

Notes on Seychelles mosses. 6. A generic revision of *Clastobryophilum* M.Fleisch. (Sematophyllaceae, Bryopsida)

Brian J. O'Shea

141 Fawnbrake Avenue, London SE24 0BG, United Kingdom

Abstract The genus *Clastobryophilum* M.Fleisch. (Sematophyllaceae, Bryopsida) is reviewed, and two species are maintained: *C. bogoricum* (Bosch & Sande Lac.) M.Fleisch. and *C. balansaeaeum* (Besch.) Broth.. *C. rufo-viride* (Besch.) M.Fleisch. of Madagascar and Seychelles, the only African species, becomes a synonym of the Asian *C. bogoricum*, as does *C. asperifolium* (Thwaites & Mitt.) B.C.Tan of Sri Lanka. Several collections named as *Clastobryophilum*, including the type of *C. bogoricum* var. *laevibogoricum* (Dixon) Seki in Nog., are excluded from the genus.

It is with trepidation that one approaches the taxonomy of tropical moss genera. The nineteenth century saw an unwarrantedly large increase in the number of tropical moss species, and one would expect this total to reduce. In comparison, the European moss flora was much more closely considered and there is still a slow increase in recognised taxa, based on sophisticated characters resulting from a deeper knowledge of morphological variation. Such a knowledge does not usually exist in the tropics (witness the small numbers of collections considered in this paper), and it is only recently that more thorough collections have taken place. This helps in bridging the gaps in our understanding of morphological variation of the genus, and leads to the reductions shown in this paper. However, this study also considers a

previously unnoticed leaf cell character among some specimens that might suggest a lack of attention to detail in the face of a vast numbers of species, but also raises the consideration that with further study and more collections there may be other more subtle characters to elicit, that could by contrast increase the number of species. This document should thus be considered an interim rationalisation of the genus, and not the final word.

The division of Sematophyllaceae into four sub-families was initiated by Fleischer (1923), and has been widely adopted since, although significant disputes have occurred as which genera go into which subfamily, and how the subfamilies should be differentiated (e.g. Tan & Buck (1989) vs. Tixier (1977)). Fortunately all

these authors treat *Clastobryophilum* as a member of subfamily Clastobryoideae. The subfamily (summarised from Tan & Buck, 1989) is characterised by:

small, epiphytic plants with erect-spreading to somewhat ranked leaves when dry. ...Filamentous brood bodies are commonly born on attenuated branches..... Leaves mostly are ovate-lanceolate to oblong-linear with a single basal row of deeply coloured, much enlarged and conspicuously thick-walled alar cells. Infrequently though, a second row of one to three, much smaller, also thick-walled quadrate cells can be seen above the contrastingly larger basal alar cells. Costae are shortly double or none. Peristome teeth are small, striate, smooth or papillose, often reduced in structure, and nearly without an endostomial basal membrane. Exothecial cells are semi- or not collenchymatous.

Dixon (1933) emphasised sporophytic features to distinguish genera in the sub-family rather than the gametophytic features favoured by Fleischer (1923). Tixier (1977) provides perhaps the most thorough review of the sub-family, and takes a more rounded approach to the choice of characters defining the genera, but comes to conclusions about *Clastobryophilum* that are not accepted here.

Clastobryophilum is distinguished from other genera in the sub-family principally by the possession of a perfect peristome and long, narrow, erect leaves, without propagules.

Clastobryophilum M.Fleisch., Musci Fl. Buitenzorg, 4: 1200. 1923.

Lectotype: *C. bogoricum* (Bosch. & Sande Lac.) M.Fleisch., cf. M.Fleisch., Nov. Guinea 12(2): 121. 1914 & Musci Fl. Buitenzorg, 4: 1200. 1923. [fide *Index Muscorum* (Wijk *et al.*, 1959-1969)]

Plants of medium size, with leaves long, narrow,

erect, slightly flexuose and often twisted towards the apex, alar cells large, inflated and thick-walled, laminal cells thick-walled with a comparatively wide lumen. Dioicous; perichaetial leaves very strongly toothed; setae quite short, roughened or papillose towards the capsule; capsules oval and inclined, peristome complete.

Fleischer created this genus (Fleischer, 1914) to accommodate *C. ruficaule* (Thwaites & Mitt.) M.Fleisch. and *C. bogoricum* (Bosch. & Sande Lac.) M.Fleisch., but neglected to describe the genus. He remedied this (Fleischer, 1923), but included only *C. bogoricum* and *C. rufo-viride* (Besch.) M.Fleisch. For *C. ruficaule*, he transferred it to *Clastobryella ruficaule* (Thwaites & Mitt.) M.Fleisch. [subsequently transferred (Tan, 1991) to *Trichosteleum ruficaule* (Thwaites & Mitt.) B.C.Tan]. Brotherus added to the genus *C. balansaeaeum* (Besch.) Broth. (1925) and *C. serrulatum* Broth. (1928), and Thériot (1932) added *C. robustum* Thér. These are the five species listed in Index Muscorum. Since that date, *C. serrulatum* has been transferred to *Trichosteleum* (Tan, 1991), and *C. robustum* was made a synonym of *Myurium foxworthyi* (= *Oedocladium fragile*) (Tixier, 1962); both of these transfers are supported here. Two further species were added: *C. asperifolium* (Thwaites & Mitt.) B.C.Tan (Tan, 1993) and *C. bogoricum* var. *laevibogoricum* (Dixon) Seki (Noguchi, 1973), but the latter was subsequently synonymised with *C. bogoricum* (Tan, 1994) - leaving four species recognised in the genus.

In this revision, all but *C. balansaeaeum* of the four species mentioned above are found to be the same taxon, *C. bogoricum*, but *C. bogoricum* var. *laevibogoricum* is found not to belong to *Clastobryophilum*.

Clastobryophilum is predominantly a SW Asian genus, with outlying occurrences in the East African islands (Madagascar as well as Seychelles) and New Caledonia. This is one of several such taxa at both genus and species level (O'Shea, 1997; O'Shea *et al.*, 1996) that seem to have reached these ancient granite islands,

but not the African mainland.

Where localities have been located, latitude/longitude information is provided (although often only to the nearest degree), and this is also used for the distribution map. All measurements were made on specimens mounted in Hoyer's Solution, and cell measurements are of the full cell width, not just the lumen. Leaf width measurements are probably considerably understated because the hollow base of the leaf (where the width is usually greatest) prevents the leaf lying flat.

Diagnostic characters

Authors of species in *Clastobryophilum* have really only considered four vegetative character states in defining species in the genus, and they have proved unreliable: the degree of papillosity of leaves and setae, the degree of toothing of the perichaetial leaves and the length of the rostrum of the calyptra. The position is made more difficult because of the relative uncommonness of collections, the frequent absence of material with mature sporophytes, and the confusion that has been caused by both Dixon's view that *Clastobryophilum* was a synonym of *Acroporium*, and also by species of other genera being misidentified as *Clastobryophilum*.

Leaf papillosity. *Clastobryophilum* can be papillose to a greater or less degree, although it does appear that all collections of *Clastobryophilum* can probably demonstrate papillae, even though they may be hard to find. Looking at folded leaves in profile, which can be achieved most easily by looking at a mount of a whole plant, is the best way to spot the leaf papillae. Tixier (1977) effectively used papillosity as the sole character to distinguish between the two species he recognised, but was convinced that *C. bogoricum* had smooth leaves, despite the fact that the papillae are clearly visible in the type specimen, and the type description also emphasises this character. The degree of papillosity can be variable within one branch, and Noguchi (1973) suggests that it might be environmentally affected, with the degree of papillosity directly related to the degree of

exposure. It certainly seems a very variable character, and one not to be relied upon for taxonomic distinctions within the genus.

Seta papillosity. Sporophyte characters, whilst often diagnostic in the Sematophyllaceae, are not always useful in *Clastobryophilum*. It is not unusual to find setae on plants, but quite uncommon to find a capsule. The late A. Eddy (pers. comm.) suggested that the capsules must be of short duration and soon deciduous. The papillosity of the seta has also been used as a character, for instance to distinguish between *C. bogoricum* and *C. balansaeenum*, but this too seems variable, and there are very few specimens of the latter to confirm this as a useful character.

Toothing of perichaetial leaves. Although capsules may be absent, perichaetial leaves can often be found. They are often very strongly dentate, with long, often curved teeth, but the degree of toothing is different within similar leaves in the same perichaetium so this is not a character to distinguish species, although it does seem a useful character for the genus.

Calyptra rostrum. Descriptions of this can only be found in the type description, but it is said to be oblique, and in *C. bogoricum* to be almost as long as the capsule, but rather shorter in *C. balansaeenum*.

After removing the collections not belonging to *Clastobryophilum*, the remaining collections are consistently similar, and appear to form a coherent and readily identified genus, 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. (In most Sematophyllaceae with thick laminal cell walls, it is not easy to distinguish the cell walls between the cell lumina. This is not the case with this plant, where they are usually quite clearly visible, and the lumina are particularly wide.) This sometimes gives an oblique, stippled pattern to the leaf, caused by the cell walls and lumina being so prominent, and emphasised by the pores

between the ends of adjacent cell lumina. Species of *Acroporium*, which can also have long, needle-like leaves, can be distinguished *inter alia* by the more rigid leaves and narrower cell lumina, with thinner cell walls.

Key to species

1. Leaf laminal cells more than 11 times as long as wide (New Caledonia).....*C. balansaeana*
 1. Leaf laminal cells less than 11 times as long as wide (West Malesia and Indian Ocean islands)
*C. bogoricum*

Clastobryophilum bogoricum (Bosch & Sande Lac.) M.Fleisch., Musci Fl. Buitenzorg 4: 1200. 198. 1923.

Hypnum bogoricum Bosch & Sande Lac., Bryol. Jav. 2: 217. 318. 1870. *H. bogoricum* Bosch & Sande Lac. ex Hampe, Nuov. Giorn. Bot. Ital. 4: 285. 1872 *nom. inval. err. pro. H. bogoricum* Bosch & Sande Lac.; *Sematophyllum bogoricum* (Bosch & Sande Lac.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1876-1877: 385. 1878 (Ad. 2: 451)).

Lectotype (**lect. nov.**): JAVA: in m. Salak, altit. 5500', in truncis, 17 July 1860, *Kurz s.n.* (L, 0060161!; isotype L, 0060160!).

= *Sematophyllum asperifolium* Thwaites & Mitt. in Mitt., J. Linn. Soc. Bot. 13: 319. 1873 **syn. nov.** *Acroporium asperifolium* (Thwaites & Mitt.) Dixon, Bull. Torrey Bot. Cl. 51: 250. 1924; *Clastobryophilum asperifolium* (Thwaites & Mitt.) B.C.Tan, J. Hattori Bot. Lab. 74: 227. 1993.)

Type: SRI LANKA: Dr. Thwaites 228 (NY; isotypes NY; BM! 672507, 672509, 672510, 672511).

= *Rhaphidostegium rufo-viride* Besch., Ann. Sc. Nat. Bot. ser., 6, 10: 298. 1880 **syn. nov.** *Sematophyllum rufo-viride* (Besch.) Broth., Nat. Pfl. 1(3). 1(3): 1121. 1908; *Clastobryophilum rufo-viride* (Besch.) M.Fleisch., Musci Fl. Buitenzorg 4: 1203. 1923.)

Lectotype (**lect. nov.**): SEYCHELLES. Mahé, forêt-noire, *G. de l'Isle s.n.* (H-BR,

1032006!)

Syntype: MADAGASCAR. Nossi-Comba, 8/1879, *Marie s.n.*

Plants reddish- or yellowish-green, often somewhat shiny, laxly or usually more densely foliate, with very long, slightly flexuose leaves, twisted towards the apex, especially when dry. Leaves lanceolate, widest at the base and tapering gradually, hollowed at the base, margins usually reflexed for most of the length, toothed or not with the projecting ends of cells, more strongly towards apex, ecostate, 1.15-2.8 x 0.15-0.36 mm (ratio 4.1-11.6:1); laminal cells regularly ranked often forming an oblique pattern, elongate, (39-)45-80(-111) x 6.5-10 µm (ratio 6.1-10.4:1) with the lumen occupying 70-90% of the cell width, strongly porose, variably papillose on the dorsal surface; alar cells large, swollen and thick-walled, straight or curved, sometimes inclined towards the centre line of the leaf, usually strongly coloured brown, orange or yellow, the colour often extending across the whole leaf base. Dioicous. Perichaetial leaves lanceolate, wide at the base, very strongly toothed, usually with some teeth long and curved, alar cells larger than other cells, rectangular, not swollen or porose, cells above narrower and porose. Seta verrucose, usually for most of the upper half.

Habitat: epiphytic on living and dead trees, humus and rock, usually weft forming but can be pendulous, mainly in comparatively moist forest, but in drier places where there is shade, altitude from 45-1725 m, but most frequent from 400-1000m, probably reflecting availability of forest. The Seychelles specimens were bimodally distributed by altitude, with one half from 450-550 m, the other from 700-800m, with no collections in between: this may also be related to habitat availability.

Leiden has two specimens labelled in agreement with the type description of this species, and both agree physically with the type description and appear to be from the same collection, and are labelled 'TYPE'; they are bar-coded L0060160 and L0060161. However, the latter numbered packet has additional information, including a date, and is stamped 'Herbarium v. d. Sande

Lacoste', and is thus nominated the lectotype, with the other packet an isotype.

Both new synonyms differ in no significant way from the type of *C. bogoricum*:

Clastobryophilum asperifolium (Thwaites & Mitt.) B.C.Tan. The type specimen collected by Dr. Thwaites is in Mitten's herbarium at NY. There are two specimens there (Thiers, 1992: 34) which have not been seen, one of which should be nominated the lectotype. The four BM duplicates from NY are isotypes. As the original description was in *Sematophyllum* (and subsequently in *Acroporium*), no comparison was made at the time with other species of *Clastobryophilum*, but this taxon was collected as both *C. bogoricum* and *A. asperifolium* in Sri Lanka, and the collections are indistinguishable.

Clastobryophilum rufo-viride (Besch.) M.Fleisch. Tan (1993) considered that *C. rufo-viride* was likely to be a synonym of *C. asperifolium*, and the examination of an isotype and three other Sri Lankan specimens of *C. asperifolium* in BM confirmed this view. Specimens from Seychelles tend to be less papillate both on the leaves and setae, and the toothing on the perichaetial leaves is usually less vigorous, but continues to the apex. This is well within the variation seen in the type specimen of *C. bogoricum*. Neither of the syntypes of *C. rufo-viride* are present in BM (which houses Bescherelle's herbarium) and the only specimen that could be regarded as type material came from Brotherus' herbarium at Helsinki. In the interim, this specimen (H-BR, 1032006) must be regarded as the lectotype.

The recorded distribution of *C. rufo-viride*, *C. asperifolium* and *C. bogoricum* could be seen as almost contiguous (although separated by ocean), but only overlapping in Sri Lanka, where both *C. asperifolium* and *C. bogoricum* were recorded. This particular distribution pattern has also appeared before in Sematophyllaceae, e.g. *Acanthorrhynchium papillatum* (O'Shea, 1997) and *Acroporium punctuliferum* (O'Shea *et al.*, 1996) (= *A. lamprophyllum*), where in each case the Seychelles plants were initially found to be identical with Sri Lankan plants, and then linked to a centre of distribution in SE Asia.

The record of this taxon for Réunion appears to be an error, originating from Renauld's (1891) inclusion of the taxon on the list, which he stated was according to Bescherelle's Réunion flora (1880) - although Bescherelle does not list it for Réunion, and there is no other evidence of a collection from the island.

Distribution: Madagascar, Seychelles, Sri Lanka, Malaya, Java, Sumatra, Sarawak, Brunei, Kalimantan (Tengah), Cambodia, Thailand, Philippines.

Specimens examined: **BRUNEI DARUSSALAM**: Temburong, Batu Apoi Forest Reserve [4°N 114°E], walkway along Temburong River, dipterocarp forest, on small trunk, semi-open, 26 December 1995, *B.C. Tan 95-1109* (MO 4463849). **JAVA**: Mt Salak [6°44'S 106°43'E], 1680 m, *Kurz s.n.* (L 0060160, 0060161); near falls of Tjileurum, 1725 m, 22 Nov 1953, *A.H.G. Alston 12542d.* (BM 672496). **KALIMANTAN TENGAH**: 'Borneo', Koeala-Koeroen [=Kualakurun] [1°10'S 113°54'E], 1924, *H. Lampmann 23* (BM 672502); E. Kutai, peak of B.Papan, terrace Sembuni [1°S 116°E], [mossy forest, very humid, 1000 m (habitat and altitude data from Meijer (1954)), 14 July 1952, *W. Meijer B2209* (L 0246386); 16 km E of Sampit [2°S 113°E], 17 January 1954, *A.H.G. Alston 13034b, 13037d, 13042b* (BM 672492, 672493, 672494). **PENINSULAR MALAYA**: Negri Sembilan: Pasoh Forest Reserve, Smithsonian 50 ha plot (pristine forest), tree 141725 [2°N 102°E], ca. 100 m, 28 March 1995, *L.T. Ellis, s.n.* (BM); Pahang: S. Reniang, G. Tahan, on tree in jungle [4°34' 102°17'E], 20 ft from ground, [1000 m], 27 Aug 1928, *R.E. Holttum 20847a* (BM 672499). **PHILIPPINES**: Palawan, Puerto Princesa Municipality, Irawan Barungay, Mt. Malinao [9°N 118°E], slightly disturbed mid-montane forest, 800 m, 4 May 1983, *B.C. Tan 93-318* (L 0246387). **SARAWAK**: Dulit Ridge [3°N 114°E], 18 Sep 1932, *P.W. Richards 1930* (paratype of *A. laevibogoricum*) (BM 672517, 672520); *loc. cit.* 5 Oct 1932, *P.W. Richards 2135* (paratype of *A. laevibogoricum*) (BM 672518, 672519); Gunung Mulu NP: G. Api, near 3000' camp [4°05'N 114°55'E], lower montane mossy forest on steep N-facing slope, ca. 900 m, 16 May 1978,

Touw 20542 (L 0246389), Pinnacles Camp, scrub on ridge, on humus overhang at entrance of shallow limestone cave, 1200 m, 15 May 1978, *Touw 19979* (L 0246392; MO 3991030); Gunung Serapi, 15 km N of Kuching [1°N 110°E], at peak, 780 m, 21 July 1991, *H.Mohamed & B.Bakar 3094* (MO 4428017), forest by road to peak, 680 m, 22 July 1991, *H.Mohamed & B.Bakar 3166* (MO 3964249). **SEYCHELLES** (all as *C. rufo-viride*): **Mahé**: *G. de l'Isle s.n.* (H-BR 1032006) (lectotype of *C. rufo-viride*); Mount Harrison [4°40'S 55°28'E], [300 m.] 1908, *J. Stanley Gardiner s.n.* (BM 672491; H-BR 1032005); Morne Seychellois NP: Congo Rouge [4°38'S 55°26'E], 700-750 m, 10 October 1973, *Norkett 17094, 17118, 17140, 17145b, 17148, 17205* (BM 518536, 518535, 518534, 518533, 672125, 518532); Morne Seychellois NP: Congo Rouge [4°38'S 55°26'E], 700-750 m, 17 October 1973, *Norkett 17227b* (BM 518537); Ridge of Brulée, from Montagne Posée road [44°2'S 55°30'E], 350 m, 29 November 1973, *Norkett 17915* (BM 672123); Morne Seychellois NP: Ridge from Dans Iles to Vingt Cinq Sous [4°37'S 55°24'E], 300 m, 1 December 1973, *Norkett 17986* (BM 672124); *loc. cit.*, 450 m, 14 December 1973, *Norkett 18128* (BM 672126); Morne Seychellois NP: Vingt cinq sous [4°37'S 55°24'E], 450-500 m, 22 December 1973, *Norkett 18234, 18245, 18270* (BM 518531, 518530, 518529); Between Old Mission and Salazie, Foret Noir road [4°39'S 55°26'E], 450 m, 15 January 1974, *Norkett 18515, 18529, 18538* (BM 672127, 518528, 518527); Morne Seychellois NP: footpath to Morne Blanc [4°39'S 55°26'E], 550 m, blocks of granite under trees, 23 January 1974, *Onraedt 74.S.074* (PC), 650 m, *Norkett 18625* (BM 672128); Morne Seychellois NP: Congo Rouge [4°38'S 55°26'E], 700 m, June 1987, *Friedmann 5572* (PC). **Silhouette**: Below Corgate, rock in forest [4°29'S 55°14'E], 450 m, 11 November 1973, *Norkett 17786, 17787a* (BM 672129). **SRI LANKA** (all as *C. asperifolium*): *Thwaites 228* (isotype) (BM 672507, 672509, 672510, 672511); ex herb. Boswell, 1888, *s. leg.* (BM 672514); on fallen wood in forest of the Haycock Mt (Hiniduma) [6°19'N 80°20'E], 400 m, February 1906, *Herzog 20* (BM 672513; L); Kanniliya: Ndugana (from the Peradeniya Herb. Ceylon), 1 June 1928,

A.H.G. Alston 1619 (BM 672512). **SUMATRA**: Habinsaram, Tapianoeli, mossy jungle on lower slopes of Dolok Soeroengan, May 1927, *H.H. Bartlett 7988b* (BM 672501); Djambi: Pladju, Meruo Senami [1°S 102°E], 45 m, October 1953, *G.J.F. Breedveld 9a* (L). **THAILAND**: Krabi: Lanta [7°52'N 98°22'E], on tree in evergreen forest, c. 400 m, 15 April 1930, *A.F.G. Kerr M524* (BM 672498).

Clastobryophilum balansaeum (Besch.) Broth., Nat. Pfl. ed. 2, 11: 408. 1925.

Sematophyllum balansaeum Besch., Ann. Sc. Nat. Bot. ser. 5, 18: 237. 1873.

Lectotype (**lect. nov.**): New Caledonia: In cacumine montis Mi, 1000m, 1869, *Balansa 913* ex herb. Bescherelle (BM 672528!; isotypes BM 672529!; H-BR 1032001!; L!)

Very similar to *C. bogoricum*, but differs as follows: leaves (1.7-)2.3-3.1 x (0.2-)0.3-0.4 mm (ratio 5.2-8.8:1), laminal cells (85-)110-120(-130) x 9-10 µm (ratio 11.2-12.5:1), seta less scabrous above (usually top one third at the most). The differences are thus in the overall larger size of the plant, with the cell length in particular being larger, and the less papillose seta.

Habitat: apparently as for *C. bogoricum*, but recorded from 50-1000 m altitude.

The specimen nominated by Bescherelle (1873) is the same as that in Bescherelle's collection at BM, which also agrees with Bescherelle's description, so is here selected as the lectotype. Tixier (1977) selected the PC specimen of the same collection as the holotype, but the BM specimen must take priority, and the PC collection becomes an isotype.

It is almost 6000 kilometres between New Caledonia and the nearest site for *C. bogoricum* (in Kalimantan): the genus is not recorded from the Lesser Sunda islands, and I have found no records from Sulawesi or New Guinea. The differences seen between the two species are not great but are consistent in the three specimens

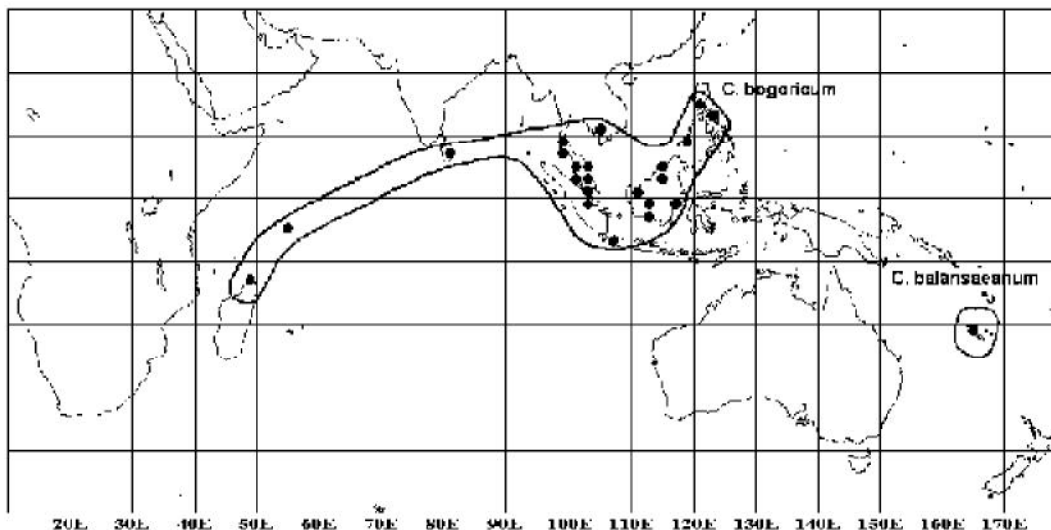


Figure 1. Distribution of *Clastobryophilum*.

This distribution data is taken from the species examined and from the following literature sources: Dixon (1926), Noguchi (1973), Tan & Iwatsuki (1991).

of *C. balansaeorum* available for study, and no similar variation has been seen amongst the *C. bogoricum* populations. The taxa are thus both recognised at species level.

Distribution: New Caledonia.

Specimens examined: **NEW CALEDONIA:** Mt. Mi [20°S 164°E], 1000 m, 1869, *Balansa 913* (BM 672528; isotypes BM 672529; H-BR 1032001; L); baie du Sud [21°S 165°E], sur écorces, September 1915, *Franc s.n.* (BM 672490); Maquis serpentineux secondaire au-dessus de la ferme Ducomum (vallée de Boulari), 50 msm, [no date], *H. Hürlimann 2353* (MO 2552917).

Excluded

Clastobryophilum bogoricum var. *laevibogoricum* (Dixon) Seki in Nog., Bull. Nat. Sci. Mus. 16: 302, 1973
Acroporium laevibogoricum Dixon, J. Linn. Soc. Bot. 50: 118, 1935
 Holotype: *P.W. Richards 1023* (BM!) (fide Tan, 1994, p. 29).

= *Clastobryum bornense* Broth. in M.Fleisch., Musci Fl. Buitenzorg 4: 1201. 1923 *nom nud.* in *synon.*, fide M.Fleisch., Musci Fl. Buitenzorg 4: 1200. 198. 1923

This taxon does not fit in with the concept of *Clastobryophilum* described here. It looks similar to *Clastobryophilum bogoricum*, but with the leaves much more rigid, not flexuose, the leaf lamina cells about half the width and not forming a strong oblique pattern, the perichaetial leaves much less strongly toothed at the apex, but with strongly toothed shoulders, and the seta smooth. It shares with *Clastobryophilum* comparatively thick-walled laminal cells, with pores, and thickened alar cell walls, and a similar leaf shape and dimension. One of the four collections seen had mature sporophytes, which may be chance, but which contrasts with the rarity of mature sporophytes in *C. bogoricum*. As the taxon is found in both Malaya and Sarawak and is totally consistent in its structure, with no intermediates with *Clastobryophilum*, it is clearly an independent taxon, and my first inclination was to regard it as a species of

Acroporium, but it does not fit within that genus either. If it were to remain within *Clastobryophilum*, the justification for the genus would be seriously compromised (identified principally in having long, narrow leaves). I have thus treated the taxon as excluded, but for the time being without a new identity outside the genus.

Habitat: lowland 'heath forest' on white sand soils, on trees and rotten logs, near sea level. The type collection contains largely *Arthrocormus schimperi* with only a small amount of this taxon.

It should be noted that the two paratypes of *A. laevibogoricum* listed by Dixon (1935) are *Clastobryophilum bogoricum*, and are listed under that taxon as specimens examined.

Distribution: Malaya, Sarawak.

Specimens examined: **PENINSULAR MALAYA:** Johore, Gunong Arong, 10 mi N of Mersing & 0.5 mi E of Mersing-Endau road [2°30'N 103°40'E], on lower bole of a 12 ft girth *Pithecelobium* sp. up to 15 ft, in lowland rainforest, very moist and shady, creeping, sparsely fruiting, occasional, 20 Jan 1954, *G.H.S. Wood 1356* (BM 672497). **SARAWAK:** 'Native collector' 1191 (type of *Clastobryum bornense* Broth., *nom. nud.*) (BM 672504, 672506; H-BR 1032003, 1032204; L 0246390; PC); Marudi (Claudetown), Baram, rotten logs in 'heath' (white sand) forest [4°17'N 114°19'E], 25 Jul 1932, *P.W. Richards 1023* (holotype of *Acroporium laevibogoricum*) (BM 672515, 672516); low lands, partly in forest, partly on lime stone, Jun 1888, *A.H. Everett 517* (BM 672503, 672505).

Clastobryophilum robustum Thér., *Rev. Bryol.* n. ser. 4: 136. 4 f. 12-17. 1932.

Holotype: VIETNAM. Ba-na, près Tourane [Da Nang] [16°2'N 107°59'E], sur arbre en forêt, 1500 m, *Poilane 7141b*. (PC!).

Tixier (1962) correctly synonymises this with *Myurium foxworthyi* (Broth.) Broth. (now = *Oediacidium fragile* Cardot, *fide* Iwatsuki,

1979). Comparing Bartram's (1939) description of *Myurium foxworthyi* with Thériot's type description does not suggest that the two could be the same, but there are errors in both: in particular, Thériot's illustration of the alar cells exaggerates their size and form, and Bartram describes a very large form not typical of those I have seen in BM and incorrectly describes the apex as 'piliform'.

Clastobryophilum serrulatum Broth., *Mitteil. Inst. Allg. Bot. Hamburg* 7(2): 129. 1928.
Holotype: KALIMANTAN BARAT (Indonesian Borneo): 'West-Borneo: Am mittleren Serawei oberhalb Djotta' [2°N 113°E], *H. Winkler 3270* (H-BR 1032002!).

The transfer of this taxon to *Trichosteleum* by Tan (1991) is correct. It differs from *Clastobryophilum* in its ovate-lanceolate leaves, thin-walled alar cells and non-serrate perichaetial leaves.

Acknowledgements

My thanks are due to Elinor Wiltshire for the original identification to genus of the Norkett Seychelles collections, to Ben Tan for his support and periodic injections of knowledge and wisdom (and particularly for his views on the delimitation of *Acroporium*), and to Len Ellis for assistance throughout the period of the study.

References

- Bartram, E.B. 1939.** Mosses of the Philippines. *Philippine Journal of Science* **68**: 1-437.
- Bescherelle, E. 1873.** Florule bryologique de la Nouvelle-Calédonie. *Annales des Sciences Naturelles, Botanique, série 5* **18**: 184-245.
- Bescherelle, E. 1880.** Florule bryologique de la Réunion et des autres îles austro-africaine de l'océan indien (Deuxième partie). *Annales des Sciences Naturelles, Botanique, série 6* **10**: 233-332.
- Brotherus, V.F. 1925.** *Die natürlichen Pflanzenfamilien. Musci (Laubmoose)*. Band 11, Hälfte 2. Leipzig: Engelmann.
- Brotherus, V.F. 1928.** 6. Musci., in: Irmacher, E. (ed.) *Beiträge zur Kenntnis der Flora von*

- Borneo. *Mitteilungen aus dem Institut für allgemeine Botanik in Hamburg* **7(2)**: 115-140.
- Dixon, H.N. 1926.** A list of the mosses of the Malay Peninsula. *Gardens' Bulletin of the Straits Settlements* **4**: 1-46.
- Dixon, H.N. 1933.** New species of Clastobryeae from Indo-Malaya. *Annales Bryologici* **6**: 31-37.
- Dixon, H.N. 1935.** A contribution to the moss flora of Borneo. *Journal of the Linnean Society, Botany* **50**: 57-140.
- Fleischer, M. 1914.** Laubmoose. In: Résultats de l'expédition scientifique Néerlandaise à la Nouvelle-Guinée en 1912 et 1913. *Nova Guinea* **12(2)**: 109-128.
- Fleischer, M. 1915-1922 [1923].** *Die Musci der Flora von Buitenzorg*. Leiden: E.J. Brill.
- Iwatsuki, Z. 1979.** Re-examination of *Myurium* and its related genera from Japan and its adjacent areas. *Journal of the Hattori Botanical Laboratory* **46**: 257-283.
- Meijer, W. 1954.** Collecting bryophytes in Borneo. *Bryologist* **57**: 261-272.
- 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, B.J. 1997.** A revision of *Acanthorrhynchium* (Sematophyllaceae) in Africa. *Tropical Bryology* **13**: 125-130.
- O'Shea, B.J., Frahm, J.-P. & Porembski, S. 1996.** Die Laubmoosflora der Seychellen. *Tropical Bryology* **12**: 169-191.
- Renauld, F. 1891.** Documents nouveaux sur les Muscinées des îles Austro-Africaine de l'Océan indien. *Revue de Botanique, Bulletin Mensuel* **8**: 209-229.
- Tan, B.C. 1991.** Miscellaneous notes on Asiatic mosses, especially Malesian Sematophyllaceae (Musci) and others. *Journal of the Hattori Botanical Laboratory* **70**: 91-106.
- Tan, B.C. 1993.** Noteworthy range extension of Malesian mosses. *Journal of the Hattori Botanical Laboratory* **74**: 227-233.
- Tan, B.C. 1994.** The bryophytes of Sabah (North Borneo) with special reference to the BRYOTROP transect of Mount Kinabulu. XIX. The genus *Acroporium* (Sematophyllaceae, Musci) in Borneo, with notes on species of Java and the Philippines. *Willdenowia* **24**: 255-294.
- Tan, B.C. & Buck, W.R. 1989.** A synoptic review of Philippine Sematophyllaceae with emphasis on Clastobryoideae and Heterophylloideae (Musci). *Journal of the Hattori Botanical Laboratory* **66**: 307-320.
- Tan, B.C. & Iwatsuki, Z. 1991.** A new annotated Philippine moss checklist. *Harvard Papers in Botany* **3**: 1-64.
- Thiers, B.M. 1992.** Indices to the species of mosses and lichens described by William Mitten. *Memoirs of the New York Botanical Garden* **68**: 1-113.
- Thériot, I. '1931' [1932].** Mousses de l'Annam. 4e contribution. *Revue Bryologique et Lichénologique* **4**: 135-137.
- Tixier, P. 1962.** Bryophytes du Vietnam. Premières récoltes dans le massif de Bach-Ma. *Revue Bryologique et Lichénologique* **31**: 190-203.
- Tixier, P. 1977.** Clastobryoidées et taxa apparentés. *Revue Bryologique et Lichénologique* **43**: 397-464.
- Wijk, R. van der, Margadant, W.D. & Florschütz, P.A. 1959-1969.** *Index Muscorum*. Utrecht: IAPT.

