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Taxonomic Results of the BRYOTROP Expedition to Zaire and Rwanda

23. Neckeraceae, Pterobryaceae, Hypopterygiaceae

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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).

NECKERACEAE

Neckera Hedw.

I follow De Sloover's (1977) treatment of the three species of *Neckera* reported here.

Neckera submacrocarpa Dix.

Neckera submacrocarpa may be recognized by the numerous paraphyllia to ca. 2 mm long, and distally rugose perichaetial leaves. According to De Sloover (1977), it occurs in montane forests and *Senecio* heaths between 2 400 and 3 650 m. The present material was collected between 3 400 and 3 700 m; one specimen was growing on rotten wood and the others on *Senecio*. *Neckera submacrocarpa* is endemic to Africa, being mainly distributed on the mountains of East Africa (Uganda, Kenya, Tanzania, Zaire, Rwanda). A disjunct occurrence is located on Mt. Cameroon.

Ka: 161, *Pócs 8384*; 162, *Frahm 8096*, *8247*, *Pócs 8086*, *8232*.

Neckera platyantha (C. Müll.) Par. (*Distichia platyantha* C. Müll.)

Neckera platyantha lacks or has only very few

paraphyllia which do not exceed ca. 0.5 mm in length. Especially the branch leaves are often strongly spreading, relatively long and narrow, and usually distinctly narrowed towards the apex. For the differences between this species and *N. remota*, see discussion under the latter below.
This species is restricted to the mountains of East Africa (Uganda, Kenya, Tanzania, Zaire, Rwanda, Burundi) and encountered between (1 500-) 2 000 - 4 000 m in montane forests and alpine heaths (De Sloover 1977). The Zairean and Rwandan specimens reported here were collected between 2 200 and 2 600 m. One of them was growing on peat in a bog. The rest of the specimens were epiphytic in montane forests and (one) ericaceous heath.

KB: 118, *Pócs 6557*; 128, *Pócs 7607, 7614*; 130, *Pócs 7082*; 131, *Frey & Kürschner 6918*; 133, *Pócs 7198, Frey & Kürschner 6981*; 139, *Frey & Kürschner 7024*; 144, *Pócs 7574, 7793*. **Ny:** 102, *Pócs 6068*; 114, *Pócs 6708.*

Neckera remota Bruch & Schimp. ex C. Müll.

Neckera remota can be distinguished from *N. platyantha* by the usually (but not consistently) shorter and relatively wider leaves with broader apices; less strongly porose walls of the laminal cells; shorter (3-5 mm) inner perichaetial leaves more abruptly narrowed above; more numerous (5-15 per capsule) apophysal stomata; mostly 550-750 µm long exostome teeth; and smaller spores, (16)20-33(-45) µm in diameter.
The geographic distribution of *Neckera remota* encompasses Cameroon, Zaire, Ethiopia, Uganda, Kenya, Tanzania, Rwanda, Burundi, and Madagascar. It occurs between 1 500 and 2 600 m (De Sloover 1977). The BRYOTROP specimens from Zaire were epiphytic and collected in mesic montane forest at 2 200 m and in bamboo forest between 2 300 and 2 600 m.

KB: 118, *Frey & Kürschner 6533*; 144, *Frey & Kürschner 7509.*

Neckeropsis Reichardt

According to a recent treatment by Enroth (1993), seven species of *Neckeropsis* occur in continental Africa and the adjacent islands. Two species are represented in the present material.

Neckeropsis lepineana (Mont.) Fleisch. (*Neckera lepineana* Mont.)

The paleotropical *Neckeropsis lepineana* was dealt with by Touw (1962), and a map of its total distribution was presented by Pócs (1976). It is easily distinguished from the other African species of *Neckeropsis* by its large size, transversely undulate leaves with non-auriculate bases, and obsolete costa. The remote, irregular mode of branching, mostly rounded or truncate leaf apices, and short leaf cells distinguish *N. lepineana* from species of *Neckera*.
In Africa, *Neckeropsis lepineana* is known from Cameroon, Gabon, Zaire, Uganda, Tanzania, South Africa, Comoros, Madagascar, and Réunion of the Mascarenes. According to Touw (1962), it grows epiphytically or on rocks from sea level up to 1 700 (- 2 150) m. The two Zairean specimens were growing on tree trunks at 1 100 m in primary tropical rain forest and at 1 300 m in submontane rain forest.

KB: 123, *Pócs 6748*; 124, *Pócs 6777.*

Neckeropsis madecassa (Besch.) Fleisch. (*Neckera madecassa* Besch.)

This species can be distinguished from the fairly common *N. disticha* (Hedw.) Kindb. by the distinctly auriculate leaf bases and the filiform rather than leaf-like paraphyses in the perichaetia. *Neckeropsis madecassa* is very closely related to the west African *N. spuriotruncata* (Dus.) Fleisch. In the former, however, well-developed limbidia formed of elongate cells are present in both leaf margins, whereas in *N. spuriotruncata* the limbidium in the acroscopic leaf margin is short or discontinous and ill-defined, or sometimes absent (Enroth 1993).
The geographic range of *Neckeropsis madecas-*

sa includes Cameroon, Gabon, Zaire, Madagascar, and Réunion. The two BRYOTROP specimens are somewhat different in aspect, since the leaves of *Frahm 6608* are more strongly spreading and slightly longer than those of *Pócs 6612*. In all other characters, however, the specimens are identical. Both were collected in primary tropical rain forest at the altitude of 850 m, one grew on temporarily inundated riverbed rocks and the other on roots.

KB: 119, *Frahm 6608*, *Pócs 661.2*

Homaliodendron Fleisch.

**Homaliodendron piniforme* (Brid.) Enroth (*Pilotrichum piniforme* Brid.)

Superficially, *Homaliodendron piniforme* is fairly similar to *Porotrichum molliculum*; the distinctions are given in the discussion under the latter species below.
Homaliodendron piniforme is distributed in the Neotropics and Africa (Enroth 1990). The African range encompasses Liberia, Nigeria, Cameroon, Congo, Uganda, Kenya, Tanzania, Madagascar, and the Mascarenes. The Zairean specimens were epiphytic and collected in primary tropical rainforest at 900 m and in submontane rain forest at 1 300 m.

KB: 120, *Frey & Kürschner 6586*; 124, *Frey & Kürschner 6674.*

Porotrichum (Brid.) Hampe

De Sloover (1983) treated in detail five African species of *Porotrichum*, including the two reported here. His paper lacked *Porotrichum usagarum* Mitt., endemic to Tanzania (Enroth 1991, 1992).

**Porotrichum elongatum* (Welw. & Duby) Gepp

Porotrichum elongatum can be distinguished by the relatively long, often prorate laminal cells and the often obtuse-mucronate and cucullate apices of the branch leaves. A closely related species is *P. caudatum* Broth., in which the apices of the branch leaves are sharper and plane, and the abaxial terminal spike of the costa is stronger.
De Sloover's (1983) distribution map shows that *Porotrichum elongatum* is mainly distributed in the continental Africa between ca. 10°N and 10°S. It is also known from Natal, Seychelles, Comores, Madagascar, and Mascarenes. The Zairean specimens were growing on tree trunks in primary tropical rain forest at 1 100 m and "summit forest of Mt Ilimo dominated by *Julbernardia seretii* and montane elements such as *Ocotea keniensis* and *Beilschmiedea* sp." at 1 500 m. One of the specimens was mixed with *Lopidium hemiloma* (C. Müll.) Fleisch. of the Hypopterygiaceae. According to De Sloover (1983), *Porotrichum elongatum* occurs between 150 and 1 800 m.

KB: 123, *Frey & Kürschner 6653*, *Pócs 6753* (mixed with *Lopidium hemiloma*); 126, *Frey & Kürschner 6706b*.

Porotrichum molliculum Broth.

This variable species is characterized by the relatively wide leaves mostly with obtuse and mucronate apices; costa which ends in a distinct abaxial spike; smooth, short leaf cells; and stipe leaves which often are not as strongly spreading as in the other African species of *Porotrichum*. The numerous misidentified herbarium specimens show that it has frequently been confused with *Homaliodendron piniforme*. As for the gametophyte characters, the fronds of the latter are usually clearly more complanate in appearance; the stipe leaves are always closely appressed; the stems lack a central strand; the costa lacks a terminal spike or, at the very most, has a very indistinct one; and the upper leaf cells are clearly more regularly rhomboid to oval. Also the very rarely encountered sporophytes of *H. piniforme* are different from those of *Porotrichum molliculum* (cf. Enroth 1990).
Porotrichum molliculum is distributed in the tropical Africa, the adjacent islands to the east, and a few localities in eastern South Africa; it is clearly commonest in tropical East Africa (De

Sloover 1983). The BRYOTROP specimens were epiphytic and collected in submontane rain forest at 1 930 m, submontane rain forest at 2 000 and 2 100 m, montane rain forest at 2 400, 2 470 and 2 500 m, at the upper margin of bamboo forest at 2 600 m, and in *Erica* heath at 3 200 m. De Sloover (1983) gave the altitudinal range of 600 - 3 500 m.

KB: 131, *Pócs 7115*, *Frey & Kürschner 6914*; 133, *Frey & Kürschner 6975*; 143, *Pócs 7767*; 152, *Pócs 7842*, *Frey & Kürschner 7519*.
Ny: 103, *Pócs 6122*; 110, *Frey & Kürschner 7918*, *7921*, *7925*; 113, *Frahm 6485*.

Porothamnium Fleisch.

De Sloover's (1983) revision pointed out that two species of *Porothamnium* occur in Africa. In addition to a few relatively minor gametophyte differences, such as the typical "metallic" luster and somewhat longer leaf cells, *Porothamnium* is distinct from *Porotrichum* by having a perfect hypnoid peristome. In the latter genus, the peristome is reduced: endostomal cilia are lacking or highly rudimentary, the endostome segments are perforate rather than fenestrate below, and the exostome teeth are narrower and their dorsal cross-striolations are clearly less prominent, mostly restricted to the proximal parts of the teeth.

Porothamnium stipitatum (Mitt.) Touw ex De Sloover (*Trachyloma stipitatum* Mitt.).

Relative to *Porothamnium variifolioides*, *P. stipitatum* is characterized by the usually strongly dentate leaf margins, conspicuous abaxial spike of costa, and thinner-walled leaf cells not distinctly porose in the alar region (cf. De Sloover 1983).
De Sloover (1983) gave the altitudinal amplitude of 300 - 3 500 m for *Porothamnium stipitatum*. The BRYOTROP specimens were collected between 900 and 1 930 m in tropical and submontane rain forests and at 2 400 m in mesic montane evergreen forest. Five of them were saxicolous, one epiphytic on branches, and one epiphytic on a tree trunk. The species is distributed throughout tropical Africa and evidently most frequent in East Africa.
KB: 122, *Frahm 6635*; 123, *Pócs 6768*, *6773*; 124, *Pócs 6785*; 152, *Pócs 7840*, *7843*. **Ny:** 110, *Frey & Kürschner 7926*.

Porothamnium variifolioides De Sloover

Porothamnium variifoliodes is distinguishable from *P. stipitatum* mainly by the usually less strongly dentate leaf margins and very indistinct to non-existing abaxial spike of costa. Also, the walls of the leaf cells of *P. variifolioides* are slightly thicker and, in the alar region, more strongly porose.
The two BRYOTROP specimens were growing on the trunk of a tree in montane rain forest at 2 100 m, and on soil in a bamboo thicket at 3 040 m. *Porothamnium variifolioides* is a sparingly distributed and apparently rare African species. De Sloover (1983) reported it from Equatorial Guinea (Bioko), Zaire, Rwanda, Tanzania, Madagascar, and La Réunion.

KB: 147, *Pócs 7744*.
Ny: 112, *Frahm 6455*.

PTEROBRYACEAE

Argent's (1973, 1974) revision of the Pterobryaceae in Africa included a key to the genera. My identifications and the discussion below are based on his treatment of the taxa.

Calyptothecium Mitt.

Calyptothecium hoehnelii (C. Müll.) Argent

In this species, the costa is usually absent but sometimes it may be distinguishable and reaching to ca. 1/4 the leaf length. The only other African species with such costal characters is *Calyptothecium pterobryoides* Argent, which is only known from the type specimen from Uganda. *Calyptothecium hoehnelii* can mainly be distinguished from that species by the dioicous sexual

condition; ovoid, short capsules; longitudinal median furrows in the proximal parts of the peristome teeth; and spore diameter, which is variable but up to ca. 40 µm. The present specimens lack sporophytes.
Calyptothecium hoehnelii is essentially an East African species, but also known from South Africa. According to Argent (1974), the species of *Calyptothecium* "appear to favour montane forests of moderate altitudes". The present specimens come from submontane rain forest at 1 930 m, montane rain forest at 2 300 m, mesic montane evergreen forest at 2 400 m, and *Podocarpus-Psychotria* forest at the upper margin of bamboo forest at 2 600 m. Four specimens were epiphytic on tree trunks and one on branches.

KB: 131, *Frey & Kürschner 6913*; 151, *Pócs 7811*; 152, *Pócs 7856*. **Ny:** 110, *Pócs 6400*, *Frey & Kürschner 7912*.

Orthostichidium C. Müll. in Dus.

Orthostichidium involutifolium (Mitt.) Broth. subsp. *involutifolium*

Orthostichidium involutifolium is the single species of this genus in Africa, represented by subsp. *involutifolium* and subsp. *thomeanum* (Broth.) Argent. In the former subspecies, the perichaetial leaves are lanceolate, tapering gradually to a long, slender acumen, and the peristome teeth are narrower, possessing distinct transverse processes. The perichaetial leaves of the subsp. *thomeanum* are ovate and more abruptly narrowed to a long, piliform acumen, and the peristome teeth much wider, lacking conspicuous transverse processes. None of the Zairean specimens reported here have sporophytes. Only one of them has female gametoecia and can thus be identified by the shape of the perichaetial leaves. The vegetative characters of the three other specimens are in accordance with the description by Argent (1974).
Orthostichidium involutifolium subsp. *involutifolium* was reported from Zaire (Kivu Province) by De Sloover (1979); a duplicate of the Zairean specimen cited by him is deposited in H. The taxon is also known from Guinea, Sierra Leone, Liberia, Ghana, Cameroun, Equatorial Guinea (Bioko), Nigeria, and Angola. It is epiphytic and encountered between 300 and 1 700 m (Argent 1974). The four Zairean specimens were collected at 850 and 900 m in moist or very wet tropical rain forests.

KB: 119, *Pócs 6614*, *6870*; 122, *Frahm 6634*, *6886*

HYPOPTERYGIACEAE

Hypopterygium Brid.

**Hypopterygium mildbraedii* Broth.

According to Brotherus' (1925) treatment, four autoicous taxa of *Hypopterygium* occur in Africa and the adjacent islands to the east: *H. mildbraedii*, *H. torulosum* Schimp., *H. torulosum* var. *kameruniae* Broth., and *H. sphaerocarpum* Ren. Examination of the H and H-BR material of the three former taxa showed that the differences are not very convincing, but in *H. mildbraedii* the ventral leaves tend to be slightly narrower and have shorter aristae. In *H. torulosum* and *H. torulosum* var. *kameruniae* the ventral leaves are mostly orbicular. The specimens *Pócs 6506* and *7837* have fairly wide ventral leaves, but their aristae are clearly shorter and somewhat broader than in *H. torulosum*. I have not seen any material of *H. sphaerocarpum*, but Renauld (1889) described the ventral leaves as orbicular. The latter name has been used for plants from Madagascar and Mascarenes (Mauritius) (Crosby et al. 1983).
According to Bizot & Pócs (1982), *Hypopterygium mildbraedii* is distributed on the east African mountains from Ethiopia to Tanzania. It has also been reported for Malawi (Bizot et al. 1976). It occurs in montane forests and may grow epiphytically or on shady rocks. The present specimens cover an altitudinal range between 1 500 and 2 300 m. Two of them were growing epiphytically in montane rain forest and one on soil in "*Lobelia mildbraedii* - *Cyperus denudatus* bog". The Tanzanian specimens cited by Bizot & Pócs (1982) were collected between

500 and 2 600 m.

KB: 126, *Frey & Kürschner 6706a* (mixed with *Lopidium hemiloma*); 152, *Pócs 7837* (c. fr. juv.). **Ny:** 114, *Pócs 6506*

Hypopterygium laricinum (Hook.) Brid. det. W.R. Buck

This species is characterized by dendroid plants with differentiated underleaves. All leaves are broad and bordered by hyaline, elongate cells. The costa is single and in the larger leaves ends about midleaf, but is shorter in underleaves. The laminal cells are short (ca. 2:1) throughout.
The plants grew in a mesic montane evergreen forest at 2400 m.
Ny: 110, *Frey & Kürschner 7913.*

Lopidium Hook. f. & Wils.

**Lopidium hemiloma* (C. Müll.) Fleisch. (*Hypopterygium hemiloma* C. Müll.)

Lopidium hemiloma is the single African species in which a limbidium formed of elongate cells is restricted to one margin of the leaves, while the cells in the other margin do not markedly differ from the laminal cells. According to Bizot & Pócs (1982), the species has previously been known from the Comores and Tanzania. Four of the present specimens, one mixed with *Hypopterygium mildbraedii*, were growing epiphytically at 1 500 m in montane forest. One specimen was collected from the trunk of a tree in primary tropical rainforest at 1 100 m, and it has *Porotrichum elongatum* (Welw. & Duby) Gepp of the Neckeraceae as a companion. The Tanzanian specimens cited by Bizot & Pócs (1982) covered an altitudinal range between 800 and 1 450 m.

KB: 123, *Pócs 6753* (mixed with *Porotrichum elongatum*); 126, *Frey & Kürschner 6701, 6706a* (mixed with *Hypopterygium mildbraedii*), *6714, Pócs 6847*

References

Argent, G. C. G. 1973. A taxonomic study of African Pterobryaceae and Meteoriaceae. I. Pterobryaceae. J. Bryol. 7: 353-378.

Argent, G. C. G. 1974 ("1973"). A taxonomic study of African Pterobryaceae and Meteoriaceae. II. Pterobryaceae - continued. J. Bryol. 7: 563-602.

Bizot, M. & Pócs, T. 1982. East African bryophytes, V. - Acta Bot. Acad. Sci. Hungaricae 28: 15-64.

Bizot, M. Dury, M. & Pócs, T. 1976. East African bryophytes, II. Collections made by L. Ryvarden in Malawi, S. E. Africa. - Acta Bot. Acad. Sci. Hungaricae 22: 1-8.

Brotherus, V. F. 1925. Hypopterygiaceae. - In: Engler, A. & Prantl, K. (Eds.), Die natürlichen Pflanzenfamilien, ed. 2, 11: 270-278. Leipzig

Crosby, M. R., Schultze-Motel, U. & Schultze-Motel, W. 1983. Katalog der Laubmoose von Madagaskar und den umliegenden Inseln. - Willdenowia 13: 187-255.

De Sloover, J. L. 1977. Note de bryologie africaine VIII. *Neckera*, *Neckeropsis*. Bull. Jard. Bot. Nat. Belgique 47: 31-48.

De Sloover, J. L. 1979. Note de bryologie africaine. X. - *Blindia*, *Pilopogon*, *Bryoerythrophyllum*, *Orthodontium*, *Orthostichidium*, *Oligotrichum*. Bull. Jard. Bot. Nat. Belgique 49: 393-408.

De Sloover, J. L. 1983. Note de bryologie africaine XII. *Porotrichum* et *Porothamnium*. Bull. Jard. Bot. Nat. Belgique 53: 97-152.

Enroth, J. 1990. Notes on the Neckeraceae. 3-7. *Homaliodendron piniforme* comb. nov. and new synonyms in *Porotrichum*, *Himantocladium* and *Neolindbergia*. Nova Hedwigia 51: 551-559.

Enroth, J. 1991. Notes on the Neckeraceae (Musci). 9. *Porotrichum usagarum*, a neglected Tanzanian endemic, with a note on the growth pattern in the Neckeraceae. Ann. Bot. Fennici 28: 197-200.

Enroth, J. 1992. New records for *Porotrichum usagarum* (Neckeraceae, Musci), a Tanzanian endemic. J. Bryol. 17: 159.

Enroth, J. 1993. Notes on the Neckeraceae (Musci). 17. A taxonomic study on the genus *Neckeropsis* in Africa. J. Hattori Bot. Lab. 73: 159-173.

Pócs, T. 1976. Correlations between the tropical African and Asian bryofloras. I. J. Hattori Bot. Lab. 41: 96-106.

Renauld, F. 1889. Notice sur une collection de mousses de l'île Maurice. Suite 1. - Rev. Bryol. 16: 81-87.

Touw, A. 1962. Revision of the moss-genus *Neckeropsis* (Neckeraceae) 1. Asiatic and Pacific species. Blumea 11: 373-425.