

Clastobryophilum (Bryophyta: Sematophyllaceae) new to the Australian flora

Andi Cairns¹ and David Meagher²

¹College of Marine and Environmental Sciences, James Cook University, Townsville, Queensland, 4811, Australia

²School of Botany, The University of Melbourne, Victoria, 3010, Australia

Author for correspondence: andi.cairns@jcu.edu.au

Abstract

The genus *Clastobryophilum* (Bryophyta: Sematophyllaceae) is reported as new to the Australian flora on the basis of a recent collection of *Clastobryophilum balansaeianum* from northern Queensland. This species was previously known only from New Caledonia.

Introduction

We recently collected bryophytes from the catchment of Boulder Creek, on the north-eastern slope of Mount Tyson, near Tully in the Wet Tropics bioregion, northern Queensland. Among our collections was an unusual epiphytic moss mixed with the leafy liverwort *Heteroscyphus aselliformis* (Nees) Schiffn (Fig. 1). The moss clearly belonged to family Sematophyllaceae *s. lat.* (costa absent, enlarged alar cells in a distinct basal row, laminal cells long and narrow) but we were unable to identify the genus using the current moss key for Australia (Buck and Vitt 2006). Fortunately the Sematophyllaceae have been partially treated in the series on the bryophyte flora of the Huon Peninsula in Papua New Guinea (Tan et al. 2007). Using this paper and the illustration in Fleischer (1923) we were able to identify the moss as belonging to genus *Clastobryophilum* M.Fleisch.

Clastobryophilum was thoroughly revised by O'Shea (2000). He recognised two species: *C. bogoricum* (Bosch & Sande Lac.) M.Fleisch., a widespread species from Madagascar to the Indian subcontinent, south-eastern Asia and Malesia, and the similar, but larger *C. balansaeianum* (Besch.) Broth., endemic to New Caledonia. Although O'Shea did not record the genus from New Guinea, Tixier (1977) reported *C. bogoricum* from Papua New Guinea, and Tan et al. (2007) reported another collection from there and two collections from the Solomon Islands. However, *Clastobryophilum* has not been reported from Australia (O'Shea 2000; Ramsay et al. 2002, 2004; Ramsay 2012).

O'Shea (2000, p. 99) found the genus *Clastobryophilum* to be 'distinguished by its often reddish-brown colouration and shiny appearance, with very long, slightly flexuose leaves, usually twisted towards the apex, short, thick-walled alar cells, and laminal cells with a wide lumen and prominent walls...[which] sometimes gives an oblique stippled pattern to the leaf.' For circumscribing species within *Clastobryophilum* O'Shea found characters identified by previous authors (e.g. Tixier 1977), including the degree of papillosity of leaves and setae, the degree of tothing of perichaetial leaves, and the length of rostrum of the calyptra, to be unreliable and often variable within one plant. Nevertheless, when comparing the two species, O'Shea (2000, pp. 100 & 102, respectively) described the seta of *C. bogoricum* as 'verrucose, usually for most of the upper half', in contrast to that of *C. balansaeianum*, which he described as 'less papillose'.

We consider that our collection fits best with *Clastobryophilum balansaeinum* on the basis that the leaf cells are often much longer than those specified by O'Shea (2000) for *C. bogoricum*, and the leaves are generally larger (Table 1). Unfortunately our material lacks setae, so the degree of papillosity of the seta could not be assessed. Measurements of leaf width in the Australian specimen were limited by the concave lamina and revolute margins of the lower leaf (Fig. 3a), a problem also encountered by O'Shea (2000, p. 99) who found leaf width to be 'probably considerably understated because the hollow base of the leaf (where the width is usually greatest) prevents the leaf lying flat'.

The following description is based on our Australian material (Figs 1–3).

Clastobryophilum balansaeinum (Besch.) Broth., *Die Natürlichen Pflanzenfamilien* (2nd edn) 11: 408 (1925)

Sematophyllum balansaeinum Besch., *Annales des Sciences Naturelles; Botanique* (série 5) 18: 237 (1873)

TYPE: New Caledonia, in cacumine montis Mi, *Balansa* 913 (1869) ex herb. Bescherelle; lectotype BM672528, isolectotypes BM672529, H-BR1032001, L (*vide* O'Shea 2000), *non vidi*.

Plants yellow-green, shiny, densely foliate, with stem procumbent, foliose, red, from which ascending branches arise at irregular intervals, branches up to 1.5 cm long. Rhizoids orange-brown in fascicles. **Branch leaves** narrowly lanceolate, twisted towards apex, widest above base, concave and gradually tapering to a narrow apex, ecostate, 2.2–3.1 × 0.3–0.4 mm; margins revolute, serrulate by projecting ends of cells; laminal cells in mid-leaf elongate, rhomboid to sigmoid, 79–127 × 7.9–10.1 μm (length : width ratio 8.6–15.7:1), thick-walled and strongly porose, walls bulging strongly on both abaxial and adaxial sides, regularly ranked, forming an oblique pattern because of the very thick-walled and porose ends of the cells, unipapillose with simple, prominent papillae on dorsal surface; alar cells thick-walled, yellow-orange, colour extending across leaf base to the opposing alar group. **Stem leaves** similar but much more variable in size, not or hardly twisted when dry, margins not or hardly revolute. **Androecia** not seen. **Gynoeceia** common on lower branches. **Perichaetial leaves** smaller than branch leaves, 0.8–1.3 × 0.2–0.3 mm, subulate from a widely ovate base, apex acute; margins strongly toothed; variously papillose, alar cells larger than laminal cells, rectangular-rhomboid, hyaline. **Sporophytes** not seen.

Specimen examined: Australia: Queensland: North Kennedy (Anonymous 1975): Wet Tropics: Boulder Creek near Tully, on bark of tree overhanging creek, mixed with *Heteroscyphus aselliformis* (Nees) Schiffn., about 2.5 km upstream from Alligators Nest, Cairns & Meagher WT-353A, 7 May 2014 (BRI, CNS).

Discussion

O'Shea (2000) distinguished the two species of *Clastobryophilum* based on three specimens of *C. balansaeinum* from New Caledonia, which he compared with a large number of specimens of *C. bogoricum*. Commenting on the paucity of *Clastobryophilum* collections, O'Shea recognised the limitations of his revision, stating: 'This document should thus be considered an interim rationalisation of the genus, and not the final word' (O'Shea 2000, p. 97). However, he found the leaf dimensions and laminal cell lengths in *C. balansaeinum* to be consistently different from those of *C. bogoricum*. On that basis our material agrees more closely with *C. balansaeinum* rather than *C. bogoricum* (Table 1), although there is a clear overlap and to some extent it bridges the gap between the two species. This suggests that the two species may not be as distinct as previously thought, and therefore might well be conspecific.

Although O'Shea (2000) did not differentiate between branch and stem leaves, we assume that his measurements refer to branch leaves because they are most likely to be dissected from the plant. Many stem leaves on the Australian specimen were damaged (thus rendering them unsuitable for measurement) or absent (Fig. 2). Stem leaves of specimens examined by O'Shea were possibly similar.

Some bryologists consider *C. balansaeinum* to 'probably not be a good species' (BC Tan, pers. comm. to AC, 2014). Since differences in leaf size, laminal cell dimensions and papillosity of the seta might simply reflect morphological plasticity under varying environmental conditions (e.g. Noguchi 1973, Buryova and Shaw 2005, Pereira et al. 2013), the taxonomic status of this taxon may be uncertain. However, we prefer to take a conservative approach here and follow O'Shea's treatment in the absence of any further study of the genus. A molecular study of plants from a wide range of geographical localities would no doubt resolve the question of possible synonymy.

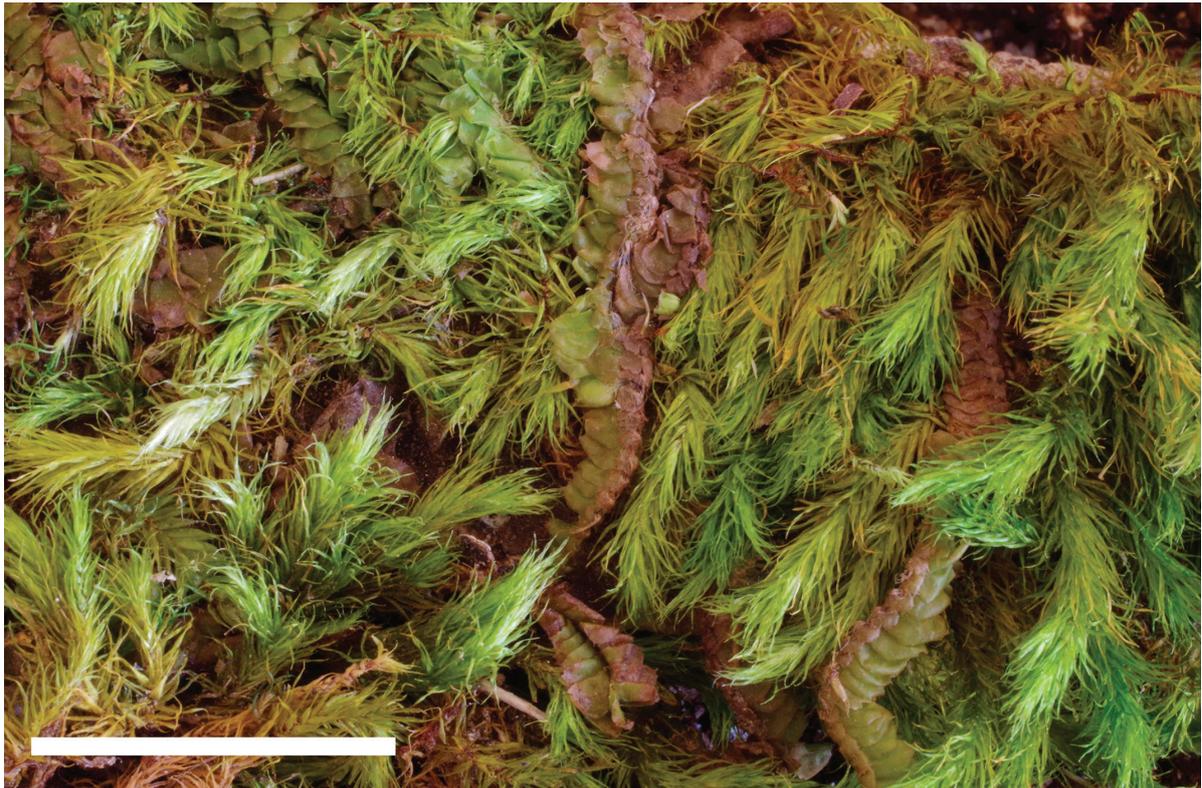


Fig. 1. *Clastobryophilum balansae anum* at Boulder Creek, Queensland, growing as an epiphyte with the leafy liverwort *Heteroscyphus aselliformis*. Scale bar: 10 mm.

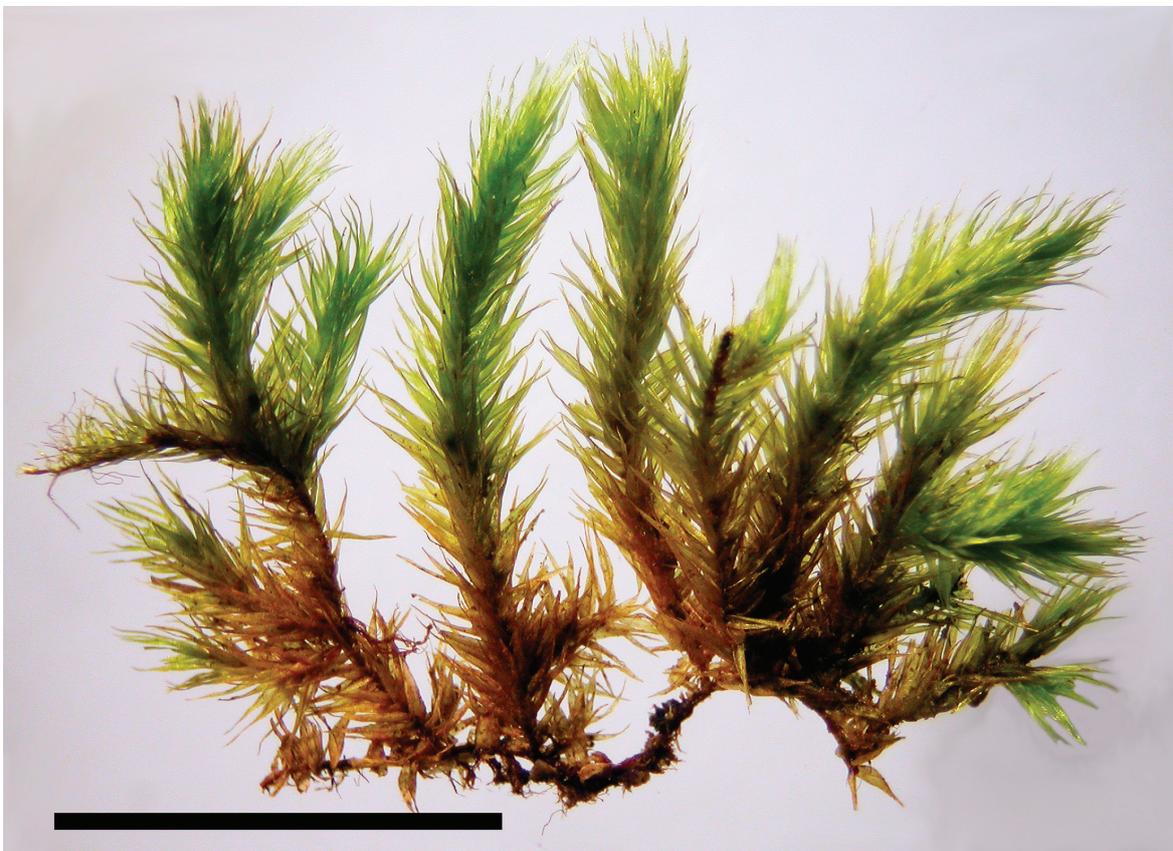


Fig. 2. *Clastobryophilum balansae anum*. Whole plant, showing procumbent stem and ascending branches. Scale bar: 10 mm.

Table 1. Comparison of leaf characters reported for *Clastobryophilum bogoricum* and *C. balansaeum*, compared against our material of *C. balansaeum* from Queensland.

Dimension	<i>C. bogoricum</i>	<i>C. balansaeum</i>	Australian material
Leaf length (mm)	1.2–2.8	(1.7–)2.3–3.1	branch: 2.2–3.1 stem: 1.4–2.8
Leaf width (mm)	0.2–0.4	(0.2–)0.3–0.4	branch: 0.3–0.4 stem: 0.3–0.4
Leaf length: width ratio	4.1–11.6	5.2–8.8	branch: 5.5–9.3 stem: 3–6(–6.8)
Laminal cell length (μm)	(39–)45–80(–111)	(85–)110–120(–130)	79–119(–127)
Laminal cell width (μm)	6.5–10	9–10	(5.6–)7.9–9.5(–10.1)
Laminal cell l:w ratio	6.1–10.4	11.2–12.5	8.6–15.7

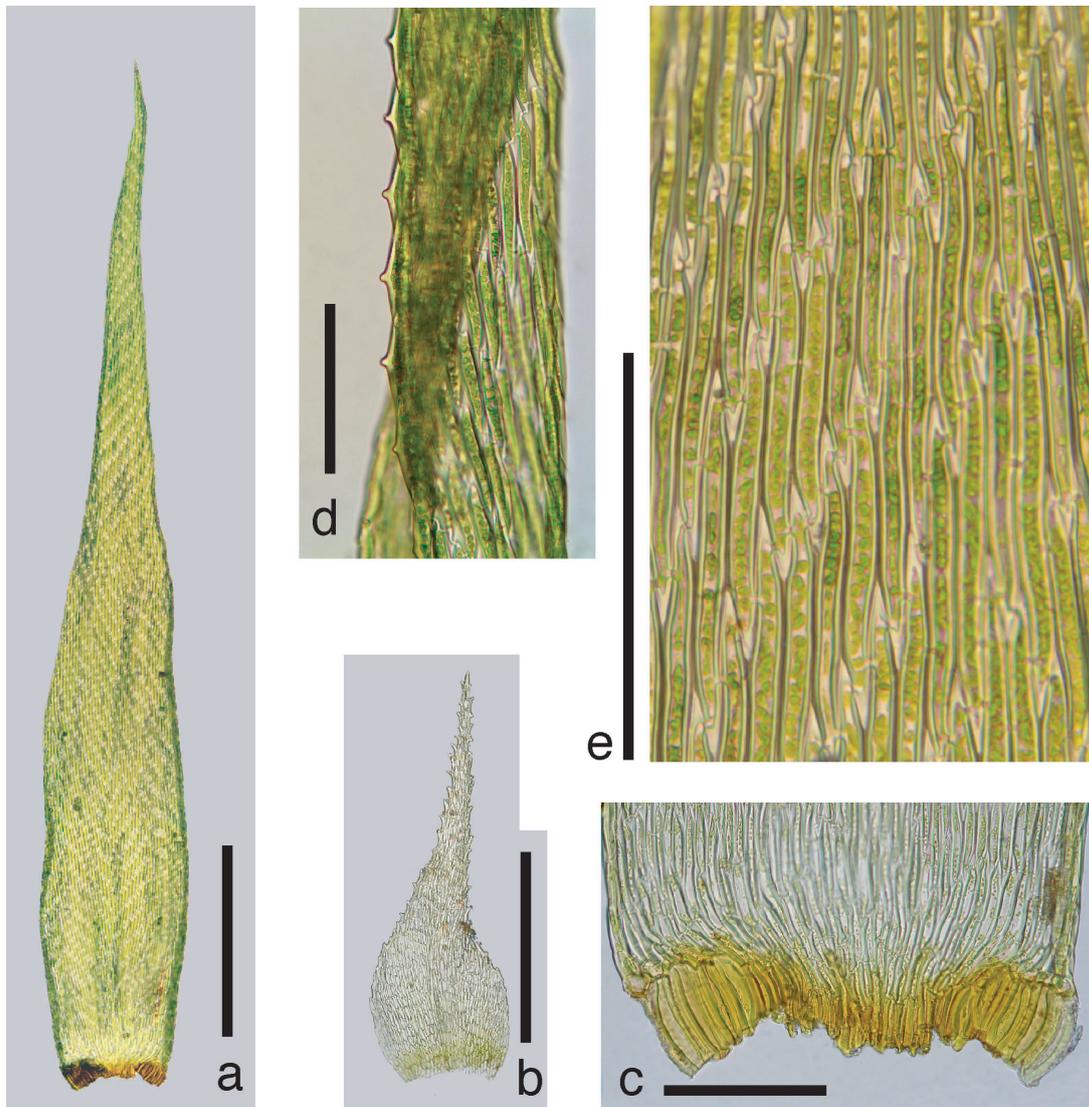


Fig. 3. *Clastobryophilum balansaeum*, Cairns & Meagher WT-353A. **a**, typical branch leaf. **b**, typical perichaetial leaf, showing the large marginal teeth. **c**, leaf base showing thick-walled, coloured alar cells. **d**, laminal cells in side view, showing the papillae. **e**, cells in middle of leaf lamina. Scale bars: **a**, **b** – 0.5 mm, **c–e** 100 μm .

Clastobryophilum balansaeae would key out at couplet 51 (*Trichosteleum*) of the current Australian moss key (Buck and Vitt 2006), or perhaps at couplets 94, 118, 121 or 123 if the papillosity of the cells was overlooked. It has been confused with species of *Acroporium* (couplet 121) because of the long, narrow leaves. However, in *Acroporium* the leaves are characteristically involute or tubulose and (in known Australian species) generally do not exceed 2 mm in length (Ramsay et al. 2004). We suggest the following amendment to the key to accommodate *Clastobryophilum*:

- 51 Plants often pendulous, flagelliform; alar cells quadrate, not inflated ***Barbellopsis***
 Plants usually in mats or wefts; alar cells elongate and rounded, inflated 51A
- 51A Plants dioicous; leaves narrowly oblong-lanceolate to linear, twisted towards apex wet or dry; laminal cells regularly ranked, often forming oblique pattern ***Clastobryophilum***
 Plants autoicous; leaves ovate-lanceolate to broadly oblong-lanceolate, not twisted; laminal cells not regularly ranked ***Trichosteleum***

Acknowledgments

We dedicate this paper to the memory of Dr Elizabeth Brown. Elizabeth's company and expertise on field trips and at Australian Bryological Workshops will not be forgotten.

We thank the Cassowary Coast Regional Council for allowing access to the Boulder Creek catchment, and the Queensland Department of Environment and Heritage Protection for permission to collect bryophytes there. We also thank Roger Fryer for his generous assistance in the field, and Helen Ramsay and Ben Tan for valuable discussions and advice. Two anonymous reviewers provided useful comments on this manuscript.

References

- Anonymous (1975) [untitled map] *Contributions of the Queensland Herbarium* 19: end paper
- Buck WR, Vitt DH (2006) Key to the genera of Australian mosses. *Flora of Australia* 51: 67–88.
- Buryova B, Shaw AJ (2005) Phenotypic plasticity in *Philonotis fontana* (Bryopsida: Bartramiaceae) *Journal of Bryology* 27: 13–22.
- Fleischer M (1923) *Die Musci der Flora von Buitzenorg* Vol. 4: 1202 Fig. 198 (EJ Brill, Leiden) <http://www.biodiversitylibrary.org/item/10 - page/128/mode/1upw> (downloaded 28 May 2014).
- Noguchi A (1973) Mosses of Malaya collected by Dr Hiroshi Inoue *Bulletin of the National Science Museum Tokyo, Series B, Botany* 16: 293–304.
- O'Shea BJ (2000) Notes on Seychelles mosses. 6. A generic revision of *Clastobryophilum* M.Fleisch. (Sematophyllaceae, Bryopsida). *Tropical Bryology* 18: 97–105.
- Pereira MR, Dambros C de S, Zartman CE (2013) Will the real *Syrrhopodon leprieurii* please stand up? The influence of topography and distance on phenotypic variation in a widespread Neotropical moss. *The Bryologist* 116(1): 58–64.
- Ramsay HP (2012) *Australian Mosses Online. 1. Sematophyllaceae*. Australian Biological Resources Study, Canberra www.anbg.gov.au/abrs/Mosses_online/01_Semat.html (downloaded 1 June 2014)
- Ramsay HP, Schofield WB, Tan BC (2002) The family Sematophyllaceae (Bryopsida) in Australia. Part 1. Introduction, family data, key to genera and the genera *Wikia*, *Acanthorrhynchium*, *Trismegistia* and *Sematophyllum*. *Journal of the Hattori Botanical Laboratory* 90: 1–50.
- Ramsay HP, Schofield WB, Tan BC (2004) The family Sematophyllaceae (Bryopsida) in Australia. Part 2. *Acroporium*, *Clastobryum*, *Macrohymenium*, *Meiotheciella*, *Meiothecium*, *Papillidiopsis*, *Radulina*, *Rhaphidorrhynchium*, *Trichosteleum* and *Warburgiella*. *Journal of the Hattori Botanical Laboratory* 95: 1–69.
- Tan BC, Koponen T, Norris DH (2007) Bryophyte flora of the Huon Peninsula, Papua New Guinea LXX. Sematophyllaceae (Musci) 1. *Acanthorrhynchium*, *Acroporium*, *Clastobryophilum*, *Pseudopiloecium*, *Radulina* and *Trichosteleum*. *Annales Botanici Fennici* 44 (suppl. A): 35–78.
- Tixier P (1977) *Clastobryoidées et taxa apparentés*. *Revue Bryologique et Lichenologique* 43: 397–464.

