

PYRRHOBRYUM

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Pyrrhobryum Mitt., *J. Linn. Soc., Bot.* 10: 174 (1868); from the Greek *pyrros* (red) and the *bryon* (a moss), presumably in reference to the reddish colour of the capsule mouth.

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

Synoicous or dioicous. Lax to densely tufted in moist conditions, usually olive-green. Stems short to long, tomentose in lower half or only at the base. Rhizoids red-brown, smooth or rarely lightly papillose. Propagula absent. Leaves mostly unranked, characteristically curled and twisted when dry, erect-spreading to squarrose, linear-lanceolate, lanceolate or oblong, acute to acuminate; margins bistratose, with paired teeth; costa strong, percurrent to excurrent, not always cutting leaf evenly, toothed abaxially; laminal cells small, isodiametric. Perichaetia on a short stem, attached to lower part of stem or basal. Calyptra cucullate. Capsules erect to horizontal, cylindrical to pyriform, arcuate; exothecal cells hexagonal; operculum rostrate and curled to one side. Peristome double; endostome c. half the length of the exostome. Spores smooth, globose.

Six of the ten species of *Pyrrhobryum* are known from Australia where they are found in moist areas along the east coast.

This genus is readily recognised by its long leaves and paired teeth. However, separation of some of the species can be very difficult, especially in the absence of perichaetial bracts. The *P. spiniforme* complex is particularly problematic and is in need of a comprehensive revision. *Pyrrhobryum spiniforme*, *P. paramattense* and *P. latifolium* are all very similar and, possibly, conspecific.

References

Bell, N.E., Quandt, D., O'Brien, T.J. & Newton, A.E. (2007), Taxonomy and phylogeny in the earliest diverging pleurocarps: square holes and bifurcating pegs, *Bryologist* 110: 533–560.

Eddy, A. (1996), Rhizogoniaceae, *Handb. Malesian Mosses* 3: 197–214.

Koponen, T., Touw, A. & Norris, D.H. (1986), Bryophyte flora of the Huon Peninsula, Papua New Guinea. XIV. Rhizogoniaceae (Musci), *Acta Bot. Fenn.* 133: 1–24.

Manuel, M.G. (1981), Synopsis of Rhizogoniaceae Broth. in Malaya, *Cryptog. Bryol. Lichénol.* 2: 449–455.

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|----|--|-------------------------|
| 1 | Stems dendroid; branch leaves in 2 ranks | 1. P. bifarium |
| 1: | Stems simple or rarely branched, never dendroid; leaves not ranked | 2 |
| 2 | Plants minute, less than 15 mm tall; upper stem leaves planar and dimorphic (1:)..... | 3. P. medium |
| 2: | Plants larger, more than 15 mm tall; upper stem leaves not planar or dimorphic..... | 3 |
| 3 | Leaves strongly curled and twisted when dry; leaf size not varying greatly along stem; perigonia and perichaetia lateral; stems tomentose on lower half to one-third (2:)..... | 4. P. mnioides |
| 3: | Leaves curved but not markedly twisted when dry; leaf size very different along stem; perigonia and perichaetia basal; stems tomentose only at the base | 4 |
| 4 | Inner perichaetial bracts with an ovate base, abruptly tapering to a narrow apex; bract margins singly serrate (3:) | 6. P. spiniforme |
| 4: | Inner perichaetial bracts with a lanceolate base, gradually tapering to a narrow apex; bract margins singly or doubly serrate..... | 5 |

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- 5 Leaves distinctly widest at their mid-point (4:) **2. P. latifolium**
 5: Leaves widest at or near the base **5. P. paramattense**

1. *Pyrrhobryum bifarium* (Hook.) Manuel, *Cryptog., Bryol. Lichénol.* 1: 70 (1980)*

Hypnum bifarium Hook., *Musci Exot.* 1: 57 (1818); *Rhizogonium bifarium* (Hook.) Schimp., *Bot. Zeitung (Berlin)* 5: 803 (1847); *Mnium bifarium* (Hook.) Müll.Hal., *Syn. Musc. Frond.* 1: 172 (1848). T: “Dusky Bay” [Dusky Sound], New Zealand, 1791, *A.Menzies* 87; holo: BM.

Illustrations: G.O.K.Sainsbury, *Bull. Roy. Soc. New Zealand* 5: 296, pl. 44 (1955), as *Rhizogonium bifarium*; G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 310, pl. 54 (1976), as *Rhizogonium bifarium*; J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 102, fig. 45a–d (1992).

Dioicous. Plants densely tufted, pale green to olive-green. Stems dendroid, c. 15 mm tall, tomentose at the base. Branches with distichous leaves; stems with unranked leaves. Leaves erect-spreading, often curled when dry, lanceolate to oblong-lanceolate, acute, 1–2 mm long, 0.3–0.6 mm wide; costa percurrent to short-excurrent; laminal cells irregularly shaped throughout, 7–16 µm wide.

Perigonia and perichaetia axillary on primary stem. Perichaetial bracts ovate to lanceolate, with a thin tapering apex; inner perichaetial bracts with a finer and more tapered apex; margin entire; laminal cells elongate and thin-walled below, similar to vegetative leaf cells above. Setae c. 20 mm long. Capsules pyriform. Endostome with 1 cilium per segment. Spores 18–22 µm.

Occurs in moist habitats in south-eastern N.S.W. and Tas.; grows on wood, rock or soil. Also in New Zealand and SE Asia.

N.S.W.: Macquarie Pass Natl Park, *H.Streimann* 53089 (CANB). Tas.: Mt Wellington, *A.V.Ratkowsky* H46 (CANB); Hobart Rivulet, 15 Dec. 1888, *W.A.Weymouth s.n.* (CANB).

This moss is readily distinguished from other Australian *Pyrrhobryum* species by its dendroid habit and distichous branch leaves.

2. *Pyrrhobryum latifolium* (Bosch & Sande Lac.) Mitt., *J. Linn. Soc., Bot.* 10: 175 (1868)

Rhizogonium latifolium Bosch & Sande Lac., *Bryol. Javan.* 2, t. 133 (1861). T: “Habitat insulam Banca”, [Indonesia]; syn: BR; Banca; syn: SOL, *fide* T.Koponen *et al.*, *Acta Bot. Fenn.* 133: 14 (1986).

Illustration: A.Eddy, *Handb. Malesian Mosses.* 3: 208, fig. 473 (1996).

Dioicous. Plants loosely tufted, green to olive-green. Stems simple, c. 20 mm tall, tomentose only at the very base. Leaves unranked, wide-spreading, slightly curled and twisted when dry, lanceolate to oblong, often falcate, tapering at the base, 1.7–4.2 mm long, 0.3–0.5 mm wide, distinctly widest at mid-leaf, acuminate; costa percurrent; laminal cells irregularly shaped throughout, rarely subquadrate below, 7–12 µm wide.

Perigonia and perichaetia basal. Outer perichaetial bracts with an oblong base and abruptly tapering to an acute apex, or with a lanceolate base and tapering more gradually to an acuminate apex; inner bracts with a lanceolate base, gradually tapering to a long thin apex; margin with single or paired teeth; basal cells elongate, thin-walled; apical cells identical to those of the vegetative leaf lamina. Setae to 35 mm tall. Capsules elongate, cylindrical. Endostome with 3 (rarely 2) papillose cilia per segment. Spores 13–18 µm.

Grows on wood in moist areas in eastern Qld; also throughout Malesia.

Qld: Moho Ck, *H.Streimann* 16926 (CANB); Credition State Forest, *H.Streimann* 37659 (CANB); Dawes Ra., *H.Streimann* 52465 (CANB); Mt Misery, *H.Streimann* 57479 (CANB).

This species is very similar to *P. paramattense* and *P. spiniforme*, with leaf size varying greatly along the stem, basal perigonia and perichaetia, and rhizoids only at the very base of the stem. It differs by having leaves that are broader in the mid-leaf than at the base.

* = *Hymenodontopsis bifaria* (Hook.) N.E.Bell, A.E.Newton & D.Quandt, *Bryologist* 110: 555 (2007).

3. *Pyrrhobryum medium* (Besch.) Manuel, *Cryptog., Bryol. Lichénol.* 1: 69 (1980)

Rhizogonium medium Besch., *Ann. Sci. Nat. Bot.*, sér. 5, 13: 217 (1873). T: Île des Pins, New Caledonia, Pancher; holo: BM *n.v.*, *fide* N.Bell. (pers. comm.).

Rhizogonium brevifolium Broth., *Oefvers Förh. Finska Vetensk.-Soc.* 33: 102 (1891); *Mnium brevifolium* (Broth.) Müll.Hal., *Genera Musc. Frond.* 140 (1901); *Pyrrhobryum brevifolium* (Broth.) Manuel, *Cryptog., Bryol. Lichénol.* 1: 69 (1980). T: Bellenden Ker Ra., Qld, *F.M.Bailey* 621, 653; syn: H-BR *n.v.*, BM.

Illustration: T.Koponen, A.Touw & D.H.Norris, *Acta Bot. Fenn.* 133: 18, fig. 9 (1986).

Dioicous. Plants small, slightly tufted, dull olive-green. Stems simple, to 15 mm tall, tomentose only at the very base. Leaves unranked, but often appearing 3- or 4-ranked at the apex. Basal leaves small, spreading, lanceolate and slightly tapered at the base; costa percurrent; laminal cells isodiametric, c. 6–7 µm. Leaves higher on the stem becoming larger, planar and dimorphic. Dorsal row of leaves oblong-lanceolate, asymmetrical, 1.3–2.1 mm long, 0.2–0.5 mm wide, widest in mid-leaf; costa percurrent to slightly excurrent, arcuate. Ventral row (or rows) of leaves similar to basal leaves, lanceolate, symmetrical, 0.87–1.35 mm long, 0.11–0.30 mm wide, widest just above leaf base; costa percurrent to short-excurrent; laminal cells isodiametric, 5–11 µm.

Perigonia and perichaetia basal. Outer perichaetial bracts broadly triangular-lanceolate to lanceolate; inner perichaetial bracts from an ovate or oblong base and gradually tapering to a long thin apex; margin with single or paired serration; basal cells long-hexagonal, thin-walled; upper cells like those of the vegetative leaves, but more often with elongate (rectangular) cells. Sporophyte not seen. *n* = 6, *fide* H.P.Ramsay, *Austral. J. Bot.* 22: 316 (1974), as *R. brevifolium*.

Uncommon on moist wood and tree ferns in north-eastern Qld; also in Borneo and New Guinea and in the Pacific east to French Polynesia.

Qld: Crater State Forest, Hugh Nelson Ra., *H.Streimann* 27064 (CANB); Mt Misery, *H.Streimann* 57377, 57406, 57414 (CANB); Paluma Reservoir road, *H.Streimann* 57824 (CANB).

There is often a marked difference between the two leaf types in Australian material, with plants often appearing very like *Calomnion* (Calomniaceae) in having 3-ranked, dimorphic leaves. However, in other Australian collections the planar leaf arrangement and dimorphic leaves are less obvious.

4. *Pyrrhobryum mnioides* (Hook.) Manuel, *Cryptog., Bryol. Lichénol.* 1: 70 (1980)

Hypnum mnioides Hook., *Musci Exot.* 1: 57, t. 77 (1818); *Rhizogonium mnioides* (Hook.) Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 116 ('1855') [1854]. T: Staten Is., near Cape Horn, *A.Menzies* 17; holo: BM *n.v.*

Rhizogonium mnioides (Hook.) Wilson var. *contortum* Wilson, in J.D.Hooker, *Fl. Tasman.* 2: 216 (1859). T: Mt Wellington, [Tas.], *S.Mossman*; syn: BM? *n.v.*; Browns R., Back River Gully, [Tas.], *A.F.Oldfield* 114, 326; syn: BM *n.v.*

Rhizogonium mnioides (Hook.) Wilson var. *lutescens* Wilson, in J.D.Hooker, *Fl. Tasman.* 2: 216 (1859). T: "Western Mtns", [Tas.], *R.C.Gunn* 1612; holo: BM? *n.v.*

Mnium hookeri Müll.Hal., *Syn. Musc. Frond.* 2: 555 (1851); *Rhizogonium hookeri* (Müll.Hal.) Mitt., *J. Proc. Linn. Soc., Bot.* 4: 95 (1860). T: Auckland Islands, *J.D.Hooker*; holo: BM? *n.v.*

Mnium mossmanianum Müll.Hal., *Bot. Zeitung (Berlin)* 9: 547 (1851); *Rhizogonium mossmanianum* (Müll.Hal.) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1873–74: 221 (1875). T: Mt Wellington, Tas., *S.Mossman* 753; holo: B? *n.v.* (probably destroyed).

Polytrichum gullweri Hampe, *Linnaea* 40: 315. (1876); *Pogonatum gullweri* (Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1877–78: 453 (1879). T: Mt Wellington, Tas., *J. & B.Gullifer s.n.*; holo: BM. [commonly misspelled "gulliveri"].

Illustrations: G.O.K.Sainsbury, *Bull. Roy. Soc. New Zealand* 5: 296, pl. 44 (1955), as *Rhizogonium mnioides*; G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 315, pl. 56 (1976), as *Rhizogonium mnioides*; R.D.Seppelt, *The Moss Flora of Macquarie Island* 249, fig. 97 (2004).

Dioicous. Plants tufted, pale green to dull olive-green. Stems to 5 cm tall, tomentose on the lower 33–50%. Leaves unranked, strongly curled and twisted when dry, wide-spreading,

linear-lanceolate, acuminate, 1.6–4.0 mm long, 0.3–0.8 mm wide; costa percurrent; upper laminal cells irregular in shape, 8–14 µm; basal cells subquadrate to short-rectangular.

Perichaetia and perigonia lateral in lower half of stem. Outer perichaetial bracts short, ovate to ovate-lanceolate with a short-acute to acuminate apex; inner bracts ovate to lanceolate, with a long and often twisted apex; margin serrate towards the apex; costa percurrent; basal cells thin-walled, greatly elongated; upper cells thick-walled, rectangular. Setae c. 35 µm tall. Capsules horizontal, cylindrical. Endostome with 2 slightly papillose cilia. Spores 18–20 µm. *n* = 12, *vide* H.P.Ramsay, *New Manual of Bryology* 1: 195, 221 (1981).

Occurs in very moist habitats at higher altitudes in N.S.W., A.C.T., Vic. and Tas.; grows on rock and soil and, less commonly, on wood. Also in New Zealand and South America.

N.S.W.: Leatherbarrel Ck, *H.Streimann 1467* (CANB). A.C.T.: head of Gingera Ck, *H.Streimann 4193* (CANB); Brindabella Ra., *H.Streimann 4164* (CANB). Vic.: Results Ck, *H.Streimann 43688* (CANB). Tas.: The Spring, *A.V.Ratkowsky H51* (CANB).

The leaves vary in size along the stem, but not as much as in other species of *Pyrrhobryum*. *Pyrrhobryum mnioides* is characterised by the appearance of the strongly curled and twisted leaves, the lateral perigonia and perichaetia and the presence of tomentum above the base of the stem.

5. *Pyrrhobryum paramattense* (Müll.Hal.) Manuel, *Cryptog., Bryol. Lichénol.* 1: 69 (1980)

Mnium paramattense Müll.Hal., *Syn. Musc. Frond.* 2: 555 (1851); *Rhizogonium paramattense* (Müll.Hal.) Reichardt, *Reise Novara, Pilze, Leber-Laubm.* 1(3): 180 (1870). T: Parramatta, [N.S.W.], Huegel; holotype: B n.v. (probably destroyed).

Illustrations: G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 316, pl. 57 (1976), as *Rhizogonium paramattense*; H.Streimann, *The Mosses of Norfolk Island* 139, fig. 62 (2002).

Dioicous. Plants loosely to densely tufted, pale to dark olive-green. Stems simple, to 7 cm long, tomentose only at the extreme base. Leaves unranked, curled and slightly twisted when dry, wide-spreading, linear-lanceolate to triangular-lanceolate, often falcate, widest at the base, acuminate, 3.6–6.0 mm long, 0.3–0.7 mm wide; costa percurrent; basal laminal cells subquadrate; apical cells isodiametric and irregular, 6–12 µm.

Perichaetia and perigonia basal. Outer perichaetial bracts ovate and abruptly tapering to acute apex, or triangular-lanceolate; inner bracts lanceolate and gradually tapering to a long thin apex; margin with single or paired serration; basal cells elongate, thin-walled; apical cells identical to those of the leaf lamina or short-rectangular and thick-walled. Setae to 6 cm tall. Capsules elongate, cylindrical to urceolate. Endostome with 3 papillose cilia. Spores 13–18 µm. *n* = 6, *vide* H.P.Ramsay, *Austral. J. Bot.* 22: 316 (1974).

Occurs on wood, rarely on rock, in very moist habitats in eastern Qld, N.S.W. and Vic.; also known from Norfolk Is. and New Zealand.

Qld: Fraser Is., *C.Borough 3* (CANB); slopes of Black Mtn, Atherton Tableland, *H.Streimann 31145* (CANB); Cridition State Forest, *H.Streimann 37671* (CANB). N.S.W.: Brindle Ck, *H.Streimann 6092* (CANB). Vic.: McKensie R., *H.Streimann 1338* (CANB).

There is a marked difference in leaf size along the stem with the basal leaves greatly reduced, and the longer leaves at the apex giving it a tassel-like appearance. While *P. paramattense* has previously been reported from Tasmania, all Tasmanian specimens examined were referable to *P. mnioides*.

6. *Pyrrhobryum spiniforme* (Hedw.) Mitt., *J. Linn. Soc., Bot.* 10: 174 (1868)

Hypnum spiniforme Hedw., *Sp. Musc. Frond.* 236 (1801); *Rhizogonium spiniforme* (Hedw.) Bruch, *Flora* 29: 134 (1846). T: Jamaica; holotype: G-HEDW n.v.

Synocous or dioicous. Plants loosely to densely tufted, pale to dark olive-green. Stems simple, to 5.5 cm long, tomentose only at the extreme base. Leaves unranked, curled and slightly twisted when dry, wide-spreading, linear-lanceolate to triangular-lanceolate, often falcate, widest in the lower 25–33%, acuminate, 2.5–7.7 mm long, 0.2–1.0 mm wide; costa percurrent; basal laminal cells subquadrate, irregular above, 7–13 µm.

Perichaetia and perigonia basal. Outer perichaetial bracts broadly ovate, abruptly tapering to an acute apex; inner bracts ovate, abruptly tapering to a long thin apex; margin singly serrate; basal cells elongate, thin-walled; cells in apex rectangular, rarely irregular. Setae to 5.5 cm tall. Capsules elongate, cylindrical to urceolate. Endostome with 2 or 3 papillose cilia. Spores 14–18 μm .

Occurs on rock, soil and wood in Qld, N.S.W. and Vic. Widespread in Central and South America, the Hawaiian Is., Africa, SE Asia, Malesia and Lord Howe Is.

Qld: Home Rule Falls, *H.Streimann 57013* (CANB); Tozers Gap, *H.Streimann 56428* (CANB).
N.S.W.: Middle Ck, *H.Streimann 5720* (CANB); Bodalla State Forest, *H.Streimann 38212* (CANB).
Vic.: Ferntree Gully, *Martin s.n.* (MEL).

Pyrrhobryum spiniforme has the same tassel-like apices as are seen in the far more common *P. paramattense*. It has been described as synoicous, but it is more commonly dioicous in Australia.