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(BRYALES, MUSCI) FOR AUSTRALIA

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ABSTRACT

Two Australasian species of *Bryum* are transferred to *Ptychostomum* Hornsch. The genus *Gemmabryum* is newly described for the species of *Bryum* in sections *Alpiniformia*, *Apalodictyon* and *Doliolidium* and *Brachymenium* section *Dicranobryum*. The type species, *G. pachytecum* (*Bryum pachyteca* Müll. Hal.) and 24 other Australian species are transferred to *Gemmabryum*. The genus *Ochiobryum* is newly described for *Bryum blandum* and *B. handelii*.

KEY WORDS: Australia, mosses, Bryaceae, *Gemmabryum*, *Ochiobryum*, *Ptychostomum*, *Bryum*

INTRODUCTION

Research on the family Bryaceae for the *Flora of Australia* has resulted in the publication of the new genus *Rosulabryum* (Spence 1996, Spence & Ramsay 1999a) and the newly described genera *Ochiobryum* and *Gemmabryum*. In addition, the reinstatement of the genus *Ptychostomum* applies to many of the species previously recorded for *Bryum* s.str. as explained in the work on North American species by Spence (2005). In our Australian studies, since the proposal put forward to the Bryophyte Committee on Nomenclature (Spence &

Ramsay 1999b) was rejected, we have acknowledged *Bryum argenteum* as the type for the genus but limit the genus *Bryum* to those 5 species described by Spence & Ramsay (2002) as being referable to *Anomobryum*, the latter now being in synonymy with *Bryum*.

This paper was written in conjunction with that on the family in North America (Spence 2005). In both papers, we have taken a new look at *Bryum* and related genera, primarily using characters of the gametophyte. The phylogenetic basis of our revisions will be published elsewhere (Spence & Ramsay in prep.). Here, we describe two new genera, *Gemmabryum* and *Ochiobryum*. The former accommodates those species of *Bryum* and *Brachymenium* characterized by a combination of elongate distal and median lamina cells, short and wide proximal cells, imbricate leaves, general lack of a leaf border (limbidium), costa with guide cells, and the presence of several different types of asexual gemmae. Our work indicates that this is a well-defined group based on morphology, and it is most closely related to true *Bryum*, typified by *B. argenteum*. The second genus, *Ochiobryum*, is described for a pair of distinctive, closely related Asian-Australasian species of *Bryum* which have complanate leaves, unique in the Bryaceae.

The genus *Ptychostomum* was described by Hornschuch in 1822 for the species now known as *Bryum algovicum* and *B. uliginosum*. Our work, as well as other research based on DNA sequences and morphology (e.g., Pedersen et al. 2003; Cox & Hedderson 2003) indicates that these species form a well supported clade. *Ptychostomum* is primarily Northern Hemisphere in its distribution, with a few species in southern temperate and subantarctic regions. Because most species occur only in the Northern Hemisphere, with more than 40 in North America alone, most transfers were made elsewhere (Spence 2005). Two Australasian species are recombined below.

Ptychostomum Hornsch., Flora 5, 2: syll. 62, 1822.

Type species: *Ptychostomum cernuum* (Hedwig) Hornsch. Basionym *Cynodontium cernuum* Hedwig, Species Musc. 58. t. IX. 1801. TYPE: In fissuris rupium malidis Sueciae, legit. Ol. Swartz (G).

Ptychostomum altisetum (Müll. Hal.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum altisetum* Müll. Hal., Hedwigia 37: 96, 1898. Protologue: Australia, Victoria, Moyston, Oct. 1883: *D. Sullivan* 1883 misit; prope Dimboola, Oct. 1893: *F. Reader* mis. 1894.

Ptychostomum cylindrothecium (R.Br.ter.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum cylindrothecium* R.Br.ter., Trans. New Zeal. Inst. 31, 1899. Protologue: New Zealand, damp banks, Waikari, April 1882: *R. Brown*.

Gemmabryum J.R. Spence & H.P. Ramsay **gen. nov.**

Caules gemmiformes vel uniformiter foliati. Folia imbricata, ovata vel ovato-lanceolata, areolatione laminae heterogenea, cellulis distalibus atque medianis elongatis, proximalibus quadratis vel brevis-rectangulis latioribus. Costa in sectione transversali cellulis ducum in strato unico adaxialiter supra stratum stereidarum bene effectum situs praedita, margine unistratosa non vel sublimbata. Gemmae asexuales vulgares, tubera sphaerica rhizoidalia, caules moniliformes rhizoidales aut bulbili axis foliaris. Plantae dioicae vel raro synoicae. Capsulae nutantes vel rectae; peristomium perfectum vel reductum, ciliis brevibus vel nullis, membrana basali humili, segmentis endostomii perforationibus carentibus; peristomia reducta cum capsulis rectis conjuncta. Sporae parvae, 8–20 (–25) μm diametro.

Stems gemmiform or evenly foliate, simple to branched by subgametangial innovations, sparsely to densely rhizomatous, with both micronemata and macronemata; creeping stolons absent. Rhizoids usually pale or red to red-brown, rarely purple, papillose. **Leaves** imbricate or slightly twisted when dry, ovate to ovate-lanceolate or triangular, concave to flat; costa strong, not reaching apex to excurrent in hairpoint, in cross-section with single layer of guide cells ventral to a

well-developed stereid band; lamina margins smooth or serrulate distally, unistratose, not or sometimes weakly bordered by 1 or 2 rows of incrassate linear cells, areolation heterogeneous, with elongate hexagonal, rhomboidal or vermicular distal and median cells and quadrate to short-rectangular and wider proximal cells across leaf base or sometimes differentiated from justacostal cells in alar region only, quadrate auriculate subalar decurrency of inflated cells absent. **Specialized asexual gemmae** common, including sphaerical rhizoidal tubers, moniliform rhizoidal tubers, stem tubers, leaf axis bulbils, and flagelliform branchlets. **Sexual condition** dioicous or rarely synoicous. **Seta** elongate, red to brown, not geniculate or curved. **Capsules** nodding to erect, short-ovate to pyriform, rarely elongate-clavate, often with a thick wrinkled apophysis; peristome double, perfect or reduced, exostome teeth 16, lanceolate, acuminate, fused at extreme base, yellow to brown, hyaline at tip, generally densely papillose on outer surface, usually bordered, trabeculate at back; endostome extremely variable, finely papillose, basal membrane well developed with segments keeled and perforate to poorly developed, cilia 0–4, nodulose or appendiculate, sometimes cilia short or absent, strongly reduced peristome associated with erect capsules; annulus large and revolvable; opercula hemispheric or convex conic, umbonate or apiculate, occasionally rostrate; stomata superficial, numerous in neck. **Calyptra** cucullate, smooth, naked. **Spores** small, 8–20 (–25) μm diam., smooth to finely papillose. $n = 10, 11, 20, 21, 30$ in Australia (Ramsay & Spence 1996).

Type: *Gemmabryum pachythemum* (Müll. Hal.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum pachythea* Müll. Hal., Syn. 1: 307, 1848. Protologue: Nova Hollandia prope York: *Preiss. India Orientalis: Hb Gottscheanum*.

Species of *Gemmabryum* are morphologically related to true *Bryum* (*B. argenteum*), with similar lamina areolation, but they can be distinguished by a variety of features. Stems tend to be bud-like or, if elongate, they are not julaceous; the costa is strong, often excurrent, with guide cells, and there are several different types of specialized asexual gemmae produced. The principal gemmae include rhizoidal

tubers, stem tubers and axillary bulbils. Four traditional sections of *Bryum* and *Brachymenium* belong to *Gemmabryum*: *Bryum* sections *Alpiniformia*, *Apalodictyon*, *Doliolidium* and *Brachymenium* section *Dicranobryum*. This is the largest genus of the Bryaceae in Australia with 25 species, and with perhaps 125 species worldwide. The following new combinations are made for species known from Australia.

Gemmabryum acuminatum (Harv. ex Hook.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Brachymenium acuminatum* Harv. ex Hook. Icon. Pl. Rar. 1: 19, 1836.

Gemmabryum apiculatum (Schwaegr.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum apiculatum* Schwaegr. Spec. Musc. Suppl. 1(2): 102 t. 72, 1816. Protologue: In America meridionali lectum, ni fallor, *Richardus dedit*.

Gemmabryum australe (Hampe) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum australe* Hampe, Icon. Musc. t. 26, 1844. Protologue: In Nova Hollandia, ad flumen Cygnorum: *Dr. L. Preiss legit*.

Gemmabryum austrosabulosum J.R. Spence & H.P. Ramsay **nom. nov.** Basionym: *Bryum sabulosum* Catcheside ex Spence & Ramsay, J. Adelaide Bot. Gard. 17: 114, fig. 4, 1996. Protologue: Western Australia, Porongorups, *F. Mueller s.n.*, x.1867 (MEL 30812), hom. illeg.. non Thériot, Recueil Publ. Soc. Havraise Études Dir. 1929: 111. 1930.

The name *B. sabulosum* already exists for a species from Madagascar (M. Crosby pers. comm.). We therefore provide a new name.

Gemmabryum cheelii (Broth.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum cheelii* Broth. Proc. Linn. Soc. New South Wales 41: 591, 1916. Protologue: Australia, N.S.W.: Shell Harbor: *Cheel n. 407*.

Gemmabryum chrysoneuron (Müll. Hal.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum chrysoneuron* Müll. Hal., Bot. Zeitung (Berlin) 9: 549. 1851. Protologue: Nova Seelandia, paludes sylvarum "Kauri forests" et "fern land" nuncopatarum ad fumen Wairoa-river prope portuna Kaipara, Ceratodoni purpureo intermixtum. *Cool.* No. 730.

Gemmabryum clavatum (Schimp.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Pohlia clavata* Schimp., Ann. Sci. Nat., Bot., ser.2 6: 148, 11, 1836. Protologue: ad scaturigines collium provinciae Quillota Chiles, ubi. clar. Bertero, anno 1829, legit cumque n. 867 in suo herbario adnotavit.

Gemmabryum coarctatum (Bosch & Sande Lac.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum coarctatum* Müll.Hal., *Syn. Musc.Frond.* 1: 312 (1849); *Brachymenium coarctatum* Müll.Hal.) Bosch & Sande Lac., *Bryol. Javan.* 1: 140, t. 115 (1860). T: Ost Java, bei Jogjakarta, [Indonesia], *Junghuhn*; holo: *n.v.*

Gemmabryum coronatum (Schwaegr.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum coronatum* Schwaegr. Spec. Musc. Suppl. 1(2):103, 1816. Protologue: In Guiana legit. cl.: *Richard*; In Jamaica: *Swartz*.

Gemmabryum crassum (Hook. f. & Wils.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum crassum* Hook. f. & Wils. Fl. Nov. Zel. 2:86, 1854. Protologue: New Zealand, Northern Island: scoriae at Manukau Bay, west coast, Colenso.

Gemmabryum dichotomum (Hedw.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum dichotomum* Hedw., Spec. Musc., p. 183, 1801. Protologue: Nova Seelandia.

Gemmabryum eremaeum (Catcheside *ex* Spence & Ramsay) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum eremaeum*

Catcheside *ex* Spence & Ramsay, J. Adelaide Bot. Gard. 17: 112, fig. 3, 1996. Protologue: Australia, South Australia: Mirra Mitta Bore, midway between Marree and Birdsville: *R.E. Grandison s.n.*, ix.1978 (AD).

Gemmabryum exile (Dozy & Molk.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum exile* Dozy & Molk., Ann. Sci. Nat. Bot. Sér. 3, 2: 300, 1844. Protologue: Java, Sumatra.

Gemmabryum inaequale (Tayl.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum inaequale* Tayl., Lond. J. Bot. 5: 53, 1846. Protologue: Western Australia, Swan River: *Mr. James Drummond*.

Gemmabryum indicum (Dozy & Molk.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum indicum* Dozy & Molk. Musci Fr. Ined. Archip. Indici. 1: 22, 1845. Protologue: Java: Trogon et in agro Boboriensi: *Korthals*; Amboina: in solo calcarea, intermixta Bryo coronato: *Zippelius*.

Gemmabryum klinggraeffii (Schimp.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum klinggraeffii* Schimp. in Klinggr..., Höh. Crypt. Preuss., p. 81, 1858. Protologue: Am ufer eines tortigen Wiesengrabens in Wiszniewo bei Löbau. Juni.

Gemmabryum laevigatum (Hook. f. & Wils.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum laevigatum* Hook. f. & Wils. Lond. J. Bot. 3: 546, 1844. Protologue: Hermite Island, Cape Horn and Falkland Islands, barren.

Gemmabryum preissianum (Hampe) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum preissianum* Hampe Icon. Musc. p.25, 1844. Protologue: In rupibus ad saxa calcarea Novae Hollandiae (prope Freemantle) celeberrimus peregrinator *Dr. Preiss legit*.

Gemmabryum radiculosum (Brid.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum radiculosum* Brid., Spec. Musc. 3: 18, 1817. Protologue: Germ., Wurzelfaseriger Knotenmoor. Circa Romam in humidis herbidis legi., Maio.

Gemmabryum rubens (Mitt.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum rubens* Mitt., Hooker's J. Bot. Kew Gard. Misc. 8: 232, 1856. Protologue: Throughout the temperate parts of Europe, Asia and northwest America. *B. erythrocrpum*, β *sylvaticum*, Hampe, Exsic. No. 201.—In sylvis Blankenburgieis.

Gemmabryum sauteri (B.S.G.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum sauteri* B.S.G., Br. Eur. 4: 162, 377, 1846. Protologue: Ad terram humidum in jago bormiensi prope *Trafoi*, ad ripas arenosas fl. *Salzach* prope *Mittersill* et ad viam praeruptam inter Hof – et Bad-Gastein Salisburgiae inferioris W.P. Schimper annis 1840 et 1842 legit. Jullo.

Gemmabryum subapiculatum (Hampe) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum subapiculatum* Hampe, Vid. Medd. Naturk. for Kjoebenh. Ser. 3, 4: 51, 1872. Protologue: *Glaziou*, sub Nr. 5148.

Gemmabryum sullivanii (Müll. Hal.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum sullivanii* Müll. Hal. in Broth. Oefvers Forh. Finska Vetensk.-Soc. 35: 48, 1893. Protologue: Victoria, Mount William, ubi m. Nov. 1887 leg. *Sullivan* (n. 22).

Gemmabryum tenuisetum (Limpr.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum tenuisetum* Limpr., Jahresber. Schles. Ges. Vaterl. Kult. 74 (2): 4, 1897. Protologue: Auf nasser Erde an einem Grabenrande vor dem Karrwalde bei Leibnitz in Steiermark bei 280 m am 8 März 1889 von *J. Breidler* mit nicht vollig ausgereiften Kapsein entdeckt.

Ochiobryum J.R. Spence & H.P. Ramsay **gen. nov.**

Caules uniformiter foliati. Folia complanata, ovata vel lanceolata, areolatione laminae e cellulis elongatis anguste hexagonis composita, marginibus distincte limbatis. Costa in sectione transversali cellulis ducum in strato unico adaxialiter supra stratum stereidarum bene effectum sitis praedita. Gemmae asexuales nullae. Plantae dioicae. Capsulae inclinatae vel nutantes pyriformes; peristomia duplicia bene effecta. Sporae parvae, 10–18 μm .

Plants medium-sized, forming dense tufts 2–6 cm, variously coloured red, pink, silver or sometimes green, dark brown below. **Stems** simple or branched with short innovations, radiculose below. **Rhizoids** papillose. **Leaves** imbricate and appressed, concave, complanate, suberect to erect-patent, obtuse to broadly acute, little-altered when dry; costa weak, not reaching apex to shortly excurrent in a slender point, in cross-section with single row of guide cells ventral to a well-developed stereid band; laminal cells elongate, narrowly hexagonal to prosenchymatous, (6–15:1), often thicker-walled and narrower near margin, generally forming a distinct border, not much altered towards leaf base except at insertion,—where the cells are somewhat shorter and wider. **Asexual specialized gemmae** none. **Sexual condition** dioicous. **Seta** 2–4.5 cm long, slender, somewhat flexuose, reddish. **Capsules** 3–4 mm long, suberect or inclined, pyriform with a distinct tapered neck; opercula conical apiculate; peristome double, perfect, exostome teeth 16, lanceolate, acuminate, yellow to brown, hyaline at tip, endostome basal membrane well developed with segments keeled and perforate, cilia 2–4, appendiculate; annulus large and revoluble; opercula hemispheric or convex-conic, apiculate; stomata superficial, numerous in neck. **Calyptra** cucullate, smooth, naked. **Spores** 10–18 μm .

Type: *Ochiobryum blandum* (Hook. f. & Wils.) J.R. Spence & H.P. Ramsay **comb. nov.** Basionym: *Bryum blandum* Hook. f. & Wils., Lond. J. Bot. 3: 546, 1844. Protologue: Campbell's Island, barren.

One other Chinese species is also transferred to the genus:

Ochiobryum handelii (Broth.) J.R. Spence & H.P. Ramsay **comb. nov.**
Basionym: *Bryum handelii* Broth., Symb. Sin. 4: 58, 1929.
Protologue: Massenhaft in Bachläufen in der ktp. und Hg. St. des
birm. Mons. in Hintergrunde des Doyon-lumba, vines linken
Seitentalen des Salwin, 28°9'. and Glimmerschiefer, 3600—4300
m, 5., 6. VIII. 1916 (9719).

This genus is described for the highly distinctive *B. blandum* and
B. handelii, species with complanate leaves and elongate *Pohlia*-type
lamina areolation. It is named in honor of the late Harumi Ochi (1920-
2001), acknowledged expert on *Bryum*, who discussed the two species
in one of his papers (Ochi 1968).

In Spence (2005) *Brachymenium* section *Leptostomopsis* was
raised to generic rank. However, the sectional basionym was
inadvertently left out, hence the combination is invalid. The corrected
combination is cited below in full:

Leptostomopsis (Müll. Hal.) J.R. Spence & H.P. Ramsay **stat. nov.**
Basionym: *Brachymenium* sect. *Leptostomopsis* (Müll. Hal.)
Broth., in Engler & Prantl, Nat. Pfl. 1(3), 558. 1903. Type species:
Leptostomopsis systylium (Müll. Hal.) J.R. Spence & H.P.
Ramsay, **comb. nov.** Basionym: *Bryum systylium* Müll. Hal., Syn.
Musc. Frond. 1: 320, 1848. Lectotype: Mexico. Prope Xalapam,
Deppe & Schiede 1079 (L, NY).

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