

Notes on Seychelles mosses. 3-4. A revision of *Papillidiopsis* (Broth.) Buck & Tan, *Rhaphidostichum* Fleisch. and *Warburgiella* Müll. Hal. ex Broth. (Sematophyllaceae, Bryopsida) in Africa¹

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Abstract Three genera of the moss family Sematophyllaceae are revised for Africa as part of a project looking at the mosses of Seychelles. Two of the three species of the genus *Rhaphidostichum* Fleisch. (Sematophyllaceae, Bryopsida) prove to belong to different genera (*Papillidiopsis* (Broth.) Buck & Tan and *Acroporium* Mitt.). One of the two species of *Warburgiella* Fleisch. is shown to belong to *Trichosteleum*. All species are described and illustrated. The following two new combinations are made: *Papillidiopsis mahensis* (Besch.) O'Shea (basionym *Rhaphidostegium mahense* Besch.) and *Acroporium subluxurians* (Dix. & Thér.) Tan & O'Shea (basionym *Rhaphidostichum subluxurians* Dix. & Thér.). *Papillidiopsis malayana* (Dix.) Tan is made a synonym of *P. mahensis*, and the basionym of *Warburgiella leptorrhyncha* is altered to *Hypnum leptorrhynchum* Müll. Hal., Synopsis 2: 313. 1851.

3. A revision of *Papillidiopsis* (Broth.) Buck & Tan and *Rhaphidostichum* Fleisch. in Africa

Taxonomists of the past have been overly generous in describing new species in Sematophyllaceae, particularly in Africa, thus making taxonomic revision a difficult and time-

consuming task; the task is made more difficult as many of the descriptions are no more than a few words of Latin, with no illustration, often based on a scrappy specimen. Naturally, many of these 'species' have not been recorded since. Fortunately some genera have been spared this profligacy, and it is encouraging to be able to make some progress in taming this difficult family by documenting its more straightforward parts. There is a view that the boundaries between genera in the family are vague and founded on too few characters or inconsistent

¹ This paper contains the third and fourth contributions from the project on A.H. Norkett's Seychelles collections of 1973/4, from the Natural History Museum, London (BM). See Bruggeman-Nannenga (1998) for the previous contribution.

characters. Nevertheless, strategies such as placing all non-papillose species in *Sematophyllum* is not helpful, and defining segregates such as *Rhaphidostichum* can only reduce the current chaos and add a little more structure and clarity to the picture, teasing out the tractable from the (as yet) intractable.

The shortage of collections is often a real problem: how can you tell whether two similar species belong to the same taxon or not when each is known only from one or two collections? Without sufficient collections the range of variation cannot be known and an apparent discontinuity cannot be challenged. Within *Rhaphidostichum*, three species were recorded for Africa (O'Shea, 1995), but I could only find three published reports of *R. gracile*, two of *R. subluxurians*, and four of *R. mahense*. Fortunately A.H. Norkett's expedition to Seychelles in 1973/4 yielded 17 specimens of *R. mahense*, so it became possible to get a much clearer picture of the range of variation, and as a result, two of the species have now been transferred to other genera (*Papillidiopsis* and *Acroporium*).

This paper is an attempt to gather together, review and put into order the existing information about *Rhaphidostichum* and *Papillidiopsis*, two of the smaller genera of Sematophyllaceae in Africa, with the interim aim of providing assistance to those trying to identify African Sematophyllaceae, as well as to prepare the way in the longer term for a more wide-ranging revision. (*Acroporium* will be dealt with in a separate paper.) There is thus a concentration on taxonomic characters useful in identification, with some characters of apparent phylogenetic importance being ignored. References are given where fuller taxonomic accounts can be found.

Rhaphidostichum* and *Papillidiopsis

The genus *Rhaphidostichum* was created by Fleischner (1923) to accommodate two Javan species with particularly long, loriform (parallel-sided) apices, each of which was placed in a different section of the genus, one with papillose laminal

cells and one without. The former has now become *Papillidiopsis* (Buck & Tan, 1989), and the latter remains as *Rhaphidostichum*. Both genera are concentrated in Asia and Oceania: *Index Muscorum* (Wijk *et al.*, 1959-1969) does of course not distinguish those taxa which would now belong to *Papillidiopsis*, but lists 32 species of *Rhaphidostichum* for Asia and 9 for Oceania. In addition, three species are noted as endemic to tropical Africa and 2 endemic to the neotropics (Buck, 1989). An initial survey suggests that the majority of *Rhaphidostichum s. l.* species from Asia/Oceania will be transferred to *Papillidiopsis*, and one of the species from Africa is transferred in this paper.

A new interim key to the African genera of Sematophyllaceae will be published separately (O'Shea, in press), but all genera with papillose leaf cells (including *Papillidiopsis*) can be identified using the key in Buck & Tan (1989), and *Rhaphidostichum* can be distinguished from others in the family by its loriform leaf apex, its lack of leaf papillae and its prominent, thin-walled, inflated alar cells. *Papillidiopsis* possesses strongly inward-pointing alar cells like *Acroporium*, but differs in the leaf shape and particularly the abruptly narrowed apex. As the generic boundaries within Sematophyllaceae are still undergoing active revision, it remains to be seen whether these two genera can be maintained as monophyletic.

Rhaphidostichum has only one species in Africa and *Papillidiopsis* has two, but a generic description has been given for each genus in case further species are found. These descriptions are based on those in Buck & Tan (1989), extended where necessary to include the African species.

Rhaphidostichum Fleisch., Musci Fl. Buitenzorg, 4: 1307. 1923.

Quite large plants, in dense, glossy, usually golden mats. Stems irregularly branched, forming tufts up to 1 cm tall. Branches densely foliate, cuspidate. Leaves erect-spreading, concave, often twisted, narrowing quite rapidly from an oblong to slightly ovate base to a long, narrow,

usually loriform (parallel-sided) acumen; margins plane, notched above but usually entire below; costa absent; cells linear, smooth, very thick-walled, porose; alar cells large, oblong, inflated, larger near the margin and then often curved, frequently pointing inwards to the leaf insertion, usually 3 on each side, basal cell walls usually coloured yellow or brown. Autoicous or dioicous. Perichaetial leaves erect, sheathing the perichaetium, lanceolate, otherwise as normal leaves. Setae long, red, sometimes roughened above; capsules inclined (more so when dry), narrowed below the mouth when dry, exothecial cells collenchymatous. Spores small and papillose. Calyptrae long, cucullate, naked, smooth.

A fuller description appears in Buck (1989), and it is also described, *sensu lato*, in Fleischer (1923).

Of the three species previously recorded for Africa (O'Shea, 1995), two are transferred here into other genera (*R. mahense* to *Papillidiopsis*, and *R. subluxurians* to *Acroporium*), leaving *R. gracile* as the remaining African representative. Tan (1994) comments on the similarity of some species of this genus to *Acroporium*, which is true with this species.

Rhaphidostichum gracile Dix., Ann. Bryol., 6: 28. 1933. **Fig. 1, f-j.**

Holotype: Cameroon: Mt. Cameroon, January 1932, *Miss Steele 116a p.p.*, BM!

Leaves 2-2.6 mm long, 0.3-0.4 mm wide (width:length ratio 1:6-7), slightly notched towards the apex, the acumen forming 35-40% of leaf length; mid-leaf cells quite thick walled, porose, lumina 55-80 µm long, 4 µm wide; basal laminal cells thicker-walled and strongly porose; alar cells usually 3 to 5 (to 7 or more in Bioko specimens), 75-150 µm x 30-35 µm; basal area between alar cells yellow. Autoicous. Seta 12-16 mm, smooth; capsule obovate, when wet inclined to horizontal, 1.05 mm long (plus peristome 0.25-0.3 mm), width 0.6 mm (0.5 mm at mouth), when dry contracted below mouth and horizontal to slightly pendent. Spores 17-18 µm.

Rhaphidostichum gracile agrees well with the

type specimen of the genus, *R. bunodicarpum* (Müll. Hal.) Fleisch. of southeast Asia and Oceania, as well as with the Caribbean *R. schwaneckeanum* (Müll. Hal.) Broth. Future revisionary work in this genus may well find insufficient differences to maintain the present number of species in the genus, but the Asian species need separating from *Papillidiopsis* before this can happen. All specimens with habitat details were found growing on tree ferns. (Dixon (1933) unfortunately omits habitat information in his description of the type specimen, and neither does it appear on the specimen packet.)

Other descriptions/illustrations: None. A description and illustration of the type specimen of the genus (*R. bunodicarpum*) appears in Brotherus (1925) (p. 434 and fig. 739).

Distribution: Equatorial Guinea (Bioko), Cameroon.

Specimens examined: CAMEROON: Mt. Cameroon, 1/1932, *Steele 116a p.p.* (BM); Victoria Division, Cameroon Mt. Above Buea, 1220 m, growing abundantly on trunks of tree ferns in deep shade by the main path up the mountain, 8/11/1965, *Argent AR664* (BM). EQUATORIAL GUINEA (BIOKO): Berg Caldera 10 km S Luba am NON-Hang am Weg von Ruiche zum Gipfel, 2000-2260 mNN; N 3°22' E 8°32'; Bergnebelwald, epiphytisch an Baumfarn, 15/8/1994, *F. Müller B237, B239* (Hb. F. Müller); *loc. cit.*, 1200-1500 mNN, N 3°23' E 8°32', Bergregenwald, epiphytisch an Baumfarn, 18/8/1994, *F. Müller B236, B238* (Hb. F. Müller) (see Müller, 1996). [Also seen: *R. bunodicarpum* (Müll. Hal.) Fleisch.: ?, Achtal (?), New Hanover, Bismarck Archipelago, 24/7/1875, *Nauman 66* (BM - type specimen); *R. schwaneckeanum* (Müll. Hal.) Broth.: Morne Micotrin, Dominica, 920 m, 13/1/1896, *W.R.Elliott 1087c* (BM).]

Papillidiopsis (Broth.) Buck & Tan, Acta Bryolichenologica Asiatica 1: 11. 1989.

Quite large plants, in loose, slightly shiny, pale green mats, sometimes golden, usually (in our area) on rocks. Stems creeping, slightly flattened. Branch leaves patent, concave, ovate-lanceolate to oblong-lanceolate, abruptly

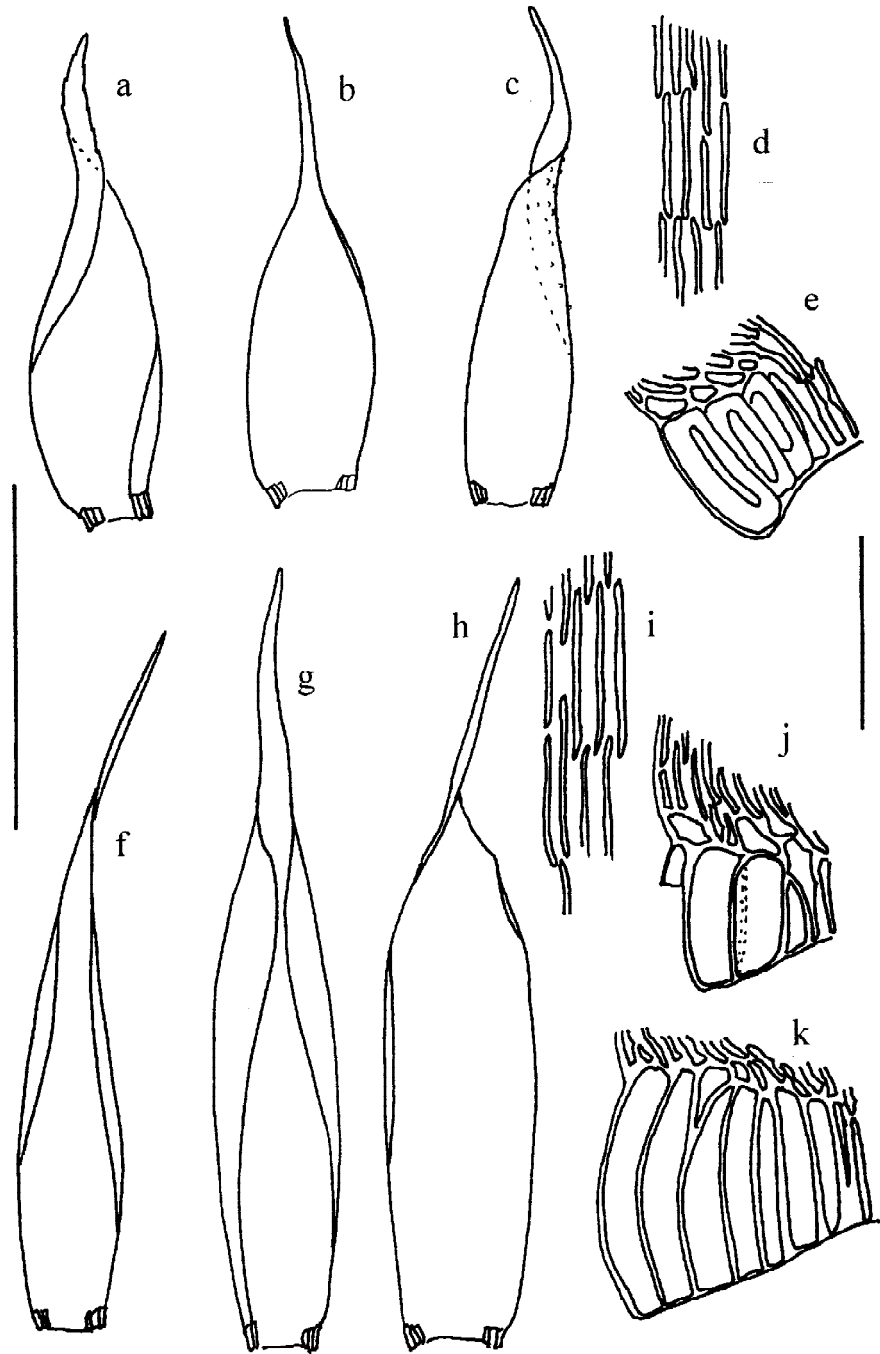


Fig 1. *Rhabdostichum* and *Acroporium*

Acroporium subluxurians. a-c, leaf shape; d, upper laminal cells; e, alar cells. *Rhabdostichum gracile*. f-h, leaf shape; i, upper laminal cells; j-k, alar cells. (a-e, Linder s.n., Liberia; f-g, Steele 116a, Cameroon; h-i, Argent AR664, Cameroon; j, Müller B238, Bioko; k, Müller B236, Bioko.) Scale bars: leaves 1 mm; leaf cells, 100 μ m.

contracted into an acute apex, margin toothed above; cells linear, flexuose, shorter at the base and in the acumen, thick-walled, porose (more so at base), unipapillose over lumen in upper part of leaf, alar cells enlarged, inflated, oblong, thin-walled, in a single row, usually coloured. Polyoicous. Perichaetial leaves erect, lanceolate, margins toothed, cells thick-walled, porose, smooth. Seta reddish, sometimes roughened above, capsules small, inclined to nodding, constricted at neck when dry, exothecial cells strongly collenchymatous. Calyptra cucullate, smooth.

This is the first record of this genus for Africa, which is regarded by Buck & Tan (1989) as principally Asian in distribution. However, Seychelles and the East African islands appear to be an outlier in the distribution of several Asian/Oceanic taxa not otherwise known for Africa, for instance *Acanthorrhynchium* (O'Shea, 1997) and *Clastobryophilum* (O'Shea *et al.*, 1996). At the species level this is also true for instance for *Acroporium lamprophyllum*, *Aerobryopsis longissima*, *Calymperes taitense* and *Syrrophodon croceus* (O'Shea *et al.*, 1996). Continuing work on the Seychelles flora is likely to reveal more.

Recent work on the Ugandan bryoflora has revealed another species of this genus in Africa (Porley *et al.*, 1998), a common Asian species, and it is possible that more will be found as work continues on revising African *Trichosteleum*. The species may be distinguished as follows:

1. Most leaves shorter than 2 mm; alar cells not curved towards stem; setae usually 1.5 mm or less; sporophyte almost 1 mm long

P. complanata

1. Most leaves longer than 2 mm; alar cells curved towards stem (*Acroporium*-like); setae usually greater than 1.5 mm; sporophyte c. 0.6 mm long

P. mahensis

Papillidiopsis complanata (Dix.) Buck & Tan, Acta Bryolichenologica Asiatica 1: 12. 1989. **Fig. 2, a-e.**

Basionym: *Acroporium complanatum* Dix., Bull. Torrey Bot. Cl. 51: 256. 4 f.

15. 1924. (\equiv *Warburgiella complanata* (Dix.) Broth., Nat. Pfl. ed. 2, 11: 535. 1925.)

Holotype: Base of Gunung Ledang, Malacca, 1892, *Ridley 236*. (BM!)

Plants light green; branches densely foliate, a little flattened; leaves 1.7-2.3 mm long, c. 0.3 mm wide (width:length ratio c. 1:6-8), the concave lamina extending into a flat acumen 15-25% of the leaf length, slightly toothed above; mid-leaf cell lumina 65-80 μm x 4-5 μm (width:length ratio 1:15-18), porose, upper-leaf cells shorter, 45-57 μm x 4 μm (ratio 1:11-17), papillae present throughout the lamina (apart from the base), alar cells large and prominent, not noticeably turned inwards, with relatively thin walls. Autoicous. Perichaetial leaves shorter, otherwise similar to stem leaves. Setae red, 12-15 mm, smooth; capsules 0.9-1.0 mm long x 0.6 mm across when wet. Spores spherical, 12-19 μm , smooth.

This plant has leaves rather shorter than *P. mahensis*, with a shorter acumen, more prominent papillae, alar cells less *Acroporium*-like, with a shorter seta and larger sporophyte. The African plants were growing on the adventitious roots of *Cyathea*, but elsewhere it grows also on rock.

Other descriptions/illustrations: Dixon (1924) includes a brief discussion of the differences from related plants and of his reasons for putting this plant in *Acroporium* rather than *Warburgiella*, and provides a small illustration of the leaf apex. Distribution: Uganda, Malayan Peninsula, Thailand.

Specimens examined (all specimens in BM unless otherwise stated): UGANDA. Bushenyi. Kalinzu Forest, tributary of Kiryantama R., W. of Kayanga, 1440 m, 0°23'S 30°5'E, on a tree fern in valley near stream, 4 Feb 1997, *Hodgetts 4543d* (E). Rukungiri. Bwindi-Impenetrable Forest, Buhoma, 1720 m, 1°0'S 29°37'E, *Cyathea* by waterfall, 7 Feb 1997, *O'Shea 5539a*, *Wigginton 8343a* (both E). SINGAPORE. Bukit Timah Nature Reserve, 70 m, 1°21'N 103°46'E, rocks by path, 10 Jun 1998, *O'Shea 98E19* (Hb. O'Shea). MALAYAN PENINSULA. Malacca. Base of Gunung Ledang, epiphyte on twigs, Jun 1892, *H.N. Ridley 236*. Negri Sembilan. Gunung Angsi,

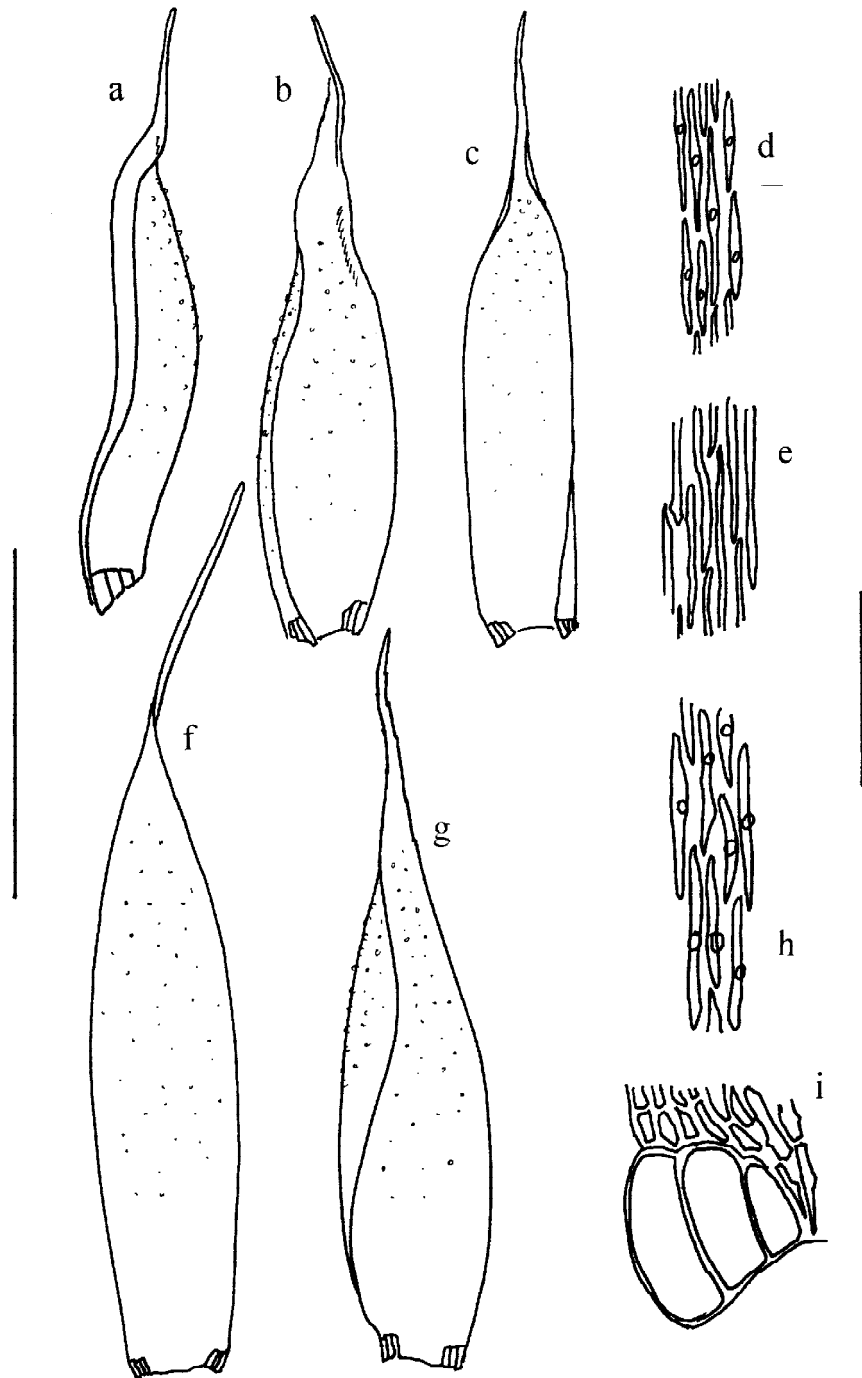


Fig 2. *Papillidiopsis*

Papillidiopsis complanata. a-c, leaf shape; d, upper laminal cells; e, lower laminal cells. *Papillidiopsis mahensis*. f-g, leaf shape; h, upper laminal cells; i, alar cells. (a,d, *O'Shea 5539a*, Uganda; b, *Hodgetts 4543d*, Uganda; c, *Wigginton 8343a*, Uganda; e, *Ridley 236*, Malaya; f, *Gardiner s.n.*, Seychelles; g, *Jeffrey & Zelia 396*, Seychelles; h-i, *Norkett 16397*, Seychelles.) Scale bars: leaves 1 mm; leaf cells, 100 μ m.

600-800 m, 30 Jun 1930, *G.A.C. Herklots 222*. Penang. Western Hill, 600-820 m, twigs, 5 Aug 1940, *G.H. Spare 3135, 3156*; Penang Hill, 300-600 m, dry tree stems, 22 Oct 1939, *G.H. Spare 2614*. THAILAND. Udawn, Lôi, Kao Krading, c. 1200 m, on rock in evergreen forest, 11 Feb 1931, *A.F.G. Kerr 571*.

***Papillidiopsis mahensis* (Besch.) O'Shea, **comb. nov.** Fig. 2, f-i.**

Basionym: *Rhaphidostegium mahense* Besch., Ann. Sci. Nat. Bot., sér.6, 10: 308. 1880. (= *Sematophyllum mahense* (Besch.) Kindb., Enum. Bryin. Exot. 104. 1891; *Rhaphidostichum mahense* (Besch.) Broth., Nat. Pfl. ed. 2, 11: 434. 1925.)
 Isotype: Seychelles: Forêt Noire, à Mahé, 7/1876, *G. de l'Isle s.n.* (PC!)
 = *Acroporium malayanum* Dix., Bull. Torrey Bot. Club 51: 257. 1924, **syn. nov.** (= *Rhaphidostichum malayanum* (Dix.) Dix., J. Linn. Soc. Bot. 50: 127. 1935; *Papillidiopsis malayana* (Dix.) Tan, Willdenowia 24: 292. 1994.)

Branches densely foliate, some branches secund, particularly towards the apex, sometimes cuspidate; leaves 2.1-2.8 mm long, 0.3-0.6 mm wide (width:length ratio 1:4-6), extending, often quite suddenly, into a long acumen 20-35% of the leaf length, slightly toothed above; mid-leaf cells sinuose, porose, lumina 45-100 µm x 3.5-6 µm (width:length ratio 1:(8-)15-23, the shorter cells often being noticeably wider), papillae always present in the upper part of the lamina, but sometimes only visible on the dorsal side of the leaf; alar cells often all curved inwards (as with *Acroporium*), with slightly thickened walls. Autoicous. Perichaetial leaves shorter, ovate, sheathing, attenuate towards apex. Setae red, 15-20 mm, smooth; capsules short (about 0.6 mm long x 0.45 mm across when wet), constricted below neck when dry, pendent from a terminal twist of the seta. Spores spherical, 17 µm, smooth.

The papillae may be difficult to see, but all specimens examined possessed them: the folded edge of a bent over leaf is the easiest place to see them, but they are often quite difficult to see on

the ventral surface, although they seem most prominent at the base of the acumen as it flattens from the concave lamina. Bescherelle's original protologue does not mention papillae, but the isotype collection bears leaves varying from weakly to quite strongly papillate. The most obvious differences from *Rhaphidostichum gracile* are the sinuose, papillate and more porose laminal cells, the thicker-walled, banana-shaped alar cells, and the generally slightly broader leaves with a shorter acumen. For differences from *P. complanata*, see above.

There is no specimen from Bescherelle's herbarium in BM, but there is a specimen in PC from Cardot's herbarium labelled "Seychelles: Mahé, Leg. G. de l'Isle". This specimen agrees well with the other collections examined for this revision, and there appear to have been no other collections of this taxon between de l'Isle's visit in 1876, and Gardiner's in 1908. However, as the specimen is not from Bescherelle's herbarium, it is nominated as an isotype rather than the holotype, until such time as the fate of Bescherelle's specimen can be established.

As all the appropriate transfers to *Papillidiopsis* have yet to be made from *Rhaphidostichum* and probably from *Trichosteleum*, it is too early to comment on the range of character states in the genus. However, the length of the acumen in the Seychelles specimens seems to be consistently longer than those of the genus described by Noguchi *et al.* (1994) and Buck & Tan (1989), although within the range of *Papillidiopsis malayana* (Dix.) Tan. Dr B.C. Tan suggested (pers. comm.) that this latter species was a synonym of *P. mahensis*, and following an examination of the type species, that is supported here.

Other descriptions/illustrations: None.

Distribution: Seychelles, Malayan Peninsula, Philippines.

Specimens examined (all specimens in BM unless otherwise stated): SEYCHELLES (MAHÉ). Forêt Noire, 7/1876, *G. de l'Isle s.n.* (PC); Cascade Mountains, 1908, *J.S. Gardiner s.n.*; On boulders in cinnamon forest, above Sans Souci, 400 m, 7/11/1961, *Jeffrey & Zelia 396*; Le Niol reservoir,

200 m, 24/8/1973, *Norkett 16216*; Between Old Mission and Salazie, Forêt Noire road, 450 m, 4/9/1973, *Norkett 16397, 16441A*; Le Niol, just above reservoir, 230 m, 14/9/1973, *Norkett 16571, 16575, 16576, 16577, 16590, 16598*; On soil, Sans Souci road, 200 m, 20/9/1973, *Norkett 16689*; 'Casa Procter', Forêt Noire road near Val Riche, 320 m, 22/9/1973, *Norkett 16734, 16740*; Morne Seychellois National Park: Gongo Rouge, path up to and near the stream, 700 m, 17/10/1973, *Norkett 17286*; Near Solitude River, 300 m, 20/10/1973, *Norkett 17428A*; Trois Frères river, Victoria, 180 m, 1/11/1973, *Norkett 17487*; On rocks, forest below Trois Frères, 300 m, 22/11/1973, *Norkett 17856*; Path to Sixpenny Hill, 200 m, 24/11/1973, *Norkett 17876*; On rock surfaces, Ridge of Brulée, 350 m, 29/11/1973, *Norkett 17931, 17944*; Path from Dans Isles to Vingt Cinq Sous, 300 m, 1/12/1973, *Norkett 18005*; On rock, Bernica gorge, 230 m, 19/12/1973, *Norkett 18196*; Morne Seychellois National Park, forest track above Vingt Cinq Sous, near stream, 450 m, 22/12/1973, *Norkett 18227, 18247*; Shady rocks just below waterfall, R. Cascade, just above Cascade village, 200 m, 30/12/1973, *Norkett 18313*; On humic crust and dead wood, between Old Mission and Salazie, Forêt Noire road, 460 m, 15/1/1974, *Norkett 18524*. SEYCHELLES (SILHOUETTE). Large rock, forest below Corgate, 400 m, 11/11/1973, *Norkett 17806*. MALAYA (PINANG). Botanical Gardens, 11/6/1913, *C.H. Binstead, s.n.* (as *Sematophyllum malayanum* Dix. *nom. herb.*).

Acroporium Mitt., J. Linn. Soc. Bot. 10: 182. 1868.

Acroporium subluxurians (Dix. & Thér.) B.C. Tan & O'Shea **comb. nov.** **Fig. 1, a-e.**

Basionym: *Rhaphidostichum subluxurians* Dix. & Thér., Rev. Bryol. n.s. 3: 48. 13. 1930.

Lectotype (nominated here): Liberia: Totakwith, Medina, 30/12/1926, *D.H. Linder 1354* BM!

Plants in greenish-yellow, shiny mats; branches densely foliate; leaves erect when dry, patent when wet, 1.3-1.6 mm long, strongly concave,

oblong, contracted rapidly into a sub-denticulate apex; costa absent; cells linear, slightly flexuose, lightly papillose on dorsal surface, 50-70 µm long, 2.5-6 µm wide; alar cells 3-4 in a row, large, inflated, thick-walled (lumen narrower than walls in some leaves), 70-80 µm long. Perichaetial leaves erect-sheathing, similar to branch leaves, but narrower. Setae rugose above, 12-15 mm. Capsule small, horizontal to inclined, oblong, neck rugose and long, constricted below the mouth when dry.

Although two collections are quoted by Thériot preceding the original description, one of the two (Ghana: Abbontiakoon, Tarkwa, 1910, *H.H. Saxby s.n.*. BM!) belongs to a different taxon, and Dixon's own annotations at BM state that it does not belong to *Rhaphidostichum subluxurians*, but to *Trichosteleum chrysophyllum* Potier de la Varde. I have examined both Saxby's collection and the type of *T. chrysophyllum*, and they are the same, although not necessarily correctly placed in *Trichosteleum*. A specimen of the Linder collection is in BM (Ex. Hb. Thériot), annotated "Type. H.N.D." in Dixon's handwriting, and it also shows a strong concordance with the description and illustrations in Thériot's paper (1930). Linder's collection from Liberia is thus nominated as lectotype. It is assumed, but not confirmed, that the remainder of the collection remains in Thériot's herbarium. So far as I know, *Acroporium subluxurians* has not been collected since under this name.

The allocation of this plant to *Acroporium* was made on the basis of: the *Acroporium*-like alar cells, the non-papillose laminal cells, the long leaves, and the collenchymatous exothecial cells.

Other descriptions/illustrations: Thériot (1930), as well as the Latin description, provides an illustration and a one sentence summary.

Distribution: Liberia.

Specimens examined: LIBERIA: Totakwith, Medina, 30/12/1926, *D.H. Linder 1354*. (BM).

Excluded taxon

Rhaphidostichum replicatum (Hampe) Fleisch.

This species is included for Africa-3 (East African islands) in *Index Muscorum* (Wijk *et al.*, 1959-1969). However, there is no evidence in Hampe (1872) or Fleischer (1923) that this taxon is known from Africa, and there is no mention in Crosby *et al.*'s (1983) thorough listing for the area. Bescherelle (1880) describes a *Rhaphidostegium* (*Rhaphidorrhynchium*) *replicatum*, but Dixon (1920) synonymised this with *Sematophyllum caespitosum*. I have examined specimens of the Hampe taxon from Sri Lanka, and it is clear that the taxon should never have been assigned to this genus. Whether or not the mention of Africa in this taxon's distribution was a mistake in *Index Muscorum*, the species is excluded from the genera considered in this revision.

4. A revision of *Warburgiella* Müll. Hal. ex Broth. in Africa

The genus *Warburgiella* has not yet been found in Seychelles, but investigations into other genera found in Seychelles has necessitated an examination of the species of this genus also.

Warburgiella Müll. Hal. ex Broth., *Monsunia* 1: 176. 1900.

Small plants in dense shiny mats. Stems creeping. Branch leaves typically strongly falcate-secund to circinate (but in two of our species not or only slightly circinate), lanceolate to ovate-lanceolate, concave, long-acuminate; margins sharply serrate above with long cell wall extensions, entire below; costa short and double or none; cells linear, smooth to slightly papillose, walls thin to thickened; alar cells enlarged, inflated, thick-walled, often coloured, in a single row. Autoicous. Setae long, curved at apex, smooth or papillose above; capsules inclined, \pm symmetric, cylindrical to conical with an elongate often pustulose neck; exothecial cells not collenchymatous. Spores small, finely papillose. Calyptrae mitrate or cucullate, large, covering most of the mature capsule, smooth.

Buck & Tan (1989) say that the perichaetial

leaves of *Warburgiella* are similar to the vegetative leaves, but with a more clasping base without differentiated alar cells. This was not the case with *W. leptorrhyncha* (type not seen by Buck & Tan), where the leaves were longer and narrower, straight not falcate, and had differentiated short rectangular cells in the lower part of the leaf, including the alar area.

Two species were recorded for the genus in O'Shea (1995), but on investigation, one of these proved to belong to a different genus (*Trichosteleum*), in which it had already been named: a description is provided of both species.

Warburgiella leptorrhyncha (Müll. Hal.) Broth., *Nat. Pfl.* ed. 2, 11: 429. 1925. **Fig. 3, a-f.**

Basionym: *Hypnum leptorrhynchum* Müll. Hal., *Synopsis* 2: 313. 1851. [*Hypnum leptorrhynchum* Brid., *Sp. Musc. Suppl.* 2: 222. 1812, *nom. illeg. incl. spec. prior*] (\equiv *Rhaphidostegium leptorrhynchum* (Müll. Hal.) Jaeg., *Ber. S. Gall. Naturw. Ges.* 1876-77: 404. (Ad. 2: 470) 1878, *nom. illeg. incl. spec. prior*; *Trichosteleum leptorrhynchum* (Müll. Hal.) Ren., *Prodr. Fl. Bryol. Madag.* 239. 1898.)

Lectotype: Réunion: in sylvis humidis Insulae Borboniae terrae adrepens, *Bory St. Vincent s.n.*, BM!

= *Trichosteleum leptorrhynchum* var. *subintegrifolium* Thér. & P.Varde, *Bull. Soc. Bot. France* 71: 1058. 1924; *syn. nov.* (type not seen).

Plants small, in pale green, shiny mats on trees; leaves falcate, narrow lanceolate, concave, 1.2-1.5 mm long, usually toothed (more strongly in upper half), apex flexuose; costa indistinct to absent; mid-leaf cells linear, some slightly flexuose, walls slightly thickened, 60-75 μ m in length, not, slightly to strongly papillose (papillae particularly noticeable on the dorsal surface); alar cells large, inflated, thick-walled, 40-50 μ m in length. Perichaetial leaves long and narrow (ca. 1.8 mm), straight, toothed, with short rectangular cells in the basal area. Setae smooth, 15-30 mm. Capsule horizontal, smooth, narrowly cylindrical-

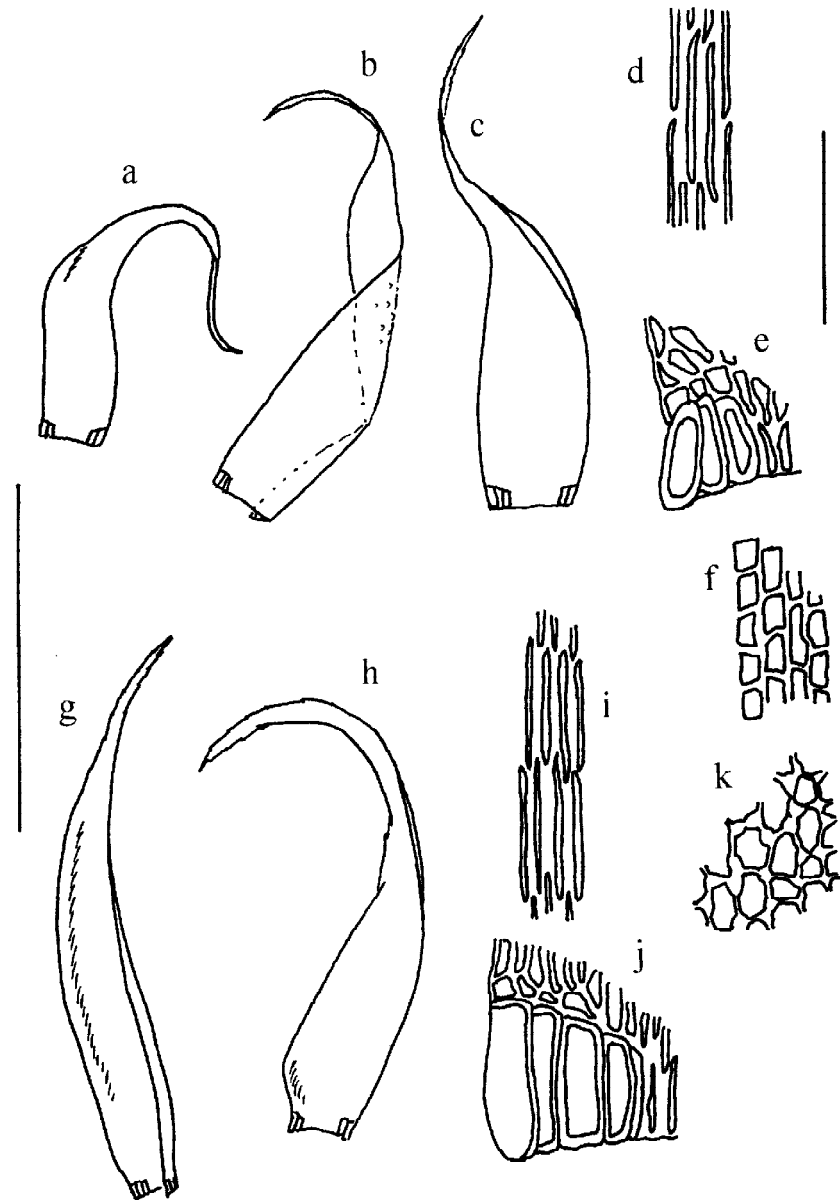


Fig 3. Warburgiella and Trichosteleum

Warburgiella leptorrhyncha. a-c, leaf shape; d, upper laminal cells; e, alar cells; f, exothecial cells. *Trichosteleum adhaerens*. g-h, leaf shape; i, mid-leaf cells; j, alar cells; k, exothecial cells. (a-f, *Lepervanche s.n.*, Réunion; g-k, *Frappier s.n.*, Réunion.) Scale bars: leaves 1 mm; leaf cells, 100 μm .

oblong, constricted below the mouth when dry; exothelial cells non-collenchymatous; peristome teeth striate below, papillose above, no central furrow.

The leaves could be mistaken for those of *Trichosteleum* species, but that genus always has collenchymatous exothelial cells. This is one of the few genera in the Sematophyllaceae with non-collenchymatous exothelial cells.

There are some nomenclatural problems with the name used for this taxon by *Index Muscorum* (Wijk *et al.*, 1959-69): *Warburgiella leptorrhyncha* (Jaeg.) Broth. Bridel's (1812) original description of *Hypnum leptorrhynchum* was illegal as he included within its scope a taxon he had previously named as *Hypnum cyparioides*. *Hypnum cyparioides* was based on a Tasmanian plant collected by La Billardière, and *H. leptorrhynchum* was based on this plant as well as a further collection by Bory de Saint Vincent from Réunion, which proved to be a different taxon: not only was the name illegal, it also included two different taxa. Müller (1851) resolved the problem by reconstituting the name *H. cyparioides* for the Tasmanian specimen, and legitimising *H. leptorrhynchum* by including specifically only the Réunion specimen. Brotherus (1925) followed this by including only the Réunion specimen when he transferred *H. leptorrhynchum* to *Warburgiella*. Unfortunately, Jaeger (1878) ignored Müller (1851) and transferred *H. leptorrhynchum* to *Rhaphidostegium* including both Tasmanian and Réunion specimens, and it was this publication that *Index Muscorum* mistakenly assumed had validated Bridel's name; unfortunately it only perpetuated the original illegality. Müller rather than Jaeger is thus the original legal author. *Index Muscorum* correctly regards *H. cyparioides* as a synonym of *Rhaphidorrhynchium amoenum* (based on Dixon's (1929) synonymisation), known from Australasia and South America. Any non-African collections labelled '*W. leptorrhyncha*' are likely to belong to this taxon.

There are specimens that purport to be types of this taxon in both BM and PC. It is possible that both collections came from the same collection,

but the BM specimen is nominated as lectotype for the following reasons: it states clearly (in Hampe's handwriting) that the specimen was collected by Bory; and the specimen is from Hampe's herbarium, and annotations by Gepp indicate that Hampe was aware of the confusion caused by Bridel's merging of two different taxa under one name. Unfortunately the specimen has no sporophytes. The PC collection has no collector name (although it is identified "No. 32. Leskea?") and is from herb F. Camus, and prior to that from herb. Richard. There appear to be seven different authors to the annotations on the packet, but the 'type' annotation appears to be from 1878 to 1898. In addition, the specimen, which is glued to paper, has only one capsule, which makes examination difficult: it does appear though that the exothecium has non-collenchymatous cells. It is possible that this is an isotype.

Trichosteleum leptorrhynchum var. *subintegrifolium* (type not seen) is merely a form with very little serration (which is a variable character in this taxon), and is thus made a synonym.

Several BM specimens (e.g. ZAIRE. Ruwenzori (Lamuri), ± 2500 m, on bamboos, 24/5/1914, *Bequaert s.n.* SOUTH AFRICA. Forests St. August, 2500-3000', *Baur 397*; Kooksbosch, Clarkson, Cape Province (ex Hb. Schimper).) did not belong to *Warburgiella* but *Trichosteleum*. Because of problems in finding appropriate names in *Trichosteleum*, it can only be said that they appeared to be the same as *T. pervilleanum*, although a more appropriate name may emerge following revision of the genus. It is suggested that all collections be reviewed.

Other descriptions/illustrations: Bescherelle (1880) (description only).

Distribution: Ethiopia, Kenya, Tanzania, Zaire, Madagascar, Mauritius, Réunion, South Africa. Specimens examined (all specimens from BM): MADAGASCAR. North-east Madagascar, 1841, *Perville 817*. (There is also a second Perville specimen, annotated 'Perville Mus. Par. 52', which may be from the same collection.) RÉUNION. *Bory s.n.*; *P. Lépervanche s.n.*

Trichosteleum Mitt., J. Linn. Soc. Bot. 10: 181. 1868.

Trichosteleum adhaerens (Besch.) Kindb., Enum. Bryin. Exot. 104. 1891. **Fig. 3, g-k.**

Basionym: *Rhaphidostegium adhaerens* Besch., Ann. Sci. Nat Bot. ser. 6, 10: 305. 1880. (≡ *Warburgiella adhaerens* (Besch.) Broth., Nat. Pfl. ed. 2, 11: 429. 1925.)

Lectotype (nominated here): La Réunion: sur les écorces d'arbres, associé au *Rhaphid. Borbonicum* [= *Radulina borbonica*], *Frappier s.n.* BM!

Plants in pale green, creeping mats on trees; leaves patent, ovate-lanceolate to lanceolate, narrowed at base, concave, 1.7 mm in length, with long acumen toothed, often strongly, with projecting cell ends; mid-leaf cells linear, wall slightly thickened, 35-70 µm long, 3-4 µm wide, slightly papillose; basal cells shorter, porose; alar cells in one row, large (65-80 µm in length), inflated, variously thickened, sometimes with walls almost as thick as the lumen. Perichaetial leaves similar. Setae 10-12 mm, smooth; capsule small, sub-pendulous, narrowed below mouth when dry. Exothecial cells strongly collenchymatous.

A lectotype is cited here from BM, as they are the holder of the Bescherelle herbarium, and the packet is clearly identified as Frappier's collection. No other collections are known of this species under this name.

The papillae are not always easy to see, but as the concavity of the leaves causes them usually to be folded when on a microscope slide, the papillae are visible on the folded edge.

Other descriptions/illustrations: None.

Distribution: Réunion.

Specimens examined: RÉUNION. On the bark of trees, associated with *Radulina borbonica*, *Frappier s.n.* BM.

Excluded:

Trichosteleum leptorrhynchum var. *madagassum* Ren. & Card., Bull. Soc. R. Bot. Belg. 41(1): 97. 1905.

I have not seen the type specimen of this taxon, but the illustrations associated with the type description show strongly collenchymatous exothecial cells, excluding it from *Warburgiella*.

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References

- Bescherelle, E. 1880.** Florule bryologique de la Réunion et des autres îles austro-africaines de l'océan Indien. Annales des Science Naturelles; Botanique, sér.6 10: 233-332.
- Bridel, S.A. 1812.** Muscologiae recentiorum supplementum seu species muscorum. Pars II Gothae: Ex officina libraria Ettingeriana.
- Brotherus, V.F. 1925.** Die natürlichen Pflanzenfamilien. Musci (Laubmoose). Band 11, Hälfte 2. Leipzig: Engelmann.
- Bruggeman-Nannenga, M.A. (in press).** Notes on Seychelles Mosses. 2. Revision of the Fissidentaceae. Bryobrothera
- Buck, W.R. 1989.** Miscellaneous notes on Antillean mosses, 2. *Rhaphidostichum* (Sematophyllaceae) in the New World. Moscosoa 5:189-193.
- Buck, W.R. & Tan, B.C. 1989.** The Asiatic genera of Sematophyllaceae associated with *Trichosteleum*. Acta Bryolichenologica Asiatica 1: 5-19.
- Crosby, M.R., Schultze-Motel, U. & Schultze-Motel, W. 1983.** Katalog der Laubmoose von Madagaskar und den umliegenden Inseln. Willdenowia 13: 187-255.
- Dixon, H.N. 1920.** *Rhaphidostegium caespitosum*

- (Sw.) and its affinities. *Journal of Botany* 58: 81-89.
- Dixon, H.N. 1924.** New species of mosses from the Malay Peninsula. *Bulletin of the Torrey Botanical Club* 51: 225-259.
- Dixon, H.N. 1929.** Studies in the bryology of New Zealand. *New Zealand Institute Bulletin* 3(6): 299-313.
- Dixon, H.N. 1933.** Mosses collected on Mt. Cameroon by Miss M. Steele. *Annales Bryologici* 6: 20-30.
- Fleischer, M. 1915-1922 [1923].** Die Musci der Flora von Buitenzorg. Leiden: E.J. Brill.
- Hampe, E. 1872.** Musci frondosi in insulis Ceylon et Borneo a Dr. OD Beccari lecti. *Nouv. Giorn. Bot. Ital.* 4: 273-291.
- Jaeger, A. 1878.** Genera et species muscorum systematice disposita seu adumbratio florum muscorum totius orbis terrarum. Bericht über die Thatigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft 18: 211-454.
- Müller, C. 1851.** Synopsis Muscorum Frondosorum omnium hucusque cognitorum - Pars secunda. Berolini: Sumptibus Alb. Foerstner.
- Müller, F. 1996.** Beitrag zur Moosflora der Insel Bioko (=Fernando Póo), Äquatorial-Guinea. *Tropical Bryology* 12: 75-96.
- Noguchi, A., supplemented by Iwatsuki, Z. & Yamaguchi, T. 1994.** Illustrated Moss Flora of Japan. Part 5. Nichinan: Hattori Botanical Laboratory
- O'Shea, B.J. 1995.** Checklist of the mosses of sub-Saharan Africa. *Tropical Bryology* 10: 91-198.
- O'Shea, B.J. 1997.** A revision of *Acanthorrhynchium* (Sematophyllaceae) in Africa. *Tropical Bryology* 13: 125-130.
- O'Shea, B.J. (in press).** African Sematophyllaceae (Bryopsida) and a new key to the genera, using mainly gametophytic characters. *Bryobrothera*.
- O'Shea, B.J., Frahm, J.-P. & Porembski, S. 1996.** Die Laubmoosflora der Seychellen. *Tropical Bryology* 12: 169-191.
- Porley, R.D., O'Shea, B.J., Wigginton, M.J., Matcham, H.W., Hodgetts, N.J. & Stevenson, C.R. (in press).** Bryophytes of Uganda, 2. New and interesting records for Uganda, 1.
- Tan, B.C. 1994.** The bryophytes of Sabah (North Borneo) with special reference to the BRYOTROP transect of Mount Kinabalu. XIX. The genus *Acroporium* (Sematophyllaceae, Musci) in Borneo, with notes on species of Java and the Philippines. *Willdenowia* 24: 255-294.
- Thériot, I. 1930.** Mousses du Congo Belge et du Liberia récoltées par D.H. Linder (Expedition of the Harvard Institute of Tropical Biology and Medicine 1926-27). *Revue Bryologique et Lichénologique* 3: 30-50.
- Wijk, R. van der, Margadant, W.D. & Florschütz, P.A. 1959-1969.** Index Muscorum. Utrecht: IAPT.

