Rhaphidophora bogneri (Araceae: Monsteroideae: Monstereae) a new species from West Africa, and notes on the *Rhaphidophora africana* Complex

Peter C. Boyce*
Honorary Research Scientist
Ludwig-Maximilians-Universität München
Department Biologie I
Systematische Botanik und Mykologie
Menzinger Straße 67, 80638 München, Germany
boyce@biologie.uni-muenchen.de
***corresponding author**

Anna Haigh
The Herbarium
Royal Botanic Gardens
Kew, Richmond
Surrey, TW9 3AE, U.K.

ABSTRACT

Rhaphidophora bogneri P. C. Boyce & Haigh is described as a new species from Gabon, equatorial West Africa, defined by inflorescences pendent during anthesis and fruiting. *Rhaphidophora* is additionally reviewed for Africa and three described species are accepted, of which *R. africana* N. E. Br. is considered undoubtedly polyphyletic, likely encompassing upwards of four species of which at least three are considered to be taxonomic novelties. Unfortunately, available preserved collections coupled with political circumstances prevailing throughout much of the species' geographical range currently make a proper taxonomic treatment impossible. *Rhaphidophora ovoidea* A. Chev., described from fragmentary material from basalts, is treated as inadequately known. *Rhaphidophora bogneri* is illustrated from cultivated living plants, all described species are also illustrated from their nomenclatural types. The three accepted African *Rhaphidophora* species are delineated with a key.

KEY WORDS

Gabon, Bioko, Cameroon, Côte d'Ivoire, Montes de Crystal (Sierra de Crystal), Bakossi Mountains, basalt

INTRODUCTION

Rhaphidophora Hassk. is principally a tropical Asian genus of about 100 species of mostly hemiepiphytic lianes ranging from NE India through Indo-Malaya, Malesia and Papuasia to the tropical western Pacific, and extending as far south as NE Australia, but also with limited representation in tropical Africa, where species' distribution corresponds with the incidence of equatorial humid evergreen forests (Baharuddin & Boyce 2010; Boyce 1999a,b, 2000a,b, 2001a,b, 2005, 2006a,b; Boyce & Bogner 2000; Boyce & Nguyen 2012; Boyce et al. 2012; Hay 1993; Li et al. 2010; Ntépé-Nyamè 1988; Sofiman & Boyce 2010).

With qualification that this account is emphatically provisional, based, with the exception of *Rhaphidophora bogneri* P. C. Boyce & Haigh, **sp. nov.**, entirely on inadequate historical herbarium material supported by minimal fieldwork, we conclude that *Rhaphidophora* in tropical Africa comprises one undoubtedly polyphyletic taxon for which the name *R. africana* N. E. Br. is overall applicable, two further highly distinctive species (*R. bogneri* and *R. pusilla* N. E. Br.), and one inadequately known species (*R. ovoidea* A. Chev.) known from fragmentary material, and which may or may not be conspecific *R. africana sens. str.*

KEY TO AFRICAN *RHAPHIDOPHORA* SPECIES

1a. Spathe c. 2 cm long, white; spadix c. 1.8 cm long; stems of flowering shoots very slender, c. 3 mm in diameter, flexuous . . . . . ***Rhaphidophora pusilla***

1b. Spathe always exceeding 5 cm long, occasionally up to 18 cm long, dirty white to deep yellow; spadix 5–16 cm long; stems of flowering shoots moderately robust, at least 5 mm in diameter, not flexuous 2

2a. Inflorescence erect at anthesis; infructescence mostly erect; spathe mostly white; active shoot tips often copious persistent fibre derived from degraded cataphylls and petiolar sheath; leaf blades occasionally conspicuously fenestrate . . . . . ***Rhaphidophora africana* sens. lat.**

2b. Inflorescence pendent at anthesis; infructescence pendent; spathe yellow; active shoot tips without persistent fibre; leaf blades never fenestrate . . . . . .***Rhaphidophora bogneri* sp. nov.**

Rhaphidophora bogneri P. C. Boyce & Haigh, **sp. nov.** Type: Gabon, Sibang, 9 Nov 1973, *J. Bogner 708* (holo M!; iso B!, K! & K (spirit – 37463.000!); US!). **Figure 1–4.**

Figure 1. *Rhaphidophora bogneri* P. C. Boyce & Haigh. Type clone plant in cultivation, R.B.G., Kew. **A.** Overall view of flowering plant. **B.** Detail of flowering shoots; the two green inflorescences (top left) are pre-anthesis; middle inflorescence at pistillate anthesis; right hand inflorescence at late staminate anthesis. **C.** Sterile shoot. **D.** Developing inflorescences. All from *J. Bogner 708*. Images © D. Scherberich, used with permission.

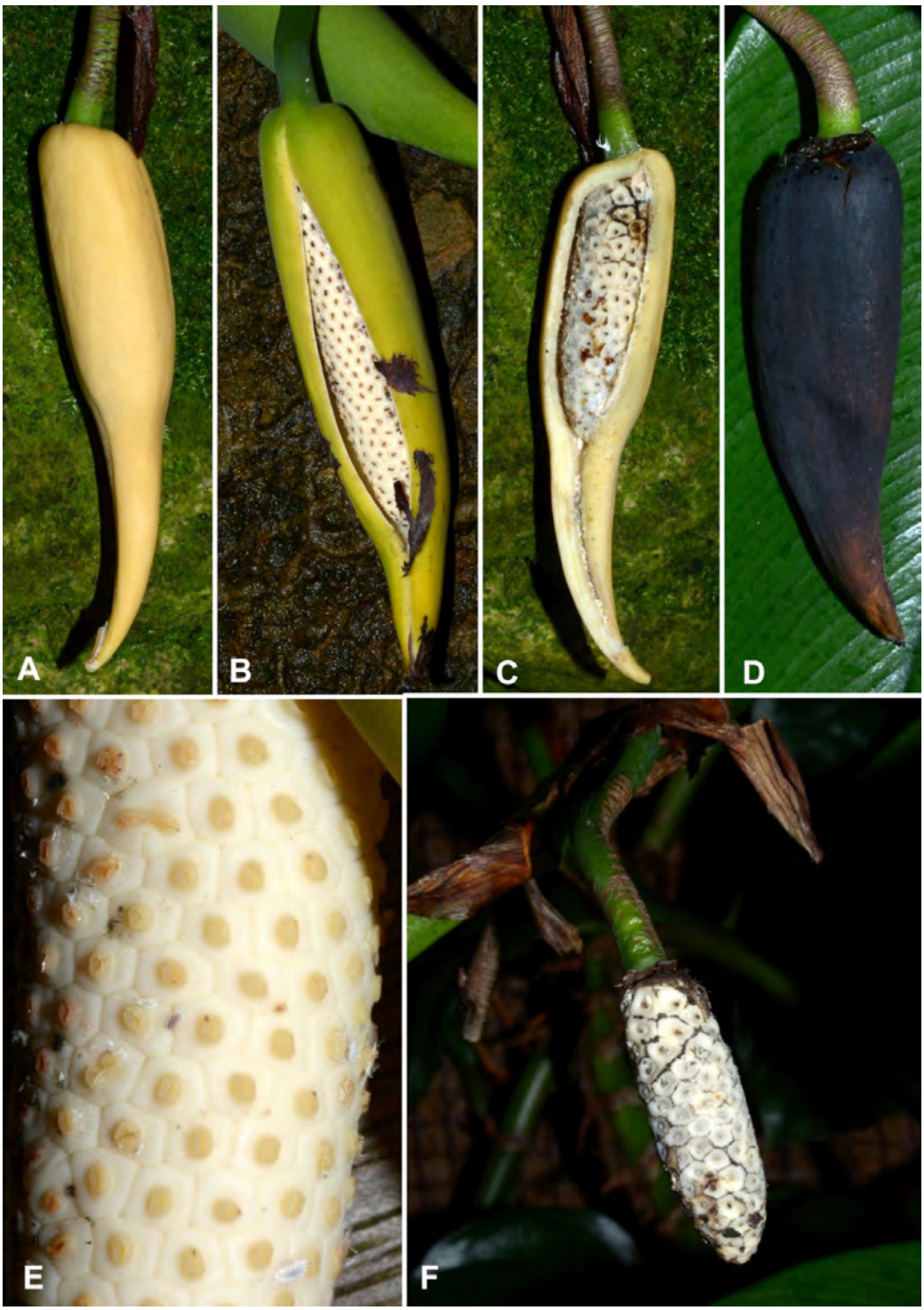

Figure 2. *Rhaphidophora bogneri* P. C. Boyce & Haigh. Type clone plant in cultivation, R.B.G., Kew. **A.** Inflorescence at pistillate anthesis. **B.** Inflorescence at staminate anthesis. **C.** Post-anthesis inflorescence, nearside spathe artificially removed. **D.** Older post-anthesis inflorescence with spathe darkened and about to be shed (note cracks at insertion on peduncle). All from *J. Bogner 708*. Images © D. Scherberich, used with permission.

Figure 3. *Rhaphidophora bogneri* P. C. Boyce & Haigh. *J. Bogner 708*. Isotype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

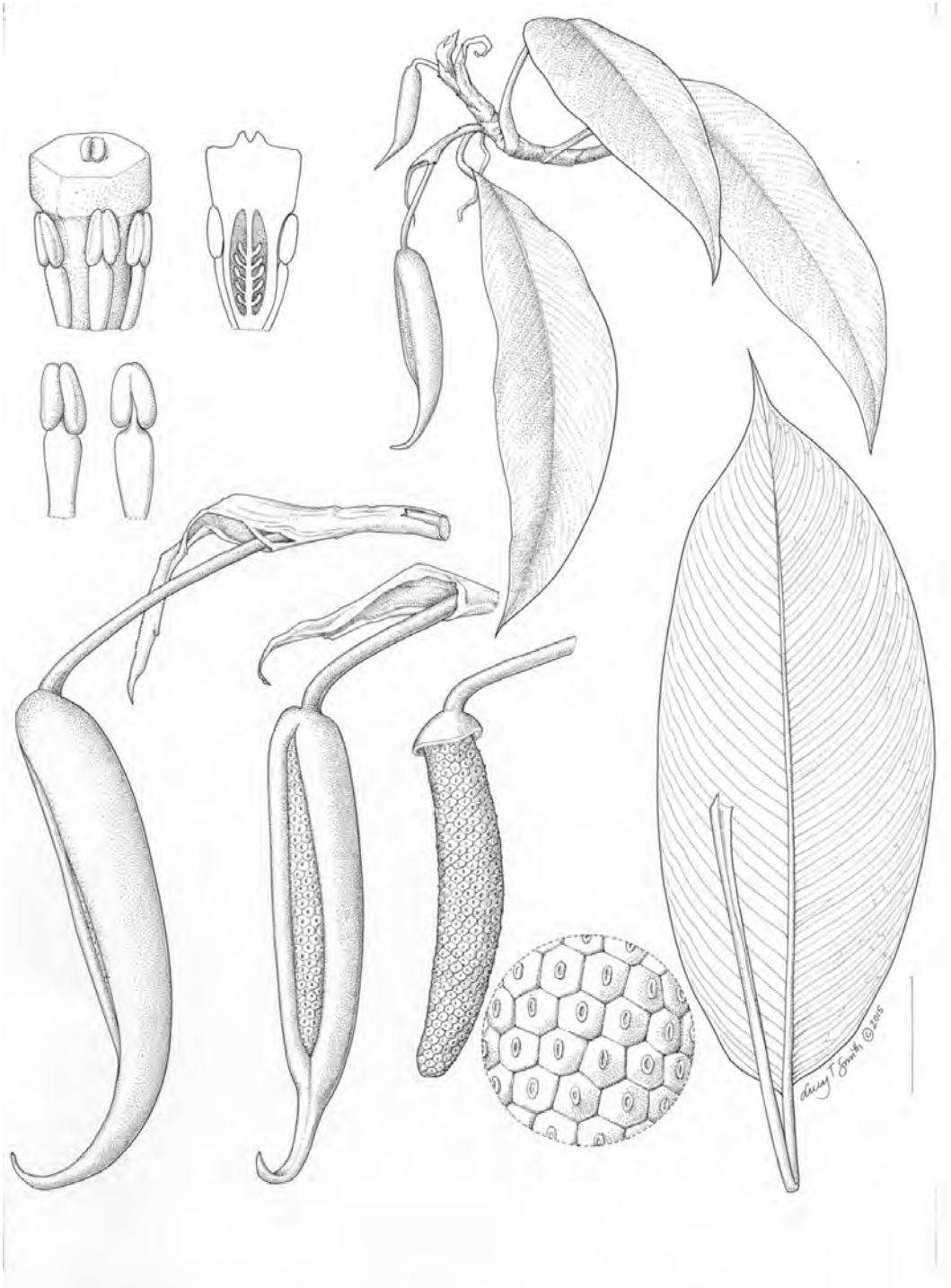

Figure 4. ***Rhaphidophora bogneri*** **P. C. Boyce & Haigh. A.** Flowering shoot. **B.** Leaf blade, abaxial surface. **C & D.** Inflorescence at pistillate anthesis. **E.** Spadix, spathe partially removed. **F.** Detail of styles and stigmas. **G.** Whole flower, pistillate anthesis. **H.** fFlower, longitudinally sectioned. **I.** Stamens ventral and dorsal view. Scale bar: A = 4cm; B = 2 cm; C–F = 7 mm; G & H = 3.3 mm; I = 2.5 All from *J. Bogner 708*. Plate prepared by Lucy Smith © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Diagnosis

Rhaphidophora bogneri is distinguished from *R. africana sens lat.* by pendent inflorescences (vs inflorescences erect), pendent infructescences (vs infructescences mostly erect), and by active shoot tips lacking persistent fibre derived from degraded cataphylls and petiolar sheathes. *Rhaphidophora bogneri* is separated from *R. pusilla* by the longer spathe (5 cm vs 2 cm long), and by flowering shoots with much more robust stems.

Moderately robust, semi-leptocaul homeophyllous liane to c. 8 m high; **seedling stage** a non-skototropic shingling shoot; **pre-adult plants** forming rather extensive terrestrial colonies; **adult shoot architecture** comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and long, moderately elaborated, free, densely leafy, flowering stems; **stems** smooth, medium semi-glossy green, climbing stems terete in cross-section, free stems spreading, sub-terete in cross-section, with spare sparse prophyll, cataphyll and petiolar sheath remains at the tips of active shoots, internodes to (4–)5–9(–10) cm long 0.5–0.6 cm in diam., separated by oblique to almost straight leaf scars, older stems sub-woody; **flagellate foraging stems** present, internodes 10–15 cm long, with a clasping cataphyll on each node, cataphyll 2.5–3 cm long, first whitish green, soon becoming brown and dry; **clasping roots** 4–5 arising from the nodes, rarely a few roots on the internodes of clinging stems, epidermis rough, brown; **feeding roots** occasionally formed by one of the few roots at the node becoming elongate and growing downwards to ground, c. 4 mm in diam., brown, somewhat rough outside, dividing at tip when reaching soil; **leaves** spiro-distichous on clinging and free shoots; **cataphylls and prophylls** membranous, 4–5 cm long, at first whitish green, soon drying light brown, clasping the internodes; **petiole** channelled adaxially (7–)9–17(– 20) x 0.4–0.5 cm in diam., narrowing somewhat to apex, smooth, medium green, apical geniculum well defined, 0.5–1.5 cm long, c. 5 mm in diam., somewhat thicker than petiole, initially green, soon becoming brown, rough with slight horizontal ridges; basal geniculum prominent, ca 2.5 cm long, 0.6–0.8 cm diam., with the dorsal side canaliculate; **petiolar sheath** prominent, more or less reaching apical geniculum, soon drying and degrading into straw-coloured to brown netted fibres, eventually falling to leave a scar from the petiole base; **blade** entire, narrowly elliptic to elliptic-oblong, often slightly falcate and unequal (one side of the blade narrower from the midrib than the other), (16–) 26 (–40) long × 6.5–9.5 cm wide, coriaceous, adaxially matte medium to dark green, abaxially light green, base cuneate, apex cuspidate to acuminate, venation parallel-pinnate; **midrib** strongly prominent abaxially, sunken adaxially; **primary lateral venation** ascending upwards 12–15 per side, slightly raised abaxially and adaxially; **interprimaries** parallel to primaries and less prominent, slightly raised abaxially and adaxially; **secondary** and **tertiary venation**

± obscure in fresh material, visible as a very faint reticulum in dried specimens; **inflorescence** solitary or up to three in sequence, pendent from tips of lateral free branches, subtended by a cataphyll up to 7 cm long more-or-less clasping the peduncle; **peduncle** compressed-cylindric, 5–6 × 0.4 cm, pale green; **spathe** broadly canoe-shaped, 5–7 (–10) long, stoutly acuminate, base rounded, stiff-fleshy, dark green when young, exterior buttercup-yellow at anthesis, often with almost black marks seemingly resulting from bruising, spathe interior somewhat paler to cream-coloured, spathe soon darkening and falling post-anthesis; **spadix** cylindrical, ± sessile, inserted level on peduncle, (3.5–) 4–5 (–6) cm long × 0.9–1 cm in diam., tip blunt, pale cream; **flowers** bisexual, naked (lacking perigone), 2.5–2.8 mm long; **stylar region** rhombo-hexagonal, c. 1.7 mm in diam., truncate, angled in view from above; **stigma** elliptic, raised with a central depression, c. 0.4 mm in diameter, cream; **anthers** barely exserted at staminate anthesis; **thecae** oblong, c. 1.5 mm long; **filament** flat, distally somewhat widened; **pollen grains** ellipsoid, 18–20 × 15–16 um, extended sulcate, exine verrucate; **infructescence** 7–11 cm long, dirty white; **seeds** numerous, on 2–3 intrusive parietal placentas, individually ellipsoid, c. 2 mm long, testa smooth, brittle, pale cream. **Chromosome number** 2n = 60.

Ecology — Lowland rainforest on leached red soils at c. 20m asl.

Distribution — Gabon, known with certainty only from the Type locality – but see notes under *R. africana*.

Eponymy — Named for Dr Josef Bogner (Munich Botanic Garden) in recognition for the immeasurable contribution he has made to our current knowledge and understanding of the aroids.

Notes — *Rhaphidophora bogneri* is immediately distinguishable from all other African *Rhaphidophora* species by the pendent inflorescences and infructescences. Elsewhere in *Rhaphidophora* pendent inflorescences are known only for *R. hookeri* Schott (NE India through N Thailand and Indochina to SW China), a species quite unrelated to *R. bogneri*.

Rhaphidophora africana N. E. Br., Bull. Misc. Inform. Kew 1897: 286. 1897; Brown in Th. Dyer, Fl. Trop. Afr. 8(1 & 2): 200. 1902; Hepper, Fl. West. Trop. Afr. 3(1): 114. 1968; Knecht, Aracées Côte d'Ivoire 1983; Mayo, Fl. Trop. East Afr., Araceae: 7. 1985; Ntépé-Nyamè, Fl. Cameroun 31: 75. 1988; Cabezas, Barquero & Velayos, Fl. Guinea Equat. 12: 98. 2015.

Afrorhaphidophora africana (N. E. Br.) Engl., Nat. Pflanzenfam., Nachtr. 3: 31. 1906; Engler & Krause in Das Pflanzenr., 37 (IV.23B): 54. 1908. Type: See under notes. **Figure 5–10.**

Ecology — Moist evergreen forest seemingly on a wide variety of soil types

Figure 5. ***Rhaphidophora africana*** **N. E. Br.** *G. Mann 103*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Figure 6. ***Rhaphidophora africana*** **N. E. Br.** *G. Mann 103*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Figure 7. *Rhaphidophora africana* N. E. Br. *G. Mann 103*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Figure 8. ***Rhaphidophora africana*** **N. E. Br.** *H. A. Cummins 47*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Figure 9. ***Rhaphidophora africana*** **N. E. Br.** *G. F. Scott-Elliot 4940*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

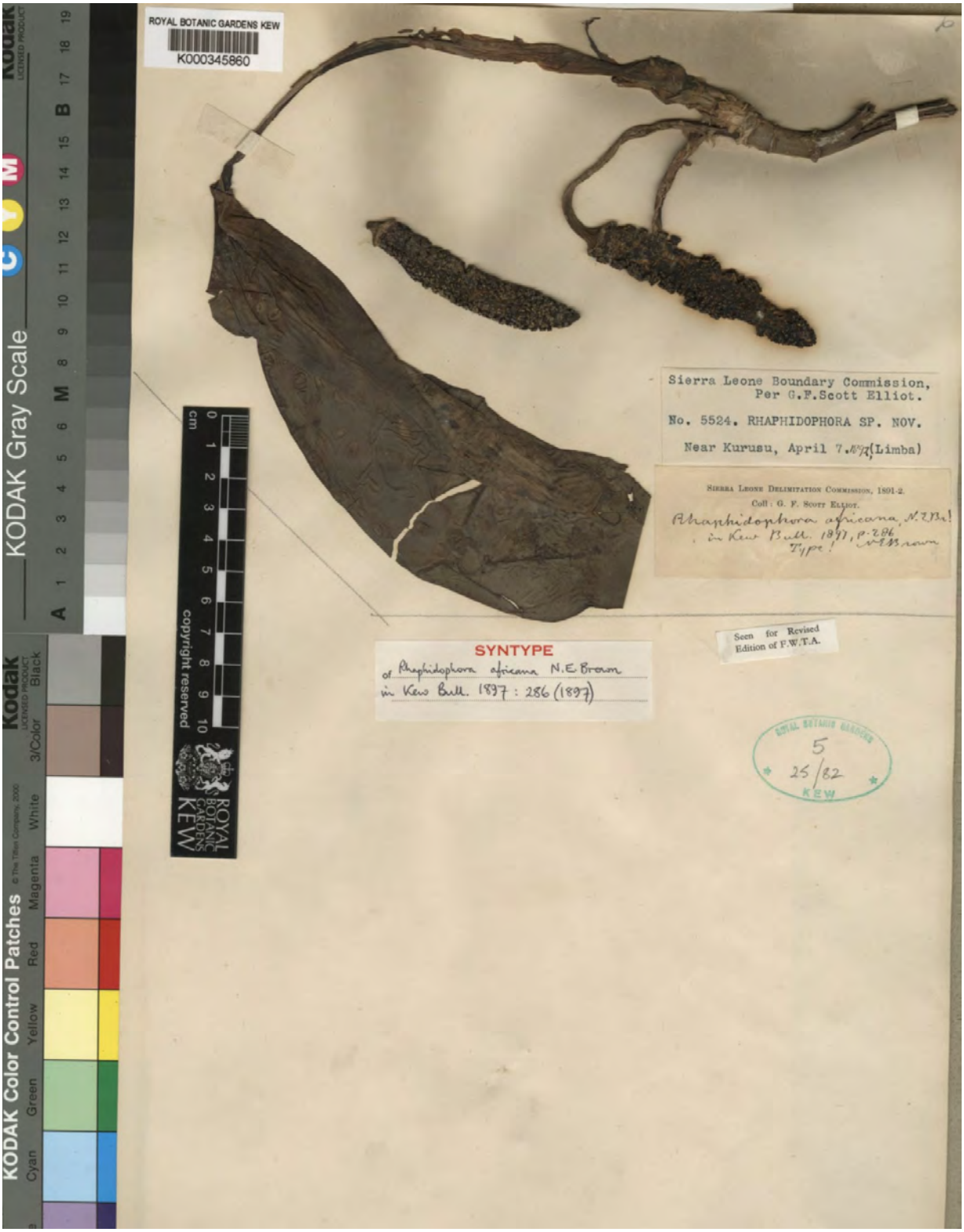

Figure 10. ***Rhaphidophora africana*** **N. E. Br.** *G. F. Scott-Elliot 5524*. Syntype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

(although ecological data are scarce and often imprecise), persisting in forest fragments, mostly at low altitudes, but with a maximum recorded occurrence 1000 m asl for Ugandan specimens (but see below).

Distribution — As here defined *Rhaphidophora africana sens lat.* occurs (from W–E) in Sierra Leone, Liberia, Cote d'Ivoire, Ghana, Benin, Nigeria, Cameroon, Bioko & Rio Muni (Equatorial Guinea), Gabon, Democratic Republic of Congo, Central African Republic, and Uganda.

Notes — Brown (1897) cites four syntypes: *G. F. Scott-Elliot 4940* and *G. F. Scott-Elliot 5524* both from Sierra Leone, *G. Mann 103* from Fernando Po (now Bioko, Equatorial Guinea), and *H. A. Cummins 47* from Ashanti (present day southern Ghana). Only *G. Mann 103* is a precise match for Brown's (uncharacteristically sketchy) diagnosis.

Rhaphidophora africana is heterogeneous, probably significantly so. At the very least elements collected at c. 1000 m asl in Uganda in which the primary and interprimary veins are finely striated and the spathe is furnished with a pronounced robust terminal rostrum [*H.C. Dawkins D475*, *M.V. Loveridge 89*, *R. Dümmer 2817*, and *T.S. Maitland 680* (all K!)], represent a new species; likewise D.R. Congo specimens with large fenestrations to the leaf blades [*J. Louis 7829* (K!)]; and the remarkably diminutive but stout material from Mount Mafa, Côte d'Ivoire [*Aké Assi 9532* (K!)] are all distinct enough to warrant description were the available specimens adequate.

Typically for lianescent aroids the available herbarium material combines inadequate sampling and mediocre preservation with scanty to missing descriptions, vague to non-existent ecological observations, and imprecise localizations. Given this, it comes as no surprise that the material is unserviceable for describing these evident novelties, let alone of any use in determining the bulk of the material that plausibly falls into Brown's heterogeneous concept of *R. africana*. Much work, and especially field-based work and subsequent cultivation of a wide range of material, is required in order to make any taxonomic headway with *Rhaphidophora africana sens. lat.*

Rhaphidophora pusilla N. E. Br., Bull. Misc. Inform. Kew 1897: 286. 1897; Brown in Th. Dyer, Fl. Trop. Afr. 8: 199. 1902.

Afrorhaphidophora pusilla (N. E. Br.) Engl., Nat. Pflanzenfam., Nachtr. 3: 31. 1906; Engler & Krause, Pflanzenr. 37(IV.23B): 54. 1908. Type: French Congo Territory [comprised present day Republic of the Congo, Gabon, and Central African Republic], Gaboon [present day Gabon], Sierra del Crystal, *G. Mann 1700* (K!). **Figure 11.**

Figure 11. ***Rhaphidophora pusilla*** **N. E. Br.** *G. Mann 1700*. Holotype (K). Image © Trustees of the Royal Botanic Gardens, Kew. Used with permission.

Figure 12. *Rhaphidophora ovoidea* A. Chev. *A. Chevalier 19643* Holotype (P). Image © Muséum national d'histoire naturelle, Paris. Used with permission.

Ecology — "Rainforest", 700–1520 m asl.

Distribution — Gabon (Monts de Crystal) and Cameroon (Bakossi Mountains), known from one locality each, the known sites being c. 500 km distant.

Notes — *Rhaphidophora pusilla* is highly distinctive and impossible to confound with any other African *Rhaphidophora* species, described or otherwise. It is unaccountable why two major on-line data resources (The Plant List, 2013; WCSP, 2016) should treat *R. pusilla* as a synonym of *R. africana*.

Inadequately known species

Rhaphidophora ovoidea A. Chev., J. Bot. (Morot) 22: 135. 1909. Type: Côte d'Ivoire "environs de Grabo sur les arbres dans la forêt. Très commun dan le bassin de Cavally, 28–29 juillet 1907", *A. Chevalier 19643* (holo P!). **Figure 12.**

Ecology — Although not recorded on the type of *R. ovoidea*, material collected by Chevalier from the same locality at approximately the same time states (translated from original French) "forested basalt hills, Mt Tou, at ca 200 m asl."

Distribution — Known only from the Type location.

Notes — The only known collection of *Rhaphidophora ovoidea* was considered, even by the publishing author, as doubtfully distinct from *R. africana*. Knecht (1983) considered *R. ovoidea* and *R. africana* to be conspecific. Unsurprisingly the existing material is far too incomplete to allow acceptable comparisons, although we draw attention to the characteristic chartaceous texture of the leaf blades as being of significance should additional material ever be recollected.

References

Baharuddin S. & P. C. Boyce 2010. Studies on Monstereae (Araceae) of Peninsular Malaysia I: *Rhaphidophora megasperma*, a new record for West Malaysia. *Trop. Life Sci. Research* 21(2): 1–6.

Boyce, P. C. 1999a. The genus *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in Peninsular Malaysia, and Singapore. *Gard. Bull. Singapore* 51: 183–256.

Boyce, P. C. 1999b. *Rhaphidophora glauca*. *Curtis's Bot. Mag.* 16(4): 273–280, Pl. 377.

Boyce, P. C. 2000a. The genus *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in the southern and western Indonesian archipelago. *Gard. Bull. Singapore* 52: 101–183.

Boyce, P. C. 2000b. The genus *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in the Philippines. *Gard. Bull. Singapore* 52: 213–256.

Boyce, P. C. 2001a. The genus *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in Borneo. *Gard. Bull. Singapore* 53: 19–74.

Boyce, P. C. 2001b. The genus *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in New Guinea, Australia and the tropical western Pacific. *Gard. Bull. Singapore* 53: 75–183.

Boyce, P. C. 2005. A new species of *Rhaphidophora* Hassk. (Araceae: Monstereae) from Borneo. *Gard. Bull. Singapore* 57: 211–216.

Boyce, P. C. 2006a. *Rhaphidophora tenuis* (Araceae: Monstereae) Resurrected. *Gard. Bull. Singapore* 58: 1–5.

Boyce, P. C. 2006b. *Rhaphidophora crassifolia* (Araceae: Monstereae): a new record for Sarawak and notes on the *Rhaphidophora* 'Hongkongensis' group in Borneo. *Gard. Bull. Singapore* 58: 19–24.

Boyce, P. C. & J. Bogner. 2000. An account of neotenic species of *Rhaphidophora* Hassk. (Araceae–Monsteroideae–Monstereae) in Australia and New Guinea. *Gard. Bull. Singapore* 52: 89–100.

Boyce, P. C. & Nguyen V. D. 2012. In P. C. Boyce, D. Sookchaloem, W. L. A. Hetterscheid, G. Gusman, N. Jacobsen, T. Idei & Nguyen V. D. Acoraceae & Araceae. *Flora of Thailand* 11(2): pp 225+89 plates.

Boyce, P. C., Zulhazman H. & Mashhor M. 2012. Studies on Monstereae (Araceae) of Peninsular Malaysia IV: The enigmatic *Rhaphidophora corneri* refound after 75 years. *Gard. Bull. Singapore* 64: 281–288.

Hay, A. 1993. *Rhaphidophora petrieana* – a new aroid liane from tropical Queensland; with a synopsis of the Australian Araceae-Monstereae. *Telopea* 52: 293–300.

Knecht, M. 1983. Contribution a I'etude biosystematique des represntentes d'Aracées de la Côte d'lvoire. *Phanerogamarum Monographiae* 12: VII, 1–290, planches a - y (21 plates).

Li H., Zhu G., P. C. Boyce, J. Murata, W. L. A. Hetterscheid, J. Bogner J. & Jacobsen N. 2010. Araceae. *Flora of China* 23: 3–79.

Ntépé-Nyamè, C. 1988. Aracees. In B. Satabie & Ph. Morat, *Flore du Cameroun* 31: 1–138.

Sofiman O. A. & P. C. Boyce. 2010: Studies on Monstereae (Araceae) of Peninsular Malaysia II: *Rhaphidophora latevaginata*, newly recorded for West Malaysia. *Gard. Bull. Singapore* 62: 1–8.

The Plant List. 2013. Version 1.1. Published on the Internet: *http://www.theplantlist.org/* (accessed 10th May 2016).

WCSP. 2016. *World Checklist of Selected Plant Families*. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet: http://apps.kew.org/wcsp/ Retrieved 10 May 2016.