

NECKERACEAE
(N.G. Hodgetts)

Plants medium sized to rather large, forming tufts or mats, light to dark green, yellowish-green to golden-brown. **Primary stems** creeping, leaves scale-like or eroded. **Secondary stems** stipitate, dendroid and frondose to sub-dendroid, ascending or pendent, irregularly to regularly pinnately branched; paraphyllia present or absent; pseudoparaphyllia foliose or absent; distal branch tips sometimes flagelliform. **Stipe leaves**, if present, triangular to ovate-triangular. **Leaves** of secondary stems often complanate, ovate to oblong-lanceolate, oblong-ligulate, or cultriform, smooth, plicate or undulate, often strongly asymmetric, apex obtuse to acute, truncate or acuminate, base weakly auriculate or not, often shortly decurrent on one side; margins plane, recurved below or folded at base (usually along one side), entire below, distally entire or dentate, serrulate to serrate, often coarsely and irregularly so at apex; costa long and single or short and somewhat forked, occasionally absent; laminal cells smooth or prorate, linear and often vermicular, or rhomboidal to shortly hexagonal, walls firm or porose. **Branch leaves** often differentiated from secondary stem leaves, usually narrower, oblong-ligulate. **Autoicous** or dioicous. **Perichaetia** lateral, leaves usually sheathing, strongly differentiated. **Seta** short to elongate, smooth. **Capsule** immersed or exserted, erect to horizontal, urn ovoid to cylindrical. **Operculum** shortly to longly rostrate, occasionally oblique. **Peristome** double, exostome teeth 16, papillose, or smooth to striate below, distally papillose. **Calyptra** cucullate or mitrate (-campanulate), smooth and naked. **Spores** spherical, usually papillose.

DISCUSSION. The Neckeraceae contains about 16 or 17 genera and perhaps more than 300 species; in sub-Saharan Africa 8 genera and 36 species. *Thamnobryum* and related genera are here retained in the Neckeraceae, although some authors (e.g. Magill & van Rooy, 1998) have placed them separately, in Thamnobryaceae. A record of the genus *Homalia* for African has been excluded (see O'Shea & Ochyra, 2000). Most species can be identified by leaves alone; however stems should be examined for the presence of paraphyllia, and sporophytes are important in separating some species of *Neckera*. Leaves from the stipe, secondary stem and branches should all be examined in dendroid plants, such as species of *Porotrichum*. Presence or absence of a central strand in the stem is important in distinguishing between some genera. Enroth & Hodgetts (1996) provided a key to the species known from Malawi. Further useful information about several of the species is provided by Enroth (1993) and Magill & van Rooy (1998).

LITERATURE. **Enroth, J. 1993.** Taxonomic results of the BRYOTROP expeditions to Zaire and Rwanda. 23. Neckeraceae, Pterobryaceae, Hypopterygiaceae. *Tropical Bryology* 6: 193-198. **Enroth, J. & Hodgetts, N.G. 1996.** British Bryological Society expedition to Mulanje Mountain, Malawi. 5. Neckeraceae (Musci). *Journal of Bryology* 19: 135-141. **Magill, R.E. & van Rooy, J. 1998.** - see general refs. **O'Shea, B.J. & Ochyra, R. 2000.** Families and genera of mosses no longer believed to occur in sub-Saharan Africa. *Tropical Bryology* 18: 119-127.

1. Habit not dendroid but irregularly to regularly pinnately branched; leaves complanate, often distinctly and regularly undulate; capsules usually immersed to shortly exserted on short (up to 5 mm) seta 2
1. Habit ± dendroid, with stipe and variously-branched secondary stems; leaves complanate or not, not undulate, capsules usually exserted on long (1--3 cm) seta 4
2. Leaves broadly ovate to ligulate-lanceolate, usually distinctly and regularly undulate with acute to acuminate apex and short, forked costa; linear-ligulate ramenta absent *Neckera*
2. Leaves broadly ligulate, ± truncate, apiculate or not, regularly undulate or not, with single costa reaching to 3/4 the length of the lamina or more; linear-ligulate ramenta often (*Neckeropsis*) present at base of capsule 3

3. Leaves often regularly undulate, auriculate or not, abruptly truncate, subentire to weakly crenulate-serrulate at apex, occasionally apiculate; leaf arrangement 'pseudotetrastichous'; capsules frequent, immersed, without apophysal stomata *Neckeropsis*
3. Leaves not regularly undulate or auriculate, with relatively less abruptly truncate, more strongly crenulate, apiculate leaf apex; leaf arrangement octastichous; capsules very rare, exserted, with apophysal stomata *Himantocladium*
4. Stipe leaves appressed; costa not terminating in distinct abaxial spine; upper leaf cells regularly shortly rhomboid to oval; central strand of stem absent *Homaliodendron*
4. Stipe leaves various, often patent or squarrose; costa often terminating in distinct abaxial spine; upper leaf cells various but not regularly and shortly rhomboid to oval; central strand of stem present 5
5. Leaf apices nearly entire or crenulate by slightly protruding cell corners (not whole cells); median laminal cells isodiametric or nearly so *Pinnatella*
5. Leaf apices dentate by uni- to multicellular teeth; median laminal cells clearly longer than wide 6
6. Plants often with a distinct metallic lustre; seta deep red, lustrous; exostome teeth striate from base to approximately half their length; endostome with well-developed cilia *Porothamnium*
6. Plants dull or somewhat lustrous but not with a metallic lustre; seta yellow to somewhat reddish, dull; exostome teeth striate from base to well below half their length; endostome with cilia absent or very rudimentary *Porotrichum*

Himantocladium (Mitt.) M.Fleisch. (Fig. XX)

Mainly a genus of S.E. Asia, Australasia and Oceania, with only one species, *H. cyclophyllum* (Müll.Hal.) M.Fleisch. definitely recorded in sub-Saharan Africa, and this confined to the Seychelles. A collection of *H. implanum* (Mitt.) M.Fleisch. nominally from Ascension Island could be regarded as of dubious provenance.

Plants medium-sized to large, forming tufts, pale green. **Primary stems** creeping; leaves small, distant. **Secondary stems** remotely, irregularly and complanately, sometimes subpinnately, branched. **Stipe leaves** appressed, small, abruptly narrowing from ovate base to acute acumen. **Secondary stem leaves** lingulate, complanate, spreading, rugose or irregularly undulate, 2.4--2.8 mm long, to 1.2 mm wide, asymmetric, apex truncate, obtuse or rounded, usually apiculate; margins plane, often folded below, irregularly and coarsely crenulate-denticulate at apex; costa strong, single, often forked above, reaching near leaf apex; leaf cells incrassate, mid-leaf and upper cells \pm hexagonal-rhomboid and isodiametric, basal cells elongate with incrassate, porose longitudinal walls and thin transverse walls; alar cells \pm undifferentiated; intramarginal limbidium of elongate cells usually extending up both margins. **Branch leaves** similar but smaller. **Dioicous**, usually sterile. **Sporophyte** not observed.

HABITAT. On tree trunks, branches, roots and occasionally rocks in forest.

DISCUSSION. *Himantocladium* is closely related to *Neckeropsis*. It may usually be distinguished (Enroth 1992) by the octastichous rather than 'pseudotetrastichous' leaf arrangement, the leaves not being regularly undulate or auriculate, and the less abruptly truncate, more strongly crenulate, apiculate leaf apex. In addition, *Himantocladium* has exserted capsules and apophysal stomata, but unfortunately the capsule is seldom observed in *H. cyclophyllum*. The species was further described and illustrated by Enroth (1989).

LITERATURE. **Enroth, J. 1989.** Bryophyte flora of the Huon Peninsula, Papua New Guinea. XXVII. Neckeraceae (Musci). Acta Botanica Fennica 137: 41-80. **Enroth, J. 1992.** Notes on the Neckeraceae (Musci). 13. Taxonomy of the genus *Himantocladium*. Annales Botanici Fennici 29: 79-88.

Homaliodendron M.Fleisch. (Fig. XX)

Three species in sub-Saharan Africa, of which only one, *H. piniforme* (Brid.) Enroth, is widespread; about 30 species primarily from Southeast Asia.

Plants rather large, forming tufts. **Primary stems** creeping. **Secondary stems** frondose, perpendicular to substrate, to 15 cm tall (but usually much shorter), irregularly pinnately branched, flagellate branches frequent; in cross-section outer rows of cells small, thick-walled, inner cells larger, central strand absent; pseudoparaphyllia foliose. **Stipe leaves** erect-appressed, triangular to lanceolate. **Secondary stem leaves** \pm complanate, erect-spreading to spreading, oblong-ligulate to obovate, 1.5--3 mm long, to 1 mm wide, apex obtuse and apiculate; margins plane, folded at base or not, denticulate to coarsely and sharply toothed above, teeth uni- or multicellular; costa single, 1/2--3/4 lamina length, rather slender, without terminal abaxial spine; apical cells regularly rhomboid or oval; median cells rhomboidal; basal cells oblong-rectangular. **Branch leaves** similar, 2-3 times smaller, often proportionately shorter and relatively more strongly toothed above. **Dioicous**. **Perichaetia** lateral. **Seta** rather short, 3.6--5.5 mm long. **Capsule** erect, urn ovoid to cylindrical, 1.8--2.4 mm long; stomata superficial; annulus absent. **Operculum** conic. **Peristome** with exostome teeth lanceolate, faintly striate-papillose below, distally papillose; endostome basal membrane moderately high, segments narrow, keeled and narrowly perforate, papillose, cilia absent. **Calyptra** cucullate, hairy. **Spores** spherical, papillose.

HABITAT. Montane forests, at elevations from 1000-3000 m.

DISCUSSION. *Homaliodendron* is distinguished by the frequently flagellate, frondose plants, obtuse to rounded, short oblong-ligulate to obovate leaves, single costa, coarse and sharp teeth along the upper margin, with teeth composed of several cells, and rhombic median cells. Sporophytes of this genus are known in Africa only from one specimen of *H. piniforme* (Brid.) Enroth collected from Cameroon (Enroth 1990); reproduction is by propagula in the form of flagellate branches.

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

Neckera Hedw. (Fig. XX)

About 11 species in sub-Saharan Africa; a pantropical genus of some 40-50 species, extending into the temperate regions.

Plants medium to somewhat robust, forming mats or wefts, glossy olive-green to golden-yellow. **Primary stems** creeping, leaves scale-like. **Secondary stems** spreading to more commonly ascending, often \pm perpendicular to substrate or pendent, irregularly to regularly pinnately branched; paraphyllia few to abundant or appearing absent; pseudoparaphyllia filamentous to foliose. **Secondary stem leaves** weakly to strongly complanate, suberect to spreading, undulate or occasionally flat, broadly ovate-lanceolate to oblong-ligulate, 2--5.5 mm long, asymmetric, apex obtuse to abruptly acute or short acuminate, base somewhat auriculate on proximal side; margins folded on proximal side at base, serrulate distally, rarely smooth; costae double, usually unequal, one costa much longer, to 1/5--1/3 lamina length; laminal cells smooth, porose or not, apical cells rhombic to fusiform; median cells linear, \pm vermicular, smooth, insertion cells irregularly rectangular, porose; alar region weakly differentiated, cells subquadrate to short rectangular. **Autoicous** or dioicous. **Perichaetial** leaves broadly lanceolate to oblanceolate, long acuminate to subulate. **Seta** short or somewhat elongate, 0.5--5 mm long, erect or slightly curved. **Capsule** immersed or shortly exerted, erect, urn short-cylindrical or ovoid to subglobose, 1--5 mm long; exothecial cells quadrate to rectangular, thick-walled; stomata at urn base, superficial. **Operculum** short to long rostrate, often oblique. **Peristome** with exostome teeth narrowly lanceolate, finely cross-striate at base, and occasionally just above vertically striate or smooth, distally papillose or smooth;

exostome basal membrane low, segments linear, keeled and perforate, papillose. **Calyptra** cucullate or mitrate, smooth. **Spores** rather coarsely papillose.

HABITAT. Epiphytic on trunks and branches, occasionally on humus, logs or rocks; premontane, becoming more common in montane forests, and extending into the bamboo and ericaceous belts and the Afro-alpine zone, 1100-4500 m.

DISCUSSION. The genus is characterized by the complanate, often undulate, broadly ovate-to ligulate-lanceolate leaves, acute to acuminate apex, short and forked costa, and immersed to shortly exserted capsules. Most of the African species were keyed out, and some described and illustrated, by De Sloover (1977).

LITERATURE. De Sloover, J.L. 1977. Note de bryologie africaine VIII. *Neckera*, *Neckeropsis*. Bulletin du Jardin Botanique National de Belgique 47: 31-48.

Neckeropsis Reichardt (Fig. XX)

Eight species in sub-Saharan African; a genus of about 25 species with a pantropical distribution.

Plants small to medium sized, occasionally robust, forming loose tufts, occasionally mats, light to dark green, occasionally golden-brown to blackish. **Primary stems** creeping, leaves scale-like, ovate-acuminate, base partially clasping; rhizoids clustered beneath. **Secondary stems** ascending, usually perpendicular to substrate, irregularly to regularly pinnately branched, occasionally distally flagellate; in cross-section outer 2--4 rows of cells small, thick-walled, inner cells larger, thin- to \pm thick-walled, central strand absent; pseudoparaphyllia foliose. **Secondary stem leaves** complanate, smooth to slightly or regularly and strongly undulate, broadly lingulate, 1--2.5 mm long, asymmetric, apex truncate, sometimes with apiculus, base decurrent or not on one side; margins subentire to weakly serrulate at apex, usually entire or subentire below; costa single, 3/4--4/5 lamina length; median cells irregularly rhomboidal or hexagonal or longer and sinuose, smooth, often porose. **Branch leaves** similar but smaller. **Synoicous** or autoicous. **Perichaetial** leaves ovate- to oblong-subulate; ramenta (leaf-like paraphyses) positioned along the vaginula, when present narrowly oblong- to linear-ligulate, ca. 2--3 mm long, often as long as or longer than sporophyte. **Seta** short, 0.3--0.7 mm long, smooth. **Capsule** immersed to emergent, erect, short-cylindrical to oblong, 1--2.6 mm long; exothelial cells short rectangular to subquadrate, \pm thick-walled; stomata absent; annulus absent. **Operculum** conic-long rostrate. **Peristome** with exostome teeth linear-lanceolate, papillose; endostome basal membrane low, segments linear, papillose, cilia absent. **Calyptra** mitrate-campanulate, smooth or with paraphyses. **Spores** papillose.

HABITAT. Epiphytic, on branches and trunks, rarely found on logs or rocks; moist or wet lowland to premontane forests; from sea level to 2000 m.

DISCUSSION. The genus is distinguished by the strongly complanate, broadly lingulate, truncate leaves, single costa (3/4 lamina length), linear-ligulate ramenta (when present), and immersed capsules. The most common species of *Neckeropsis*, *N. disticha* and *N. lepineana*, occur in moist or wet lowland forests where both species can grow in proximity to each other; *N. lepineana* can extend into lower montane forests. De Sloover (1977) provided some information on the genus, and later Enroth (1993) monographed *Neckeropsis* in Africa.

LITERATURE. Enroth, J. 1993. Notes on the Neckeraceae (Musci). 17. A taxonomic study on the genus *Neckeropsis* in Africa. Journal of the Hattori Botanical Laboratory 73: 159-173. De Sloover, J.L. 1977. (see under *Neckera*).

Pinnatella M.Fleisch. (Fig. XX)

Two species in sub-Saharan Africa, of which only *P. minuta* (Mitt.) Broth. is widespread (also found in the neotropics and southern India); the other species, *P. mucronata* (Bosch &

Sande Lac.) M.Fleisch. is confined, in Africa, to the Seychelles, where it is the only species of the genus to occur. A pantropical genus of 15 species.

Plants small, forming inconspicuous short tufts. **Primary stems** creeping; leaves ovate-lanceolate, acute, margins crenulate. **Secondary stems** erect to somewhat curved, frondose, 1-2(-4) cm tall, regularly pinnately branched, flagellate branches slender. **Secondary stem leaves** erect-spreading, ovate-short ligulate, 1-1.4 mm long, slightly concave, apex obtuse to broadly acute; margins plane, \pm entire to crenulate or rarely slightly serrulate; costa single, ca. 3/4 lamina length, usually strong, often notched at the tip; apical and median cells incrassate, oval to irregularly rounded, mostly isodiametric, smooth or unipapillose; basal cells oblong-rectangular, smooth. **Branch leaves** ligulate, smaller. **Dioicous**. **Perichaetia** lateral. **Seta** short (2-3 mm long), roughened above. **Capsule** erect, 1.3-1.7 mm long, urn ovoid; stomata superficial; annulus somewhat differentiated. **Operculum** conic-short rostrate. **Peristome** with exostome teeth papillose; endostome basal membrane low, segments papillose, cilia absent. **Calyptra** with paraphyses. **Spores** spherical, papillose.

HABITAT. On tree trunks and rocks; moist lowland to premontane forests, from near sea level to 1500 m.

DISCUSSION. The genus is readily distinguished by the small habit, obtuse to broadly acute-rounded, ovate, short-ligulate leaves, and unipapillose, rounded upper laminal cells. Sporophytes are rare (Enroth, 1994) but asexual reproduction by flagellate branches can take place.

LITERATURE. **Enroth, J. 1994.** A taxonomic monograph of the genus *Pinnatella* (Neckeraceae, Bryopsida). Acta Botanica Fennica 151: 1-90.

Porothamnium M.Fleisch. (Fig. XX)

Two species, of which one, *P. stipitatum* (Mitt.) Touw ex De Sloover, is very common while the other, *P. variifolioides* De Sloover, is much scarcer, though also widespread.

Plants medium sized to very robust, forming loose, often dense, tufts, glossy dark green or yellowish-green, usually with a metallic lustre. **Primary stems** creeping, leaves scale-like or eroded, radiculose. **Secondary stems** frondose, 2-12 cm tall, regularly to irregularly pinnately branched, flagelliform branches rare; **stipe** short to long, leaves clasping to squarrose. **Secondary stem leaves** usually strongly complanate, rather asymmetric, spreading, mostly ovate-oblong or -ligulate, 1.5-3 mm long, apex broadly acute to obtuse, apiculate; margins plane, folded on one side at base, irregularly and usually strongly serrate in distal 1/2 or 3/4 on one side, in distal 1/4 or 1/2 on the other; costa single, 1/2-3/4 lamina length, usually with a terminal abaxial spine; median cells thin or thick-walled, fusiform-rhomboidal to oblong-linear, smooth or nearly so, apical cells elongate rhomboidal or vermicular, basal cells linear to rectangular, alar region \pm undifferentiated but sometimes porose. **Branch leaves** similar but progressively smaller. **Dioicous**. **Perichaetial** leaves oblong- or ovate-subulate. **Seta** elongate, 1.5-2.6 cm long, smooth, deep red, lustrous. **Capsule** erect to inclined, urn cylindrical to nearly globose, 1.5-3 mm long, stomata at urn base. **Operculum** rostrate. **Peristome** with exostome teeth striate in lower half, distally papillose; endostome basal membrane high, segments papillose, cilia well developed. **Calyptra** cucullate, smooth and naked. **Spores** spherical, smooth, finely punctate or papillose.

HABITAT. On rocks and banks, especially by streams, occasionally on tree roots and dead wood; more rarely as an epiphyte on trunks and branches. Medium-altitude to montane forest, 300-3500m.

DISCUSSION. *Porothamnium* is characterised, and distinguished from *Porotrichum*, by the large, glossy plants with a metallic lustre, the deep red, lustrous seta, the exostome teeth striate from their base to about half their length and the endostome with well-developed cilia. The rarer species, *P. variifolioides*, is distinguished from *P. stipitatum* by the less strongly-toothed leaves, the thicker-walled leaf cells, porose cells in the alar region, and the lack of a

distinct abaxial spine at the end of the costa. The species are described in detail and illustrated by De Sloover (1983).

LITERATURE: **De Sloover, J.L. 1983.** Note de bryologie africaine XII. *Porotrichum* et *Poroathamnium*. Bulletin du Jardin Botanique National de Belgique 53: 97-152.

Porotrichum (Brid.) Hampe (Fig. XX)

About nine species in sub-Saharan Africa.

Plants medium sized to large, forming loose, rarely dense, tufts, glossy to dull green, yellowish-green or golden. **Primary stems** creeping, leaves scale-like or eroded, radiculose. **Secondary stems** frondose, 2--10 cm tall, regularly to irregularly pinnately branched, flagelliform branches common; **stipe** short to long, leaves clasping to squarrose. **Secondary stem leaves** erect to erect-spreading, mostly ovate-oblong or -ligulate, 1--2.5 mm long, apex mostly broadly acute to obtuse, often apiculate; margins plane to recurved, serrate in distal 3/4 or less, serration often irregular, coarse; costa single, 1/2--3/4 lamina length, often with terminal abaxial spine; median cells fusiform-rhomboidal to oblong-linear, or occasionally shortly rectangular, smooth to papillose, papillae projecting at cell angles, variously porose throughout, or only at base, apical cells almost isodiametric to elongate rhomboidal or fusiform, basal cells linear to rectangular, alar region undifferentiated or differentiated, cells short-rectangular or subquadrate. **Branch leaves** often differentiated, or progressively so, smaller and often narrower. **Dioicous. Perichaetial** leaves oblong- or ovate-subulate. **Seta** elongate, 10--20(--30) mm long, smooth, yellow to reddish, dull. **Capsule** erect to horizontal, urn cylindrical, 1.5--2.5 mm long, stomata at urn base. **Operculum** short to long rostrate. **Peristome** with exostome teeth striate below to well under half their length, distally papillose; endostome basal membrane high, segments papillose, perforate, cilia rudimentary or absent. **Calyptra** cucullate, smooth and naked. **Spores** spherical, papillose.

HABITAT. Epiphytic on trunks and branches of trees and saplings, occasionally on rocks or logs, in moist shaded sites; usually occurring in medium-altitude to montane forest, but has a wide altitudinal distribution, from near sea level to 3500 m.

DISCUSSION. The genus is characterised by the frondose habit, short to long stipes bearing scale-like leaves, mostly irregularly pinnate with complanate-foliate branches, mostly symmetric or not strongly asymmetric leaves, marginal serrations of 1(-2) cells, slender costa 1/2-3/4 leaf length, and almost isodiametric to elongate rhomboidal or fusiform apical cells. Sporophytes have only been occasionally observed among herbarium collections or in the field. Undoubtedly the primary means of reproduction and dispersal is by the rather fragile flagellate branches that are usually present. The species are described and illustrated by De Sloover (1983).

LITERATURE. **De Sloover, J.L. 1983.** (see under *Poroathamnium*).

Thamnobryum