The Dicranaceae, Rhabdoweisiaceae and Leucobryaceae of Uganda[1]

Jan-Peter Frahm

DICRANACEAE

Plants variable in size and appearence, from a few mm to more than 10 cm tall, in loose to dense tufts. **Stems** erect, simple, rarely branched, radiculose, sometimes densely tomentose; rhizoids reddish-brown to whitish. **Leaves** erect-patent, sometimes curled when dry or falcate (sometimes erect and falcate expressions in the same species), short to longly lanceolate, often subulate; margins entire or serrate at leaf tips; costa single, percurrent to short excurrent, sometimes hyaline excurrent, filling 1/6 to 4/5 of leaf width, in transverse-section with median deuter cells and dorsal stereids, rarely hyalocysts, ventrally either stereids or more rarely hyalocysts; laminal cells usually smooth, occasionally bulging mammillose, cell walls smooth; alar cells differentiated or not, when distinct, hyaline or reddish brown, inflated, thin-walled or incrassate, basal laminal cells mostly rectangular, thin-walled or incrassate, occasionally pitted, upper laminal cells quadrate to rectangular or oval, leaf border present in some taxa. **Vegetative propagation** by microphyllous branches, deciduous leaves or stem tips, or anisophyllous brood leaves in the axils of the upper leaves. **Dioicous** or autoicous. **Perichaetia** terminal, or occasionally pseudolateral by stem innovations, perichaetial leaves often different in shape, from sheathing base subulate. **Seta** mostly elongate (1-4 cm), rarely short (<1 cm) or almost absent, erect, in few genera flexuose, cygneously curved and twisted. **Capsule** immersed to more commonly exserted, inclined to suberect or erect, symmetric to asymmetric, short long-cylindrical to ovoid-cylindrical or ovoid,, smooth or furrowed when dry and empty; stomata present or absent; annulus present or absent. **Operculum** conical to long-rostrate. **Peristome** single, teeth 16, mostly divided 1/2 or more toward base, vertically striate below, distally papillose to papillose throughout. **Calyptra** cucullate, smooth, naked, base entire or ciliate. **Spores** almost smooth to coarsely papillose.

[1] Contribution for a former project of the British Bryological Society initiated about twenty years ago, which was never completed and published. With respect to the fact that any comparable survey of the families for Central Africa is missing and the potential use of this treatment, it is made here accessible. The genera Holomitrium, Dicranum and Dicranoloma should have been worked out by another author and are not treated here.

Key to the genera

1. Alar cells not differentiated	2
Alar cells differentiated	5
2. Plants a few mm high, strongly julaceous foliate with imbricate leaves	2. *Aongstroemia*
Plants larger, not julaceous	3
3. Seta 1 mm long, capsule cleistocarpous, immersed in perichaetial leaves	11. *Pseudephemerum*
Seta longer, capsule stegocarpous	4
4. Leaf base widened and suddenly contracted into the subula	5
Leaf gradually narrowed	6. *Dicranella*
5. Seta cygneous	10. *Microcampylopus*
Seta straight	1. *Anisothecium*
6. Costa narrow, filling 1/4 or less of the leaf width	9
Costa filling 1/3 of leaf width or more	7
7. Seta cygneous when moist, twisted	8
Seta straight when moist	3. *Atractylocarpus*
8. Operculum as long as the capsule. Adaxial side of peristome teeth smooth	4. *Bryohumbertia*
Operculum shorter than the capsule. Adaxial side of peristome teeth papillose.	*5. Campylopus*
9. Leaves bordered a narrow elongate cells.	7. *Dicranoloma*
Leaves not bordered by elongate cells	10
10. Upper laminal cells isodiametric.	9. *Holomitrium*
Upper laminal cells elongate.	*8. Dicranum*

Excluded taxa
Dicranodontium was reported from Uganda with *D. humile* P.de la Varde described from the alpine region of Mt. Muhadara, which proved to be a species of *Blindia*, probably *B. acuta* (Hedw.) Bruch, Schimp. & W. Gümbel (cf. Frahm, J.-P., Ann. Bot. Fennici 34: 179-204, 1997).

1. **ANISOTHECIUM** Mitt. J. Linn. Soc. Bot. 12: 39, 1869.

The genus is often included in *Dicranella* and differs only by the sheathing leaf bases.

Key to the species

1. Upper laminal cells rectangular	1. *A. subsubulata*
Upper laminal cells quadrate	2. *A. ugandae*

1. Anisothecium subsubulatum (Hampe ex Muell.Hal.) J.-P. Frahm
(*Dicranella subsubulata* Hampe ex Muell.Hal.)

ISSN 0945-3466

Plants small, to 5 mm high, yellow green. Stems erect. Leaves erect, to 5 mm long, the lower smaller, the upper ones longer, comose, from broad sheathing base abruptedly contracted into a subula. Margins entire. Costa narrow, filling the subula, percurrent, slightly serrate at tips. Laminal cells rectangular, incrassate.

Seta erect, to 5 mm long, yellowish. Capsules shortly cylindrical, erect, symmetric, red brown. Spores 30 µm in diameter.

An African species known from Burundi, Central African Republic, Gabon, Malawi, Nigeria, Rwanda, Tanzania, Zaire, Zimbabwe and South Africa (Cape Province, Lesotho, Natal, Transvaal). On open soil in open forests and grasslands and especially along roadside banks.
This species vegetatively much resembles *Microcampylopus* but is distinguished from the latter by its straight setae.

2. **Anisothecium ugandae** P.de la Varde

Plants in loose shiny, mats. Stems flexuose, 20 mm long. Leaves erect patent, homomallous at stem tips, from obovate base narrowed into a long acumen, about 3 mm long and 0.5 mm wide at leaf base. Margins entire, often involute at one side. Costa 100 µm wide at leaf base, vanishing before the leaf tip. Basal laminal cells rectangular or hexagonal, 90 x 20 µm, shorter and narrower at margins, 35-40 x 7-8 µm. Upper laminal cells subquadrate, 12-13 µm wide. (translated from the protologue).

Known only from the type specimen collected on Mt. Muhawura, 3350 m alt. On moist shaded rock.

Anisothecium ugandae is a dubious taxon because it was described from sterile material. Sterile specimens of this genus usually cannot be identified, and cannot be named or separated from *Microcampylopus.* The only conspicuous distinguishing character is the quadrate upper laminal cells, whereas species of *Dicranella* or *Anisothecium* usually have rectangular upper laminal cells.

2. **AONGSTROEMIA** Bruch, Schimp. & W. Gümbel, Bryol. Eur. 1 171, 1846.

A genus with about a dozen species worldwide on high mountains, of which *A. filiformis* (B. Beauv.) Wijk & Marg. and the following species are found in tropical Africa.

Aongstroemia julacea (Hook.) Mitt.

Plants small, to 5 mm high, in loose turfs or amongst other bryophytes. Stems julaceous, very densely foliate with imbricate leaves, the single leaves hardly visible. Leaves short oval, 0,5 mm long, with rounded apex. Margins erose-denticulate in the upper part. Costa ending below apex. Upper laminal cells rhombic, incrassate, 10-12 x 4-5 µm. Basal laminal cells quadrate to short rectangular incrassate but less than the upper ones, 10-14 x 10 µm. Sporophytes not known in Africa.

Scattered through the tropical mountains, in the Andes and African mountains, so far known from Lesotho, Natal, Malawi, Tanzania, Madagascar, Reunion, in Uganda found only on Mt. Elgon 3500 m. On open bare soil in the alpine zone.

3. **ATRACTYLOCARPUS** Mitt. nom. cons.

There has been some confusion about the use of *Atractylocarpus* and *Metzleria* in the past. The type of *Atractylocarpus* turned out to belong to *Campylopodiella*. Since this would have caused serious nomenclatural confusions, *Atractylocarpus* was proposed as nomen conservandum. This proposal was rejected by the nomenclature committee at the Botanical Congress in Tokyo, causing lots of nomenclatural changes, however reconsidered at the St. Louis Congress and got support, making all previous changes unnecessary

Atractylocarpus alticaulis [Broth.] Williams
(Metzleria alticaulis Broth. in Mildbr., *Metzlerella alticaulis* [Broth.] Broth., *Atractylocarpus flexifolius* Dix., A. *capillifolius* Dix.)

Plants in loose to compact tufts, 5-30 mm high. Stems radiculose. Leaves erect-patent, lanceolate, ending in a long acumen, entire or with a few teeth at tips; costa filling ½ - 2/3 of the leaf base, excurrent, in transverse section with large ventral and dorsal hyalocysts, a median band of stereids and 2-4 ventral stereids; alar cells weakly developed; laminal cells elongate rectangular. Dioicous; perigonial leaves from broader base suddenly contracted into a slender subula. Seta yellowish or brownish in age, erect, twisted in the upper part. Capsule erect, elliptical to cylindrical, yellowish, without stomata; operculum longly rostrate; annulus present; peristome 16, teeth divided nearly to the base. Spores 11 – 19 µm in diameter. Calyptra cucullate, fimbriate or entire at base.

A species confined to Central and East Africa (Ruwenzori, Kahuzi, Karisimbi, Mt. Kenya, Kilimanjaro).

On rotten wood from subalpine forests at 3000 m altitude to the tree line.

4. **BRYOHUMBERTIA** P. Varde & Thér., Bull. Soc. Bot. France 86: 422, 1939

A genus with three species worldwide in tropical America, Africa and Asia. Vegetatively, it much resembles some species of *Campylopus* but differs by the basal laminal cells graduating into the upper laminal cells, the smooth cell walls on the inner surface of the peristome teeth, a dehiscent annulus, a longer operculum and a longer, almost straight seta. According to phylogenetic trees (Stech 1999), *Bryohumbertia* can be separated from *Campylopus* only et the subgenus level.

Bryohumbertia flavicoma (Müll.Hal.) J.-P.Frahm
(*Campylopus flavicoma* Muell.Hal., *C. metzlerelloides* [P. Varde & Thér.] Biz., *Bryohumbertia metzlerelloides* P. Varde & Thér.)

Plants to 25 mm tall, younger ones with low stems and comose at tips, older plants interruptedly foliate, in loose tufts. Leaves narrow lanceolate, to 7 mm long, ending in a long, fine, serrate tip. Costa percurrent to excurrent, filling ½ of leaf base, in transverse section with dorsal and ventral bands of stereids, smooth at back. Alar cells reddish or hyaline, inflated. basal laminal cells rectangular, incrassate, gradually merging into the shorter upper laminal cells. Dioicous. Seta 1 cm long, +/- straight, slightly flexuose, twisted. capsule brownish, asymmetric, curved, 1.5 – 2 mm long, furrowed when dry and empty. Peristome teeth 16, split to the middle into two prongs, smooth. Spores about 13 µm in diameter, finely papillose. Calyptra cucullate, fringed at base.

A species confined to tropical Africa and so far reported from Angola, Burundi, Cameroon, Rwanda, Tanzania, Congo and Zambia. On soil, rotten wood and earth covered rocks in montane rain forests between 1500 and 3000 m.

ISSN 0945-3466

5. **CAMPYLOPUS** Brid., Mant.Musc. 71, 1819

Plants small to robust, 1 – 15 cm high, erect, rarely branched. Stems sparsely to densely white or reddish tomentose or not tomentose. Leaves 5 – 15 mm long, lanceolate, erect patent to appressed, the uppermost often longer and comose, straight or homomallous. Leaf tips smooths or denticulate. Costa filling 1/3 – 4/5 of leaf base, ending in the leaf tip or more or less excurrent, in transverse section with a ventral layer of hyalocysts or stereids, a median row of chlorocysts (deuter cells), below a layer of stereidal or non stereidal cells (guide cells) and dorsally a layer of chlorocysts, which are smooth, ridged or lamellose with lamellae 1-6 cells high. Alar cells lacking or differentiated, reddish or hyaline, inflated to auriculate. basal laminal cells hyaline and thin-walled or chlorophyllose and incrassate, with smooth or pitted walls, subquadrate to rectangular. Upper laminal cells incrassate, quadrate to rectangular, oblique or oval to elongate oval. Dioicous. Perichaetia terminal or rarely pseudolateral, sometimes bud like. Perichaetial leaves differentiated, with broader sheathing base and suddenly contracted narrow subula. Setae 5-15 mm long, often several in one perichaetium, incurved in young sporophytes, later cygneous and almost erect but sinuose and twisted. capsules erect to curved, sometimes strumose, striate to furrowed when empty. Annulus present but not dehiscent. Operculum rostrate, half as long as the capsule. Peristome teeth 16, divided to the middle or deeper into two prongs, reddish, horizontally striate below, papillose at ends. Spores ca 13 μm in diameter, nearly smooth to papillose. Calyptra cucullate, ciliate or smooth at base.

A survey of the 50 African species was provided by Frahm (1985).

Key to the species

1. Basal laminal cells incrassate, chlorophyllose	2
Basal laminal cells thin-walled, hyaline	8
2. Costa excurrent in a hyaline hair-point	3
Costa not excurrent in a hyaline hair-point	5
3. Upper laminal cells rectangular. Leaves more than 1 cm long	7. *C. hensii*
Upper laminal cells oblique, oval or quadrate. Leaves < 1 cm long.	4
4. Transverse section of costa with ventral stereids	17. *C. savannarum*
Transverse section of costa with ventral hyalocysts	16. *C. robillardei*
5. Leaves to 3 mm long, blunt, with excurrent costa	6
Leaves longer, acuminate	7
6. Transverse section of costa without stereids	3. *C. decaryii*
Transverse section of costa with dorsal groups of stereids	12. *C. perpusillus*
7. Upper laminal cells subquadrate, in rows. Plants with microphyllous branches	5. *C. flexusosus*
Upper laminal cells shortly rectangular to oblique. Plants without flagellate branches	14. *C. praetermissus*
8. Costa excurrent in a hyaline hair.point	9
Costa not excurrent in a hyaline hair.point	11
9. Basal laminal cells hyaline, thin-walled	10
Basal laminal cells incrassate, pitted	2. *C. crateris*
10. Costa dorsally with distinct lamellae 3-4 cells high	13. *C. pilifer*
Costa without lamellae, only slightly ridged at back	10. *C. kivuensis*
11. Leaves 7-12 mm long. Costa filling 4/5 of leaf width	9. *C. jamesonii*
Leaves shorter. Costa narrower	12
12. Upper laminal cells quadrate	6. *C. fragilis*
Upper laminal cells longer	13

13. Upper laminal cells shortly rectangular (1.5:1) to oblique	14
Upper laminal cells rectangular to oval	15
14. Basal laminal cells short rectangular to subquadrate. Ventral hyalocysts small, not larger than the median deuter cells	1. *C. cambouei*
Basal laminal cells elongate rectangular, ventral hyalocysts larger than the median deuter cells	8. *C.hildebrandtii*
15. Upper laminal cells rectangular	15. *C. pyriformis*
Upper laminal cells oval	17
17. Plants with homomallous leaves	4. *C. dicranoides*
Plants with erect leaves	11. *C. nivalis*

1**. Campylopus cambouei** Renauld & Cardot

Plants to 1 (-3) cm high, light green, in loose tufts. Stems equally foliate with appressed leaves when dry, erect patent when wet. Leaves to 5 mm long, from broadly lanceolate base longly and narrowly acuminate. Leaf tips serrate, canaliculate, much longer than the lamina. Costa filling half of the leaf width, in transverse section with ventral substereids, which are as wide or smaller than the median deuter cells, and dorsal groups of stereids, slightly ribbed at back. Alar cells large, inflated, hyaline or reddish brown. Basal laminal cells thin-walled, hyaline, shortly rectangular, 10-15 x 15-30 µm, smaller at margins in 4-6 rows. Upper laminal cells incrassate, subquadrate or oblique, 5-6 x 6-12 µm. Seta 5 mm long, yellowish, cygneous. Capsule 2 mm long, slightly assymmetric, furrowed. Operculum 1 mm long, rostrate. Calyptra ciliate at base.

Very scattered through Africa, so far reported from Madagascar, Tanzania, Mozambique, also in Guinea. On soil and soil covered rocks in open habitats between 20 and 2300 m.

2. **Campylopus crateris** Besch.

Plants to 5 cm high, brownish green to almost blackish or golden yellowish above and blackish below. Stems erect, densely and evenly foliate, appressed at tips. Leaves 5-6 mm long, lanceolate, ending in a hyline tip. Costa filling ½-⅓ of the leaf base, smooth at back, in transverse section with small ventral and dorsal stereids. Alar cells inflated, reddish or hyaline, protruding into the costa. Basal laminal cells rectangular, incrassate, strongly pitted, 6-10 x 45-60 µm, narrower at margins, forming a hyaline border of 5-10 cell rows. Upper laminal cells oval to elongate oval, 5-6 x 20-30 µm. Sporophyte not known.

On high mountains or mountains peaks in Madagascar, Reunion, Comores, Kenya. On rocks, especially volcanic rocks, at high altitudes, in Uganda only found at Mt Elgon, 3990m.

3. **Campylopus decaryii** Thér.

Plants very slender, to 1 cm tall, in green turfs. Leaves lanceolate, 2-3 mm long. Costa narrow, filling only ¼ of leaf width, excurrent in a short detate spine, in transverse section almost without stereids, slightly ridged at back in the upper part of the leaf. Alar cells hyaline or brownish, very weak. Basal laminal cells shoretly rectangular, incrassate, 15-40 x 8-12 µm, smaller at margins. Upper laminal cells short rectangular (2:1) or subquadrate, incrassate, 4-8 x 8-16 µm. Sporophyte not known.

A species described from Madagascar and also identified from South Africa. Habitat insufficiently known, on soil, in Uganda collected on gravel edge of stream at 1360 m.

ISSN 0945-3466

4. **Campylopus dicranoides** Ther. & Nav., Bull. Soc. R. Bot. Belg. 60: 15, 1927

Plants to 7 cm tall, green above, bleeched below. Stems tomentose, erect, equally foliate, homomallous at tips. Leaves falcate, lanceolate, from broad base narrowed into a long tubulose acumen, 8-9 mm long, serrate at the outermost tip. Costa filling ½ of the leaf width at leaf base, in transverse section with ventral hyalocysts; dorsal stereids only in the midth of the costa, smooth at back. Alar cells large, protruding into the costa, hyaline or brownish. Basal laminal cells rectangular, thin-walled, 8-14 x 36-50 µm, narrower at margins. Upper laminal cells oblique, rhombic or shortly rectangular, 4-10 x 6-20 µm. Sporophyte not known.

Confined to the mountains (e.g. Mt. Elgon, Muhavura, Karisimbi, Mt. Kenya) of Central Africa in Uganda, Congo, Rwanda and Kenya. On rotten wood in montane forests.

A species easily recognized by its robust *Dicranum*-like appearance with falcato-secund leaves.

5. **Campylopus flexuosus** (Hedw.) Brid., Mant. Musc. 4: 71, 1819.

Plants to 5 cm tall, usually 2-3 cm, in dense dark green mats. Stems equally foliate, usually with microphyllous branches in the axils of the upper leaves, reddish tomentose. Leaves 5-6 mm long, appressed to the stem when dry, erect patent when wet, lanceolate. Margins entire. Costa filling 1/3 of leaf base, shortly excurrent in the leaf tip, in transverse section with ventral substereids and dorsal groups of stereids, ridged at back. Alar cells distinct, reddish or brownish, often inflated. Basal laminal cells incrassate, rectangular, smooth, 10-16 x 30 – 60 µm, narrower at margins. Upper laminal cells subquadrate, in distinct rows, 8-10 x 10-16 µm. Seta 7-8 mm long. capsule inclined, asymmetric, strumose, brownish, furrowed when dry and empty. Calyptra ciliate at base. Vegetative propagation by means of small microphyllous branches in the axils of the upper leaves.

Widespread in western Europe, rarely in North America, through the Andes of Central and South America and tropical montane Africa (Madagascar, Mauritius, Reunion, Rwanda, Sao Thomé, S. Helena, Tanzania, Congo, Zambia). On soil and rotten wood in montane forests from 1400 – 3000 m.

This species is usually easily recognized by the preence of microphyllous flagellate branches.

var. **incacorralis** (Herzog) J.-P.Frahm
(*Campylopus incacorralis* Herzog, *C. subperichaetialis* Biz. & Kilb.)

Differs from var. *flexuosus* by pitted basal laminal cells, strongly appressed leaves and growth in dense compact tufts.

In the Andes of South America and the mountains of tropical Africa in Tanzania, Uganda, Congo as well as on Mauritius and Reunion. On humid soil in subalpine heathland and ericaceous shrubs.

6. **Campylopus fragilis** (Brid.) Bruch, Schimp. & W.Gümbel

Plants yellowish green, to 3 cm tall, in loose mats, whitish tomentose at base. Stems swollen foliate, comose at tips, usually with clusters of small hamate brood leaves in the axils of the upper leaves. Leaves 5 mm long, from narrow base widened below mid leaf, contracted into a leaf tip aof various length. Costa widest below mid leaf, contracted towards the leaf base, in transverse section with large lax ventral hyalocysts, filling half of the leaf thickness, and a small band of dorsal

substereids, almost smooth at back. Alar cells lacking or weakly differentiated. Basal laminal cells hyaline, thin-walled, 8-12 x 50-60 µm, extending up the leaf margins. Upper laminal cells incrassate, quadrate, 8-10 x 10-12 µm. Seta 6-7 mm long. Capsule erect, symmetric, yellowish brown, darker coloured, furrowed and contracted below the mouth in age. Calyptra ciliate at base. A species easily identified by the clusters of yellow brood leaves in the comal leaves. Microscopically, the species is well characterized by quadrate upper laminal cells, the V-shaped hyaline basal laminal cells and the leaf and costa widest below midleaf and contracted towards the base.

Widespread in the Neotropics, western Europe, east Asia, and rarely in North America. In Africa in the mountains of Cameroon, Congo, Ethiopia, Kenya, Malawi, Reunion, Rwanda, Tanzania, Transvaal and Uganda. On humic or peaty soil, rotten wood and soil covered rocks at higher altitudes, especially in the subalpine; usually not below 2000 m, only in Transvaal descending to 1300 m.

7. **Campylopus hensii** Renauld & Cardot

Plants robust, *Dicranum*-like, to 8 cm tall, erect. Stems equally foliate, at the apex somewhat comose and homomallous, tomentose. Leaves more than 1 cm to 1.5 mm long, from broad base contracted into a long acumen. Margin strongly serrate from apex to midleaf. Costa filling 1/3 of leaf base, excurrent in a spinosely dentate awn, in transverse section with ventral and dorsal groups of stereids, ridged and serrate at back. Alar cells large, well defined, reddish brown. Inner basal laminal cells incrassate, rectangular, 12-18 x 24-38 µm, becoming shorter and finally quadrate towards the margins. Upper laminal cells incrassate, in distinct rows, quadrate, 6-10 x 10-12 µm, reaching far into the leaf apex. Sporophyte not known.

Through tropical Africa in Angola, Cameroon, Central African Republic, Congo, Equatorial Guinea, Gabon, Ivory Coast, Kenya, Liberia, Malawi, Natal, Nigeria, Rwanda, Tanzania and Zambia. On soil, earth-covered rocks, bases of trees (buttresses) and rotten wood in rain forests from the lowlands to the montane regions.

Campylopus hensii is closely related to *C. savannarum* with respect to the leaf anatomy with dorsal and ventral layers of stereids in the costa and the quadrate outer basal laminal cells but is larger with longer leaves, which are coarsely dentate down to mid leaf, quadrate and never oblique or oval upper laminal cells and the costa weakly lamellose in the upper part with serrate ridges. In contrast to *C. savannarum*, which grows in open, dry, savannah habitats, *C. hensii* is found in rain forest and can be regarded as an ecological vicariant of the latter. It could therefore also be regarded as a subspecies of *C. savannarum*.

8. **Campylopus hildebrandtii** Muell.Hal.

Plants to 4 cm high, yellowish green, slender, appressed foliate when dry, sometimes homomallous in the same tufts, reddish tomentose. Leaves ca 8 mm long, lanceolate, longly and finely acuminate, serrate at tips. Lamina reaching only to mid leaf. Costa filling 2/3 of the leaf base, in transverse section with large ventral hyalocysts, which fill half of the leaf thickness at leaf base, getting smaller towards leaf tip, and dorsal groups of narrow stereids, smooth at back or weakly ridged. Alar cells hyaline, only slightly differentiated, not inflated. Basal laminal cells thin-walled, loosely rectangular, 14-20 x 30-50 µm, smaller at margins. Upper laminal cells irregular oblique or oval, incrassate, 6-10 x 14-20 µm. Seta 7-8 mm long, olive brown. Capsule 2 mm long, short cylindric,suddenly contracted into the seta, getting narrower towards tip, smooth or slightly furrowed. Operculum 1 mm long, like the annulus dark brown, almost straight. Calyptra smooth at base.

Presumably widespread in central and eastern tropical Africa but distribution not exactly known because of confusions with other species (such as C. *bartramiaceus* [Mül. Hal.] Thér. in South Africa and *C. perichaetialis* P. Varde & Thér. in central Africa. Burundi, Cameroon, Comores, Kenya, Madagascar, Malawi, Natal, Teunion, Tanzania, Zaire. On soil, rotten and living wood between 1600 and 3000 m.

In humid habitats it is swollen foliate (leucobryoid) and resembles *Paraleucobryum enerve* in appearance. Such forms occur in subalpine *Philippia*-forests and can form hugh mossballs in the canopy of forests at lower elevations. Smaller forms are found as epiphyte (characteristically on *Agaurea salicifolia*), where sporophytes are regularly produced. The species much resembles *C. perichaetialis*, which has longer (4:1) upper laminal cells and no stereids in transverse section of the costa.

9. **Campylopus jamesonii** (Hook.) A.Jaeger

Plants to 10 cm tall, *Dicranum*-like (and in fact much resembling *D. johnstonii*, with which it can grow together), brownish and tomentose below, yellow to light green above. Stems equally foliate. Leaves somewhat curled but patent when dry and straight patent when wet, to more than 1 cm long, from broad base narrtowed into a long serrate apex. Costa very broad, filling 4/5 of the leaf base, excurrent, in transverse section with large, lax ventral hyalocysts, which fill half of the leaf thickness (or more at leaf base), with dorsal groups of stereids, smooth at back. Alar cells differentiated, reddish or hyaline, conspicuously protruding into the costa. Inner basal laminal cells rectangular to rhombic, more or less thick walled with slightly pitted walls, 8-10 x 35-45 µm, in 4-5 narrowed at margins. Upper laminal cells very small, quadrate to shortly rectangular or oblique, incrassate, 4-6 x 6-8 µm. Several setae arising from one perichaetium, to 1 cm long, yellow to red brown. Capsule asymmetric, slightly strumose, 2 mm long. Operculum longly rostrate. Calyptra fimbriate at base.

A tropical montane species through the Andes from southern Mexico to Bolivia, in Africa in the mountains of Cameroon, Congo, Kenya, Madagascar, Malawi, Mozambique, Reunion, Rwanda, Tanzania, Transvaal and Zimbabwe. On soil, rarely rocks in montane and subalpine forests between 1700 and 2800 m, characteristic of the forest floor in subalpine *Erica* forests but also at lower altitudes but only in open habitats such as rocky slopes or roadsides.

10. **Campylopus kivuensis** P. de laVarde & Thér.

Plants to 2 (-3) cm high, yellowish-brownish, in loose tufts. Leaves to 7 mm long, erect patent to appressed, from broad ovate base longly acuminate, ending in a longly acuminate, canaliculate, entire apex. Costa broad, filling ¾ of leaf width, excurrent in a hyaline tip (which is often broken), in transverse section with ventral hyalocysts and dorsal groups of stereids, ridged at back. Alar cells differentiated, hyaline or reddish, protruding into the costa. Basal laminal cells hyaline, rectangular, 6-8 x 30-40 µm, at margins 6-7 rows narrower. Upper laminal cells incrassate, rhombic to oval, 4-6 x 15-30 µm. Sporophyte not known.

So far only known from the type locality at the volcano Nyragongo in Congo and another specimen without locality, in Udanda found on Mt. Elgon in 3990 m. On open rocks in alpine habitats.

This species is related to *C. pilifer* but distinguished by the lack of dorsal lamellae on the costa and by smaller ventral hyalocysts.

11. **Campylopus nivalis** (Brid.) Brid.

Plants in dense light or yellow green tufts, to 8 cm high. Stems equally foliate with erect patent leaves, rarely falcate leaves, tomentose below. Leaves 4-6 mm long, narrow lanceolate, ending in a fine acumen which is serrate at the tip. Costa 2/3 of leaf base, filling the leaf tip, in transverse section with large ventral hyalocysts which fill half of the leaf thickness or more, and dorsal groups of stereids, smooth at back. Alar cells lacking or weakly differentiated. Basal laminal cells thin-walled, hyaline, rectangular, 4-10 x 25 – 60 µm, in 6-10 rows narrower at margins. Upper laminal cells incrassate, oval, ca 3-6: 1, 4-6 x 10-28 µm. Seta terminal or pseudolateral, ca 8 mm long, sinuose and twisted. Capsule erect, symmetric, elongate oval when young, cylindrical and narrowed below the mouth when empty. Operculum rostrate, darker than the rest of the capsule. Calyptra cilate or smooth at base.

A species disjunct in the Andes from Mexico to northern Argentina and also in the African mountains in Cameroon, Congo, Kenya, Madagascar, Malawi, Mauritius, Natal, Reunion, Rwanda, Tanzania. On soil, rotten wood, earth covered rocks, lava flows, volcanic ash, in swamps, also epiphytic on giant *Senecio*, predominantly above the forest line to 4500 m, rarely in open habitats below 3000 m.

Because of the broad ecological amplitude, this species is very variable regarding size, length of leaf apex and length of upper laminal cells and has therefore be described under many names (e.g. *C. denticuspes* Broth., *C. stramineus* [Mitt.] Jaeg., *C. substramineus* Broth., *C. leptodrepanium* [Broth.] Broth., amongst others). Modifications from drier habitats are smaller, have shorter leaf apices and shorter laminal cells.

12. **Campylopus perpusillus** Mitt.

Plants small, only 5-6 mm high, rarely to 3 cm, greenish to brownish green, in loose mats. Stems erect, with appressed or erect patent leaves. Leaves 2.5 – 3.5 mm long, with broadly lanceolate leaves, serrate at tips. Leaf margins broadly involute at tips. Perichaetial leaves with long, serrate subhyaline apex. Costa filling only 1/5 – ¼ of the leaf width, excurrent in a short awn, in transverse section with few ventral substereids (which are often lacking in the upper part of the leaf) and dorsal groups of stereids, ridged at back. Alar cells not or slightly differentiated. basal laminal cells shortly rectangular or subquadrate, incrassate, 10-12 x 30-40 µm, narrower at margins. Upper laminal cells rhombic or elongate oval, incrassate, 4-7 x 30-40 µm. Seta very short, 3-4 mm long, strongly curved. capsule ovate, symmetric, shortly rostrate, usually immersed in the perichaetial leaves. Calyptra fimbriate at base.

Endemic to tropical Africa in Burundi, Cameroon, Central African Republic, Congo, Gabun, Guinea, Kenya, madagascar, Mozambique, Natal, Nigeria, Rwanda, Sierra Leone, Tanzania, Transvaal, Zambia and Zimbabwe. On open soil beside roads and trails, in villages, in savannahs or open forest from the lowlands to 2000 m.

13. **Campylopus pilifer** Brid.

Plants to 3 (-5) cm high, in loose tufts, olive to dark green, rarely light or yellowish green. Stems appressed foliate when dry, erect patent when wet, tomentose at base. Fertile plants with bud-like perichaetia. Leaves 5-6 mm long, broadly lanceolate, sharply acuminate at tips, with entire, margins, involute at tips. Costa filling ½-3/4 of leaf base, excurrent in a hyaline dentate awn, in transverse secton with ventral hyalocysts and dorsal groups of stereids, lamellose at back with lamellae 3-4 cells high. Alar cells hardly differentiated or indistinct, hyaline or reddish brown, rarely inflated. Basal laminal cells hyaline, rectangular, thin-walled, 8-10 x 30-60 µm,

narrower at margins. Upper laminal cells rhombic or oval, incrassate, 2-4 x 8-16 µm. Seta 7-8 mm long, curved. capsule 1.5 mm long, brownish, in age often blackish, slightly asymmetric. Operculum obliquely rostrate. Calyptra ciliate at base.

A species occurring in tropical montane South and Central America, southern North America, SW-Europe, Sri Lanka and in Africa in Angola, Ascension, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comores, Congo, Ethiopia, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritius, Namibia, Natal, Orange free State, Reunion, Rwanda, Seychelles, Sierra Leone, Socotra, Swaziland, Tanzania, Transvaal and Zimbabwe. On open soil and rocks as a pioneer species on acidic lava flows, along roadside cuts, in open forests, also in rain forest along road slopes, asphalt or rocks, with a broad altitudinal amplitude from 800 to 2800 m. . According to its broad ecological amplitude and wide range, very variable in appearance and accordingly described from Africa under 19 different names.

14. **Campylopus praetermissus** J.-P.Frahm

Plants to 1.5 cm high, light green, in loose turfs. Stems slenderly appressed foliate, tomentose at base. Leaves about 5 mm long, gradually narrowed into a serrate, canaliculate apex. Costa filling 1/3-1/2 of leaf base, in transverse section with relatively small ventral hyalocysts, which are about as large as the median deuter cells, and dorsal groups of stereids, ridged at back. Alar cells differentiated, hyaline. Basal laminal cells rectangular, the inner incrassate, getting narrower and thin-walled towards the margins. Upper laminal cells shortly rectangular or oblique, incrassate. Sporophyte not known.

A species with scattered distribution through Africa known from Gabun, South Africa, Kenya, Tanzania and Mauritius. On soil, rocks and tree stumps, from 450 to 2300 m.

15. **Campylopus pyriformis** Schultz
C. paludicola Broth.

Plants 1-2 cm high, in soft mats, light green at tips and darker below, without tomentum. Stems loosely foliate, with erect patent leaves. Leaves 7-8 mm long, from ovate base narrowed into a long acumen, serrate at tips. Costa filling ¼ - 1/3 of leaf base, excurrent, in transverse section with relatively small ventral hyalocysts and dorsal groups of stereids, smooth or slightly ridged at back. Alar cells hyaline or brownish, inflated. Basal laminal cells lax, thin-walled, rectangular, narrower at base. Upper laminal cells incrassate, rectangular, ca 3-6:1. Seta 10-15 mm long, sinuose and twisted, yellowish. Capsule darker, 1.5 mm long, elongate ovate to cylindrical, longly rostrate. Calyptra fimbriate at base.

Widespread in temperate austral regions, also in western Europe and SE North America, in tropical Africa only in South Africa (in the Cape Province, Natal, Orange Free State, Transvaal, Swaziland, Zimbabwe and Malawi as part of its austral range) and disjunct in Kenya, Rwanda and Congo as well as Mauritius and Reunion. The habitat comprises a broad ecological range from wet open sand and humic soil to peat in subantarctic heathlands. It has been described as *C. paludicola* Broth. from Central Africa. These plants have longer pointed leaves and longer setae than usual, which may be caused through genetic drift by isolation or attributed to the humid habitat in comparably warm regions.

16. **Campylopus robillardei** Besch.

Plants to 4 cm high, green to yellow green. Stems erect patent foliate, tomentose below. Leaves to 7 mm long, lanceolate. Costa filling 1/3 of leaf base, excurrent in a subhyaline serrate awn, in transverse section with ventral hyalocysts and dorsal groups of stereids, smooth at back in the lowe rpart of the leaf but ridged in the upper part. Alar cells inflated, reddish brown. Basal laminal cells shortly rectangular, incrassate, 8-10 x 36-50 µm, shorter and narrower at margins, forming a border of quadrate cells, at the leaf base a border of 1-3 rows of hyaline cells. Upper laminal cells shortlx rectangular to oblique or oval, 4-6 x 12-20 µm. Seta 6 mm long, brownish. Capsule 1.5 mm long, asymmetric, brownish.

Present in eastern and southern Africa in Congo, Madagscar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Tanzania, Zimbabwe and South Africa (Cape Province, Natal, Swaziland, Transvaal), also in Australia. On soil and rocks in open (often degraded) forest and savannah, 1500 – 1800 m.

This species much resembles *C. savannarum* but is distinguished from the latter by ventral hyalocysts in the costa, especially in the lower part of the leaf, as well as some other minor differences. Both species are undoubtedly of common origin and form a species pair which is adapted to different habitats by its different costal anatomy.

17. **Campylopus savannarum** Müll.Hal.

Plants robust, to 8 cm tall, in loose mats, green. Stems tomentose below, either appressed or loosely patent foliate when dry. Leaves 5-7 mm long, ending in a subhyaline or hyaline serrate tip. Costa filling half of the leaf width, in transverse section with ventral substereids in the lower part of the leaf and stereids in the upper part as well as dorsal groups of stereids, ridged at back. Alar cells differentiated, inflated, hyaline or rddish brown. Basal laminal cells shortly rectangular, incrassate, partly pitted, 10-12 x 30-44 µm, in 1-2 rows quadrate at margins. Upper laminal cells shortly oval, rhombic or short rectangular, incrassate, 4-6 x 16-24 µm. Vegetative propagation by short microphyllous branches in the axils of the upper leaves, rarely by detached stem tips with shorter, broader leaves. Several sporophytes from one plant. seta 6-7 mm long, brownish. Capsule 1.5 mm long, brownish, slightly asymmetric, strumose, striate. Operculum darker, obliquely rostrate. Calyptra fimbriate at base.

This species is found in the neotropics as well as in tropical Africa, where it is widespread in Angola, Botswana, Burundi, Cameroon, Central African Republic, Congo, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Natal, Nigeria, Principe, Rwanda, Sao Thomé, Sierra Leone, Swaziland, Tanzania, Togo, Transvaal, Zambia and Zimbabwe. On soil, rocks and wood, usually in dry, savannah-like vegetation, but also in rain forests, from 300 to 2800 m elev., usually at lower elevations.

The species varies much in appearance and has been described alone from Africa under 22 different names. It forms a complex of species with *C. robillardei* and *C. hensii* (see notes under the latter).

6. **DICRANELLA** (Müll.Hal) Schimp., Coroll. 13, 1856

Plants small, to 2 cm high, in loose tufts, yellowish green. Stems erect, unbranched, not tomentose, often comose and homomallous at tips. Leaves erect patent, to 5 mm long, narrow lanceolate, subulate, with entire margins. Costa narrow, with dorsal and ventral stereids, percurrent. Alar cells

not differentiated. Basal laminal cells rectangular, shorter above. Seta long, erect. Capsule ovoid to short cylindrical, erect or curved. Peristome teeth 16, striate below, papilose at tips, splut to the middle. Operculum longly rostrate. Calyptra cucullate. Spores papillose.

Dicranella nodicoma Müll.Hal. ex Dusen

Plants in dense mats, bright green above, dirty green below. Stems erect,. slender, to 5 cm high, simple or branched, remote foliate, tomentose at base, male plants with bud-like perichaetia. Leaves to 2.9 mm long and 0.3 mm wide, erect, erect patent or slightly curved, patent when wet, gradually narrowed, ending in a elongate, acute, carinate subula. Margins plane or slightly reflexed at base, erose at the extreme apex. Costa incrassate, excurrent. Perigonial leaves longer, with broad sheathing base suddenly contracted into a long subula. Basal laminal cells subrectangular, upper laminal cells rhombic.

A species described from Cameroon and also reported from Kenya. On soil in open habitats, along roadsides and trails.

7. **DICRANOLOMA**

Dicranoloma billardierei (Brid. ex Anon.) Paris

8. **DICRANUM**

Dicranum johnstonii Mitt.
Dicranum petrophyllum G.Negri

9. **HOLOMITRIUM**

Holomitrium angolense P.de la Varde UGA(46).
Holomitrium cylindraceum var. *cucullatum* (Besch.) Wijk & Margad.
Holomitrium cylindraceum var. *obtusifolium* (Besch.) Wijk & Margad.

10. **MICROCAMPYLOPUS** (Muel.Hal) Fleisch., Musci Fl. Buitenzorg 1: 59, 1904

Microcampylopus laevigatus (Thér.) Giese & J.-P.Frahm

Plants 5-10 mm tall, yellowish green. Stems loosely foliate. Leaves with broad sheathing base apressed to the stem and suddenly narrowed into a long patent subula. Costa excurrent, filling the subula, in transverse section with ventral and dorsal stereids and a median band of guide cells. Basal laminal cells narrow rectangular, 5-8 x 50-80 µm. Upper laminal cells shorter and more incrassate, 6-8 x 15-25 µm. Seta 6 mm long, curved and flexuose. Capsules 1-1.2 mm long, two times longer than wide, deeply furrowed when empty, without stomata. Annulus present. Peristome teeth 16, divided to the middle, reddish and striate at base, yellowish and papillose

above. Operculum half as long as the urn, obliquely rostrate. Spores yellowish, coarsely papillose, with 6-8 warts per diameter.

A species from Central and Eastern Africa reported from Congo, Kenya, Madagascar, Malawi, Rwanda, Tanzania, also in SE-Asia, Ascension and the Azores. Like species of *Dicranella* on open soil often in disturbed places especially along roadsides in montane regions.

11. **PSEUDEPHEMERUM** (Lindb.) Hag., K. Norsk Vid. Selsk. Skrifter 1910: 45, 1910.

Pseudephemerum nitidum (Hedw.) Loeske

Plants small, to 5 mm high, pale green, in loose mats. Stems erect, unbranched, with erect spreading laves, comose at tips. Rhizoids often with yellow or orange tubers. Leaves lanceolate, ending in a shrp acumen. Costa narrow, percurrent. Alar cells lacking. laminal cells lax, thin-walled, rectangular, 11-5 mm wide, widened at base, getting narrower towards leaf tip. Margins flat, entire. Seta short, 1 mm long. Capsule oval, with a short point, cleistocarpous, with stomata. Spores 25-30 µm diameter, finely and highly papillose. Calyptra cucullate.

A species reported scattered from Central Africa (Congo, Rwanda), Kenya, Madagascar and Tanzania, widespread in Europe. On open damp clay at the margin of ditches, on wet trails, in plantations.

The species is always found with sporophytes and easily recognised by its cleistcarpous capsules.

RHABDOWEISIACEAE

Plants very small to somewhat medium sized, solitary or forming short tufts. Stems short, simple or few branched by innovations. Leaves mostly progressively larger distally, lanceolate to narrowly lanceolate or subulate from an oblong or oblong-ovate base; margins plane or recurved, entire or distal tips serrulate; costa single, subpercurrent to short excurrent; laminal cells smooth. Asexual structures absent. Autoicous. Sporophytes terminal; perichaetial leaves often larger and longer. Seta short to elongate, erect or curved to flexuose, smooth. Capsule immersed to exserted, rest of the capsule ovoid to pyriform with a neck distinctly elongate, occasionally as long as or much longer than the urn; stomata numerous in neck region, superficial; annulus often well developed. Operculum absent or present and rostrate. Peristome absent or single with 16 teeth. Calyptra cucullate or mitrate. Spores variously ornamented.

The Rhabdoweisiaceae, although introduced by Limpricht in 1890, were usually included as a subfamily in the Dicranaceae. Recent molecular systematic studies (Stech, 1999) support Limpricht´s concept. Limpricht included *Cynodontium, Dichodontium, Oreas, Oreoweisia, Rhabdoweisia* and *Amphidium* in this family, of which all genera except *Dichodontium* and *Oreas* occur in tropical Africa..

1. Upper laminal cells smooth or mamillose; capsules with peristome. 2. *Rhabdoweisia*

Upper laminal cells papillose; capsule without peristome. 1. *Amphidium*

ISSN 0945-3466

1. AMPHIDIUM Schimp. Coroll. 39, 1856

Amphidium tortuosum (Hornsch.) H.Rob.

Plants 10-15 mm high, in dense cushions, greenish above, brownish below. Stems densely foliate with crispate leaves when dry. Leaves linear, 2.5 mm long, keeled. Margins slightly serrate in the upper part. Alar cells lacking. Laminal cells rectangular in the lower part of the leaf, quadrate in the upper part. Costa vanishing shortly before leaf tip. Seta 1 mm high. Capsules just above the cushions or immersed, pear- shaped when young and spindle-shaped when mature, 1 mm long, erect, brown and striate in the upper part, greenish and smooth at base.

Widespread on tropical mountains all over the world from California to Chile, Papua New Guinea, Tasmania, Australia, Hawaii, in Africa in Cameroon, Congo, Ethiopia, Kenya, Tanzania and South Africa (Cape, Lesotho, Natal). On rocks and in seeping rock fissures between 3000 and 4000 m.

Excluded taxa

Amphidium aloysii-sabaudiae G.Negri has been described from the Ruwenzori Mtns., however, it was never reported again. A type is not available. According to Negri´s description, it might be a synonym of *A. tortuosum* (Frahm et al., 2000b).

2. **RHABDOWEISIA** Bruch, Schimp. & W. Gümbel, Bryol. Eur. 1: 97, 1846.

Plants a few mm high, in short turfs. Stems without central stand. Leaves crispate when dry, loosely patent when wet, longly lanceolate to linear. Margins entire or serrate in the upper half of the leaf. Costa ending shortly before leaf tip. Upper laminal cells quadrate to rounded quadrate or shortly rectangular, basal laminal cells elongate rectangular, hyaline, to 6 times as long as wide. Seta erect, yellowish, 2-5 mm long, twisted when dry. Caspule erect, shortly cylindrical, yellowish or brownish, dry with 8 longitudinal ribs. Operculum longly rostrate. peristome teeth smooth to weakly striate, narrow lanceolate.

A genus with 4 species worldwide (Frahm et al., 2000a). Three occur in the oceanic parts of Laurasia but are also found on some tropical mountains. Only *R. africana* is an African endemic.

Key to the species

1. Leaf margins serrate in the upper third of the leaf. Peristome teeth from broad base narrowly lanceolate 1. *R. africana*
   Leaf margins entire or only finely crenulate. Peristome teeth from narrow base filiforme. 2. *R. fugax*

1. Rhabdoweisia africana Dixon & Naveau

Plants to 1 cm high, in green tufts. Leaves 5 mm long, narrow lanceolate. Margins finely serrate in the upper part. Costa vanishing shortly below leaf apex. Laminal cells rectangular at leaf base, 3-4 times longer than wide, getting shortly rectangular to almost quadrate in the upper part, arranged in distinct rows. Seta 2-4 mm long. Capsule yellow-orange, shortly cylindric, longly and obliquely rostrate. Peristome teeth reddish, longitudinally striate.

Endemic to the mountains of Central Africa in Congo, Uganda and Kenya. On wet rocks in the subalpine belt.

2. Rhabdoweisia fugax (Hedw.) B.S.G.

Plants to 5 mm high, in dark green turfs. Leaves 3-4 mm long, lineal-lanceolate. Margins entire or finely crenukate in the upper third. Costa ending before leaf apex. Upper laminal cells rounded, basal laminal cells 2-4 times as long as wide, smaller and wider than long along the margins. Seta 2-4 mm long, Capsule ovoid.

Widespread but scattered in the northern hemisphere in the oceanic parts of Japan, western North America and western Europe, also in Central and South America (south too Peru), Central and South Africa (Congo [Ruwenzori], Rwanda, Kenya, Natal, Transvaal), in Uganda collected once on Mt. Elgon at 2850 m. On wet rocks and soil in the subalpine belt.

LEUCOBRYACEAE

Small to robust plants in loose to dense whitish or glaucous green cushions. Stems densely foliate with leaves of about the same length. Leaves almost completely filled by the costa. Costa consisting of 2-10 layers of large, empty cells (hyalocysts), which are perforated by large pores, and 1-3 rows of small chlorophyllose cells (chlorocysts). Lamina unistratose, very narrow. Sporophyte typical dicranoid.

LEUCOBRYUM Brid., Bryol. Univ. I: 763, 1826

With the general characteristics of the family, but chlorocysts in one layer. Thirty species have been described from tropical Africa, which are in need of a revision.

1. Leaves ca 2.5 mm long, erect, cucullate at tips.
   Costa with 4-5 layers of hyalocysts at leaf base. ….1. *L. cucullatum*
   Leaves longer, not cucullate at tips. Costa with 2 layers of hyalocysts. … 2
2. Plants robust, 4 cm high. Leaves 5-8 mm long. … 3. *Leucobryum sp.* 1
   Plants smaller, Leaves shorter. 3
3. Leaves not bordered by elongate cells. Lamina well developed, to 10 cells wide. 7. *Leucobryum sp.* 4
   Leaves bordered by 4-5 rows of elongate cells. lamina indistinct or small (2-3 cells rows) 4
4. Leaves distinctly hamate. Plants large, to 2.5 cm tall. …….. 5. *Leucobryum sp.* 3
   Leaves straight. Plants smaller, about 1 cm tall. 5
5. Leaves slightly secund, to 3 mm long. Plants whitish. …… 2. *L. molliculum*
   Leaves straight, 4-5 mm long. Plants glaucous. …….. 4. *Leucobryum* sp. 2

1. **Leucobryum cucullatum** Broth.

Plants small, in low whitish-green cushions. Stems 1 cm high, branched at base with erect branches, densely foliate, slightly brownish tomentose at base. Leaves about 2.5 mm long and 0.7-0.8 mm wide, in indistinct rows, imbricate when dry, with incurved apices, erect patent when wet,

lanceolate, deeply canaliculate, cucullate and obtuse at apex with a short hyaline mucro. Costa in transverse section in the lower part of the leaf with 2-3 layers of dorsal and 2 layers of ventral hyalocysts. Margins involute in the upper part, smooth, bordered by 6 rows of hyaline cells in the lower part of the leaf, getting narrower and finally vanishing in the leaf tip. Upper lamina consisting of 2 cell rows.

Tropical African species found in Angola, Congo, Gabon, Kenya, Madagascar, Malawi, Tanzania and Zambia. On rotten wood in relatively dry forests. Kalinzu Forest Reserve, 1450 m.

2. **Leucobryum molliculum** Broth.

Plants slender, in dense whitish-green low tufts. Stems 1 cm high, densely foliate, slightly tomentose at base, with short branches. Leaves 3 mm long and 0.5 mm wide, deeply concave, canaliculate, lanceolate, gradually longly acuminate, ending in a hyaline mucro. Margins involute in the upper part, smooth, bordered by 5-6 rows of elongate hyaline cells, vanishing towards apex. Upper lamina consisting of 2 cell rows. . Costa in transverse section with median chlorocysts, a band of smaller dorsal and a band of larger ventral hyalocysts, in the middle of the costa one cell with 2 rows of ventral hyalocysts.

A species reported also from Cameroon, Mozambique, Tanzania. On soil and rotten wood in relatively dry forests between 900 and 1600 m. Biwindi Nat. Park.

3. **Leucobryum spec. 1**

Plants robust to 4 cm high, whitish green. Stems densely foliate with erect patent leaves, slightly bent when dry. Leaves 5-8 mm long, from ovate base lanceolate, with a short mucro at tips. Leaf margin entire, bordered by 5-6 rows of hyaline cells along the leaf base.
Upper lamina consisting of 2 cell rows. Costa in transverse section with each one layer of ventral and dorsal hyalocysts and median chlorocysts.

Biwindi NP, on dry forest floor, 1750 m.

4. **Leucobryum sp. 2**

Plants medium sized, larger than *L. molliculum* or *L. cucullatum*, smaller than *L. spec*. 1, glaucous green. Stems 1 cm long, erect, unbranched, densely covered with loosely appressed leaves when dry, erect patent when wet. Leaves 4-5 mm long, lanceolate, ending in a short mucro. Margins entire, with a hyaline border of 5 cell rows at base, vanishing at midleaf. Upper lamina consisting of 2 cell rows. Costa in transverse section with each one layer of ventral and dorsal hylocysts. Although anatomically and morphologically with regard to similar leaf shape, leaf border, transverse section of the costa, width of upper lamina similar to the preceeding species, it differs by its smaller size, glaucous green colour and leaves appressed when dry.

Budongo forest reserve, on trunk of tree 1060 m.

5. **Leucobryum sp. 3**

Plants in whitish pale, loose cushions. Stems to 2.5 cm tall, branched at base, distinctly homomallous foliate. Leaves to 5 mm long and 1 mm wide, curved, from ovate base suddenly contracted into a narrowed channelled tip. Ovate leaf base 1/3 as long as the leaf, with a narrow border of 4-5 rows of elongated, hyaline cells. Lamina indistinct. Leaf apex triangular, with short mucro consisting of one hyaline cell. Costa in transverse section with median chlorocysts, a band of smaller doesal and a band of larger ventral hyalocysts, rarely in the middle of the costa 2 rows of ventral hyalocysts.

Rukungiri, Bwindi Impenetrable Forest NP, loamy bank of forest, 1500 m.

6. **Leucobryum sp. 4**

Plants in pale, light yellowish green cushions. Stems to 1.5 cm tall, densely foliate with erect or slightly curled leaves. Leaves to 5.5 mm long and 1.2 mm wide, from ovate base gradually narrowed into a tubulose acumen. Leaf base 1/3-2/3 of leaf length. lamina distinct, to 10 cell rows wide at the broadest part of the leaf, getting narrower towards leaf tips, reaching into leaf tip. Leaf tip blunt with a short mucro consisting of one hyaline cell. Costa in transverse section with a median band of chlorocysts and a larger dorsal and a smaller ventral band of hyalocysts.

Bwindi Impenetrable Forest NP, on liana, buttress and forest floor, 1650 – 1995 m.

References

Frahm, J.-P. 1985. Afrikanische *Campylopus*-Arten (Dicranaceae, Musci). *Bryoph. Bibl.* 31, 216 pp.

Frahm, J.-P., Ahmed, J., Hagen, M., Peles, M. 2000a. Revision der Gattung *Rhabdoweisia* (Musci, Dicranaceae). Tropical Bryology 18: 161-172.

Frahm, J.-P., Klöcker, T., Schmidt, R., Schröter, C. 2000b. Revision der Gattung *Amphidium* (Musci, Dicranaceae). Tropical Bryoogy 18: 171-184.

La Farge, C., A.J. Shaw, and D.H. Vitt. 2002. The circumscription of the Dicranaceae (Bryopsida) based on chloroplast regions trnL-trnF and rps4. Systematic Botany 27(3): 435-452).

Stech, M. 1999. A reclassification of Dicranaceae (Bryopsida) based on non-coding cpDNA sequence data. *Journal of the Hattori Botanical Laboratory* 86: 137-160.

Online Feb. 8, 2012

ISSN 0945-3466