

The Genus *Rhaphidophora* Hassk. (Araceae-Monsteroideae- Monstereae) in New Guinea, Australia and the Tropical Western Pacific

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Abstract

An alpha-taxonomic account of *Rhaphidophora* in New Guinea, Australia and the tropical western Pacific is presented as a precursor to the forthcoming Flora Malesiana *Araceae* treatment. Thirty species are recognized, of which 12 (*R. cravenschoddeana*, *R. cryptantha*, *R. fortis*, *R. gorokensis*, *R. guamensis*, *R. intonsa*, *R. intrusa*, *R. jubata*, *R. kokodensis*, *R. mima*, *R. pilosa* and *R. waria*) are novel. Twenty new synonymies are made: *R. holtrungii* and *R. iboensis* = *R. australasica*; *R. pallidivenia* = *R. conica*; *R. oreophila* = *R. discolor*; *R. wentii* = *R. geniculata*; *R. nutans* = *R. microspadix*; *R. buergersii*, *R. conferta*, *R. drepanophylla*, *R. obliquata* and *R. peekelii* = *R. schlechteri*; *R. apiculata*; *R. engleri* [syn. *R. palauensis* Engl. & K. Krause (1921) non Koidz. (1916)], *R. forbesii*, *R. kanehirae* and *R. palauensis* Koidz. (1916) = *R. spathacea*; *R. graeffei* and *R. reineckeii* = *R. spuria*; *R. ledermannii* = *R. versteegii*. One species (*R. dahlii* Engl.) is treated as doubtful. A dichotomous key to species is provided. All species are illustrated.

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Introduction

Rhaphidophora Hassk. (including *Afrorhaphidophora* Engl.; at least 3 species in tropical Africa) comprises c. 100 species of small to large, occasionally enormous, root-climbing lianes (*sensu* Schimper, 1903), rarely

rheophytes, distributed from tropical West Africa eastwards to the western Pacific (Samoa), north to southern Japan (Ryukyu Islands) and south to Northern Australia. *Rhaphidophora* is one of the largest aroid genera represented in tropical Asia and has several nodes of diversity; the Himalaya (SE Nepal to NE Vietnam, roughly 17°—23° N), West Malesia (including southernmost peninsular Thailand), the Philippines, and East Malesia. Thirty species occur in New Guinea, Australia and the tropical Western Pacific region.

The last complete revision of *Rhaphidophora* was that of Engler and Krause (1908) and a summary of the taxonomic and nomenclatural history of *Rhaphidophora* was presented in Boyce (1999).

This is the sixth in a series of papers intended to present a complete alpha-taxonomy of the genus *Rhaphidophora*. Accounts for Peninsular Malaysia and Singapore (Boyce, 1999), south and west Indonesia (Boyce, 2000a), the Philippines (Boyce, 2000b), Borneo (Boyce, 2001) and for neotenic species in New Guinea and Australia (Boyce & Bogner, 2000) have been published to date. Accounts for each of India, Sri Lanka and the Himalaya, Thailand and Indochina, and Africa are being prepared and will be published separately.

Synonymy cited is for the species, not for the review area. The reason for this is that synonymous names based on types from outside the review area are frequently applied to specimens in local herbaria.

Infrageneric Relationships

Boyce (2000a) proposed eight informal morpho-taxonomic groups for the *Rhaphidophora* of Indochina and Thailand, Sunda and Wallacea, each group named with the earliest accepted species epithet belonging to that group. It should be noted that these groups are a first, pragmatic attempt at creating morpho-taxonomic units. Molecular work underway at Cambridge will result in a better, infrageneric classification.

Of the eight groups proposed by Boyce (2000a), three occur in the New Guinea and Pacific region:

1. **Korthalsii Group** (*R. korthalsii* Schott).
2. **Neoguineensis Group** (*R. neoguineensis* Engl., *R. intrusa* P.C. Boyce, *R. mima* P.C. Boyce, *R. schlechteri* K. Krause).
3. **Spathacea (Hollrungii) Group** (*R. australasica* F.M. Bailey, *R. guamensis* P.C. Boyce, *R. spathacea* Schott, *R. versteegii* Engl. & K. Krause, *R. waria* P.C. Boyce). The Hollrungii Group is here renamed the Spathacea Group, following recognition of *R. spathacea* as the earliest described attributable species.

In addition, a further eight indigenous New Guinea/Pacific groups are proposed and described here:

1. **Brevispathacea Group** (*R. brevispathacea* Engl. & K. Krause, *R. stolleana* Engl. & K. Krause, perhaps *R. geniculata* Engl.):- Long pendent stems (erect and clinging in *R. geniculata*) with much abbreviated inflorescence-bearing shoots arising in the leaf axils. Spathe marcescent.
2. **Discolor Group** (*R. discolor* Engl. & K. Krause, *R. stenophylla* K. Krause, *R. conica* Engl., *R. petrieana* A. Hay):- Flowering on free shoots. Spadix long stipitate. Rather to markedly narrow leaves. (Perhaps not a good group because free shoots and stipitate spadices recur throughout the genus but morphologically it is quite homogeneous.)
3. **Fortis Group** (*R. fortis* P.C. Boyce):- Extremely stout, clinging flowering shoots and short-petioled leaves. Inflorescences with appearance of being borne in the leaf axils.
4. **Jubata Group** (*R. jubata* P.C. Boyce):- Robust, pachycaul, flowering on adherent shoots. The crested reniform seeds are unique in the genus. (Similar in appearance to *R. intonsa* P.C. Boyce and *R. cravenschoddeana* P.C. Boyce, which are different in not having crested reniform seeds.)
5. **Microspadix Group** (*R. microspadix* K. Krause):- Long, very slender shoots flowering at the tip. Spathe small, marcescent. (May be part of the Neoguineensis Group).
6. **Okapensis Group** (*R. gorokensis* P.C. Boyce, *R. kokodensis* P.C. Boyce, *R. okapensis* P.C. Boyce & Bogner, *R. pilosa* P.C. Boyce):- Montane species with stiff coriaceous leaves with prominent petiolar sheathes that degrade into fibres, or fall completely. Inflorescences on adherent or free shoots. Spathe marcescent where known (perhaps early marcescent in *R. okapensis*).
7. **Pachyphylla Group** (*R. cryptantha* P.C. Boyce & C.M. Allen, *R. hayi* P.C. Boyce & Bogner, *R. pachyphylla* K. Krause (+ *R. parvifolia* Alderw. – Maluku):- Defined by neotenic shingling habit with petioles much shorter than the lamina.
8. **Spuria Group** (*R. intonsa*, *R. cravenschoddeana*, *R. spuria* (Schott) Nicolson):- Fibre-covered shoot apices, large inflorescences, often several together as in the Spathacea Group (*q.v.*), but inflorescences subtended by fibrous, not chartaceous, remains. (Possibly heterogeneous).

Geography and Endemism

New Guinea, Australia and the western Pacific region is remarkable for the high number of *Rhaphidophora* species, coupled with very high diversity and a high percentage of endemics (30 species of which 29 are endemic; only the widespread and common *R. korthalsii* is not endemic to the area). Apart from *R. guamensis* (endemic to Guam) and *R. petrieana* (endemic to Australia), all the rest occur on the island of New Guinea, of which 16 species are endemic to the island. These figures, compared with those for the other main nodes of diversity for the genus in tropical Asia - Borneo (5 endemics out of a total of 13 species), Peninsular Malaysia (2 out of 15), Sumatera (4 out of 15) and the Philippine islands (7 out of 11) - suggest *Rhaphidophora* is a genus of Gondwana origin.

There are no data for the conservation status of any of these endemic species and much remains to be done by way of field studies to ascertain whether any or all of these species are threatened. Nevertheless, it seems that several species have very restricted distributions (e.g., *R. kokodensis*, *R. gorokensis*, *R. jubata*), others are known from a single or very few collections (e.g., *R. pilosa*, *R. intrusa*).

RHAPHIDOPHORA

Rhaphidophora Hassk., Flora 25 (2) Beibl. 1 (1842) 11; Schott, Gen. Aroid. (1858) 77 & Prodr. Syst. Aroid. (1860) 377—388; Miquel, Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 81—82; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 238—248; Engl. in Beccari, Malesia, 1 (1882) 266—272, Tab. xix 6—9, xx 1—5; Benth. & Hook. f., Gen. Pl. 3(2) (1883) 993—993; Engl. & Prantl, Nat. Pflanzenfam. T. 2, Ab. 3 (1889) 119—120; Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1 (1897) 58; K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 17—53; Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 3 (1908) 29; Nicolson in A.C. Sm., Fl. Vitiensis Nova, 1 (1979) 443—445, Fig. 88; Hay in R.J. Johns & Hay, Students' Guide Monocot. Papua New Guinea. Part 1 (1981) 68—72, Fig. 29; Schott, Icones aroideae et reliquiae (IDC Microfilm) (1983) fiche nos. 28—31, 121; Hay, Aroids of Papua New Guinea (1990) 83—87, Figs. 34, 35, Pl. XIVb, XV & Telopea 5 (1993) 293—300; Hay *et al.* Checklist & botanical bibliography of the aroids of Malesia, Australia and the tropical western Pacific. Blumea, suppl. 8 (1995) 111—127; Mayo *et al.*, Genera Araceae (1997) 118—121, Pl. 14, 109 D. — *Scindapsus* subgen. *Rhaphidophora* (Hassk.) Miq., Flora Ned. Indië 3 (1856) 185. — Type: *Rhaphidophora lacera* Hasskarl, *nom. illeg. pro. Pothos*

pertusus Roxb. [= *Rhaphidophora pertusa* (Roxb.) Schott].

Scindapsus Schott subgen. *Pothopsis* Miq., Flora Ned. Indië 3 (1856) 187.
— Type: *Scindapsus sylvestris* (Blume) Kunth [= *Rhaphidophora sylvestris* (Blume) Engl.].

[*Raphidophora* Hassk., Cat. Hort. Bogor. (1844) 58, *orth. var.*].

Medium-sized to very large, occasionally enormous, slender to robust, leptocaul or pachycaul, homeophyllous or heterophyllous, rarely neotenic, root-climbing lianes, very seldom clustering and rheophytic and then with a creeping juvenile stage; *cut surfaces* producing clear, odourless sticky juice either drying \pm invisibly or coagulating into yellowish, translucent jelly and eventually hardening to a brittle amber-like mass; *seedling stage* mostly not observed but where known either leafy at germination and skototropic (see Strong & Ray, 1975) by an alternating series of congested leafy and elongated leafless shoots or germinating to give rise to a non-skototropic shingling juvenile shoot; *pre-adult plants* often forming modest to extensive terrestrial colonies of varying morphological and physiological form (descriptive generalisations are nearly impossible), largest terrestrial colonies generally occurring in places of less than optimum adult growth potential (e.g., depauperate tree canopy, dry, exposed sites); *adult shoot architecture* broadly divisible into three types: i. physiognomically unbranched clinging non-flowering stems rooting along their entire length giving rise to variously elaborated free lateral lateral flowering stems, or ii. all stems physiognomically unbranched, clinging and flowering, or iii. physiognomically unbranched leader and sympodial lateral stems clinging but only sympodial lateral stems flowering; *stems* with internodes of various lengths separated by variously prominent leaf scars, smooth or asperous or densely pubescent to ramentose (the last not in the review area), older stems sub-woody or somewhat corky or with distinctive matt to sub-lustrous pale brown papery epidermis, with or without variously textured prophyll, cataphyll and petiolar sheath fibre either at the tips or along the newer sections, rarely with both cataphylls and prophylls deliquescing to black mucilage and later drying leaving fragmentary parchment-like remains on petioles, developing laminas and inflorescences; *flagellate foraging stems* occurring in some species, often exceedingly long, reaching the ground then rooting, variously foraging and climbing again; *clasping roots* sparsely to densely arising from the nodes and internodes, strongly adherent to substrate; *feeding roots* rare to abundant, smooth pubescent or prominently scaly, later often becoming woody, strongly adherent to substrate or free;

cataphylls and *prophylls* subcoriaceous to membranous, caducous or degrading or deliquescing to variously persistent, variously textured, sheaths and fibres, these where present variously clothing upper stem before eventually decaying and falling; *leaves* distichous or weakly spiralled, evenly distributed or scattered or clustered distally; *petiole* canaliculate to weakly carinate, smooth or pubescent, with variously prominent apical and basal genicula; *petiolar sheath* prominent, nearly reaching to overtopping the geniculum, occasionally one side greatly expanded and auriculate, especially in juvenile plants, at first membranous to coriaceous, then soon drying chartaceous completely or along the margins, sometimes degrading to untidy variously netted or simple fibres and later variously falling leaving a scar, or disintegrating marginally or completely; *lamina* submembranous to stiffly chartaceous or coriaceous, lanceolate or oblong, \pm oblique, base decurrent to unequal or cordate, apex acute to acuminate, entire to regularly pinnatifid or perforated, if pinnate then divisions pinnatifid to pinnatisect (Stearn, 1992: 324), midrib often \pm naked between segments, lamina occasionally with small to well developed perforations adjacent to the midrib and primary veins, these sometimes extending to lamina margin (fenestrations then occasionally additional to fully developed pinnae), rarely abaxially pubescent when expanding, rarely strongly concolorous at maturity; *midrib* usually prominently raised abaxially and prominently sunken, sometime flush or rarely slightly raised adaxially; *primary venation* \pm pinnate; *interprimaries* mostly present, sub-parallel to primaries and sometimes indistinguishable from them but usually less prominent and often drying paler, usually glabrous, occasionally pubescent with domatia in the axils of the primary and secondary veins; *secondary venation* striate to reticulate, variously prominent, often very difficult to distinguish from primary venation; *tertiary venation* where visible reticulate to tessellate; *inflorescences* solitary to several together, first inflorescence subtended by a (usually fully developed) foliage leaf and/or a very swiftly disintegrating cataphyll, subsequent inflorescences usually each subtended by a prophyll and cataphyll, more rarely by a prophyll and partially to almost fully formed foliage leaf, inflorescences at male anthesis naked by disintegration of subtending cataphyll or partially to almost completely obscured by netted and sheet-like fibres; *peduncle* terete to laterally compressed; *spathe* ovate to narrowly or broadly canoe-shaped, stoutly to rather weakly beaked, barely gaping to opening almost flat at male anthesis, usually caducous before male anthesis is complete, occasionally marcescent into the early stages of infructescence development, stiff to rather soft- or stoutly coriaceous, dirty-white, greenish, cream or yellow; *spadix* subglobose to clavate-cylindrical, cylindrical or fusiform, sessile or stipitate, often obliquely inserted on peduncle, tapering towards the apex; *flowers* bisexual, naked;

ovary 1- to partially 2-locular, lower part \pm bilaterally compressed, upper part cylindrical and variously angled, most often rhombohexagonal, those upper- and lower-most on the spadix often sterile and bereft of stigma, those uppermost frequently either scattered or partially fused to each other and forming a rudimentary appendix; *ovules* few to many, anatropous, funicle long, placentas parietal to basal, sometimes \pm subaxile, partial septa variably intrusive; *stylar region* well developed, usually broader than ovary, usually truncate apically, rarely elongate-conic; *stigma* sticky at female male anthesis, punctiform, broadly elliptic or oblong, orientation circumferential or longitudinal; *stamens* 4—6; *filaments* strap-shaped; *anthers* usually prominently exerted from between ovaries at male male anthesis, rarely not exerted and pollen extruded from between ovaries, thecae dehiscing by a longitudinal slit; *infructescence* with stylar regions greatly enlarged, transversely dehiscent, the abscission developing at the base of the enlarged to massive stylar region and this shedding to expose the ovary cavity with the many seeds embedded in variously coloured sticky pulp; *seeds* oblong, testa thin, smooth, embryo axile, straight, endosperm copious; *pollen* dicolpate, extended monosulcate to fully zonate, ellipsoid or hamburger-shaped, medium-sized (mean 33 μm , range 24—55 μm) (Mayo *et al.*, 1997), exine foveolate, subreticulate, rugulate, fossulate, scabrate, retiscabrate, verrucate, or psilate; *chromosomes* $2n = 60, 120 (42, 54, 56)$ (Mayo *et al.*, 1997).

Distribution: About 100 species from tropical Africa, South and South East Asia, Australia and the Pacific with extensions into the subtropical Himalaya, southern China and the southernmost islands of Japan.

Habitat: Usually in well drained subtropical and tropical wet, humid, or seasonally moderately dry primary and established secondary evergreen forest at low to mid-montane elevations as lianescent bole-climbers, lithophytes, rarely rheophytes

Etymology: Greek *rhaphis*, *rhaphidos* (needle) and *pherô* (I bear); refers to the macroscopic (to 1cm long), needle-like unicellular trichosclereids present in tissues.

Key to Adult Flowering* *Rhaphidophora* plants in New Guinea, Australia and the Tropical Western Pacific

* juvenile vegetative phases included for species where confusion is possible

- 1a. Shingle climber (petiole much shorter than lamina, lamina appressed to substrate) 2
- 1b. Not as above 6
- 2a. Leaf lamina cordiform, chartaceous, base cordate, posterior lobes overlapping; primary venation strongly reticulate 3
- 2b. Leaf lamina variously shaped (not cordiform), membranous to stiffly coriaceous, base slightly cordate to truncate; primary venation pinnate 4
- 3a. Primary venation conspicuously silver-grey; inflorescences arising from behind appressed shingling leaves, carried on abbreviated shoots arising from the leaf axil. Papua New Guinea (not known with certainty) **5. *R. cryptantha***
- 3b. Primary venation not silver grey; plant never flowering in the shingling phase. Indonesian Papua, Papua New Guinea (including New Ireland) **29. *R. versteegii*** (juvenile phase)
- 4a. Leaf lamina membranous, with c. 3 prominent veins per side, these running from near the base to the upper margin or tip and crossing over the reticulate minor venation; plant never flowering in the shingling phase. Throughout region **16. *R. korthalsii*** (juvenile phase)
- 4b. Leaf lamina coriaceous to stiffly coriaceous, without prominent veins running from the base to the upper margin or tip; plant fertile in the shingling phase. 5
- 5a. Leaf lamina of flowering shoots with base truncate; spadix stoutly cigar-shaped, shortly stipitate, inserted \pm level on stipe; stipe 4—6 x 3—3.5 mm; stigma elongated, longitudinally orientated; plant with disarticulating side shoots functioning as vegetative propagation units. Indonesian Papua, Papua New Guinea [including New Britain, New Ireland, Bougainville and Muyua (Woodlark) Island], and Australia (Eastern tropical Queensland) **11. *R. hayi***
- 5b. Leaf lamina of flowering shoots with base acute to cuneate; spadix narrowly cigar-shaped, long stipitate, inserted obliquely on stipe; stipe 6—10 x 2—2.4 mm; stigma punctiform; plant without

- disarticulating side shoots. Indonesian Papua, Papua New Guinea .
 **21. R. pachyphylla**
- 6a. Leaf lamina variously pinnately divided and/or perforated; roots
 smooth or pubescent 7
- 6b. Leaf lamina entire, if pinnate then with densely ramentose-scaly
 roots 8
- 7a. Leaf lamina of mature plants pinnatisect to slightly to extensively
 perforated, perforations round to rhombic, extending c. + of lamina
 width on each side of the midrib; shoot tips with prominent
 chartaceous prophyll and cataphyll remains. Indonesian Papua, Papua
 New Guinea (including New Ireland) **29. R. versteegii**
- 7b. Leaf lamina of mature plants pinnatisect, the pinnae often perforated
 basally; active shoot tips with sparse to copious netted fibre.
 Throughout the region **16. R. korthalsii**
- 8a. Inflorescences arising on clinging shoots 9
- 8b. Inflorescences arising on free shoots 17
- 9a. Shoot tips without variously textured cataphyll, prophyll and petiolar
 sheath fibre; lamina ovate, 2.5—8.5 x 0.9—4 cm, very stiffly
 coriaceous, base cordate to rounded and slightly notched, apex long-
 acuminate with a pronounced tubule. Papua New Guinea
 **20. R. okapensis**
- 9b. Shoot tips with variously textured cataphyll, prophyll and petiolar
 sheath fibre; leaf laminae various, but not the above combination of
 characters 10
- 10a. Leaf lamina pinnatisect; feeding roots densely ramentose-scaly.
 Throughout region **16. R. korthalsii**
- 10b. Leaf lamina entire; feeding roots smooth or pubescent 11
- 11a. Spadix sessile 12
- 11b. Spadix stipitate 16
- 12a. Inflorescences solitary; stylar region conical, stigma not prominent.
 New Guinea and Australia (eastern tropical Queensland)
 **1. R. australasica**
- 12b. Inflorescences two or more together; stylar region truncate, stigma
 prominent 13

- 13a. Inflorescences subtended by netted fibre and copious sheet-like tissue, arising two or more sequentially between foliage leaves. Papua New Guinea **7. R. fortis**
- 13b. Inflorescences each subtended by prominent chartaceous prophyll and one or more large cataphylls, the whole forming a synflorescence not interspersed with foliage leaves 14
- 14a. Prophylls and cataphylls subtending inflorescences soon degrading and falling; spathe caducous, 16—24 cm long, stiff, thin; spadix slender cylindrical, 13—21 x 1—3 cm, long decurrent (to 2 cm) at peduncle/spathe insertion. New Britain and Bougainville **14. R. jubata**
- 14b. Prophylls and cataphylls subtending inflorescences drying chartaceous and persisting into fruit maturation; spathe marcescent, 5—13.5 cm long, stiff-fleshy, very thick-walled (up to 1 cm at tip); spadix stoutly cylindrical, 3—16.5 x 1—1.5 cm, inserted almost level on peduncle 15
- 15a. Leaf lamina drying pale grey-green, often (but not always) profoundly perforated; juvenile growth phase shingling. Indonesian Papua, Papua New Guinea (including New Ireland) **29. R. versteegii**
- 15b. Leaf lamina drying strongly bicolored, adaxially dark brown, abaxially bright orange-brown with copious, minute tannin cells, never perforate; juvenile growth phase not shingling. Palau, Indonesian Papua, Papua New Guinea (including Woodlark (Muyua) Island), Federated States of Micronesia (Yap) **25. R. spathacea**
- 16a. Inflorescence solitary, terminating short shoots arising singly in the axils of several adjacent leaves, each inflorescence subtended by a prophyll and several degraded, netted cataphylls; spathe ovoid-ellipsoid, 3.5—6.5 cm long; spadix ovoid-ellipsoid, 2.5—3.5 x 1.3—1.7 cm; stylar region prominently conical, hexagonal in plan view; stigma punctiform. New Guinea **8. R. geniculata**
- 16b. Inflorescences several close together in a synflorescence, each subtended by a prominent chartaceous prophyll and one or more chartaceous cataphylls, the entire synflorescence emerging from a mass of chartaceous cataphylls; spathe canoe-shaped, 4—5.5 cm long; spadix cylindrical, c. 3.2 x 0.9 cm; stylar region rounded-conical, almost circular in plan view; stigma deeply excavated. Indonesian Papua (Mimika Prov.) and Papua New Guinea (East Sepik Prov.) **29. R. waria**

- 17a. Shoot tips with variously textured cataphyll, prophyll and petiolar sheath fibre 16
- 17b. Shoot tips without cataphyll, prophyll and petiolar sheath fibre 24
- 18a. Spadix stipitate 19
- 18b. Spadix sessile 20
- 19a. Flowering shoots extremely abbreviated, arising from axils of leaves, all but obscured by netted petiolar sheath and cataphyll fibre; spathe ovoid-cylindric, 3—4 cm long, thinly coriaceous; spadix slender cylindrical, 2.9—3.4 x 1.7—1.9 cm; stylar region depressed centrally; anthers exerted at male anthesis. Indonesian Papua (Mimika/Digul Prov. Boundary) **2. R. brevispathacea**
- 19b. Flowering shoots elongated and leafy, not as above; spathe canoe-shaped, 20—23 cm long, stiffly very fleshy; spadix cylindrical to slightly cigar-shaped, 13.5—19 x 2.2—4 cm; stylar region truncate with a raised rim; anthers not exerted at male anthesis. Indonesian Papua (Yapen), Papua New Guinea (East & West Sepik, Milne Bay & Morobe Prov.) **6. R. discolor**
- 20a. Leaf lamina narrowly lanceolate to narrowly lanceolate-elliptic, not exceeding 25 x 6 cm, stiffly coriaceous 21
- 20b. Leaf lamina ovate to oblong-elliptic or oblong lanceolate, slightly oblique, frequently exceeding 30 x 10 cm, up to 76 x 32, submembranous, subcoriaceous, only rarely coriaceous and then never stiffly so 22
- 21a. Cataphylls, prophylls and petiolar sheath degrading to simple robust fibres. Papua New Guinea (Kokoda & Port Moresby) **15. R. kokodensis**
- 21b. Cataphylls, prophylls and petiolar sheath degrading to weak fibres and strips of soft felt-like tissue. Indonesian Papua (Kepala Burung – Arfak Mts) **23. R. pilosa**
- 22a. Leaf lamina drying strongly bicolored, adaxially mid-brown, abaxially pale brown; inflorescences usually several together, occasionally solitary each subtended by a soon-degrading membranous prophyll and cataphyll; spathe 9.5—12 (–16 cm) long. Papua New Guinea (Western Prov.), Solomon Islands (Guadalcanal, New Georgia, San Cristobal and the Santa Cruz Group), Fiji, Western and American Samoa **26. R. spuria**

- 22b. Leaf lamina not drying bicolored *or* if bicolored then abaxially greenish brown, adaxially dark brown with dense faint dark speckling; inflorescence always solitary, subtended by a ± fully developed foliage leaf and copious netted fibre and sheet-like tissue *or* a ± fully developed foliage leaf and one or more degrading papery cataphylls; spathe 17—22 long..... 23

- 23a. Leaf lamina subcoriaceous, drying concolorous, base subacute to slightly decurrent; inflorescence subtended by a ± fully developed foliage leaf and copious netted fibre and sheet-like tissue; spathe 17—20 cm long; spadix 10.5—18.5 x 1.7—2.3 cm; anthers not exerted at male anthesis. Papua New Guinea (Central & Morobe)
 **12. R. intonsa**
- 23b. Leaf lamina submembranous, drying bicolored, abaxially greenish brown, adaxially dark brown and densely faint dark speckled, base oblique, one side rounded to almost truncate, the other subacute; inflorescence subtended by a ± fully developed foliage leaf and one or more degrading papery cataphylls; spathe c. 22 cm long; spadix 17—19 x 1.5—2 cm, yellow green; anthers long-exserted at male anthesis. Papua New Guinea (East Sepik, Morobe & Bougainville)
 **4. R. cravenschoddeana**

- 24a. Spadix stipitate 25
- 24b. Spadix sessile 29

- 25a. Styler region conical 26
- 25b. Styler region truncate 28

- 26a. Spadix base with cochleate insertion; stigma glossy, black, at tip of long (c. 2 mm) slender stipe; anthers not exerted at male anthesis. Guam **10. R. guamensis**
- 26b. Spadix base tapering to almost truncate; stigma not as above; anthers exerted at male anthesis. Papua New Guinea (including Louisiade Archipelago), Australia (Queensland) 27

- 27a. Petiolar sheath soon drying and eventually falling more-or-less entire leaving a conspicuous scar; inflorescence solitary, subtended by a partially developed foliage leaf and a membranous cataphyll; spathe 6—8 cm long; spadix stipe c. 1 x 0.6 cm. Australia (Queensland) ...
 **22. R. petrieana**
- 27b. Petiolar sheath persistent through to leaf fall; inflorescence not solitary, subtended by a ± fully developed foliage leaf; spathe 11—

- 13 cm long; spadix stipe 2.5—3 x 3—0.4 cm. Papua New Guinea (including Louisiade Archipelago)..... **27. R. stenophylla**
- 28a. Petiolar sheath extending beyond the apical geniculum by two ligules adaxially and by fused extensions along the *abaxial* midrib for up to half the leaf lamina length; leaf lamina oblong-elliptic, up to 16.5 cm long, submembranous; spathe apex truncate and extending into a very long, slender beak up to $\frac{1}{3}$ length of entire spathe; spadix cigar-shaped; anthers not exerted at male anthesis. Indonesian Papua (Kepala Burung) **13. R. intrusa**
- 28b. Petiolar sheath extending beyond the apical geniculum only by two tiny ligules; leaf lamina, lanceolate to oblong-lanceolate, up to 34 cm long and usually exceeding 18 cm, thinly coriaceous; spathe apex stoutly short-beaked, beak not exceeding $\frac{1}{6}$ length of entire spathe; spadix cylindrical; anthers strongly exerted at male anthesis. Papua New Guinea (including Bismarck Archipelago), Solomon Islands ..
..... **24. R. schlechteri**
- 29a. Styler region conical. Primary lateral veins drying much paler than abaxial leaf lamina. Indonesian Papua (Kepala Burung & Mimika Prov.), Papua New Guinea (Muyua, New Britain) **3. R. conica**
- 29b. Styler region truncate. Primary lateral veins not as above 30
- 30a. Leaf lamina stiffly coriaceous, narrowly lanceolate; spathe 6—6.5 cm long; spadix cylindrical, 3.3—3.5 x c. 0.7 cm. Papua New Guinea (Eastern Highlands – Goroka; Southern Highlands – Mendi)
..... **9. R. gorokensis**
- 30b. Leaf lamina membranous to thinly coriaceous, variously shaped but not narrowly lanceolate, *or* if narrowly lanceolate then not stiffly coriaceous and inflorescences borne on the tips of long, slender, pendent stems; spathe 2.5—3 cm long; spadix ovoid-globose to ovoid-cylindric, 1—1.5 x 0.5—0.6 cm 31
- 31a. Inflorescences arising from long, pendent shoots 32
- 31b. Inflorescences arising from short, spreading shoots 33
- 32a. Leaf lamina narrowly lanceolate to lanceolate falcate, 4—19 x 1—3 cm, thinly coriaceous, weakly bicolored, adaxially dull mid-brown, abaxially paler brown with dense tannin cells; inflorescences borne at tips of very long, slender flowering stems (c. 2 mm diam. in dried material); spathe ovoid-ellipsoid, stoutly long-beaked, 2.5—3 x 0.7—0.9 cm; spadix ovoid-globose to ovoid-cylindric, 1—1.5 x 0.5—0.6

- cm. Indonesian Papua (Mimika Prov.), Papua New Guinea (Madang & Morobe Prov.)
 **17. *R. microspadix***
- 32b. Leaf lamina elliptic to oblong-elliptic, 20—29 x 8—13 cm, membranous, markedly bicolored, adaxially mid-brown, abaxially pale orange brown; inflorescences borne on short shoots arising from axils of leaves along long, pendent flowering stems c. 1 cm diam. in dried material; spathe elongate-cylindric, stoutly short-beaked, c. 10.2 x 1.7 cm; spadix slender cylindrical, 8 x 1.1 cm. Papua New Guinea (East Sepik Prov.) **28. *R. stolleana***
- 33a. Spathe cigar-shaped, 1—4.5 x 0.7—1.2 cm, caducous; spadix cylindrical, 1.5—2.5 x 0.5—0.8; anthers not exerted at male anthesis. Papua New Guinea (Bougainville & Manus), Solomon Islands
 **18. *R. mima***
- 33b. Spathe globose to ovoid-ellipsoid, 1—2 x 1—2.5 cm, marcescent; spadix globose to ellipsoid-cylindrical, 1—1.5 x 0.7—1 cm; anthers well-exserted at male anthesis. Mainland New Guinea.
 **19. *R. neoguineensis***

The Species

1. *Rhaphidophora australasica* F.M. Bailey

Rhaphidophora australasica F.M. Bailey, Queensland Agric. J. 1 (1897) 452 & Fl. Queensland 5 (1902) 1697; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 28; Williams, Native Pl. Queensland 1 (1979) 252, unnumbered plate; Jones & Gray, Climbing Pl. Australia (1988) 316, unnumbered plate p. 322; Hay, Telopea 5 (1993) 296—297. — Type: Australia, Queensland, Cairns, *Cowley s.n.* (BRI, holo; K, iso).

Rhaphidophora hollrungii Engl. in K. Schum. & Hollrung, Fl. Kais.-Wilh. Land (1889) 19; Engl. in Bot. Jahrb. Syst. 25 (1898) 9; K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 44, Fig. 18, **synon. nov.** — Type: Papua New Guinea ('Kaiser Wilhelmsland'), West Sepik Prov., Augusta River, Sept. 1897, *Hollrung 746* (B, lecto; selected here). Engler cited two syntypes, the other (Papua New Guinea ('Kaiser Wilhelmsland'), Morobe Prov., Sattelberg, July 1890, *Lauterbach 588*) is missing from Berlin and presumed destroyed.

Rhaphidophora iboensis K. Krause, Bot. Jahrb. Syst. 49 (1912) 93, **synon. nov.** — Type: Papua New Guinea ('Kaiser Wilhelmsland'), Madang Prov., Ibo Range, 17 Dec. 1908, *Schlechter 18985* (B, holo).

Figure 1

Moderately robust, pachycaul, homeophyllous liane to 15 m; *seedling stage* not observed; *pre-adult plants* forming sparse terrestrial colonies; *adult shoot architecture* comprised of clinging, physiognomically unbranched, densely leafy flowering stems; *stems* smooth, later with lustrous papery epidermis, cataphylls and prophylls soon degrading into long, untidy fibres, internodes 1—5 x 0.5—1 cm, separated by prominent slightly oblique corky leaf scars; *flagellate foraging stem* absent; *clasping roots* densely arising from the nodes and internodes, minutely pubescent; *feeding roots* not observed; *leaves* spiro-distichous; *cataphylls* and *prophylls* chartaceous but soon degrading into long fibres; *petiole* deeply grooved, 9—22 x 0.25—0.3 cm, smooth, apical and basal geniculum prominent and drying slightly darker; *petiolar sheath* extending to apical geniculum, short-persistent, at first, chartaceous, soon degrading to fibres; *lamina* entire, lanceolate to elongate-lanceolate or elongate-oblongate, slightly falcate, 19—46 x 2.5—9.5 cm, subcoriaceous, base rounded to subacute, apex acute to acuminate; *midrib* raised abaxially, ± sunken adaxially; *primary venation* pinnate, slightly raised abaxially, much less-so adaxially; *interprimaries* sub-parallel to primaries, and almost indistinguishable from primary lateral veins; *secondary venation* reticulate, slightly to barely visible; *inflorescence* solitary, subtended by an incompletely developed leaf and much fibrous cataphyll remains; *peduncle* slightly robust, terete, 3.5—9.5 x 0.2—0.35 cm; *spathe* slender canoe-shaped, long beaked, 5—9.5 x 2—2.5 cm, stiff-fleshy, cream, caducous leaving a prominent scar; *spadix* cylindrical, sessile, inserted slightly obliquely on peduncle, 3.75—8 x 1—2 cm, cream; *stylar region* long-conical, weakly hexagonal in top view, drying longitudinally ribbed, 1.1—1.2 x 1—1.1 mm; *stigma* punctiform, minutely excavated, 0.1—0.2 x c. 0.3 mm; *anthers* exerted at male anthesis; *infructescence* oblong-cylindrical, 8—9 x 1.5—2 cm.

Distribution: New Guinea (widespread but scattered; often abundant where it occurs), Australia (eastern tropical Queensland).

Habitat: Rain forest. Sea level to 760 m altitude.

Other specimens seen: INDONESIA PAPUA. Jayapura Prov.: Cyclop Mts, above Ifaar ('Ifar'), *McKee 1877* (L). PAPUA NEW GUINEA. Morobe Prov.: Lae, *White et al. NGF 1555* (L). AUSTRALIA. Queensland: Cook District, Mossman, entrance to Mossman Gorge,



Figure 1. *Rhapsidophora australasica* F.M. Bailey

A. flowering shoot x 1/2; B. leaf lamina x 1/3; C. venation detail x 4; D. inflorescence, spathe fallen x 1/2; E. spadix detail, post-male anthesis x 8; F. stylar region and stigma, side view x 8. A-C from McKee 1877; D-F from Hollrung 746.

Blake 19756 (K); c. 20 miles NNW of Daintree, *Boylard 399* (K); Along road from Atherton to Main Coastal Highway, along Palmerston Highway, Henrietta Falls, *Croat 52614* (MO); Wright Creek, Lake Eacham State Park, 20 km E of Atherton, *Croat 52575* (K, MO); S.F.R. 756, East Downey L.A., *Hyland 5608* (K, L); Wright Creek, c. 10 miles E of Atherton, *Melville 3693* (K, L, US); Lacey's Creek, Mission Beach area, *Smith 10189* (K).

Notes. 1. Almost all New Guinea specimens previously identified as *R. australasica* (incl. *R. hollrungii*) belong to either *R. spathacea* or to one of several new species described elsewhere in this paper. The combination of solitary inflorescences arising on clinging shoots, fibrous cataphyll remains and conical style is diagnostic for *R. australasica*.

2. The two widely separated New Guinea localities suggest a species that is widespread but uncommon in New Guinea.

2. *Rhaphidophora brevispathacea* Engl. & K. Krause

Rhaphidophora brevispathacea Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 79; K. Krause & Alderw., Nova Guinea 14 (1924) 212. — Type: Indonesian Papua, Mimika/Digul Prov. boundary, Lorentz River, near Kloofbivak, 31 Oct. 1912, *Pulle 254* (B, holo; BO, K, L, iso).

Figure 2

Moderate, somewhat slender, leptocaul, homeophyllous (?) liane of unknown ultimate height; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* not completely known, but observed to be comprised of greatly elongated, spreading to strongly pendent, physiognomically unbranched, leafy, non-flowering stems giving rise to extremely short, free, sympodial, (foliage) leafless, flowering stems; *stems* smooth, climbing stems not observed, free stems weakly rectangular to \pm terete in cross-section, dull yellow brown, internodes to 5 x 0.7 cm, flowering shoots extremely abbreviated, arising from axils of leaves and, where stems pendent then twisting to present inflorescences upwards, stems all but obscured by netted petiolar sheath and cataphyll fibre; *flagellate foraging stems* not observed; *clasp ing roots* arising singly from the nodes and internodes, slightly pubescent, later glabrescent; *feeding roots* not observed; *leaves* weakly spiralled, scattered; *cataphylls* and *prophylls* membranous, very quickly degrading leaving semi-persistent netted remains; *petiole* grooved adaxially, 7–9.5 x 0.2–0.3 cm, smooth, with a weakly defined apical and slightly prominent basal geniculum; *petiolar sheath* slightly prominent, extending beyond the apical geniculum by two ligules, caducous leaving a slight continuous scar from the petiole base, around the top of the apical

geniculum and back to the base; *lamina* entire, elliptic to elliptic- or lanceolate-elliptic, 6.2—20 x 2.5—8.75 cm, coriaceous, upper surfaces very slightly glossy, drying strongly bicolorous, adaxially dark brown, abaxially bright orange-brown with copious, minute tannin cells, base subovate, very briefly decurrent, apex acute to briefly acuminate, with a minute apiculate tubule; *midrib* slightly raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised abaxially, prominent (darker veins against pale lamina) in dried material; *interprimaries* parallel to, but much less distinctive than, primaries, very slightly raised abaxially; *secondary* and *tertiary venation* ± invisible in dried specimens, very weakly reticulate; *inflorescence* solitary, subtended by several reduced leaves (lamina absent) with rapidly degrading petiolar sheaths and netted cataphylls, the whole obscuring the peduncle; *peduncle* terete, 3—4 x 0.25—0.3 cm; *spathe* ovoid-cylindric, stoutly very short-beaked, 3—4 x 2—2.3 cm, thinly coriaceous, marcescent to fruiting, then abscising basally and pushed off by developing fruits, leaving a slight scar; *spadix* slender cylindrical, stipitate, inserted more or less level on stipe, 2.9—3.4 x 1.7—1.9 cm; *stipe* slender terete, c. 3 x 1.5 mm; *stylar region* rhombohexagonal, 1.7—2.1 x c. 2 mm, depressed centrally; *stigma* punctiform, c. 0.4 mm diam., prominent in dried material; *anthers* exerted at male anthesis; *infructescence* not observed.

Distribution: Indonesian Papua (Mimika/Digul Prov. boundary). Known only from the type.

Habitat: Not recorded. 100 m altitude.

Note: Distinctive by the long pendent stems with much abbreviated, netting-sheathed flowering shoots and a small, marcescent spathe. *Rhaphidophora stolleana* shares the habit of long pendent stems with abbreviated or inflorescence-bearing shoots arising in the leaf axils, but is readily distinguished by a much longer spathe (c. 10.2 cm long) and spadix (c. 8 cm long). To date *R. brevispathacea* is known only from Mimika/Digul Prov. and *R. stolleana* only from East Sepik. In the small, marcescent spathe, *R. brevispathacea* resembles *R. neoguineensis*, although the latter has a quite different growth habit and inflorescence presentation.

3. *Rhaphidophora conica* Engl.

Rhaphidophora conica Engl., Bot. Jahrb. Syst. 1 (1881) 181. — Type: Indonesian Papua, Kepala Burung Prov., Ramoi, Feb. 1875, *Beccari PP 409* (FI, holo).



L. GURR.

Figure 2. *Rhaphidophora brevispathacea* Engl. & K. Krause

A. adult shoot with flowering branches x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 2; D. inflorescence, spathe fallen x $1\frac{1}{2}$; E. spadix detail, post-male anthesis x 8; F. stylar region and stigma, side view x 8. All from *Pulle 254*.

Rhaphidophora pallidivenia Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 339, **synon. nov.** — Type: Indonesian Papua, Mimika Province, Varen (Lorentz) River, 15 June 1907, *Djibda s.n.*, ex cult. Bogor B.G. Y.40, April 1921, *Alderwerelt s.n.* (BO, holo).

Figure 3

Moderately robust, semi-leptocaul, homeophyllous (?) liane to 5 m; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and elongated, free, leafy, flowering stems; *stems* smooth, flexuous, stems \pm terete in cross-section, without prophyll, cataphyll fibre, internodes 5–10 x 0.5–1 cm, separated by weak straight leaf scars, older stems woody; *flagellate foraging stems* not observed; *clasp ing roots* arising singly from nodes; *feeding roots* solitary from nodes; *leaves* weakly spiro-distichous, moderately densely arranged; *cataphylls* and *prophylls* membranous, caducous; *petiole* grooved adaxially, 7–30 x 0.6–1 cm, smooth, with a prominent apical and basal geniculum; *petiolar sheath* prominent, extending to base or top of apical geniculum, soon drying chartaceous, then degrading very slightly to weak fibres before falling leaving a feeble scar; *lamina* entire, elliptic to elliptic-lanceolate, 10–40 x 5–12 cm, thinly coriaceous, base cuneate to acute, apex acute-acuminate, with a minute tubule; *midrib* raised abaxially, slightly sunken adaxially, drying conspicuously lighter than surrounding lamina; *primary venation* pinnate, slightly raised on both surfaces in dried material, drying lighter; *interprimaries* sub-parallel to primaries and only slightly less conspicuous; *secondary venation* reticulate, fine but conspicuous; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* slightly compressed-terete, 2.5–10 x 0.2–0.35 cm; *spathe* broadly cone-shaped to ellipsoid, truncate basally at insertion on petiole, apex briefly to rather long-beaked, 5–12 x 2–4 cm, thinly fleshy, greenish yellow, caducous, drying pale brown, falling leaving a thin scar; *spadix* cylindrical, sessile, inserted level on peduncle, 2–7 x 0.7–1.2 cm, obtuse, white to yellow; *stylar region* rounded-rhombohexagonal, 0.9–1.1 x 0.9–1.1 mm, slightly blunt-conical; *stigma* punctiform, c. 0.3 mm diam., rather prominent in dried material; *anthers* slightly exerted at male anthesis; *infructescence* not observed.

Distribution: Indonesian Papua (Kepala Burung and Mimika Prov.), Papua New Guinea (Muyua, New Britain).

Habitat: Rain forests, sometimes on coralline limestone. No altitudes recorded.

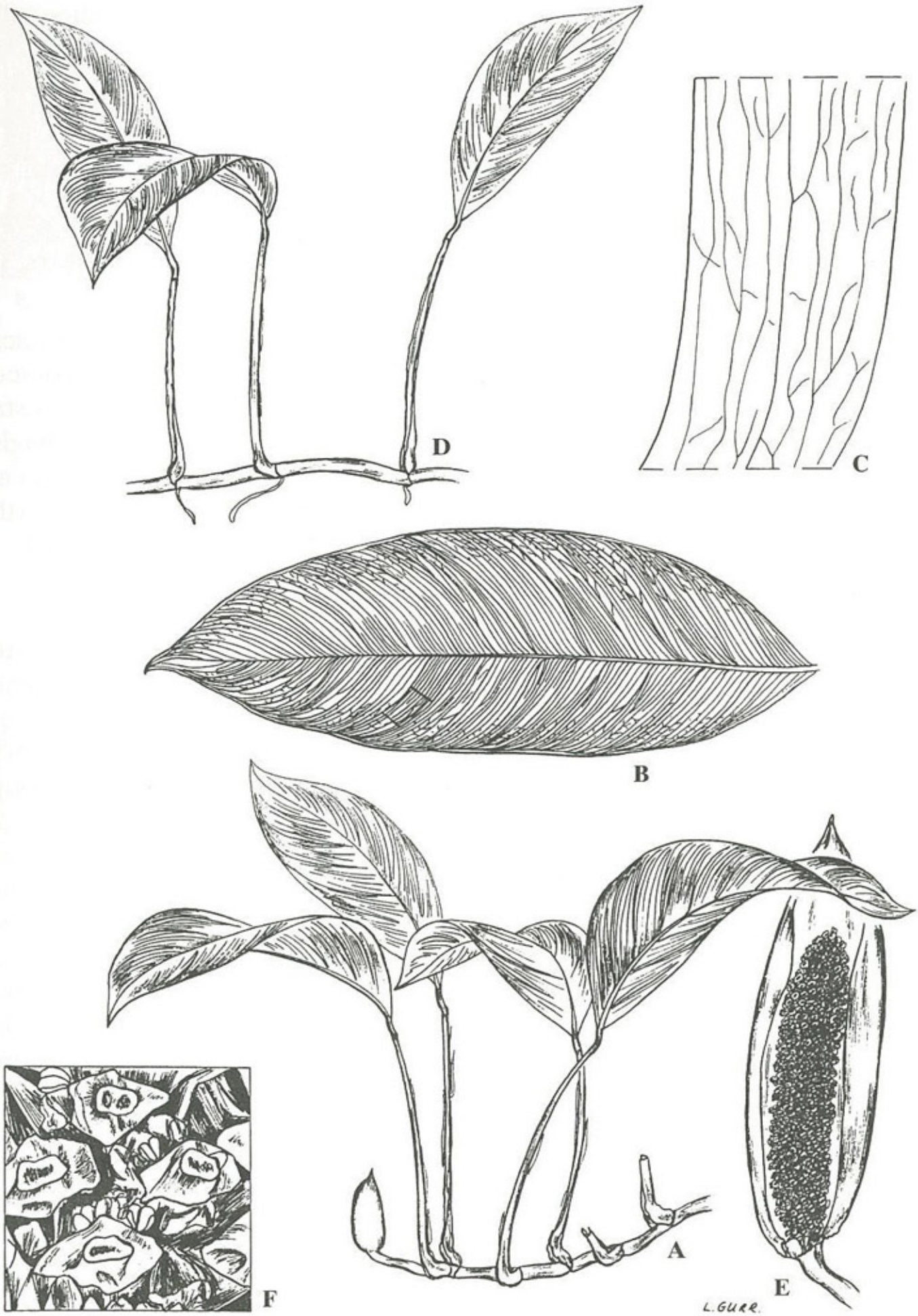


Figure 3. Rhaphidophora conica Engl.

A. flowering shoot x $\frac{1}{6}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 3; D. portion of creeping adult stem x $\frac{1}{6}$; E. inflorescence x $\frac{2}{3}$; F. spadix detail, pre-anthesis x 8. All from *Furtado s.n.*

Notes: 1. *Brass* 28608, while much smaller than the other collections, is morphologically identical.

Other specimens seen: INDONESIA PAPUA. Mimika Prov.: Varen (Lorentz) River, Cult. Bogor, Y40, *Furtado s.n.* (SING), *Nicolson* 926 (US). PAPUA NEW GUINEA. Woodlark (Muyua) Island: Kulumadu, *Brass* 28608 (GH, L); West New Britain Prov.: 2 miles northeast of Kandrian, *Nicolson* 1552 (K, L, US).

4. *Rhaphidophora cravenschoddeana* P.C. Boyce, *sp. nov.*

Rhaphidophora cravenschoddeana facile cum *R. intonsa* confunditur (species etiam cum inflorescentiis grandibus et apicibus surculorum fibrosis) sed fibris simplicibus neque reticulatis, lamina foliae textu tenuiore, costa abaxialiter prominenti, venis lateralibus primariis eis interprimariis magis diversis, antheris longe exsertis seorsa. — TYPUS: Papua New Guinea, North Solomons Prov., Bougainville, near Koniguru No.1, c. 11 miles north of Buin, 18 July 1963, *Craven & Schodde* 14 (CANB, holo; GH, K, iso).

Figure 4

Large, robust, pachycaul (?), homeophyllous liane to unknown ultimate height; *seedling stage* not observed; *pre-adult plants* consisting of sparse terrestrial colonies; *adult shoot* comprised of elongated, clinging, physiognomically unbranched, non-flowering stems and free lateral, leafy flowering stems; *stems* with cataphylls and prophylls degrading to long sparse ragged fibres and weak sheets of tissue, internodes 0.5—3 x 0.5—2 cm, separated by prominent to very large unevenly oblique corky leaf scars; *flagellate foraging stem* and *claspings roots* not observed; *feeding roots* stout, arising singly from the node, densely velvety-hairy; *leaves* spirodistichous; *cataphylls* and *prophylls* quickly degrading to long sparse ragged fibres and weak sheets of tissue; *petiole* canaliculate, 6—46.5 x 1.3—1.5 cm, apical geniculum very large, prominent, basal geniculum very weakly defined; *petiolar sheath* very prominent, extending to apical geniculum, swiftly degrading to long ragged fibres and weak sheets of tissue, later falling leaving a jagged scar; *lamina* entire, ovate to oblong-elliptic or oblong-ovate, strongly oblique, 8—53 x 6—26 cm, submembranous, drying discolourous, adaxially dark brown, densely faint dark speckled, abaxially greenish brown, base oblique, one side rounded to almost truncate, other subacute, apex subacute to acuminate or briefly attenuate; *midrib* very prominently raised abaxially, slightly sunken adaxially; *primary venation* pinnate, prominently raised abaxially, very slightly raised adaxially, drying paler than lamina; *interprimaries* parallel to primaries, much less prominent, slightly raised abaxially, very slightly raised adaxially; *secondary venation*

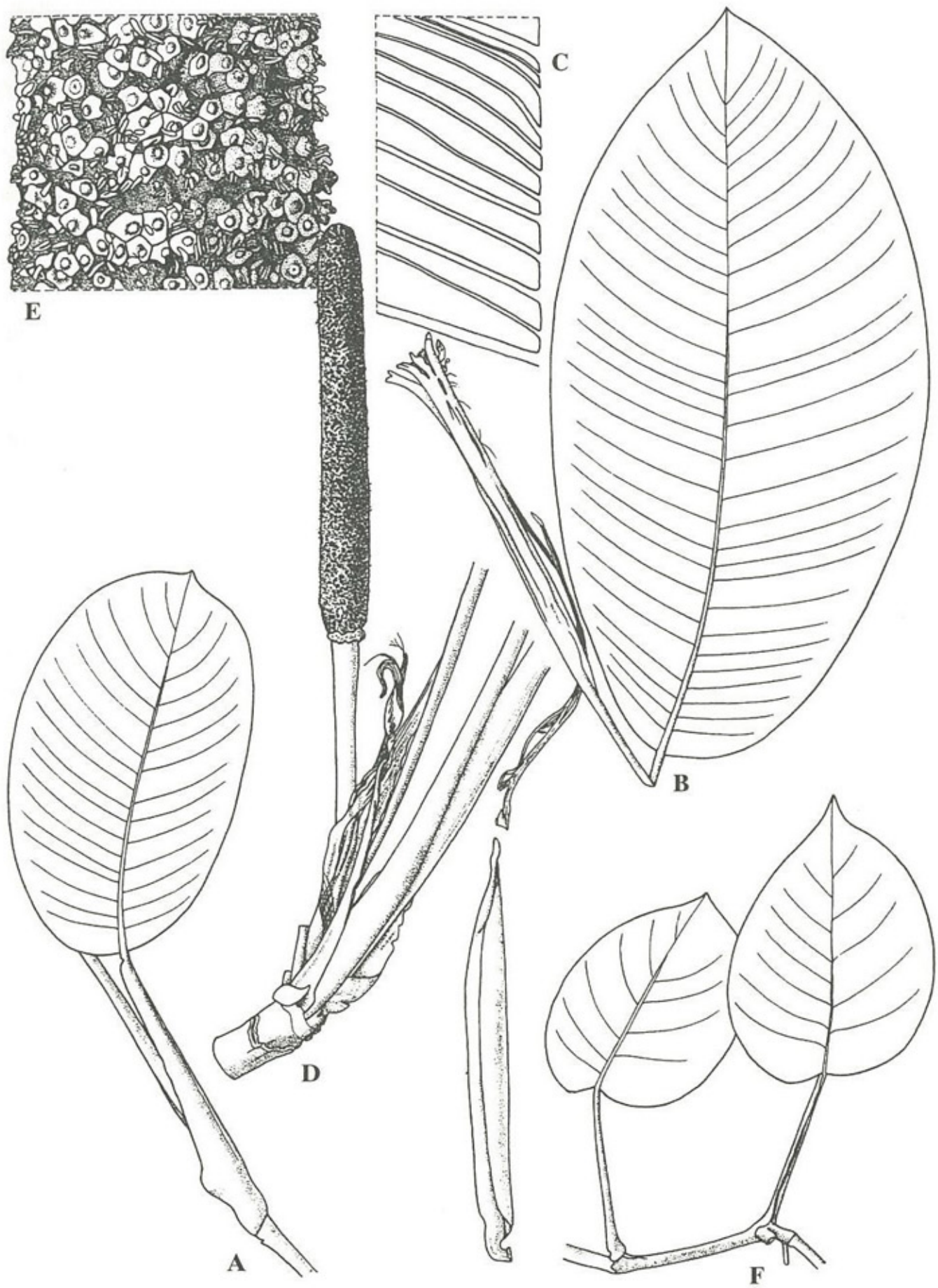


Figure 4. *Rhaphidophora cravenschoddeana* P.C. Boyce

A. part of flowering shoot x $\frac{1}{2}$; B. leaf lamina x $\frac{1}{5}$; C. venation detail x 2; D. entire inflorescence x $\frac{1}{4}$; E. spathe detail, post-male anthesis x $2\frac{1}{2}$; F. portion of creeping juvenile stem x $\frac{2}{5}$; G. portion of pre-adult stem x $\frac{1}{4}$; A-E from Craven & Schodde 14, F & G from Croat 52760.

parallel to interprimaries and only slightly less prominent, very slightly raised abaxially and adaxially; *tertiary venation* reticulate, weakly raised abaxially, invisible abaxially; *inflorescence* solitary, subtended by a \pm fully developed foliage leaf and one or more degrading papery cataphylls; *peduncle* laterally compressed, stout, 13–15 x 0.7–1 cm; *spathe* slender canoe-shaped, 22 x 4 cm, stoutly long-beaked, caducous before male anthesis, falling leaving a large scar; *spadix* stoutly cylindrical, sessile, inserted more or less level on peduncle, 17–19 x 1.5–2 cm, yellow green; *stylar region* hexagonal, 1.5–2 x 1.2–1.5 mm, truncate; *stigma* punctiform to slightly ellipsoid, very slightly raised, 0.4 x 0.4–0.5 mm diam.; *anthers* long-exserted at male anthesis; *infructescence* not observed.

Distribution: Papua New Guinea (East Sepik and Morobe Prov.), Bougainville.

Habitat: Primary and secondary riverine rain forest. 100–1000 m altitude.

Notes: 1. Easily confused with *Rhaphidophora intonsa* (also with large inflorescences and fibrous shoot tips) but separated by the simple, not netted, fibres, thinner-textured leaf lamina with, on the abaxial surface, a conspicuously raised midrib and much more pronounced differentiation between the primary lateral and interprimary veins, and by the long-exserted anthers.

2. The specific epithet is for the collectors of the type, Lyndley Craven and Richard Schodde now at CANB, who made many collections in Papua New Guinea.

Other specimens seen: PAPUA NEW GUINEA. East Sepik Prov.: Vicinity of Wewak, along trail beyond Boys Town (Reform School operated by S.V.D. Missionaries), *Croat* 52760 (MO), *Croat* 52763A (MO); Angoram, Upper Karawari River, *Domstreich* 77 (L); Morobe Prov.: Sattelberg, *Clemens* 8064 (B), 2066 (B); Along road to Sankewap, 1 km in from Sankewap River, beginning 2.7 km south of Lutheran School, *Croat* 52818 (MO); Along Busu River, 22.6 km by road SE of Lae via road past PNG University of Technology and Igam road past Army Base, beginning 3.8 km from asphalt road at Army Base, *Croat* 52842 (MO); North Solomons Prov.: Bougainville: Maide River gorge, lower south slopes of Lake Lolow crater, c. 15 miles north of Buin, *Craven & Schodde* 286 (CANB, GH); Near Barilo village, c. 6 miles north of Buin, *Craven & Schodde* 375 (CANB, GH, K).

5. *Rhaphidophora cryptantha* P.C. Boyce & C.M. Allen, *sp. nov.*

Architectura surculi *R. cryptanthae* eam *R. hayi* ob inflorescentias in apicibus surculorum abbreviatorum facile depulsorum ex axillis surculorum scindulantium exorientium feruntur arctissime revocat. *R. cryptantha* inflorescentias post folia ferenti, forma atque colore folii laminae, spatha minore marcescenti, spadice ellipsoidali atque stylo stigmatico longo nihilominus differt. Inflorescentiis in surculis post folia appressa scindulantia vectis orientibus ac aperientibus *R. cryptantha* distincta est ab omnibus speciebus ceteris neotenicis (*R. hayi*, *R. pachyphylla* et *R. parviflora*) in quibus inflorescentiae in surculis a foliis porrectis portatae sunt, atque in genere unica est. — TYPUS: Cultivated Fairchild Tropical Garden (acc. no. 74407), ex Papua New Guinea, Botanic Garden, Lae, 24 Sept. 2000, *Boyce 1447* (FTG, holo; K, M, MO, SING, iso).

Figures 5 & 6

Moderate-sized, slender to somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 3 m; *seedling stage* unknown; *pre-adult plants* shingling, hardly or not forming terrestrial colonies; *adult shoot* architecture comprised of clinging, physiognomically unbranched, densely leafy, sterile stems and very abbreviated, free, flowering stems arising from the axils and remaining concealed behind the leaves of the main stem; *stems* rectangular in cross-section, widest side slightly convex, smooth, dark green, without prophyll and cataphyll fibre but with newest parts very thin, adherent, petiolar sheath tissue, internodes 1–5 x 0.2–0.5 cm, separated by \pm straight scars; *flagellate foraging stems* rather weakly developed, usually at least partially leafy; *clasp ing roots* arising from the internodes, prominently pubescent, spreading but usually not extending much beyond the leaf span; *feeding roots* not observed (absent?); *leaves* distichous, shingling and ascending on adherent shoots, densely arranged and slightly spreading on free shoots, on flagella shoots leaves scattered with internodes between carrying a prominent cataphyll of short duration; *cataphylls* and *prophylls* membranous, caducous; *petiole* very shallowly grooved, 0.75–1.5 x 0.3–0.4 cm, smooth, apical and basal genicula barely visible; *petiolar sheath* prominent, membranous, long-ligulate, margins of ligule fused, the ligule extending up to 3.5 cm above base of lamina and enclosing shoot apex, caducous but adhering to stem; *lamina* broadly ovate, coriaceous, base cordate, apex rounded with a tiny tubule; *midrib* barely visible abaxially and adaxially; *primary venation* reticulate, barely visible abaxially, slightly raised and silver-grey adaxially; *interprimaries* more-or-less absent; *secondary venation* reticulate, flush abaxially, very weakly raised adaxially, silver-grey; *inflorescence* sequentially produced from a shoot arising from



Figure 5. *Rhapsiphora cryptantha* P.C. Boyce & C. Allen

A. abaxial view of adult stem with two flowering branches, $\times \frac{2}{3}$; B. entire flowering branch with inflorescence, spathe cut away to show spadix $\times 2$. All from *Boyce 1447*.



Figure 6. *Rhaphidophora cryptantha* P.C. Boyce & C. Allen

A. adaxial view of adult stem, $\times \frac{2}{3}$; B. adaxial view of juvenile stem, $\times \frac{2}{3}$; C. flagellate stem $\times \frac{2}{3}$.
All from *Boyce 1447*.

behind the leaf, each subtended by a very small membranous, caducous prophyll and one or more very reduced leaves; *peduncle* terete, 0.75—1 x 0.2—0.3 cm; *spathe* ellipsoid, weakly beaked, 3.5—4 x 1.2—1.5 cm, spongy-fleshy, yellow, inflated and gaping at female anthesis and then closing and drying onto developing infructescence; *spadix* ellipsoid, stipitate, inserted \pm level on stipe, 2.1—2.2 x 0.7—0.8 cm, creamy white; *stipe* 5—6 x 2—2 mm, white; *stylar* region irregularly rhombohexagonal, 2—2.2 x 2.1—2.3 mm, weakly conical; *stigma* very prominently raised on a c. 1 mm stipe, punctiform to globose, c. 0.5 mm diam.; *anthers* exerted at male anthesis; *infructescence* not seen.

Distribution: Not known with certainty. The specimen used to make the type was introduced into cultivation from Lae Botanic Garden and it seems quite possible that it originated in Papua New Guinea. The plant in cultivation at Kew was received from Ted Green, also ex Papua New Guinea.

Habitat: Unknown. In cultivation the plant is very intolerant of cool conditions, suggesting that it originates from low elevations.

Notes: 1. A species of extraordinary appearance, both in flowering in a neotenic state (otherwise known from *R. hayi*, *R. parvifolia* (Maluku) and *R. pachyphylla*) and especially by the inflorescences arising and opening on shoots carried *behind* the appressed shingling leaves. Often the mature inflorescences are completely obscured by the leaves, although occasionally the tip of the spathe is visible. In this flowering mode *R. cryptantha* is distinct from the neotenic species listed above (in which the inflorescences are carried on shoots held clear of the leaves), and unique in the genus.

The shoot architecture of *R. cryptantha* most closely recalls that of *R. hayi* in that the inflorescences are borne on the tips of easily dislodged abbreviated shoots arising from the axils of shingling shoots. However, *R. cryptantha* differs in bearing the inflorescences behind the foliage, in the shape and coloration of the leaf lamina, the smaller, marcescent spathe, ellipsoid spadix and long style.

2. In cultivation *R. cryptantha* has been confused with *Monstera dubia*, a species with a similar shingling juvenile stage and variegated leaves. The two are readily separable by the orientation of the leaves, those of *R. cryptantha* are ascending, those of *M. dubia* descending. Dissection of the ovary of *R. cryptantha* reveals two intrusive parietal placentae and numerous ovules, assigning it to *Rhaphidophora*.

3. Despite the as yet unconfirmed origin of this plant, we have no hesitation in publishing it as a new species as it is of such distinctive appearance.

4. The specific epithet alludes to the inflorescences that open hidden or barely emerging from behind the shingling, substrate-clasping leaves.

Other specimens seen: CULTIVATED. Ex Papua New Guinea, Cult. Kew acc. no. 1983-4495, *Green s.n.* (K).

6. *Rhaphidophora discolor* Engl. & K. Krause

Rhaphidophora discolor Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 80. — Type: Papua New Guinea, East Sepik Prov., April River, 7 Sept. 1912, *Ledermann 8569* (B & B spirit, holo).

Rhaphidophora oreophila Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 80, **synon. nov.** — Type: Papua New Guinea, Morobe Prov., Erap (Erappenberg), 31 Oct. 1912, *Ledermann 9590* (B & B spirit, holo).

Figure 7

Medium-sized, robust, pachycaul, homeophyllous (?) liane to 25 m; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* not fully observed but apparently comprised of elongated, clinging, physiognomically unbranched, non-flowering stems and free, sympodial, leafy flowering stems; *stems* smooth, cataphylls and prophylls caducous, internodes 1—3 x 0.5—1 cm, separated by wide but not especially prominent slightly oblique corky leaf scars; *flagellate foraging stem*, *clasping roots* and *feeding roots* not observed; *leaves* distichous to very weakly spiro-distichous; *cataphylls* and *prophylls* caducous; *petiole* deeply canaliculate, 17—37 x 0.4—1 cm, apical geniculum prominent, basal geniculum large but weakly defined; *petiolar sheath* prominent, extending to apical geniculum, slowly degrading to chartaceous strips and a very few simple fibres, then falling leaving a pale scar; *lamina* entire, ovate to oblong-lanceolate or oblong-elliptic or oblanceolate, slightly oblique, 18—47 x 9—16 cm, coriaceous, base rounded to oblique and very weakly cordate on one side and slightly decurrent on the other, apex acute to briefly acuminate, drying adaxially dull olive-green and abaxially dark brown in the one known collection; *midrib* prominently raised abaxially, sunken adaxially; *primary venation* pinnate, raised abaxially and adaxially; *interprimaries* sub-parallel to primaries, only slightly less prominent, slightly raised abaxially and adaxially; *secondary venation* reticulate, slightly raised abaxially and adaxially in dry specimens;

inflorescence solitary, subtended by a fully developed foliage leaf; *peduncle* stout, terete, 9—10 x 1.7—2 cm; *spathe* canoe-shaped, stoutly acuminate, 20—23 x 2.5—2.5 cm, stiffly very fleshy, marcescent, eventually falling leaving a very large (c. 1.5 cm wide) scar; *spadix* cylindrical to slightly cigar-shaped, slightly curved, long-stipitate, inserted more or less level on stipe, 13.5—19 x 2.2—4 cm; *stipe* slender-terete, 1.5—3 x 0.4—1.5 cm; *stylar region* rhombohexagonal, 1.75—2.5 x 1.5—3 mm, truncate with a raised rim; *stigma* punctiform, flat, c. 0.4 mm diam.; *anthers* not exerted at male anthesis; *infructescence* cylindrical, c. 17 x 2 cm (known from fragments).

Distribution: Indonesian Papua (Yapen), Papua New Guinea (East and West Sepik, Milne Bay and Morobe Provinces).

Habitat: Lowland swamp forest to upper hill *Araucaria* forest. 20–900 m altitude.

Notes: 1. A remarkable and readily identifiable species with a large, very long-stipitate spadix. Confusion with *Rhaphidophora stenophylla* (also flowering on free shoots and with long-stipitate spadix) is possible, although the latter is readily identifiable by the much narrower leaf laminae, persistent petiolar sheath not degrading to strips and fibre, smaller (6—9 x 1.5—2.2 cm) spadix and long, pointed style

2. While *Nicolson 1475* seems clearly to belong here on morphology, it occurs in very different habitat (upper hill *Araucaria* forest) from that of the type (lowland swamp).

3. *Rhaphidophora oreophila* Engl. & K. Krause is a smaller manifestation of this species.

Other specimens seen: INDONESIA PAPUA. Pulau Yapen, Kamuda, near Serui, *Aet & Idjan s.n.* (L). PAPUA NEW GUINEA. West Sepik Prov.: Telefomin, Sandaun, Hak Valley, contour transect on south bank of Nenem river, opposite community school, *Frodin & Morren 3209* (K); East Sepik Prov.: Angoram, Latoma village, Wogupmeri river, *Leach NGF 34337* (L); Morobe Prov.: *Araucaria* forest plantation 2 miles west of Wau, *Nicolson 1475* (B, L, K, US); Milne Bay Prov.: Raba Raba, Mayu River, near Mayu Island, *Streimann NGF 28712* (L, US).

7. *Rhaphidophora fortis* P.C. Boyce, *sp. nov.*

Rhaphidophora fortis in Nova Guinea singularis est characteribus sequentibus concatenatis: folia breviter petiolata, surculi florentes

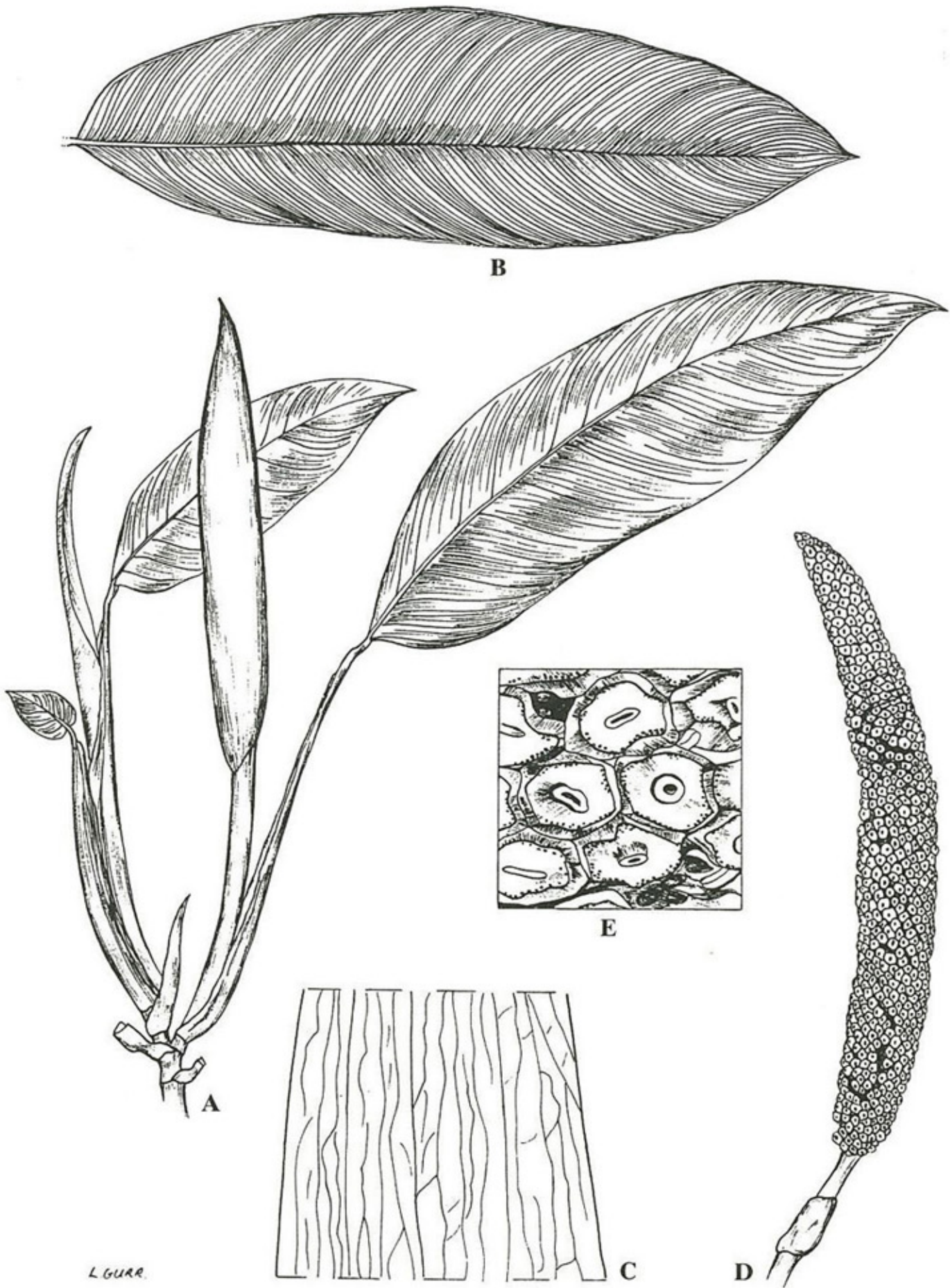


Figure 7. *Rhaphidophora discolor* Engl. & K. Krause

A. flowering shoot x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 4; D. inflorescence, early stages of fruiting, spathe fallen x $\frac{4}{5}$; E. lower spadix detail, early fruiting x 6; F. upper spadix detail, early fruiting x 3. All from *Streimann & Kairo NGF 39190*.

adhaerentes valde robusti, inflorescentiae ex axillis foliorum enascentes ut videtur. — TYPUS: Papua New Guinea, West Sepik Prov., Vanimo SubProv., Ossima, 27 Jan. 1969, *Streimann & Kairo NGF 39190* (K, holo; L, LAE, CANB, US, iso).

Figure 8

Robust, pachycaul (?), homeophyllous (?) liane to unknown ultimate height; *seedling stage* and *pre-adult plants* not observed; *adult shoot* architecture not fully observed but apparently comprised of elongated, clinging, physiognomically unbranched, flowering stems; *stems* with epidermis drying smooth and yellowish, with cataphylls and prophylls degrading to weak netted fibres and sheets of chartaceous tissue at the stem tips, internodes 1—2.5 x 1.5—2 cm, separated by weakly defined leaf scars; *flagellate foraging stem* and *feeding roots* not observed; *clasp ing roots* arising from nodes and internodes, smooth with dark chartaceous epidermis; *leaves* distichous; *cataphylls* and *prophylls* very conspicuous, extending almost to apical geniculum of newly emerging leaves, quickly degrading to netted fibres and strips of chartaceous tissue; *petiole* stout, broadly and shallowly canaliculate, 14—16 x 0.8—1 cm, apical geniculum prominent, basal geniculum weakly defined and obscured by cataphyll remains; *petiolar sheath* very prominent, extending to apical geniculum, but very swiftly degrading to netted fibres, later falling leaving a smooth, scar; *lamina* entire, elliptic to oblong-elliptic or lanceolate elliptic, slightly to markedly oblique, 24—31 x 8—12 cm, subcoriaceous, base rounded to subacute, apex acute to briefly acuminate, falcate; *midrib* raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries, less prominent, slightly raised abaxially and adaxially; *secondary venation* tessellate-reticulate, slightly raised abaxially and adaxially in dry specimens; *inflorescences* not known but apparently arising two or more sequentially between foliage leaves, subtended by netted fibre and copious sheet-like tissue; *infructscences* with *peduncle* laterally compressed, c. 5 x 0.6 cm, more or less obscured by cataphyll remains; *spathe* not observed; *spadix* massively ovoid-cylindrical, sessile, inserted more or less level on peduncle, 8—9 x c. 3 cm; *stylar region* rounded-rhombohedral, c. 2.3 x 2.7, truncate; *stigma* punctiform, slightly raised, c. 0.6 mm diam.; *anthers* not observed.

Distribution: Papua New Guinea (West Sepik Prov.). Known only from the type.

Habitat: Lowland forest. 25 m altitude.

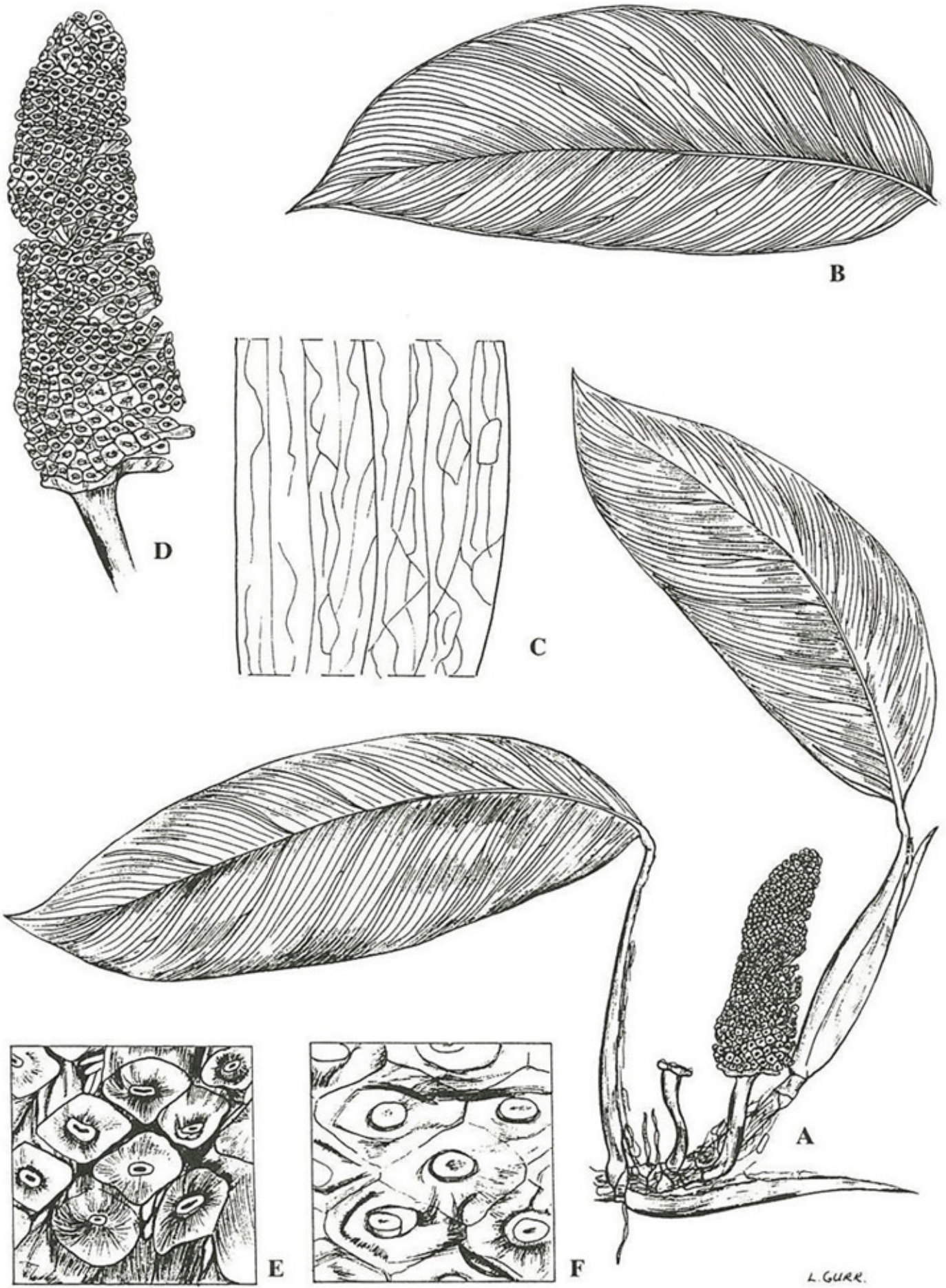


Figure 8. Rhaphidophora fortis P.C. Boyce

A. flowering shoot x $\frac{1}{4}$; B. leaf lamina x $\frac{1}{4}$; C. venation detail x 3; D. inflorescence, spathe fallen x $\frac{1}{2}$; E. spadix detail, post-male anthesis x 4. F. spadix detail, early fruiting x 4. All from Nicolson 1475.

Notes: 1. An extraordinary species with extremely stout, clinging flowering shoots and short-petioled leaves, the whole shoot resembling a plant of Bornean *Scindapsus beccarii* Engl.. Inflorescences are borne in the leaf axils. It is not clear from the material available whether the inflorescence terminates the main axis which then reiterates, displacing the inflorescence, or whether the inflorescence is borne on a much abbreviated shoot arising from the axil.

2. The specific epithet comes from the Latin, *fortis*, strong or stout, in allusion to the plant's relatively massive form.

8. *Rhaphidophora geniculata* Engl.

Rhaphidophora geniculata Engl., Bot. Jahrb. Syst. 25 (1898) 7; K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 25, Fig. 7; Engl. & K. Krause, Nova Guinea 8 (1910) 249. — Type: Papua New Guinea, Madang Prov. (?), Bismarck Range, 9 Sept. 1896, *Lauterbach* 827 (B, neo; designated here). In describing *R. geniculata*, Engler cited three syntypes [Papua New Guinea ('Kaiser Wilhelmsland'), Morobe Prov., Sattelberg, July 1890, *Lauterbach* 616a (B†); Papua New Guinea ('Kaiser Wilhelmsland'), Madang Prov., Gogol river, Nov. 1890, *Lauterbach* 976 (B†) & 1058a (B†)]. The specimen chosen here as the neotype was determined as *R. geniculata* by Engler and matches the protologue well.

Rhaphidophora wentii Engl. & K. Krause, Nova Guinea 8 (1910) 248 & Nova Guinea 8 (1912) 805, **synon. nov.** — Type: Indonesian Papua, Noordfluss, 2 June 1907, *Versteeg* 1191 (B, holo; BO, L, K, iso).

Figure 9

Rather small, slender, semi-pachycaul homeophyllous liane to 3 m; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, sterile stems and very short, adherent (always?) flowering stems arising from the axils of the leaves; *stems* smooth, terete in cross-section, drying deeply longitudinally sulcate; with very sparse to copious netted prophyll, cataphyll and petiolar sheath fibre, internodes 1–4 x 0.5–1.2 cm, separated by large, oblique, slightly corky leaf scars; *flagellate foraging stems* absent; *clasp ing roots* arising from the nodes and internodes, pubescent; *feeding roots* not observed; *leaves* distichous; *cataphylls* and *prophylls* membranous, quickly drying and degrading into netted fibres, these later falling; *petiole* shallowly grooved, 1.4–27 x 0.2–0.7 cm, apical geniculum long but not

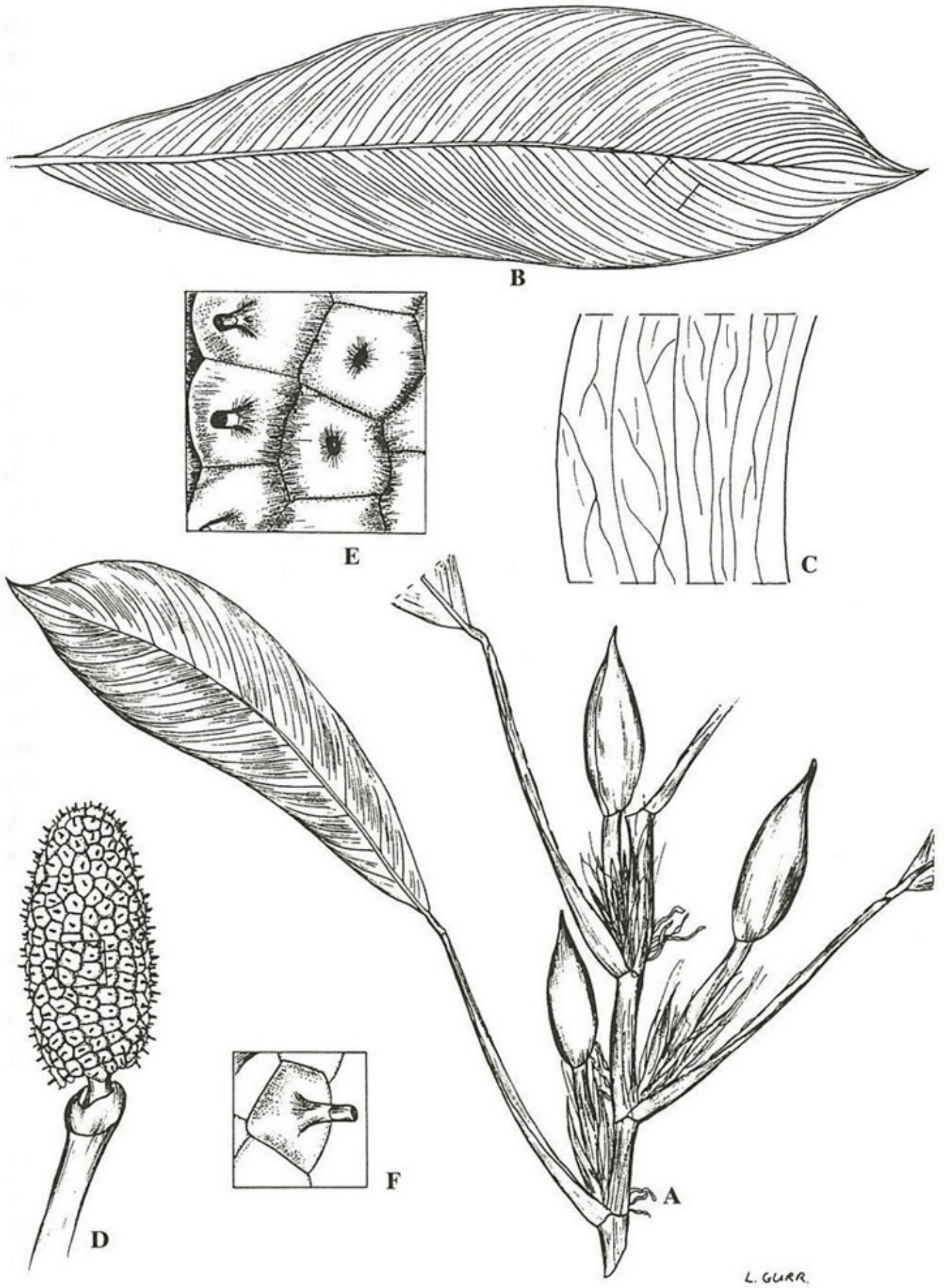


Figure 9. Rhaphidophora geniculata Engl.

A. flowering shoot x $\frac{1}{3}$; B. leaf lamina x $\frac{4}{9}$; C. venation detail x 3; D. inflorescence, spathe removed x 1; E. spadix detail, pre-anthesis x 6; F. stylar region and stigma, side view x 6. All from Johns 9870.

especially prominent, basal geniculum barely visible to rather large (dependent on age), moderately prominent; *petiolar sheath* extending to just below the apical geniculum degrading into semi-persistent netted fibres, eventually falling; *lamina* entire, oblanceolate or oblong-elliptic, slightly to markedly oblique, oblique, 1.8—35 x 3—7 cm, thinly coriaceous to weakly chartaceous, usually drying conspicuously discoloured, adaxially dark olive-brown, abaxially pale olive-green to reddish brown, base decurrent, apex acute, falcate-acute, acuminate or rounded-acuminate; *midrib* prominently raised and usually darker abaxially, ± flush adaxially; *primary venation* arching-pinnate, slightly raised abaxially, almost flush adaxially; *interprimaries* sub-parallel to primaries, slightly to much less prominent, slightly raised; *secondary venation* weakly reticulate, slightly raised; *tertiary venation* reticulate-striate, barely visible; *inflorescence* solitary, terminating a short shoot arising in the axils of leaves, occasionally arising from axils of fallen leaves, and usually inflorescences arising from several adjacent leaves, and thus sections of stems carrying several inflorescences in diffuse clusters, each inflorescence subtended by a prophyll and several degraded, netted cataphylls; *peduncle* strongly compressed-terete, 5—9 x 0.3—0.6 cm; *spathe* ovoid-ellipsoid, base decurrent and oblique, apex rounded, slender-acuminate, 3.5—6.5 x 1.5—2.5 cm, white, marcescent falling at fruit maturation leaving a large oblique scar; *spadix* ovoid-ellipsoid, stipitate, inserted obliquely on stipe, 2.5—3.5 x 1.3—1.7 cm; stipe 2—8 x 1—2 mm; *stylar region* mostly hexagonal, 1.5—2 x 2.1—2 mm, prominently conical; *stigma* punctiform on a long (c. 2 mm) stipe, c. 0.2—0.35 diam.; *anthers* not exerted at male anthesis. *Infructescence* stout ellipsoid-cylindrical, c. 4 x 2 cm.

Distribution: New Guinea. Widespread but, in view of the rather few collections, perhaps uncommon.

Habitat: Primary and slightly disturbed lowland to upper hill forest and lower montane forest, 150–790 m altitude.

Notes: 1. In flowering on clinging shoots and by the conical style *Rhaphidophora geniculata* resembles *R. australasica* from which it may be distinguished by the ovoid-ellipsoid, stipitate spadix (cylindrical and sessile in *R. australasica*) and the lack of fibrous petiolar sheath remains. It also differs from that species by the inflorescences borne on short shoots arising from the leaf axils. In this respect it is reminiscent of *R. brevispathacea* and *R. stolleana*, although in these the stems are pendent and not clinging.

2. The protologue of *R. wentii* states the spadix to be sessile; examination

of the fertile types (B, BO, L) shows this to be incorrect; all are stipitate. The illustration accompanying the protologue of *R. geniculata* is a good match for the B holotype and L isotype of *R. wentii*.

Other specimen seen: INDONESIAN PAPUA. Digul Prov.: Merauke, Branderhorst 324 (L); Mimika Prov.: Freeport Concession Area, Golf Course surrounds, Johns 9970 (BO, K, MAN); Kali Kopi, between Kali Kopi levee and the Kopi River, Utteridge 79 (BO, K, MAN). PAPUA NEW GUINEA. West Sepik Prov.: Vanimo, Vanimo hinterland, Streimann LAE 52964 (LAE, US); Southern Highlands Prov.: Mt Bosavi, northern side, 2–4 km west of Ludesa mission station, Jacobs 9331 (L); Wasu, NE slope of Mt Bosavi, Moi et al. 196 (BFC, L, LAE); Morobe Prov.: vicinity of Kajabit Mission, Clemens 10662 (GH); Vicinity of Lae, along logging road to Busu River, from 3.8 km E of Igam road and Military Base to c. 6 km up the road junction, Croat 52787 (MO), Croat 52788 (MO); Left off of Igam road past Military Reserve, Croat 52803 (MO).

9. *Rhaphidophora gorokensis* P.C. Boyce, *sp. nov.*

Rhaphidophora gorokensis *R. kokodensi* *R. okapensi*, *R. pilodi* atque *R. wariae* similis, species omnes monticolae foliis parvis rigide coriaceis sunt. A *R. waria* atque *R. okapensi* in surculis liberis lateralibus florenti et spadice sessili prompte distinguibilis est; porro a *R. waria* vaginis petiolaribus plus minusve omnino cadentibus neque in fibris fatiscentibus, atque a *R. okapensi* forma laminae foliae (anguste lanceolate vel elliptics, basi acuta, apice longe acuminata tubulo minuto instructa, neque ovata, basi ovata, apice longe acuminata tubulo manifeste) distinguitur. A *R. pilode* atque *R. kokodensi* (ambo in surculis liberis lateralibus florentes) *R. gorokensis* fibra vaginae petiolaris carenti distinguitur. — TYPUS: Papua New Guinea, Eastern Highlands Prov., Goroka, Marafunga logging area, Upper Asaro Valley, 6 Sept. 1961, Womersley & Sleumer NGF 13971 (GH, holo; L, LAE, iso).

Figure 10

Small, homeophyllous (?) liane to 12 m; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* not fully observed but presumably comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and (observed), free, little branching, sympodial, densely leafy flowering stems; *stems* terete in cross-section, without cataphyll, prophyll and petiolar sheath fibre, internodes to 1–4 x 0.5–0.8 cm, separated by slightly oblique, corky leaf scars; *flagellate foraging stems*, *clasping roots* and *feeding roots* unknown; *leaves* spiro-distichous on free shoots; *cataphylls* and *prophylls* chartaceous, caducous; *petiole* deeply canaliculate, 6.5–11 x 0.15–0.25 cm, smooth, genicula weak; *petiolar sheath* prominent, chartaceous, extending to apical geniculum, briefly persistent,

then partially caducous, later falling leaving an irregular, corky scar; *lamina* entire, narrowly lanceolate to elliptic, oblique, falcate, 7—16 x 2—5 cm, stiffly coriaceous, base acute, oblique, apex long-acuminate with a minute tubule; *midrib* raised abaxially, flush to slightly sunken adaxially; *primary venation* densely pinnate, raised abaxially and adaxially; *interprimaries* sub-parallel to primaries, indistinguishable from them; *secondary* and *tertiary venation* conspicuously parallel-reticulate; *inflorescence* solitary, subtended by an under-developed foliage leaf; *peduncle* compressed-terete, 5—7 x 0.2—0.25 cm; *spathe* narrowly canoe-shaped, stout-acuminate, 6—6.5 x c. 1.5 cm, marcescent(?); *spadix* cylindrical, sessile, 3.3—3.5 x c. 0.7 cm; *stylar region* rhombohexagonal, c. 0.9—1 x 0.8—1.1 mm, truncate; *stigma* punctiform, flush with a raised rim, c. 0.5 mm diam.; *anthers* not exerted at male anthesis; *infructescence* not observed.

Distribution: Papua New Guinea (Eastern Highlands Prov. - Goroka and Mendi).

Habitat: Lower montane rain forest, Fagaceae and Nothofagaceae forest on limestone. 1600–2440 m altitude.

Note: Similar to *Rhaphidophora kokodensis*, *R. okapensis*, *R. pilosa* and *R. waria* in being a montane species with small, stiffly coriaceous leaves. It is readily distinguishable from *R. okapensis* and *R. waria* by flowering on free lateral shoots and by the sessile spadix. It can be further distinguished from *R. waria* by the petiolar sheaths falling more or less entire and not degrading into fibres, and from *R. okapensis* by the shape of the leaf lamina (narrowly lanceolate to elliptic, base acute, apex long-acuminate with a minute tubule v. ovate, base cordate, apex long acuminate with a pronounced tubule). From *R. kokodensis* and *R. pilosa* (both flowering on free lateral shoots) *R. gorokensis* is distinguished in lacking petiolar sheath fibre.

Other specimens seen: PAPUA NEW GUINEA. Southern Highlands Prov.: Mendi, Det Mission, 16 km SSW of Mendi, *Vinas 151* (GH, K); Eastern Highlands Prov.: Goroka, Collins Mill, Omahaiga River valley, Mt Otto area, *Robbins 870* (L).

10. *Rhaphidophora guamensis* P.C. Boyce, *sp. nov.*

Dum *Rhaphidophoram spathaceum* simulans, *R. guamensis* inflorescentia solitaria apicem surculi liberi lateralis ferenti neque e mole prophyllorum chartaceorum cataphyllorumque exorienti, etiam specie robuste stipitato statim distinguibilis est. Praeterea, stipes stigmaticus egregie longus insignis

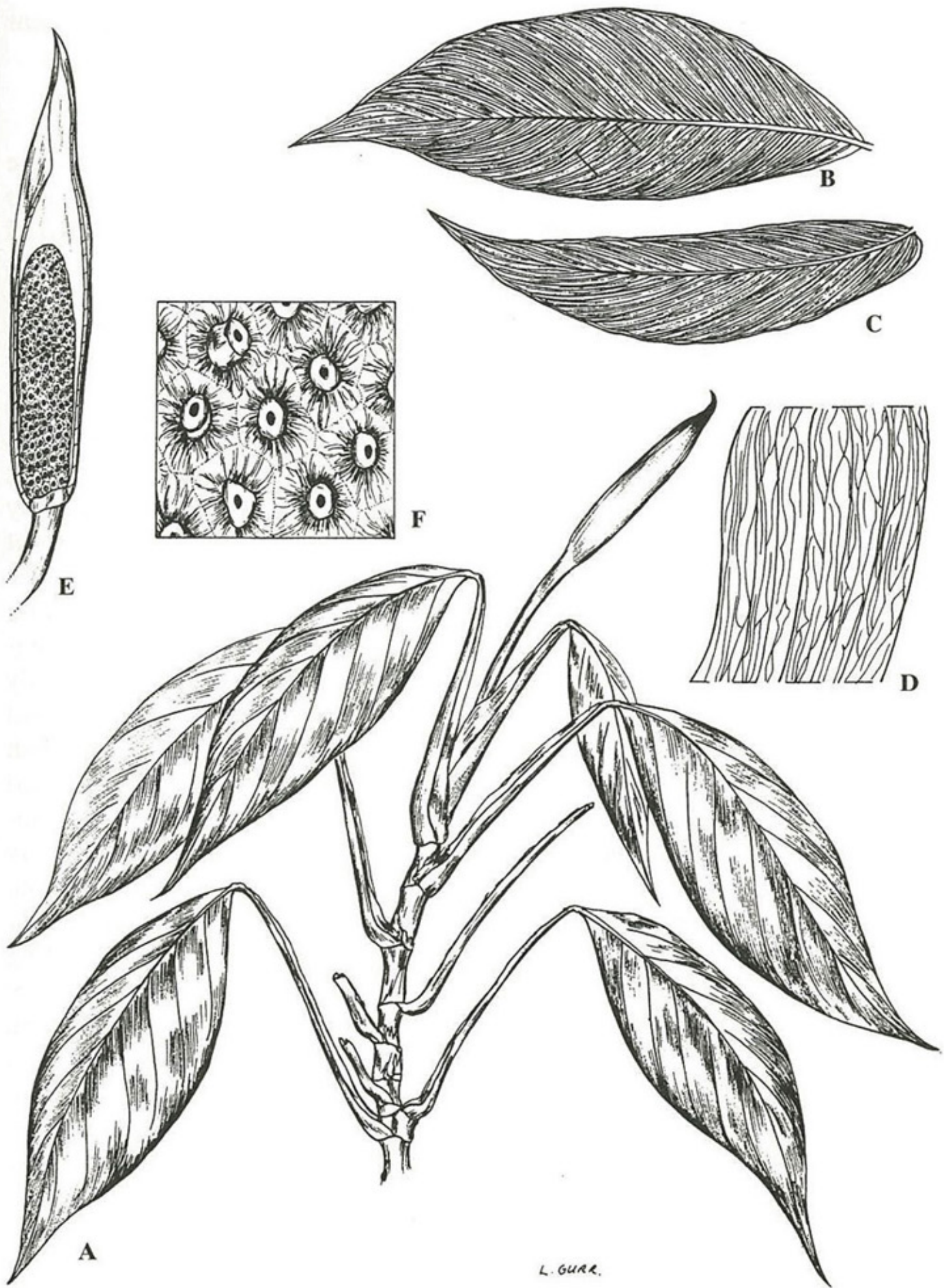


Figure 10. *Rhaphidophora gorokensis* P.C. Boyce

A. flowering shoot x $\frac{1}{2}$; B. leaf lamina x $\frac{2}{3}$; C. leaf lamina x $\frac{1}{2}$; D. venation detail x 4; E. inflorescence x 1; F. spadix detail, pre-anthesis x 8. A & B, D-F from *Womersley & Sleumer NGF 13971*; C from *Robbins 870*.

est. — TYPUS: Guam, slopes of Mt Almagosa, Naval Magazine, near Fena Dam, 28 April 1962, *B.C. Stone 4101* (L, holo; GUAM, US, iso).

Figure 11

Moderately robust, medium-sized semi-leptocaul, heterophyllous(?) liane to unknown ultimate height; *seedling stage* not observed; *pre-adult plants* forming scattered terrestrial colonies; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, scattered-leafy, non-flowering stems and free, sympodial, leafy flowering stems; *stems* smooth, mid-green, cataphylls and prophylls briefly persistent then falling leaving bare stems, internodes 0.5—3 x 0.3—1 cm, separated by prominent straight leaf scars; *flagellate foraging stem* not observed; *clasp ing roots* solitary to somewhat densely produced arising from the nodes and internodes adjacent to nodes; *feeding roots* not observed; *leaves* more-or-less distichous; *cataphylls* and *prophylls* drying chartaceous, briefly persistent; *petiole* deeply canaliculate, 9—15 x 0.2—0.4 cm, smooth, apical geniculum large but not especially prominent, basal geniculum almost invisible; *petiolar sheath* extending to base of apical geniculum, broad, chartaceous, short-persistent, degrading to very sparse papery strips, then falling; *lamina* entire, oblong-elliptic to oblong-lanceolate or oblanceolate, slightly oblique to markedly oblique, 15—32 x 4—8.5 cm, submembranous to coriaceous, base rounded to acute, apex acute to weakly acuminate; *midrib* raised abaxially, ± flush adaxially to weakly raised abaxially; *primary venation* pinnate, slightly raised abaxially, flush adaxially, drying darker than lamina; *interprimaries* sub-parallel to primaries, much less prominent, slightly raised abaxially, barely visible adaxially; *secondary venation* reticulate, raised, especially notable in dry material; *inflorescence* solitary, subtended by a fully to partially developed foliage leaf and one to several degraded and soon-falling chartaceous cataphylls; *peduncle* rather stout, terete, 6—8 x 0.3—0.5 cm; *spathe* broadly canoe-shaped, briefly stout-beaked, 10—12 x 2—7 cm, spongy-fleshy, very thick-walled, pale yellow, caducous, falling leaving a very prominent oblique scar; *stipe* stoutly terete, 1—1.5 x 0.4—0.5 cm; *spadix* slender to somewhat stout-cylindrical, stipitate, cochleate at insertion on stipe, 7—9 x 1—1.5 cm, white at male anthesis; *stylar region* strongly conical, mostly hexagonal in top view, 0.9—1.2 x 1—1.1 mm; *stigma* punctiform on the tip of a long (c. 2 mm) stipe, 0.5—0.2 x c. 0.3 mm, glossy and black in dried material; *anthers* not exerted at male anthesis; *infructescence* not observed.

Distribution: Guam.

Habitat: Mixed forest, coconut plantation, on limestone. c. 400 m altitude.

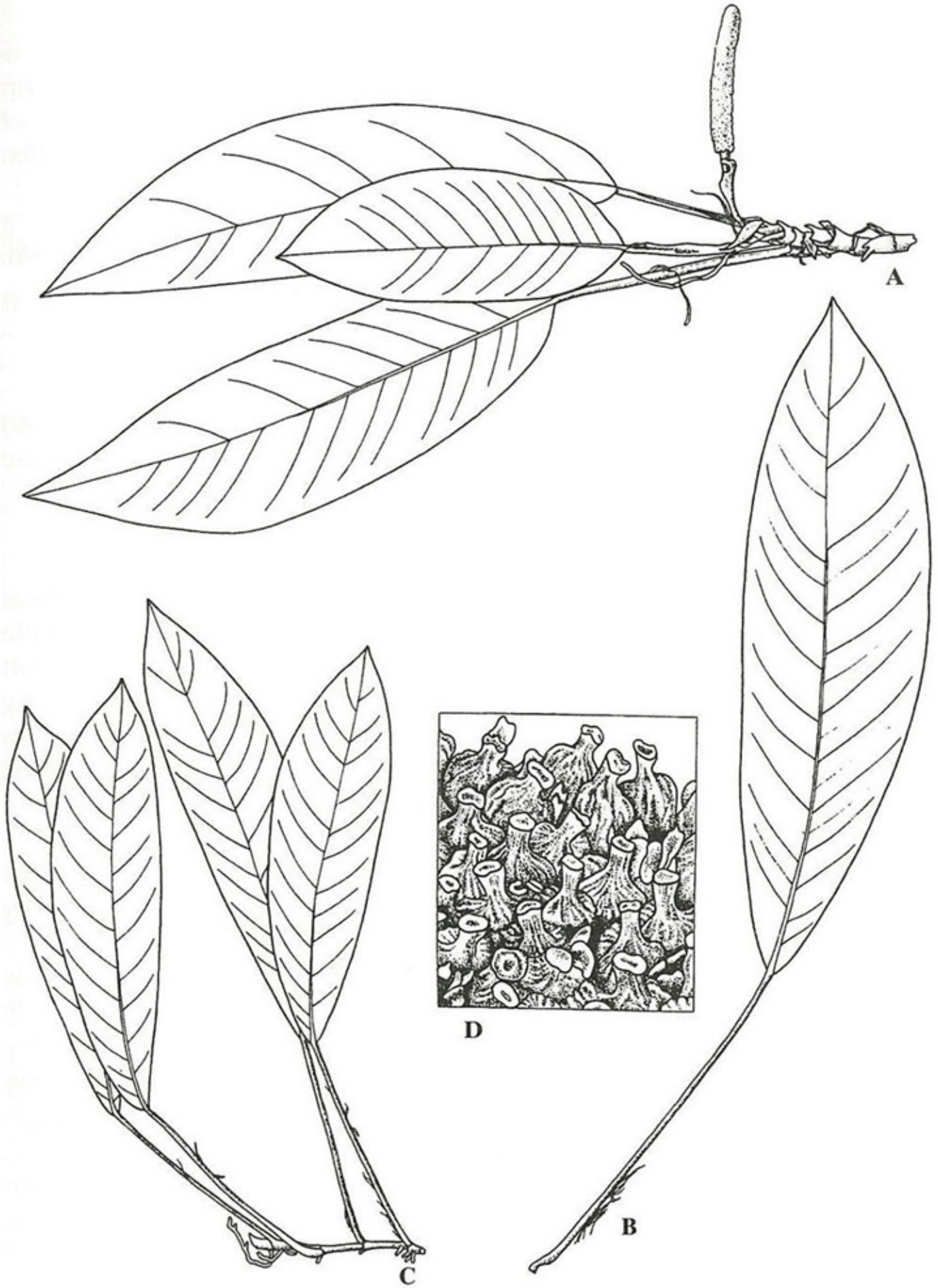


Figure 11. *Rhaphidophora guamensis* P.C. Boyce

A. flowering shoot x $\frac{1}{4}$; B. leaf x $\frac{1}{3}$; C. pre-adult creeping shoot x $\frac{1}{5}$; D. spadix detail at post male anthesis x 6. All from *Stone 4101*.

Note: While resembling *Rhaphidophora spathacea*, *R. guamensis* is immediately distinguishable by the solitary inflorescence carried on the tip of a free lateral shoot, and which does not emerge from a mass of chartaceous prophyll and cataphylls, and also by the robustly stipitate spadix. In addition, the remarkably long stigmatic stipe is notable.

Other specimens seen: GUAM. Mt Lamlam summit, near lighthouse, *Anderson 147* (GUAM, US); Almagosa Springs area, Naval Magazine, *Rinehart 15568* (GUAM, US).

11. *Rhaphidophora hayi* P.C. Boyce & Bogner

Rhaphidophora hayi P.C. Boyce & Bogner, Gard. Bull. Singapore 52 (2000) 91, fig.1. — Type: Australia, Queensland, Cooroo Lands, north Johnstone River, near Innisfail, Nov. 1965, *Webb & Tracey 7066* (BRI, holo).

Figure 12

Moderate-sized, slender to somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 5 m; *seedling stage* a non-skototropic shingling juvenile shoot; *pre-adult plants* forming small terrestrial colonies; *adult shoot architecture* comprised of clinging, physiognomically unbranched, mostly densely leafy, sterile stems and abbreviated, free, flowering stems; *stems* rectangular to terete in cross-section, widest side prominently convex, smooth, dark green, without prophyll and cataphyll fibre but with very thin, adherent, petiolar sheath tissue, internodes to 8 x 1 cm, separated by slight \pm straight scars, older stems sub-woody; *flagellate foraging stems* weakly developed, usually at least partially leafy and mostly replaced by short, readily disarticulating free side shoots functioning as vegetative propagation units; *clasp ing roots* arising from the internodes, prominently pubescent; *feeding roots* c. 3 mm diam., brown, minutely pubescent, sparsely lenticellate; *leaves* distichous, shingling and ascending on adherent shoots, densely arranged or slightly scattered on free shoots, scattered leaves with internodes between carrying a prominent cataphyll of short duration; *cataphylls* and *prophylls* membranous, caducous; *petiole* deeply grooved, 1—2 x 0.2—0.3 cm, smooth, apical and basal genicula barely visible; *petiolar sheath* prominent, caducous but adhering to stem, membranous, ligulate, margins of ligule fused, the ligule extending up to 3 cm above base of lamina and enclosing shoot apex; *lamina* broadly to narrowly ovate-elliptic, coriaceous, base truncate to cuneate or cordate (the last not on flowering shoots), and briefly decurrent, apex acute with a tiny tubule; *midrib* prominently raised abaxially, slightly raised adaxially; *primary venation* densely pinnate, slightly raised abaxially, somewhat impressed adaxially;



Figure 12. *Rhaphidophora hayi* P.C. Boyce & Bogner

A. adult shoot with flowering branch x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{2}$; C. venation detail x 3; D. pre-adult climbing shoot x $\frac{1}{4}$; E. disarticulating side shoot x $\frac{1}{3}$; F. inflorescence x 1; G. spadix detail at female anthesis x 10; H. spadix detail at post-male anthesis x 10. A-C from *Backer 11199*; D-H from *Sands et al. 2384*.

interprimaries sub-parallel to primaries, slightly raised on both leaf surfaces; *secondary venation* reticulate, slightly raised abaxially, \pm flush adaxially; *inflorescence* solitary, subtended by a membranous, caducous prophyll and one or more similar cataphylls; *peduncle* slightly laterally compressed, 2—3 x 0.6—1 cm; *spathe* canoe-shaped, stoutly beaked, 5.5—8 x 2—4 cm, stiffly fleshy, yellow, gaping wide at female anthesis and then slowly falling leaving a large scar at the base of the spadix; *spadix* stoutly cigar-shaped, shortly stipitate, inserted \pm level on stipe, 3.5—6 x 1—1.2 cm, yellow; *stipe* 4—6 x 3—3.5 mm; *stylar* region weakly developed, mostly irregularly rhombohexagonal, 1.1—1.3 x 1—1.1 mm, truncate; *stigma* prominently raised, elongated, longitudinally orientated, c. 0.3—0.5 x 0.2—0.4 mm; *anthers* not exerted at male anthesis; *infructescence* not seen.

Distribution: Indonesian Papua, Papua New Guinea (including New Britain, New Ireland, Bougainville and Muyua (Woodlark) Island), and Australia (eastern tropical Queensland).

Habitat: Primary and secondary monsoon or rain forest on coralline limestone and basalt. 20–600 m altitude.

Notes: 1. While resembling *Rhaphidophora pachyphylla*, *R. hayi* is immediately distinguishable by the flowering shoots with broader, truncate-based leaf laminae, the raised, larger, elongated, longitudinally orientated stigmatic region, the occasional foraging shoot, and by the presence of free, disarticulating side shoots functioning as vegetative propagation units. This last character occurs also in *R. cryptantha* (q.v.).

2. Very similar to *R. parvifolia* Alderw. (Maluku: Pulau Ternate) but differing by the stipitate spadix. From available material it is not possible to tell if *R. parvifolia* has the disarticulating side shoots typical of *R. hayi*.

3. There are many collections of *R. hayi* originating from Australia (mostly in BRI and QRS) but all except those cited here are sterile.

Other specimens seen: INDONESIA PAPUA. Kepala Burung Prov.: 2 km N of Manokwari, *Nicolson 1577* (B, K, L, US). PAPUA NEW GUINEA. Woodlark (Muyua) Island: Kulumadau, *Brass 28831* (GH, L); Central Prov.: Sogeri Plateau, 5 - 7 miles beyond Kokoda Trail Monument, 30 miles east of Port Moresby, *Nicolson 1431* (L, US); Milne Bay Prov.: Esa'ala, Normanby Island, Sewa Bay, 21 Oct. 1971, *Lelean & Streimann LAE 52541* (L, LAE, US); North Solomons Prov.: Bougainville, Arawa, McKillup's Plantation, 6 m west of Kieta, *Nicolson 1512* (B, K, US); West New Britain Prov.: Kandrian, along road from airport, *Nicolson 1540* (L, US); New Ireland, Namatanai, Hans Meyer Range, above Mandih river, near Mandih Lake, c. 6 km WNW of Taron, 30 Oct. 1975, *Sands et al. 2384* (K, K

(living collection acc. no. 1975-5026, K spirit no. 63938). AUSTRALIA. Queensland: Cape Tribulation, *Rijkers 1484* (BRI).

12. *Rhaphidophora intonsa* P.C. Boyce, *sp. nov.*

Rhaphidophora intonsa apicibus surculorum reticulo fibroso denso inclusis distinguitur, porro inflorescentiae grandes in surculis liberis diagnostici sunt. Cum *R. spuria* eam confundere potest, sed haec basi laminae truncata vel leniter cordata atque apicibus surculorum multo minus fibrosis facile distinguitur. Cum *R. australasica* eam etiam confundere potest, sed ab illa *R. intonsa* in surculis liberis florenti et inflorescentias multo maiores (spatha 17—20 cm nec 5—9.5 cm, spadice 10.5—18.5 cm nec 3.75—8 cm) procreanti differt; praetera, apex regionis stylaris truncata est, neque manifeste conica. — TYPUS: Papua New Guinea, Central Prov., Boridi, 30 Sept. 1935, *Carr 14313* (SING, holo; BM, L, iso).

Figure 13

Medium to large, robust, pachycaul (?), homeophyllous (?) liane to 12 m; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* not fully observed but apparently comprised of elongated, clinging, physiognomically unbranched, non-flowering stems and free lateral, leafy flowering stems; *stems* with cataphylls and prophylls degrading to dense ragged fibres and sheets of tissue and forming dense matting at the stem tips, internodes 1—3 x 0.5—1.4 cm, separated by prominent slightly oblique corky leaf scars; *flagellate foraging stem*, *clasping roots* and *feeding roots* not observed; *leaves* spiro-distichous; *cataphylls* and *prophylls* quickly degrading to dense ragged fibres and sheets of tissue; *petiole* shallowly canaliculate, 12—43 x 0.4—0.9 cm, apical geniculum prominent, basal geniculum weakly defined and obscured by fibre; *petiolar sheath* very prominent, extending to apical geniculum, swiftly degrading to copious netted fibres, later falling leaving a smooth, corky scar; *lamina* entire, ovate to oblong-elliptic, slightly oblique, 17—47 x 9—20 cm, subcoriaceous, base subacute to slightly decurrent, apex acute to briefly acuminate; *midrib* prominently raised abaxially, very slightly raised adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries, slightly less prominent, raised abaxially, slightly impressed adaxially; *secondary venation* reticulate, slightly raised abaxially and adaxially in dry specimens; *inflorescence* solitary, mostly subtended by a ± fully developed foliage leaf and copious netted fibre and sheet-like tissue; *peduncle* laterally compressed to terete, 9—13 x 0.9—2 cm; *spathe* canoe-shaped, 17—20 x 1.5—2.5 cm, stoutly long-beaked, stiffly fleshy, caducous leaving a large scar at the base of the spadix; *spadix* cylindrical, slightly

curved, sessile, inserted more or less level on peduncle, 10.5—18.5 x 1.7—2.3 cm, cream; *stylar region* rhombohexagonal, 1—2 x 1—1.5 mm, truncate; *stigma* punctiform, raised at male anthesis flattened in dry material, c. 0.3 mm diam.; *anthers* not exerted at male anthesis; *infructescence* curved-cylindrical, c. 17 x 2 cm.

Distribution: Papua New Guinea (Central & Morobe Prov.).

Habitat: Montane forest. 1290–1800 m altitude.

Notes: 1. The densely netted fibre-encased shoot tips and large inflorescences are diagnostic. *Nicolson 1473* is smaller and less robust than the type but otherwise matches very well.

2. Confusion with *R. spuria* is possible although the latter is readily distinguished by the truncate to weakly cordate lamina base and in having very much less fibre at the shoot tips. Confusion with *R. australasica* is possible. *Rhaphidophora intonsa* differs by flowering on free shoots and in producing much larger inflorescences (spathe 17—20 cm/spadix 10.5—18.5 cm vs. spathe 5—9.5 cm/spadix 3.75—8 cm in *R. australasica*). Additionally, the stylar region is truncate-topped in *R. intonsa* and prominently conical in *R. australasica*.

3. The specific epithet comes from the Latin *intonsa*, unshaven, in allusion to the dense, untidy prophyll and cataphyll fibre clothing the stem tips.

Other specimens seen: PAPUA NEW GUINEA. Morobe Prov.: Ogeramnang to Malang, *Clemens 4637* (GH); Sambangan, *Clemens 7779* (B); Edie Creek road, above Wau, *Nicolson 1473* (B, K, L, P, US).

13. *Rhaphidophora intrusa* P.C. Boyce, *sp. nov.*

Dum *Rhaphidophoram schlechteri* simulans, *R. intrusa* apice spathae longe extenso (usque ad tertiam partem longitudinis spathae toto) atque ligulis vaginae petiolaris valde elongatis secundum costam abaxialem usque ad dimidiam longitudinis laminae extensis et secum adnatis statim cognoscibilis. Hic character etiam, in spatone minore, in *R. hayi* repertus est, a qua *R. intrusa* habitu non scindulanti, petiolis longioribus, lamina foliorum tenuiore atque longiore differt. — TYPUS: Indonesian Papua, Kepala Burung Prov., Kabupaten Manokwari, Kecamatan Manokwari, Arfak Plains, close to road from SP & to Sg. Wariori crossing, 22 April 1994, *Sands 6276* (K, holo; BO, MAN, iso).

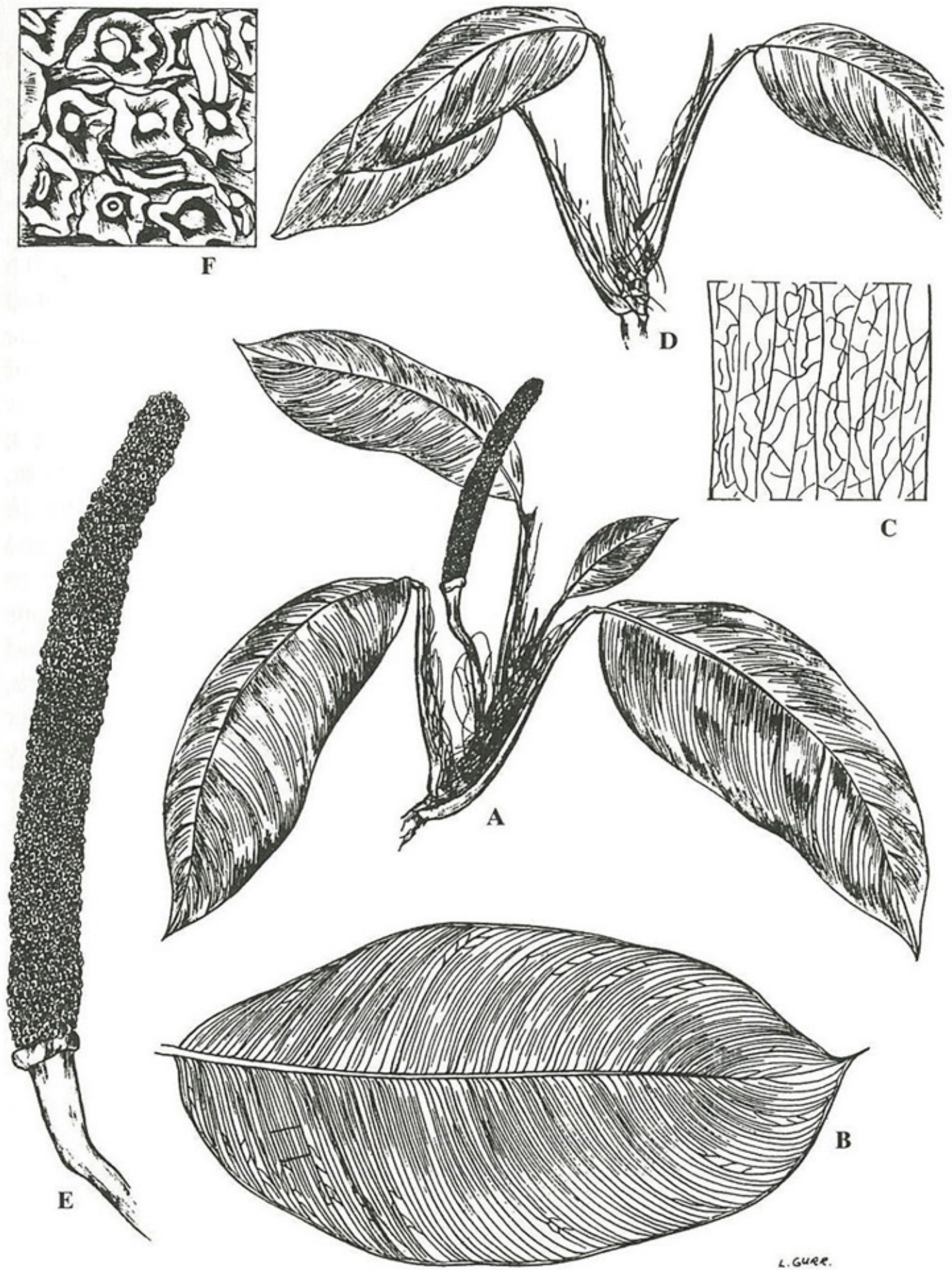


Figure 13. *Rhaphidophora intonsa* P.C. Boyce

A. flowering shoot x $\frac{1}{6}$; B. leaf lamina x $\frac{1}{4}$; C. venation detail x 2; D. portion of clinging adult stem x $\frac{1}{6}$; E. inflorescence, spathe fallen x $\frac{1}{2}$; F. spadix detail, male anthesis x 6; F. A-C, E & F from Carr 14313; D from Nicolson 1473.

L. GURR.

Figure 14

Slender, leptocaul, homeophyllous liane to 5 m; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and somewhat lengthened mostly unbranched, free, sympodial, spreading to pendent, rarely ascending, leafy, flowering stems; *stems* smooth, flexuous, climbing stems \pm terete, free stems somewhat longitudinally flattened, without prophyll, cataphyll and petiolar sheath fibre, internodes 1—6 x 0.6 cm on clinging shoots, those on free shoots much more slender, separated by weak straight to slightly oblique leaf scars, older stems woody; *flagellate foraging stems* not observed; *clasp ing roots* arising sparsely from nodes of clinging stems, slightly pubescent; *feeding roots* not observed; *leaves* distichous, somewhat scattered; *cataphylls* and *prophylls* not observed; *petiole* shallowly to rather deeply grooved adaxially, 2.5—5 x 0.1—0.2 cm, smooth, with very slight apical and basal geniculum; *petiolar sheath* prominent, chartaceous, extending beyond the apical geniculum by two ligules adaxially and by ligules fused along the abaxial midrib for up to half the leaf lamina length, sheath eventually falling leaving a continuous scar from the petiole base, around the top of the apical geniculum and back to the base and remnants along the abaxial midrib; *lamina* entire, oblong-elliptic, 6—16.5 x 3.5—6 cm, submembranous, base subovate, apex weakly acuminate, with a minute tubule; *midrib* raised abaxially, slightly sunken adaxially in fresh material, slightly sunken abaxially and adaxially in dry material; *primary venation* pinnate, slightly raised on both surfaces in dried material; *interprimaries* sub-parallel to, but much less distinctive than, primaries; *secondary venation* very feebly reticulate, almost invisible; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* slender-terete, 3.5—4 x 0.15 cm; *spathe* cigar-shaped, cuneate basally at insertion on petiole, apex truncate and extending into a very long slender beak up to $\frac{1}{3}$ length of entire spathe, 7—8 x 1.3—1.5 cm, thick fleshy, marcescent(?), later pushed off by developing infructescence(?) leaving a large scar; *spadix* cigar-shaped, stipitate, inserted level on stipe, 4.5—5.5 x 0.9—1.2 cm, obtuse; *stipe* slender terete, c. 1 x 0.2 cm; *stylar region* dorso-ventrally compressed-rhombohexagonal, 0.9—1.5 x 0.85—1.2 mm, truncate; *stigma* punctiform, c. 0.45 mm diam., prominent in dried material; *anthers* not exerted at male anthesis; *infructescence* stoutly cigar-shaped, c. 5 x 1.5 cm.

Distribution: Indonesian Papua (Kepala Burung Prov.). Known only from the type.



Figure 14. *Rhaphidophora intrusa* P.C. Boyce

A. flowering shoot $\times \frac{2}{5}$; B. leaf lamina $\times \frac{2}{3}$; C. inflorescence $\times \frac{2}{3}$; D. inflorescence, spathe partly removed to show spadix $\times \frac{2}{3}$. E. spadix detail, male anthesis $\times 6$. All from Sands 6276.

Habitat: Partially disturbed lowland rain forest. Sea level to 20 m altitude.

Notes: 1. While resembling *Rhaphidophora schlechteri*, *R. intrusa* is immediately recognizable by the long extended spathe apex (up to $\frac{1}{3}$ the length of the entire spathe) and by the greatly elongated petiolar sheath ligules that extend fused along the abaxial midrib for up to half the leaf lamina length. The latter character is also found, to a much lesser extent, in *R. hayi*, from which *R. intrusa* differs in the non-shingling habit, longer petioles and thinner, longer leaf lamina.

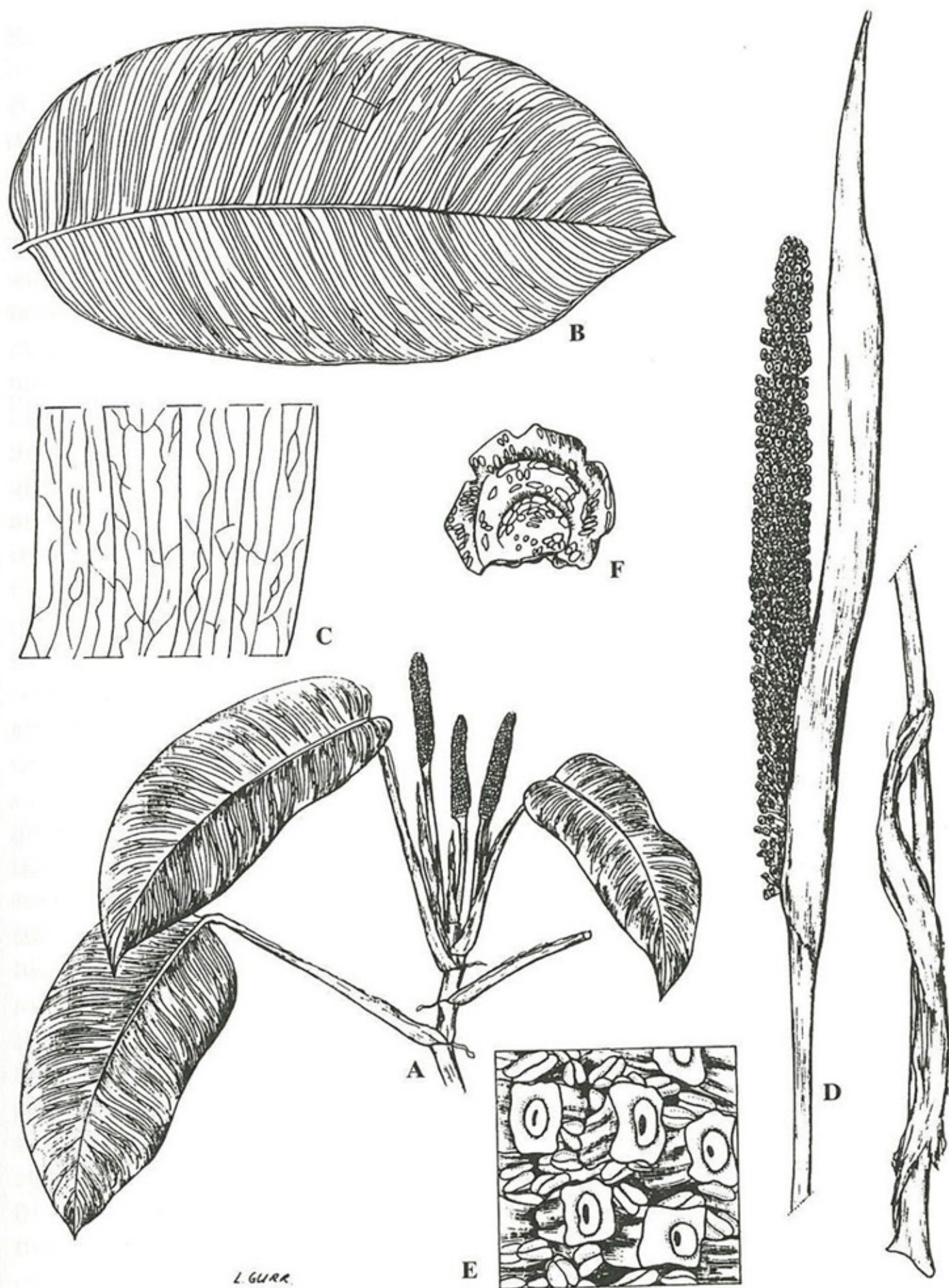
2. The specific epithet comes from the Latin, *intrusus*, to intrude, in allusion to the extraordinary ligules described above.

14. *Rhaphidophora jubata* P.C. Boyce, *sp. nov.*

Rhaphidophora jubata species valde distincta est magnitudini grandi, pedunculo longo, apicibus styliaribus parvis stigmatibus prominentibus atque seminibus cristatis reniformibus notabilis (his adhuc *Rhaphidophorae* non perscriptis). Cum *R. spuria* eam confundere potest, sed haec stylares maiores (1.6—2.4 x c. 2 mm diametro) atque stigmata punctiforma vel leviter ellipsoidea non manifeste elevata neque siccitate nigra seminaque ellipsoidea e cristata habet. — TYPUS: Papua New Guinea, North Solomons Prov., Bougainville, path from Arawa to Korpei, 10 miles southwest of Kieta, 1 Nov. 1964, *Nicolson 1529* (L, holo; B, K, P, US, iso).

Figure 15

Very robust, pachycaul, homeophyllous liane to 10 m; *seedling stage* not observed; *pre-adult plants* forming extensive terrestrial populations; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, densely leafy, flowering; *stems* smooth, with cataphylls and prophylls degrading into weak slightly fibrous patches and then falling, internodes to 4—13 x 1—3.5 cm; *flagellate foraging stem* not observed; *clasping roots* not observed; *feeding roots* arising singly from nodes, robust; *leaves* spiro-distichous; *cataphylls* and *prophylls* subcoriaceous, degrading to weakly fibrous patches, then falling; *petiole* deeply canaliculate, (6—) 40—85 x 0.35—0.5 cm, smooth, apical and basal genicula very large though not especially prominent; *petiolar sheath* very prominent, extending from between $\frac{2}{3}$ petiole length up to the apical geniculum, short-persistent, falling leaving thin scar; *lamina* entire, ovate to oblong-ovate, slightly oblique, 21.5—90 x 10.5—35 cm, thinly coriaceous to submembranous, drying pale yellow-brown to brown, base oblique, broadly rounded to



L. GURR.

Figure 15. *Rhaphidophora jubata* P.C. Boyce

A. flowering shoot x $\frac{1}{18}$; B. leaf lamina x $\frac{2}{9}$; C. venation detail x 2; D. inflorescence, plus lower peduncle x $\frac{2}{3}$; E. spadix detail, pre-anthesis x 6; F. mature seed, side view x 20. A from *Nicolson 1496*; B-C from *Nicolson 1530*; D-F from *Nicolson 1529*.

shallowly and minutely cordate, more rarely subacute, apex rounded-acuminate with a small apical tubule; *midrib* very prominently raised and abaxially, \pm impressed adaxially; *primary venation* pinnate, raised abaxially and adaxially; *interprimaries* parallel to primaries, much less prominent; *secondary venation* reticulate, hardly visible; *inflorescence* several together, each subtended by a prophyll and one or more chartaceous cataphylls, these soon degrading; *peduncle* terete, 11–25 x 0.3–2 cm; *spathe* slender canoe-shaped, stoutly attenuate-beaked, 16–24 x 2.5–3 cm, stiffly thin-fleshy, caducous, yellow; *spadix* slender cylindrical, sessile but long decurrent (to 2 cm) on peduncle/spathe insertion, 13–21 x 1–3 cm; *stylar region*, weakly rhombohexagonal to trapezoid, 1–1.2 x 1–1.3 mm, truncate; *stigma* punctiform, prominently raised, c. 0.25 mm diam., drying glossy black; *anthers* not exerted at male anthesis; *infructescence* slender cylindrical, 14.5–17.5 x 2.5 cm; *seed* reniform, laterally compressed, conspicuously crested along dorsal side (i.e., the side opposed to the insertion of the funicle), c. 1.2 x 2.5 mm at maturity, c. 8–12 per fruit arranged on two parietal placentae.

Distribution: Papua New Guinea (New Britain and Bougainville).

Habitat: Primary and secondary lowland to upper hill forest, along streams and paths. 90–980 m altitude.

Notes: 1. A very distinct species notable for its overall large size, long peduncle and small stylar tops with prominently raised stigmas. Confusion with *Rhaphidophora spuria* is possible although the latter has larger stylar tops (1.6–2.4 x c. 2 mm diam.) and punctiform to slightly ellipsoid stigmas that are not prominently raised and do not dry glossy black, and ellipsoid seeds lacking a crest.

2. The specific epithet is derived from the Latin, *jubatus*, crested, in allusion to the crested reniform seeds of this species, a form of seed not hitherto recorded for *Rhaphidophora*. This seed form is common in *Epipremnum* Schott, which differs from *Rhaphidophora* by having 4 (– 6) seeds at base of a single intrusive parietal placenta. Furthermore, the testa in *Rhaphidophora* (including *R. jubata*) is brittle, while that of *Epipremnum* is tough and bony.

Other specimen seen: PAPUA NEW GUINEA. North Solomons Prov.: Bougainville, path up Dakao Creek near Korpei, 11 miles southwest of Kieta, *Nicolson 1530* (B, K, L, P, US); Pavairi, *Ridsdale & Lavarack NGF 30628* (LAE, US); Kapikavi, *Ridsdale & Lavarack NGF 31600* (LAE, US); East New Britain Prov.: Kareeba road, 2 miles west of Kerevat, *Nicolson 1496* (US).

15. *Rhaphidophora kokodensis* P.C. Boyce, *sp. nov.*

Rhaphidophora kokodensis *R. australasicae* similis videtur sed in surculis liberis lateralibus florenti, stylis apice planis, et foliis minoribus angustioribus magis coriaceis prompte sejuncta. Porro species montana est igitur altitudinaliter sejuncta. Cum *R. pilode* (etiam in surculis liberis lateralibus florenti) eam confundere potest, quamquam *R. kokodensis* non fibras aspectu coacto proprio ut in *R. pilode* habet. — TYPUS: Papua New Guinea, Central Prov., Kokoda, eastern side of Lake Myola no. 1, 23 July 1974, Croft *et al.* LAE 61974 (GH, holo; BRI, CANB, L, LAE, iso).

Figure 16

Small, homeophyllous (?) liane to unknown ultimate height; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy flowering stems; *stems* terete in cross-section, internodes to 1—4 x 0.5—0.8 cm, separated by slightly oblique, prominent leaf scars; *flagellate foraging stems*, *clasping roots*, and *feeding roots* unknown; *leaves* spiro-distichous on free shoots; *cataphylls* and *prophylls* chartaceous but very soon degrading into long tough fibres; *petiole* deeply canaliculate, 5—16 x 0.2—0.25 cm, smooth, apical geniculum quite well defined, basal geniculum weak; *petiolar sheath* prominent, chartaceous, extending to apical geniculum, very swiftly degrading to fibres; *lamina* entire, narrowly lanceolate to narrowly lanceolate-elliptic, occasionally slightly falcate, 13—25 x 1.75—6 cm, stiffly coriaceous, base acute, apex acuminate to long-acuminate with a minute tubule; *midrib* slightly raised abaxially, slightly sunken adaxially; *primary venation* densely pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries indistinguishable from them; *secondary* and *tertiary venation* very faintly reticulate; *inflorescence* solitary, subtended by an underdeveloped foliage leaf and much degraded cataphyll fibre; *peduncle* compressed-terete, 7—12 x 0.2—0.3 cm; *spathe* narrowly cigar-shaped, long stout-acuminate, (4—)8—9 x c. 1.3 cm, marcescent(?); *spadix* cylindrical, sessile, 2—6 x 0.8—1 cm; *stylar region* rhombohexagonal, c. 0.9—1 x 0.8—1.1 mm, truncate; *stigma* punctiform, very slightly raised, c. 0.4 mm diam.; *anthers* not exerted at male anthesis; *infructescence* cylindrical, c. 11 x 1.3 cm.

Distribution: Papua New Guinea (Central Prov. - Kokoda and Port Moresby).

Habitat: Submontane rain forest on dark brown loam. 1500–2000 m altitude.

Note: Superficially similar to *Rhaphidophora australasica* but readily separated by its flowering on free lateral shoots, by the flat-topped styles and the smaller, narrower, much more coriaceous leaves. In addition, being a montane species, *R. kokodensis* is separated altitudinally. Confusion with *R. pilosa* (also flowering on free lateral shoots) is possible, although *R. kokodensis* has petiole and shoot fibres without the distinctive felted appearance of those of *R. pilosa*.

Other specimens seen: PAPUA NEW GUINEA. Central Prov.: Port Moresby, Boridi, Carr 13237 (BM, K, L, SING), Carr s.n. (BM); East slope of Lake Myola No. 2, Croft & Lelean NGF 34561 (GH, K, L).

16. *Rhaphidophora korthalsii* Schott

Rhaphidophora korthalsii Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 129; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 246; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 49–51, Fig. 21; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 341; Hay, Aroids of Papua New Guinea, pl. XV, a–c. — Type: Indonesia, Java, P.W. Korthals s.n. (L, holo; L, P, iso).

Pothos celatocaulis N.E. Br., Gard. Chron. 13 (1880) 200. — *Rhaphidophora celatocaulis* (N.E. Br.) Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 382 & Bull. Jard. Bot. Buitenzorg III, 4 (1922) 198. — Type: Malaysia, Sabah, Burbidge s.n., Hort. Veitch no. 215 (K, holo; K, iso).

Rhaphidophora maxima Engl., Bull. Soc. Tosc.ortic. 4 (1879) 269; Beccari, Malesia 1 (1882) 271, Tab. xx 1–5; K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 48–49; K. Krause & Alderw., Nova Guinea 14 (1924) 214. — Type: Sarawak, G. Gading, July 1866, Beccari PB 2314 (FI, lecto, selected by Boyce, 1999).

Rhaphidophora tenuis Engl., Bot. Jahrb. Syst. 1 (1881) 181; Beccari, Malesia 1 (1882) 271–272; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 53. — Types: Malaysia, Sarawak, Beccari PB 1977 (FI lecto; B isolecto; selected by Boyce, 1999).

Rhaphidophora korthalsii var. *angustiloba* Ridl. ex Engl. & K. Krause in Engler, Pflanzenr. 37 (IV.23B) (1908) 49. — Type: Malaysia, Sarawak, Matang, July 1903, Ridley s.n. (SING, lecto; selected by Boyce, 1999).

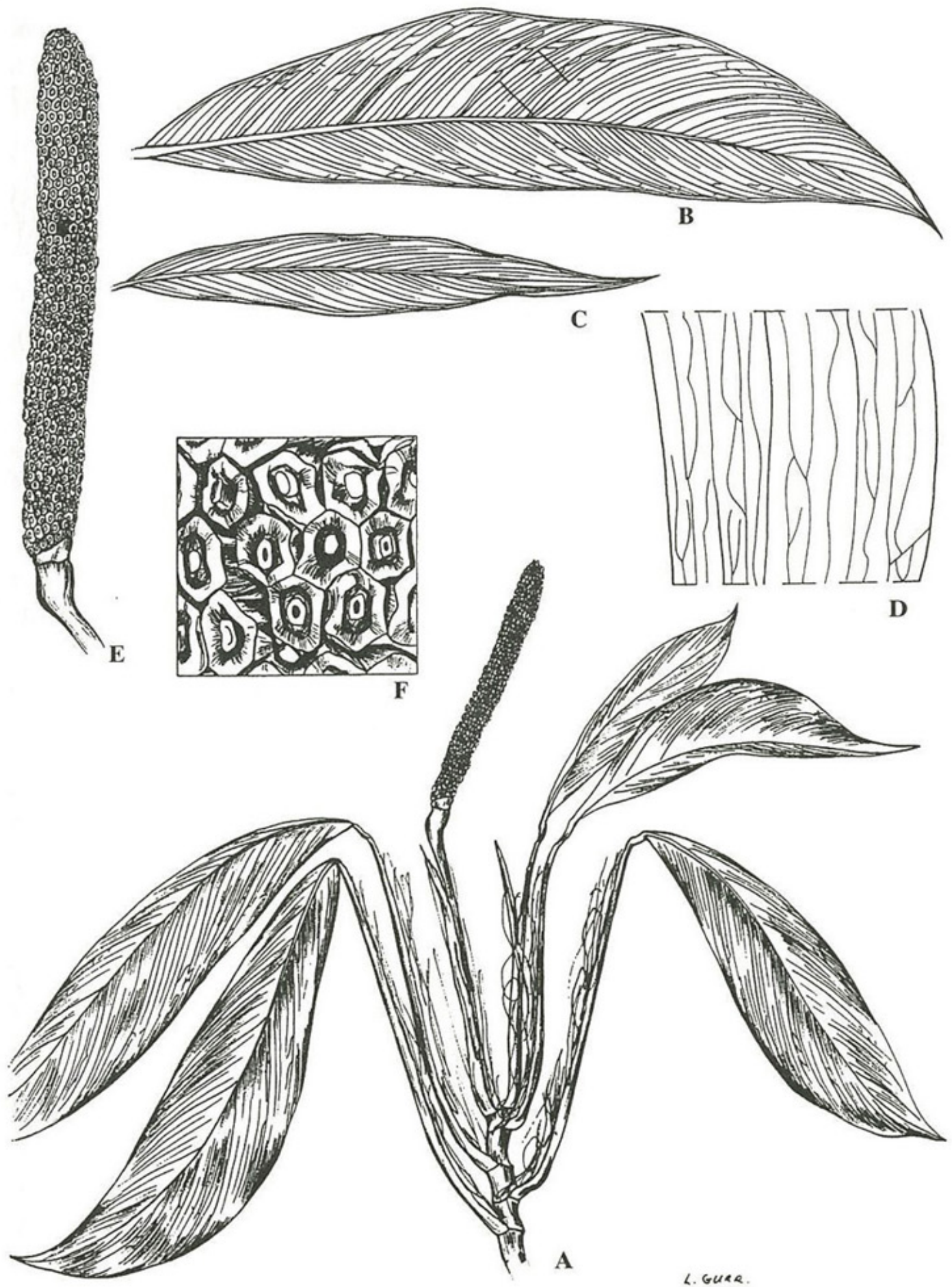


Figure 16. Rhaphidophora kokodensis P.C. Boyce

A. flowering shoot x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{2}$; C. leaf lamina x $\frac{1}{2}$; D. venation detail x 3; E. inflorescence, spathe fallen x $\frac{2}{3}$; F. spadix detail, post-male anthesis x 4. A & D from *Croft et al. LAE 61974*; B-C, E-F from *Carr 13237*.

Rhaphidophora copelandii Engl., Bot. Jahrb. Syst. 37 (1905) 115; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 49. — Type: Philippines, Mindanao, Davao, Mt Apo, April 1904, *Copeland 1193* (B holo; PNH iso†).

Monstera latevaginata Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 11. — Type: Cult. Bot. Gard. Berlin, *Engler & Krause s.n.* (B, holo).

Rhaphidophora grandifolia K. Krause, Bot. Jahrb. 44, Beibl. 101 (1910) 11. — Type: Philippines, Negros, Negros Orientale, Dumaguete (Cuernos Mts), March 1908, *Elmer 9464* (B, holo; E, K, L, LE, MO, PNH† iso).

Rhaphidophora trinervia Elmer, Leafl. Philipp. Bot. 8 (1919) 3073. — Type: Philippines, Laguna, Los Baños (Mt Maquiling), June—July 1917, *Elmer 18057* (PNH, holo†; FI, K, L, MO, P, iso).

Rhaphidophora ridleyi Merr., J. Str. Br. Roy. As. Soc. Special Edition (Enum. Pl. Borneo) (1921) 90. — *Rhaphidophora grandis* Ridl., J. Straits Branch Roy. Asiat. Soc. 49 (1907) 51, *nom. illeg., non* Schott 1858 [India = *R. decursiva* (Roxb.) Schott]. — Type: Malaysia, Sarawak, Tambusan, Sept. 1905, *Ridley 12414* (SING, holo).

Rhaphidophora latifolia Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 341; K. Krause & Alderw., Nova Guinea 14 (1924) 213. — Type: Indonesian Papua, Bonggo Range, Mamberamo, Pionierbivak, 23 July 1920, *Lam 711* (BO, holo; L, iso).

Rhaphidophora palawanensis Merr., Philipp. J. Sci. 26 (1925) 451. — Type: Philippines, Palawan, Malampaya Bay, Oct. 1922, *Merrill BoS 11570* (PNH, holo†; B, K, P, iso)

Rhaphidophora trukensis Hosok., J. Jap. Bot. 13 (1937) 195. — Type: Federated States of Micronesia, Chuuk (Truk) Island, near Orrip, 29 July 1939, *Hosokawa 8334* (TI, holo).

[*Epipremnum multicephalum* Elmer, Leafl. Philipp. Bot. 10 (1938) 3624, *nom. inval., descr. Angl.* — Based on: Philippines, Luzon, Sorsogon, Irosin (Mt Bulusan), May 1916, *Elmer 16061* (FI, K, L, MO, P, PNH†)].

Figures 17 & 18

Very large, occasionally enormous, slender to rather robust, pachycaul, heterophyllous liane to 20 m; *seedling stage* a non-skototropic shingling juvenile shoot; *pre-adult plants* never forming terrestrial colonies; *adult shoot architecture* comprised of greatly elongated, clinging, physiognomically unbranched, densely leafy flowering stems; *stems* smooth, bright green, with sparse to copious prophyll, cataphyll and petiolar sheath fibre, especially at the stem tips, internodes to 15 x 3.5 cm, separated by prominent oblique leaf scars, older stems subwoody; *flagellate foraging stems* absent; *clasping roots* densely arising from the nodes and internodes, prominently pubescent; *feeding roots* abundant, adherent and free, very robust, densely ramentose-scaly; *leaves* distichous; *cataphylls* and *prophylls* membranous, soon drying degrading to intricately reticulate fibres, these only very slowly falling; *petiole* shallowly grooved, upper part \pm terete, (1—) 9—65 x 0.2—1.5 cm, smooth, apical and basal genicula prominent; *petiolar sheath* prominent, membranous, strongly to slightly unequal on one side, extending almost to or reaching the apical geniculum, of \pm short-duration, soon degrading into persistent netted fibres, these eventually falling leaving a prominent, slightly corky scar; *shingling lamina* entire, falcate-lanceolate, 5—11 x 3.5—6 cm, base slightly cordate, *pre-adult* and *adult lamina* spreading, entire, pinnatipartite, pinnatisect or pinnatifid, 10—44 x 14—94 cm, broadly oblong-elliptic to oblong lanceolate, slightly oblique, membranous to chartaceous or subcoriaceous, base truncate and very briefly decurrent, apex acute to acuminate, individual pinnae 1—10 cm wide, frequently perforated basally adjacent to the midrib, thus appearing stilted; *midrib* very prominently raised abaxially, slightly sunken adaxially; *primary venation* pinnate, raised abaxially, somewhat impressed adaxially, 2—4 primary veins per pinna; *interprimaries* sub-parallel to primaries, slightly raised abaxially, slightly impressed adaxially; *secondary venation* strongly reticulate, slightly raised; *tertiary venation* invisible; *inflorescence* solitary to several together, first inflorescence subtended by a membranous prophyll and one or more cataphylls, these swiftly degrading to netted fibres, subsequent inflorescences subtended by one or more swiftly degrading cataphylls, the whole forming a mass of developing and open inflorescences and developing infructescences partially concealed by persistent netted cataphyll and prophyll remains; *peduncle* slightly laterally compressed to terete, 6—26 x 1—1.5 cm; *spathe* narrowly canoe-shaped, stoutly beaked, 10—30 x 3—5 cm, stiffly fleshy, greenish to dull yellow, gaping wide at female anthesis and then caducous leaving a large straight scar at the base of the spadix; *spadix* cylindrical, sessile, inserted \pm level on peduncle, 9—26 x 1.5—2 cm, dull green to dirty white; *stylar region* rather well developed,

mostly rhombohexagonal, 1.5—2 x c. 2 mm, slightly conical; *stigma* punctiform to slightly elliptic, if the latter then mostly longitudinally orientated, c. 0.3—0.5 x 0.2—0.4 mm; *anthers* barely exerted at male anthesis; *infructescence* 14—27 x 3—3.5 cm, dark green ripening to dull orange, stylar tissue abscising to reveal orange ovary cavity pulp.

Distribution: Widespread in south tropical Asia from Sumatera and southern Thailand to Borneo and the Philippines eastwards through the tropical western Pacific.

Habitat: Disturbed lowland, lower and upper hill forest primary, riverine or secondary forest, on basalt, granite, clay and coralline limestone. 10–800 m altitude.

Notes: 1. *Rhaphidophora korthalsii* is a very widespread and variable species, with an extensive synonymy. However, as with *Epipremnum pinnatum* (L.) Engl. (Boyce, 1998) there are several geographical elements that, given more intensive study, might warrant formal taxonomic recognition. Unfortunately, current herbarium material is inadequate to confirm these plants' status and more field observations are needed.

2. Sterile herbarium material lacking the pre-adult stage may prove difficult to distinguish from the *Epipremnum pinnatum*. Mature leaves of 'typical' *E. pinnatum* never have more than one primary lateral vein per pinna and the stems of *R. korthalsii* lack the prominent irregular whitish longitudinal crests and older stems the distinctive matt to sublustrous pale brown papery epidermis typical of *E. pinnatum*. The feeding roots of *R. korthalsii* are prominently scaly while those of *E. pinnatum* are lenticellate-corky. The pre-adult stage of *R. korthalsii* is a shingle climber with oblong-elliptic to ovate slightly falcate upwards pointing leaves overlapping in the manner of roof tiles and with c. 3 prominent veins per side, running from near the base of the leaf to the upper margin or tip and crossing over the minor venation,.

3. Fertile material of *R. korthalsii* and *E. pinnatum* is readily separated by the shape of the style apex (round v. trapezoid) and the shape and orientation of the stigma (\pm punctiform and circumferential v. strongly linear and longitudinal) and, if fruits are mature, by seed characters. The fruits of *R. korthalsii* each contains many small ellipsoid seeds with a brittle, smooth testa whereas *E. pinnatum* has fruits with two large, strongly curved seeds with a bony and ornamented testa.



Figure 17. *Rhaphidophora korthalsii* Schott

A. pre-adult shoot x $\frac{1}{4}$; B. pre-adult shingling shoot x $\frac{1}{4}$. A from *Boyce 679*; B from *Nicolson 1712*.

4. Confusion is possible between *R. korthalsii* and *Amydrium zippelianum* (Schott) Nicolson although there is a suite of characters that distinguish them. The leaflet tips of the *Amydrium* species are acute to acuminate, those of *R. korthalsii* are truncate, the petiolar sheath in *R. korthalsii* extends to the apical geniculum while in *Amydrium* the sheath only reaches to the top of the basal geniculum, the remainder of the petiole being terete with two sharply defined low keels running its length to merge with the base of the leaf lamina. The feeding roots of *R. korthalsii* are prominently scaly while those of *A. zippelianum* are smooth. Fruiting material of *R. korthalsii* has the styler region abscising to reveal a pulp cavity with numerous, small, ellipsoid seeds whereas *A. zippelianum* has one or two large reniform to ovoid seeds in each indehiscent fruits.

Other specimens seen: INDONESIA PAPUA. Kepala Burung Prov.: surroundings of Ayawasi, Ave 4330 (BO, L); Manokwari Prov.: Pungunungan Maoke (Nassua Mts), *Docters van Leeuwen 10750* (BO); Wariori River, river valley west of camp between Wariori and Mangopi rivers, c. 11 km inland, *Johns 8197* (BO, K, MAN); Fanindi, 1 km west of Manokwari, *Nicolson 1573* (B, K, L, P, US); Arfak Mountains, Mupi Dessa, trail from Mupi village to G. Humibou, near S. Mupi, c. 3 km from Kali Umera, between Kali Ureda and the confluence of Kali Ngwes and S. Mupi, *Sands 6846* (K); Mimika Prov.: Freeport Concession Area, along road from bridge to Kuala Kenchana, along track near left turn by river, *Barker 145* (BO, K, MAN); Kali Kopi, between Kali Kopi levee and the Kopi River, *Johns 9796* (BO, K, MAN); Lorentz River, near Bivak Island *Pulle 66* (L); Beaufort (Van der Sande) River *Pulle 353* (K, L); Biak Island, hill northeast of Mokmer airport, *Nicolson 1567* (B, K, L, US). PAPUA NEW GUINEA. East Sepik Prov.: vicinity of Wewak, along trail beyond Boys Town (Reform School operated by S.V.D. Missionaries), *Croat 52763* (MO); Lordberg, *Ledermann 10319* (B spirit); Malu, *Ledermann 10826* (B spirit); Central Prov.: Port Moresby, northeast of Manumu village, *Isles & Vinas NGF 33829* (US), *Isles & Vinas NGF 34488* (L); Manus Prov.: Manus, 1 km SW of Kabuli village on south coast in western Manus, *Sands 2779* (K); Western Prov., Kiunga, *Streimann & Womersley LAE 51847* (L, US); Morobe Prov.: vicinity of Lae, along logging road to Busu River, from 3.8 km E of Igam road and Military Base to c. 6 km up the road junction, *Croat 52792* (MO), *Croat 52793* (MO); c. 20 km SE of Lae, along logging road to Busu River (left off Igam road past Military Reserve), *Croat 52800* (MO); Along Busu River, 22.6 km by road SE of Lae (via road past PNG University of Technology and Igam road past Army Base), beginning 3.8 km from asphalt at Army Base, *Croat 52840* (MO); Lae B.G. *Croat 52849* (MO); Bumbu logging area, 7 miles north of Lae, *Nicolson 1385* (L, US); Oomsis Creek, 20 miles from Lae on Bulolo road, *Nicolson 1483* (B, K, L, P, US); Madang Prov.: no further data, *Ledermann 6641* (B spirit); Lower Ramu-Atitau area, SE of Aiome Patrol Post, along Apenam track, east side of Tiganants River (Ioka Creek), *Pullen 949* (CANB, L); North Solomons Prov.: Bougainville, McKillip's Arawa Plantation, 6 miles west of Kieta, *Nicolson 1520* (B, K, L, US); West New Britain Prov.: Kandrian, along road to airport, *Nicolson 1542* (B, K, L, US); East New Britain Prov.: Kareeba road, 2 miles west of Kerevat, *Nicolson 1498*, (B, K, L, P, US). FEDERATED STATES OF MICRONESIA. Chuuk (Truk), Toi Island, Suiyota, *Takamatsu 40* (K, L); Winipwoot, *C.C.Y. Wong 278* (GH, US). SOLOMON ISLANDS. Rennell Island: *Dissing 2776* (K); Kolombangara: 2 miles NNW of Kuzi village, *Hunt RSS 2398* (K, US); San Cristobal: Ridge between Warahito and Pegato river, *Whitmore 6204* (K, L, US). VANUATU. Erromango: Poututu, *Bourdy 228* (P);

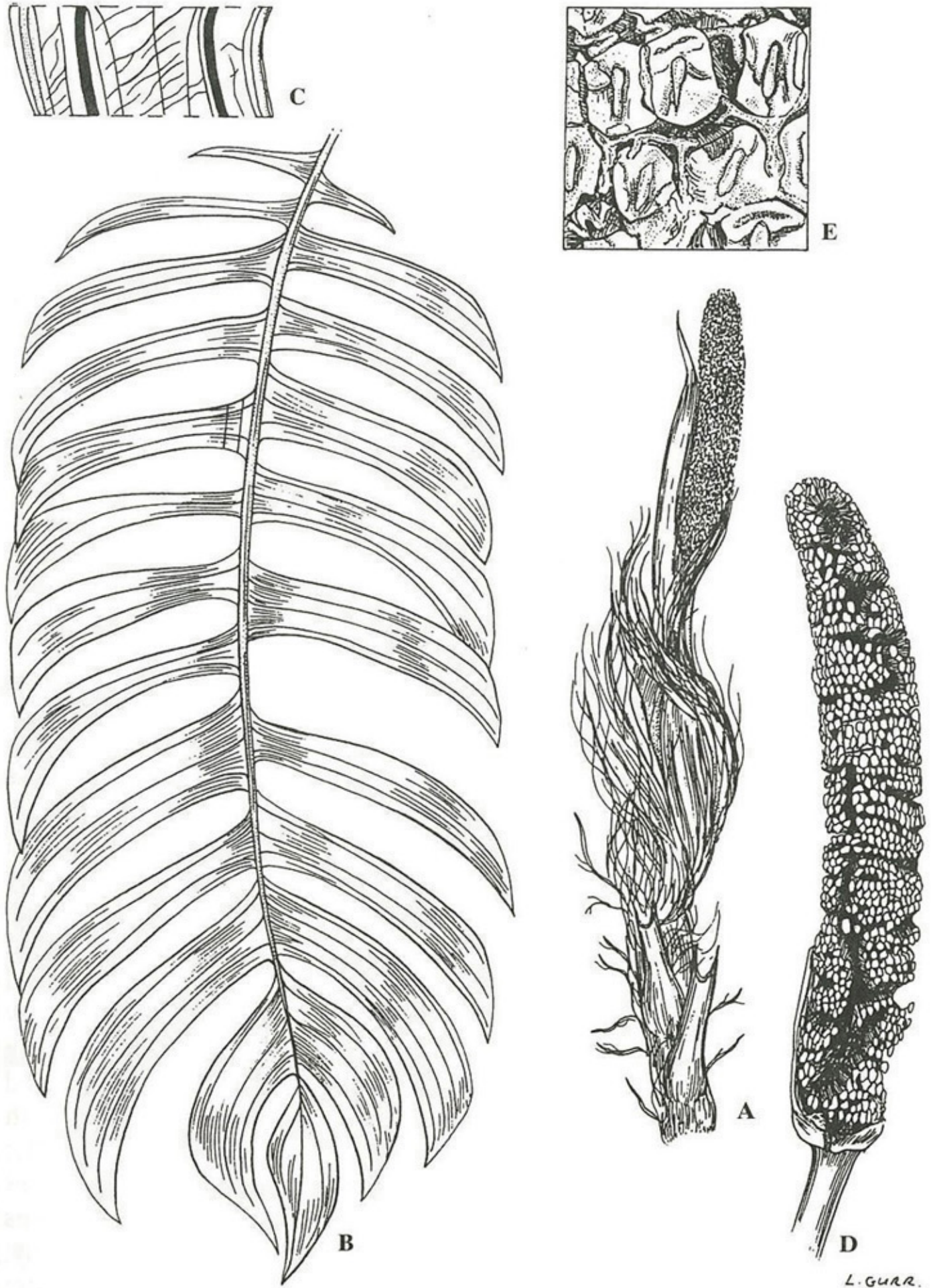


Figure 18. *Rhaphidophora korthalsii* Schott

A. flowering shoot, leaves removed x $\frac{1}{2}$; B. leaf lamina x $\frac{1}{4}$; C. venation detail x 2; D. inflorescence, spathe removed x 1; E. spadix detail, post floral x 8. All from *Kerr 15051*.

L. GARR.

Ipota, Bourdy 244 (K, P); Portnarvin, Rautop, Cabalion 2370 (P); vicinity of Nouankao Camp, Green RSNH 1267 (K); Forestry route, km 16.5, Raynal RSNH 16222 (K); Espiritu Santo: Bank of Achone River, opposite side from Casevaia village, Curry 939 (K); Kuvutant, Ludvigson 20 (L); Anatom (Aneityum): Anelgauhat Bay, Kajewski 830 (K, P), Morrison s.n. (K).

17. *Rhaphidophora microspadix* K. Krause

Rhaphidophora microspadix K. Krause, Bot. Jahrb. Syst. 49 (1912) 92. — Type: Papua New Guinea ('Kaiser Wilhelmsland'), Madang Prov., Bismarck Range, 11 Nov. 1908, Schlechter 18678 (B, holo).

Rhaphidophora nutans Ridl., Trans. Linn. Soc. Lond. 9 (1916) 239, **synon. nov.** — Type: Indonesian Papua, Mimika Prov., Puncak Jaya (Mt. Carstensz), Camp 6a, 16 Jan. 1913, Boden Kloss s.n. (BM, holo; K iso).

Figure 19

Small, very slender, leptocaul, homeophyllous (?) liane to unknown ultimate height; *seedling* and *pre-adult plants* not observed; *adult shoots* comprised of greatly elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and long, free, sympodial, leafy flowering stems; *stems* smooth, somewhat flexuous, stems terete in cross-section, branching little, growing to considerable lengths and pendent with flowering tips upturned, without prophyll, cataphyll and petiolar sheath fibre, internodes to 4 x c. 0.2 cm, separated by weak slightly oblique leaf scars, older stems woody; *flagellate foraging stems* absent; *clasp ing roots* arising singly from each node; *feeding roots* not observed; *leaves* weakly distichous and sparsely arranged; *cataphylls* and *prophylls* membranous, caducous; *petiole* deeply grooved adaxially, 2—5 x 0.15—0.25 cm, smooth, with a slight apical and basal geniculum; *petiolar sheath* slightly prominent, extending to the apical geniculum, caducous in strips leaving a slender scar; *lamina* entire, narrowly lanceolate to lanceolate falcate, 4—19 x 1—3 cm, thinly coriaceous, drying adaxially dull mid-brown, abaxially paler brown with dense, well-defined to somewhat obscure tannin cells, base cuneate, apex long-acuminate with a slender prominent tubule; *midrib* slightly raised abaxially and adaxially; *primary venation* pinnate, very slightly raised on both surfaces; *interprimaries* sub-parallel to, but much less distinctive than, primaries, sometimes degrading into weakly reticulate venation, very slightly raised abaxially; *secondary venation* ± invisible in dried specimens, parallel-reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and a caducous cataphyll; *peduncle* compressed-terete, 3—7.3 x 0.2—0.25 cm; *spathe* ovoid-ellipsoid, stoutly long-beaked and tipped with a fine tubule,



Figure 19. *Rhaphidophora microspadix* K. Krause

A. flowering shoot x $\frac{1}{2}$; B. leaf lamina x $1\frac{1}{2}$; C. venation detail x 6; D. inflorescence, spathe fallen x 4. All from *Boden Kloss s.n.*

2.5—3 x 0.7—0.9 cm, marcescent until early fruiting, then falling leaving a large, oblique scar; *spadix* ovoid-globose to ovoid-cylindrical, sessile, inserted slightly obliquely on peduncle, 1—1.5 x 0.5—0.6 cm; *stylar region* rhombohexagonal, 1.4—2 x c. 2 mm, truncate; *stigma* punctiform, c. 0.4 mm diam., prominent in dried material; *anthers* well-exserted at male anthesis; *infructescence* ovoid-globose, c. 1.2—2.5 x 1—1.5 cm.

Distribution: Indonesian Papua (Mimika Prov.), Papua New Guinea (Madang and Morobe Provinces).

Habitat: Lower montane forest. 945–1700 m altitude.

Notes: 1. The type specimen of *Rhaphidophora microspadix* has the abaxial leaf lamina with dense conspicuous tannin cells visible to the naked eye. These cells are also present on the type of *R. nutans*, but much less clearly visible (x10 lens is required).

2. *Rhaphidophora microspadix* appears to be allied to *R. neoguineense*, differing in the much narrower leaf lamina with a long acuminate tip and in flowering habitually on long, pendent shoots.

Other specimens seen: PAPUA NEW GUINEA. Morobe Prov.: Matap, Clemens 11151, 41197 (GH); Gumi Divide, 25 km west of Bulolo, Kairo 757 (L, LAE).

18. *Rhaphidophora mima* P.C. Boyce, *sp. nov.*

Rhaphidophora mima multum cum *R. neoguineensi* (non in Insulas Solomonenses inventa) persimili confusa est, quamquam ab ea spatha fusiformi caduca atque spadice cylindrica (spatha globosa marcescensque et spadix globoso-ellipsoideus in *R. neoguineensi*) prompte distinguitur. — TYPUS: Solomon Islands, Guadalcanal, Wanderer Bay area, 23 Oct. 1968, Mauriasi et al. BSIP 12268 (SING, holo; BSIP, K, iso).

Figure 20

Slender, leptocaul, homeophyllous liane to 4 m; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* not fully observed but seemingly comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and slightly lengthened mostly unbranched, free, leafy, flowering stems; *stems* smooth, flexuous, climbing stems \pm terete, occasionally weakly angled, free stems terete, to similarly sulcate, without prophyll, cataphyll and petiolar sheath fibre, internodes 0.3—5 x 0.2—0.3 cm on free shoots, flowering shoots with shorter internodes, separated by

weak straight leaf scars, older stems woody; *flagellate foraging stems* not observed; *clasping roots* and *feeding roots* not observed; *leaves* spirodistichous, slightly scattered; *cataphylls* and *prophylls* membranous, caducous; *petiole* grooved adaxially, 1.5—5 x 0.1—0.18 cm, smooth, with a slight apical and basal geniculum; *petiolar sheath* slightly prominent, extending beyond the apical geniculum by two ligules, caducous leaving a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, elliptic to elliptic-lanceolate or oblanceolate, slightly falcate, 5—16 x 2.2—7 cm, thinly coriaceous, base cuneate subovate or minutely cordate, apex acute to briefly acuminate, with a small tubule; *midrib* raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised on both surfaces in dried material; *interprimaries* reticulate to sub-parallel to, but much less distinctive than, primaries, degrading into weakly reticulate venation, very slightly raised abaxially; *secondary* and *tertiary venation* reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and a caducous cataphyll; *peduncle* slightly compressed-terete, 1—3 x 0.2—0.3 cm; *spathe* cigar-shaped, apex beaked, 1—4.5 x 0.7—1.2 cm, fleshy, yellow-green to yellow-cream, caducous leaving a large scar; *spadix* cylindrical, sessile, inserted level on peduncle, 1.5—2.5 x 0.5—0.8 cm, obtuse, white; *stylar region* rounded-rhombohexagonal, 0.9—1 x 0.85—1.1 mm, truncate; *stigma* punctiform, c. 0.3 mm diam., slightly prominent in dried material; *anthers* not exerted at male anthesis; *infructescence* not observed.

Distribution: Papua New Guinea (Bougainville, Manus), Solomon Islands (Fauore, Guadalcanal, Kolombangara, Malaita, San Jorge, Small Malaita).

Habitat: Well-drained primary and secondary forest on flat and hilly terrain, occasionally in lowland swamp forest. 3–1000 m altitude.

Notes: 1. In herbaria *Rhaphidophora mima* is much confused with the very similar *R. neoguineensis* (absent from the Solomon Islands) although it is readily distinguished by a caducous, cigar-shaped spathe and cylindrical spadix (spathe globose and marcescent, spadix globose-ellipsoid in *R. neoguineensis*).

2. The specific epithet is the adjectival form of *mimus*, from the Greek, *mimos*, actor, in allusion to the confusing similarity of this species to *Rhaphidophora neoguineensis*.

3. The Manus collection (Foreman & Katik LAE 59291A), while outside the main geographical range of the species, is undoubtedly *R. mima*.

Other specimens seen: PAPUA NEW GUINEA. Manus Prov.: Manus, near Pelikawa, Foreman & Katik LAE 59291A (L, US); North Solomons Prov.: Bougainville, Sulka wide bay, Bateson 89, 91, 92, 93 (K); Buin, Kugumaru, Kajewski 1891 (BM, GH, K, SING); Koniguri, Kajewski 2162 (GH, P); Pavairi, Lavarack & Lavarack NGF 31091 (K, L, US); McKillup's Arawa Plantation, 6 miles west of Kieta, Nicolson 1516 (US), Nicolson 1522 (B, K, L, US); vicinity of Aku village, c. 10 miles west of Buin, Schodde 4070 (BRI, CANB, GH, K, L, LAE, US); Siwai, Waterhouse 207 (GH, K), Waterhouse 778 (K). SOLOMON ISLANDS. Malaita: SW Malaita, Wairokai River area, Gafui et al. BSIP 10215 (BSIP, K, SING); Su'u area, Mauriasi et al. BSIP 13632 (BSIP, L, SING); Tantalau - Kwalo trail, near Kwalo, Stone 2366 (BISH, K, US); Small Malaita: Palasu'u, east of Rota School, Gafui BSIP 17296 (BSIP, K, SING); San Jorge: Talise village, Hunt RSS 2722 (K, US); Kolombangara: Ridge west of Vila river, Mauriasi et al. BSIP 8429 (BSIP, K, SING); Fauore: Halluma River, Mauriasi et al. BSIP 13977 (BSIP, K, L, SING).

19. *Rhaphidophora neoguineensis* Engl.

Rhaphidophora neoguineensis Engl. in K. Schum. & Hollrung, Fl. Kais. Wilh. Land (1889) 19 ('*neo-guineensis*'); K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 20—21, Fig. 3 ('*novo-guineensis*'); Engl. & K. Krause, Nova Guinea 8 (1912) 805; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 386 ('*novo-guineensis*'); Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 337—338 ('*novo-guineensis*'); K. Krause & Alderw., Nova Guinea 14 (1924) 212 ('*novo-guineensis*'). — Type: Papua New Guinea ('Kaiser Wilhelmsland'), Madang Prov., Adelbert Range, near Hatzfeldthafen, Oct. 1886, Hollrung 372 (B, holo).

Figure 21

Slender, leptocaul, homeophyllous liane to 5 m; *seedling* not observed; *pre-adult plants* forming small terrestrial colonies; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and very short to somewhat lengthened mostly unbranched, free, sympodial, leafy, flowering stems; *stems* smooth, flexuous, climbing stems \pm terete, occasionally weakly sulcate on two opposing sides, free stems terete, to similarly sulcate, without prophyll, cataphyll and petiolar sheath fibre, internodes 1—9 x 0.2—0.6 cm on clinging and free shoots, flowering shoots with shorter internodes, separated by weak straight leaf scars, occasionally disarticulating into 2—4 internode lengths and these later rooting and forming independent plants, older stems woody; *flagellate foraging stems* frequent, terete in cross-section with reduced leaves basally, terminal portion with caducous cataphylls; *clasp ing roots* arising sparsely from the clinging stems, very slightly pubescent; *feeding roots* solitary from



Figure 20. Rhaphidophora mimia P.C. Boyce

A. flowering branch, spathe intact x $\frac{1}{3}$; B. flowering branch, spathe fallen, x 2; C. inflorescence, spathe fallen, x 2; D. spadix detail, post-anthesis x 4. A from *Kajewski 1891*; B from *Foreman & Katik LAE 59291A*; C-D from *Nicolson 1522*.

nodes, clinging to climbing surface; *leaves* weakly spiro-distichous, moderately densely arranged; *cataphylls* and *prophylls* membranous, caducous; *petiole* grooved adaxially, 3—12 x 0.1—0.2 cm, smooth, with a slight apical and basal geniculum, although older leaves often with genicula enlarged and cracking-corky; *petiolar sheath* slightly prominent, extending beyond the apical geniculum by two ligules, caducous leaving a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, elliptic to elliptic-lanceolate or oblanceolate, 6—25 x 2—9 cm, thinly coriaceous to submembranous, base cuneate to acute or subovate, apex acute to weakly acuminate, with a minute tubule; *midrib* raised abaxially, slightly sunken adaxially in fresh material, slightly sunken abaxially and adaxially in dry material; *primary venation* pinnate, slightly raised on both surfaces in dried material; *interprimaries* reticulate to sub-parallel to, but much less distinctive than, primaries, degrading into weakly reticulate venation, very slightly raised abaxially; *secondary* and *tertiary venation* reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and a caducous cataphyll; *peduncle* slightly compressed-terete, 1.3—2.5 x 0.15—0.3 cm; *spathe* globose to ovoid-ellipsoid, truncate basally at insertion on petiole, apex briefly beaked, 1—2 x 1—2.5 cm, thick fleshy, dark yellow, marcescent, drying brown, later pushed off by developing infructescence leaving a large scar; *spadix* globose to ellipsoid-cylindrical, sessile, inserted level on peduncle, 1—1.5 x 0.7—1 cm, obtuse, yellow-white; *stylar region* rounded-rhombohedral, 0.9—1.5 x 0.85—1.2 mm, truncate; *stigma* punctiform to very slightly elliptic, c. 0.45 x 0.3 mm diam., prominent in dried material; *anthers* well-exserted at male anthesis; *infructescence* not observed.

Distribution: New Guinea. Widespread but, by the exclusion of many collections here recognized as new species, not as common as was once thought.

Habitat: Primary to disturbed secondary lowland, gallery and hill monsoon and rain forest on various substrates including coralline limestone. 3–700 m altitude.

Note: *Rhaphidophora neoguineensis* is characterized by a small (1—2 x 1—2.5 cm), marcescent, globose spathe and ellipsoid-cylindrical spadix. In herbaria it is much confused with *R. mima* but which is readily separated by the cigar-shaped, caducous spathe and cylindrical spadix. Confusion with *R. schlechteri* is also possible, although this has a larger spathe (4—6 x c. 2.4 cm) and a stipitate spadix.

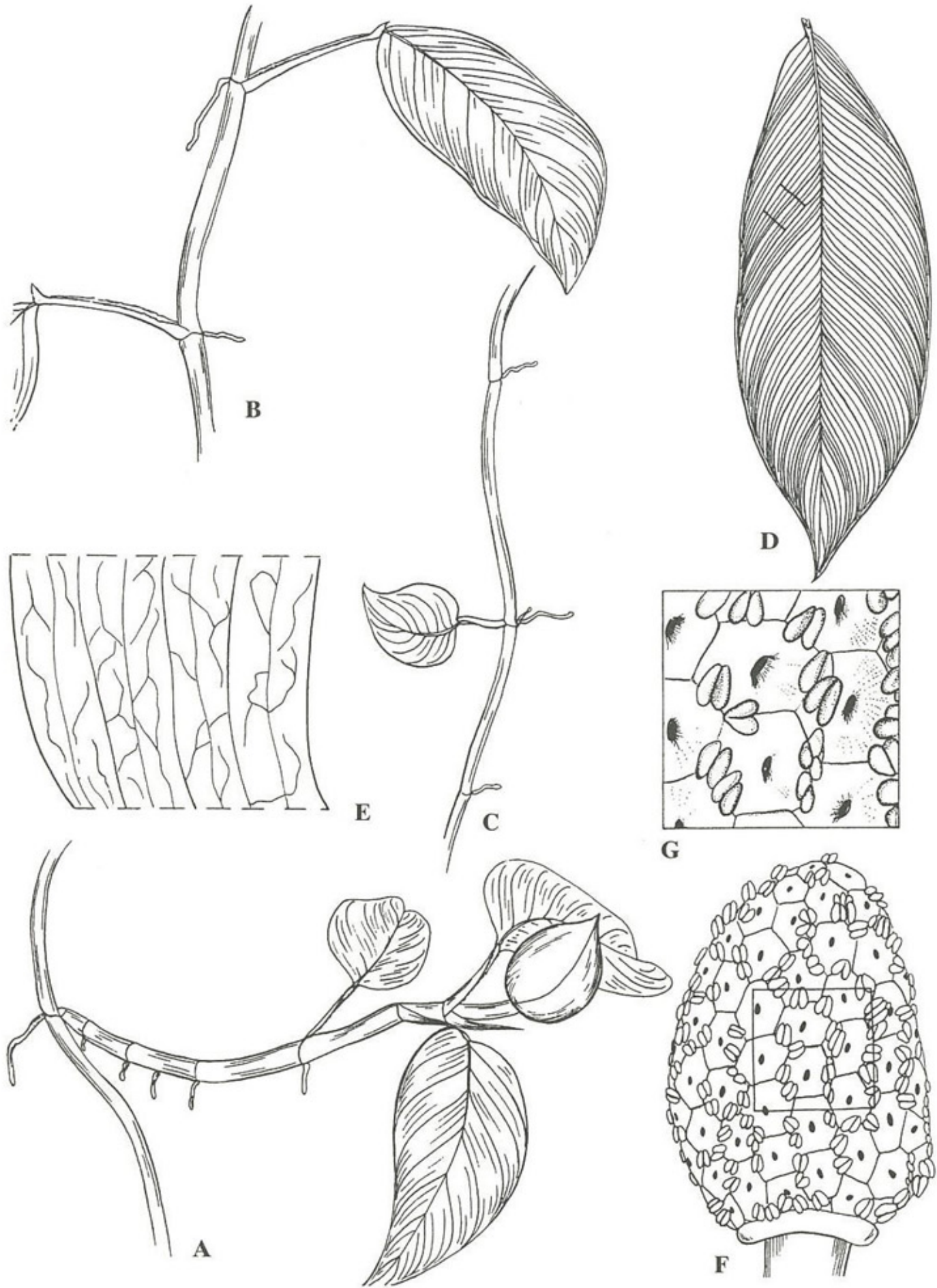


Figure 21. *Rhaphidophora neoguineensis* Engl.

A. adult shoot with flowering branch $\times \frac{3}{4}$; B. adult clinging shoot $\times \frac{1}{3}$; C. flagellate shoot $\times \frac{1}{2}$; D. leaf lamina $\times \frac{1}{3}$; E. venation detail $\times 3$; F. inflorescence, spathe removed $\times 4$; G. spadix detail, male anthesis $\times 6$. A-C, F-G from *Hay K2* [cult. Kew (Acc. no. 1982-5010) & K spirit no. 58061] $\times \frac{1}{3}$; D-E from *Nicolson 1402*.

Other specimens seen: INDONESIA PAPUA. Bonggo Range, Mamberamo, Pionierbivak, Lam 763 (L). Jayapura Prov.: Taritatau (Idenburgh) River, Bernhard Bivak, Meyer Drees 279 (L); Biak, hill northeast end of Mokmer airport, Nicolson 1565 (L, US). PAPUA NEW GUINEA. East Sepik Prov.: Wewak, 2 miles west of But village, Essig & Martin LAE 55124 (L, LAE); West Sepik Prov.: Vanimo, Wutung, on Papua New Guinea/Indonesian Papua border, Streimann LAE 52789 (LAE, US); Sepik Prov.: Sepik River, Gjellerup 330 (L); Kelel, Schlechter 16329 (P); Keneyia, Schlechter 18298 (P); Western Highlands Prov.: Mt Hagan, near Ruti E.L.G., Henty & Streimann NGF 38835 (US); Morobe Prov.: Lae, Markham Bridge, Kairo & Streimann NGF 30715 (GH, K, L, SING, US); Lae B.G., Millar NGF 9938 (GH, K, L), Nicolson 1402 (B, BM, K, L, P, SING, US); Near Markham River, 9 miles southwest of Lae on Bulolo road, Nicolson 1480 (US); Central Prov.: Port Moresby, Brown River F.R., 20-25 miles northwest of Port Moresby, Nicolson 1427 (US).

20. *Rhaphidophora okapensis* P.C. Boyce & Bogner

Rhaphidophora okapensis P.C. Boyce & Bogner, Gard. Bull. Singapore 52 (2000) 94, fig.2. — Type: Papua New Guinea, Eastern Highlands, 5 miles NE of Okapa, 24 Sept. 1964, Hartley TGH 13098 (CANB, holo; GH, K, L, iso).

Figure 22

Moderate, slightly robust, semi-leptocaul, homeophyllous neotenic liane to unknown ultimate height; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* comprised of clinging, physiognomically unbranched, densely leafy, sterile stems, and clinging, leafy flowering stems; *stems* terete in cross-section, smooth, without prophyll, cataphyll and petiolar sheath remains, internodes to 5 x 0.75 cm, separated by slightly swollen nodes with \pm sloping scars, older stems sub-woody; *flagellate foraging stems* not observed; *clasping roots* arising sparsely from the internodes, smooth to very slightly pubescent; *feeding roots* not observed; *leaves* distichous, those on adherent shoots weakly shingling to slightly scattered, those on free shoots pendent to slightly spreading; *cataphylls* and *prophylls* membranous, caducous; *petiole* shallowly and broadly grooved, 1–4 x 0.1–0.2 cm, smooth, apical and basal genicula quite prominent; *petiolar sheath* prominent, membranous, ligulate, ligule extending c. 1.5 cm beyond apical geniculum, soon drying and adhering to stem, later disintegrating and falling; *lamina* ovate, adaxially mid-green, abaxially paler, very stiffly coriaceous, 2.5–8.5 x 0.9–4 cm, base cordate to rounded and slightly notched, apex long acuminate with a pronounced tubule; *midrib* proximally raised abaxially, slightly impressed adaxially; *primary venation* pinnate, slightly raised on both leaf surfaces; *interprimaries* sub-parallel to and barely distinguishable from primaries, slightly raised on both leaf surfaces; *secondary venation* reticulate, slightly raised abaxially and adaxially;



Figure 22. *Rhaphidophora okapensis* P.C. Boyce & J. Bogner

A. adult shoot with flowering branch x $\frac{3}{4}$; B. leaf lamina x 1; C. venation detail x 4; D. inflorescence x $\frac{1}{2}$; E. spadix detail at male anthesis x 10; F. pistil, side view x 10. All from Hartley 13098.

inflorescence solitary on short leafy shoots, subtended by a fully developed or reduced foliage leaf, and a soon-degrading, membranous, long-ligulate prophyll; *peduncle* terete, 4–6 x 0.15–0.2 cm; *spathe* broadly canoe-shaped, rounded, minutely apiculate, 3–3.5 x 1.2–1.5 cm, stiffly fleshy, yellow, turning purple, (early marcescent?) leaving a large scar at the base of the spadix; *spadix* stout, cigar-shaped, stipitate, inserted level on stipe, 1.9–2.2 x 0.75–1 cm; *stipe* 4–4.5 x 1–1.2 mm; *stylar* region conical, regularly rhombohexagonal in plan view, 0.8–1 x c. 1 mm; *stigma* slightly raised, punctiform, c. 0.4 mm diam.; *anthers* exerted at male anthesis; *infructescence* not seen.

Distribution: Papua New Guinea (Eastern Highlands and Central Provinces).

Habitat: Disturbed mixed forest on slope. 1200–1600 m altitude.

Note: A very distinctive species notable for the stiffly erect, densely leafy stems, the thickly coriaceous, ovate-cordate leaves with a long acuminate tip, the relatively large inflorescences turning purple at maturity, the long-stipitate spadix, and the conical stigmatic region.

Other specimens seen: PAPUA NEW GUINEA. Central Prov.: Boridi, Carr 14863 (BM, L, SING); Eastern Highlands Prov.: Kainantu, Arau-Andandara road, Streiman NGF 23963 (US).

21. *Rhaphidophora pachyphylla* K. Krause

Rhaphidophora pachyphylla K. Krause, Bot. Jahrb. Syst. 49 (1912) 92; P.C. Boyce & Bogner, Gard. Bull. Singapore 52 (2000) 94, fig.2. — Type: Papua New Guinea, Madang Prov., near Wabbe, 29 Aug. 1907, Schlechter 16463 (B, holo; P, iso).

Figure 23

Moderate to rather large, somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 5 m; *seedling stage* a non-skototropic shingling juvenile shoot; *pre-adult plants* forming small terrestrial colonies; *adult shoot architecture* comprised of clinging, physiognomically unbranched, mostly densely leafy, sterile stems and free, leafy flowering stems; *stems* rectangular-terete in cross-section, widest side prominently convex, smooth, mid-green, without prophyll, cataphyll and petiolar sheath fibre although flowering shoots occasionally with parchment-like remains, internodes to 3 x 1 cm,

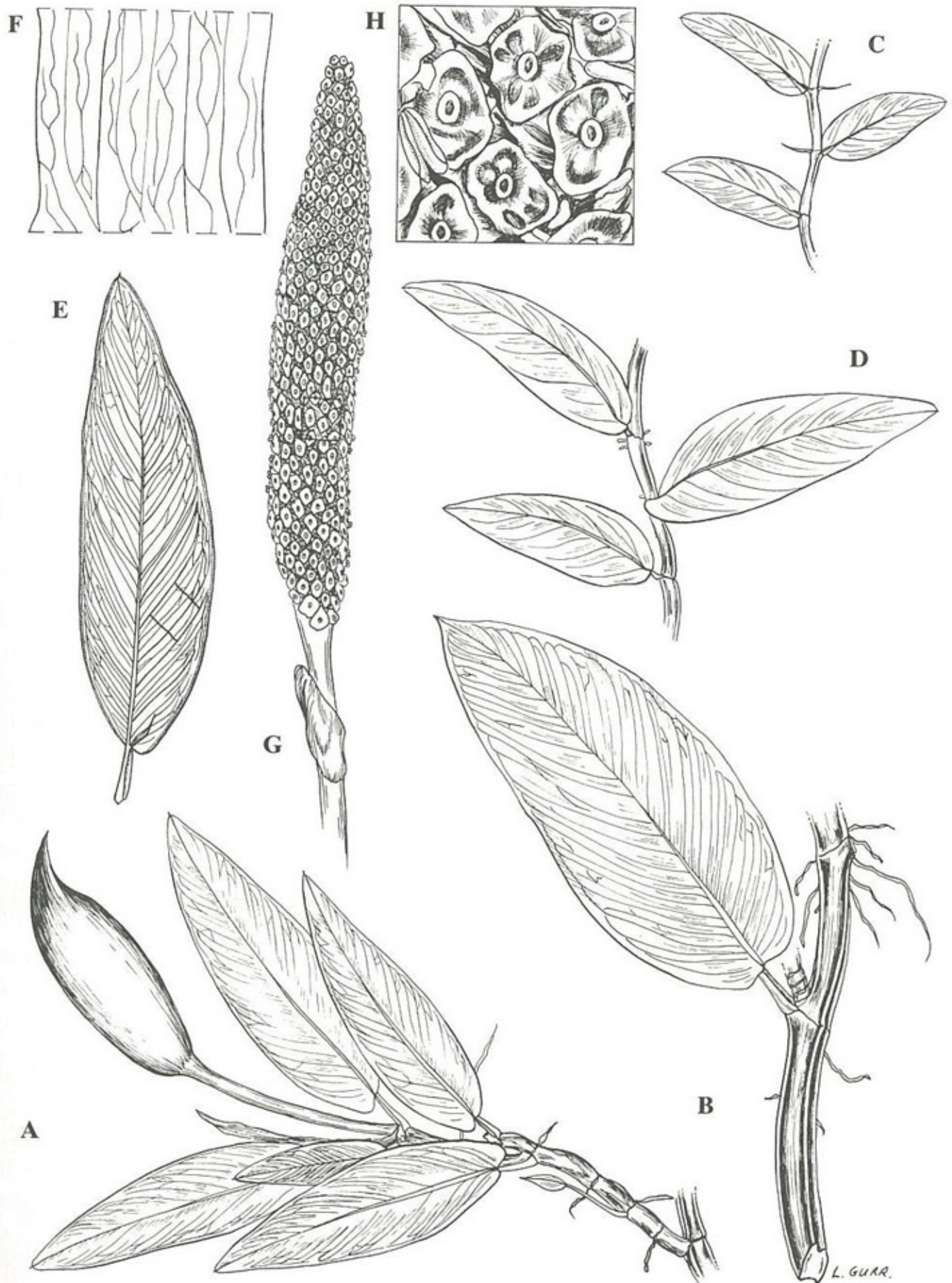


Figure 23. *Rhaphidophora pachyphylla* K. Krause

A. adult shoot with flowering branch x $\frac{1}{2}$; B. section of adult climbing shoot x $\frac{1}{2}$; leaf lamina x $\frac{1}{2}$; C. juvenile climbing shoot x $\frac{1}{3}$; D. pre-adult climbing shoot x $\frac{3}{4}$; E. leaf lamina x $\frac{3}{4}$; F. venation detail x 4; G. inflorescence, spathe fallen x $1\frac{1}{2}$; H. spadix detail, post-male anthesis x 10. A, E – F from *Krause 108*; B from *Kalkman 3389*; C–D from *Nicolson 1416*; G–H from *Schlechter 16436*.

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separated by rather prominent \pm straight scars, older stems sub-woody; *flagellate foraging stems* absent; *clasping roots* arising sparsely from the internodes, pubescent; *feeding roots* not observed; *leaves* distichous, those on adherent shoots shingling, those on free shoots slightly spreading, all densely arranged; *cataphylls* and *prophylls* membranous, caducous; *petiole* deeply grooved, 1.5—4 x 0.15—0.2 cm, smooth, apical and basal genicula quite prominent; *petiolar sheath* prominent, membranous, ligulate, slightly unequal on one side, of short-duration, degrading to very weak fibres and soon falling; *lamina* narrowly ovate-elliptic, stiffly coriaceous, base acute to cuneate, apex acute with a short tubule; *midrib* prominently raised abaxially, slightly impressed adaxially; *primary venation* pinnate, slightly raised abaxially, somewhat impressed adaxially; *interprimaries* sub-parallel to primaries, slightly raised on both leaf surfaces; *secondary venation* weakly reticulate, slightly raised abaxially, \pm flush adaxially; *inflorescence* solitary on short to somewhat elongated leafy shoots, subtended by a fully developed foliage leaf, and soon-degrading membranous prophyll; *peduncle* terete, 4—7 x 0.2—0.25 cm; *spathe* broadly canoe-shaped, obtuse to slightly pointed, 5—6.5 x 1.5—2.2 cm, stiffly fleshy, yellow, gaping at female anthesis and then caducous leaving a large scar at the base of the spadix; *spadix* narrowly cigar-shaped, long stipitate, inserted obliquely on stipe, 4—5.5 x 1.2—1.6 cm, yellow; *stipe* 6—10 x 2—2.4 mm; *stylar* region weakly developed, mostly irregularly rhombohexagonal, 1—1.2 x 1—1.4 mm, truncate; *stigma* slightly raised, punctiform, c. 0.2—0.3 x 0.3—0.35 mm; *anthers* slightly exerted at male anthesis; *infructescence* not seen.

Distribution: Indonesian Papua, Papua New Guinea. The scattered localities and few collections suggest a widespread but uncommon species.

Habitat: Lowland monsoon or rain forest at 10–30 m altitude.

Notes: 1. Long confused with *Rhaphidophora hayi*, *R. pachyphylla* differs in leaf shape, and form of the stigma. Additionally, *R. pachyphylla* lacks the disarticulating shoots unique to *R. hayi*, and never has foraging shoots.

2. It is still not fully clear whether *R. pachyphylla* as here defined is a single taxon. Hoogland & Schodde 6943 (Western Highlands Prov., Wabag, near Poio village, west slopes of lower Yaki valley, 6 July 1960, in montane *Nothofagus* forest, 2380 m (BM, GH, L), while vegetatively matching typical *R. pachyphylla*, has a markedly rounded spathe apex, a shorter stipe (c. 3 mm long) and also represents an enormous altitudinal increase on the other specimens seen. More specimens of '*R. pachyphylla*' from higher altitude are required to resolve this plant's status.

Other specimens seen: INDONESIAN PAPUA. Tamimonding, *Kalkman* s.n. (L); Digul Prov.: Merauke, Bis, Agats, *Widjaja* 6344 (BO, K, L). PAPUA NEW GUINEA. Central Prov.: Brown River F.R., 20 - 25 miles northwest of Port Moresby, *Nicolson* 1416 (K, L, US).

22. *Rhaphidophora petrieana* A. Hay

Rhaphidophora petrieana A. Hay, *Telopea* 5 (1993) 295, fig. 1. — Type: Australia, Queensland, National Park Reserve 904, Palmerston Highway, 30 Nov. 1982, *B. Gray* 2862 (QRS, holo).

Rhaphidophora sp. aff. *australasica* (Qld) in Jones & Gray, *Climbing Pl. Australia* (1988) 316, unnumbered plate p. 322.

Figure 24

Medium to large, moderately robust, semi-leptocaul homeophyllous liane to 20 m; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* comprised of greatly elongated, clinging, physiognomically unbranched, sparsely leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* smooth, climbing and free stems terete in cross-section, green, later mid-brown, without prophyll, cataphyll and petiolar sheath fibre, internodes to 2.5—5 x 0.5—1 cm on clinging shoots, usually less stout on free shoots, separated by well defined, slightly oblique, corky leaf scars, older stems subwoody; *flagellate foraging stems* absent; *clasp ing roots* sparse, arising from the nodes of clinging stems, minutely pubescent; *feeding roots* not observed; *leaves* spiro-distichous on clinging shoots, disticho-secund on free shoots; *cataphylls* and *prophylls* membranous, very quickly drying and falling; *petiole* grooved adaxially, 4.5—8 x 0.15—0.3 cm, smooth, apical and basal genicula weakly defined; *petiolar sheath* very prominent, extending to just below apical geniculum, swiftly drying and eventually falling more-or-less entire leaving a conspicuous scar; *lamina* entire, narrowly ovate to lanceolate, somewhat falcate, slightly oblique, 4.5—22.5 x 1—4.5 cm, thinly coriaceous, base acute, apex acuminate, with a tiny tubule; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries and barely less prominent, very slightly raised abaxially and adaxially; *secondary venation* ± obscure in fresh material, visible as a faint reticulum in dried specimens; *inflorescence* solitary, subtended by a partially developed foliage leaf and a membranous cataphyll; *peduncle* compressed-terete, 3—10 x 0.15—0.8 cm; *spathe* canoe-shaped, stoutly short- to rather long-beaked, 6—8 x 1—3 cm (8 cm wide flattened out), thickly stiff-fleshy, creamy yellow, caducous at female

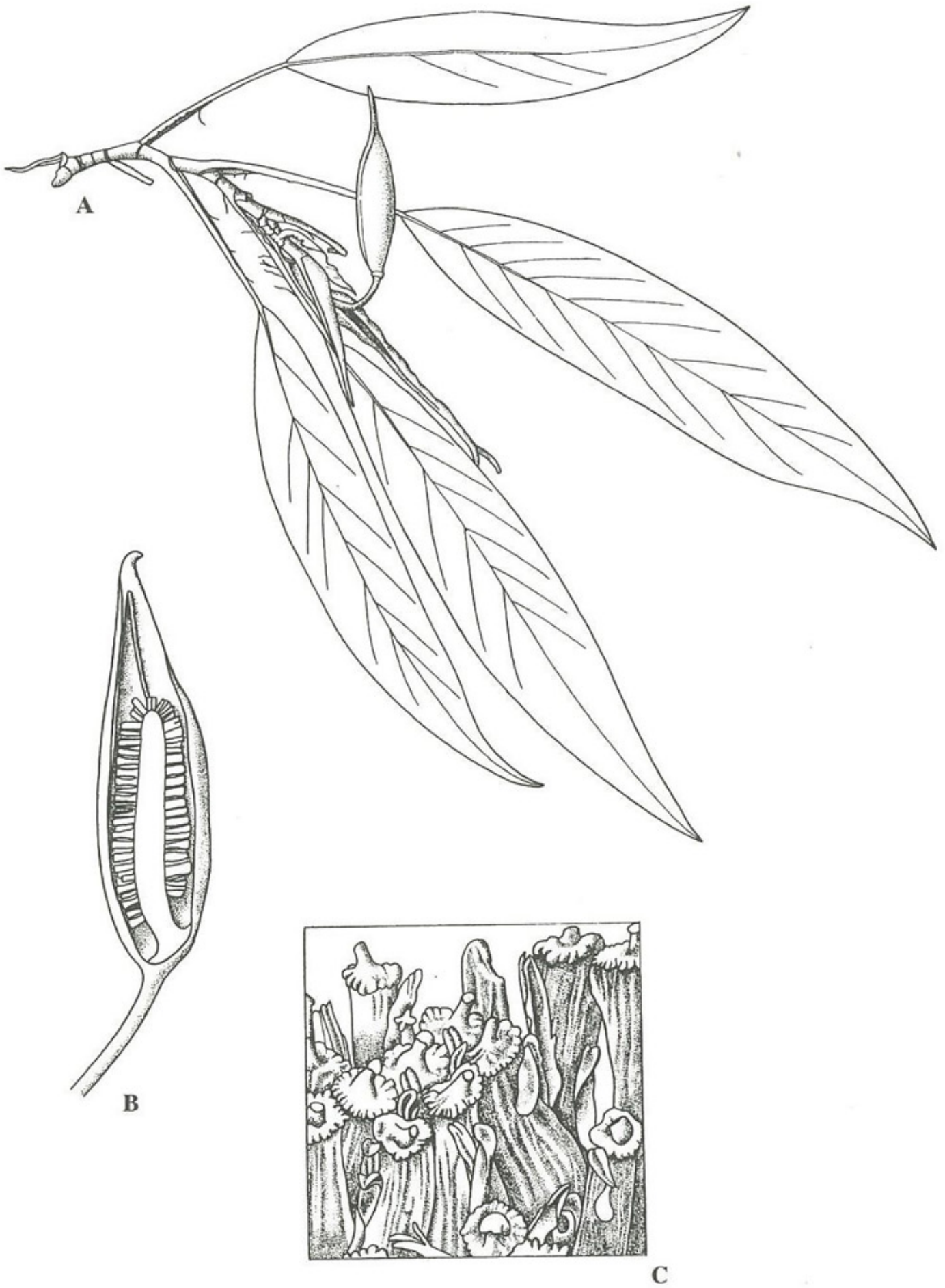


Figure 24. *Rhapsidophora petricana* A. Hay

A. flowering shoot $\times \frac{2}{5}$; B. inflorescence, longitudinal section $\times \frac{2}{3}$; C. spadix detail, male anthesis $\times 6$. All from *Hyland 9162*.

anthesis; *spadix* bluntly tapering-cylindric, stipitate, inserted \pm level on stipe, 3—6 x 1—2.5 cm; *stipe* terete, c. 1 x 0.6 cm; *stylar region* mostly rounded-hexagonal, c. 2 x 1.8—2 mm, conical; *stigma* punctiform and prominently raised, c. 0.25—0.3 mm diam.; *anthers* exerted at male anthesis; *infructescence* not observed.

Distribution: Australia (wet tropical regions of eastern Queensland).

Habitat: Lowland to lower montane rain forest. Sea level to 800 m altitude.

Note: Long confused in herbaria and literature with *Rhaphidophora australasica* but readily distinguished by flowering on free lateral shoots and by the stipitate spadix. Further, in *R. petrieana* the petiolar sheaths fall more-or-less intact and do not degrade into semi-persistent fibres as they do in *R. australasica*.

Other specimens seen: AUSTRALIA. Queensland: Foot of Mt Demi, *Flecker 9005* (QRS); Timber Reserve 55, Whyanbeel, *Gray 202* (QRS); State Forest Reserve 310, Upper Goldsborough Logging Area, *Gray 1055* (QRS); Cooper Creek, *Hind 246* (NSW); State Forest Reserve 755, Barong Logging Area, *Hyland 9162* (BRI, L, NSW, QRS).

23. *Rhaphidophora pilosa* P.C. Boyce, *sp. nov.*

Rhaphidophora pilosa *R. gorokensi* *R. kokodensique* simillima est, ab illa apices surculorum fibrosos (fibram in *R. gorokensi* deest) habenti atque ad hac natura coacta (non simpliciter fibrosa) reliquiarum apicum surculorum differens. Cum *R. waria* eam confundere potest, quamquam illa species magis major est in surculis adhaerentibus non liberis florens. — TYPUS: Indonesian Papua, Kepala Burung Prov., Arfak Mts, Minjambau, 20 May 1962, C. Versteegh BW 12647 (L, holo; MAN, iso).

Figure 25

Small, homeophyllous (?) liane to unknown ultimate height; *seedling stage* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy(?), non-flowering stems and short, free, sympodial, flowering stems; *stems* terete in cross-section, internodes to at least 5 x 0.5 cm, separated by straight oblique, weak leaf scars; *flagellate foraging stems*, unknown; *clasping roots* solitary, stout, arising from nodes; *feeding roots* not observed; *leaves* weakly spiro-distichous on free shoots; *cataphylls* and *prophylls* chartaceous, very soon degrading into weak fibres and patches of soft felt-like debris; *petiole* weakly canaliculate, 4.5—9 x 0.2—0.25 cm, smooth, apical and basal geniculum



Figure 25. *Rhapsidophora pilosa* P.C. Boyce
A. flowering branch, spathe intact x $2/5$; B. flowering branch, spathe fallen x $2/5$; C. spadix detail, post-anthesis x 5. All from *Versteegh BW12647*.

well defined *petiolar sheath* prominent, chartaceous, extending to apical geniculum, very swiftly degrading to weak fibres and strips of soft felt-like debris; *lamina* entire, narrowly lanceolate to narrowly lanceolate-elliptic, occasionally very slightly falcate, 6—18 x 2—3.5 cm, stiffly coriaceous, base rounded to acute, apex long-acuminate with a prominent apicule; *midrib* raised abaxially, slightly flush to very slightly sunken adaxially; *primary venation* densely pinnate, very slightly raised abaxially and adaxially; *interprimaries* parallel to primaries, slightly less pronounced; *secondary venation* very faintly open-reticulate; *inflorescence* solitary, subtended by a foliage leaf and felted debris; *peduncle* stout, compressed-terete, 8—11 x 0.3—0.5 cm; *spathe* canoe-shaped, very long stout-acuminate, 9.5 x c. 1.8 cm, marcescent; *spadix* cigar-shaped, sessile, 5.5 x 1 cm; *stylar region* rhombohexagonal, c. 0.9—1 x 1.2—1.5 mm, truncate; *stigma* punctiform, flush, c. 0.4 mm diam.; *anthers* not exerted at male anthesis; *infructescence* cylindrical, c. 8 x 1.8 cm.

Distribution: Indonesian Papua (Kepala Burung Prov.). Known only from the type.

Habitat: Secondary submontane forest. 1250 m altitude.

Notes: 1. *Rhaphidophora pilosa* is one of several montane species with stiffly coriaceous leaves (Okapensis Group). It is most similar to *R. gorokensis* and *R. kokodensis*, differing from the former in possessing fibrous shoot tips (*R. gorokensis* lacks fibre) and from the latter in the felted (not simply fibrous) nature of the shoot tip debris. Confusion with *R. waria* is possible although this is a much larger species flowering on clinging, not free, shoots.

2. The specific epithet is from the Greek 'pilosa', felt-like, in allusion to the unique manner in which the cataphylls, prophylls and petiolar sheath degrade into felted fibres.

24. *Rhaphidophora schlechteri* K. Krause

Rhaphidophora schlechteri K. Krause, Bot. Jahrb. Syst. 49 (1912) 94. — Type: Papua New Guinea, Eastern Highlands Prov., Tanqueti camp, 27 Nov. 1908, *Schlechter 18888* (B, holo).

Rhaphidophora conferta K. Krause, Bot. Jahrb. Syst. 49 (1912) 95, **synon. nov.** — Type: Papua New Guinea, Keneyia Camp, 2 Oct. 1908, *Schlechter 18308* (B, holo; P, iso).

Rhaphidophora peekelii Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 78; Peekel ex Henty, Fl. Bismarck Archipelago (1984) 66—67 fig. 110, **synon. nov.** — Type: Papua New Guinea, New Ireland, Namatanai, *Peekel* 296 (B, holo).

Rhaphidophora buergersii Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 78 (*'bürgersii'*), **synon. nov.** — Type: Papua New Guinea, Sepik Prov., Lordberg, 9 Dec. 1912, *Ledermann* 10241 (B, holo).

Rhaphidophora drepanophylla Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 340; K. Krause & Alderw., Nova Guinea 14 (1924) 213, **synon. nov.** — Type: Indonesian Papua, Bonggo Range, Mamberamo, near Prauwen Bivak, 1 Sept. 1920, *Lam* 1014 (BO, holo; L, iso).

Rhaphidophora obliquata Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 340; K. Krause & Alderw., Nova Guinea 14 (1924) 212, **synon. nov.** — Type: Indonesian Papua, Bonggo Range, Mamberamo, near Pionier Bivak, 30 June 1920, *Lam* 483 (BO, holo).

Figures 26 & 27

Slender to moderately robust, leptocaul, homeophyllous (?) liane to 20 m; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and very short to somewhat lengthened, unbranched, free, sympodial, leafy, flowering stems; *stems* smooth, flexuous, terete, without prophyll, cataphyll and petiolar sheath fibre, internodes 1—9 x 0.5—1.5 cm, separated by thin, slightly oblique, leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* arising singly from the node; *feeding roots* not observed; *leaves* spiro-distichous, scattered; *cataphylls* and *prophylls* membranous, caducous; *petiole* grooved adaxially, 7—14 x 0.2—0.3 cm, smooth, with a very slight apical and prominent basal geniculum; *petiolar sheath* very prominent on newest leaves, very broad basally, narrowing c. + way along petiole and extending beyond the apical geniculum by two tiny ligules, caducous leaving a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, lanceolate to oblong-lanceolate, slightly to prominently oblique, 10—34 x 4—9.5 cm, thinly coriaceous, base obtuse-cuneate to rounded and minutely cordate, apex falcate, acute to long-acuminate, with a tiny tubule; *midrib* slightly raised abaxially, flush to very slightly sunken adaxially; *primary venation* pinnate, slightly raised on both surfaces; *interprimaries* sub-parallel and barely less distinctive than primaries; *secondary* and *tertiary venation* reticulate, conspicuous in dry material; *inflorescence* solitary, subtended by

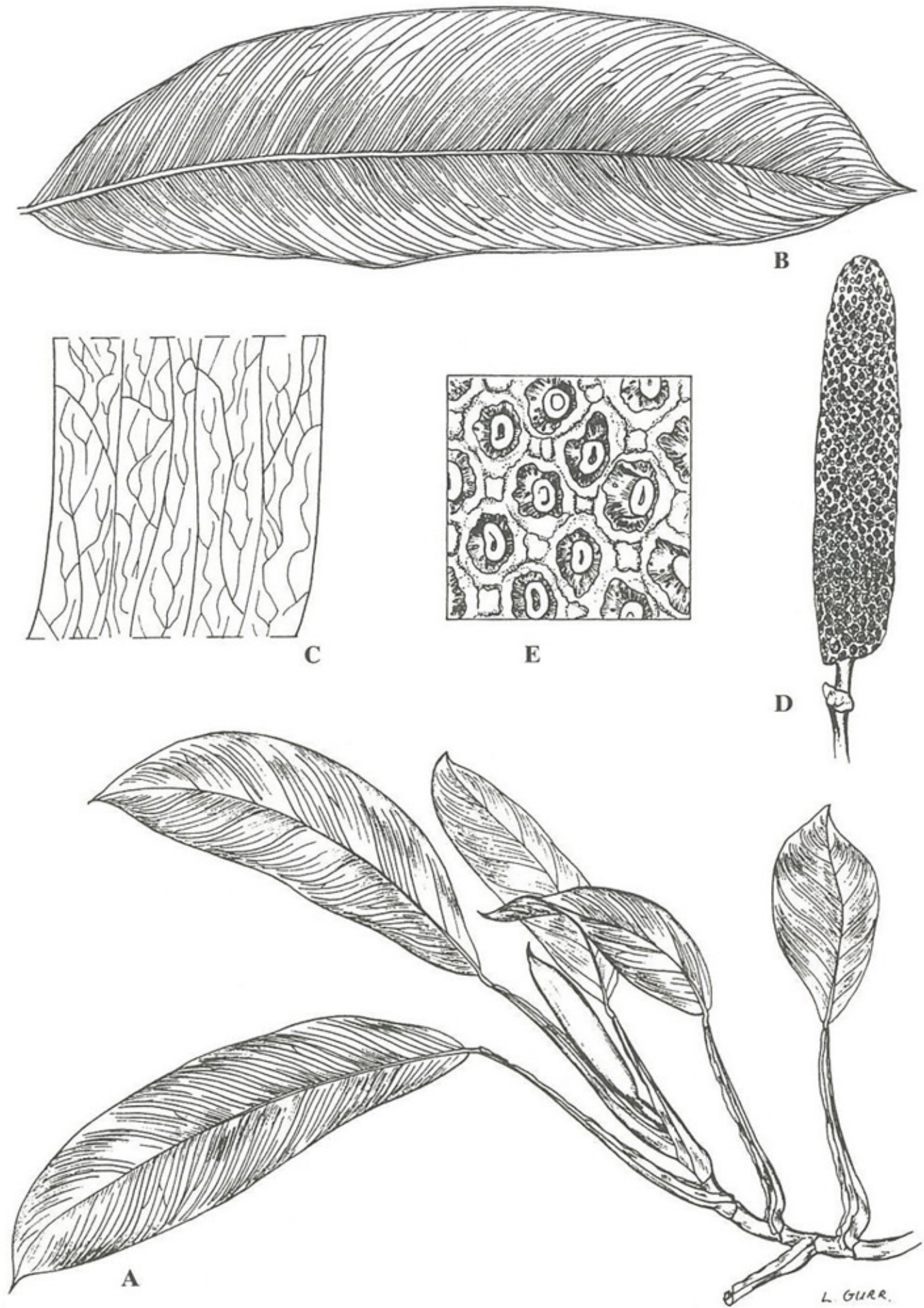


Figure 26. Rhaphidophora schlechteri K. Krause

A. flowering shoot x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{2}$; C. venation detail x 4; D. inflorescence, spathe fallen x 1; E. spadix detail, pre-anthesis x 8. A & C from *Schlechter 18888*; B, D-E from *Boraule et al. BSIP 9141*.

a incompletely developed foliage leaf and one or more prominent caducous cataphylls; *peduncle* slightly compressed-terete, 5—9 x c 0.5—1 cm; *spathe* cigar-shaped, apex stoutly beaked, 4—11 x c. 3.5 cm (flattened out), thick, marcescent, falling as fruits ripen, green at male anthesis; *spadix* cylindrical, stipitate, inserted slightly obliquely on stipe, 6—8.5 x 1.5—2 cm, creamy white; *stipe* terete, 0.5—1 cm long; *stylar region* depressed-rhombohedral, c. 1.2 x 1.3 mm, truncate; *stigma* punctiform, c. 0.3 mm diam., raised at male anthesis but barely prominent in dried material; *anthers* strongly exerted at male anthesis; *infructescence* stoutly cylindrical, c. 8 x 3 cm, with dry spathe persisting.

Distribution: Widespread from Papua New Guinea (including Bismarck Archipelago) to the Solomon Islands.

Habitat: Primary to disturbed secondary broadleaf and coniferous (*Araucaria*) forest on humus, alluvium and lava. Sea level to 1500 m altitude

Notes: 1. As defined here *Rhaphidophora schlechteri* is a variable and widespread species. The broad species concept adopted is based on examining all the numerous duplicates of the Nicolson collections cited here that exhibit wide variation, which supports the merging of elements recognized as separate species by earlier workers.

2. In most of its medium to large manifestations *R. schlechteri* is similar in overall appearance to *R. mima*, but is distinguishable by the marcescent spathe and stipitate spadix. Small forms of *R. schlechteri* maybe confused with *R. neoguineensis*, although the globose spathe and sessile ellipsoid spadix readily distinguish the latter.

Other specimens seen: PAPUA NEW GUINEA. West Sepik Prov.: Telefomin, Sanduan, track on leaf bank of Mai (Yuwa) river, to 0.5 km south of Fiak airstrip, *Frodin et al.* 2553 (K); Central Prov.: Sogeri Plateau, Rouna Waterfall, 20 miles east of Port Moresby, *Nicolson* 1432 (B, BM, K, L, P, SING, US); Morobe Prov.: Wau, road half way to Yamap, *Kairo NGF* 44078 (L, NGF, US); 10 miles north of Bulolo, *Nicolson* 1477 (B, K, L, P, US); Madang Prov., southern slopes of Finisterre Range, near Budemu, *Pullen* 5996 (BM, L, LAE); Saidor, Matafuma village, vicinity of Pukie Primary School, *Vandenberg & Katik NGF* 42372 (GH, K, L, US); North Solomons Prov.: Bougainville, vicinity of Barilo village, c. 6 miles north of Buin Station, *Schodde* 3935 (GH, L); New Ireland: Mussau, *Køie & Olsen* 1377 (L); Namatanai, coastal region, near Tamul River, c. 0.5km NW of Taron, east coast, *Sands et al.* 2044 (GH, K, L, US); SOLOMON ISLANDS. Guadalcanal: West Guadalcanal, Wanderer Bay, Vuragoba area, *Boraule et al.* BSIP 9141 (BSIP, K, SING); North central Guadalcanal, Tina River, *Nakisi & Babala* BSIP 8222 (BSIP, K, SING); San Cristobal: Puepue River, *Brass*, 2794 (BO, GH, L); South Ridge west of Tetera village, *Gafui et al.* BSIP 1 2575 (BSIP, K, SING); Fauore ('Fauo') Island: *Guppy* 196 (K); Ulawa: Moli, *Teona* BSIP 6303 (BSIP, K, L, SING).

25. *Rhaphidophora spathacea* Schott

Rhaphidophora spathacea Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 129. — Type: 'New Guinea', Zippelius *s.n.* (L, holo).

Rhaphidophora apiculata K. Krause, Bot. Jahrb. Syst. 49 (1912) 93, **synon. nov.** — Type: Papua New Guinea ('Kaiser Wilhelmsland'), Madang Prov., Finisterre Range, 2 Sept. 1908, *Schlechter 18152* (B, holo; P, iso).

Rhaphidophora palauensis Koidz., Bot. Mag. Tokyo 30 (1916) 400, **synon. nov.** — Type: Palau, Angaur Island, *Kayima 154* (TI, holo).

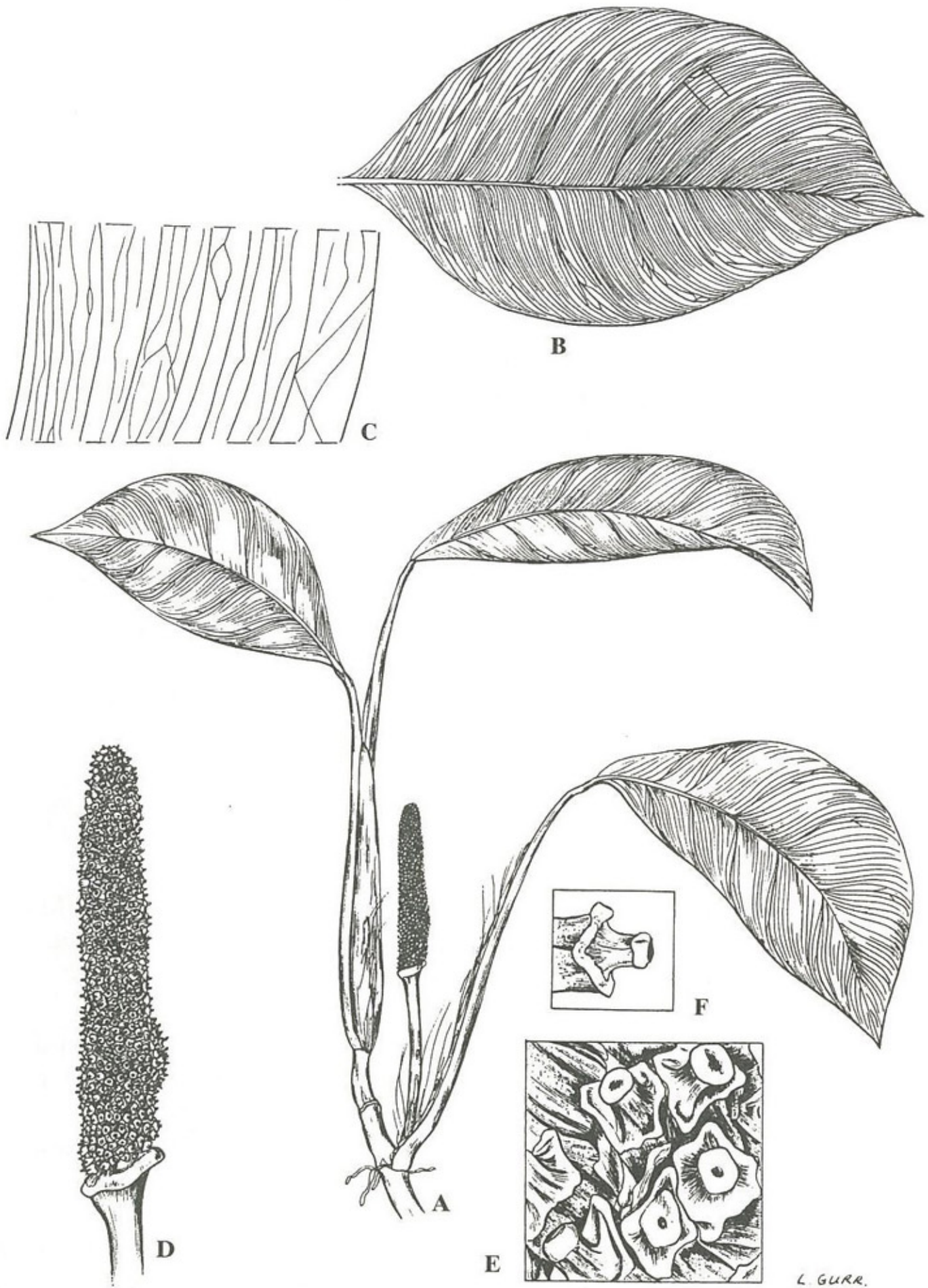
Rhaphidophora forbesii Rendle, J. Bot. 61, Suppl. (1923) 58, **synon. nov.** — Type: Papua New Guinea, Sogeri Prov., 1885-1886, *Forbes 323* (BM, holo).

Rhaphidophora engleri Kanehira, Fl. Micrones. (1933) 409. — *Rhaphidophora palauensis* Engl. & K. Krause, Bot. Jahrb. Syst. 56 (1921) 433, *nom. illeg., non* Koidz. (1916), **synon. nov.** — Type: Palau, Babelthuap ('Babelthaob'), Dorfe Ngarsul, 21 Feb. 1914, *Ledermann 14336* (B, holo).

Rhaphidophora kanehirae Hatusima, J. Japanese Bot. 15 (1939) 19, fig. 1, g—j, **synon. nov.** — Type: Federated States of Micronesia, Yap, *Kanehira 1188* (TI, holo).

Figures 28 & 29

Moderately robust, medium-sized pachycaul, homeophyllous liane to 15 m; *seedling stage* not observed; *pre-adult plants* forming scattered terrestrial colonies; *adult shoot architecture* comprised of clinging, physiognomically unbranched, densely leafy flowering stems; *stems* smooth, mid-green, with cataphylls and prophylls persistent and drying dark yellow, then degrading into fibres and parchment-like remains, internodes 1—6 x 0.4—1.5 cm, separated by prominent slightly oblique leaf scars; *flagellate foraging stem* absent; *clasp roots* densely arising from the nodes and internodes, smooth and drying with parchment-like epidermis; *feeding roots* not observed; *leaves* spiro-distichous to distichous; *cataphylls* and *prophylls* chartaceous, later degrading into strips of tissue and fibres, especially at tips of flowering shoots; *petiole* deeply canaliculate, 8—53 x 0.4—0.8 cm, smooth with faint to rather prominent dark dense speckling, apical geniculum prominent, basal geniculum slightly less so; *petiolar sheath* extending to apical geniculum, broad, chartaceous, short-persistent, degrading to sparse fibres and papery strips, then falling; *lamina* entire, ovate-elliptic to oblong-



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Figure 28. *Rhaphidophora spathacea* Schott

A. flowering shoot x $\frac{1}{4}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 3; D. inflorescence, spathe removed x $\frac{3}{4}$; E. spadix detail, post-male anthesis x 8; F. styler region and stigma, side view x 6. All from *Forbes* 323.

lanceolate or oblong-elliptic, slightly oblique, 11—35 x 2.5—18 cm, chartaceous to coriaceous, base rounded to acute, apex acute to acuminate; *midrib* prominently raised abaxially, \pm flush adaxially; *primary venation* pinnate, raised abaxially, less so adaxially; *interprimaries* sub-parallel to primaries, slightly to much less prominent than the primaries, slightly raised abaxially, barely visible adaxially; *secondary venation* reticulate, raised, especially conspicuous in dry material; *tertiary venation* minutely reticulate, hardly visible; *inflorescences* two, three or more together, each subtended by a prominent chartaceous prophyll and one or more chartaceous cataphylls, the entire synflorescence emerging from a mass of dried, chartaceous cataphyll remains; *peduncle* slender to stout, terete, partially to completely obscured by cataphylls, 4—12 x 0.2—0.8 cm; *spathe* slender canoe-shaped, hardly to stoutly beaked, 5—13.5 x 2—2.5 cm, stiff-fleshy, lower 0.7—1 cm with connate margins (*vide Nicolson 1580*, but not observed elsewhere), yellow to yellow green, marcescent to early fruiting, eventually falling leaving a prominent scar; *spadix* stoutly cylindrical, sessile, inserted almost level on peduncle, 3—16.5 x 1—1.5 cm, white at male anthesis; *stilar region* conical, mostly hexagonal in top view, 0.9—1.2 x 1—1.1 mm; *stigma* punctiform, very prominently raised, those at the tip of the spadix even more raised, 0.1—0.2 x c. 0.3 mm, glossy and almost black in dried material; *anthers* exerted at male anthesis; *infructescence* stoutly oblong-cylindrical, 6—9 x 1.4—2 cm.

Distribution: Palau, Indonesian Papua, Papua New Guinea (including Woodlark (Muyua) Island), Federated States of Micronesia (Yap).

Habitat: Lowland to lower montane primary to disturbed secondary forest on a variety of substrates including granite, coralline limestone, volcanically-derived soils. Sea-level to 1500 m altitude.

Notes: 1. Most similar to *Rhaphidophora versteegii* but readily separated by the non-shingling juvenile phase and on drying the strongly discoloured leaf laminae of which the abaxial surface is bright orange-brown with copious, minute tannin cells. Further, *R. spathacea* never has perforated leaf laminae.

2. In publishing *R. spathacea*, Schott stated that it was from Java, although both type sheets in L are labelled 'Nov. Guinea.' The types of *R. spathacea* match very well collections from New Guinea made under the various synonyms proposed above.



Figure 29. *Rhaphidophora spathacea* Schott

A. flowering shoot x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 2; D. pre-adult clinging shoot x $\frac{1}{4}$; E. inflorescence, spathe sectioned x 1; F. spadix detail, post male anthesis x 8; G. stylar regions and stigmas at spadix tip x 8. All from *Brass* 23847.

3. The type of *R. engleri* has rather narrow leaves, although other collections from Palau match collections of *R. spathacea* from New Guinea.

4. The holotype of *R. apiculata* K. Krause is notable for the ovate-elliptic leaf laminas with primary and interprimary veins almost indistinguishable. However, the isotype (P) is of a much longer, narrower leaf, which is much closer in appearance to the type of, for example, *R. versteegii* and *R. spathacea*.

5. The type of *R. forbesii* is very incomplete. Nonetheless, the leaf lamina shape and spadix match the type of *R. apiculata* almost exactly.

Other specimens seen: PALAU: Babelthuap: trail along Japanese pipeline between Ngardmau and waterfront, *Bowden-Kerby 5983* (US); Lake Ngardok *Fosberg 32572* (US); Aulupse'el, Dii'ebachal Beach, *Evans 581* (US); Yap: Talgo n Bibau village agroforest, *Falanrum & Faimaw 6795* (US); Angaur: East coast, *Fosberg 31986* (US); Angaur, *Koidzumi s.n.* (TI). INDONESIA PAPUA. Kepala Burung Prov.: Surroundings of Ayawasi, *Ave 4736* (BO, L); Triton Bay, *Le Guillou 'Triton 48'* (P); 2 km north of Manokwari, west end of Tafelberg F.R., *Nicolson 1580* (B, K, L, P, US); Mimika Prov.: Freeport Concession Area, path east at Mile 50 on road to Tembagapura, *Coode 8037* (BO, K, MAN); Golf Course surrounds, *Johns 9967* (BO, K, MAN); Freeport Concession Area, *Johns 10393* (BO, K, MAN); Golf Course surrounds, *Johns 10431* (BO, K, MAN). PAPUA NEW GUINEA. East Sepik Prov.: vicinity of Malu and April river, *Ledermann 7384* (B spirit); Western Prov., Palmer River, 2 miles below junction of Black River, *Brass 7100* (GH), *Brass 7380* (GH); Central Prov.: Port Moresby, above Boridi village, *Foreman & Vinas LAE 60099* (BRI, L, LAE, US); Morobe Prov.: Along road to Sankwep SE of Lae, c. 10 km beyond Sankwep, *Croat 52808* (MO); North slopes of Mt Missim (Misson), *Croat 52952* (K, MO); Bumbu Logging Area, 7 miles north of Lae, *Nicolson 1386* (B, P, SING, US), *Nicolson 1409* (SING, US); Lae, Sankwep, 10 miles east of Lae, *Streimann NGF 47654* (US); Milne Bay Prov.: Bibiguni Camp, Gwariu River, *Brass 23847* (GH, L, US); Alotau, Kulumadau Island, *Kairo 237* (GH, L); Woodlark (Muyua) Island: Kulumadau, *Brass 28618* (L).

26. *Rhaphidophora spuria* (Schott) Nicolson

Rhaphidophora spuria (Schott) Nicolson, *Allertonia* 1 (1978) 348. — *Cuscuaria spuria* Seem. ex Schott, *Bonplandia* 9: 260, *nom. nud.*; Schott, *Bonplandia* 9 (1861) 367; Seeman, *Viti* (1862) 444 & *Fl. Vit.* (1868) 287; Engl., DC, *Monogr. Phan.* 2 (1879) 251, *in syn. pro Cuscuaria marantifolia* Schott; Engl. & K. Krause in Engl., *Pflanzenr.* 37 (IV.23B) (1908) 68, *in syn. pro Scindapsus cuscuaria* (Aubl.) Presl. — Type: Fiji, Viti Levu, 1860, *Seeman 655* (K, holo).

Rhaphidophora storckiana Schott, *Bonplandia* 10 (1862) 346; Seeman, *Fl. Vit.* (1868) 287; Engl. & K. Krause in Engl., *Pflanzenr.* 37 (IV.23B) (1908)

43; Parham, Pl. Fiji Isl. (1964) 267; ed.2 (1972) 363. — *Rhaphidophora peepla* var. *storckiana* (Schott) Engl., DC, Monogr. Phan. 2 (1879) 243; Drake, Ill. Fl. Ins. Mar. Pac. (1892) 326. — Type: Fiji, Ovalau, 1862, *Storck 911* (K, holo; BM, iso).

Rhaphidophora reineckei Engl., Bot. Jahrb. Syst. 25 (1898) 9; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 41, **synon. nov.** — Type: Western Samoa, Savai'i, 1894, *Reinecke 594* (B, holo).

Rhaphidophora graeffei Engl., Bot. Jahrb. Syst. 25 (1898) 9; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 40, **synon. nov.** — Type: Western Samoa, Upolu, *Graeff 73* (B, holo).

Figure 30

Moderate to large, robust, semi-pachycaul homeophyllous liane to 15 m; *seedling stage* not observed; *pre-adult plants* forming small terrestrial colonies; *adult shoot architecture* comprised of elongated, clinging, physiognomically unbranched, leafy, non-flowering stems and short, usually unbranched, free, sympodial, densely leafy, flowering stems; *stems* smooth, terete in cross-section, with sparse prophyll, cataphyll and petiolar sheath fibre, this soon falling, internodes 0.5—8 x 0.5—2 cm on clinging shoots, usually shorter and stouter on free shoots, separated by large, straight, corky leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* densely arising from the nodes and internodes of clinging stems, notably pubescent; *feeding roots* not observed; *leaves* weakly spiro-distichous on clinging and free shoots; *cataphylls* and *prophylls* membranous, quickly drying and degrading into sparse fibres, these soon falling; *petiole* deeply canaliculate, 14—66 x 0.3—0.15 cm, apical and basal geniculum moderately prominent; *petiolar sheath* prominent, extending to the apical geniculum, swiftly drying and degrading into sparse, soon-falling fibres; *lamina* entire, ovate-oblong to oblong-lanceolate or oblong-elliptic, sometimes slightly oblique, occasionally falcate, 5.7—76 x 2.5—32 cm, thinly to quite coriaceous (larger laminas tending to be thinner textured), often drying strongly discoloured, adaxially mid-brown, abaxially pale brown, base unequal, cuneate to rounded, subtruncate or weakly cordate, where present basal 'lobes' more developed on one side, apex acute to obtuse, acuminate with a prominent, short tubule; *midrib* prominently raised abaxially, ± sunken adaxially; *primary venation* pinnate, raised abaxially and adaxially; *interprimaries* sub-parallel to primaries, hardly less prominent, slightly raised abaxially and adaxially; *secondary venation* reticulate, slightly raised; *inflorescence* solitary to several together, strongly sweet-fragrant, if solitary

then subtended by a partially to fully developed foliage leaf, if more than one than subsequent inflorescences each subtended by a soon-degrading membranous prophyll and cataphyll; *peduncle* compressed-terete, often with a deep longitudinal sulcus on the shoot side, 5—19 x 0.25—1 cm; *spathe* broadly canoe-shaped, stoutly beaked, 9.5—16 x 2.5—5.5 cm (up to c. 7 cm wide when flattened out), stiff-fleshy, cream at male anthesis, caducous leaving a large, straight scar; *spadix* cylindrical, inserted \pm level to somewhat obliquely on peduncle, 6.2—15.5 x 1.2—1.5 cm, creamy white at male anthesis; *stylar region* mostly hexagonal, 1.6—2.4 x c. 2 mm diam., truncate, area around stigma sunken; *stigma* punctiform to slightly ellipsoid, c. 0.5—0.7 mm x 0.5 mm; *anthers* exerted at male anthesis; *infructescence* stoutly oblong to tapering-cylindrical, 10—12 x 1.1—2.5 cm.

Distribution: Papua New Guinea (Western Prov.), Solomon Islands (Guadalcanal, New Georgia, San Cristobal and the Santa Cruz Group), Fiji, Western and American Samoa.

Habitat: Well-drained primary and secondary lowland to upper hill forest, on rocky, red soils. 30–1000 m altitude.

Notes: 1. *Rhaphidophora spuria* is the only entire-leaved *Rhaphidophora* indigenous to Fiji and Samoa. Examination of the types of *R. spuria*, *R. graeffei* and *R. reinecke* reveals no characters separating these species hitherto recognized as endemic for Fiji (*R. spuria*) and the Samoan islands (*R. graeffei* and *R. reinecke*). The earliest name, *R. spuria*, is adopted here.

2. *Rhaphidophora spuria* is most similar to *R. intonsa* from Papua New Guinea (Morobe and Central Prov.) but may be readily distinguished by the truncate to weakly cordate lamina base and in having very much less fibre at the shoot tips.

3. Despite the geographical disjunction, the single collection from mainland Papua New Guinea is of this species, matching the Pacific plants in vegetative and floral characters.

Other specimens seen: PAPUA NEW GUINEA. Western Prov.: Fly River, Madiri Plantation, Womersley & Simmonds 5047 (GH). SOLOMON ISLANDS. New Georgia: Hovoro, Cowmeadow's collectors BSIP 3791 (BSIP, K, SING); San Cristobal: Ridge west of Warahito, Hunt RSS 2297 (BSIP, K, L); Santa Cruz Group: Vanikolo (Vanikoro) Island, Kajewski 584 (GH, K); Guadalcanal: adjacent to Tina River, 12 miles inland from coast, Womersley & Whitmore BSIP 1110 (BSIP, K, L, SING). FIJI. No further data, Capt. Wilkes Exped. s.n. (US); Viti Levu: Nausori Highlands, 16 km from Bukika Sawmill, Melville & Melville

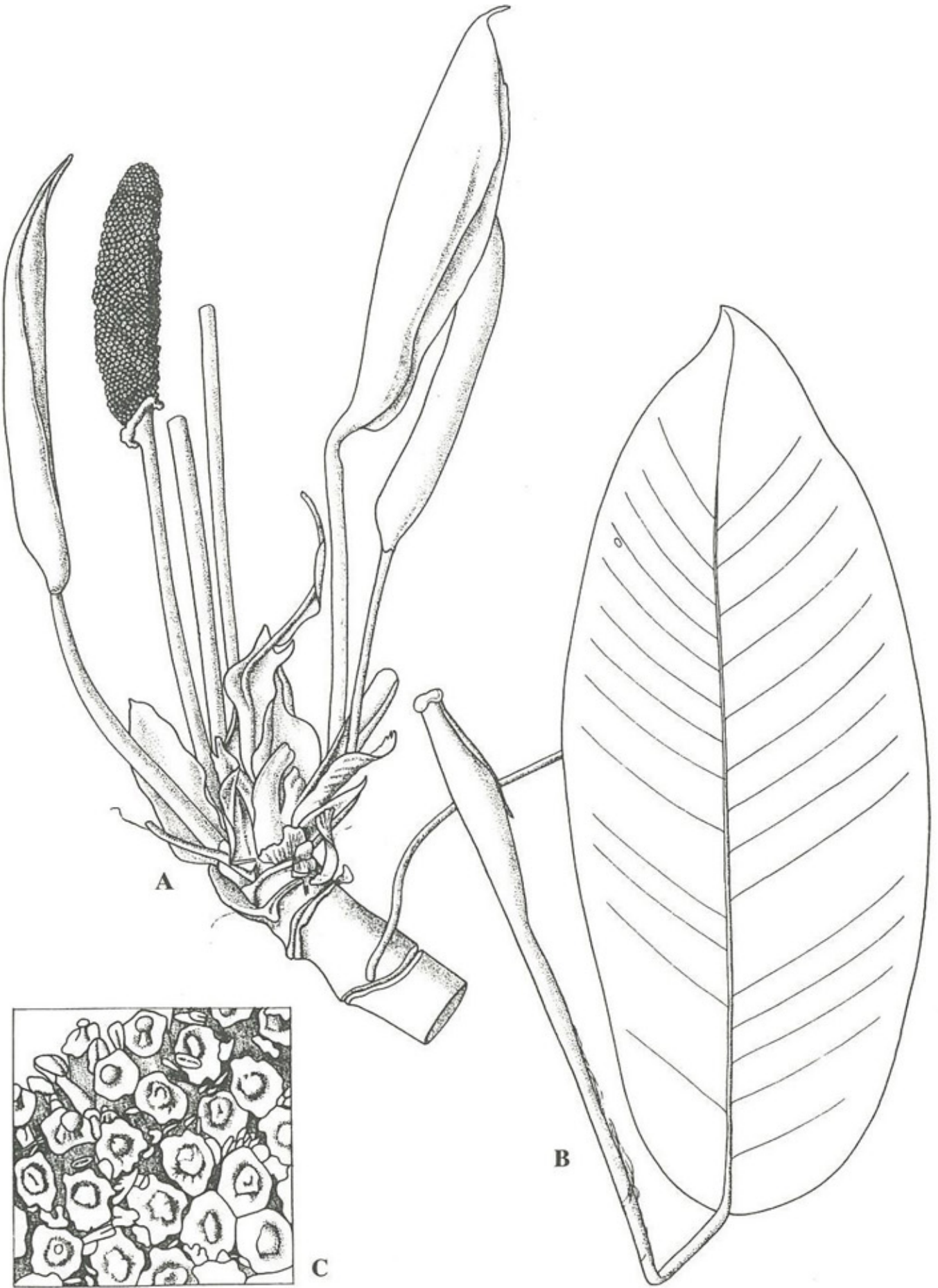


Figure 30. *Rhaphidophora spuria* (Schott) Nicolson

A. flowering shoot x $\frac{1}{2}$; B. leaf x $\frac{3}{10}$; C. spadix detail, male anthesis x 10. A from *Kajewski* 584; B from *Teraoka & Kennedy* 64; C from *Smith* 8653.

71.998 (K); Naitasiri, Colo-I-Suva, *Parham 11246* (K); MBA, vicinity of Nalotawa, eastern base of Mt Evans Range, *Smith 4443* (US); Namosi, northern base of Korombasambasanga Range, in drainage of Wainavindrau Creek, *Smith 8653* (K, L, P, US); Namosi, hills east of Wainikoroiluva River, near Namuamua, *Smith 8947* (K, L, P, US). Kadavu (Kandavu), Namalata Isthmus region, *Smith 29* (K, P, US); WESTERN SAMOA. Upolu: Lake Lanuto'o, *Christophersen 402* (BISH, K); Above Vaipouli, *Christophersen & Hume 1902* (BISH, K, P, US); Tapatapa, *Cox 34* (K); Near Lotofaga, Lafulemu Ranch (property of Fay Ala'ilima), west of Fagatola River, c. 0.5 km NW of the bridge, *Teraoka & Kennedy 64* (US); Near Mt Leou'e, *Whistler 743* (B, US); Savai'i: Salailua, *Christophersen 2956* (BISH, K, P); La Vai, above Salailua *Christophersen 3004* (BISH, US); Above Asau, Block 28, *Whistler 1036* (B, US). AMERICAN SAMOA. Pago Pago, *Meebold 8209* (K).

27. *Rhaphidophora stenophylla* K. Krause

Rhaphidophora stenophylla K. Krause, Bot. Jahrb. Syst. 49 (1912) 94. — Type: Papua New Guinea ('Kaiser Wilhelmsland'), East Sepik Prov., Djamu, 22 April 1908, *Schlechter 17581* (B, holo†; P, iso).

Figure 31

Large, rather robust, semi-leptocaul, homeophyllous liane to unknown ultimate height; *seedling stage* very slender terrestrial to climbing, leaves arranged in two ranks; *pre-adult plants* clinging, slender, with very narrow leaves; *adult shoot* comprised of elongated, clinging, physiognomically unbranched, non-flowering stems and free lateral, leafy flowering stems; *stems* terete to strongly compressed, but not rectangular in cross-section, without cataphyll, prophyll and petiolar sheath fibre, internodes 1—3 x 0.2—2 cm, separated by prominent almost straight, slightly corky leaf scars; *flagellate foraging stem* absent; *clasp ing roots* arising from nodes and internodes; *feeding roots* not observed; *leaves* spiro-distichous in mature plants; *cataphylls* and *prophylls* caducous; *petiole* deeply canaliculate, 2—16 x 0.2—1 cm, apical geniculum small and very obscure, basal geniculum weakly defined; *petiolar sheath* very prominent, broadly winged and extending to apical geniculum, persistent almost through to leaf fall; *lamina* entire, linear-lanceolate to narrowly lanceolate or narrowly oblong-lanceolate, slightly falcate, 9—38 x 1.5—4 cm, subcoriaceous, base subacute to slightly decurrent, apex acute to briefly acuminate with a prominent tubule; *midrib* raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised abaxially, almost flush adaxially; *interprimaries* reticulate-parallel to primaries, almost indistinguishable from them, slightly raised abaxially, almost flush adaxially; *secondary venation* reticulate, hardly visible; *inflorescence* solitary, subtended by a ± fully developed foliage leaf; *peduncle* slightly laterally compressed to terete, 6—10 x c. 1 cm; *spathe* broadly canoe-shaped, stoutly long-beaked, 11—13 x 1.5—2.5 cm, stiffly

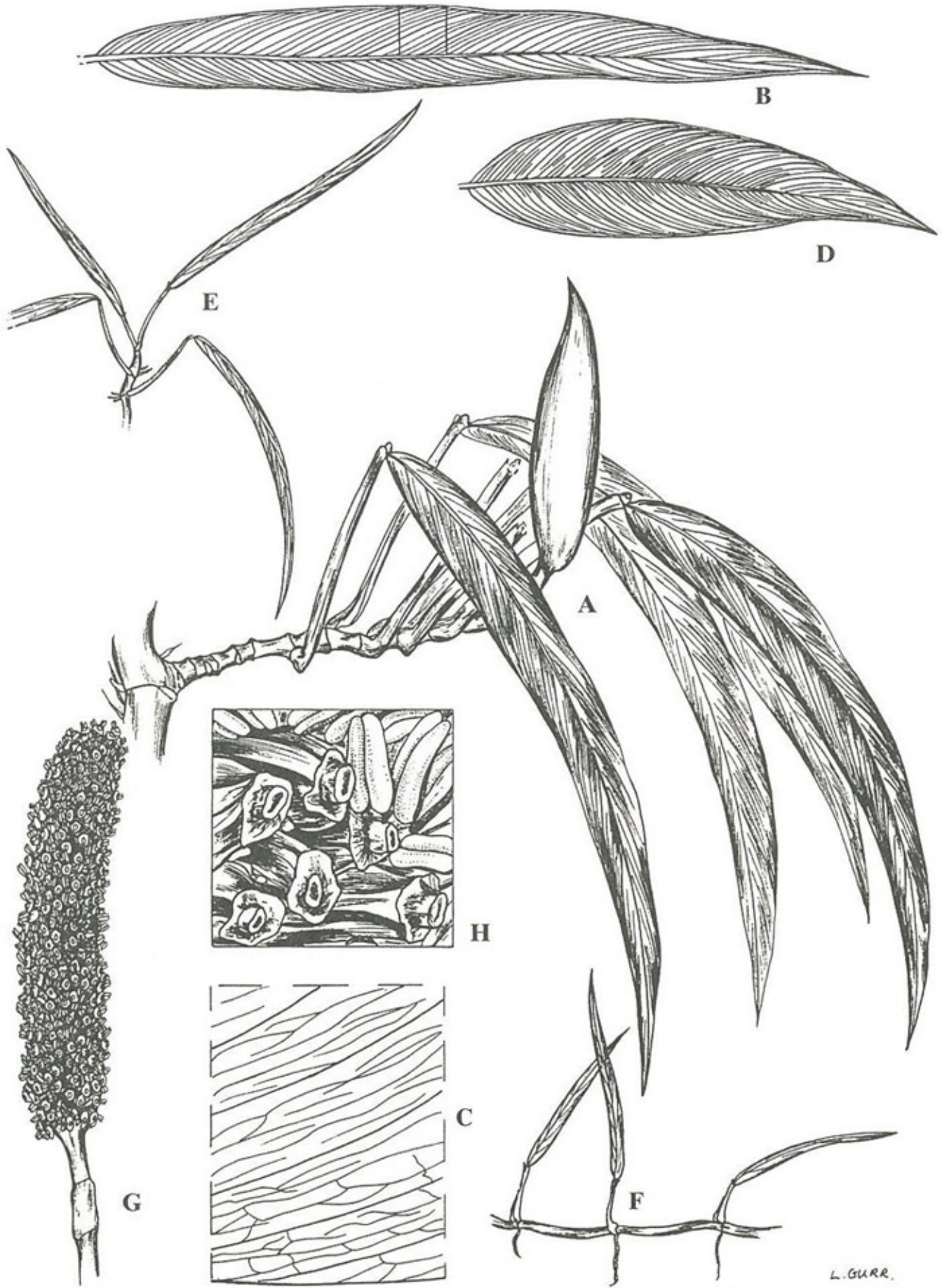


Figure 31. *Rhaphidophora stenophylla* K. Krause

A. adult shoot with flowering branch x $\frac{1}{3}$; B. leaf lamina x $\frac{1}{2}$; C. venation detail x 3; D. leaf lamina x $\frac{1}{3}$; E. pre-adult clinging shoot x $\frac{1}{4}$; F. pre-adult creeping shoot x $\frac{2}{3}$; G. inflorescence, spathe fallen x 1; H. spadix detail, male anthesis x 6. A-C, E & F from *Nicolson 1430*; D, G-H from *Streimann NGF 44247*.

fleshy, yellow, caducous leaving a large scar at the base of the spadix; *spadix* cylindrical, slightly curved, long stipitate, 6—9 x 1.5—2.2 cm, inserted level to almost truncate on stipe, white; *stipe* slender to stoutly terete, 2.5—3 x 3—0.4 cm; *stylar region* rhombohexagonal, 1—2 x 1—1.5 mm, conical; *stigma* punctiform, prominently raised, c. 0.3 mm diam.; *anthers* strongly exerted at male anthesis; *infructescence* not observed.

Distribution: Papua New Guinea (including the Louisiade Archipelago).

Habitat: Monsoon lower montane forest to submontane primary forest on moderate to steep slopes, sometimes on limestone. 20–940 m altitude.

Notes: 1. Unmistakable by the long, narrow leaves, persistent winged petiolar sheath, long stipitate spadix and prominently raised stigma. There exist plants with broader laminas than typical (*Brass* 27691 & 28311 are of this broad-leaf type) that may be confused with *Rhaphidophora discolor* (also flowering on free shoots and with long-stipitate spadix), although the latter is readily distinguished by the broader leaf laminas, petiolar sheath degrading to strips and fibres, larger (13.5—19 x 2.2—4 cm) spadix and flat stigmas.

2. *Scindapsus schlechteri* K. Krause is superficially similar in its narrow leaf lamina and persistent-winged petioles but differs, aside from a single ovule per ovary (and thus one-seeded fruits), by the sessile spadix and thicker leaf lamina with almost no visible venation.

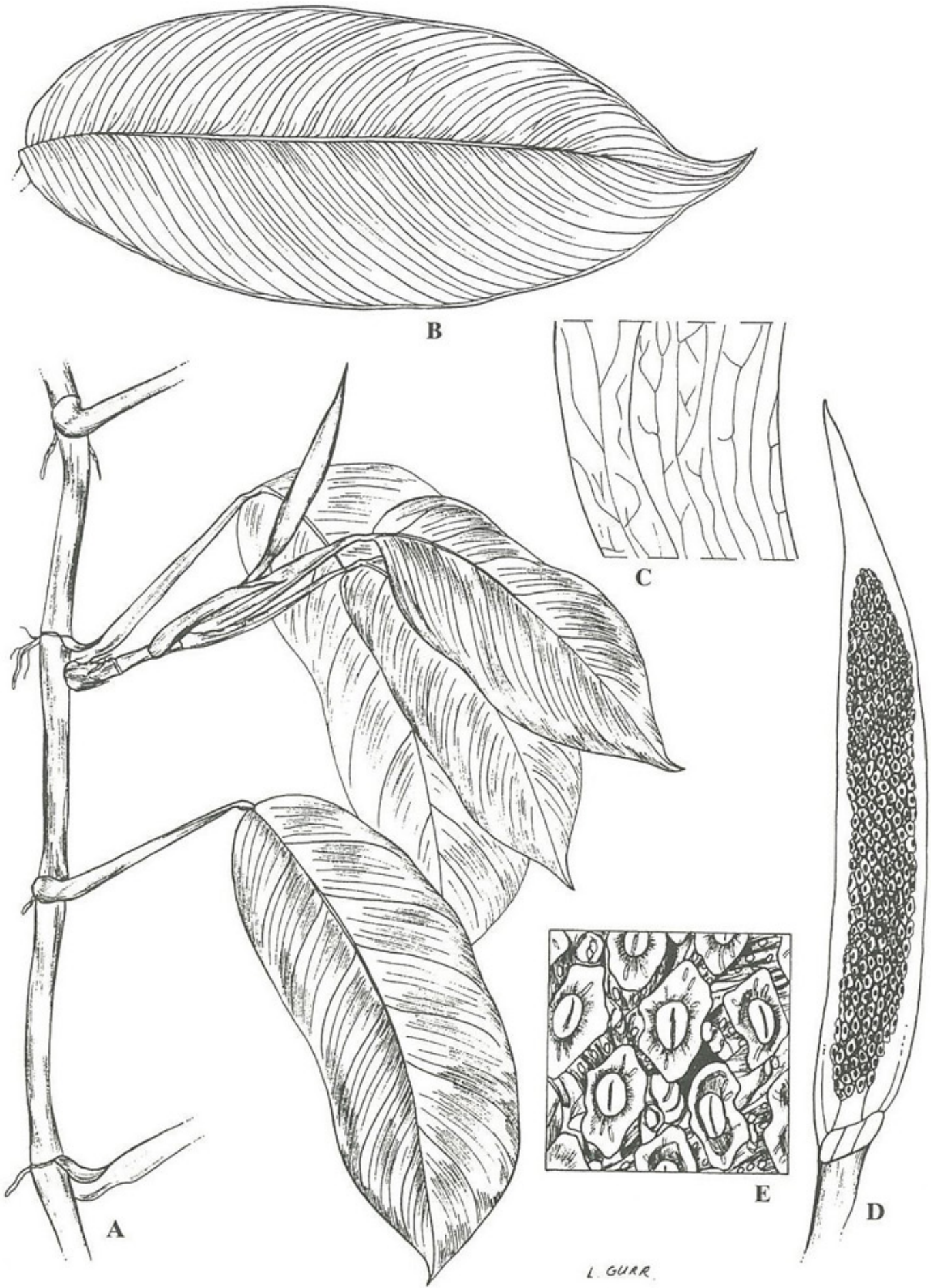
Other specimens seen: PAPUA NEW GUINEA. West Sepik Prov.: Telefomin, Sandaun, Hak Valley, Gentry transect on slope above Nenem, SE of Mianmin Airstrip, *Frodin & Morren* 3155 (K); East Sepik Prov.: vicinity of Malu & April river, *Ledermann* 8614 (B spirit); Central Prov.: Port Moresby, Koitaki (c. 30 km WNW of Port Moresby), *Carr* 12218 (BM, SING); Sogeri Plateau, 5–7 miles beyond Kokoda Trail Monument, 30 miles east of Port Moresby, *Nicolson* 1430 (K, L, P, SING, US); Milne Bay Prov.: Louisiade Archipelago, Rossel and Misima Island, Narian, *Brass* 27691 (GH, L); Abaleti, *Brass* 28311 (L); Morobe Prov.: Wau, Bulolo, Middle L.A., *Streimann NGF* 44247 (GH, K, LAE, SING, US).

28. *Rhaphidophora stolleana* Engl. & K. Krause

Rhaphidophora stolleana Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 79. — Type: Papua New Guinea, East Sepik Prov., April River, 24 May 1912, *Ledermann* 7382 (B, holo).

Figure 32

Moderate, somewhat robust, semi-leptocaul, homeophyllous (?) liane



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Figure 32. *Rhaphidophora stolleana* Engl. & K. Krause

A. adult shoot with flowering branch x $\frac{1}{4}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 3; D. inflorescence, spathe sectioned x $1\frac{1}{2}$; E. spadix detail, post-male anthesis x 8. All from Ledermann 7382.

unknown ultimate height; *seedling* and *pre-adult plants* not observed; *adult shoot architecture* not completely known, but observed to comprise of greatly elongated, strongly pendent, physiognomically unbranched, leafy, non-flowering stems giving rise to abbreviated short, free, sympodial, flowering stems; *stems* smooth, climbing stems not observed, free stems weakly four angled to \pm terete in cross-section, occasionally with two close longitudinal keels along one side, dull pale yellow brown, without prophyll, cataphyll and petiolar sheath fibres, internodes to 13.5 x 1 cm, flowering shoots abbreviated, arising from just above the axils of leaves and twisting to present inflorescences upwards; *flagellate foraging stems* not observed; *clasping roots* arising singly from the nodes and internodes, slightly pubescent; *feeding roots* not observed; *leaves* very weakly spiralled, scattered; *cataphylls* and *prophylls* membranous, caducous; *petiole* shallowly canaliculate, 13—14 x 0.35—0.7 cm, smooth, with a well defined apical and large, slightly prominent basal geniculum; *petiolar sheath* very prominent, extending to apical geniculum, swiftly caducous leaving a slight scar; *lamina* entire, elliptic to oblong-elliptic, 20—29 x 8—13 cm, membranous, drying discoloured, adaxially mid-brown, abaxially pale orange-brown, base subovate, very briefly decurrent, apex acute to briefly acuminate, slightly falcate with a minute apiculate tubule; *midrib* slightly raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised abaxially; *interprimaries* parallel to primaries, occasionally slightly reticulated, slightly raised abaxially; *secondary* and *tertiary venation* reticulate, prominent abaxially in dried specimens; *inflorescence* solitary, subtended by a foliage leaf; *peduncle* terete, c. 6 x 0.3 cm; *spathe* elongate-cylindric, stoutly short-beaked, c. 10.2 x 1.7 cm, thinly stiff-coriaceous, duration unknown; *spadix* slender cylindrical, sessile, inserted very obliquely on to the peduncle, c. 8 x 1.1 cm; *stylar region* rhombohexagonal, 1—1.2 x c. 1 mm, truncate; *stigma* slightly longitudinally elongate to punctiform, c. 0.4 x 0.25 mm; *anthers* exsertion not observed; *infructescence* not observed.

Distribution: Papua New Guinea (East Sepik Prov.). Known only from the type.

Habitat: Lowland riverine forest. 20–50 m altitude.

Note: In its growth form, with long pendent stems with abbreviated flowering shoots arising in the leaf axils, *Rhaphidophora stolleana* resembles *R. brevispathacea*. The inflorescences are, however, quite different, with the spathe ovoid-cylindrical, 3—4 cm long, spadix slender cylindrical, 2.9—3.4 cm long in *R. brevispathacea* v. the spathe c. 10.2 cm long, spadix c. 8 cm

long in *R. stolleana*. To date, *R. stolleana* is known only from East Sepik and *R. brevispathacea* only from Mimika/Digul Province.

29. *Rhaphidophora versteegii* Engl. & K. Krause

Rhaphidophora versteegii Engl. & K. Krause, Nova Guinea 8 (1910) 248, Nova Guinea 8 (1912) 805; K. Krause & Alderw., Nova Guinea 14 (1924) 213. — Type: Indonesian Papua, Mimika/Digul border, near Sabang, 25 June 1907, *Versteeg 1308* (B, holo; BO, L, K, iso).

Rhaphidophora ledermannii Engl. & K. Krause, Bot. Jahrb. Syst. 54 (1916) 81; Hay, Aroids of Papua New Guinea (1990) Pl. XIV, b, **synon. nov.** — Type: Papua New Guinea, West Sepik Prov. (Felsspitz), 7 Aug. 1913, *Ledermann 12684* (B, lecto; selected here). Engler & Krause cited two syntypes, the other, Papua New Guinea, West Sepik (Felsspitz), Aug. 1913, *Ledermann 12722*, is missing from Berlin and presumed destroyed.

Figures 33 & 34

Robust, large, pachycaul, heterophyllous liane to 20 m; *seedling stage* not observed; *pre-adult plants* shingling; *adult shoot architecture* comprised of clinging, physiognomically unbranched, densely leafy flowering stems; *stems* smooth, mid-green, with cataphylls and prophylls persistent and drying dark yellow, degrading into parchment-like remains, internodes 1–4 x 0.4–2.5 cm, separated by very prominent slightly oblique leaf scars; *flagellate foraging stem* absent; *clasp ing roots* densely arising from the nodes and internodes, smooth and drying with parchment-like epidermis; *feeding roots* not observed; *leaves* distichous; *cataphylls* and *prophylls* chartaceous, degrading into strips of tissue and weak fibres at tips of flowering shoots; *petiole* deeply canaliculate, 8–48 x 0.4–0.8 cm, smooth, with faint to rather prominent dark dense speckling, apical geniculum prominent, basal geniculum very large but not prominent; *petiolar sheath* extending to apical geniculum, broad, chartaceous, short-persistent, degrading to papery strips and sparse fibres, then falling; *shingling lamina* entire, cordiform, 2.5–7.5 x 3–6.5, chartaceous, base cordate, posterior lobes overlapping, apex obtuse and minutely apiculate; *adult lamina* entire to slightly or extensively perforated, perforations elliptic to rhombic, extending from c. + to entire width of lamina on each side of the midrib, lamina ovate-elliptic to oblong-lanceolate or oblong-elliptic, slightly oblique, 33–57 x 9.5–27 cm, sub-membranous, drying pale grey-green to bright green, base rounded to acute, apex acute to acuminate; *midrib* prominently raised abaxially, ± flush adaxially; *primary venation* pinnate, prominently raised abaxially, weakly

so adaxially; *interprimaries* sub-parallel to primaries, less prominent than interprimaries, slightly raised abaxially and adaxially; *secondary venation* feebly reticulate to subtesselate; *inflorescence* very rarely solitary, usually several together, each subtended by a prominent chartaceous prophyll and one or more chartaceous cataphylls, the entire synflorescence emerging from a mass of dried, chartaceous cataphyll remains; *peduncle* slender to stout, terete, partially to completely obscured by cataphylls, 4–12 x 0.2–0.8 cm; *spathe* slender canoe-shaped, hardly to stoutly beaked, 5–10.5 x 1–2 cm, stiff-fleshy, very thick-walled (up to 1 cm at tip), yellow to yellow green, marcescent to early fruiting, eventually falling leaving a prominent scar; *spadix* stoutly cylindrical, sessile, inserted almost level on peduncle, 3–9.5 x 1–1.5 cm, white at male anthesis; *stylar region* conical, mostly hexagonal in top view, 0.9–1.2 x 1–1.1 mm; *stigma* punctiform, very prominently raised, those at the tip of the spadix even more raised, 0.1–0.2 x c. 0.3 mm, glossy, almost black in dried material; *anthers* exerted at male anthesis; *infructescence* stoutly oblong-cylindrical, 6–9 x 1.4–2 cm.

Distribution: Indonesian Papua, Papua New Guinea (including New Ireland). Seemingly widespread but, based on known collections, perhaps not common.

Habitat: Lowland to lower montane primary to secondary rain forest on clays and silts. Sea level to 1500 m altitude.

Notes: 1. *Rhaphidophora versteegii* is most similar to *R. spathacea* in having clusters of inflorescences subtended and interspersed by chartaceous prophylls and cataphylls. It is readily identifiable, and distinguished from *R. spathacea*, by the distinctive pale grey-green colour of dried material and the form of the juvenile growth phase. Further, leaf lamina perforations occur in most (but not all) individuals of *R. versteegii*; laminas of *R. spathacea* are never perforated. The arrangement and shape of the juvenile shingling leaves of *R. versteegii* are unique in the genus although known from only one collection (Croft 5252).

2. The type of *R. ledermannii* differs primarily in the perforation of the leaf lamina (*R. ledermannii* has profoundly perforated laminas) and as such appears to represent distinct species. However, the occurrence of perforated and unperforated laminas in different plants of the same species is not rare, e.g. *R. puberula* Engl., *R. megasperma* Engl. (see Boyce 1999, 2001) and its occurrence in *R. ledermannii* is not sufficient to warrant segregating the two species. Furthermore, a suite of characters – clustered inflorescences arising on clinging stems and subtended by chartaceous, later weakly fibrous



L. GARR.

Figure 33. *Rhaphidophora versteegii* Engl. & K. Krause

A. flowering shoot x $\frac{2}{9}$; B. leaf lamina x $\frac{1}{3}$; C. venation detail x 3; D. juvenile shingling stage, adaxial view x $\frac{1}{2}$; E. juvenile shingling stage, abaxial view x $\frac{1}{2}$; F. inflorescence, spathe removed x 1; G. spadix detail, post-male anthesis x 8; H. spadix detail, early fruiting x 8; J. stylar region and stigma, side view x 4. All from *Croat 52752*.

prophylls and cataphylls, stoutly cigar-shaped spathes, prominently raised and, compared with style diameter, large, glossy black stigmas and petioles with small speckles (tannin cells?) - leaves little doubt that one species is involved.

3. Perforated leaf laminas occur in a number of otherwise unrelated *Rhaphidophora* species (e.g., *R. foraminifera* (Engl.) Engl., *R. puberula*, *R. versteegii*, *R. pertusa* (Roxb.) Schott) suggesting that while a useful diagnostic tool, lamina perforation cannot be used to circumscribe taxonomically meaningful groups within *Rhaphidophora*.

Other specimens seen: INDONESIAN PAPUA. No locality, *Docters van Leeuwen III74* (L); Mimika/Digul Prov. boundary: Lorentz River, near Bivakeiland, *Pulle 44* (B spirit, L, K), *Pulle 67* (L, K). PAPUA NEW GUINEA. East Sepik Prov.: vicinity of Wewak, along trail beyond Boys Town (reform school operated by S.V.D. Missionaries), *Croat 52752* (MO); Southern Highlands Prov.: Aria, near Veta, *Aet 375* (L); Gulf Prov.: Baimuru, Vailala River, 70 km at 110 from Baimuru, 50 km at 318 from Kerema, *Croft et al. LAE 61251* (L, LAE); New Ireland: Lamet, NW Lavongai (New Hanover), 5km S of Lai Bay, *Croft & Lelean LAE 65461* (E, GH, K, L, LAE, M).

30. *Rhaphidophora waria* P.C. Boyce, *sp. nov.*

Vicinitate in donatione inflorescentiae condita, *Rhaphidophora waria* *R. spathaceae* proxima est, sed foliorum laminis minoribus angustioribus magis rigidioribus venis lateralibus primariis eis interprimariis clare inter se diversis, spadice stiptato, stigatibus profunde excavatis differt. — TYPUS: Papua New Guinea, East Sepik Prov., Ambunti, along Yapa (Hunstein) River, 1 Aug. 1966, *Hoogland & Craven 10796* (L, holo; GH, K, L, LAE, CANB, iso).

Figure 35

Small but robust pachycaul, homeophyllous (?) liane to unknown ultimate height; *seedling stage* not observed; *pre-adult plants* climbing with leaves arranged in two ranks and distinctive by the conspicuous yellow chartaceous petiolar sheaths; *adult shoot architecture* comprised of clinging, physiognomically unbranched, densely leafy flowering stems; *stems* with conspicuous smooth papery epidermis and cataphylls and prophylls persistent and drying dark yellow, then degrading into parchment-like remains and fibres, internodes 1—2.5 x 0.3—0.9 cm, separated by almost straight leaf scars; *flagellate foraging stem* absent; *claspings roots* densely arising from the nodes and internodes, minutely pubescent; *feeding roots* not observed; *leaves* distichous; *cataphylls* and *prophylls* thinly but stiffly chartaceous, eventually degrading into strips of tissue and fibres, particularly

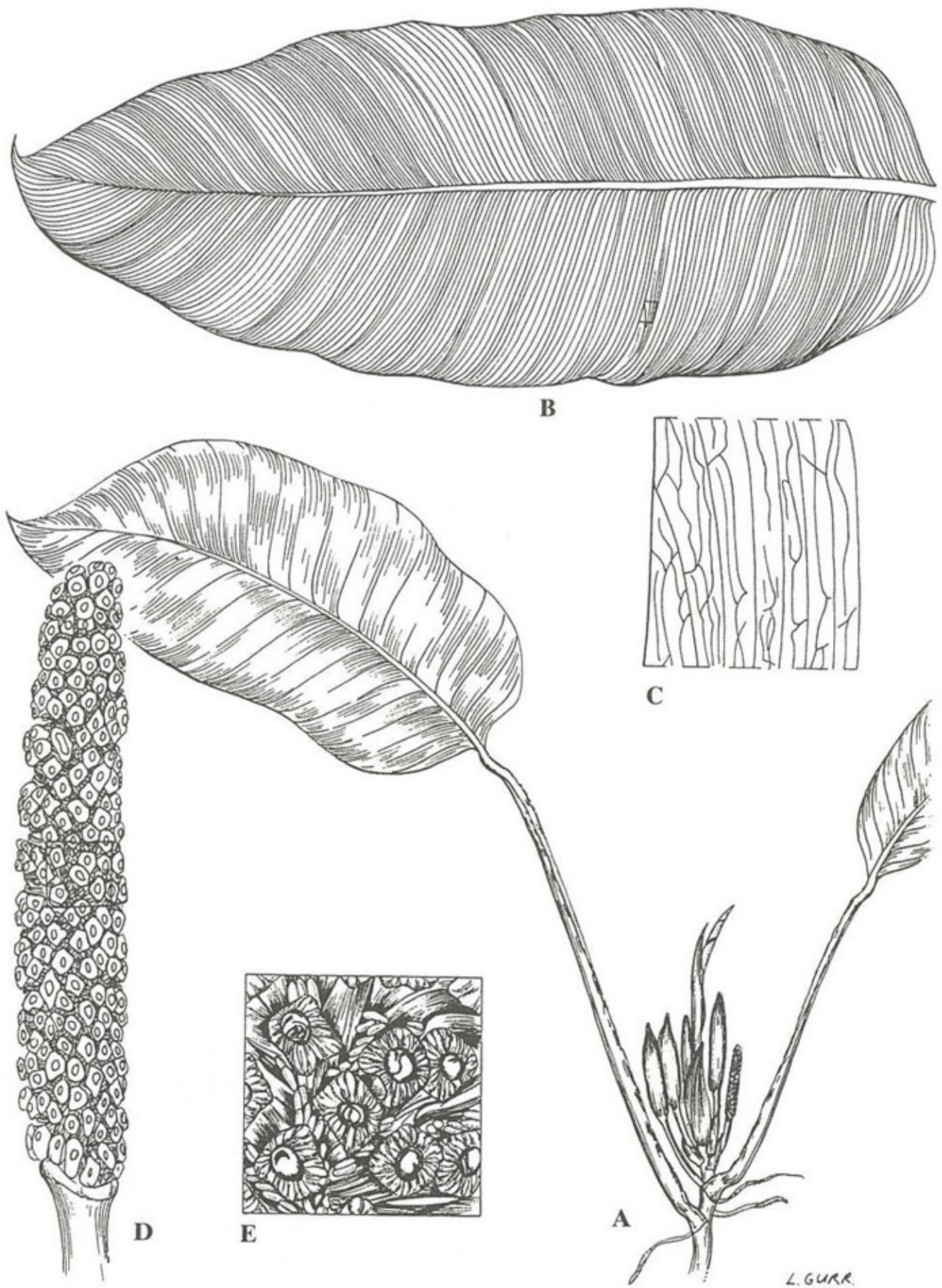


Figure 34. *Rhaphidophora versteegii* Engl. & K. Krause

A. flowering shoot x $\frac{1}{6}$; B. leaf lamina x $\frac{2}{9}$; C. venation detail x 4; D. inflorescence, spathe removed x 2; E. spadix detail, pre-anthesis x 8. A from *Versteeg 1308*; B-E from *Croft & Lelean LAE 65461*.

at tips of flowering shoots; *petiole* deeply canaliculate, 3—15 x 0.2—0.4 cm, smooth, apical geniculum weakly prominent, basal geniculum slightly less so and mostly obscured by cataphyll remains; *petiolar sheath* extending to apical geniculum, persistent, eventually degrading in strips leaving fibres; *lamina* entire, lanceolate to elliptic, falcate, 6—23 x 1.5—5 cm, stiffly coriaceous, apex acute, briefly acuminate; *midrib* raised abaxially, sunken adaxially; *primary venation* pinnate, raised abaxially, slightly less raised adaxially; *interprimaries* sub-parallel to primaries and less conspicuous; *secondary venation* tessellate-reticulate, raised abaxially, nearly flush abaxially; *tertiary venation* similar to secondary venation although more or less invisible; *inflorescences* several together, each subtended by a prominent chartaceous prophyll and one or more chartaceous cataphylls, the entire synflorescence emerging from a mass of cataphyll remains; *peduncle* stout, terete to laterally compressed, obscured by cataphylls, 2—4 x 0.3—0.35 cm; *spathe* canoe-shaped, slightly stoutly beaked, 4—5.5 x 1.5—2 cm, stiff-fleshy, duration unknown; *spadix* cylindrical, stipitate, c. 3.2 x 0.9 cm, cream; *stipe* 2—3 mm; *stylar region* rounded-conical, almost circular in plan view, 0.25—0.4 mm diam.; *stigma* deeply excavated, c. 0.2 mm diam.; *anthers* not exerted at male anthesis; *infructescence* not observed.

Distribution: Indonesian Papua (Mimika Prov.) and Papua New Guinea (East Sepik Prov.).

Habitat: Stunted forest and mixed heath forest on steep slopes. 200–580 m altitude.

Notes: 1. Based on inflorescence presentation, *Rhaphidophora waria* is close to *R. spathacea* but differs in the smaller, narrower, much stiffer leaf laminae with the primary lateral and interprimary veins clearly differentiated from one another, the stipitate spadix and the deeply excavated stigmas.

2. The specific epithet is taken from the Wasuk name 'waria' for the plant, which is recorded on the type specimen label. It does not refer to the Waria valley.

Other specimen seen: INDONESIA PAPUA. Mimika Prov.: Freeport Concession Area, *Garcinia* site on road, Johns 10418 (BO, K, MAN).



Figure 35. Rhaphidophora varia P.C. Boyce

A. flowering shoot x $\frac{1}{4}$; B. leaf lamina x $\frac{2}{3}$; C. venation detail x 3; D. juvenile creeping stage x $\frac{1}{3}$; E. inflorescence, spathe sectioned x 1; F. spadix detail, post-male anthesis x 8. All from Hoogland & Craven 10796.

Insufficiently known species

Rhaphidophora dahlii Engl.

Rhaphidophora dahlii Engl., Bot. Jahrb. Syst. 25 (1898) 8; K. Schum. & Lauterbach, Fl. Schutzgeb. Südsee (1900) 211; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 33. — Type: Papua New Guinea, East New Britain, Gazelle Peninsula, Ralum, Jan. 1897, *Dahl s.n.* (B†, holo).

With no extant type, no spirit material in B (where the rich spirit collection is occasionally a source of type material in the absence of a dried type specimen), no specimens annotated by Engler or Krause (who presumably would have been familiar with, and have annotated, authentic material), and an ambiguous protologue, it is impossible to unequivocally ascribe the name *R. dahlii* to any known species.

On the face of it, attempts to match Engler's protologue to known *Rhaphidophora* in the Bismarck Archipelago should be straightforward. There are only five *Rhaphidophora* species present on New Britain (*R. conica*, *R. hayi*, *R. jubata*, *R. korthalsii* and *R. mima*) and two (*R. hayi* and *R. schlechteri*) on nearby New Ireland. Of these, *R. korthalsii* and *R. hayi* may be immediately discounted since neither is remotely similar to the vegetative characters described for *R. dahlii*. Of the remaining four species, *R. schlechteri* can be ruled out because of its stipitate spadix (that of *R. dahlii* is described as sessile), and *R. jubata* because it is far too large (petiole to 85 cm long, lamina to 90 cm long, spathe 16–24 cm, spadix 13–21 v. petiole to 14 cm, lamina to 24 cm, spathe c. 4 cm, spadix to 3 cm in *R. dahlii*). The remaining species, *R. conica* and *R. mima*, are both possible candidates, but there remain several problems, not least of which is that while in description rather similar to *R. dahlii*, *R. conica* and *R. mima* are clearly distinguishable from one another on characters such as spathe persistence and shape of the stylar region, characters that are either not or only scantily recorded by Engler for *R. dahlii*. Thus it is impossible to be certain if either or neither is attributable to *R. dahlii*.

Excluded species

Rhaphidophora amplissima Schott = **Epipremnum amplissimum** (Schott) Engl.

Rhaphidophora carolinensis (Volk.) Fosberg = **Epipremnum carolinense** Volk.

Rhaphidophora cunninghamii Schott = **Epipremnum pinnatum** (L.) Engl.

- Rhaphidophora koidzumii* Kanehira = **Epipremnum carolinense**
Rhaphidophora lovellae F.M. Bailey = **Epipremnum pinnatum**
Rhaphidophora neocaledonica Guillaumin = **Epipremnum pinnatum**
Rhaphidophora pinnata (L.) Schott = **Epipremnum pinnatum**
Rhaphidophora pertusa var. *vitiensis* (Schott) Engl. = **Epipremnum pinnatum**
Rhaphidophora vitiensis Schott = **Epipremnum pinnatum**
Rhaphidophora zippeliana Schott = **Amydrium zippelianum** (Schott) Nicolson

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