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Taxonomic Results of the BRYOTROP Expedition to Zaire and Rwanda

24. Leskeaceae, Brachytheciaceae, Stereophyllaceae, Plagiotheciaceae, Entodontaceae, Sematophyllaceae p.pte, Hypnaceae (except Hypnum)

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Abbreviations::

* New record for Rwanda viz. Zaire
KB: Kahuzi-Biega (Zaire)
Ka: Karisimbi (Rwanda)
Ny: Nyungwe Forest (Rwanda)
Ak: Akagera region (Rwanda)
Ki: Kigali region (Rwanda)
100-171, number of collecting site.
For locality data and a description of the collecting sites see the contribution by E. Fischer on the vegetation of the study area in this volume (Tropical Bryology 8: 13-37, 1993). The specimens are deposited at the Botanical Museum Berlin as well as in the herbarium of the author (except for unicates).

LESKEACEAE

1. Plants robust; paraphyllia numerous; laminal cells papillose.....*Hylocomiopsis*
1*. Plants slender; paraphyllia none; laminal cells smooth.....*Pseudoleskeopsis*

Hylocomiopsis Card.

H. cylindricarpa Thér.

This very distinctive and easily recognized moss has terete foliation when dry, and has leaves spreading when moist. The leaves are ovate, abruptly broad-acuminate, about 1.5-2 mm long, and strongly plicate. The single costa extends to the base of the acumen, and the laminal cells are 1-2(-3):1 and low unipapillose. The stems and branches are densely clothed with paraphyllia that are 1(-2)-seriate, irregularly branches, not papillose, and with pointed terminal cells. The perichaetia are huge, with leaves to 8 mm long, oblong-lanceolate, and plicate. The costa extending almost to the apex, and the cells are linear-rectangular. The vaginula is densely hairy but the cucullate calyptra is naked. The setae are 2.5-3.5 cm long and capsules are 3-4 mm long and slightly curved. The BRYOTROP material lacks capsules with good peristomes. The species has been described in detail and

illustrated by De Sloover (1976).

The collections cited here grew in montane forests at 2250-2500 m, and mostly on the bark of *Hagenia*.

Ny: 103, *Pócs 6177*. **KB:** 128, *Pócs 7626*; 135, *Pócs 7246*; 136, *Frahm 6961*; 139, *Pócs 7276*; 141, *Frahm 7050*.

Pseudoleskeopsis Broth.

P. claviramea (C. Müll.) Thér. (*Pseudoleskea claviramea* (C. Müll.) Jaeg.)

This small moss has julaceous branches that are curved when dry. The leaves that are less than 1 mm long are spreading when moist and with a broadly ovate base. The costa extends into the acumen, and the laminal cells are short and smooth throughout.

The single collection cited here was growing with *Entodontopsis nitens* on the bark of a roadside tree at 1800 m.

Rwanda: 100, *Frahm 8003A*.

BRACHYTHECIACEAE

1. Branch and stem leaves strongly differentiated .....*Eurhynchium*
1*. Branch and stem leaves similar.....2

2. Leaf margins entire or only serrulate in upper half .....*Brachythecium*
2*. Leaf margins serrulate throughout 3

3. Leaves plicate .....*Palamocladium*
3*. Leaves sometimes carinate above, but not plicate.....4

4. Plants complanate-foliate; leaves with alar cells few and restricted to extreme base; capsules horizontal; peristome not reduced.....*Rhynchostegium*
4*. Plants evenly foliate; leaves with extensive regions of alar cells; capsules suberect to erect; endostome reduced.....*Schimperella*

Brachythecium Schimp. *in* B.S.G.

1. Plants small and slender; leaves less than 1.5 mm long .....*B. implicatum*
1*. Plants more robust; leaves greater than 1.5 mm long 2

2. Plants and leaves stiff when dry; laminal cells ca. 3 µm wide .....*B. rigens*
2*. Plants and leaves softer when dry; laminal cells 5-6 µm wide 3

3. Leaves greater than 2.5 mm long.....4
3*. Leaves less than 2.5 mm long.....5

4. Costa ending about 1/4 the leaf length; leaves ± cuspidate with apex often recurved; alar cells well developed in decurrencies.....*B. hedbergii*
4*. Costa ending near midleaf; leaves gradually straight-acuminate; alar cells few...*B. gloriosum*

5. Leaves ca. 2 mm long, with a long, slender, almost hair-pointed acumen; plants on tree trunks and branches.....*B. vellereum*
5*. Leaves ca. 1.7 mm long, shorter and broader acuminate; plants not epiphytic or only on extreme bases of trees 6

6. Leaves distinctly plicate, long-acuminate; alar cells clear.....*B. salebrosum*
6*. Leaves scarcely plicate, short-acuminate; alar cells opaque .....*B. plumosum*

B. gloriosum (C. Müll.) Kindb.

The specimens referred here are large, yellowish plants with leaves about 2.6 mm long, gradually acuminate (with the apex often twisted 1-2 times), and plicate. The laminal cells are about 60 × 6 µm and the alar cells are few, quadrate and clear in the extreme angles. The autoicous plants have smooth seta about 2.3 cm long.

I have not seen any material, authentic or otherwise, placed under this name. However, there are not many species of *Brachythecium*

growing at very high elevations in East Africa, and the original description is a very good match for this material.

The plants grew in *Senecio* paramo and alpine vegetation at 3600-4240 m, on the trunks of *Senecio* and on the ground.
Ka: 162, *Frahm 8299*; 163, *Frahm 8235, 8289*; 164, *Pócs 8325*.

B. hedbergii P.-Varde

This species is characterized by robust plants that have a hint of a blackish tinge on some shoots. The leaves are about 2.8 mm long, broadly ovate, and abruptly slender-cuspidate with the apex often recurved. The costa is usually very weak, only extending about 1/4 the leaf length. The laminal cells are about 75 × 5 µm and the alar cells are well developed, almost inflated, in strong decurrencies.

Although I have not seen any material of this species, the illustrations provided in the protologue are unmistakable. Similarly, I have seen no material of *B. nigro-viride* Par., but strongly suspect, based on the original description and habitat, that this is the same species (and the older name).

The plants grew in *Alchemilla johnstonii* vegetation in the alpine belt at 4300 m on soil below *Senecio*.
Ka: 164, *Pócs 8131*.

B. implicatum (Hornsch.) Jaeg.

This species is characterized by small, slender, soft plants that are usually yellowish. The leaves are only about 1.2 mm long, ± lanceolate,acuminate, and strongly plicate (including a plica that often obscures the costa). The margins are strongly serrulate; the laminal cells are about 60 × 6 µm; and the alar cells are relatively large (ca. 12 µm wide), short-rectangular, and clear. The plants are dioicous.

From material so-named, I think that *B. atrotheca* (Duby) Besch. is a synonym. It differs by occurring in Madagascar and the Mascarenes rather than mainland Africa. Of more interest, *B. implicatum* is the same as (and older name for) *B. stereopoma* (Mitt.) Jaeg. of neotropical uplands, thus adding yet another species to the ever-growing list of bicontinental taxa. I have superficially looked over Asian Brachythecia but have not found the species there. *Brachythecium procumbens* (Mitt.) Jaeg. is probably related, but is a more robust plant with longer setae.

The plants grew in a variety of open forest types at about 2500 m, usually on soil.
Ny: 103, *Pócs 6171*. **Rwanda:** 169, *Pócs 8052*.

B. plumosum (Hedw.) Schimp. *in* B.S.G.

This widespread species is characterized by relatively stiff, dark plants with oblong to oblong-ovate leaves with somewhat abruptly tapering, blunt acumina. The costa is strong, reaching well above midleaf, and the laminal cells are about 50 × 5-6 µm. The alar cells are ± excavate and inflated in broad, short decurrencies.

The plants grew along streams in various forest types, at 3300 m locally, and almost always in rocks in streams.
Ka: 159, *Frahm 8257, 8266*.

Brachythecium rigens Buck, n. sp.

Folia rigide erectopatentia ovato-deltoidea ca. 2.1 mm longa sensim longiacuminata decurrentia tantum vadose concava et leviter plicata; margines plani versus apicem subserrulati; costa ca. 2/3 folii longitudinem attingens; cellulae lineares versus folii apicem perangustae ca. 60 × 3 µm, versus basim latiores; cellulae alares numerosae obscurae subquadratae vel brevirectangulatae versus insertionem irregulariter formatae et non seriales.

Plants golden-green in stiff, dense mats. Leaves stiffly erect-spreading, little altered when dry, ovate-deltoid, ca. 2.1 mm long, gradually long-acuminate, decurrent, only shallowly concave and slightly plicate; margins plane, subserrulate above, entire below; costa slender, about 2/3 the leaf length; cells linear, very narrow, firm- to thick-walled, ca. 60 × 3 µm, becoming somewhat broader below; alar cells numerous, dark, subquadrate to short-rectangular above, toward insertion becoming irregularly shaped and not in rows. Rest unknown.

Type. Rwanda. Pref. de Ruhengeri: Mt. Karisimbi, *Alchemilla johnstonii* vegetation interrupted by boulders on the E-slope in the alpine belt, 4400 m; on soil, 14 September 1991, *Frahm 8208* (holotype NY).

This species is characterized by the very

stiff, gradually acuminate, shallowly concave, weakly plicate leaves about 2.1 mm long. The laminal cells are exceptionally narrow, only about 3 µm wide, and the alar cells are small, dense, and opaque in well developed areas.

Initially, from the description this species sounded like *B. duemmeri* Dix., but that species has leaves only half as long as this new one. Similarly *B. stricto-patens* C. Müll. (= *B. populeum* (Hedw.) Schimp. *in* B.S.G.) sounded similar, but in that species the costa is almost percurrent, not ending well below the acumen as here.

The plants grew in *Alchemilla johnstonii* vegetation in the alpine zone at 4400 m on soil.
Ka: 164, *Frahm 8208*.

B. salebrosum (Web. & Mohr) Schimp. *in* B.S.G.

This species is characterized by autoicous plants with plicate, gradually acuminate leaves about 1.7 mm long. The setae are smooth and smooth throughout, and the capsules are relatively short and inclined.

This primarily north temperate species, though also known from more southerly Africa, is an interesting addition to the flora.

The plants, locally, grew in a mesic montane forest at 2200 m, presumably on soil [microhabitat not given], and in *Alchemilla johnstonii* vegetation at 4200 m on soil.
Ka: 164, *Pócs 8192*. **KB:** 118, *Frey & Kürschner 6537*.

B. vellereum (Mitt.) Jaeg.

This is a very attractive species with a silky aspect conferred by the slenderly, long-acuminate leaf apices. The leaves are ovate-lanceolate, about 2 mm long, and gradually acuminate. The margins are subentire to serrulate above, and the single costa is often obscured by a single plica. The alar cells are well differentiated. The setae are smooth throughout, about 1.5 cm long, and subtend erect capsules. The peristome has only rudimentary cilia.

This was the most commonly collected species of *Brachythecium* collected on the BRYOTROP expedition, and also one of the most easily recognized from the long, almost hair-pointed leaves. The type is from the Cameroon (!) and the species seems to occur across central Africa at higher elevations.

The plants grew in montane forests, often with *Hagenia*, and not uncommonly with bamboo, at 2200-2500 m, mostly on tree trunks and branches.
Ny: 103, *Pócs 6168*. **KB:** 118, *Pócs 6559*; 135, *Frey & Kürschner 6993*; 136, *Frahm 6947*; 139, *Pócs 7287*; 144, *Frahm 7573*.

Eurhynchium Schimp. *in* B.S.G.

E. africanum Herz. var. *latifolia* Demar. & Leroy (*Kindbergia africanum* (Herz.) Ochyra var. *latifolia* (Demar. & Leroy) Ochyra)

This taxon is characterized by strongly differentiated branch and stem leaves. The stem leaves are about 0.85 mm long, broadly ovate, and abruptly tapering with the acumen about the same length as the base. They are very long decurrent, with the decurrencies about 0.55 mm long. The laminal cells are relatively short, about 30 × 7-8 µm, with subquadrate cells filling the decurrencies. The costa ends below midleaf and does not project at the apex. The branch leaves are oblong-ovate, about 0.65 mm long, with a stronger costa projecting at its tip. The decurrencies are much shorter.

Although this taxon and other allied ones have been segregated into *Kindbergia*, I am not convinced that generic recognition is warranted. I think they are nothing more than modified species of *Eurhynchium*, and their removal leaves this latter genus paraphyletic.

The plants grew in a *Senecio* paramo at 3600 m, scrambling over litter.
Ka: 162, *Pócs 8206*.

Palamocladium C. Müll.

P. sericeum (Jaeg.) C. Müll. (*P. sericeum* var. *afro-striatum* C. Müll., *Homalothecium afro-striatum* (C. Müll.) Ochyra, ? *P. involvens* Broth.)

This species is characterized by relatively robust, dull green plants with wide-spreading leaves that are tooth all the way to the insertion. The costa ends well below the leaf apex, and is sometimes difficult to observe because the leaves are strongly plicate. There are a relatively large number of alar cells for a member of the Brachy-

theciaceae.

Although this species (as well as the whole genus) has been considered a part of *Homalothecium*, I disagree with this placement. Not only is *Palamocladium* morphologically distinct, but it grows in a very different habitat from species of *Homalothecium*. Although Ochyra (in Ochyra & Pócs 1982) transferred the *P. sericeum* var. *afro-striatum* to the species level, I suspect that *P. involvens* is the same thing and that name would have priority at the species level. In the same paper, Ochyra suggested that the neotropical *P. leskeoides* (Hook.) Britt. and the Asian *P. nilgheriense* (Mont.) C. Müll. might be synonymous. However, New World material is very distinct in the percurrent costa. Asian material, with more detailed study, may indeed be synonymous with the African taxon, but there are enough small differences that provisionally I wish to maintain them as distinct.

The plants grew in montane forests at about 2500-3000 m, on rotten wood or on bark (presumably at the base) of *Hagenia*.
KB: 130, *Pócs 7093*. **Ka:** 159, *Pócs 8245*.

Rhynchostegium Schimp. *in* B.S.G.

1. Leaves ovate-lanceolate; laminal cells ca. 100 × 8-9 µm; perichaetial leaves slenderly and ± gradually long-acuminate, with margins subentire; setae ca. 1.5 cm long.....*R. brachypterum*
1*. Leaves broadly ovate; laminal cells ca. 110-180 × 9-11 µm; perichaetial leaves abruptly short-acuminate, with upper margins strongly toothed; setae 2.5-3.5 cm long.....*R. omocrates*

R. brachypterum (Hornsch.) Jaeg. (*R. megapelma* (Broth.) Par., *syn. nov*.)

The species is characterized by complanate plants with ovate-lanceolate leaves about 2 mm long, serrulate almost to the base. The acuminate leaf apex is plane to twisted. The costa ends somewhat above midleaf and projects as a small spine. The alar cells are very few and gradually acuminate. The 2 mm long perichaetial leaves are often falcate and have an oblong base and a ± gradually tapering acumen of about the same length. The acumen is entire to weakly toothed. The setae are about 1.5 cm long.

This is a very weedy species and probably has a much more extensive synonymy than indicated here, perhaps including *R. horridum* Broth. *in* Mildbr. and *R. gracilipes* Thér. However, an examination of the type of *Hypnum* (*Rhynchostegium*) *tenuivagum* C. Müll. *ex* Broth. (NY!), indicates that it is not a synonym, and does not even belong in *Rhynchostegium*, but rather should be treated as ***Eurhynchium tenuivagum*** (C. Müll. *ex* Broth.) Buck, comb. nov. (*Hypnum tenuivagum* C. Müll. *ex* Broth., Bot. Jahrb. 24: 279. 1897).

The plants grew in montane and submontane forests, including secondary growth, at 2100-2500 m, on soil and rotten wood.
Ny: 103, *Frahm 6127*. **KB:** 143, *Pócs 7600*.

Rhynchostegium omocrates Buck, n. sp.

Folia late ovata 1.7-2.2 mm longa brevidecurrentia acuminata apice saepe carinata aliquando torta; margines ubique serrulati; costa gracillima, 2/3-3/4 folii longitudim attingens; cellularum parietes tenues, 110-180 × 9-11 µm; cellulae alares paucae. Folia perichaetialia late oblonga abrupte late acuminata ca. 1.65 mm longa ad humeros et acumen serrata. Setae 2.5-3.5 cm longae; capsulae ca. 2 mm longae.

Plants relatively robust; stems to ca. 6 cm long, ± complanate-foliate. Leaves somewhat contorted when dry, erect- to wide-spreading when moist, broadly ovate, 1.7-2.2 mm long, short-decurrent, acuminate, the apex often keeled and sometimes twisted; margins plane, serrulate to base; costa very slender, ending about 2/3-3/4 the leaf length; cells 110-180 × 9-11 µm, thin-walled; alar cells very few, extending up the margins by about 4 cells, otherwise with 1-2 rows of short-rectangular cells across the insertion. Autoicous. Perichaetial leaves broadly oblong, abruptly broadly acuminate, ca. 1.65 mm long, strongly toothed on the shoulders and the acumen; costa slender and ending below the base of the acumen. Setae slender, reddish, flexuose, 2.5-3.5 cm long; capsules horizontal, ca. 2 mm long.

Type. Rwanda. Pref. de Cyangugu: Forêt de Nyungwe, BRYOTROP locality 111, Uwinka Station along road from Butare to Cyangugu, 2300 m; mesic montane evergreen forest with *Parinaria excelsa*, *Carapa grandifolia* and

Symphyonia globulifera, 14 August 1991, *Pócs 6410* (holotype NY).

Etymology: From Greek, meaning strong-shouldered, in reference to the perichaetial leaves.

The species is characterized by broadly ovate leaves that are often keeled in the apex. The very distinctive perichaetial leaves are broadly oblong, strongly shouldered, and terminating in a broadly acuminate apex. The perichaetial leaf shoulders and acumen are coarsely serrate.

The plants grew in mesic montane evergreen forests at 2300 m on soil.
Ny: 111, *Pócs 6410*.

Schimperella Thér.

Schimperella bello-intricata (C. Müll. *ex* Broth.) Buck, comb. nov. (*Hypnum bello-intricatum* C. Müll. *ex* Broth., Bot. Jahrb. 24: 279. 1897; *Rhynchostegium bello-intricatum* (C. Müll. *ex* Broth.) Par.; *Schimperella katalensis* (P.-Varde & Leroy *in* Leroy) P.-Varde, *syn. nov.*; *S. atrotheca* (P.-Varde) P.-Varde)

This species is characterized by epiphytic plants with equally, i.e., noncomplanate, foliation. The ca. 1.5 mm long leaves are ovate-lanceolate to ovate, usually with the apex twisted 1-2 times, and margins serrulate to the base. The alar regions are filled with numerous subquadrate, clear cells. The capsules are suberect to erect and the peristome is slightly reduced.

I previously monographed the genus (Buck 1985) and documented the range of this species to include Zaire, Rwanda and Burundi. However, when trying to name *Rhynchostegium* material for this project, I examined two Cameroon specimens (neither types but one collected by Dusén from near the type locality) of *R. bello-intricatum*, and found them inseparable from *Schimperella katalensis*, thus prompting the new combination. I have recently also seen material from Ethiopia.

The plants grew in mesic montane forests at 2200-2400 m, often on bamboo culms but sometimes on tree branches.
KB: 118, *Pócs 6567*; 128, *Pócs 7610*; 144, *Pócs 7640*.

STEREOPHYLLACEAE

Entodontopsis Broth.

E. nitens (Mitt.) Buck & Irel. (*Stereophyllum nitens* Mitt.)

This species is characterized by complanately foliate plants, usually growing appressed to the substrate. The leaves are oblong-ovate to broadly oblong, with the apex broadly acute to obtuse-rounded. The single costa ends just above midleaf. The laminal cells are linear. The alar cells are subquadrate and numerous on one side of the costa but very few or none on the other side.

The plants cited here grew on the bark of a roadside tree at 1800 m.
Rwanda: 100, *Frahm 8003*.

PLAGIOTHECIACEAE

Plagiothecium B.S.G.

P. nitidifolium (Mitt.) Jaeg.

This species is characterized by strongly complanate plants with asymmetric, decurrent leaves about 2 mm long. The upper cells are narrowly linear, about 6 µm wide. The cells of the decurrencies are mostly in three tiers and about 5-6 cells long; they are rectangular and about 85 × 20-28 µm. The plants are autoicous with setae about 2 cm long. The capsules are somewhat inclined and about 2 mm long with a conic operculum about 0.85 mm long. The peristome is hypnoid and unreduced, and the spores are 11-14 µm in diameter and roughened.

The plants described here, from Rwanda, are a perfect match for the type from Fernando Po. Although I have not seen material of *P. mildbraedii* Broth. *in* Mildbraed, I strongly suspect that it is a synonym. The only conflicting character is that Brotherus described the plants as dioicous. Since they were fertile, though, he could have mis-sexed the plants. The other local species, not represented in the BRYOTROP collections, is *P. nitens* Dix. It has laminal cells about twice as wide as those of *P. nitidifolium* (and *P. mildbraedii*).

The plants grew in a *Hagenia-Hypericum*

forest, with moss balls on branches, at 3100-3300 m, both on the stems and roots of *Hagenia*. **Ka:** 159, *Pócs 8124, 8283*.

ENTODONTACEAE

1. Leaves broadly decurrent; alar cells mostly oblate .....*Erythrodontium*
1*. Leaves not decurrent; alar cells quadrate to short rectangular .....*Entodon*

Erythrodontium Hampe

E. squarrosum (Hampe) Par. (*E. abruptum* (Wright) Broth.)

This name has not been used in Africa before, but African plants are inseparable from those of South America. The leaves are essentially suborbicular and broadly cuspidate; the setae are red; the exostome is reddish and striate. Among the African species it seems nearest to *E. engleri* (Broth.) Par., but that species has somewhat more oblong leaves that are very concave, almost cucullate above. I have not been able to verify the previous synonymy of *E. abruptum* with *E. rotundifolium* (C. Müll.) Par., but if true that name would also go into synonymy with *E. squarrosum*. In tropical America the species occurs from Mexico to southern Brazil.

The plants cited here grew on the bark of trees at 1800 m.
Rwanda: 100, *Frahm 8008*; 171, *Fischer 8380*.

Entodon C. Müll.

1. Leaves acute; exostome teeth not perforate; endostome with continuous basal membrane and striate segments .....*E. adyris*
1*. Leaves acuminate; exostome teeth perforate; endostome with areolate basal membrane and papillose segments .....*E. vulcanicus*

Entodon adyris Buck, n. sp.

E. dregeano similis, sed ab eo exostomii dentibus nec geminatis nec lacunosis, ab urnae ore ad dentem medium usque verticaliter striatis, superne ± laevibus, endostomii segmentis etiam verticaliter striatis differt.

Plants pale green in flat mats. Stems creeping, freely branched, the branches less than 1 cm long. Branch leaves erect-spreading to spreading, oblong-lanceolate, ca. 1.7 mm long, narrowly acute, narrowed toward the insertion, broadest at about 1/4 the leaf length; margins plane, serrulate in upper 1/4, subentire below; costa short and double; cells linear, ± thin-walled, to 125 µm long, 3-6 µm wide, becoming broader toward the insertion, not noticeably shorter in the apex; alar cells ± gradually differentiated, quadrate to short-rectangular, 17-29 x 17-20 µm, in about 5 tiers, not reaching the costa. Autoicous. Setae yellow, ca. 2 cm long; capsules cylindric, ca. 3.5 mm long; peristome deeply inserted, by ca. 100-110 µm; exostome teeth linear-lanceolate, dark orange, ca. 0.5 mm long, not paired, on outer surface at very base (below mouth) cross-striolate, from slightly below mouth to mid-tooth vertically striate, becoming fainter above, in upper half of tooth ± smooth, on inner surface ± smooth throughout, not perforate; endostome from a continuous, low, unornamented basal membrane, segments narrow, keeled, narrowly perforate, striate throughout but more obscure above, best observed at base. Operculum and calyptra not seen. Spores 17-23 µm, papillose.

Type: Zaire. Prov. Kivu: Kahuzi-Biega National Park, Tshivanga Park Station 30 km W of Bukavu, BRYOTROP Loc. 118, 2200 m; mesic montane forest dominated by *Dombeya goetzenii*, *Zanthoxylum gilletii*, *Hagenia abyssinica* and *Alangium chinense*, base of tree, 20 August 1991, *T. Pócs 6564* (holotype NY). Paratypes: identical locality, *Frey & Kürschner 6539, 6543* (hb. Frey).

Like many species of *Entodon*, this one is best told by its peristome features. Gametophytically, it is similar to *E. geminidens* (Besch.) Par. and *E. dregeanus* (Hornsch.) C. Müll. (which, with *E. lacunosus* Broth., may be synonymous) in the ovate, acuminate leaves and gradually differentiated alar cells. It is distinct from the other African species, though, in the following ways. From *E. geminidens* it differs in the non-paired exostome teeth; from *E. dregeanus* it differs in the eperforate exostome teeth that are vertically striolate except below the mouth; from

E. usambaricus Broth. it differs in the exostome teeth striate only half way up (rather than to the apex), and smooth above; from *E. subgeminidens* P.-Varde it differs in the striate rather than papillose endostome segments; and from *E. lacunosus* Broth. it differs in the eperforate exostome teeth. So far the species is known only from a single locality, but from the three collections it appears to be locally common.

The epithet, *adyris*, is derived from Greek, meaning windowless, in reference to the eperforate exostome.

The plants grew on the bases of trees (? and old wood) in mesic montane forests at 2200 m.

KB: 118, *Pócs 6564*, *Frey & Kürschner 6539*, *6543*.

E. vulcanicus Demar. & Leroy

This species is characterized by its gradually acuminate leaves with ± abruptly differentiated alar cells that almost, but not quite reach the costa. The yellow seta is shorter than in *E. adyris*, only about 1-1.5 cm rather than ca. 2 cm. The exostome teeth are cross-striolate for several rows of plates above the mouth of the capsule, then obliquely or vertically striate for 1-2 rows, then ± smooth to the apex. The most distinctive feature, though, is the endostome. The basal membrane is broadly perforate and thus coarsely areolate or almost reticulate. Since the basal membrane is entirely below the capsule mouth, it is much easier to see by dissecting the capsules and observing the endostome from the back side. The segments are papillose below and ± smooth above. The spores are smooth, in contrast to the papillose spores in *E. adyris*.

The plants grew on tree trunks and branches (and on lianas in the type) in moist forests and rainforests at 2500-3000 m.

KB: 135, *Frey & Kürschner 6989*. **Ka:** 158, *Fischer 8061*. **Ny:** 103, *Pócs 6164*.

SEMATOPHYLLACEAE

1. Leaf cells papillose 2
1*. Leaf cells smooth 3

2. Leaf cells unipapillose .....*Trichosteleum*
2*. Leaf cells pluripapillose .....*Radulina*

3. Branch and stem leaves differentiated . . . . . .*Wijkia*
3*. Branch and stem leaves similar 4

4. Alar cells curved toward the insertion; stem and branch tips cuspidate; exostome furrowed .....*Acroporium*
4*. Alar cells inflated but not curved; stem and branch tips not cuspidate; exostome not furrowed 5

5. Exostome teeth bone-white when dry, strongly trabeculate on front surface; endostome segments not or scarcely keeled .....*Donnellia*
5*. Exostome teeth yellow, not trabeculate; endostome segments keeled .....*Sematophyllum*

Acroporium Mitt.

1. Leaves less than 2 mm long, lanceolate; laminal cells scarcely porose; alar cells mostly hyaline; perichaetial leaves distinctly toothed.... .....*A. prionophylax*
1*. Leaves 2-3 mm long, ovate; laminal cells strongly porose throughout; alar cells mostly colored; perichaetial leaves more or less entire.... .....*A. pungens*

Acroporium prionophylax Buck, n. sp.

Ab A. pungenti foliis lanceolatis brevioribus, folii cellulis non valde porosis, cellulis alaribus hyalinis, et foliis perichaetialibus cuspidatis dentatis differt.

Plants small, slender, epiphytic. Stems creeping, to ca. 4 cm long. Leaves wide-spreading, not altered when dry, lanceolate, ca. 1.8 mm long, gradually acuminate, concave to subtubulose; margins entire except at extreme apex and directly above alar cells where serrulate; costa none; upper cells linear-flexuose, thick-walled, somewhat porose in central part of leaf, not or scarcely porose toward margins; alar cells large and inflated, mostly hyaline except an occasional yellow one adjacent to colored insertion. Synoicous. Perichaetial leaves ovate, cu-

spidate, distinctly toothed on upper shoulders. Setae reddish, roughened above, ca. 5 mm long; capsules erect, ca. 0.6 mm long, constricted below the mouth when dry; exothecial cells strongly collenchymatous; exostome teeth on front surface cross-striolate with overlying papillae and with narrow furrow; endostome with moderately high basal membrane, narrow, keeled segments and rudimentary cilia. Spores (15-)20-22 µm, almost smooth.

Type: Zaire. Prov. Kivu: Irangi Forest Station 110 km W of Bukavu, BRYOTROP locality 119, alt. 850 m, primary tropical rain forest along Luhoro stream; riverine forest influenced by moisture of stream; dominated by *Uapaca kirkii* and *U. zanziberica*. 22 Aug 1991, *T. Pócs 6869* (holotype NY).

Additional specimens examined. Zaire. Prov. Kivu: Irangi Forest Station 110 km W of Bukavu, BRYOTROP locality 124, alt. 1300 m, submontane rainforest with *Aningeria altissima* and *Mommaea africana* below cliffs at the SW slope of Mt. Ilimo, 23 Aug 1991, *Frey & Kürschner 6677, 6678* (BSB).

The epithet is derived from Greek, meaning toothed guardian, in reference to the toothed perichaetial leaves.

Acroporium prionophylax is distinct from *A. pungens* in the smaller plants with shorter, narrower leaves, laminal cells not nearly as porose, alar cells mostly hyaline, shorter setae, and toothed perichaetial leaves. It differs from all other mainland African species, among other characters, in the synoicous inflorescences. *Acroporium megasporum* is also synoicous and is discussed under *A. pungens*.

Plants of *A. prionophylax* grew on branches in rainforests at 850-1300 m.
Zaire: 119, *Pócs 6869*; 124, *Frey & Kürschner 6677, 6678*.

A. pungens (Hedw.) Broth. (*Pungentella ochreifolia* C. Müll. *ex* Par., *nom. nud.*, *Sematophyllum ochreifolium* Par., *nom. nud.*, *syn. nov.*)

Acroporium pungens is characterized by wide-spreading, ovate leaves 2-3 mm long. The laminal cells are linear and strongly porose throughout. The alar cells are mostly colored except for the outermost one on each side of the leaf. The inflorescences are synoicous, and the perichaetial leaves are essentially entire. The setae are mostly about 1 cm long and roughened above. The exostome teeth are cross-striolate and strongly furrowed.

This species is a widespread pantropical moss, occurring commonly at low to middle elevations in rainforests. This is the first use of the name for Africa. Similarly, it has not been reported from Asia, but there it has gone under the name of *A. sigmatodontium* (C. Müll.) Fleisch. African material in the past has sometimes been referred to *A. megasporum* (Duby) Fleisch. However, an isotype (or at least an authentic specimen) at NY, collected by Robillard on Mauritius, is not the same as *A. pungens*. It differs in smaller leaves that are distinctly falcate. I have only seen material of this species from Mauritius and Reunion. Material so named from mainland Africa and the Comoro Islands is *A. pungens*.

The plants grew on branches in rainforests at 900-2000 m.
Zaire: 120, *Frey & Kürschner 6602b*. **Ny:** 155, *Frahm 7968, 7983*, *Pócs 8029*.

Donnellia Aust.

Donnellia matutina Buck, n.sp.

Folia homomalla anguste ovata ob margines supernos recurvatos abrupte breviacuminata; cellulae alares inflatae in serie singulari; capsulae siccae subarcuatae, humidae suberectae; exothecii cellulae infirme collenchymatosae; peristomium siccum osseoalbidum, dentes exostomii ut apud congeneres pagina antica valde trabeculati sed ornamentatione transstriolata papillis superposita; endostomium e membrana basali alta papillosa, processibus latis vix carinatis nonperforatis, ciliisque 1-2 validis compositum.

Plants golden green, epiphytic, ± turgid. Leaves homomallous, narrowly ovate, 1.1-1.7 mm long, abruptly short-acuminate from recurved upper margins, concave; margins subserrulate above; costa short and double or absent; upper cells linear, subflexuose, smooth; alar cells inflated and colored in a single row with about 2 rows of quadrate supraalar cells. Autoicous. Setae reddish, about 1.5 cm long, smooth; capsules

subarcuate and constricted below the mouth when dry, suberect when moist; exothecial cells weakly collenchymatous; annulus not differentiated; operculum obliquely long-rostrate; peristome double, exostome teeth bone-white, when dry sometimes erect and sometimes wide-spreading, on the front surface strongly trabeculate, toward the base individual plates cross-striolate with overlying papillae, but becoming smooth with age, on the back surface with the cross-walls spiculose; endostome with a high, papillose basal membrane, segments lanceolate, not or scarcely keeled, not perforate, papillose, cilia 1-2, stout.

Type: Rwanda. Pref. de Gikongora: Forêt de Nyungwe, Rwasenoko, BRYOTROP locality 102, 2°31-34'S, 29°21'E, 2500 m; ericaceous heath on the drier slopes of valley with patches of *Andropogon shirensis*; on branch; 11 August 1991, *T. Pócs 6060* (holotype NY). Additional specimens seen cited below.

The epithet is from Latin meaning "of the morning" and refers to the basal position this species seems to occupy in the genus.

Donnellia matutina appears to be the most primitive species in the genus, although the genus has its center of diversity in southeastern Brazil and there is only a single other African species. Like all other species in the genus the peristome is bone-white with the outer surface of the exostome strongly trabeculate, with the horizontal cross-walls strongly projecting from the sides of the teeth. It is just these characters that define the genus. However, all other species have the outer surface of the exostome either unornamented or faintly papillose, unlike the cross-striae with overlying papillae here. However, older, weathered teeth become smooth like in the other species. I have no explanation for the disappearance of the ornamentation. In most of the other species the endostome is greatly reduced and sometimes even falls shortly after capsule dehiscence and thus appears absent. However, in this species the endostome is well developed with a high basal membrane, relatively broad segments, and paired cilia. The segments are unusual in that for the most part they are not at all keeled. These peristomial differences may justify erection of a new genus, but I have no doubt that this species is within the same line of evolution as the others, and just represents a less derived morphology.

All specimens seen grew on trunks and branches of trees in open vegetation at 2250-3200 m.

Ny: 101, *Pócs 6015*; 102, *Pócs 6060*. **KB:** 128, *Frey & Kürschner 7324*; 132, *Pócs 7130*; 139, *Pócs 7296*; 144, *Frey & Kürschner 7677*; 148, *Pócs 7771*; 149, *Pócs 7635*.

Radulina Buck & Tan

Radulina borbonica (Bél.) Buck, comb. nov. (*Leskea borbonica* Bél., Voyag. Ind. Or. Bot. 2 (Crypt.): 97. 1846. *Trichosteleum buettnerianum* (C. Müll. *in* Büttner) Broth. *in* Par., *syn. nov.*; *T. mammillipes* Broth., *syn. nov.*; *T. perhamosum* Broth., *syn. nov.*; *T. subpycnocylindricum* Broth., *syn. nov.*)

This species is characterized by falcate leaves with very enlarged alar cells and seriately pluripapillose laminal cells . The seta is strongly papillose above. Although several names have been used for species in this group in tropical Africa, all specimens seen from throughout the area represent a single taxon.

Radulina borbonica grew on tree trunks and branches and rotting wood in rainforests at 900-2000 m.

Ny: 107, *Frahm 6305*; 108, *Pócs 6363*; 113, *Frahm 6492*. **Zaire:** 122, *Pócs 6794*.

Sematophyllum Mitt.

This has proven to be the most difficult genus in the family. Not many species have been described from the high elevation regions of central and western Africa, and those that have, from their descriptions, do not sound very close to the specimens described here. Therefore, I have boldly described four new species, following in the grand tradition of the last century.

1. Upper laminal cells mostly over 100 µm long .....*S. cellulosum*
1*. Upper laminal cells mostly less than 80 µm long 2

2. Leaves pale green; branches dark red, easily visible on moist plants.....*S. subsimplex*
2*. Leaves golden green to dark green; branches

green to somewhat red, not visible through moist leaves.....3

3. Leaves gradually acuminate, ca. 1.2 mm long or shorter; largest alar cells 60 µm (or considerably less) long.....*S. nebulosum*
3*. Leaves abruptly acuminate, longer than 1.5 mm; largest alar cells 75-100 µm long.....4

4. Leaves oblong, acumen above shoulders (0.3-)0.5 mm long.....*S. brachytheciiforme*
4*. Leaves ovate, acumen above shoulders 0.15-0.3 mm long.....5

5. Plants turgid, epiphytic; leaf near insertion often concave with alar regions higher than costal area; alar cells on each side costa 4-5, ca. 20 µm wide, not much wider than adjacent insertion cells; capsules inclined from curved seta apex, but straight.....*S. stylites*
5*. Plants not turgid, epilithic; leaf insertion plane; alar cells on each side of costa 3-4, 25-30 µm wide, abruptly wider than adjacent insertion cells; capsules arcuate on straight setae.....*S. flavovesiculosum*

S. brachytheciiforme (Broth.) Broth.

The plants assigned here are turgid with broadly oblong-lanceolate leaves ca. 1.75 mm long. The leaf acumen is abruptly tapered and (0.3-)0.5 mm long. The leaf margins are plane to narrowly recurved and subentire. The laminal cells are about 40-50 × 6 µm. The alar cells are colored and inflated in 1-2 rows with the basal row with 3-5 cells on either side of the costa and each ca. 75 × 20 µm; when present the second row has cells smaller and quadrate. The supra-alar cells are quadrate and extend up the margins in 2-4 rows. The setae are about 1.5 cm long. The capsules are about 1.5 mm long, erect, and symmetric. The peristome is unreduced. The spores are irregularly ovoid, mostly not spherical, 22-28 µm, and papillose.

I have not seen either a type of this name or any other material so named, and am basing my usage solely upon descriptions. There are several species apparently related to *S. brachytheciiforme*, including *S. alticaule* Dix. & Thér., *S. elgonense* (Dix.) Broth. and *S. subbrachytheciiforme* P.-Varde. From the descriptions alone they may well all be synonyms and so I have chosen the oldest name to use here.

The specimens here grew in open *Erica* heath with *Senecio johnstonii*, and *Senecio* paramo and subparamo, from 3200-3600 m, growing on *Senecio* and ?rock [not given].
KB: 149, *Frey & Kürschner 7423*. **Ka:** 161, *Pócs 8196p.p.*; 162, *Pócs 8109*.

Sematophyllum cellulosum Buck, n. sp.

Folia lanceolata 1.4-1.7 mm longa gradatim acuminata marginibus saepe omnino recurvatis; cellulae lineares 100-115 µm longae.

Plants medium-sized, golden green to golden. Leaves loosely erect, scarcely altered when dry, lanceolate, ca. 1.4-1.7 mm long, gradually acuminate, plane to concave; margins plane to rather strongly recurved almost throughout, entire or almost so; costa short and double; upper cells linear, ca. 100-115 × 6-8 µm, firm-walled, not or scarcely porose; alar cells inflated in a single row, 3-5 on each side of the costa, hyaline or pale yellow, ca. 60 µm long, often more divided on one side of the leaf than the other; supra-alar cells quadrate, extending up the margins in 4-5 rows, about 18 µm wide. Autoicous. Sporophytes unknown.

Type: Rwanda. Pref. de Cyangugu: Forêt de Nyungwe, BRYOTROP locality 111, Uwinka Station along road from Butare to Cyangugu, 2300 m; mesic montane evergreen forest with *Parinarium excelsum*, *Carapa grandifolia* and *Symphyonia globulifera*, on bark, 14 Aug 1991, *Pócs 8360* (holotype NY).

The epithet refers to the characteristic cells of this species, i.e., their length.

This species is characterized primarily by its very long laminal cells and scarcely colored alar cells.

The plants grew in a mesic montane evergreen forest, on bark, at 2300 m.
Ny: 111, *Pócs 8360*.

Sematophyllum flavovesiculosum Buck, n. sp.

Folia ovata vel late ovata 1.6 mm longa abrupte breviacuminata; cellulae alares coloratae vesiculosae 3-4 in quoque costae latere, abrupte a cellulis vicinis diversae; setae erectae; capsulae subarcuatae.

Plants moderately sized, golden green with older parts bronzish, epipetric. Leaves spreading to wide-spreading, little altered when dry, ovate to broadly ovate, ca. 1.6 mm long, abruptly short-acuminate with the acumen 0.15-0.3 mm long, strongly concave above, plane toward the insertion; margins plane, subentire; costa short and double; upper cells ca. 40-50 × 7 µm; alar cells colored and inflated in a single row of 3-4 on each side of the costa, ca. 75-100 × 25-30 µm, abruptly broader and inflated from the narrow, thick-walled, porose juxtacostal cells; supra-alar cells quadrate in 2-4 rows. Autoicous. Setae 1-1.3 cm long, erect; capsules inclined, subarcuate, ca. 1 mm long; exostome teeth on front surface with projecting cross-walls, cross-striolate with overlying papillae below, coarsely papillose above, projecting at back; endostome with a high basal membrane, segments keeled, perforate, papillose, cilia 1-2. Spores spherical, 11-15 µm in diameter, almost smooth.

Type: Rwanda. Pref. de Cyangugu: Forêt de Nyungwe, BRYOTROP locality 106, Karamba, 2000 m; rocky slopes in heath forest along abandoned road to Burundi; on roadside rocks, 13 Aug 1991, *Pócs 6239* (holotype NY).

The epithet refers to the yellow, bladder-like alar cells.

This species most closely resembles *S. stylites*, but differs by the epipetric habitat, non-turgid plants with spreading leaves, plane leaf insertions, broader, abruptly differentiated alar cells, and arcuate capsules on erect setae.

The plants grew in open forests at 2000 m, and grow on rock.
Ny: 106, *Pócs 6239*.

Sematophyllum nebulosum Buck, n. sp.

Folia lanceolata 0.9-1.2 mm longa gradatim acuminata concava; cellulae 40-55 × 6 µm; cellulae alares coloratae minusculae.

Plants moderately sized, golden green, epiphytic. Leaves spreading, ± homomallous, scarcely altered when dry, lanceolate, 0.9-1.2 mm long, gradually acuminate, concave; margins plane or irregularly erect, subentire; costa short and double; upper cells 40-55 × 6 µm, firm-walled, ± porose, especially below; alar cells colored and inflated in a single row, ca. 45 × 20 µm, 3-4 on each side of the costa; supra-alar cells in 1-3 rows up the margins. Sterile.

Type: Zaire. Prov. Kivu: Kahuzi-Biega National Park, BRYOTROP locality 139, Mt. Biega, 2 km N of Kaziruziru park gate, 2250 m; secondary montane forest dominated by *Macaranga*, *Hagenia* and *Agaurea*; on bark, 30 Aug 1991, *Frey & Kürschner 7034* (holotype NY, isotype hb. Frey).

The epithet refers to the lack of a single definitive feature.

The species is characterized, from all the others here, by its short, gradually lanceolate leaves with relatively small alar cells.

The plants grew in secondary montane forests at 2250 m, on bark.
KB: 139, *Frey & Kürschner 7034*.

Sematophyllum stylites Buck, n. sp.

Folia ovata 2 mm longa abrupte acuminata valde concava, ob regionem alarem erectam in stylobate brevi atque obeso sita; cellulae alares coloratae inflatae 4-5 in quoque costae latere, gradatim a cellulis vicinis diversae; setae ad apicem curvatae; capsulae inclinatae sed rectae non arcuatae.

Plants turgid, bright green, epiphytic. Leaves erect to erect-spreading, scarcely altered when dry, ovate, ca. 2 mm long, abruptly acuminate with the acumen 0.15-0.3 mm long, strongly concave throughout, at insertion resulting in alar regions erect and leaves appearing to sit atop a broad, squat pedestal; margins plane above, erect to recurved below, ± serrulate above; costa short and double; upper cells linear-flexuose, ca. 80 × 3 µm; alar cells colored and inflated in a single row, 4-5 on each side of the costa, gradually and only somewhat broader than juxtacostal cells, 60-85 × 20 µm; supra-alar cells short-rectangular, in 2-3 rows up the margins. Autoicous. Setae ca. 1.2 cm long, curved at apex; capsules inclined, straight, ca. 1.5 mm long; exostome teeth on front surface cross-striolate below, projecting at back; endostome with moderately high basal membrane, segments keeled, narrowly perforate, cilia 1-2, stout. Spores spherical, ca. 14 µm in diameter, finely roughened.

Type: Zaire. Prov. Kivu: Kahuzi-Biega National Park, BRYOTROP locality 144, Mt. Kahuzi, bamboo forest with *Hagenia* patches on the foothill near Karashamwa Post on the E slope

of the main ridge, 2300 m; on bamboo, 3 Sep 1991, *Pócs 7641* (holotype NY).

The epithet refers to the pedestal-like base of the leaves formed by the erect alar regions.

This species is very distinct by the relatively long, ovate, abruptly acuminate leaves with erect alar regions. The alar cells are gradually differentiated from the adjacent juxtacostal cells. The setae are curved at their apices and the capsules are thus inclined, but otherwise straight and symmetric.

The plants grew in bamboo forests at 2300-2600 m, and grow on bamboo culms.
KB: 144, *Pócs 7641*, *Frey & Kürschner 7540, 7681*.

S. subsimplex (Hedw.) Mitt. (*Rhaphidorrhynchium pseudo-brachythecium* (Broth.) Broth., *syn. nov.*; ? *Isopterygium microplumula* Par., *nom. nud.*, *syn. nov.*)

This common and weedy neotropical species, newly reported here for Africa, is distinguished by pale green leaves with dark red stems that are readily visible when the plants are moist. The leaves are ovate and about 1-1.2 mm long, constricted at the insertion, and with relatively large, colored alar cells. The setae are about 1.5 cm long, curved at the apex, and subtend subarcuate capsules about 1 mm long. The peristome is unreduced.

The plants grew in tropical rainforests at relatively low elevations (here at 900 m), and occur on rotting wood and tree bases.
Zaire: 120, *Pócs 6775*.

Trichosteleum Mitt.

1. Leaf margins irregularly recurved above, weakly serrulate; laminal cells low-papillose*T. pervilleanum*
1*. Leaf margins plane, strongly serrulate above; laminal cells conspicuously papillose*T. subulatulum*

Trichosteleum pervilleanum (C. Müll. *ex* Geh.) Buck, comb. nov. (*Hypnum pervilleanum* C. Müll. *ex* Geh., Abh. Naturw. Ver. Bremen 7: 212. 1881. *Rhaphidorrhynchium pervilleanum* (Geh.) Broth.)

This species is characterized by delicate plants with falcate leaves. The margins are serrulate above and irregularly recurved. The laminal cells are linear and the papillae are, for the most part, inconspicuous and only easily seen when the leaves are in profile. There are about 3 inflated alar cells in each basal angle. The perichaetia are enlarged with serrate leaves. The setae are above 11 mm long and smooth throughout.

I have not seen the Madagascarian type of *H. pervilleanum*, but am basing my concept of the species on another Madagascar collection made by Hildebrandt in 1880 (NY). This specimen is a perfect match for the material cited here.

The plants grew on rotten wood in montane forests and bamboo thickets at 2250-2500 m, and in elfin forest at 3200 m.
KB: 130, *Pócs 7080*; 139, *Pócs 7281*; 148, *Frey & Kürschner 7465*.

T. subulatulum (C. Müll.) Jaeg. (*Hypnum subulatulum* C. Müll., *Rhaphidostegium subulatulum* (C. Müll.) Besch.)

This specimens assigned here are characterized by medium-sized plants with falcate leaves. The margins are strongly serrulate above and plane. The laminal cells are linear and conspicuously papillose. There are 3-4 inflated alar cells in each basal margin. The perichaetia are enlarged and the leaves are strongly serrulate. The setae are 1-2 cm long and smooth throughout.

I have not seen a type or any other specimen associated with this name. I am only going by Müller's original description of plants from the Comoro Islands. It is at best to be considered a tentative determination. Non-type material sonamed *Warburgiella leptorrhyncha* (Jaeg.) Broth. at NY is also close enough to be considered a possibility. The material certainly belongs in *Trichosteleum* rather than *Warburgiella*. Unfortunately there are many African names in *Trichosteleum* and I have not had the opportunity to find types for more than a handful; the descriptions are singularly unhelpful. Thus, I am very reluctant to describe the material placed here as a new species.

The specimens cited here both grew on

rotten wood in montane forests at 2000-2400 m. **Ny:** 107, *Frahm 6306*. **KB:** 133, *Pócs 7206*; 148, *Frey & Kürschner 7465*.

Wijkia Crum

1. Stem leaves ovate, gradually acuminate; alar cells of stem leaves not or scarcely decurrent; perichaetial leaves entire.....*W. trichocolea*
1*. Stem leaves broadly ovate to broadly oblong-ovate, abruptly apiculate to cuspidate; alar cells of stem leaves decurrent; perichaetial leaves strongly ciliate.....*W. trichocoleoides*

W. trichocolea (C. Müll.) Crum (*Heterophyllium albi-alare* C. Müll., *syn. nov*.)

This species is characterized by ovate, gradually acuminate stem leaves in which the base of the alar cells is at about the same level as the insertion. The perichaetial leaves are slenderly long-acuminate, but essentially entire and not at all ciliate.

The species grew on bark (presumably at the bases of trees) and rocks in rainforests at 900-2400 m.
Ny: 103, *Pócs 6146*; 110, *Frey & Kürschner 7922*. **Zaire:** 122, *Frahm 6640*; 125, *Fischer 6734*.

W. trichocoleoides (C. Müll.) Crum (*Acanthocladium subtrichocolea* Broth., *nom. nud., syn. nov*.)

This species is characterized by broadly ovate to broadly oblong-ovate, abruptly apiculate to cuspidate stem leaves in which the base of the alar cells are well below the insertion. The perichaetial leaves are strongly and coarsely ciliate, with the apex of the leaves sometimes becoming so divided that there is no distinction between the lamina and the cilia.

The species most often grew on rocks, less often litter, in various types of forest from 900-2000 m.
Zaire: 120, *Pócs 6624*; 122, *Pócs 6808*; 124, *Pócs 7104*; 125, *Fischer 6749*. **Ny:** 106, *Frahm 6278*; 108, *Pócs 6383*; 155, *Frahm 7971*.

HYPNACEAE

1. Leaf cells prorulose.....2
1*. Leaf cells smooth.....3

2. Leaf cells prorulose at upper and lower ends; plants not stipitate.....*Chryso-hypnum*
2*. Leaf cells prorulose only at upper ends; plants stipitate.....*Mittenothamnium*
3. Basal-most alar cells, at least in extreme angles, hyaline and inflated, ± decurrent.....4
3*. Alar cells quadrate or poorly differentiated, not inflated.....5

4. Leaves falcate-secund, with only a single inflated alar cell.....*Ectropothecium*
4*. Leaves not falcate-secund, with several inflated alar cells.....*Rhacopilopsis*

5. Alar cells numerous, in several tiers and extending up the margins by more than 5 rows6
5*. Alar cells few.....8

6. Leaves falcate-secund or branches flagelliform.....*Hypnum*
6*. Leaves sometimes homomallous, but never falcate and branches never flagelliforme.....7

7. Median laminal cells over 100 µm long, notably shorter in the acumen.....*Taxiphyllum*
7*. Median laminal cells less than 50 µm long, not shorter in the acumen.....*Pylaisiella*

8. Laminal cells lax, 4-8:1; dorsal and lateral leaves often differentiated.....*Vesicularia*
8*. Laminal cells prosenchymatous; leaves monomorphic.....9

9. Stems with a hyalodermis; leaves symmetric, serrulate almost to base; pseudoparaphyllia foliose.....*Herzogiella*
9*. Stems without a hyalodermis; leaves asymmetric, serrulate only at apex; pseudoparaphyllia filamentous..... *Isopterygium*

Chryso-hypnum Hampe

Chryso-hypnum frondosum (Mitt.) Buck, comb.

nov. (*Stereodon frondosum* Mitt., J. Linn. Soc., Bot. 7: 158. 1863; lectotype (chosen here): Fernando Po, 3-8000 ft. up the mountain, growing on stones, Dec 1860, *Mann 699* (NY); *Mittenothamnium frondosum* (Mitt.) Card.; *Mittenothamnium brevicuspis* (P.-Varde) Wijk & Marg., *syn. nov.*; *M. overlaetii* Thér. & Nav. *in* Dix. & Thér. is also probably a synonym.)

This species is recognized by its obscurely complanate-foliate stems, with leaves somewhat crispate when dry. The leaves are about 1 mm long, ovate, abruptly tapered to a short acumen with the upper margins often recurved, and concave. The costa is very strong, extending about 1/3 to 1/2 the leaf length. The laminal cells are rectangular, about 30 × 5 µm, and prorulose at both ends. The alar cells are quadrate and limited to a small area in the extreme basal angles. The plants are autoicous, and the perichaetial leaves are long-lanceolate, about 2 mm long, gradually acuminate, somewhat plicate, and smooth-celled. The setae range from about 1.8-3.2 cm long and are curved at the apex. The capsule has an obliquely long-rostrate operculum.

This species differs from the neotropical *C. elegantulum* (Hook.) Hampe in the more concave leaves with a stronger costa and better developed alar cells, and by a naked calyptra (rather than sparsely hairy). The South African *C. patens* Hampe (of which *C. cavifolium* (Dix.) Ochyra & Sharp is probably a synonym) differs by having smaller, flatter plants and a weaker costa, as well as more gradually tapering leaves.

The plants grew in montane forests, especially in open areas and secondary forests, at 2100-2500 m, on litter or old wood, or less often on trees.

Ny: 105, *Frahm 6220*; 112, *Frey & Kürschner 7934*. **KB:** 135, *Frey & Kürschner 6987*; 139, *Frey & Kürschner 7027*, *7029*, *Pócs 7303*.

Ectropothecium Mitt.

E. perrotii Ren. & Card.

This species is characterized by regularly pinnate plants. The leaves are falcate-secund, acute to short-acuminate, subentire to serrulate, and decurrent by a single inflated hyaline cell. It is very closely related to the widespread *E. regulare* (Brid.) Jaeg., but differs in the leaves less acuminate and less serrate.

The specimens cited here grew in a very wet rainforest at 900 m on wet rocks, in part in association with *Vesicularia*.

Zaire: 122, *Frahm 6637*, *6638A*, *Pócs 6814*.

Herzogiella Broth.

H. cylindrocarpa (Card.) Iwats.

This species is characterized by complanately foliate stems with a single-layered hyalodermis. The leaves are lanceolate-ovate, gradually acuminate, 1.1-1.5 mm long, serrate to serrulate throughout, and with scarcely differentiated alar cells. The capsules are erect with a well developed annulus and a high-conic operculum.

This is the first report of this species from Africa. It was formerly thought to be an endemic of the neotropics. There is only one other species of *Herzogiella* in Africa, *H. letestui* (Dix. & P.-Varde) Ando, and that species has longer laminal cells (90-130 µm vs. 37-60 µm), longer setae (2.8 cm vs. 1-2 cm), and inclined, arcuate capsules.

The plants grew in a humid *Hagenia-Hypericum* forest at 3060-3300 m, on a tree trunk and rotten wood.

Ka: 159, *Frahm 8228*, *Pócs 8076*.

Hypnum Hedw.

The genus is treated in this volume by Ando.

Isopterygium Mitt.

I. mbangae (C. Müll.) Jaeg. (? *I. plumigerum* Broth.)

This species is characterized by complanate-foliate plants with filamentous pseudoparaphyllia. The lateral leaves are asymmetric, acuminate, and about 1 mm long. The laminal cells are linear and about 5-6 µm wide. The alar cells are scarcely differentiated, with only about 2-3

rectangular ones in the extreme angles. However, all across the insertion is a single row of oblong cells.

The type of *I. mbangae* is a perfect match for a specimen in Jaeger's herbarium of *Hypnum subincurvans* Schimp. *ex* Jaeg., *nom. nud*., collected at the type locality in South Africa. Sim, in his South African flora, places this name in the synonymy of *I. strangulatum* (C. Müll.) Broth., but the description provided of that species gives leaves over 2 mm long, not at all like this plant. However, this species, whatever its name, certainly occurs in South Africa and therefore may have an older name there.

The plants grew in secondary submontane rainforest and montane forests at 2100-3200 m on bark.
KB: 143, *Pócs 7768*; 148, *Frey & Kürschner 7480*.

Mittenothamnium Henn.

M. reptans (Hedw.) Card. (*M. aureum* (Besch.) Card.; *syn. nov*., *M. cygnicollum* (Dix.) Wijk & Marg., *syn. nov*.; *M. fruticellum* (Mitt.) Card., *syn. nov*. (lectotype, chosen here: Fernando Po, 3-8000 ft up the mountain, on trees, Dec 1860, *Mann 688*, NY); *M. serratum* (Jaeg.) Card., *syn. nov*.)

This species is characterized by stipitate, laxly foliate plants with differentiated branch and stem leaves. The stem leaves are broadly ovate at the base and taper to a slender, toothed apex. The branch leaves are lanceolate, acute, and toothed almost throughout. Both have linear cells with some projecting at the upper ends. Alar development is scant. Both branch and stem leaves are about 0.75-1.0 mm long. The perichaetia are conspicuous with lanceolate, hair-pointed leaves about twice as long as the vegetative leaves. The setae are about 2 cm long, the capsules about 2 mm long, and the operculum is short-rostrate.

This is the only species of true *Mittenothamnium* that I have seen in Africa. It is very widespread, just as it is in the neotropics. I have also seen a specimen from India. Most of the other African taxa placed in the genus are species of *Chryso-hypnum* (characterized by non-stipitate plants with almost all cells prorulose at both upper and lower ends and mostly long-rostrate opercula) or other genera.

The plants grew in montane forests, probably in open areas, at 2000-2700 m, on bases and branches of trees and on rotten wood.
Ny: 103, *Frahm 6131, 6160, Pócs 6167*; 108, *Frahm 6332, Pócs 6359*. **KB:** 131, *Pócs 7132*; 133, *Pócs 7202*; 139, *Frey & Kürschner 7031*, *Pócs 7272*; 144, *Pócs 7818*; 145, *Frey & Kürschner 7492*.

Pylaisiella Kindb. *ex* Grout

Pylaisiella frahmii Buck, n. sp.

Plantae graciles atrovirides; rami erecti teretes; folia lanceolato-ovata ca. 0.8 mm longa concava, marginibus solum ad folium medium recurvatis; cellulae alares in areis magnis numerosae; setae elongatae capsula erecta cylindricea; dentes exostomii diluti laeves vel transstriolati.

Plants dark green in small, dense mats. Stems creeping, to ca. 2 cm long, irregularly but freely branched; branches ± erect, mostly straight, terete, to ca. 7 mm long. Leaves appressed when dry, spreading when moist, lanceolate-ovate, ca. 0.8 mm long, acute to short-acuminate, shortly decurrent, concave; margins mostly narrowly recurved at midleaf, plane about and below, serrulate above, entire below; costa short and double; median cells ca. 34 ×5 µm, firm-walled, becoming longer below, often yellow across insertion; alar cells well developed in large areas, subquadrate to oblate, in 5-6 tiers, extending up the margins by ca. 15 cells, decurrent by 1-3 cells. Autoicous. Perichaetial leaves erect, to ca. 1.8 mm long, ovate, acuminate, serrulate above, cells linear. Setae elongate, 1.6-1.8 cm long, orange, slender; capsules erect, cylindrical, 2.5-3 mm long, with fairly well developed stomatose neck; exothecial cells short-rectangular, becoming oblate at mouth, thin-walled; annulus not differentiated; operculum conic; exostome teeth pale, lanceolate, on front surface smooth to obscurely cross-striolate below, smooth above, projecting somewhat at back; endostome not seen. Spores 15-20 µm, papillose. Calyptrae cucullate, naked.

Type. Rwanda. Pref. de Cyangugu: Forêt de Nyungwe, BRYOTROP locality 112, Uwinka

Station along road from Butare to Cyangugu, 2100 m; montane rainforest in valley with tree-ferns near waterfall, *Newtonia* dominant, on branch of fallen tree, 14 Aug 1991, *J.-P. Frahm 6448* (holotype NY).

Pylaisiella frahmii is characterized by terete, erect branches. The leaves are ovate with margins recurved only at midleaf. The alar cells are well developed in large, conspicuous areas. The setae are long with cylindric, erect capsules. The exostome teeth are pale and vary from smooth to obscurely cross-striolate on the outer surface at base. The material has only old and juvenile capsules so that I am unable to observe the endostome (if present).

The plants grew in a montane rainforest at 2100 m on a tree branch, presumably in the canopy.

Ny: 112, *Frahm 6448*.

Rhacopilopsis Ren. & Card. (*Acanthocladiella* Fleisch., *syn. nov.*)

Among all the collections I received from the BRYOTROP expedition, this genus was the most commonly represented, as seen by the citations below. However, the genus was very poorly represented in NY, so I had to borrow from several herbaria in order to put names on the specimens. While doing so, it became obvious that *Acanthocladiella* is nothing more than a *Rhacopilopsis* with better developed underleaves—all other characters are the same. Since *A. kilimandscharica* has differentiated underleaves, just not as extreme as *R. trinitensis*, I could not justify the maintenance of two genera. Since I had to examine so much material, I am providing here a key to all the African taxa of *Rhacopilopsis*, as I define it. [Note: I have not seen any material of *A. albescens* (P.-Varde) Robins. & Reed.] Some new synonymy is also provided for the taxa, including those not collected by the BRYOTROP expedition [i.e., those in brackets]. The two previous articles on *Acanthocladiella*, Potier de la Varde & Thériot (1930) and Robinson & Reed (1966) do not provide either keys or useful illustrations. The former article emphasized and illustrated propagula (that I never saw on any of the collections I examined!) and pseudoparaphyllia (that I also found useless!).

1. Underleaves less than half as wide as the lateral leaves.....*R. trinitensis*
1*. Underleaves not differentiated or, if differentiated, greater than half as wide as lateral leaves.....2

2. Upper leaf margins recurved, subentire.....[*R. guineensis*]
2*. Upper leaf margins mostly plane, often strongly toothed.....3

3. Plants dark-green, in compact mats with short branches, ± complanate-foliate with underleaves plane and somewhat narrower than concave lateral leaves; leaves often strongly toothed above.....*R. kilimandscharica*
3*. Plants golden-green, in lax mats with elongate branches, not or scarcely complanate-foliate, with undifferentiated underleaves; leaves serrulate to serrate.....4

4. Plants slender; stem leaves broadly ovate, abruptly and shortly acuminate; apical leaf cells often shorter than those at midleaf; supra-alar cells in 5-6 rows.....[*R. flexilis*]
4*. Plants more robust; stem leaves lanceolate-ovate, ± gradually long- acuminate; apical leaf cells scarcely differentiated; supra-alar cells in 2-3 rows.....*R. transvaaliensis*

Rhacopilopsis flexilis (Ren. & Card.) Buck, comb. nov. (*Microthamnium flexile* Ren. & Card., Bull. Soc. Roy. Bot. Belgique 29(1): 185. 1890; type of *Acanthocladiella*.)

This species is restricted to Madagascar and is characterized by slender plants with ovate, abruptly short-acuminate leaves with numerous supra-alar cells. I have only seen, in addition to the type, a couple of specimens, and it may be a small form of *R. transsvaaliensis* (and the older name).

Rhacopilopsis guineensis (Broth. & Par.) Buck, comb. nov. (*Pylaisia guineensis* Broth. & Par. *ex* Par., Rev. Bryol. 31: 88. 1904. *Rhaphidostegium*

julicaule Broth. & Par. *ex* Par., *syn. nov*. [a sun form].)

This species is only known from West Tropical Africa and is characterized by acuminate leaves with strongly recurved and subentire upper margins.

Rhacopilopsis kilimandscharica (Broth. & P.-Varde) Buck, comb. nov. (*Acanthocladiella kilimandscharica* Broth. & P.-Varde, Bull. Soc. Bot. France 71: 1058. 1924.

Microthamnium stuhlmannii Broth., *syn. nov*. [a sun form].)

This was a commonly collected species on the BRYOTROP expedition and seems to be restricted to moderate to high elevations in central Africa. It is characterized by ±complanate-foliate plants in which the underleaves are plane, less toothed, and somewhat narrower than the concave, strongly toothed lateral leaves. In most specimens, the apices of the lateral leaves are abruptly tapered with the cells at the base of the acumen quite short (about 2-3:1). However, on a single plant this character varies and when the leaf apex is not abruptly tapered, the subapical cells are not shortened. This latter form matches the type. In almost all plants, though, the lateral leaf apices are strongly toothed, more so than in any of the other species.

The plants grew in montane forests at 2000-2500 m, usually on humus, but also on rotten wood and the bases of trees.
Ny: 111, *Frey & Kürschner 7905*, *Pócs 6413*; 112, *Frahm 6451*, *Frey & Kürschner 7931*, *7948*, *7955*; 113, *Frahm 6482*, *6487*. **KB:** 133, *Pócs 7203*; 144, *Frahm 7666*.

Rhacopilopsis transvaaliensis (Thér. & Dix. *ex* Sim) Buck, comb. nov. (*Acanthocladiell transvaaliensis* Thér. & Dix. *ex* Sim, Trans. Roy. Soc. S. Africa 25: 424. 1926. *Hypnum elaeis* C. Müll. *ex* Par., *nom. nud.*, *syn. nov*.; *Microthamnium flexile* var. *fusco-alare* Ren. & Card. *ex* Par., *nom. nud.*, *syn. nov*.)

This is a seemingly common and widespread moss, extending (based on specimens examined) from Cameroon to Madagascar and south to South Africa. It is characterized by golden-green, lax plants with lanceolate-ovate, gradually acuminate leaves. As mentioned above, it might be a form of *R. flexilis*, but differs in more elongate leaves and fewer supra-alar cells.

The plants grew in submontane and montane forests at (900-)2100-2600 m, mostly on the bases of trees, but less often on rock and soil.
Ny: 103, *Pócs 6118*; 109, *Pócs 6350*; 111, *Frahm 6429*; 112, *Frahm 6450*, *6454*, *Pócs 6440*; 113, *Pócs 6496*. **Zaire:** 120, *Frey & Kürschner 6581*; 126, *Pócs 6837*; 127, *Pócs 6884*. **KB:** 131, *Frey & Kürschner 6919*; 132, *Frey & Kürschner 6899*; 133, *Frey & Kürschner 6970*, *Pócs 7205*; 137, *Pócs 7257*; 143, *Frey & Kürschner 7414*; 152, *Frey & Kürschner 7530*.

R. trinitensis (C. Müll.) Britt. & Dix. (*Microthamnium plano-squarrosum* Broth., *syn. nov*.; *M. pobeguinii* Broth. & Par. *ex* Par., *syn. nov*.; *M. subelegantulum* Broth., *syn. nov*.; *Rhaphidostegium nivescens* Broth., *syn. nov*.)

This species is characterized by very narrow underleaves, less than half the width of the lateral leaves, that are plane and subentire. It is closely related to *R. kilimandscharica*, but in that species the underleaves are not so reduced and the plants not so complanate. It is distributed in the neotropics in northern South America, Central America, and the West Indies. In Africa it is very common in relatively lowland West Tropical Africa, where it has several other previously published synonyms that I have not confirmed.

The plants grew in a submontane forest at 1500 m, on the bases of trees.
Zaire: 126, *Frey & Kürschner 6691*, *Pócs 6823*.

Taxiphyllum Fleisch.

Taxiphyllum laxalare Buck, n. sp.

Folia in sicco contorta, madefacta complanata et lato-patentia, oblongo-ovata acuta vel breviter et late acuminata; cellulae alares numerosae 5-7-seriales trans folii fere totam insertionem dispositae.

Plants pale green; stems to ca. 4 cm long, irregularly branched with branches less than 1 cm long, complanately and densely foliate; pseudoparaphyllia narrowly foliose; in cross-section

with 1-2 rows of small, firm-walled cells surrounding large, thin-walled cells, central strand well developed; rhizoids smooth. Leaves erect-spreading and somewhat contorted when dry, wide-spreading and complanate when moist, oblong-ovate, ca. 1.5 mm long, acute to shortly and broadly acuminate, concave; margins sparsely serrulate to denticulate above, entire below; costa short and double; cells linear, to 110 × 5-6 µm, subflexuose, shorter in the acumen, smooth; alar cells relatively numerous, differentiated across almost all of insertion in 5-7 rows, subquadrate to short-rectangular, ca. 15 µm wide, chlorophyllose. Dioicous, only unfertilized perichaetia seen.

Type: Zaire. Prov. Kivu: Kahuzi-Biega National Park, BRYOTROP locality 118, Tshivanga Park Station 30 km W of Bukavu, 2200 m; mesic montane forest dominated by *Dombeya goetzenii*, *Zanthoxylum gilletii*, *Hagenia abyssinica* and *Alangium chinense*, 20 August 1991, *Frey & Kürschner 6544A* (holotype NY; isotype hb. Frey).

This species differs from the widespread *T. taxirameum* (Mitt.) Fleisch. in the densely foliate plants with many more alar cells. From the only other African species, *T. gabonense* Broth. & P.-Varde, in the acute leaf apices and numerous alar cells.

The plants grew in a mesic montane forest at 2200 m, presumably as an epiphyte, as a mixture with *Schimperella bello-intricata*.
KB: 118, *Frey & Kürschner 6544A*.

Vesicularia (C. Müll.) C. Müll.

1. Leaves decurrent by 2-3 cells in a single row.....*V. sigmangia*
1*. Leaves not decurrent.....2

2. Leaves ovate, short-acuminate, asymmetric... .....*V. perpallida*
2*. Leaves oblong, longer acuminate, symmetric .....*V. oreadelphus*

V. oreodelphus (C. Müll. *ex* Broth.) Broth.

This species is characterized by pinnately branched plants. The leaves are oblong, symmetric, and acuminate. The laminal cells are about 4-6:1. There is a hint of a single-rowed border on some of the leaves at about midleaf.

The plants grew in submontane and montane rainforests at 2000-2100 m on rock and decaying wood.
Ny: 112, *Frahm 6457*. **KB:** 143, *Pócs 7605*. **Ka:** 152, *Pócs 7822*.

V. perpallida (C. Müll. *ex* Broth.) Broth.

This species is characterized by pinnately branched plants. The leaves are ovate, asymmetric, and short-acuminate. The laminal cells are about 6:1. There is no suggestion of a laminal border.

The plants grew in rainforest near a waterfall at 900 m, and along a stream at 850 m, on wet rocks.
Zaire: 119, *Pócs 6867*; 122, *Frahm 6638*.

V. sigmangia (Broth.) Broth.

This species is characterized by irregularly branched plants. The leaves are lanceolate, ± symmetric, acuminate, and decurrent by 2-3 cells in a single row. The laminal cells are about 6-8:1, without any marginal differentiation.

The plants grew in a submontane rainforest at 2000 m on the trunk of a fallen tree.
Ny: 113, *Frahm 6486*.

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