological characters have begun to clarify the situation. Axillary hair types were found by Griffin & Buck (1989) to be diagnostic at the generic level. Using this character, in conjunction with others, there seems to be a clear grouping of the Australian *Bartramia* species into two groups, although further investigation is required to establish the exact affinities of the second (“Section *Strictidium*”) group. Magill (1987) foreshadowed this situation by transferring the South African *B. afrostricta* Müll.Hal. to synonymy under *Anacolia breutelii* (Müll.Hal.) Magill (treated here as *B. breutelii* Müll.Hal.). Further support is found in Fransén (2004b). However, there are difficulties in accommodating the group of related Australian species of *Bartramia s. lat.* within *Anacolia* Schimp. The broader concept of *Bartramia* is retained here pending further investigations. *Bartramia* was subdivided by Brotherus (1909) into 3 sections, and while these were used by Catcheside (1987), they have not been adopted in this treatment. Virtanen (2003) included only four species in his study, an insufficient number to elucidate infrageneric relationships. Fransén (2004a, b) retained the traditional sectional distinctions, with some discussion of their morphological features. *Bartramia* “*stricta*” was widely misapplied in Australia to the taxa segregated by Catcheside (1987) as *B. afrostricta*, *B. nothostricta*, *B. pseudostricta* and *B. strictifolia*.

Bartramia, with approximately 72 species, occurs on soil or, rarely, on rocks in many habitats throughout the world; however, most tropical species are found only at high altitudes (Virtanen, 2000). Nine species are known from Australia; three species and one subspecies are endemic.

References

Brotherus, V.F. (1909), *Bartramia*, *Nat. Pflanzenfam.* I, 3: 635–641.

¹ State Herbarium of South Australia, Plant Biodiversity Centre, Hackney Rd, Hackney, South Australia 5069. This treatment is based, in part, on research by the late D.G.Catcheside.

Cite as: G.H.Bell, *Australian Mosses Online*. 42. *Bartramiaceae: Bartramia*.
http://www.anbg.gov.au/abrs/Mosses_online/Bartramiaceae_Bartramia.pdf (2012)

Catcheside, D.G. (1987), The genus *Bartramia* (Bartramiaceae) in Australia, *Mem. New York Bot. Gard.* 45: 618–626.

Fransén, R. (2004a), A taxonomic revision of extra-Neotropical *Bartramia* section *Vaginella* C.Müll., *Lindbergia* 29: 73–107.

Fransén, R. (2004b), A taxonomic revision of *Bartramia* Hedw. section *Bartramia*, *Lindbergia* 29: 113–122.

Magill, R.E. (1987), Bartramiaceae, *Fl. Southern Africa: Bryophyta* 1(2): 407–438.

Matteri, C.M. (1984), Sinopsis de las especies Andino-Patagónicas, Antárticas y Subantárticas de los géneros *Bartramia*, *Bartramidula* y *Conostomum*, *Darwiniana* 25: 143–162.

Matteri, C.M. (1984), Bartramiaceae, in *Flora Criptogámica de Tierra del Fuego* XIV, Fasc. 7.

Virtanen, V. (2000), Taxonomic studies of the Bartramiaceae [Bryopsida], *Publ. Bot. Univ. Helsinki* 31. (<http://thesis.helsinki.fi/julkaisut/mat/ekolo/vk/virtanen/taxonomi.pdf>).

Virtanen, V. (2003), Phylogeny of the Bartramiaceae (Bryopsida) based on morphology and on *rbcL*, *rps4*, and *trnL-trnF* sequence data, *Bryologist* 106: 280–296.

- 1 Plants without subfloral innovations; leaf base broadened, hyaline and sheathing; axillary hairs filamentous, to 7 or 8 cells; basal 2–5 cells with pigmented cross-walls only; all basal cells of leaf elongate2
- 1: Plants with rare subfloral innovations occurring below some male inflorescences; leaf bases not differentiated; axillary hairs very short, usually comprising 1 pigmented basal cell and 1 hyaline globose cell; leaves with rows of quadrate cells at basal margins5
 - 2 Lamina cells mostly unistratose; mid-laminal cells mostly isodiametric or broader than long; mature capsules clearly asymmetrical (1) **4. B. mossmaniana**
 - 2: Laminal cells 2- or 3-stratose; mid-laminal cells elongate; mature capsules symmetrical or nearly so3
- 3 Robust plants of alpine bogs; sheathing leaf base obtuse (1.5 times longer than wide), with the lamina 2- to 3-stratose near shoulder; green lamina triangular, 3- or more stratose; spores reniform, finely and densely papillose (2:) **9. B. subsymmetrica**
- 3: Slender to small plants of drier habitats; sheathing leaf base oblong (3 times longer than wide), with the lamina unistratose; green lamina linear-lanceolate, 2-stratose; spores ±globose, verrucose4
 - 4 Plants usually > 10 mm tall; leaves usually spreading; peristome present (although often lost); exothecial cells without prominent trigones (3:) **7. B. robusta**
 - 4: Plants < 8 mm tall; leaves suberect; peristome absent; exothecial cells with prominent trigones **3. B. hampeana** subsp. **hampei**
- 5 Leaves 3.5–4.5 mm long, with 9–12 longitudinal rows of quadrate cells at basal margin (1:)6
- 5: Leaves 1.5–3.5 mm long, with up to 5 rows of quadrate cells at basal margin7
 - 6 Lamina with numerous projecting spinose papillae; margin narrowly revolute to near apex (5) **1. B. alaris**
 - 6: Laminal papillae low and ‘mounded’, not spinose; margin revolute in lower half or less **2. B. breutelii**
- 7 Leaves spreading, flexuose; spores 24–28 µm diam., with small dense verrucae (5:) **6. B. pseudostricta**
- 7: Leaves erect and appressed to stem when dry; spores 24–35 µm diam., with fewer larger verrucae8
 - 8 Spores 24–25 µm diam., with a few large domed verrucae; leaves usually with 16–22 cells between costa and margin (at the base), 2–5 rows at the margin being quadrate (7:) **8. B. strictifolia**
 - 8: Spores 30–35 µm diam., with very large irregular verrucae; leaves usually with 15–17 cells between costa and margin (at the base), 1–2 (–3) rows at margin being quadrate **5. B. nothostricta**

1. *Bartramia alaris* Dixon & Sainsbury, *J. Bot.* 71: 244 (1933)

T: near Havelock North, Hawkes Bay, New Zealand, Jan. 1929, *E.A.Hodgson* [Herb. G.O.K.Sainsbury 563];
holo: BM? *n.v.*; iso: AK?, WELT? *n.v.*

Plants moderately robust, to c. 14 mm tall, caespitose, glaucous green above with yellowish tips, dull brownish green below. Stems with a strong central strand, lacking a hyalodermis. Rhizoids basal only, papillose, reddish brown. Leaves erect, closely appressed but often curled or twisted apically when dry, linear-lanceolate, 4.4–5.0 mm long, 0.75–0.80 mm wide; margin narrowly revolute almost to apex; upper margin strongly denticulate (multiple rows), with enlarged cells; costa strong, glossy and prominent abaxially, with a strong abaxial stereid band and a weaker adaxial band; axillary hairs minute, apparently consisting of a single hyaline cell; upper lamina bistratose; cells very obscure, c. $12.5 \times 7.5 \mu\text{m}$, spinose-papillose from enlarged prorate cell ends; lower lamina patchily bistratose, with cells elongate, to $55 \times 10 \mu\text{m}$, and with c. 10 rows of shorter quadrate cells at alar margin. Sporophytes not seen in Australian material, probably also unknown in New Zealand.

Known only from several collections made by W.W.Watts in 1899 from one locality in eastern N.S.W.; rare in New Zealand. The Australian specimens were recorded from soil on a river bank, growing with *Triquetrella*, as also noted in New Zealand.

N.S.W.: bank of Nepean R., *W.W.Watts 3203* (AD, NSW).

This species may be more widespread, but further investigation is needed as there seem to be few other collections of *Bartramia* from this area of N.S.W. *Bartramia alaris* is most similar to *B. breutelii*, differing mainly in the leaf margins and the presence of spinose laminal papillae.

2. *Bartramia breutelii* Müll.Hal., *Bot. Zeitung (Berlin)* 16: 162 (1858)

Anacolia breutelii (Müll.Hal.) Magill, *Fl. Southern Africa: Bryophyta* 1(2): 411 (1987). T: Soutkloof, Cape Province, South Africa, *Breutel s.n.*; syn?: BM, G *n.v.*

Bartramia afrostricta Müll.Hal., *Hedwigia* 38: 94 (1899). T: Cape Town, South Africa, *Rehmann 203, 204*; syn: BM, PRE *n.v.*

Illustrations: D.G.Catcheside, *Mosses of South Australia* 283, fig. 169, pl. 11B (1980), as *Bartramia* sp. A; R.E.Magill, *loc. cit.* fig. 116 (14–27), as *Anacolia breutelii*.

Dioicous (in South Africa). Plants moderately robust, 1.0–2.5 (–4.0) cm tall, loosely caespitose, yellow-green above, dull brownish green below. Stems with a central strand, lacking a hyalodermis. Rhizoids sparse, basal only, weakly papillose, very dark reddish brown. Leaves erect, usually closely appressed when dry, linear-lanceolate, 3.0–4.5 mm long and 0.6–0.9 mm wide; lower margin revolute; upper margin denticulate (single or double teeth), with enlarged cells; costa strong, prominent abaxially, with a strong abaxial stereid band and a weaker adaxial band; axillary hairs c. $17.5 \mu\text{m}$ long, usually of 2 cells, the upper globose, the lower pigmented; upper lamina bistratose, with cells $17.5\text{--}37.5 \times 7.5\text{--}10.0 \mu\text{m}$, strongly papillose with low ‘mounded’ papillae (formed from the combined prorate ends of adjacent cells); lower lamina patchily bistratose, with elongate cells to c. $50 \times 15 \mu\text{m}$, with 10–12 rows of shorter quadrate cells at the alar margin. Sporophytes not seen in Australian material and said to be rare in South Africa.

Occurs in W.A., S.A., N.S.W. and Vic., on small soil pockets over rock in sheltered gorges, sometimes in otherwise dry areas. Also in South Africa.

W.A.: Swan River, *J.Drummond 31* (BM). S.A.: River Torrens Gorge, 15 km NE of Adelaide, *N.N.Donner 3442* (AD). N.S.W.: “Braehour”, 11 km E of Wagga Wagga, *H.Streimann 2066* (CANB). Vic.: Hughes Ck, 13 km ENE of Seymour, *H.Streimann 2353* (CANB).

This is one of several confused taxa related to “*Bartramia stricta*” under which name most Australian specimens were once classified. Catcheside (1987) discussed the relationships, and Magill (1987) transferred *B. afrostricta* to synonymy under *Anacolia breutelii*. However, due to difficulties accommodating a group of closely related Australian *Bartramia* species within *Anacolia*, the broader concept of *Bartramia* is retained here pending further investigation.

3. *Bartramia hampeana* Müll.Hal., *Bot. Zeitung (Berlin)* 16: 162 (1858)

subsp. **hampei** (Mitt.) Frasnén, *Lindbergia* 29: 90 (2004)

Bartramidula hampei Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 68 (1882); *Bartramia hampei* (Mitt.) Catches., *Mosses of South Australia* 281 (1980). T: Mt William, Grampians, Vic., *D.Sullivan s.n.*; holo: BM; iso: MEL? n.v.

Glyphocarpa erecta Hampe, *Linnaea* 40: 305 (1876); *Bartramia erecta* (Hampe) Broth., *Nat. Pflanzenfam.* I, 3: 637 (1904), *nom. illeg. non Mitten* (1869). T: Mt William, Grampians, Vic., *D.Sullivan s.n.*; holo: BM; iso: MEL? n.v.

Bartramia gymnostoma Broth. ex Watts & Whitel., *Proc. Linn. Soc. New South Wales* 30 (Suppl.): 151 (1906), *nom. nud.* Based on: Koorawatha, N.S.W., *W.W.Watts 7308* (NSW), *fide* annotations by Brotherus on specimen packet.

?*Bartramia papillata* Hook.f. & Wilson var. *brevifolia* Broth. & Geh., *nom. nud.* [Watts & Whitelegge, *Proc. Linn. Soc. New South Wales*, 30 (Suppl.): 152 (1906)]. Based on: summit of Mt Koscius[z]ko, N.S.W., *D.Sullivan* (MEL?).

Illustrations: D.G.Catcheside, *loc. cit.*, fig. 167, pl. 11A, as *B. hampei*; S.Frasnén, *op. cit.* 91, fig. 9.

Dioicous. Plants small, to 8 mm tall, loosely caespitose, dull brownish or yellow-green. Stems with a weak central strand and a weakly differentiated hyalodermis. Rhizoids moderately dense at base, weakly papillose, reddish brown. Leaves suberect, with an oblong to obovate hyaline sheathing base and a linear-lanceolate green upper lamina, to 2.0–5.5 mm long, 0.375–0.500 mm wide; margin plane, upper margin denticulate (single or double teeth); costa strong, not prominent abaxially, with a strong abaxial stereid band and no adaxial band; axillary hairs to c. 225 µm long, usually with 2 short basal cells with pigmented cross-walls and 1–5 elongate hyaline cells; upper lamina bistratose, with cells 25–50 × 7.5–10.0 µm, strongly papillose with high ‘twinned’ papillae (formed from the combined prorate ends of adjacent cells); lower lamina unistratose, lacking shorter quadrate cells at the alar margin, with cells elongate, to c. 200 × 17.5 µm.

Setae 5–10 mm long. Capsules suberect to inclined, subglobose, c. 1.5 mm long and 1 mm wide, sulcate when dry; exothecial cells usually hexagonal, with prominent trigones c. 30 × 20 µm. Peristome absent or, occasionally, a short membrane. Spores subglobose, 50–55 µm diam., reddish brown, densely verrucose.

Endemic to Australia, occurring in W.A., S.A., N.S.W., ACT, Vic. and Tas. Moderately common in dry, lowland or montane habitats.

W.A.: foot of Bluff Knoll, Stirling Ra., *D.G.Catcheside 74.292* (AD). S.A.: Yanagin Rd, near Greenhill, *D.G.Catcheside 80.35* (AD). N.S.W.: 3 miles [c. 4.9 km] S of Jenolan Caves, *J.M.Glime 7928* (AD, CANB). A.C.T.: Australian National Botanic Gardens, Canberra, *H.Streimann 2550* (CANB). Vic.: Mirranatawa Gap, Grampians, *D.G.Catcheside 77.211* (AD). Tas.: Ridgeway Park, *A.V.Ratkowsky H610* (HO).

This is sometimes difficult to distinguish from *B. robusta*, but it is usually smaller, often glaucous and has an oblong leaf base that is neither geniculate nor as broadened at the shoulders as in *B. robusta*. Moreover, the latter has a peristome, although immature capsules must be examined as the peristome of *B. robusta* seems to be fragile and soon lost.

Bartramia hampeana subsp. *hampeana* is endemic to South Africa.

4. *Bartramia mossmaniana* Müll.Hal., *Bot. Zeitung (Berlin)* 9: 552 (1851)

T: Mount Wellington, Tas., Apr. 1850, *S.Mossman 751*; holo: B? n.v.

Bartramia halleriana sensu Matteri, *Darwiniana* 25: 152 (1984).

Bartramia halleriana var. *brachydonta* Kabiersch, *Hedwigia* 77: 83 (1937). T: Canterbury, South Island, New Zealand, 1883, *Cheeseman 153*; syn; Castle Hill Distr. [Canterbury], New Zealand, Apr. 1895, “H? ex Herb. Cockayne, Musci n. 12”; syn; “Oberer Broken River”, 3 Feb. 1902, *L.Diels 6309*; syn; Mt Wellington, Tas., Apr. 1850, *S.Mossman 751*; syn; [Tas.], Dec. 1888, *W.A.Weymouth 102*; syn; Huon Rd, Tas., Feb. 1878, *O.Beccari*; syn; Patagonia, [Argentina], 1896, *P.Dusén*; syn; Punta Arenas, [Argentina], Nov. 1895, *P.Dusén*; syn; Burnst Island, [Argentina], May 1892, *Spegazzini*; syn.

[*Bartramia norvegica auct. non* Lindb.: L.Rodway, *Tas. Bryoph.* 1: 92 (1914)]

Illustrations: D.G.Catcheside, *Mem. New York Bot. Gard.* 45: 625, fig. 4c–f (1987); G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 325, pl. 61 (1976).

Autoicous or synoicous. Plants large, 3–10 cm tall, loosely caespitose, yellow-green. Stems with a small central strand, lacking a hyalodermis. Rhizoids dense at base, forming a somewhat matted turf, strongly papillose, pale reddish brown. Leaves geniculate, patent and loosely crisped when dry, with an obovate hyaline sheathing base and a linear-lanceolate green upper lamina, to 11.75 mm long and 1.125 mm wide; upper margin recurved, denticulate (single or double teeth) by means of differentiated enlarged cells; costa strong, \pm prominent abaxially, with a strong abaxial stereid band and no adaxial band; axillary hairs to c. 200 μ m long, with 4 or 5 basal cells with pigmented cross-walls and 2 or 3 hyaline apical cells; upper lamina unistratose except for bistratose recurved margin, with cells to $20 \times 10 \mu$ m, mostly \pm quadrate, papillose from prorate cell ends; lower lamina unistratose, lacking shorter quadrate cells at the alar margin, with cells elongate, to c. $75 \times 15 \mu$ m.

Setae 2–8 mm long. Capsules asymmetrical, suberect, subglobose to broadly cylindrical, c. 1.5×1.0 mm, curved and sulcate when dry; exothecial cells irregular, quadrate to hexagonal, evenly thickened (without trigones). Peristome of red-brown exostome teeth and with a rudimentary endostome. Spores subglobose, 25–30 μ m diam., reddish brown, coarsely papillose.

Rare in N.S.W. and Vic., but widespread in Tas. Occurs mainly in montane to subalpine habitats, sometimes in rainforest. Also recorded from southern Chile, Argentina, New Zealand and New Guinea.

N.S.W.: Yarrangobilly Caves, Reservoir Gully, *W.W.Watts 8693* (NSW). Vic.: by road from Chalet to L. Catani, Mt Buffalo, *D.G.Catcheside 74.13* (AD). Tas.: Platform Peak, *A.Moscal 7891* (HO).

The use of the epithet *mossmaniana* for this taxon (cf. Matteri, *loc. cit.*, 1984, as a synonym of *B. halleriana*) follows the usage of Catcheside (1987). Fransén (2004b) supported the separation of these two taxa, restricting *B. halleriana* to the Northern Hemisphere, and re-defining *B. mossmaniana* with a broader Southern Hemisphere distribution.

5. *Bartramia nothostricta* Catches., *Mem. New York Bot. Gard.* 45: 621 (1987)

T: Waterfall Gully, S.A., 16 Nov. 1952, *D.G.Catcheside 52.344*; holo: AD.

[*Bartramia stricta* auct. non Brid.: *D.G.Catcheside, Mosses of South Australia* 282 (1980)]

Illustrations: *D.G.Catcheside, loc. cit.* fig. 168 (1980), as *B. stricta*; *D.G.Catcheside, op. cit.* 619, fig. 1e, f (1987).

Synoicous. Plants short, 5–10 mm tall, densely caespitose, bright green above, brownish below. Stems with a comparatively large central strand, lacking a hyalodermis. Rhizoids sparse, at base only, slightly papillose, dark red-brown. Leaves erect, closely appressed when dry, narrowly lanceolate, without a sheathing base, 1.5–4.0 mm long, c. 0.5 mm wide; margin narrowly recurved, denticulate (single or double teeth) by means of differentiated enlarged cells, bistratose; costa strong, \pm prominent abaxially, with a small abaxial stereid band and a smaller adaxial band; axillary hairs c. 25 μ m long, with 2 short basal cells with pigmented cross-walls and 1 larger globose hyaline cell; lamina mainly unistratose with occasional bistratose patches, with upper cells to $45 \times 10 \mu$ m, papillose from prorate cell ends; lower lamina unistratose, with cells hyaline, smooth, elongate, to $75 \times 12.5 \mu$ m, with 3–5 weakly defined rows of shorter quadrate cells at the alar margin.

Setae c. 8 mm long. Capsules erect, subglobose to ovoid, c. 0.8–1.3 mm long and 0.6–0.8 mm wide, shallowly sulcate when dry; exothecial cells polygonal, isodiametric, with trigones. Peristome of short yellowish exostome teeth, with or without a rudimentary endostome. Spores subglobose, 30–35 μ m diam., pale reddish brown, coarsely and irregularly verrucose.

Endemic to S.A. and Vic., either rare or undercollected, on soil of banks in sclerophyll forest and beside streams, usually in small colonies.

S.A.: Alligator Gorge, Flinders Ra., *D.G.Catcheside 83.13* (AD); Waterfall Gully, *R.D.Seppelt 0117* (HO). Vic.: Mt Tarrengower, *I.G.Stone 14569* (AD, MEL).

6. *Bartramia pseudostricta* Catches., *Mem. New York Bot. Gard.* 45: 621 (1987)

T: Upper Alligator Gorge, Flinders Ra., S.A., 23 Aug. 1953, *D.G.Catcheside* 53.200; holo: AD.

Bartramia compacta sensu Stoneburner et al., *Bryologist* 96: 94 (1993); *B. cf. compacta* sensu Scott & Stone, *The Mosses of Southern Australia* 328 (1976)

Illustration: D.G.Catcheside, *Mosses of South Australia* 285, fig. 170 (1980), as *Bartramia* sp. B.

Synoicous. Plants short, 5–10 mm tall, loosely caespitose, glaucous green above, brownish below. Stems with a well-defined central strand, lacking a hyalodermis. Rhizoids at base only, slightly papillose, dark red-brown. Leaves spreading and flexuose wet or dry, linear-lanceolate, without a sheathing base, to 3.25 mm long, 0.500–0.625 mm wide; margin narrowly recurved, denticulate (single or double teeth) by means of differentiated enlarged cells, unistratose; costa strong, ±prominent abaxially, with strong abaxial and adaxial stereid bands; axillary hairs c. 15 µm long, with 1 short pigmented basal cell and 1 larger globose hyaline cell; lamina mainly unistratose with occasional bistratose patches, with upper cells 30–50 × 7–10 µm, papillose almost to base from prorate cell ends; lower lamina unistratose, with cells elongate, to 75 × 15 µm, with 2–5 weakly defined rows of shorter quadrate cells at alar margin.

Setae erect to flexuose, to c. 15 mm long. Capsules erect, ovoid to globose, to c. 1.5 mm long, shallowly sulcate when dry; exothecial cells polygonal, isodiametric, with trigones. Peristome of narrow yellowish orange exostome teeth and a short membranous endostome bearing thin filaments. Spores subglobose, 24–28 µm diam., dark brown, with small dense verrucae.

Endemic to W.A. and S.A. and either rare or undercollected; grows in small patches on soil of stream banks and by tracks in sclerophyll scrub.

W.A.: Mt Cooke, Darling Ra., *R.Wyatt & A.Stoneburner* 3900 (AD, PERTH); Serpentine Falls, *I.G.Stone* 4782 (AD, MEL). S.A.: Melrose, foot of Mt Remarkable, *D.G.Catcheside* 53.173 (AD).

7. *Bartramia robusta* Hook.f. & Wilson, *Fl. Antarct.* 1: 133, t. 59, fig. 4 (1844)

T: Lord Auckland's group [Auckland Is.], 1839–43, *J.D.Hooker*; lecto: BM n.v., *fide* S.Fransén, *op. cit.* 200 (2004a).

Bartramia ithyphylla sensu Matteri, *Darwiniana* 25: 150 (1984).

Bartramia papillata Hook.f. & Wilson, in *J.D.Hooker, Fl. Nov.-Zel.* 2: 89, t. 86, fig. 4 ('1855') [1854]. T: Bay of Islands, New Zealand, 1839–43, *J.D.Hooker*; lecto: BM n.v., *fide* C.M.Matteri, *Darwiniana* 25: 150 (1984).

Bartramia acerosa Müll.Hal. & Hampe, *Linnaea* 28: 208 (1856). T: Snowy R., Vic., 1854, *F.Mueller*; holo?: BM-Hampe n.v.; iso?: MEL n.v., *fide* H.P.Ramsay, *Register of Type Specimens of Mosses in Australian Herbaria* 12 (1994)

Bartramia fragilis Mitt. ex Wilson, in *J.D.Hooker, Fl. Tasman.* 2: 196 (1859). T: rivulet behind Cummings Head, Western Mountains, Tas., *Archer s.n.*; holo: BM? n.v.

Bartramia acerosa Müll.Hal. & Hampe var. *minor* Hampe ex Watts & Whitel., *Proc. Linn. Soc. New South Wales* 30 (Suppl.): 152 (1906), *nom. nud.*

Illustration: D.G.Catcheside, *op. cit.* 280, fig. 166, as *B. papillata*.

Dioicous. Plants medium-sized, to 3 cm tall, loosely caespitose, yellow-green. Stems with a central strand and a hyalodermis. Rhizoids dense at base, sometimes ascending the stem, papillose, reddish brown. Leaves geniculate, with an obcuneate hyaline sheathing base and a linear-lanceolate green upper lamina, to 3.50–6.25 mm long, 0.5–1.0 mm wide; upper margin plane, denticulate (single or double teeth) by means of differentiated enlarged cells; costa strong, ±prominent abaxially, with a strong abaxial stereid band and no adaxial band; axillary hairs to c. 75 µm long, usually with 2 short basal cells with pigmented cross-walls and 1 or 2 elongate hyaline cells; upper lamina bistratose, with cells c. 37.5 × 7.5 µm, papillose with mostly low 'mounded' papillae (formed from the combined prorate ends of adjacent cells); lower lamina unistratose, lacking shorter quadrate cells at the alar margin, with cells elongate, to c. 190 × 30 µm.

Setae 10–30 mm long. Capsules suberect, subglobose, c. 2 mm long and 1 mm wide, sulcate when dry; exothecial cells short-rectangular, ±evenly thickened, c. 60 × 25 µm. Peristome of

orange exostome teeth and with a rudimentary endostome. Spores subglobose to reniform, to c. $35 \times 50 \mu\text{m}$, brown, coarsely and densely verrucose.

Known from W.A., S.A., Qld, N.S.W., A.C.T., Vic. and Tas.; grows on soil in open herbfield or on and among rocks in moist valleys, often near streams. Mostly in montane to alpine areas to c. 1500 m altitude. Widespread throughout Eurasia, India to SE Asia, North Africa, North America, southern South America, New Zealand and Subantarctic islands (including Macquarie Is. and Heard Is.).

W.A.: track to Toolbrunup Peak, Stirling Range Natl Park, *H.Streimann 54512* (CANB). S.A.: Bridgewater, 25 Sept. 1954, *E.M.Wollaston* (AD). Qld: South Bald Rock, Darling Downs, *I.G.Stone 13514*, (BRI, MEL). N.S.W.: Round Mtn, Mount Kosciuszko Natl Park, *H.Streimann 35127* (CANB, HO). A.C.T.: Kambah Pool, by Murrumbidgee R., *D.G.Catcheside 64.88* (AD, CANB). Vic.: Victoria Ra., Grampians, *H.Streimann 2927* (AD, CANB). Tas.: Mt Rufus, *A.Moscal 14390* (HO).

This is by far the most common and variable *Bartramia* in Australia. Similar to *B. hampeana* subsp. *hampei*, but usually larger, greener and with an obtuse leaf base, broadened at the shoulders and usually strongly geniculate, resulting in the green upper lamina being patent, and often clearly demarcated from the hyaline sheathing base.

Traditionally called *B. papillata* in Australia, that species was placed in synonymy under *B. ithyphylla* by Matteri (1984). Fransén (2004a) reassessed the group of species including *B. ithyphylla*, and treated the geographically isolated South American material as *B. ithyphylla* subsp. *patens*, restricting *B. ithyphylla* subsp. *ithyphylla* to high latitudes of the Northern Hemisphere. Chromosome number appears to support Fransén's concept here, as Ramsay (in A.Löve, *Taxon* 16: 556, 1967) indicated $n = 8$ for Australian material (*B. robusta*, as *B. papillata*), whereas Fransén quoted reports of $n = 12$ in *B. ithyphylla* subsp. *ithyphylla* and $n = 16$ in *B. ithyphylla* subsp. *patens*.

8. *Bartramia strictifolia* Taylor, *London J. Bot.* 5: 54 (1846)

T: Swan River, W.A., *J.Drummond 31 p.p.*; holo: BM n.v.

Bartramia strictifolia Taylor var. *minor* Watts & Whitel., *Proc. Linn. Soc. New South Wales* 30 (Suppl.): 152 (1906), *nom. nud.* Based on: Kangaroo Point, [Bellerive], Tas., 2 Sept. 1889, *W.A.Weymouth s.n.* (HO 43399).

Illustration: D.G.Catcheside, *Mem. New York Bot. Gard.* 45: 619, fig. 1c, d (1987).

Synoicous. Plants small, less than 10 mm tall, loosely caespitose, usually pale yellowish green above, brown below. Stems with a small central strand, lacking a hyalodermis. Rhizoids at base only, slightly papillose, dark red-brown. Leaves closely appressed and sometimes slightly twisted around stem when dry, narrowly lanceolate, without a sheathing base, 2.75–3.50 mm long, 0.625–0.750 mm wide; margin narrowly recurved, bistratose, denticulate (single or double teeth) by means of differentiated enlarged cells; costa strong, \pm prominent abaxially, with strong abaxial and adaxial stereid bands; axillary hairs minute, c. 20 μm long, with 1 short pigmented basal cell and 1 larger globose hyaline cell; upper lamina variably bistratose, with cells c. $55 \times 10 \mu\text{m}$, papillose almost to the base from prorate cell ends; base of lamina unistratose, with inner cells elongate, to $62.5 \times 15 \mu\text{m}$, with 2–6 rows of shorter quadrate cells at alar margin.

Setae erect to flexuose, to c. 15 mm long. Capsules globose, erect, c. 1 mm long, shallowly sulcate when dry; exothecial cells \pm hexagonal, evenly thickened (without trigones). Peristome of short dull orange exostome teeth and a short membranous endostome bearing thin filaments. Spores subglobose, 24–25 μm diam., with a few large domed verrucae.

Endemic to W.A. and Tas., currently recognised from only a few sites, from the Darling Ranges near Perth, W.A. and the coast and islands of south-eastern Tas.

W.A.: Helena R., Darling Ra., 27 July 1914, *coll. unknown* (AD, UWA); Gooseberry Hill, Darling Ra., 15 Aug. 1914, *coll. unknown* (NSW, UWA). Tas.: Kangaroo Point, [Bellerive], 2 Sept. 1889, *W.A.Weymouth* (HO); Maria Is., *L.Rodway 181* (HO).

The original description of Taylor (1846) reported “stems an inch high” which seems to be either confused or erroneous, since no material seen reaches this height, even including the sporophyte.

9. *Bartramia subsymmetrica* Cardot, *Bull. Herb. Boissier*, sér. 2, 6: 8 (1906)

T: Cumberland Bay, Jason Harbour, South Georgia, *C.Skottsberg* 328; lecto: BA; isolecto: S, *n.v.* [see Matteri (1984)]

Bartramia bogongia Catches., *Mem. New York Bot. Gard.* 45: 621 (1987). T: Mt Nelse Track, Rocky Valley Reservoir, Bogong High Plains, Vic., 25 Feb. 1986, *G.A.M.Scott & B.A.Fuhrer s.n.*; holo: MUCV 7155 *n.v.*; iso: AD, MEL *n.v.*

Illustrations: D.G.Catcheside, *op. cit.* 622, fig. 2; 624, fig. 3h–k.

Plants very robust, to 10 cm tall, densely caespitose in large cushions, usually golden-yellow throughout, sometimes duller brownish towards the base. Stems with a weak central strand, lacking a hyalodermis. Rhizoids moderately dense, variably papillose, reddish brown, basal and at intervals along stem. Leaves suberect, with an obtuse hyaline sheathing base and triangular green upper lamina, to 5.25 mm long and 1.5 mm wide; margin plane, upper margin denticulate (single or double teeth) due to prorate cell ends; costa strong, not prominent abaxially, with a strong abaxial stereid band and no adaxial band; axillary hairs to c. 300 μm long, with 1–4 pigmented basal cells and 2–4 elongate hyaline cells; upper lamina mostly tristratose, with cells to 50×10 (–20) μm , strongly papillose, with low mounded papillae (formed from the combined prorate ends of adjacent cells); lower lamina unistratose, with cells elongate, to c. 160×10 μm , without rows of shorter quadrate cells at the alar margin.

Setae c. 2.5 cm long. Capsules suberect, \pm globose, c. 2 mm long and 1.5 mm wide, smooth when dry; exothecial cells uniformly thickened, 10–20 μm diam. Peristome apparently single, of short pale fragile segments. Spores brown, reniform, c. 35×30 μm , finely and densely papillose.

Restricted to the alpine areas of N.S.W. and Vic.; grows in boggy sites and beside streams. Also in Argentina and South Georgia.

N.S.W.: near Rawson Pass, Mount Kosciuszko Natl Park, *D.G.Catcheside* 68.77 (AD); Guthries Ck, Mount Kosciuszko Natl Park, *I.G.Stone* 10329 (AD, MEL). Vic.: Mt Hotham, *D.G.Catcheside* 69.196 (AD, MEL).

One of the largest species of *Bartramia* in Australia, the size, colour and leaf morphology are sufficient to distinguish it from other taxa. *Bartramia mossmaniana* has a unistratose upper lamina and much longer leaves with a more open appearance and usually a green rather than golden colour, while *B. robusta* and *B. hampeana* subsp. *hampei* are generally smaller and less robust. Previously believed to be endemic, *B. bogongia* has recently been placed in synonymy by Fransén (2004a).