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The Genus *Rhaphidophora* Hassk. (Araceae-Monsteroideae-Monstereae) in the Southern and Western Indonesian Archipelago

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Abstract

An alpha-taxonomic account of *Rhaphidophora* in Sumatera, Java, Nusa Tenggara, Sulawesi and Maluku is presented as a precursor to the forthcoming Flora Malesiana *Araceae* treatment. Twenty four species are recognized, of which five (*R. araea* P.C. Boyce, *R. balgooyi* P.C. Boyce, *R. floresensis* P.C. Boyce, *R. sabit* P.C. Boyce and *R. ustulata* P.C. Boyce) are newly described. One new synonomy (*R. scaberula* Alderw. into *R. puberula* Engl.) is made. In addition, *R. moluccensis* Engl. & K. Krause is treated as doubtful. Eight informal morpho-taxonomic units ('Groups') are proposed and compared. A dichotomous key to species is provided and 21 species are illustrated.

Contents

Introduction

Rhaphidophora Hassk. (including *Afrorhaphidophora* Engl.; c. 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, 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.

This is the second in a series of papers intended to present a complete alpha-taxonomy of the genus *Rhaphidophora* in Asia. An account for Peninsular Malaysia and Singapore has been published recently (Boyce, 1999) and accounts for each of the Himalaya, Thailand and Indochina, the Philippine islands (Boyce, 2000), Borneo, and Papuasia are being prepared and will be published separately. All morphological terms employed follow Stearn (1992).

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

History

The last complete revision of *Rhaphidophora* was that of Engler & Krause (1908). For the Malesian region, to date no critical account of the genus has been prepared for Borneo (but see Alderwerelt, 1920, 1922; Miquel, 1856a & b; Ridley, 1905; Merrill, 1921), the Philippine Islands (but see Merrill, 1923) and New Guinea (but see Engler & Krause, 1910, 1912; Krause & Alderwerelt, 1924; Hay, 1981, 1990). A summary of the taxonomic and nomenclatural history of *Rhaphidophora* was presented in Boyce (1999).

Infrageneric Relationships

With an alpha-taxonomy of *Rhaphidophora* developing, potentially informative higher morpho-taxonomic units are beginning to emerge. Although it is too soon to begin rigorously testing phylogenetic relationships within and between these groups, it is clear that they can be usefully given informal names. The groups are named using the earliest accepted species epithet belonging to the group. A summary of these groups for the review region and elsewhere follows.

The Hongkongensis Group is defined by shingling, non-skototropic seedling and shingling juvenile shoots, preadult and adult plants with climbing stems square to rectangular in cross-section, simple, often coriaceous leaf laminas, a petiolar sheath extending beyond the leaf base by short to rather long ligules and the sheath soon falling to leave a horseshoe-shaped scar around the top of the apical geniculum. All species

flower on free lateral shoots that are either angular or more-or-less terete in cross-section. Species in the Hongkongensis Group are often lofty climbers and are frequently very inadequately collected, making working from herbarium specimens tedious and unrewarding. The group contains numerous species, many from Indochina and Thailand. Species in the review area are *R. conocephala* Alderw., *R. maingayi* Hook.*f*., *R. montana* (Blume) Schott, *R. sylvestris* (Blume) Engl. and *R. talamauana* Alderw.. Perhaps the most easily recognizable, although paradoxically the most taxonomically intractable of these informal groups, much remains to be done before the Hongkongensis Group can be regarded as well understood.

The Hookeri Group has seedling and juveniles with spreading leaves, the apical geniculum and abaxial surface of leaf lamina pubescent, the primary lateral veins usually much more conspicuous than the interprimaries, and long petioles (at least three quarters as long as the lamina) with the sheath extending to the apical geniculum. The leaf lamina can either be entire or perforated, occasionally (*R. puberula* Engl.) in the same plant. All stems are terete in cross-section and are commonly glabrous, rarely tomentose (*R. hookeri* Schott – E. Himalaya to S China). Flowering is either on clinging or free shoots. Species in the review area are *R. foraminifera* (Engl.) Engl. and *R. puberula*.

The Korthalsii Group comprises four species with non-skototropic shingling seedlings, shingling juvenile growth and either heteroblastic leaf development leading to spreading, variously pinnately divided and perforated leaves, or neotenic development resulting in shingling fertile adult plants. Petioles may be long (equalling or exceeding the lamina) or much shorter, the petiolar sheath reaches the apical geniculum, overtopping it by a short auriculate ligule on one or both sides. Sheaths are either long persistent or soon degrade into persistent to swiftly falling fibres. All species are notable for producing densely ramentose-scaly feeding roots and are either high-climbing, e.g., *R. korthalsii* Schott, *R. crassicaulis* Engl. & K. Krause (Indochina) and *R. latevaginata* M. Hotta (Borneo), or creeping rheophytes, *R. beccarii* (Engl.) Engl.. Species in the Korthalsii Group covered in this treatment are *R. korthalsii* and *R. beccarii*.

The Neoguineensis Group as presently defined is mostly Wallacean, with only one species, *R. cylindrosperma* Engl. & K. Krause (Borneo) in Sundaland. The plants have long, terete stems, rather small, often slightly stiff leaf laminae, petioles with the sheath extending to the apical geniculum and overtopping it by two small ligules. Inflorescences are carried on the tips of, often long, free shoots. Specimens are notable for drying black. It is not clear what relationship, if any, exists between this and the next two monospecific groups.

The Minor Group contains only *R. minor* Hook.*f*., a diffuse climber

with flexuous, smooth, ± terete clinging stems, and flowering on the tips of often very long free shoots, leaf laminas are chartaceous with primary lateral and interprimary veins not differentiated from one another (leaf lamina thus appearing densely veined), and short petioles in which the petiolar sheath extends beyond the apical geniculum by two small ligules. *R. minor* dries a characteristic straw colour. This and the next group are notable for growing in swampy places, an unusual habitat for monsteroids.

The Lobbii Group, containing just *R. lobbii* Schott, is similar to the Minor Group but differs in having puberulent-scabrid to asperous stems, very softly coriaceous leaves not drying straw-coloured and with the primary lateral veins conspicuously thicker than the interprimaries, flowering shoots much shorter and the spathe exterior minutely puberulent. The seedling is leafy at germination becoming skototropic by alternating series of congested leafy and elongated leafless shoots. (The seedling of *R. minor* not known.)

The Hollrungii Group with one species, *R. megasperma* Engl., in Borneo and the rest in Wallacea is probably not a natural group but it is useful to recognise it at present until the majority of its constituent species are revised. The group is defined by inflorescences occurring in clusters of 3 – 10, with each inflorescence subtended by and separated from the next by a conspicuous chartaceous cataphyll. Inflorescences arise either at the tips of a clinging primary or lateral axis; if the former then vegetative growth is suspended for the flowering event and then reiterated, the vegetative portions of the axis thus occurring as discrete leafy modules separated by leafless portions bearing an inflorescence/infructescence (later naked). The spathe is persistent and marcescent.

Plants of the Decursiva Group have foliage leaves interspersed with up to seven cataphylls, giving plants a rather sparse appearance. Seedling and juvenile plants are non-shingling, adult plants have pinnately divided, occasionally perforated leaves. Stems are terete and glabrous, although in *R. glauca* (Wall.) Schott (Himalaya, Thailand, Indochina) the most robust stems are slightly muricate. Flowering occurs on the tips of clinging primary axes, more rarely on clinging lateral shoots. As with the Hongkongensis Group, many of the species occur outside the Malesian region. None is yet recorded for the review region, although *R. nicolsonii* P.C. Boyce, is endemic in Peninsular Malaysia.

Geography and Endemism

As noted in Boyce (1999), Malesian *Rhaphidophora* species divide into two distributional groups. One comprises taxa with limited distributions, sometimes narrowly endemic, more usually restricted to one or more

geographically adjacent landmasses, and displaying limited morphological variation. The other group comprises species with extensive distributions and, usually, a wide range of variation.

The southern and western Indonesian archipelago is notable for the high percentage of locally endemic *Rhaphidophora* species, with 13 of the 25 species recorded from only one island or island group. This compared with Peninsular Malaysia with only two locally endemic species from a total of 15.

While a paucity of botanical collections is undoubtedly a contributing factor to this apparent high level of local endemism, it is quite possible that the low number of botanical collections for many species is itself a result of the rarity and local distribution of these species. Indeed, the greater number of collections of widespread and common species such as *R. korthalsii* support this hypothesis.

There are no data for the conservation status of any of these locally endemic species and much remains to be done by way of field studies to ascertain whether any or all of these species are threatened.

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; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 17—53; Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 3 (1908) 29; Koorders, Exkursfl. Java, 1 (1911) 253—255; Backer, Beknopte Fl. Java, 17 (1957) 13—15; Backer & Bakh. *f.*, Fl. Java, 3 (1968) 106—107; Schott, Icones aroideae et reliquiae (IDC Microfilm) (1983) fiche nos. 28—31, 121; 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* Schott 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 (e.g., some populations of *R. beccarii*), root-climbing lianes, very seldom clustering and rheophytic (e.g., *R. beccarii*) and then always with a creeping juvenile stage; *cut surfaces* producing clear, odourless, sticky juice either drying ± 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 (e.g., *R. angustata* Schott) or germinating giving rise to a non-skototropic, shingling juvenile shoot (e.g., *R. korthalsii*); *pre-adult plants* often forming modest to extensive terrestrial colonies of varying morphological and physiological form such that descriptive generalizations 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 monopodial, clinging non-flowering stems rooting along their entire length giving rise to variously elaborated free sympodial lateral flowering stems (e.g., *R. lobbii*, *R. puberula*, *R. angustata*), *or* ii. all stems physiognomically monopodial, clinging and flowering (e.g., *R. korthalsii*), *or* iii. physiognomically monopodial and sympodial lateral stems clinging but only sympodial lateral stems flowering (e.g., *R. foraminifera*); *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 subwoody or somewhat corky or with distinctive matt to sublustrous 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 cataphylls and prophylls deliquescing to black mucilage which on drying leaves fragmentary parchment-like remains on petioles, developing laminae, 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; *leaves* distichous or weakly spiralled, evenly distributed or scattered or clustered distally; *cataphylls and prophylls* subcoriaceous to membranous, either soon drying and falling or degrading or deliquescing to variously textured sheaths and fibres, these

where present variously clothing upper stem before eventually decaying and falling; *petiole* canaliculate to weakly carinate, smooth or pubescent, with variously prominent apical and basal genicula; *petiolar sheath* prominent, extending either partly or fully or overtopping the geniculum, occasionally one side greatly expanded and auriculate, especially in juvenile plants, at first membranous to coriaceous, soon completely or along the margins drying chartaceous, sometimes degrading to untidy variously netted or simple fibres and later variously falling to leave a scar or disintegrating marginally or completely; *lamina* submembranous to stiffly chartaceous or coriaceous, lanceolate or oblong, ± 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 ± 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 (the last not in Malaysia); *midrib* usually prominent raised abaxially and prominently sunken, sometime flush, rarely slightly raised adaxially; *primary venation* ± pinnate; *interprimaries* mostly present, subparallel to primaries and sometimes indistinguishable from them (e.g., *R. monticola* K. Krause - Philippines) 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 (e.g., *R. monticola* - Philippines) to reticulate (e.g., *R. korthalsii*), variously prominent, often very difficult to distinguish from primary venation (e.g., *R. angustata*); *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 an almost fully formed foliage leaf (but not in Peninsular Malaysia), inflorescences at 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 anthesis and then usually deciduous before anthesis is complete, occasionally persisting into the early stages of infructescence development (e.g., *R. angustata*) rarely drying and persistent (e.g., *R. novoguineensis* Engl. - New Guinea), 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 ± bilaterally compressed, upper part variously cylindrical and variously angled, most often rhombohexagonal, those upper- and lowermost on the spadix often sterile and bereft of stigma, those uppermost frequently either scattered or partially fused to each other and forming an appendix; *ovules* few to many, anatropous, funicle long, placentae parietal to basal, sometimes ± subaxile, partial septa variably intrusive; *stylar region* well developed, usually broader than ovary, usually truncate apically, rarely elongate-conic; *stigma* sticky at female anthesis, punctiform, broadly elliptic or oblong, orientation circumferential or longitudinal; *stamens* 4—6; *filaments* strap-shaped; *anthers* usually prominently exserted from between ovaries at male anthesis, rarely not exserted and pollen extruded from between ovaries, 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 falling 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 in the Southern and Western Indonesian Archipelago

Note. Distributions given in the key refer to the review area only.

1a. Leaf lamina variously pinnately divided and/or perforated 2
1b. Leaf lamina entire 5

2a. Leaves variously pinnately divided and/or perforated. Plants flowering on adherent stems 3
2b. Leaves with scattered, small perforations. Plants flowering on free lateral stems. Sumatera, Nusa Tenggara ..... **17. R. puberula**

3a. Flowering plants climbing 4
3b. Flowering plants rheophytic, not climbing. Sumatera ..... **4. R. beccarii**

4a. Leaf lamina of mature plants slightly to extensively perforated, perforations round to rhombic, extending c. quarter of lamina width on each side of the midrib, abaxial surface of lamina with pubescent veins; active shoot tips with black mucilage. Sumatera ..... **7. R. foraminifera**
4b. Leaf lamina of mature plants pinnatisect, the pinnae often perforated basally and appearing stilted, lamina always glabrous; active shoot tips with sparse to copious netted fibre. Sumatera, Java, Sulawesi and Maluku. ..... **9. R. korthalsii**

5a. Abaxial surface of lamina and apical geniculum pubescent. Sumatera, Nusa Tenggara ..... **17. R. puberula**
5b. Lamina and apical geniculum glabrous. 6

6a. Flowering shoots consisting of scattered fans carried on short stout shoots and held at about 90° to the ± leafless main stem. Sumatera ..... **1. R. angustata**
6b. Flowering shoots not as above 7

7a. Plant climbing 9
7b. Plant terrestrial or rheophytic 8

8a. Peduncle much shorter than petiole, spathe 6.5—7 cm, spadix 4.5—7 cm, sessile. Plant habitually rheophytic. Sumatera ..... **4. R. beccarii**
8b. Peduncle subequalling or exceeding petioles, spathe 4—5 cm, spadix 2.4—3.2 cm, stipitate. Plant terrestrial, perhaps occasionally rheophytic. Sumatera (endemic) ..... **2. R. araea**

9a. Flowering plant with leaves appressed to substrate and shingling on adherent shoots, slightly scattered on flowering shoots. Maluku

(Ternate, Halmahera - endemic) ..... **16. R. parvifolia**

9b. Flowering plant not as above 10

10a. Stems scabrid to asperous. Spathe exterior minutely puberulent. Sumatera, Sulawesi ..... **10. R. lobbii**

10b. Stems smooth. Spathe exterior glabrous 11

11a. Adherent stems square or rectangular in cross-section; tips of active stems with netted prophyll, cataphyll and petiolar sheath. Sumatera ..... **11. R. maingayi**

11b. Adherent stems variously shaped in cross-section; tips of active stems without fibrous material 12

12a. Spadix stipitate 13

12b. Spadix sessile 19

13a. Leaf lamina thickly coriaceous. Sumatera ..... **5. R. conocephala**

13b. Leaf lamina variously textured but not thickly coriaceous. 14

14a. Lamina at least 7 times longer than wide, narrowly falcate-lanceolate to narrowly falcate-oblanceolate. Sulawesi (endemic) .... **18. R. sabit**

14b. Lamina no more than 5 times longer than wide. 15

15a. Spadix at anthesis 8—15 cm long 16

15b. Spadix at anthesis no more than 7.5 cm long 18

16a. Cataphyll, prophyll and petiolar sheath fibres present. Primary lateral veins significantly more prominent than interprimaries. Stigma elongate to rounded, raised. Maluku (Ternate, Ceram – endemic). ..... **22. R. ternatensis**

16a. Cataphyll, prophyll and petiolar sheath fibres absent. Primary lateral veins thicker and clearly differentiated from interprimaries. Stigmas various 17

17a. Spadix at anthesis 11—15 cm long; stigma round, flat. Maluku (Ternate, Buru – endemic) ..... **3. R. balgooyi**

17b. Spadix at anthesis 8—10 cm long; stigma punctiform, raised. Sulawesi (endemic) ..... **19. R. sarasinorum**

18a. Leaf lamina on flowering shoots elliptic-lanceolate to oblong-elliptic, stiffly coriaceous, base cuneate, apex acuminate to attenuate with a prominent tubule. Sulawesi (endemic) ..... **8. R. koordersii**

18b. Leaf lamina on flowering shoots lanceolate to oblong lanceolate, ± falcate, thinlycoriaceous, base acute, apex acute to long-acuminate with a slight tubule. Maluku(Ternate, Tidore, Ceram - endemic) ... . **15. R. oligosperma**

19a. Spadix at anthesis 3.5—8.5 cm long 20
19b. Spadix at anthesis 9—20 cm long. Sumatera, Java, Nusa Tenggara, Maluku, Sulawesi ..... 14. **R. montana**

20a. Spadix clavate-cylindrical 22
20a. Spadix cylindrical to tapering cylindrical 24

21a. Leaf lamina notably coriaceous. Stigmas c. 1mm diam., the middle excavated, the edges prominently raised. Sumatera (endemic) .... **12. R. megastigma**
21b. Leaf lamina not notably coriaceous, mostly rather thin. Stigmas not as above or if as large then not excavated and lacking a prominently raised edge 22

22a. Spadix not more than 3 cm long at anthesis. Sulawesi (endemic) ... . **23. R. teysmanniana**
22b. Spadix exceeding 3 cm, often up to 6 cm long, at anthesis 23

23a. Flowering shoots stems ± rectangular in cross-section. Spathe beak short. Sumatera,Java, Nusa Tenggara ..... **20. R. sylvestris**
23b. Flowering shoots terete in cross-section. Spathe beak long. Sumatera (endemic) ..... **21. R. talamauana**

24a. Leaf lamina 2.5—16 x 1.2—3 cm, drying uniformly pale straw-coloured. Spadix slender cylindrical, 2.5—7 cm long. Sumatera, Sulawesi ..... **13. R. minor**
24b. Leaf lamina 21—34 x 4—7 cm, drying darker above, paler below. Spadix tapering cylindrical, 6.5—8.5 cm long 25

25a. Petiole drying pale with apical geniculum much darker, leaf lamina drying strongly discolorous, pale yellow-brown abaxially, mid-brown adaxially. Spadix strongly tapering-cylindrical; stigma discoid, flat. Sumatera (Pulau Enggano - endemic) ..... **24. R. ustulata**
25b. Petiole drying ± uniformly mid-brown, leaf lamina drying barely discolorous. Spadix slightly tapering-cylindrical; stigma punctiform, raised. Nusa Tenggara (Pulau Flores - endemic) ..... **6. R. floresensis**

The Species

1. Rhaphidophora angustata Schott

Rhaphidophora angustata Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 128; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 241; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 25 — Type: Indonesia, "?Java", *P.W. Korthals 206* (L, holo).

Scindapsus pteropodus Teysm. & Binn., Natuurk. Tijdschr. Ned.-Indië. 27 (1864) 23; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 254 — *Rhaphidophora pteropoda* (Teysm. & Binn.) Engl., Bull. Soc. Tosc. Ortic. 4 (1879) 268 & in Beccari, Malesia 1 (1882) 268; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 25—26 — Type: Indonesia, Sumatera, Loeboe-Aloeng, *Teysmann s.n.* (BO, holo; K, iso).

Rhaphidophora laetevirens Ridl., J. Bot. 40 (1902) 37 — Type: Malaysia, Penang, Bk Penara, 1896, *Ridley s.n.* (SING, lecto; selected by Boyce, 1999).

Figures 1 & 2

Large, occasionally enormous, robust, semi-leptocaul, homeophyllous liane to 20 m; *seedling stage* leafy at germination and skototropic by alternating series of congested leafy and elongated leafless shoots; *pre-adult plants* almost never forming terrestrial colonies; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, sparsely leafy, non-flowering stems and short, free, sympodial, densely leafy, potentially flowering stems; *stems* smooth, bright green, without prophyll, cataphyll and petiolar sheath fibre, internodes to 20 x 3.5 cm on adherent shoots, considerably shorter on free shoots, separated by prominent oblique leaf scars, older stems subwoody; *flagellate foraging stems* exceedingly long with internodes to 50 cm or more and nodes with semipersistent cataphylls; *clasping roots* dense, arising from the nodes and internodes of clinging stems, prominently pubescent; *feeding roots* rare, adherent, pubescent; *leaves* weakly spiralled on adherent and flagelliform shoots, those on free shoots distichous into dense, few to many-leaved fans; *cataphylls and prophylls* subcoriaceous, soon drying and falling; *petiole* deeply canaliculate, 8—24 x 1.2—2.5 cm, smooth, apical and basal genicula prominent; *petiolar sheath* prominent, extending to or occasionally by means of a terminal brief ligule, overtopping the apical geniculum, ± long persistent and drying chartaceous; *lamina* entire, falcate-lanceolate to falcate-oblong, oblique, 15—61 x 4—20 cm, subchartaceous, base acute to unequal, apex acute to slightly acuminate;

Figure 1. Rhaphidophora angustata Schott
A. fertile shoot x $^{1}/_{6}$; B. foraging shoot x +; C. leaf lamina x $^{2}/_{9}$; D. venation detail x 4. All from *Nicolson 927.*

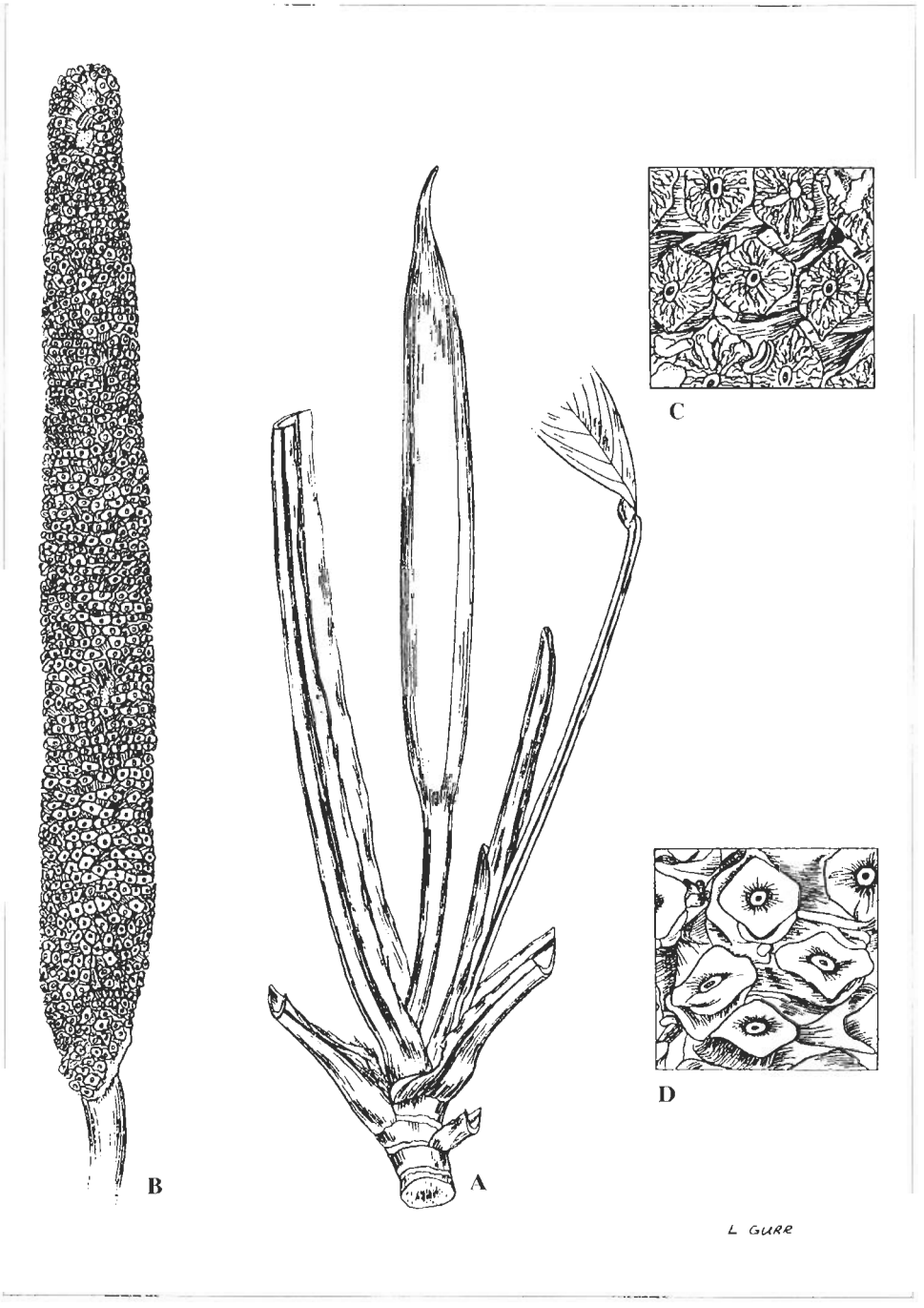

Figure 2. Rhaphidophora angustata Schott
A. flowering shoot x $^1/_3$; B. inflorescence, spathe fallen x $^1/_3$; C. spadix detail, late anthesis x 6; D. spadix detail, early fruiting x 4. All from *de Wilde & de Wilde-Duyfjes 13634*.

midrib prominently raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially, somewhat impressed adaxially, the leaf appearing slightly quilted; *interprimaries* subparallel to primaries, slightly raised abaxially, slightly impressed adaxially; *secondary venation* weakly reticulate, slightly raised; *tertiary venation* invisible; *inflorescence* solitary from the centre of the fanned leaves of a free shoot, subtended by a fully developed foliage leaf; *peduncle* terete, 11—13 x 1—1.2 cm; *spathe* narrowly canoe-shaped, stoutly beaked, 16—29 x 2—3.5 cm, stiffly fleshy, greenish to white, gaping basally at anthesis and then persistent partly into fruit development although eventually falling to leave a large oblique scar at the base of the spadix; *spadix* cylindrical, sessile, obliquely inserted on peduncle, 12—23 x 1.5—2 cm, dirty white; *stylar region* rather well developed, mostly rhombohexagonal, 2—2.2 x 2 mm, truncate; *stigma* punctiform, c. 0.3 mm diam., but ovaries on lowermost part of spadix with longitudinally orientated elongated stigmas c. 1 x 0.25 mm; *anthers* not exserted at anthesis, pollen extruded from between ovaries; *infructescence* 14—20 x 2.5—3.5 cm, dark green before ripening.

Distribution: Sumatera and Peninsular Malaysia.

Habitat: Primary to disturbed moist to wet lowland to upper hill dipterocarp forest along rivers, on lofty trees and rocks on both acid and base substrates. 125—1500 m altitude.

Notes: 1. A frequently very high-climbing species unmistakable by the scattered fans of large, bright-green, soft-textured, litter-trapping leaves carried on short stout shoots and held at about 90° to the ± leafless main stem. The large slender inflorescences arise from these fans.

2. Long known by the later name *R. pteropoda*, the epithet *R. angustata* must now be applied to this species. The type of *R. angustata* is sterile (the specimen is an immature fan of leaves but it is unmistakably the same species as that later described by Teysmann and Binnendijk as *Scindapsus pteropodus*) and of unknown provenance. In the protologue Schott cites the type as '*Sumatra occidentalis*' but the specimen label states '?Java', although *R. angustata* has never been collected wild in Java.

Other specimens seen: SUMATERA. 'comm. *D. Habury 1866*', *Binnendijk s.n* (K); Aceh Prov. - Bk. Lawang, Bohorok, Langkat, *Soedarsono 283* (K, L); G. Leuser N.R. c. 35 km NW of Kutatjane, 3—5 km upstream Lau Ketambe *de Wilde & de Wilde-Duyfjes 13634* (K, L), Ketambe Research Station, Alas river valley, c. Guhru river, *de Wilde & de Wilde-Duyfjes*

18154 (BO, K, L, MO); West Sumatera - Bt Gajabuih, about 15 km east from Padang City, *Hotta 25568* (BO, KYO).

2. Rhaphidophora araea P.C. Boyce, ***sp. nov.***

Rhaphidophora araea differt a pluribus speciebus generis habitu terrestri vel rheophytico; a speciebus *R. beccarii* et *R. wentii* (semper rheophyticis) pedunculo subaequilongo vel longiore quam petioli et spadice parvo stipitato — TYPUS: Indonesia, Sumatera, Riau Prov., S. Tulang, 13 Oct. 1939, *P. Buwalda 7032* (BO, holo; GH, K, L, SING, iso).

Figure 3

Slender, heterophyllous (?), creeping rheophyte (?) to 45 cm; *seedling* and *pre-adult plants* unknown; *adult shoot* sympodial, clinging main axis creeping or briefly ascendant; *stems* minutely longitudinally ridged, without petiolar sheath fibre, internodes 0.5--1 x 0.3—0.5 cm, separated by prominent very slightly oblique leaf scars; dormant axillary and terminal buds comparatively very large, matt black; *clasping roots* very densely arising from the nodes and internodes of clinging stems, finely pubescent; *feeding roots* adherent, densely pubescent; *leaves* spiro-distichous, erect or spreading and scattered and tending to become distally clustered on adult shoots; *cataphylls and prophylls* unknown, (soon drying and falling ?); *petiole* very narrowly canaliculate to almost carinate, 6—20 x 0.1—2.25 cm, smooth, apical and basal genicula not prominent; *petiolar sheath* barely visible, but extending to just below the apical geniculum, soon falling; *lamina* entire, very narrowly lanceolate to narrowly lanceolate-elliptic or narrowly oblanceolate, slightly to prominently oblique, 9—30 x 1.5—4 cm, coriaceous, semiglossy above, matt beneath, margins minutely revolute, base long-decurrent, apex long-acuminate with a moderately prominent tubule; *midrib* raised abaxially, sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* subparallel to primaries, slightly raised abaxially and adaxially; *secondary venation* reticulate, very slightly raised; *inflorescence* solitary, subtended by a fully developed foliage leaf and a prominent, narrow prophyll; *peduncle* subequalling or exceeding petioles, terete, 9—14 x 0.18—0.2 cm; *spathe* broadly canoe-shaped, abruptly stout-beaked, 4—5 x 0.6—1.2 cm, stiffly fleshy, yellow, falling (at anthesis ?); *spadix* cylindrical, stipitate, 2.4—3.2 x c. 0.5 cm, green; stipe c. 2 x 0.75 mm; *stylar region* rather well developed, mostly rhombohexagonal, c. 1—1.5 x 1—1.5 mm, very slightly conical to truncate; *stigma* punctiform, c. 0.3 mm diam., raised; *anthers* exserted at anthesis; *infructescence* unknown.

Distribution: Sumatera. Endemic.

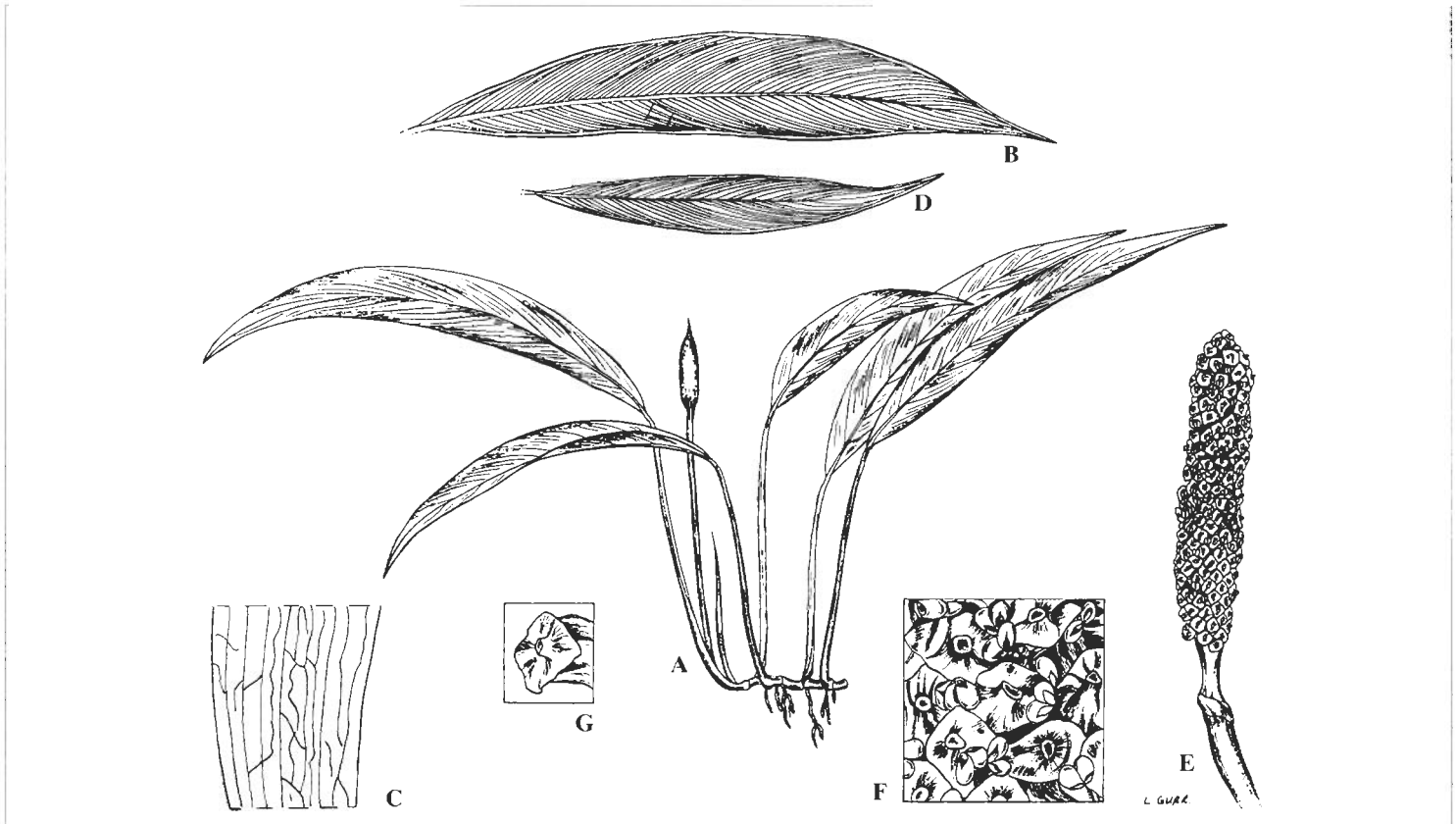

Figure 3. Rhaphidophora araea P.C. Boyce
A. flowering shoot x $^{1}/_{3}$; B. leaf lamina x +; C. venation detail x 4+; D. leaf lamina x +; E. inflorescence, spathe fallen x 2; F. spadix detail, late anthesis x 10; G. gynoecium, three quarter view, early fruiting x 10. All from *Buwalda 7032*.

Habitat: Primary forest, secondary forest on river, on rocks. 200—400 m altitude.

Notes: 1. *Rhaphidophora araea* is immediately distinguished by its terrestrial (probably rheophytic) habit (in west Malesia otherwise known only in the probably unrelated *R. beccarii*), the peduncle subequalling or exceeding the petioles and small, stipitate spadix.

2. The specific epithet comes from the Greek word áñáéüò, meaning slender, in allusion to the habit of this species.

Other specimens seen: SUMATERA. Riau Prov. - Tigapuluh Mts, 15 km SW of Talanglakat on Rengat - Jambi road, S. Sesirih, *Burley et al. 1719* (SING, GH); S. Akar, *Buwalda 6922* (BO, K).

3. Rhaphidophora balgooyi P.C. Boyce, *sp. nov.*

Rhaphidophora balgooyi differt a *R. ternatensis* cataphyllo et prophyllo et fibris vaginae petiolaris deficientibus, nervis lateralibus primariis manifeste minus prominentibus, spadice maiore, stigmatibus planis; differt a *R. sarasinorum* spadice minore stigmatibus minoribus punctiformiter elevatis — TYPUS: Indonesia, Maluku, Pulau Buru, Waeha River, between Waelanga and Lake Kunturun, 15 Nov. 1984, *van Balgooy 4768* (L, holo; GH, iso).

Rhaphidophora ternatensis Alderw. f. *major* Alderw, Bull. Jard. Bot. Buitenzorg III, 4 (1922): 194 — Type: Indonesia, Maluku, Pulau Ternate, *Beguin 1141* (BO, holo).

Figure 4

Large, robust, semi-pachycaul homeophyllous liane to 8 m; *seedling stage* & *pre-adult plants* not observed; *adult shoot* architecture comprised of elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, stout, free, sympodial, densely leafy, flowering stems; *stems* smooth, internodes 1—2 cm x 0.5—1.2 cm on free shoots, separated by well defined, oblique leaf scars; *flagellate foraging stems* not observed; *roots* not observed; *leaves* spiro-distichous on free shoots; *cataphylls and prophylls* membranous, drying and falling; *petiole* deeply grooved adaxially, 12.5—30 x 0.4—1.2 cm, apical geniculum strongly defined and drying slightly darker than the rest of the petiole; *petiolar sheath* very prominent, extending to just below the apical geniculum, upper part ending abruptly, lower part sheathing the emerging leaf or inflorescence; *lamina* entire, oblong, very

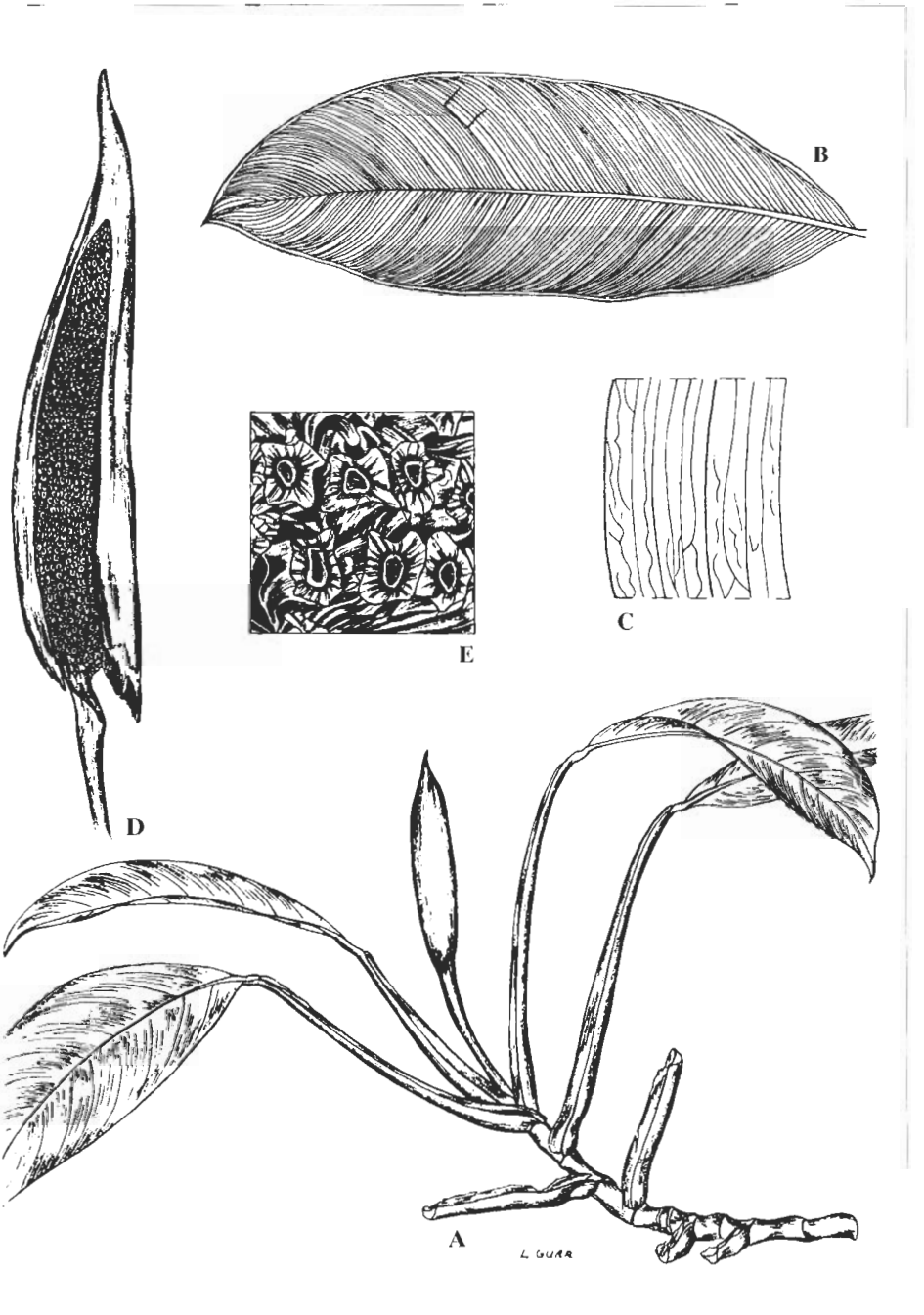

Figure 4. Rhaphidophora balgooyi P.C. Boyce
A. flowering shoot x $^{1}/_{3}$; B. leaf lamina x +; C. venation detail x 2; D. inflorescence, x +; E. spadix detail, late anthesis x 6. All from *Van Balgooy 4768*.

slightly oblique, 20—38 x 8.5—11 cm, thinly coriaceous, base cuneate to acute, apex weakly falcate, acute to briefly acuminate, with an apiculate tubule; *midrib* prominently raised abaxially, very slightly channelled adaxially; *primary venation* pinnate, almost imperceptibly raised abaxially and adaxially; *interprimaries* parallel to primaries, barely visible; *secondary* and *tertiary venation* very obscure; *inflorescence* solitary, subtended by a fully developed foliage leaf and one or more cataphylls; *peduncle* slightly compressed-cylindric, 1—12 x c. 0.5 cm; *spathe* elongate canoe-shaped, stoutly long-beaked, 12—19 x 1.5—3 cm; *spadix* cylindrical, tapering basally, apex acute, stipitate; *stipe* 6—10 x c. 2 mm; *spadix* inserted ± obliquely on stipe, 11—15 x 1.5—1.75 cm; *stylar region* mostly rhombohexagonal, 1—1.6 x 1.2—1.7 mm, truncate; *stigma* rounded, flat, c. 0.35—0.4 mm diam.; *anthers* exserted at anthesis; *infructescence* not observed.

Distribution: Maluku – Buru, Ternate. Endemic.

Habitat: Riverine forest. 350—400 m altitude.

Notes: 1. Described by Alderwerelt as a robust form of *R. ternatensis*. *R. balgooyi* differs in lacking cataphyll, prophyll and petiolar sheath fibres, in the significantly less prominent primary lateral leaf venation, the considerably larger spadix and flat stigmas. Confusion with *R. sarasinorum* is possible. The latter may be distinguished by the smaller (8—10 cm at anthesis) spadix and smaller, punctiform raised stigma.

2. Named for Dr Max M.J. van Balgooy who collected the type specimen.

4. Rhaphidophora beccarii (Engl.) Engl.

Rhaphidophora beccarii (Engl.) Engl. in Bot. Jahrb. Syst. 1 (1881) 181 & in Beccari, Malesia 1 (1882) 270, Tab. xix 6—9; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 46; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 382; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 341 — *Epipremnum beccarii* Engl., Bull. Soc. Tosc. Ortic. 4: 268 (1879) — Type: Malaysia, Sarawak, Kuching, Oct. 1865, *Beccari p.b. 833* (cited as '*832*' by Engler, 1879) (FI, holo).

Rhaphidophora borneensis Engl. *Araceae exsicc. et illustr. n.* 195 & in Bot. Jahrb. Syst. 7, Beibl. 15 (1886) 1 — Type: Indonesia, Kalimantan, Mindai to Pramassan, 19 June 1882, *H. Grabowski s.n.* (B†, BM)

Rhaphidophora fluminea Ridl., J. Straits Branch Roy. Asiat. Soc. 44 (1905)

186; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 37 — Type: Malaysia, Sabah, Bongaya, Dec. 1897, *Ridley s.n.* (SING, holo).

Figure 5

Small to medium-sized, heterophyllous, sometimes homeophyllous, creeping rheophyte, very rarely short liane, to 75 cm; *seedling stage* a non-skototropic shingling shoot, soon becoming spreading-leafy; *pre-adult plant* initially with ± appressed shingle-leaves, later with leaves erect or spreading and at this stage plants resembling the adult in all but overall size and leaf division; *adult shoots* all sympodial, clinging and flowering but main axis comprised of longer modules than axillary axes; *stems* smooth, mid- to dark green, with very sparse petiolar sheath fibre, internodes 1—7 x c. 1 cm, separated by variously prominent slightly oblique leaf scars; *flagellate foraging stems* absent; *clasping roots* very densely arising from the nodes and internodes of clinging stems, pubescent; *feeding roots* very strongly adherent, densely scaly; *leaves* distichous, appressed and shingling to erect or spreading and scattered on pre-adult shoots, tending to become distally clustered on adult shoots; *cataphylls and prophylls* membranous, soon drying and falling; *petiole* narrowly canaliculate to carinate, 8—31 x 0.3—1.5 cm, smooth, apical and basal geniculа prominent; *petiolar sheath* prominent, extending to the apical geniculum, variably persistent and mostly degrading into semipersistent weak fibres; *lamina* entire in seedling and pre-adult individuals, entire, pinnatipartite or pinnatisect in adult plants, narrowly-lanceolate to oblong-elliptic, slightly oblique, 21—51 x 2—23 cm, subcoriaceous to slightly fleshy, base decurrent, apex acuminate with a moderately prominent tubule; *midrib* prominently raised abaxially, sunken adaxially; *primary venation* pinnate, raised abaxially, slightly impressed adaxially; *interprimaries* subparallel to primaries, slightly raised abaxially, ± flush adaxially, often forming a weak reticulum; *secondary venation* prominently reticulate, slightly raised; *tertiary venation* a network of broadly spaced tessellate veins arising at c. 90° from the midrib and crossing the primaries and interprimaries; *inflorescence* one to three together, subtended by a prominent cataphyll degrading into fibres before anthesis; *peduncle* terete, 8—12 x 0.2—0.4 cm; *spathe* narrowly canoe-shaped, stoutly beaked, 6.5—7 x 1—1.5 cm, stiffly fleshy, greenish to dull white, swiftly falling at anthesis; *spadix* cylindrical, sessile, inserted perpendicular to peduncle, 4.5—7 x 0.6—1 cm, dull whitish; *stylar region* rather well developed, mostly rhombohexagonal, c. 1—1.5 x 1—1.5 mm, truncate; *stigma* elliptic, longitudinally orientated, occasionally almost circular, c. 0.5 x 0.3 mm, often very prominent especially in dried material; *anthers* exserted at anthesis; *infructescence* 7—9 x 1—2 cm, mid-green when ripe.

Figure 5. Rhaphidophora beccarii (Engl.) Engl.
A. habit x +; B. leaf lamina x +; C. leaf lamina x +; D. venation detail x 4; E. inflorescence, spathe fallen x 1; F. spadix detail, post female receptivity, pre-anthesis x 8. A, E & F from *Stone 9637*; B & D from *Ridley s.n.*; C from *Kiew 1982*.

Distribution: Southern Thailand, Peninsular Malaysia, Sumatera (including Lingga Archipelago) and throughout Borneo

Habitat: Rheophytic on rocky, wooded streambanks, on rocks in streams and rivers, in soft mud, sandy streambeds and bare rock on limestone or granite in primary to disturbed old secondary lowland to hill and swamp forest. 70—900 m altitude.

Notes: 1. One of two or three obligate rheophytic species (the others are the New Guinea *R. wentii* Eng. & K. Krause and possibly the Sumatran *R. araea*), *R. beccarii* is immediately recognized by its adult growth form, its habit of creeping along watercourses or being attached on rocks in the water, and by the usually pinnately divided leaf laminas.

2. Although the pinnately divided leaf is typical of adult plants, entire leaved stenophyllous to lanceolate-leaved flowering plants are not rare. Such plants have been referred to as *R. fluminea* and occur either as pure stands or as mixed populations with the pinnate-leaved form (*SFN* 33128 is an excellent example of the latter phenomenon). They are treated here as a neotenic manifestation of *R. beccarii*.

These narrow leaf forms have been confused with *R. araea* but may readily be distinguished by the peduncle much shorter than the petiole and the larger, sessile spadix.

Other specimens seen: SUMATERA. Riau Prov. - Lingga Archipelago, Pulau Lingga, Resun, *Bünnemyer 6785* (BO, K, L), Parbasiran, Marbau, Bilah, near Bilah Pertama, *Toroes 177* (L, US), Labuhan Batu, Kota Pinang, Si Mandi Angin, S. Kanan, *Toroes 4071* (US);; North Sumatera Prov. - Sibolangit, Boren Bila to Aek Buru, *Lörzing 9717* (BO), *Lörzing* 12240 (BO), Tapianoeli, Padang Si Dimpoean, Padang Lawas, G. Manuen, *Toroes 4594* (US); Padang Si Dimpoean, Padang Lawas, Hatiran, *Toroes 4936* (US); Padang Lawas, Sopsopan, Aek Si Olip, *Toroes 5559* (L, US); West Sumatera - Indragira, Taluk region near bivak Dewan I, *Meijer 4254* (SING);

5. Rhaphidophora conocephala Alderw.

Rhaphidophora conocephala Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 384 — Type: Indonesia, Sumatera, North Sumatera, Sibolangit, 10 May 1917, *Lörzing 5137* (BO, holo; K, L, iso).

Figure 6

Large, moderately robust, semipachycaul homeophyllous liane to 15 m;

seedling stage a non-skototropic shingling shoot; *pre-adult plants* forming small terrestrial colonies of appressed shingling shoots; *adult shoot* architecture comprised of elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and moderately elaborated, free, sympodial, moderately leafy, flowering stems; *stems* smooth, climbing stems rectangular in cross-section, free stems more or less terete to very weakly four-angled in cross-section, larger shoot systems pendent under their own weight, without prophyll, cataphyll and petiolar sheath fibre, internodes to 7 x 1.5 cm on adherent shoots, shorter and less stout on free shoots, separated by prominent oblique leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* densely arising from the nodes and internodes of clinging stems, densely pubescent; *feeding roots* rare, adherent, pubescent; *leaves* weakly spiralled on adherent shoots, slightly scattered-distichous on flowering shoots; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* shallowly canaliculate adaxially, 4—7 x 0.1—0.2 cm, smooth, with a slight apical and rather prominent basal geniculum; *petiolar sheath* prominent, extending to and encircling the apical geniculum, very swiftly drying and falling to leave a thin continuous scar from the petiole base, around the top of the apical geniculum and back to the base, occasionally newest leaves with parchment-like sheath remain briefly adherent; *lamina* entire, falcate-lanceolate to falcate-oblong or falcate-oblanceolate, 10—29.5 x 1.5—7 cm, coriaceous, upper surfaces slightly glossy, lower surfaces less so, base minutely cordate to subovate to acute or briefly decurrent, apex subacute with a prominent apiculate tubule, margins slightly revolute in dried material; *midrib* raised abaxially, very slightly sunken adaxially; *primary venation* pinnate, raised abaxially and adaxially; *interprimaries* parallel to primaries, slightly raised abaxially and adaxially; *secondary* and *tertiary venation* slightly raised in dried specimens; *inflorescence* solitary, subtended either by a fully developed foliage leaf or by one or more subfoliar (i.e., developed petiole but atrophied lamina) cataphyll; *peduncle* slightly compressed-cylindric, 3—6 x 0.3—0.5 cm; *spathe* cigar-shaped, stoutly short-beaked, 7—9.5 x 2—3.5 cm, thickly fleshy, exterior light yellow, interior darker, swiftly (?) falling at female receptivity; *spadix* cylindrical to slightly clavate, very shortly stipitate, light yellow, 4—5.3 x 1.2—1.5 cm; *stipe* c. 2 mm long; *stylar region* well developed, mostly rounded to rhombohexagonal, 1.2—1.3 x c. 1.2 mm, conical; *stigma* conspicuously raised-punctiform, c. 0.2 mm diam.; *anthers* slightly exserted at anthesis; *infructescence* stoutly cylindrical, 6.5—7.5 x 1.8—2 cm.

Distribution: Sumatera, Kalimantan and into the Philippines (Palawan).

Habitat: Damp primary and old secondary forest, 450—1000m altitude.

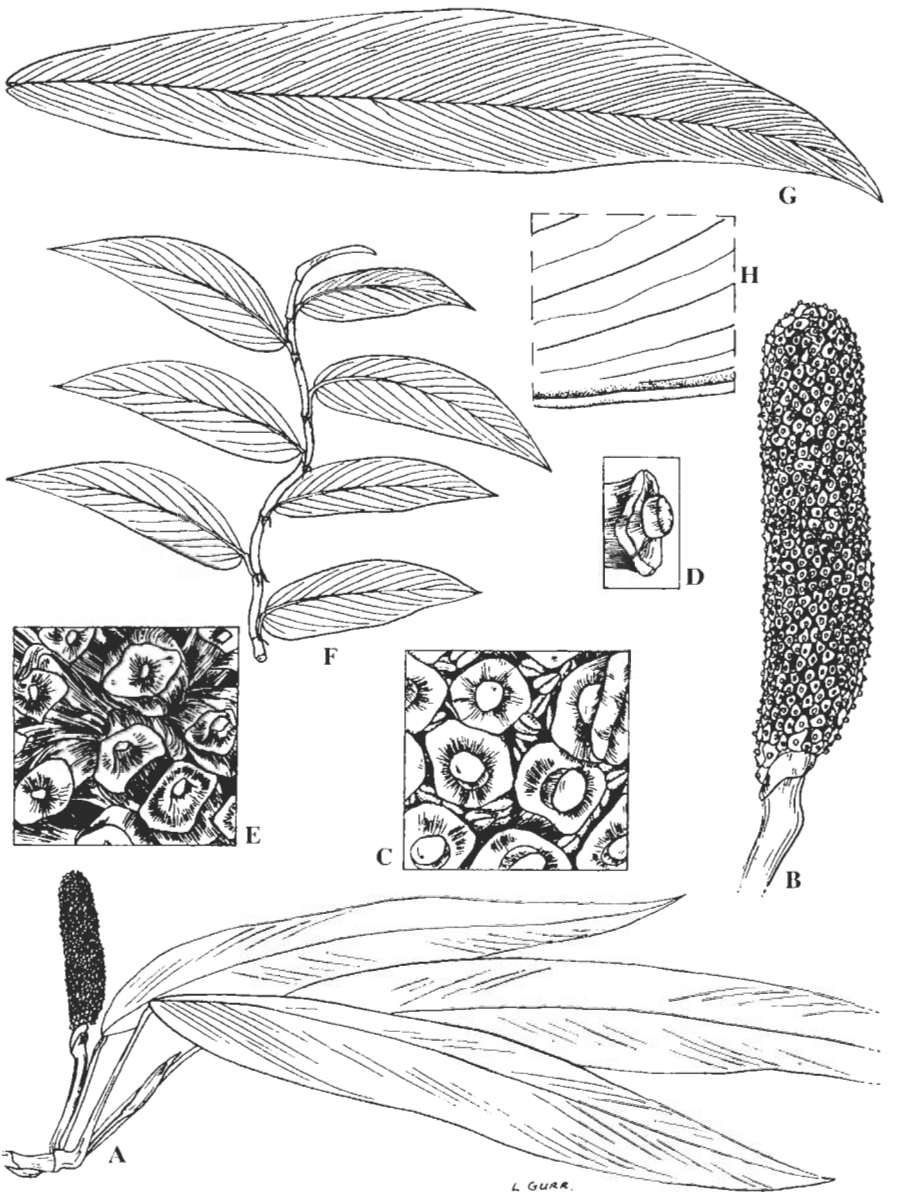

Figure 6. Rhaphidophora conocephala Alderw.
A. flowering shoot x +; B. inflorescence, spathe fallen x 1+; C. spadix detail, female receptivity x 10; D. gynoecium, three quarter view x 6; E. spadix detail, post anthesis x 10; F. portion of preadult sterile shoot x $^1/_3$; G. leaf lamina x +; H. venation detail x 3. A – E, G & H from *Nur SFN 7369*; F from *Lörzing 11750*.

Note: Very close to *R. sylvestris* but consistent in the conical style topped with a prominent, raised button-like stigma. Generally *R. conocephala* has more coriaceous leaves compared with *R. sylvestris*.

Confusion is possible with *R. crassifolia* (Peninsular Malaysia and southern Thailand) which differs by the considerably thicker, almost succulent leaves and the prominently angled and elaborately twisted adherent stems.

Other specimens seen: SUMATERA. North Sumatera - Sibolangit, *Lörzing 11750* (BO, K, L). Sibolangit, Bk Semiak, *Nur SFN 7369* (BO, K, SING).

6. Rhaphidophora floresensis P.C. Boyce, *sp. nov.*

Rhaphidophora floresensis simillima speciebus *R. apiculata*, *R. hollrungii*, *R. sabit* et *R. ustulata* , quae petiolis longis et cataphyllis chartaceis distinctae sunt; a his speciebus *R. floresensis* differt inflorescentiis in surculis lateralibus adhaerentibus, spadice sessili, stigmatibus manifeste elevatis — TYPUS: Indonesia, Nusa Tenggara, Flores, Sessok, 15 Sept. 1975, *E. Schmutz 3837C* (L, holo).

Figure 7

Large, moderately robust, semi-leptocaul (?) homeophyllous (?) liane (ultimate height unknown); *seedling* and *pre-adult plants* unknown; *adult shoot* architecture not fully known but apparently comprised of clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* smooth, free stems, ± terete in cross-section, without fibre at the tips of active shoots, internodes to 3 x 1 cm, separated by large ± straight leaf scars; *roots* unknown; *leaves* spiral-distichous on free shoots; *cataphylls and prophylls* conspicuous, membranous, very quickly drying and falling; *petiole* deeply grooved adaxially, 11—22 x 0.2—3.5 cm, smooth, apical and basal geniculum well defined; *petiolar sheath* prominent, extending to the apical geniculum, swiftly drying and leaving a slightly corky scar; *lamina* entire, elliptic to falcate-lanceolate, 21—24 x 4—7 cm, very thinly coriaceous, base acute, apex acuminate with a prominent apiculate tubule; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, barely visible in dried specimens; *interprimaries* parallel to primaries, almost invisible; *secondary* and *tertiary venation* only just visible as a faint reticulum; *inflorescence* solitary, subtended by a large papery cataphyll; *peduncle* strongly compressed cylindric, c. 7 x 0.3—0.5 cm; *spathe* canoe-shaped, stoutly very long-beaked, 9—12 x c. 2 cm, stiff-leathery, swiftly falling (at

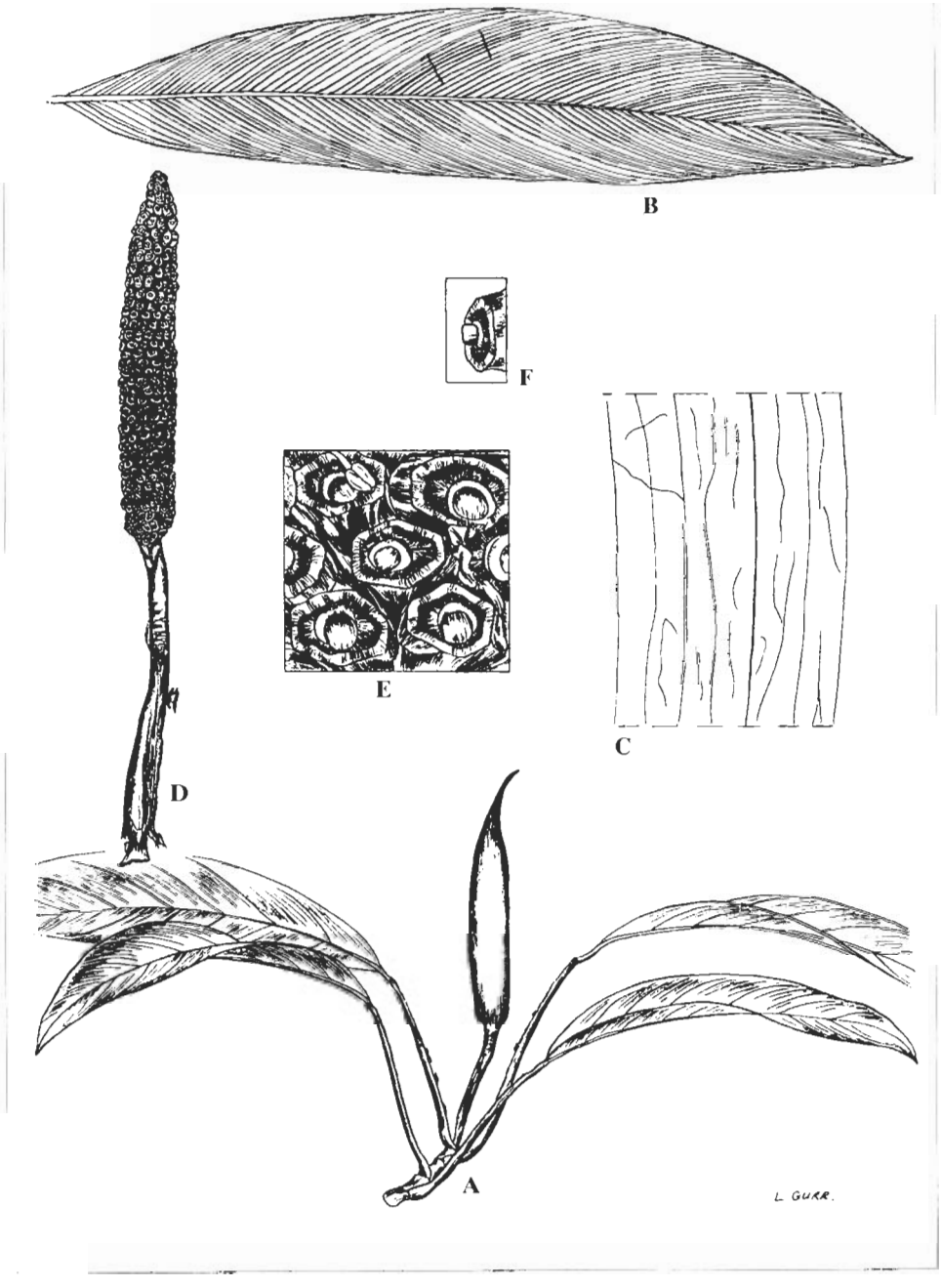

Figure 7. Rhaphidophora floresensis P.C. Boyce
A. flowering shoot x +; B. leaf lamina x +; C. venation detail x 3; D. inflorescence, x $^{1}/_{3}$; E. spadix detail, late anthesis x 6; F. gynoecium, three quarter view x 6. All from *Schmutz 3837C*.

female receptivity?), yellow; *spadix* slightly tapering-cylindrical, 6.5—8.5 x 1—1.3 cm sessile, inserted level on peduncle; *stylar region* rhombohexagonal, c. 1.8 mm diam., stigma punctiform, raised, c. 0.3 mm diam.; *anthers* barely exserted at anthesis; *infructescence* c. 9 x 1.5 cm.

Distribution: Nusa Tenggara (Pulau Flores). Endemic.

Habitat: Forest, 610 m altitude.

Notes: 1. One of a group of species that includes *R. apiculata* Engl. (New Guinea), *R. hollrungii* K. Krause (New Guinea), *R. sabit* P.C. Boyce and *R. ustulata* P.C. Boyce, distinguished by long petioles and chartaceous cataphylls. Species in this group can be distressingly similar in overall appearance and are mostly separated on characters such as inflorescence position, presence or absence of a spadix stipe and whether the top of stylar region is truncate or conical. The meagre number of botanical collections for each species exacerbates the problem of 'sameness'. *Rhaphidophora floresensis* may be distinguished by its flowering on adherent side shoots, by the sessile spadix and the prominently raised stigma.

2. Named for Flores Island where it is endemic.

Other specimens seen: NUSA TENGGARA: Pulau Flores - Ruteng, *Verheijen 2973* (L), Adjang, *Verheijen 3024*, (L).

7. Rhaphidophora foraminifera (Engl.) Engl.

Rhaphidophora foraminifera (Engl.) Engl., Pflanzenr. 37 (IV.23B) (1908) 45; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 197 — *Epipremnum foraminiferum* Engl. in Bot. Jahrb. Syst. 25 (1898) 11 — Neotype: Malaysia, Perak, Taiping, base of Maxwell's Hill Station road, *Nicolson 1047* (US, neo; L, BH, BO isoneo; designated by Boyce, 1999).

Figure 8 & 9

Moderate to large, robust, pachycaul, homeophyllous liane to 15 m; *seedling stage* not observed; *pre-adult plants* frequently (always?) forming extensive terrestrial colonies; *adult shoot* architecture comprised of elongated, clinging, physiognomically monopodial, densely leafy, non-flowering (always?) stems and shorter clinging, sympodial, densely leafy, flowering stems; *stems* smooth, mid-green, with cataphylls and prophylls deliquescing to black mucilage drying to leave fragmentary parchment-like remains on petioles; developing laminas, inflorescences, internodes 1—7 x 0.5—3.5 cm, separated

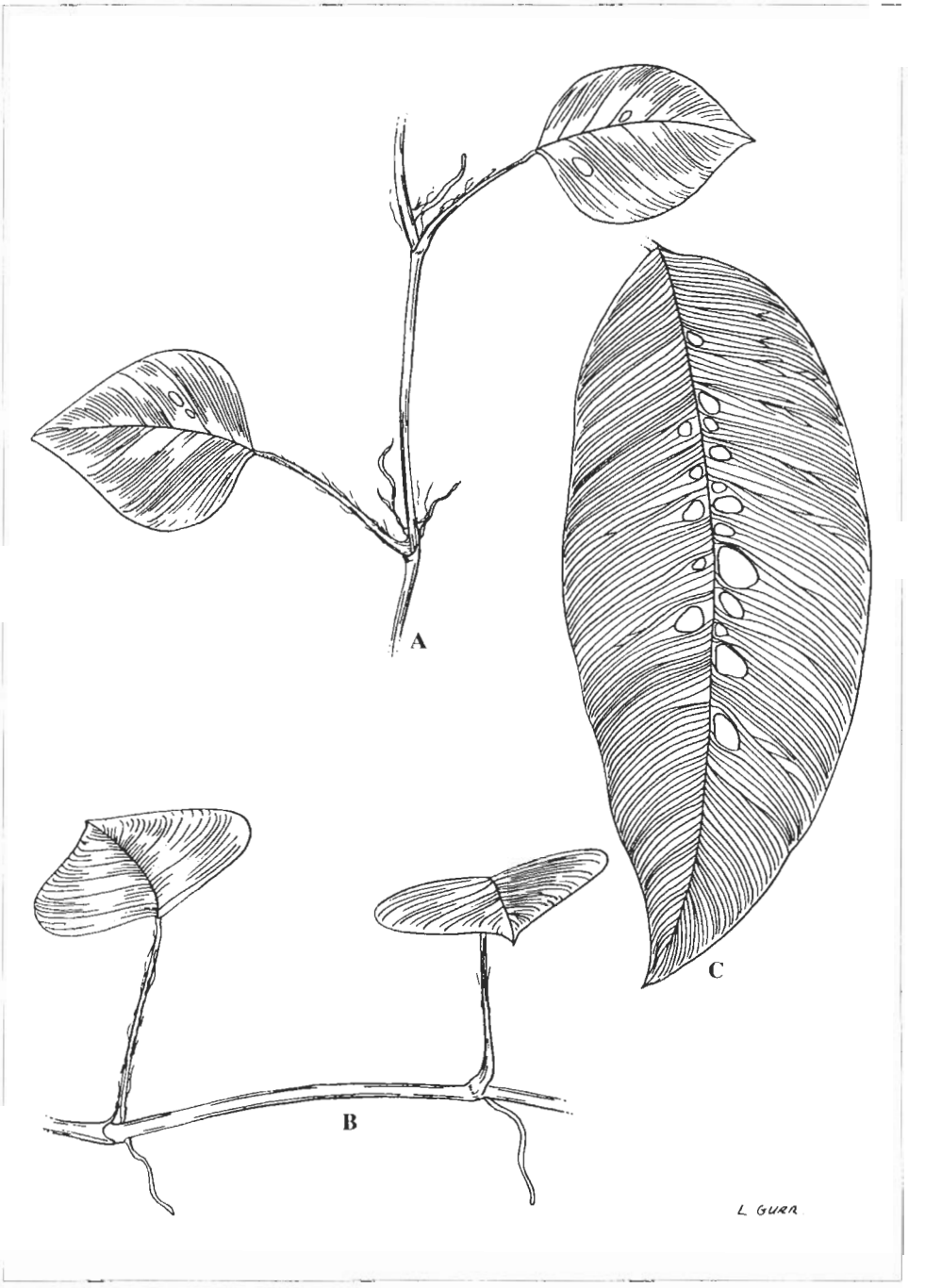

Figure 8. Rhaphidophora foraminifera (Engl.) Engl.
A. pre-adult climbing shoot x +; B. pre-adult terrestrial shoot x $^1/_3$; C. leaf lamina x +. A & B from *Nicolson 941*; C from *Boyce 722*.

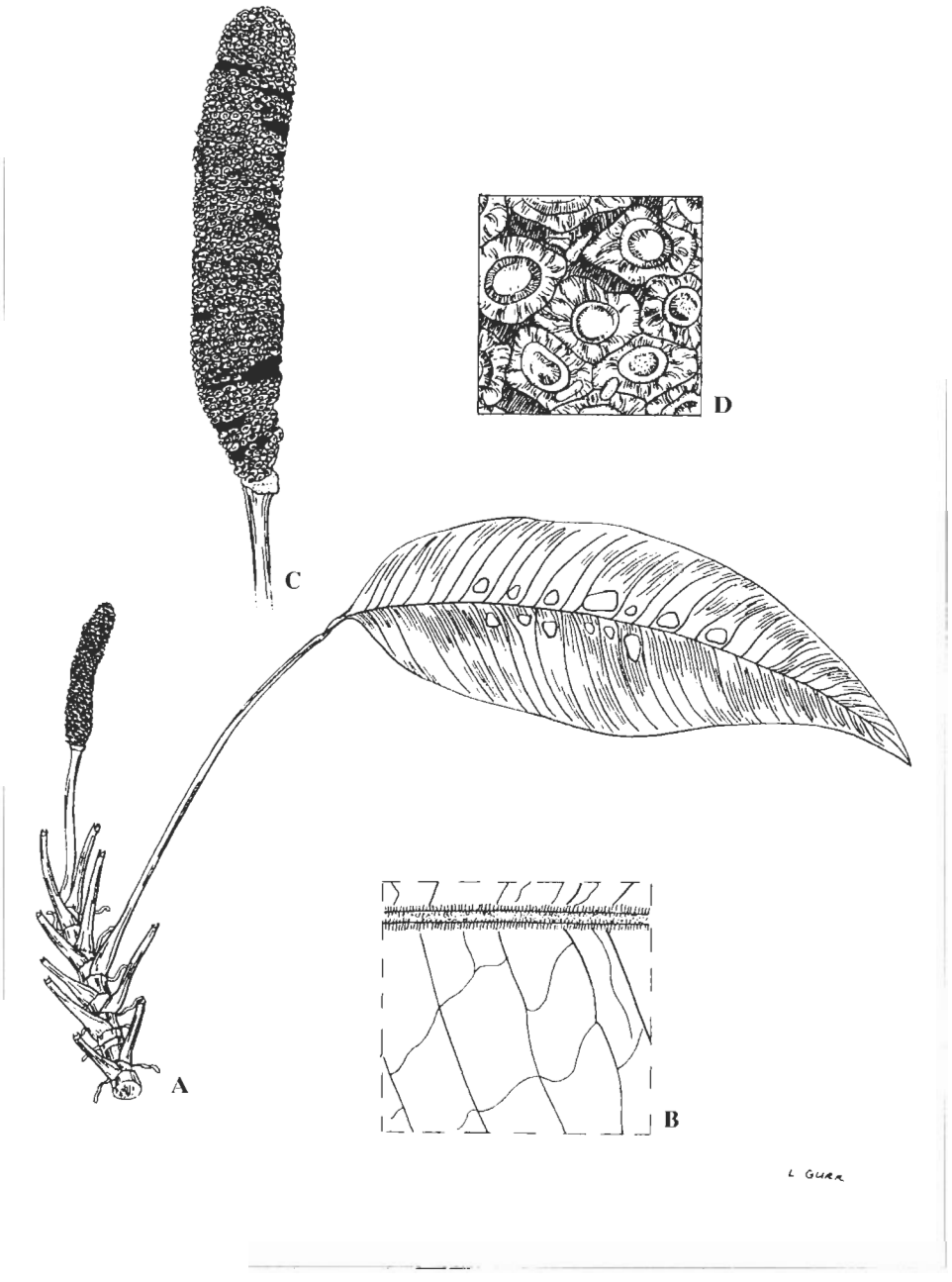

Figure 9. Rhaphidophora foraminifera (Engl.) Engl.
A. flowering shoot x $^{2}/_{15}$; B. venation detail x 6; C. inflorescence, spathe fallen x $^{2}/_{3}$; D. spadix detail, anthesis x 6. A, C & D from *Boyce 722*; B from *Croat 53118*.

by prominent straight to slightly oblique leaf scars; *flagellate foraging stem* absent; *clasping roots* densely arising from the nodes and internodes, pubescent; *feeding roots*, adherent, exceedingly robust, densely pubescent with dense verticels of prominent corky ramenta; *leaves* distichous; *cataphylls and prophylls* membranous, soon deliquescing; *petiole* canaliculate, 22—52 x 0.4—1 cm, smooth for the most part but upper 2—4 cm and apical geniculum densely pubescent, apical geniculum prominent, basal geniculum less so; *petiolar sheath* prominent, extending to apical geniculum, ± short-persistent, degrading to weak, slightly netted fibres; *lamina* entire to slightly or extensively perforated, perforations round to rhombic, extending c. quarter of lamina width on each side of the midrib, ovate to oblong-lanceolate or oblong-elliptic, slightly oblique, pubescent abaxially when young, 7—53 x 6—19 cm, membranous to subcoriaceous, base rounded, acute to slightly decurrent, apex acute to acuminate; *midrib* prominently raised and densely pubescent abaxially, ± flush adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially, the leaf appearing slightly quilted, pubescent in younger leaves, this indumentum mostly shed in older leaves; *interprimaries* subparallel to primaries, less prominent, slightly raised abaxially, slightly impressed adaxially; *secondary venation* reticulate, slightly raised; *tertiary venation* tessellate, slightly raised; *inflorescence* mostly subtended by one or two large cataphylls, these swiftly deliquescing into black mucilage, this drying and adhering patchily to developing spathe, rarely subtended by a ± fully developed foliage leaf; *peduncle* terete, 3—13 x 0.5—1.5 cm; *spathe* canoe-shaped, stoutly beaked, 10—27 x 1.5—13 cm, stiffly fleshy, dull pale to dark yellow, wide gaping at anthesis and then briefly persistent though maturation of the stamens, eventually falling to leave a large scar at the base of the spadix; *spadix* cylindrical, sessile, slightly obliquely inserted on peduncle, 7—17 x 1.3—2.5 cm, dull greenish yellow; *stylar region* moderately developed, rounded to rhombohexagonal, 1—2 x 1—1.5 mm, shortly conical when fresh, drying truncate; *stigma* punctiform or elliptic and transversely orientated, raised at anthesis but excavated in dry material, c. 0.3 mm diam.; *anthers* slightly exserted at anthesis; *infructescence* 8—15 x 2—3 cm, dark green before ripening to greenish yellow.

Distribution: Sumatera, Peninsular Malaysia and throughout Borneo.

Habitat: Disturbed forest, moist hill dipterocarp forest, on rocks in shaded position. 50—1035 m altitude.

Notes: 1. Confusion can occur between *R. foraminifera* and *R. puberula*. They are distinguished by the position of the inflorescence (on short adherent shoots in *R. foraminifera*, on short free shoots in *R. puberula*), by

black mucilage produced by the deliquescing cataphylls and prophylls (present in *R. foraminifera*, absent in *R. puberula*), in leaf size of mature flowering-sized plants (to 53 x 19 cm in *R. foraminifera*, 34 x 10.5 cm in *R. puberula*), by the more or less rounded (*R. foraminifera*) and oblong (*R. puberula*) stylar regions, and in overall size of the plant (*R. foraminifera* is a bole climber to 15 m, whereas *R. puberula* seldom climbs higher than 3 m and frequently forms large, spreading masses on rocks.)

2. Perforated leaves occur in a number of otherwise rather different-looking *Rhaphidophora* species (e.g., *R. foraminifera*, *R. puberula*, *R. ledermannii* Engl. & K. Krause, *R. veersteegii* Engl. & K. Krause) suggesting that while a useful diagnostic tool, lamina perforation cannot be used to define groups within *Rhaphidophora*.

Other specimens seen: SUMATERA. Bengkulu Prov. - Air Siman, DS Napal Putih, Kec. Ketahun, *Afriastini 2652* (BO); Aceh Prov. - between Lau Simerah & Lau Penanggajan, *Alston 14509* (BM); G. Leuser N.R., c. 35 km NW of Kutatjane, 3 - 5 km upstream Lau Ketambe, *de Wilde & de Wilde-Duyfjes 12061* (L), *de Wilde & de Wilde-Duyfjes 14592* (L), G. Leuser N.R., upper Mamas river valley, c. 15 km w of Kutacane, Camp Pawang, *de Wilde & de Wilde-Duyfjes 18426* (L); North Sumatera - Sibolangit *Lörzing 5521* (BO, L, K), *Lörzing 12534* (BO, L) Sibolangit, Cult Bogor ex *Docters van Leeuwen* (BO).

8. Rhaphidophora koordersii Engl.

Rhaphidophora koordersii Engl. in Bot. Jahrb. 25 (1898): 6; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 43—44 — Type: Indonesia, Sulawesi, Minahassa, Kawewatoe, 27 Feb. 1895, *Koorders 16166* (B, holo; BO, L, iso).

Figure 10

Slender, leptocaul, homeophyllous (?) liane (ultimate height unknown); *seedling* and *pre-adult plants* not observed; *adult shoot* architecture comprised (?) of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* smooth, flexuous, climbing stems not observed, free stems terete in cross-section, with weak prophyll, cataphyll and petiolar sheath fibre, internodes to 2 x 0.7—0.8 cm on free shoots; *leaves* weakly distichous; *cataphylls and prophylls* membranous, very quickly drying and degrading to weak fibres and sheets of tissue; *petiole* weakly canaliculate, 7—10 x 0.15—0.3 cm, smooth, with a slight apical and

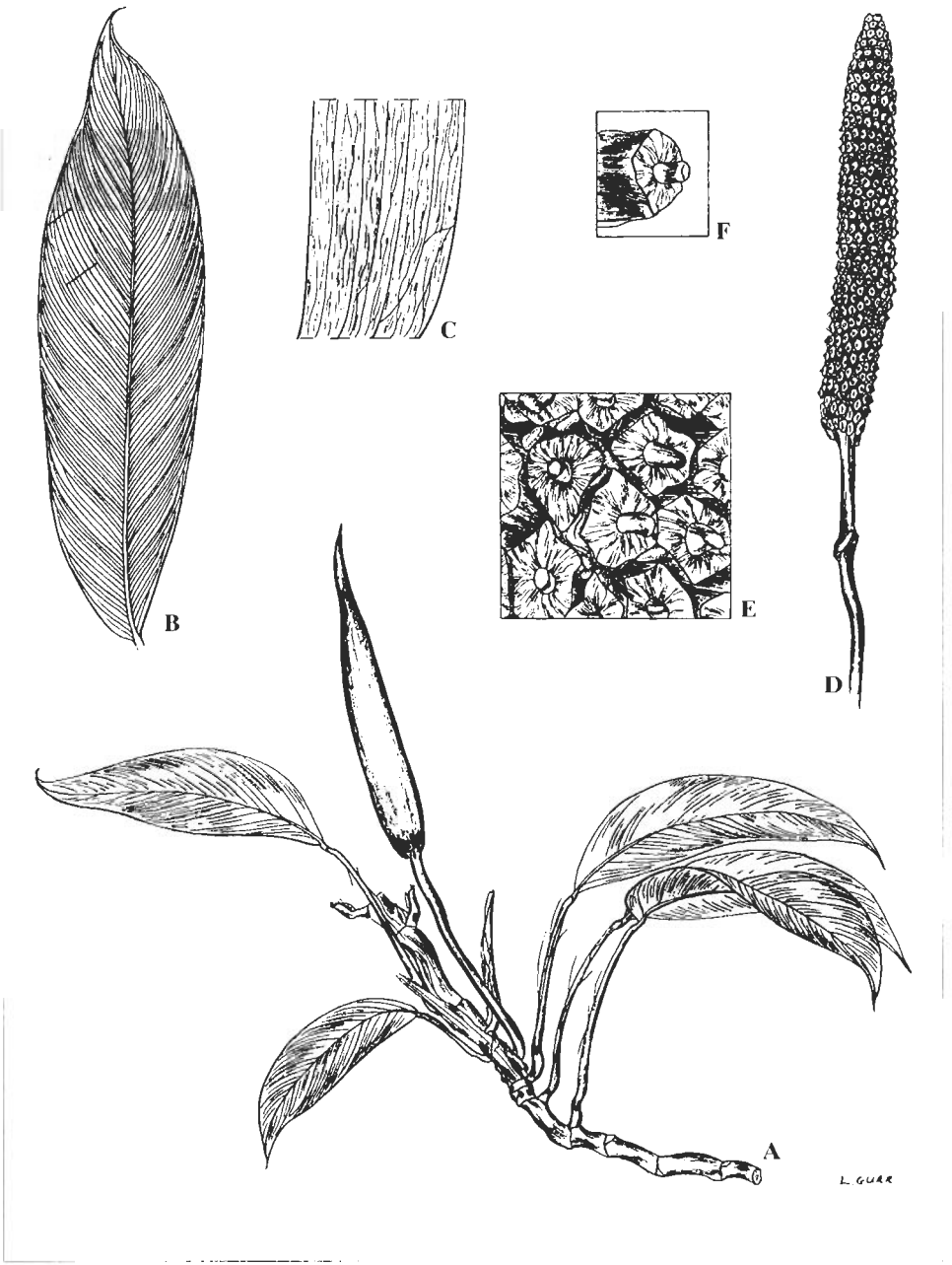

Figure 10. Rhaphidophora koordersii Engl.
A. flowering shoot x +; B. leaf lamina x +; C. venation detail x 2; D. inflorescence, x 1; E. spadix detail, female receptivity x 8; F. gynoecium, three quarter view x 8. All from *Riedel s.n.*.

prominent basal geniculum; *petiolar sheath* very prominent, extending beyond the apical geniculum by two very small ligules, swiftly drying and degrading into weak fibre and soft strips, eventually falling to leave a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, elliptic-lanceolate to oblong-elliptic, stiffly coriaceous, 7—20 x 3—6 cm, base cuneate, apex acuminate to attenuate with a prominent tubule; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised on both surfaces; *interprimaries* subparallel to and about as prominent as primaries; *secondary venation* ± invisible in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* slightly compressed-cylindric, 4—12 x 0.2—0.3 cm; *spathe* narrowly boat-shaped, stoutly long-beaked, c. 10 x 1.6 cm, coriaceous, falling to leave a large, straight, scar; *spadix* slender cylindrical, 5—6 x c. 0.7 cm, stipitate; *stipe* 1.1—1.3 x c. 0.15 cm; *stylar region* rather well developed, mostly rhombohexagonal, c. 1 x 1.2 mm, conical; *stigma* punctiform, c. 0.3 mm diam.; *anthers* exserted at anthesis; *infructescence* oblong-cylindric, 5.5—9 x 1.5—1.7 cm.

Distribution: Sulawesi (Minahassa Peninsula). Endemic.

Habitat: Unknown. 55 m altitude.

Note: Superficially similar to the widespread *R. montana*, Bornean *R. elliptica* Ridl. and *R. elliptifolia* Merr., but readily distinguished by the prominently stipitate spadix, raised stigma, the smaller, elliptic-lanceolate to oblong-elliptic, stiffly coriaceous leaves with (in dried material) more prominently raised primary venation and the fibrous cataphyll remains subtending the inflorescence.

Other specimens seen: Sulawesi, Minahassa, Gorontalo, *Riedel s.n.* (BO, K).

9. 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; Koorders, Exkursfl. Java, 1 (1911) 255; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 341; Backer, Beknopte Fl. Java, 17 (1957) 15; Backer & Bakh. *f.*, Fl. Java 3 (1968) 107 — 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 & in Beccari, Malesia 1 (1882) 271, Tab. xx 1—5; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 48—49 — Type: Sarawak, G. Gading, July 1866, *Beccari PB 2314* (FI, lecto, selected by Boyce, 1999).

Rhaphidophora tenuis Engl., Bot. Jahrb. Syst. 1 (1881) 181 & in 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 Schott *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).

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* (PNH, holo†; B iso).

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

Rhaphidophora trinervia Elmer, Leafl. Philipp. Bot. 8 (1919) 3073 — Type: Philippines, Laguna, Los Ba˜os (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 —Type: Indonesia, Irian Jaya, 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 BS 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. nud., descr. Angl.* — Based on: Philippines, Luzon, Sorsogon, Trosin (Mt Bulusan), May 1916, *Elmer 16061* (FI, K, L, MO, P, PNH†)].

Figure 11 & 12

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 monopodial, 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 and degrading into intricately reticulate fibres, these only very slowly falling; *petiole* shallowly grooved, upper part ± terete, (1—) 9—65 x 0.2—1.5 cm, smooth, apical and basal geniculа prominent; *petiolar sheath* prominent, membranous, strongly to slightly unequal on one side, extending almost to or reaching the apical geniculum, of ± short-duration, soon degrading into persistent netted fibres, these eventually falling to leave a prominent, slightly corky scar; *lamina* of seedlings overlapping in the manner of roof shingles, entire, lanceolate, 5—11 x 3.5—6 cm, base slightly cordate, lamina of pre-adult and adult plants free, 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* subparallel to primaries, slightly raised abaxially, slightly impressed adaxially; *secondary venation* strongly reticulate, slightly raised; *tertiary venation* invisible; *inflorescence* solitary

Figure 11. Rhaphidophora korthalsii Schott
A. pre-adult shoot x +; B. pre-adult shingling shoot x +. A from *Boyce 679*; B from *Nicolson 1712*.

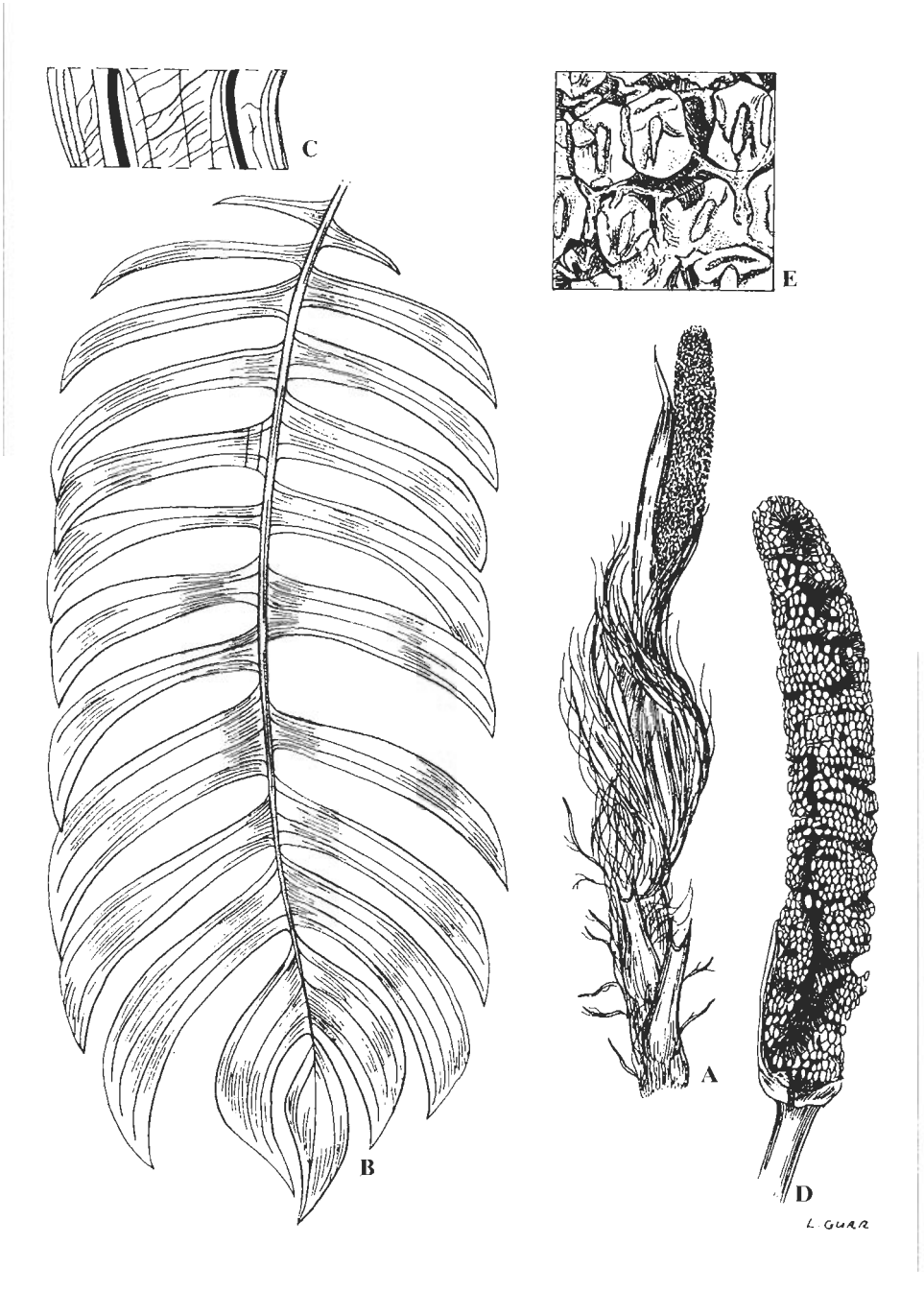

Figure 12. Rhaphidophora korthalsii Schott
A. flowering shoot, leaves removed x +; B. leaf lamina x +; C. venation detail x 2; D. inflorescence, spathe removed x 1; E. spadix detail, post floral x 8. All from *Kerr 15051*.

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 receptivity and then swiftly falling to leave a large straight scar at the base of the spadix; *spadix* cylindrical, sessile, inserted ± 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 exserted at anthesis; *infructescence* 14—27 x 3—3.5 cm, dark green ripening to dull orange, stylar tissue abscissing to reveal orange ovary cavity pulp.

Distribution: Sumatera, Java, Sulawesi and Maluku (Pulau Batjam and Ceram). Widespread in south tropical Asia from Sumatera and southern Thailand to Borneo and the Philippines eastwards through the tropical western Pacific.

Habitat: Disturbed lowland primary or secondary dipterocarp forest, lower and upper hill forest, wet submontane and montane forest, on granite, sandstone, clay and limestone, occasionally in freshwater swamp forest. 10—1700 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.

3. Fertile material of *R. korthalsii* and *Epipremnum pinnatum* is readily separated by the shape of the style apex (round vs. trapezoid) and the shape and orientation of the stigma (± punctiform and circumferential vs. strongly linear and longitudinal) and, if fruits are mature, by seed characters. The fruits of *R. korthalsii* each contain 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.

4. Confusion is possible between *R. korthalsii* and *Amydrium zippelianum* D.H. Nicolson although there is a suite of characters that distinguish them. The leaflet tips of *R. korthalsii* are truncate, those of the *Amydrium* species are acute to acuminate; 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 stylar region abcissing 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: SUMATERA. Bengkulu Prov. - Air Siman, Napal Putih, Ketahun, *Afriastini 2652A* (BO); North Sumatera - Silo Maradja, Asahan, *Bartlett 7220* (US), Lau Kakar, *Batten-Pooll SFN s.n.* (SING), Taloen na Oeli, east of Dolok Si Manoek-manoek, near headwaters of Aek Mandosi, *Rahmat si Boeea 10265* (L), Karohoogulake, north of Brastagi, *Lörzing 6787* (BO), Brastagi, *Yates 1537* (K, UC), G. Sago, Bukit Pinago, near Pajakumbuh, *Meijer 4977* (SING); Aceh Prov. - Wassemar, *Batten-Pooll SFN s.n.* (SING), Badjatinggi, south of Tebingtinggi, *Lörzing 7597* (BO), G. Leuser N.R., climbing G. Bandahara, c. 5 km NE of Kg Seldok (Alas valley), c. 25 km N of Kutatjane, camp 1, descent Bandahara, *de Wilde & de Wilde-Duyfjes 15049* (L); West Sumatera - G. Merapi, *Binnemyer 4999* (BO); Jambi Prov. - Palembang, Semangus, *Buwalda s.n.* (BO, L), Berbak Reserve, Air Hitam Laut, *Franken & Roos 249* (L); JAVA. 'Java', *Herb. Hasskarl s.n.* (L); West Java - Cibadak ('Tjibadak'), *Bakhuizen van den Brink 3886* (BO, L), Bogor, G. Pangrangor, *Bakhuizen van den Brink 6254* (BO), Bogor, Campea ('Tjiampea'), *Hallier s.n.* (BO), *Koorders 30646B* (BO, L), *Koorders 30647B* (BO), *Koorders 30726B* (BO), *Koorders 30646B* (BO, L), *Koorders 30647B* (BO), *Koorders*

30726B (BO); G. Boender, *van Steenis 4012* (BO), Ciapus ('Tjapoes'), *Hallier s.n.* (BO), 'near Batavia', *Kollmann s.n.* (BM), Takokak, *Koorders, 15124B* (BO), G. Salak, *Koorders 24132B* (BO), *Raap 160* (L), SULAWESI. Minahassa - Kelelonde, Soputan Mts, *Alston 15830* (BM, BO), Bivak Pandak, *Koorders 19641B* (BO); G. Roroka - west slope, *Balgooy 3299* (BO, L, GH, US); Lambasang, *Binnemyer 11485* (BO); Talaud Archipelago - Pulau Karakelang, Pasir Malap, east of Lobo, bank of Kuala Bahewa, *Lam 3019* (L); Pulau Kaebana - Batu Sangia, c. 7 km west of Tangkeno, *McDonald & Ismail 4117* (BO, GH), Mt Nokilalaki, above Kg Toro, *Meijer 9436, 9448* (BO); Tapalaeng, *Noerkas 466* (BO). MALUKU. Pulau Batjan - G. Damar, Masoeroeng, *Nedi 45* (BO); Ceram, *Treub s.n.* (BO).

10. **Rhaphidophora lobbii Schott**

Rhaphidophora lobbii Schott, Prodr. Syst. Aroid. (1860) 379; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 240; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 33—34 —*Rhaphidophora lobbii* Schott, Bonplandia 5(2) (1857) 45, *nom. tant.* — *Scindapsus lobbii* (Schott) Ender, Index Aroid. (1864) 74 — Type: Singapore, *Lobb 44* (K, holo).

Figure 13

Small to moderate, somewhat slender, leptocaul, homeophyllous liane to 5 m; *seedling* leafy at germination and skototropic by alternating series of congested leafy and elongated leafless shoots; *pre-adult plants* forming diffuse terrestrial colonies; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* puberulent-scabrid to asperous, especially on older growth, climbing stems weakly rectangular to ± terete in cross-section, free stems ± terete in cross-section, often branching extensively and growing to moderate lengths pendent under their own weight, dull brown, without prophyll, cataphyll and petiolar sheath fibre, internodes to 13 x 0.6 cm on adherent and free shoots, flowering shoots with much shorter internodes, separated by weak to rather prominent, slightly oblique leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* sparsely arising from the nodes and internodes of clinging stems, densely pubescent; *feeding roots* rather rare, sometimes adherent but often free, pubescent; *leaves* weakly spiralled and often sparsely arranged on adherent and proximal portions of free shoots, distally densely spirally distichous on flowering shoots; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* grooved adaxially, 4—9.5 x 0.2—0.3 cm, smooth, with a moderate apical and prominent basal geniculum; *petiolar sheath* slightly

prominent, extending beyond the apical geniculum by two ligules, very swiftly drying and falling in strips to leave a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, narrowly elliptic to elliptic-lanceolate to oblong or oblanceolate, 6—24 x 2—10 cm, very softly coriaceous, upper surfaces slightly glossy, lower surfaces pale satin-matt, drying markedly discolorous, dark brown above, pale brown below, base cuneate to acute or subovate, briefly decurrent, apex acute to ovate-acuminate, with a prominent apiculate tubule; *midrib* slightly raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially, prominent (dark 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 fresh material, barely visible in dried specimens, reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and a very quickly falling cataphyll; *peduncle* compressed-cylindric, 1.5—5 x 0.15—0.4 cm; *spathe* cigar-shaped, stoutly long-beaked, 3—5 x 0.4—1 cm, thickly fleshy, exterior minutely puberulent, dull green to yellowish, swiftly falling at female receptivity to leave a substantial, slightly oblique, scar; *spadix* slender cylindrical, sessile, inserted level on peduncle, 3—3.5 x 0.4—0.5 cm, dull yellow-white; *stylar region* rather well developed, mostly rhombohexagonal, 1.9—2.4 x c. 2 mm, truncate; *stigma* punctiform, c. 0.3 mm diam., prominent in dried material; *anthers* barely exserted at anthesis, pollen extruded from between ovaries; *infructescence* oblong-cylindric, 2.5—4 x 1—1.2 cm.

Distribution: Southern Thailand, Peninsular Malaysia, Singapore, Sumatera, throughout Borneo and into Sulawesi.

Habitat: On wet to inundated soils in lowland to hill dipterocarp forest, peat swamp and fresh water swamp forest, 10—200 m altitude.

Notes: 1. A climber distinctive by the slender, asperous stems, softly leathery leaves and minutely puberulent spathe exterior, a combination of characters unknown in any other Malesian *Rhaphidophora*. In dry material the strongly discolorous leaves, combined with the primary veins prominently darker than the abaxial leaf surface, are unmistakable.

2. *Rhaphidophora lobbii* is habitually found in wet to inundated ground, an unusual habitat for a monsteroid liane.

Other specimens seen: SUMATERA. North Sumatera - Asahan, Hoeta Bagasan, *Rahmat si Boeea 6930* (US); Aceh Prov. - S & SW of Gg Leuser

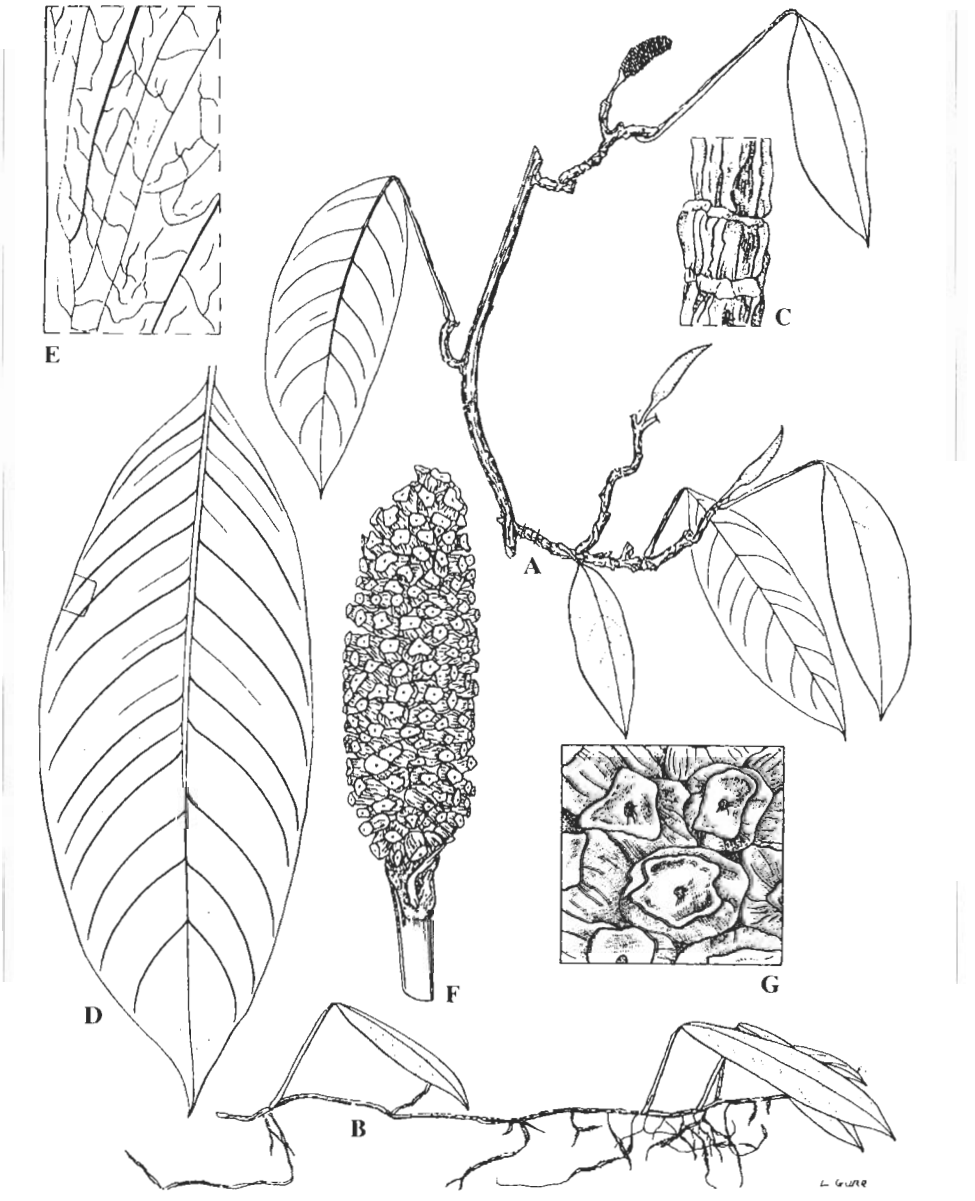

Figure 13. Rhaphidophora lobbii Schott
A. portion of stem with two flowering shoots x $^1/_3$; B. pre-adult terrestrial shoots x $^1/_3$; C. stem detail x 3; D. leaf lamina x +; E. venation detail x 4; F. inflorescence, spathe fallen x 2; G. spadix detail, early fruiting x 8. A & C from *Kunstler ('Dr King's Collector') 10571*; B from *Boyce 995*; D & E from *Nauen s.n.*; F & G from *Alvins 270*.

N.P., P.T. Hargas logging concession, south of Sibulussalam-Gelombang, just N of crossing of approach road with Lae Batu Batu (a tributary of Alas river), near Belingtang, *de Wilde & de Wilde-Duyfjes 20523, 20523B* (BO, L, US); Jambi Prov. - Berbak Reserve, Air Hitam Laut, *Franken & Roos 249, 273, 291, 292A* (L). SULAWESI. Morowali Prov. - 1 km from Ranu base camp, *Grimes 1150* (K).

11. Rhaphidophora maingayi Hook.f.

Rhaphidophora maingayi Hook.f., Fl. Brit. Ind. 6 (1893) 543; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 37 — Type: Malaysia, Malacca, 28 July 1868, *Maingay 2972* (K, holo; L iso).

Rhaphidophora apiculata Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 383, *nom. illeg., non* K. Krause (1912, New Guinea) — Based on: Indonesia, Sumatera, North Sumatera, Sibolangit, Borem Bander Ceroe, 15 Feb. 1917, *Lörzing 4733* (BO).

Figure 14

Large, occasionally very large, robust, pachycaul homeophyllous liane to 20 m; *seedling stage* a non-skototropic shingling shoot; *pre-adult plants* occasionally forming small terrestrial colonies of appressed shingling shoots; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems later pendent under their own weight; *stems* smooth, climbing stems rectangular in cross-section, the angles often winged, the surfaces between slightly convex, free stems spreading, irregularly four-angled in cross-section, sometimes irregularly terete, little branched, growing moderate lengths, green, later mid-brown, with very sparse to very copious untidy prophyll, cataphyll and petiolar sheath fibre at the tips of active shoots, internodes to 13 x 2.5 cm on adherent shoots, shorter and less stout on free shoots, separated by large oblique leaf scars, older stems woody; *flagellate foraging stems* infrequent, often of great length, ± rectangular in cross-section; *clasping roots* densely arising from the nodes and internodes of clinging stems, densely pubescent; *feeding roots* rare, adherent, pubescent; *leaves* distichous to spiral-distichous on adherent and free shoots, those distal on flowering shoots densely so; *cataphylls and prophylls* membranous, very quickly drying and degrading into netted and tangled fibres; *petiole* deeply grooved adaxially, 5—23 x 0.25—0.5 cm, smooth, apical and basal geniculа weakly defined; *petiolar sheath* very prominent, extending to and encircling the apical geniculum, briefly ligulate, very swiftly drying and degrading

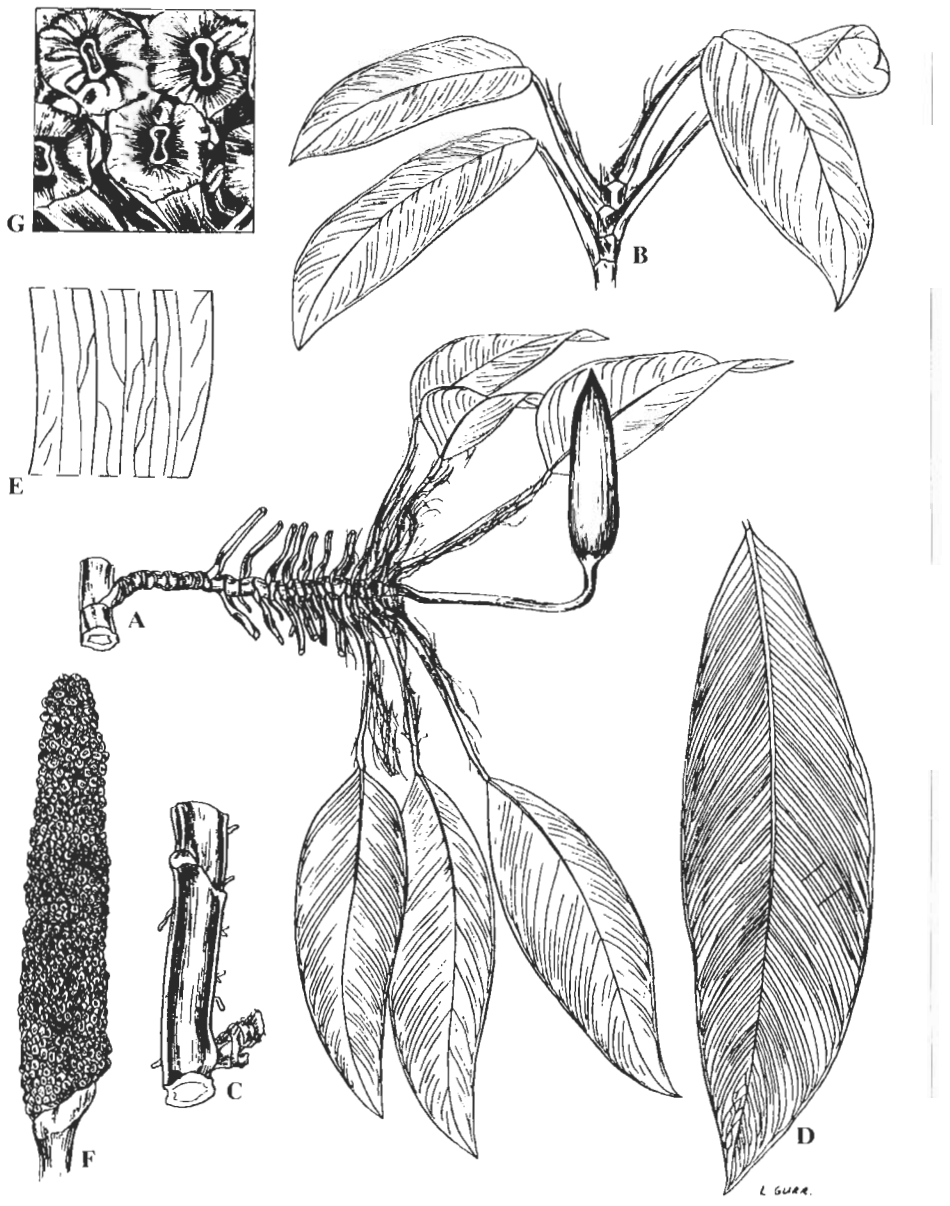

Figure 14. Rhaphidophora maingayi Hook.*f.*
A. flowering shoot x $^1/_5$; B. portion of adult, sterile shoot x $^1/_6$; C. stem cross-section detail x $^1/_3$; D. leaf lamina x +; E. venation detail x 2; F. inflorescence, spathe fallen x +; G. spadix detail, post anthesis x 8. All from *Boyce 664*.

into netted untidy fibres, eventually falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, elliptic to elliptic-lanceolate or falcate-oblong, 8—43 x 2.5—15 cm, coriaceous, upper surfaces semiglossy, lower surfaces matt, base subacute to decurrent, apex subacute with a somewhat prominent apiculate tubule, margins very slightly revolute in dried material; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries and only slightly less prominent, very slightly raised abaxially and adaxially; *secondary and tertiary venation* ± obscure in fresh material, visible as a faint reticulum in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf and sparse to copious netted petiolar sheath, prophyll and cataphyll fibre; *peduncle* compressed-cylindric, 10—15 x 0.3—0.5 cm; *spathe* canoe-shaped, stoutly short-beaked, 12—22 x 2.5—6.5 cm, thickly stiff-fleshy, exterior dull green with black bruising, white with yellow margins internally, swiftly falling at female receptivity; *spadix* tapering-cylindrical, ± sessile, inserted level on peduncle, 9—10 x 1.5—1.7 cm, cream; *stylar region* mostly rhombohexagonal, 1.5—2 x 1.7—2.1 mm, truncate; *stigma* slightly longitudinally elliptic, raised, c. 0.3 mm diam.; *anthers* barely exserted at anthesis, pollen extruded from between ovaries; *infructescence* unknown.

Distribution: Southern Thailand, Peninsular Malaysia and Sumatera.

Habitat: Open disturbed forest remnants on steep slopes, on sandstone, 755 m altitude.

Notes: 1. *Rhaphidophora maingayi* is virtually indistinguishable from *R. montana* (q.v.) but for the presence of very sparse to copious netted prophyll, cataphyll and petiolar sheath remains at the shoot tips.

2. Plants of the *R. montana* complex with copious prophyll, cataphyll and petiolar sheath fibre at the tips of active shoots are here referred to *R. maingayi* but might represent an undescribed species since the type of *R. maingayi* (*Maingay 2972*) bears only a very few such fibres.

3. Alderwerelt's *R. apiculata* [a later homonym pre-dated by *R. apiculata* K Krause (New Guinea)] is almost certainly conspecific with *R. maingayi* (and treated here as such) but is odd in drying with curiously olive-greenish yellow leaves.

Other specimens seen: SUMATERA. Aceh Prov. - Kaban Djake, *Batten-*

Pooll s.n. (SING); Lampang, Bengkulu, South Sumatera borders - Ranau, *Ruttner 273* (BO); North Sumatera - Asahan, Goerach Batu, *Yates 1691* (B, UC).

12. Rhaphidophora megastigma Engl.

Rhaphidophora megastigma Engl., Bot. Jahrb. 1: (1881): 180 & in Beccari, Malesia, vol. 1 (1882) 269; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 38—39 — Type: Indonesia, Sumatera, Ayer Montijoer, 360 m, *Beccari s.n.* (FI holo; B iso).

Robust homeophyllous liane (ultimate height unknown); *seedling stage* and *pre-adult plants* not observed; *adult shoot* comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, free, sympodial, leafy flowering shoots; *stems* smooth, subterete, internodes 1—6.5 x 0.7—1 cm, separated by weakly defined leaf scars; *clasping roots* c. 2 mm diam., minutely pubescent; *feeding roots* not observed; *petiole* narrowly but deeply channelled adaxially, 10—18 cm x c. 2 mm, basal and apical geniculi prominent; *petiolar sheath* rather prominent, extending 3.5—4 cm along petiole, soon falling to leave a prominent scar; *lamina* oblanceolate to narrowly oblong-elliptic, 15—30 x 5—6.5 cm, coriaceous and rather distinctly discolorous in dried material, apex acute to very briefly attenuate, base briefly decurrent; *midrib* prominently raised abaxially, slightly raised adaxially; *primary lateral veins* very faint, barely discernible; *peduncle* slightly compressed cylindrical, 2.5—3 x 0.25 cm; *spathe* ovate-boat-shaped, 4.5—6 x 2—2.5 cm, apex attenuate, falling at anthesis; *spadix* sessile, cylindrical, 4—4.5 x c. 1 cm; *stylar region* c. 1.25 x 2 mm, stigma ± ovoid, 1 mm diam, ± flush with the style, the middle excavated, the edges prominently raised; *anthers* barely exserted at anthesis; *infructescence* unknown.

Distribution: Sumatera. Endemic.

Habitat: Unknown. Sea level.

Note: Close to *R. montana* but differing by shorter (4.5—6 cm vs. 9—20 cm) cylindrical spadix and the large (1 mm diam.) deeply excavated stigma.

Other specimens seen: SUMATERA. West Sumatera, Padang, S. Bulu, *Beccari s.n.* (FI).

13. Rhaphidophora minor Hook.*f.*

Rhaphidophora minor Hook.*f.*, Fl. Brit. Ind. 6 (1893) 544; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 21, Fig. 4 — Type: Malaysia, Malacca, *Griffith 5988* (K, lecto; K, P, isolecto, selected by Boyce, 1999).

Rhaphidophora celebica K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem. 11 (1932) 331 —Type: Indonesia, Sulawesi, northwest of the island, near Toli-Toli, Jan. 1910, *Schlechter 20698* (B, holo).

[*Rhaphidophora palawanensis* Furtado, *nom. nud. in sched. var., non.* Merr. (1925)]

Figure 15

Small to moderate, slender, leptocaul, homeophyllous liane to 6 m; *seedling* not observed; *pre-adult plants* forming diffuse terrestrial colonies; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* smooth, flexuous, climbing stems ± terete, occasionally weakly 4-angled in cross-section, free stems somewhat laterally compressed in cross-section, often branching extensively, growing to considerable lengths and pendent under their own weight with flowering tips upturned, without prophyll, cataphyll and petiolar sheath fibre, internodes to 13 x 1.2 cm on adherent and free shoots, flowering shoots with much shorter internodes, separated by weak straight leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* arising sparsely or singly from the clinging stems, pubescent; *feeding roots* solitary from nodes, free, stout, slightly pubescent; *leaves* weakly distichous and sparsely arranged on adherent and proximal portions of free shoots, distally moderately densely distichous on flowering shoots; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* grooved adaxially, 3—6 x 0.1—0.25 cm, smooth, with a slight apical and prominent basal geniculum; *petiolar sheath* slightly prominent, extending beyond the apical geniculum by two small ligules, very swiftly drying and falling in strips to leave a continuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, narrowly falcate-elliptic to falcate-lanceolate or falcate-oblanceolate, 2.5—16 x 1.2—3 cm, thinly coriaceous, drying pale straw-coloured, base cuneate to acute or subovate, apex acute with a prominent tubule; *midrib* raised abaxially, slightly raised adaxially; *primary venation* pinnate, slightly raised on both surfaces prominent (raised) in dried material;

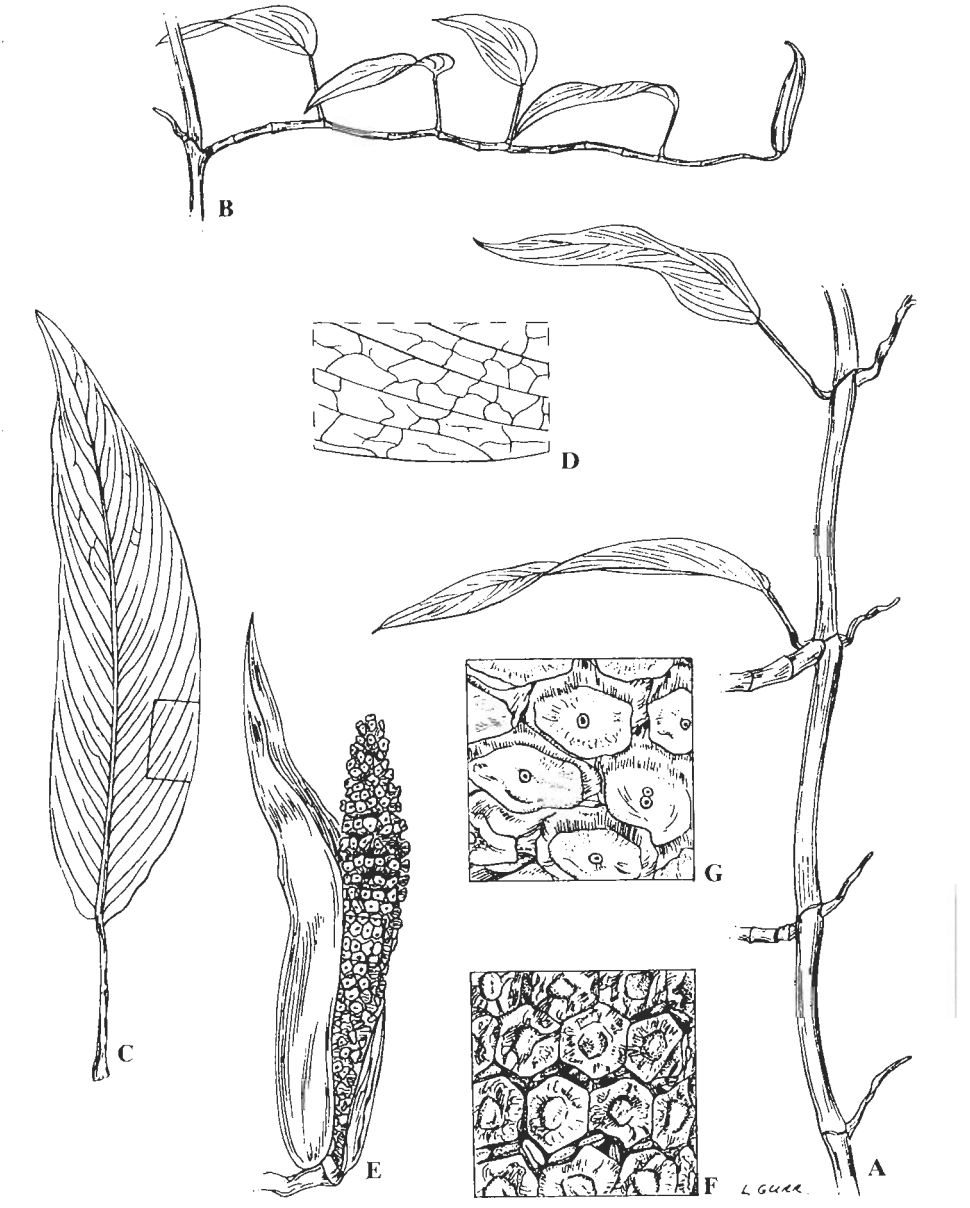

Figure 15. Rhaphidophora minor Hook.*f.*
A. portion of adult, sterile shoot x $^{1}/_{3}$; B. flowering shoot x +; C. leaf lamina x $^{2}/_{3}$; D. venation detail x 2; E. inflorescence, spathe just beginning to abscise x 1+; F. spadix detail, post female receptivity, pre-anthesis x 8; G. spadix detail, early fruiting x 5. A, C—F from *Kerr 14700*; B, G from *Niyomdham et al. 1062*.

interprimaries subparallel to, but much less distinctive than, primaries, sometimes degrading into weakly reticulate venation, very slightly raised abaxially; *secondary and tertiary venation* ± invisible in fresh material, barely visible in dried specimens, reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and a very quickly falling cataphyll; *peduncle* compressed-cylindric, 3—4 x 0.3—0.5 cm; *spathe* cigar-shaped, stoutly long-beaked, 3—9 x 1—1.5 cm, thin, dull green to dull yellow, swiftly falling at female receptivity to leave a large, straight, scar; *spadix* slender cylindrical, sessile, inserted level on peduncle, 2.5—7 x 0.5—0.6 cm, dull yellow-white; *stylar region* rather well developed, mostly rhombohexagonal, 1.4—2 x c. 2 mm, truncate; *stigma* punctiform, c. 0.3 mm diam., slightly prominent in dried material; *anthers* well-exserted at anthesis; *infructescence* oblong-cylindric, 4.5—7 x 1—2.5 cm.

Distribution: Southern Thailand, Peninsular Malaysia, Singapore, Sumatera, throughout Borneo, Sulawesi and into the Philippines (Mindanao, Palawan).

Habitat: Lowland forest, along stream margins, sometimes in swampy soil, 10—100 m altitude.

Note: In the fresh state confusion with *R. sylvestris* is possible, although the thinner, more prominently veined leaf and longer beak to the spathe of *R. minor* are diagnostic. Dried material of *R. minor* is notable for the uniformly pale straw-coloured leaves.

Other specimens seen: SUMATERA. North Sumatera - Tandjung Balai, *Alston 15358* (BM, BO, L, MO); Riau Prov. - S. Gangsal, between Kemang and Djawi-Djawi, *Buwalda 6823* (GH, K, L, SING)

14. Rhaphidophora montana (Blume) Schott

Rhaphidophora montana (Blume) Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 128; Engl. in A. & C. DC., Monogr. Phan. 2 (1879) 240—241; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 40—41; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 386—387 — *Calla montana* Blume, Catalogus (1823) 62 — *Scindapsus montanus* (Blume) Kunth Enum. pl. 3 (1841) 64 ('*montana*') — [*Rhaphidophora sylvestris* (Bl.) Engl. var. *montana* (Bl.) Nicolson, *comb. ined. in sched. var.*] — Type: Indonesia, Java, Antjal, *Blume s.n.* (L, lecto; L, isolecto, selected by Boyce, 1999).

Rhaphidophora angulata (Miq.) Schott, Prodr. Syst. Aroid. (1860) 379 — *Scindapsus angulatus* Miq., Fl. Ned. Ind. 3 (1856) 219 — Type: Indonesia,

Sumatera, Doekoe, *P.W. Korthals s.n.* (U, holo).

Rhaphidophora fallax Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 128 — Type: Indonesia, Java, *Zippelius s.n.* (L, holo; K, L, P, iso).

Rhaphidophora burkilliana Ridl., Fl. Mal. Pen. 5 (1925) 121 — Type: Malaysia, Selangor, Batu Caves, 2 Oct. 1922, *Nur SFN 8965* (SING, holo; BM, K, iso).

Figure 16

Large, occasionally very large, robust, pachycaul homeophyllous liane to 15 m; *seedling stage* a non-skototropic shingling shoot; *pre-adult plants* occasionally forming small terrestrial colonies of appressed shingling shoots; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems later pendent under their own weight; *stems* smooth, climbing stems rectangular in cross-section, the angles often strongly winged, the surfaces between more or less flat, free stems spreading, four-angled in cross-section, little branched, growing to short or moderate lengths, green, later mid-brown, without fibre at the tips of active shoots, internodes to 16 x 2.5 cm on adherent shoots, usually shorter and less stout on free shoots, separated by large oblique leaf scars, older stems woody; *flagellate foraging stems* frequent, often of great length, ± rectangular in cross-section; *clasping roots* densely arising from the nodes and internodes of clinging stems, densely pubescent; *feeding roots* rare, adherent, pubescent; *leaves* spiral-distichous on adherent and free shoots, those distal on flowering shoots densely so; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* deeply grooved adaxially, 10—23 x 0.25—0.5 cm, smooth, apical and basal genicula weakly defined; *petiolar sheath* very prominent, extending to and encircling the apical geniculum, briefly ligulate, very swiftly drying and falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, elliptic to elliptic-lanceolate or falcate-oblong, 8—43 x 2.5—15 cm, coriaceous, upper surfaces glossy, lower surfaces semi-matt, base subacute to decurrent, apex subacute with a somewhat prominent apiculate tubule, margins very slightly revolute in dried material; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries and only slightly less prominent, very slightly raised abaxially and adaxially; *secondary* and *tertiary venation* ± obscure in fresh material, visible as a faint reticulum in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage

leaf and one or more cataphylls; *peduncle* compressed-cylindric, 10—15 x 0.3—0.5 cm; *spathe* canoe-shaped, stoutly very short-beaked, 12—22 x 2.5—6.5 cm, thickly stiff-fleshy, dull yellow, paler internally, swiftly falling at female receptivity; *spadix* tapering-cylindrical, ±sessile, inserted level on peduncle, 9—20 x 1.5—2 cm, cream; *stylar region* mostly rhombohexagonal, 1.9—2.2 x 1.9—2.3 mm, truncate; *stigma* punctiform to slightly longitudinally elliptic, raised, c. 0.3 mm diam.; *anthers* barely exserted at anthesis, pollen extruded from between ovaries; *infructescence* 9—17 x 1.5—2.5 cm.

Distribution: Southern Thailand, Peninsular Malaysia, Singapore, Sumatera, Java, Nusa Tenggara, Maluku, Sulawesi and throughout Borneo.

Habitat: Open to closed, primary to disturbed secondary forest, often on steep slopes over granite, sandstone or limestone. 10—600 m altitude.

Notes: 1. A taxonomically difficult species in the Hongkongensis Group that, although easy to recognize in its typical manifestation (shoot tips without fibre, spreading stiff elliptic leaves, and a tapering cylindrical spadix to 9—16 cm long) exists in a range of forms displaying subtle differences in leaf shape, inflorescence size and that are mostly known from fewer then three, usually inadequate, collections, all usually collected without shoot tips. It is the extremes of these forms that have been described as distinct species.

2. Plants in cultivation at K from North Sumatera may possibly warrant formal recognition. They are notable in the stems consistently with the widest side strongly rounded-convex and the narrowest side somewhat sulcate. In addition, the leaves are thicker-textured than those of typical *R. montana* and have a distinctive bluish caste. However, these plants have yet to flower and for the moment I prefer to refer them to *R. montana s.l.*

3. The use of traditional morphology has proved a most unsatisfactory method for delimiting *R. montana*. With an alpha-taxonomy now proposed, excellent opportunities exist for further study of the *R. montana* complex using macromolecular data, field observations and statistical techniques to further resolve this group.

Other specimens seen: SUMATERA. Riau, Prov. - Lingga Archipelago, Pulau Singkep, Kp Raja, *Bünnemyer 7114* (L), Aer Kandis (Radja Mas), near Rantau Parapat, Bila, *Toroes 2501* (US); West Sumatera - Bk Gajabuih, about 15 km east of Padang City, *Hotta 25436* (KYO), Sidjundjang, Pajakumbuh, 6 km N of S. Langsat, *Meijer 4447* (SING);; North Sumatera

Figure 16. Rhaphidophora montana (Blume) Schott
A. flowering stem x +; B. stem cross-section x $^{2}/_{3}$; C. pre-adult terrestrial shoot x +; D. leaf lamina x $^{1}/_{3}$; E. venation detail x 4; F. spadix detail, post female receptivity, pre-anthesis x 6. A & B, D - F from *Kanda s.n.*; C from *Nicolson 943*.

- Sibolangit, *Lörzing 15529* (BO, L). JAVA. 'Java', *Blume 157* (L); Cult. Bogor B.G., Y 14, *Alston 12635* (BM), Y. 76, *Nicolson 883* (US), Y. 76, *Nicolson 944* (BO, US), *Kanda s.n.* (BO); Tjianten, near Bogor, *Backer 25974* (BO), Bogor, G. Pangrango, *Bakhuizen van den Brink 7708* (BO), G. Cibodas, near Campea ('Tjiampea'), *Hallier s.n.* (BO), Campea ('Tjiampea'), *Hallier s.n.* (BO), *Nicolson 857* (US); West Java, no further data, *Ploem s.n.* (BO). Yogyakarta, Preanger, Nanggerang, SW of Tarikmalaja, *Backer 8784* (BO). NUSA TENGGARA. Pulau Flores - *Schmutz 128* (L). SULAWESI. Minahassa - *Koorders 16154B* (BO, L). MALUKU. Pulau Sula - Sanana, *Bloembergen 4492* (BO, L).

15. Rhaphidophora oligosperma Alderw.

Rhaphidophora oligosperma Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922): 340 — Type: Indonesia, Maluku, Pulau Ternate, North Foramadiahi, 5 March 1921, *V.M.A. Beguin 1457* (BO, holo).

Figure 17

Large, moderately robust, homeophyllous (?) liane to 15 m; *seedling stage* and *pre-adult plants* unknown; *adult shoot* architecture comprised of elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, pendent flowering stems; *stems* drying with prominent longitudinally ridges, terete in cross-section, internodes to 1.2—7 x 0.5—1.5 cm, separated by large oblique, very prominent leaf scars; *flagellate foraging stems, clasping roots and feeding roots* unknown; *leaves* distichous on free shoots; *cataphylls and prophylls* membranous, conspicuous, quickly drying and falling; *petiole* broadly canaliculate, 7.5—18 x 0.3—0.4 cm, smooth, apical and particularly basal geniculum well defined, drying darker then petiole; *petiolar sheath* very prominent, extending to and encircling the apical geniculum, briefly ligulate, very swiftly drying and falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, lanceolate to oblong lanceolate, ± falcate, 14—33 x 4—8 cm, thinly coriaceous, base acute, apex acute to long-acuminate with a slight tubule; *midrib* raised abaxially, slightly sunken adaxially; *primary venation* pinnate, raised abaxially and adaxially; *interprimaries* parallel to primaries and only slightly less prominent; *secondary* and *tertiary venation* reticulate, rather prominent in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf and one (more?) conspicuous cataphylls; *peduncle* compressed-cylindric, 8 x 9 cm; *spathe* narrowly cigar-shaped, long stout-acuminate, 6—7 x c. 1 cm, exterior light green; *spadix* very slightly tapering-cylindrical, stipitate, 3—4(—7) x 0.6—0.75 cm; *stipe*

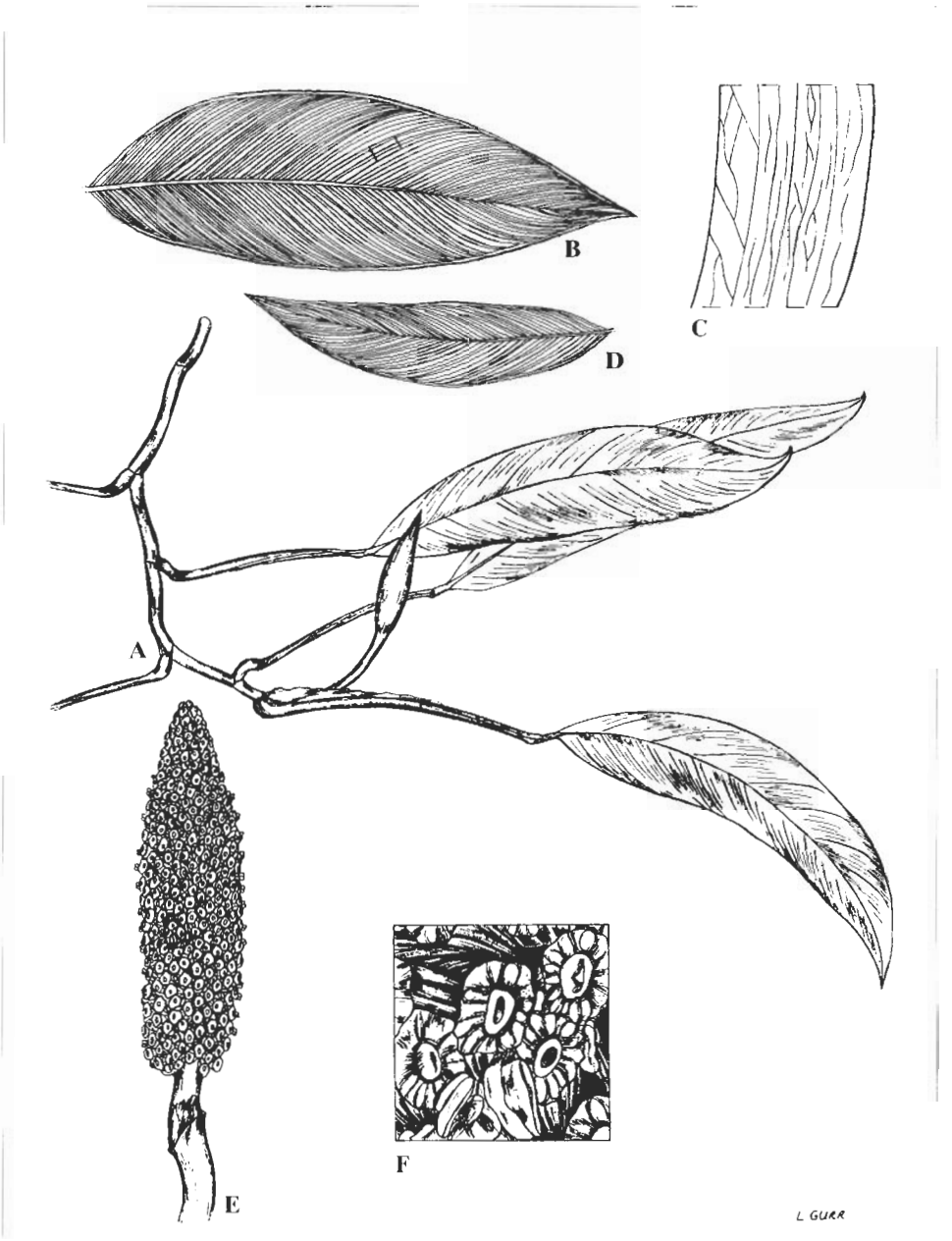

Figure 17. Rhaphidophora oligosperma Alderw.
A. flowering shoot x $^{2}/_{9}$; B. leaf lamina x $^{1}/_{3}$; C. venation detail x 3; D. leaf lamina x $^{1}/_{3}$; E. inflorescence, x 1+; E. spadix detail, late anthesis x 10. A & B from *Idjan & Mochtar 38*; D—F from *Pleyte 46*.

3—3.5 mm long; *stylar region* weakly rhombohexagonal, c. 0.8—0.9 mm diam., truncate; *stigma* punctiform, ± flat, c. 0.25 mm diam.; *anthers* well exserted at anthesis; *infructescence* tapering-cylindrical, 4.5—9.5 x 0.75—1 cm, ovaries few-seeded.

Distribution: Maluku (Ternate, Tidore, Ceram). Endemic.

Habitat: In old secondary forest, 800—1500 m altitude.

Notes: 1. Similar in appearance to *R. koordersii* (Sulawesi) but differing in the thinner, broader and shorter leaf lamina. In Maluku, the stiptate spadix and rather small habit make it distinctive.

2. Confusion with *R. oligosperma* (Sulawesi) is possible but the latter is immediately distinguished by the much narrower, strongly falcate leaves, the sessile spadix and conical style.

Other specimens seen: MALUKU: Pulau Ternate - *Moseley s.n.* (K), G. Ake Abdos, *Idjan & Mochtar 38* (BO, GH, K, L), *Pleyte 46* (L); Pulau Tidore - Buku Mala-Mala, *Lam 3778* (BO, L); Pulau Ceram - *de Vreise & Teysmann s.n.* (L)

16. Rhaphidophora parvifolia Alderw.

Rhaphidophora parvifolia Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922): 338 — Type: Indonesia, Maluku, Pulau Ternate, Laguna, 21 Dec. 1920, *Beguin 1259* (BO, holo).

Moderate-sized, slender to somewhat robust, semi-leptocaul, homeophyllous neotenic liane to 4 m; *seedling and pre-adult plants* unknown; *adult shoot* architecture comprised of clinging, physiognomically unbranched, mostly densely leafy, sterile stems and abbreviated, free, fertile stems; *stems* minutely punctate, rectangular-terete in cross-section, widest side prominently convex, narrow side sulcate, internodes to 1—7 x 0.25—1 cm, separated by slight ± straight scars, older stems woody; *clasping roots* arising from the internodes, pubescent; *feeding roots* unknown; *leaves* distichous, scattered, appressed to substrate and shingling on adherent shoots, slightly scattered on free shoots, *cataphylls and prophylls* unknown; *petiole* deeply grooved, 0.2—1.2 x 0.1—0.25 cm, smooth, groove extending into c. 1 cm into abaxial lamina surface, apical and basal genicula barely visible; *petiolar sheath* soon drying and falling, membranous, slightly ligulate; *lamina* broadly subovate to ovate, thinly coriaceous, base rounded, briefly decurrent, apex

obtuse to obtuse-acuminate with a tiny tubule; *midrib* prominently raised abaxially, slightly sunken adaxially; *primary venation* densely pinnate, slightly raised abaxially and adaxially; *interprimaries* subparallel to primaries and barely distinguishable from them; *secondary venation* reticulate, barely visible; *inflorescence* solitary; *peduncle* terete, c. 2.5 x 0.3 cm; *spathe* unknown; *spadix* cigar-shaped, sessile, inserted ± level on peduncle, c. 4 x 0.75 cm; *stylar region* mostly irregularly rhombohexagonal, 1—1.3 x c. 1.1 mm, truncate; *stigma* barely raised, rounded, c. 0.3—0.diam.; *infructescence* stoutly cigar-shaped, c. 4.5 x 1.2 cm, orange-yellow at maturity.

Distribution: Maluku. Endemic.

Habitat: 'Jungle'. 280 m altitude.

Note: Very similar to *R. hayi* P.C. Boyce & Bogner (New Guinea and northern Australia) and *R. pachyphylla* K. Krause (New Guinea) (Boyce & Bogner, 2000) but differing from both by the sessile spadix. *Rhaphidophora parvifolia* may be further distinguished from *R. hayi* by the thinner leaf laminas, the non-adherent petiolar sheaths and cataphylls, and by the rounded stigma. From available material, it is not possible to tell if *R. parvifolia* has the disarticulating side shoots typical of *R. hayi*. *R. pachyphylla* is readily separable from *R. parvifolia* by the leaf lamina on flowering shoots having an acute to cuneate base.

Other specimens seen: INDONESIA: Maluku - Pulau Halmahera, Pasih Putih, *Taylor 2841B* (BO).

17. Rhaphidophora puberula Engl.

Rhaphidophora puberula Engl., Bot. Jahrb. Syst. 1 (1881) 180 & in Beccari, Malesia 1 (1882) 269—270; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 30 — Type: Indonesia, Sumatera, Padang, Ajer Mantjoer, Aug. 1878, *Beccari s.n.* (FI, holo; B, iso).

Rhaphidophora scortechinii Hook.*f.*, Fl. Brit. India 6 (1893) 545; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 23 — Type: Malaysia, Perak, *Scortechini 347* (K, holo; CAL, iso).

Rhaphidophora kunstleri Hook.*f.*, Fl. Brit. Ind. 6 (1893) 546; 548; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 30; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 338 — Type: Malaysia, Perak, Bk Larut, July 1883, *Kunstler 4538* (K, lecto, selected by Boyce, 1999).

Rhaphidophora gracilipes Hook.*f.*, Fl. Brit. Ind. 6 (1893) 545; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 30, Fig. 10; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 384 — Type: Malaysia, Perak, June 1886, *Kunstler 10271* (K, lecto; BM, SING, isolecto, selected by Boyce, 1999).

Rhaphidophora batoensis Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 27 — Type: Indonesia, Sumatera, Kepulauan Batu, 25 Sept. 1896, *Raap 370*, (B, lecto; BO, isolecto, selected by Boyce, 1999).

Rhaphidophora hallieri Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 385; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 196 — Type: Kalimantan, *Hallier 1187* (BO, holo; BO iso).

Rhaphidophora pilosula Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 386; Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922) 196 — Type: Cult. Bogor Bot. Gard, June 1919, *Alderwerelt s.n.* (BO, holo).

Rhaphidophora scaberula Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922): 196, Fig. y., **synon. nov.** — Type: Indonesia: Sumatera, Deli, 20 March 1918, *Lörzing 5563* (BO - not traced). Alderwerelt's description, especially of the leaf lamina being tomentose abaxially, suggests that *R. scaberula* is either a form of *R. foraminifera* with unperforated leaf laminas, or more likely an exceptionally robust form of the common and widespread *R. puberula*. Although I have been unable to trace the type there is a fertile specimen that is uncontroversially *R. puberula*, *Lörzing 12538* (BO), annotated as matching *Lörzing 5563* and on which basis *R. scaberula* is placed into synonymy.

Figure 18

Moderate to large, rather robust, semi-pachycaul homeophyllous liane to 5 m; *seedling stage* not observed; *pre-adult plants* often forming small terrestrial colonies; *adult shoot* architecture comprised of elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and short, usually unbranched, free, sympodial, densely leafy, flowering stems; *stems* smooth, terete in cross-section, with very sparse prophyll, cataphyll and petiolar sheath fibre, this soon falling, internodes to 13 x 1.5 cm on adherent shoots, usually shorter and stouter on free shoots, separated by large, straight, corky leaf scars, older stems woody; *flagellate foraging stems* absent; *clasping roots* sparsely arising from the nodes and internodes of clinging stems, pubescent; *feeding roots* rare, adherent, pubescent; *leaves* distichous on

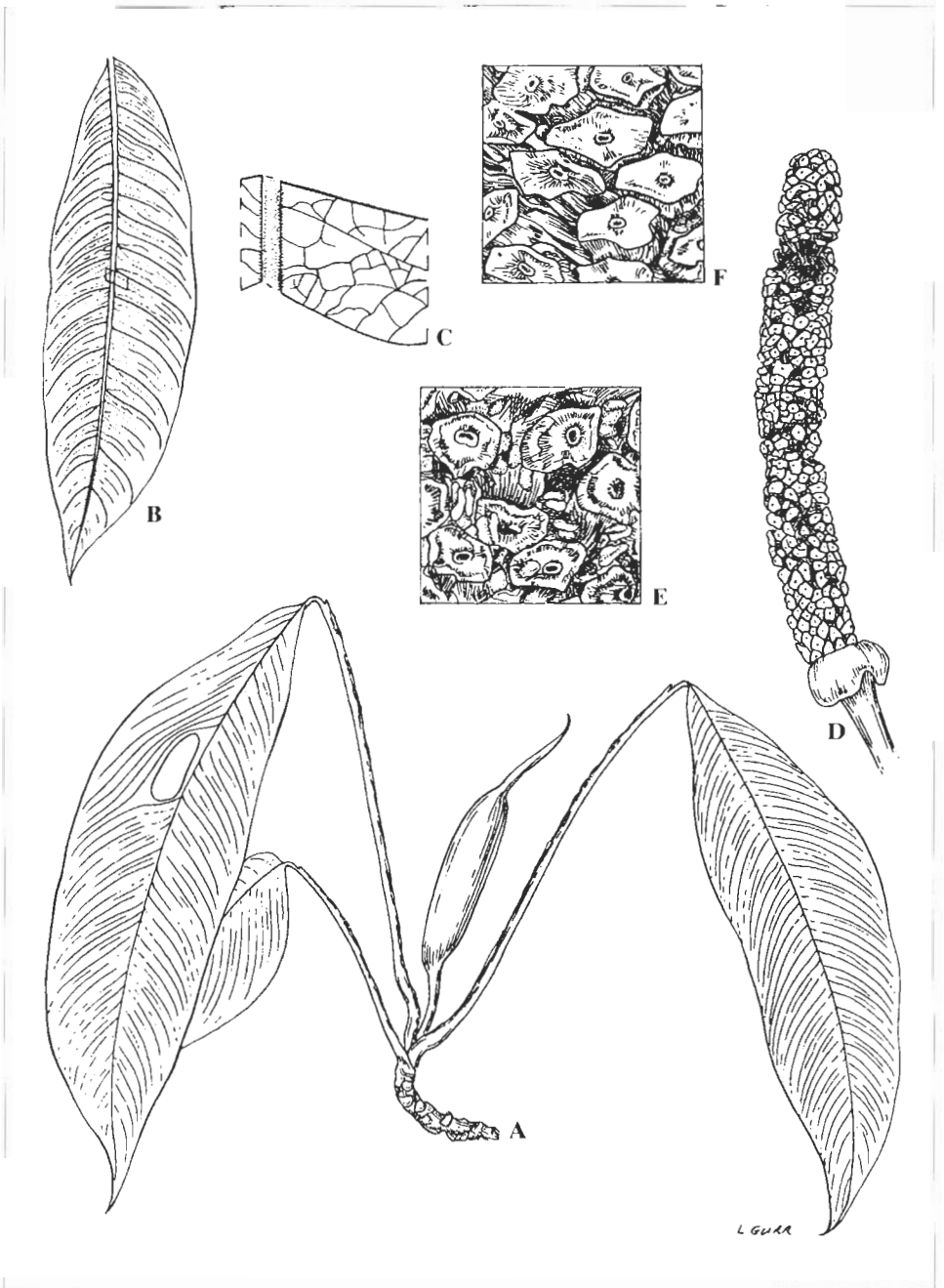

Figure 18. Rhaphidophora puberula Engl.
A. flowering shoot x +; B. leaf lamina x $^1/_3$; C. venation detail x 6; D. inflorescence, spathe removed; E. spadix detail, post anthesis x 6; spadix detail, early fruiting x 4. A & F from *Ridley 14444*; B—E from *Burkill 6267*.

adherent and free shoots; *cataphylls and prophylls* membranous, quickly drying and degrading into very sparse fibres, these soon falling; *petiole* deeply grooved to basally canaliculate, 9—33 x 0.2—3 cm, with the distal portion and apical geniculum minutely pubescent, especially when newly expanded, apical and basal geniculum moderately prominent; *petiolar sheath* very prominent, extending to just below the apical geniculum, swiftly drying and degrading into sparse blah-blah, soon-falling; *lamina* entire to slightly perforated, perforations round to rhombic, extending c. a fifth to a quarter of lamina width on each side of the midrib, ovate to oblong-lanceolate or oblong-elliptic, oblique to falcate, minutely pubescent abaxially when young, 8—34 x 3.5—10.5 cm, thinly coriaceous to subchartaceous, base unequal, rounded, acute to slightly decurrent, apex acute to acuminate; *midrib* prominently raised and pubescent abaxially, ± sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially, the leaf appearing slightly quilted, pubescent in younger leaves, indumentum mostly shed in older leaves; *interprimaries* subparallel to primaries, very slightly less prominent, slightly raised abaxially, slightly impressed adaxially; *secondary venation* tessellate to weakly reticulate, slightly raised; *tertiary venation* not visible; *inflorescence* solitary, very rarely two together, smelling of frangipani and pineapple (*fide Hay et al.* 9029) subtended by a fully developed foliage leaf and, if more than one inflorescence, then the second preceded by a large cataphyll; *peduncle* strongly compressed-cylindric, 4—9 x 0.4—0.6 cm; *spathe* canoe-shaped, stoutly long-beaked, 5.5—19 x 1—6.5 cm, stiff-fleshy, dull green to dull yellow, pale yellow to apricot-orange internally, falling (after?) female receptivity to leave a large, straight scar; *spadix* very weakly clavate cylindrical, sometimes slightly curved, sessile, inserted ± level on peduncle, 3—11.5 x 1—1.6 cm, cream; *stylar region* mostly hexagonal, 1.5—2 x 2.1—2.5 mm, truncate; *stigma* punctiform, prominent, 0.5—0.75 x 0.45—0.75 mm; *anthers* exserted at anthesis; *infructescence* stoutly oblong-cylindrical, 4.5—14 x 1.5—2 cm, glaucous.

Distribution: Sumatera, Peninsular Malaysia, Nusa Tenggara and throughout Borneo.

Habitat: On trees and rocks in primary and secondary lowland to mid-elevation dipterocarp rain forest, often on steep slopes, on granite and limestone, 15—1200 m altitude.

Notes: 1. Given the overall uniformity of this species, it is quite extraordinary that *R. puberula* should have been redescribed no fewer than seven times based mostly on minor differences of leaf shape.

2. Superficially similar to *R. foraminifera*, especially in the perforate-leaf forms, *R. pubernla* can readily be distinguished from *R. foraminifera* by the production of inflorescences on free lateral shoots and in having the active shoot tips without the characteristic black mucilage of *R. foraminifera*. Generally, flowering plants of the perforate-leaved forms of *R. pubernla* have smaller leaves that are noticeably *less* perforated than those of *R. foraminifera*.

Other specimens seen: SUMATERA. 'Sumatera', *Soepadmo 257* (BO); Aceh Prov. - between Lau Simerah and Lau Penanggajan, near Kutatjane, *Alston 14555* (BO, BM), Lau Kelawa, north of Kutatjane, *Alston 14632* (BM), G. Leuser N.R., Ketambe, valley of Lau Alas, near tributary of Lau Ketambe, c. 35 km NW of Kutatjane, *de Wilde & de Wilde-Duyfjes 14592* (BO, L, K, KEP, MO, US), Ketambe R.S., Alas River, c. 35 km NNW of Kutacane, along Guhra River, *de Wilde & de Wilde-Duyfjes 18057* (L); North Sumatera - Silo Maradja, Asahan, *Bartlett 7266* (US), Sibolangit, *Karta 30* (B, BO, L); Borem Bandar Baru, *Lörzing 5913* (BO, L), G. Sago, Bukit Pinago, near Pajakumbuh, above Halaban, *Meijer 4713* (SING), Kepulauan Batu, *Raap 325* (BO), Tapianoeli, Padang Si Dimpoean, Padang Lawas, Hatiran, *Toroes 4937* (US), Padang Si Dimpoean, Padang Lawas Subdivision, Pulau Liman, *Toroes 5356* (L).West Sumatera - Mentawi Archipelago, Pulau Siberut, *Batten Pooll SFN s.n.* (SING), *Boden-Kloss SFN 14470* (K, SING), Mentawi, Pulau Sipora, *Boden-Kloss SFN 14713* (BO, K, SING), Mentawi, Pulau Sioban, *Iboet 450* (BO, L, SING), Bk Gajabuih, Ulu Gadat, about 15 km east from Padang City, *Hotta 26035* (BO, KYO); NUSA TENGGARA.: Pulau Flores - Manggarai, near Ruteng, *Verheijen 592* (L).

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

Similis *R. oligosperma* (Maluku), sed foliis valde angustioribus valde falcatis, spadice sessili, stylo conico differt. Forma et proportio foliorum (lamina saltem septies longior quam lata) in genera unicae — TYPUS: Indonesia, Sulawesi, Kendari, G. Papalia, Kec. Ranomeeto, 13 Feb. 1986, *Mor. Amir 144* (BO, holo; L, iso).

Figure 19

Moderate, robust, semi-pachycaul, homeophyllous (?) liane (?), (ultimate height unknown); *seedling stage and pre-adult plants* not observed; *adult shoot* architecture not fully known but seemingly comprised of clinging, physiognomically, non-flowering stems and shorter clinging, sympodial,

densely leafy, flowering stems; *stems* drying deeply longitudinally ridged, internodes on flowering stems 2—3 x c. 1 cm, separated by prominent straight to slightly oblique leaf scars; *clasping roots* arising densely from the nodes, pubescent; *feeding roots*, unknown; *leaves* distichous in specimen seen; *cataphylls and prophylls* chartaceous, soon falling; *petiole* deeply canaliculate, 14—31 x 0.3—0.4 cm, apical and basal geniculum prominent; *petiolar sheath* prominent, extending to apical geniculum, ± short-persistent, degrading to chartaceous strips and a few weak fibres; *lamina* entire, narrowly falcate-lanceolate to narrowly falcate-oblanceolate, oblique, drying distinctly discolorous, dark brown above, orange-brown below, 32—46 x 4.5—7 cm, weakly coriaceous, base rounded, decurrent, apex acute with a prominent apical tubule; *midrib* prominently raised abaxially, ± sunken adaxially; *primary venation* densely pinnate, raised abaxially, slightly raised adaxially; *interprimaries* parallel to primaries and barely less prominent; *secondary venation* reticulate, very slightly raised; *inflorescence* subtended by a large chartaceous cataphyll, these swiftly degrading, and falling; *peduncle* slightly compressed, distinctly enlarged distally towards spathe insertion, 10.5—11 x 0.3—0.5 cm; *spathe* unknown, falling to leave a large scar at the base of the spadix; *spadix* slightly tapering-cylindrical, sessile, obliquely inserted on peduncle, 5 x 1 cm in the single collection known; *stylar region* moderately developed, rounded-trapezoid to weakly rhombohexagonal, c. 1 x 1.5 mm, shortly conical; *stigma* punctiform, raised, c. 0.3 mm diam.; *anthers* not exserted at anthesis; *infructescence* unknown.

Distribution: Sulawesi. Endemic. Known only from the type.

Habitat: Unknown. 100 m altitude.

Notes: 1. This new species might be confused with *R. oligosperma* (Maluku) but it is immediately distinguished by its much narrower, strongly falcate leaves, the sessile spadix and conical style.

2. The specific epithet is derived from *sabit* the Malay word for a sickle, which is in allusion to the long, narrowly falcate leaves.

19. Rhaphidophora sarasinorum Engl.

Rhaphidophora sarasinorum Engl., Bot. Jahrb. 37 (1905) 114; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 37, Fig. 15 — Lectotype selected here: Indonesia, Sulawesi, Mt Maharau, Masarang, 10 May 1894, *Sarasin 232* (lecto, B).

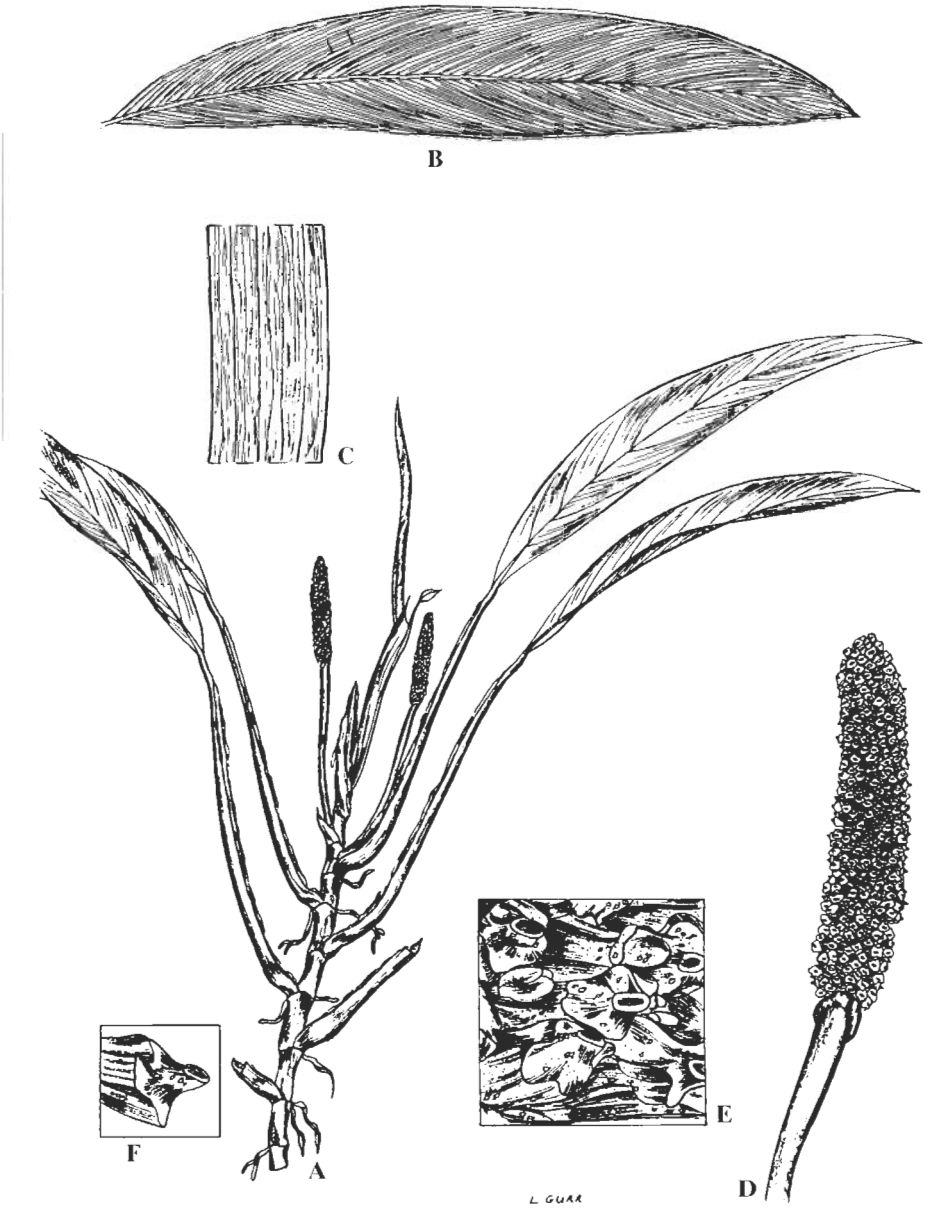

Figure 19. Rhaphidophora sabit P.C. Boyce
A. flowering shoot x $^1/_3$; B. leaf lamina x $^1/_3$; C. venation detail x 3; D. inflorescence, spathe fallen x 1; E. spadix detail, late anthesis x 10; F. gynoecium, three quarter view, early fruiting x 10. All from *Amir 144*.

Figure 20

Large, robust, homeophyllous liane to unknown ultimate height; *seedling stage* and *pre-adult plants* unknown; *stems* smooth, terete in cross-section, internodes to 1 x 1.5 cm long, separated by large oblique, very prominent, slightly shiny leaf scars; *flagellate foraging stems, clasping roots and feeding roots* unknown; *leaves* weakly spiralled on free shoots; *cataphylls and prophylls* membranous, quickly drying and degrading into soft fibre, then swiftly falling; *petiole* canaliculate, 16—22 x 0.25—0.4 cm, smooth, apical and basal geniculum well defined; *petiolar sheath* not observed, scar from (swiftly?) fallen sheath extending to the apical geniculum; *lamina* entire, oblique-oblong, 21—27 x 9.5—12 cm, coriaceous, upper surfaces semiglossy, lower surfaces matt, base obtuse, apex acuminate with a prominent tubule; *midrib* raised abaxially, very slightly sunken adaxially; *primary venation* pinnate, barely raised abaxially and adaxially; *interprimaries* parallel to primaries and barely less prominent; *secondary* and *tertiary venation* ± barely visible in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf and one (more?) cataphylls; *peduncle* compressed-cylindric, 12 x 0.5 cm; *spathe* ovate-canoe-shaped, stoutly long beaked, 14.5 x 7 cm (flattened out), thickly stiff-fleshy, exterior green, turning purple with age, yellow internally, persistent at least until anthesis; *spadix* very slightly tapering-cylindrical, very briefly stipitate, 8—10 x 1—1.5 cm; *stipe* c. 2 mm long; *stylar region* very weakly rhombohexagonal, almost circular, c. 0.8—0.9 mm diam., truncate; *stigma* punctiform, raised, c. 0.3 mm diam.; *anthers* well exserted at anthesis; *infructescence* unknown.

Distribution: Sulawesi. Endemic. Known only from vicinity of Masarang.

Habitat: Unknown.

Notes: 1. Superficially similar to *R. montana*, but readily distinguished by the terete (not rectangular) cross-section of the adherent stems, the briefly stipitate spadix, and the anthers exserted at anthesis. Further, in *R. sarasinorum* the spathe is persistent (swiftly falling in *R. montana*), with the spathe exterior turning purple prior to opening, a feature not found in *R. montana* and one that is rare in *Rhaphidophora* as a whole, the species generally having the spathe yellow, green or orange just prior to female receptivity.

2. Confusion with *R. ternatensis* and *R. balgooyi* is possible. From *R. ternatensis* the prophyll, cataphyll and petiolar sheath fibre, primary lateral veins barely differentiated from the interprimaries and much shorter spadix

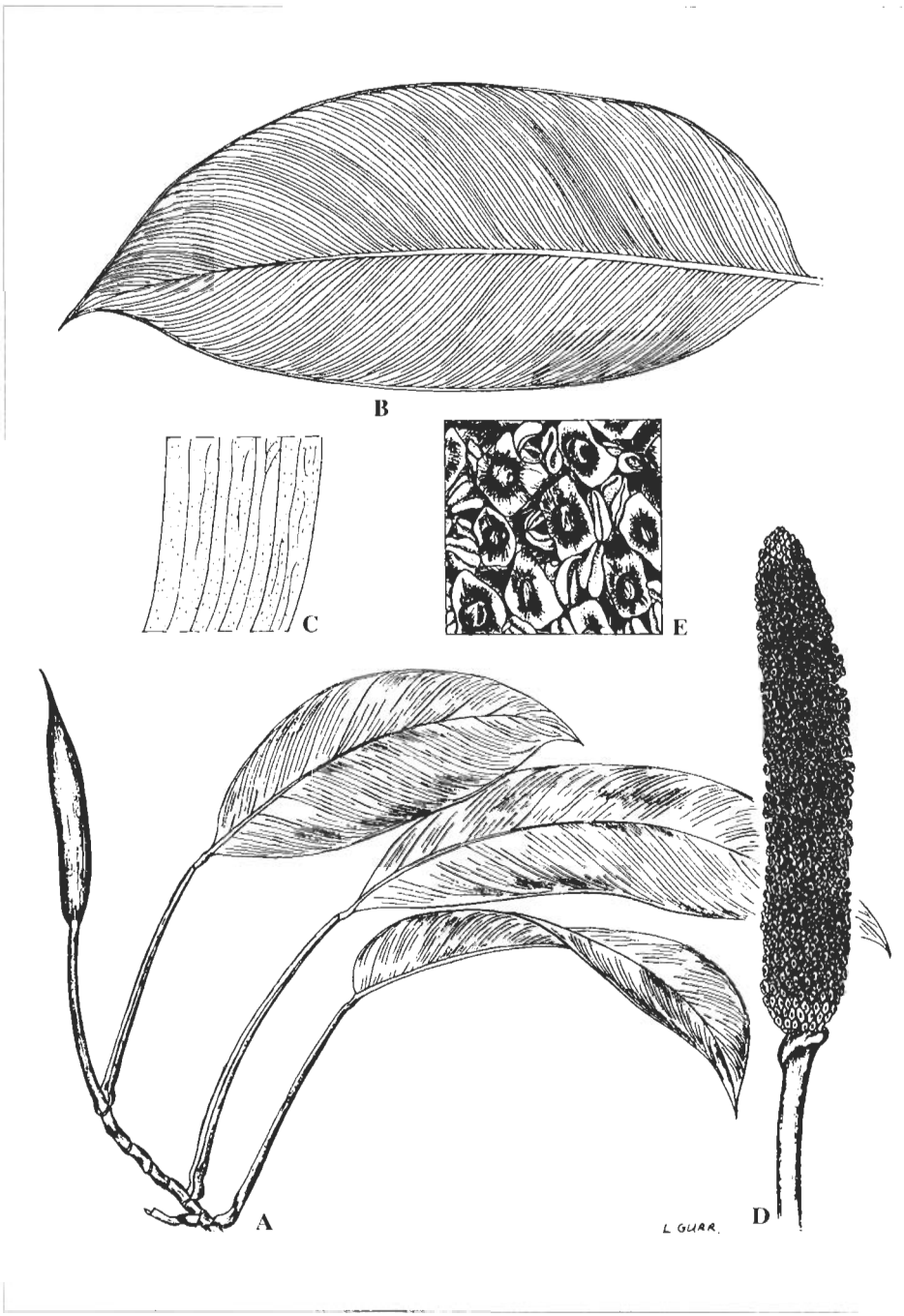

Figure 20. Rhaphidophora sarasinorum Engl.
A. flowering shoot x +; B. leaf lamina x +; C. venation detail x 2; D. inflorescence, spathe fallen x 1; E. spadix detail, late anthesis x 10. All from *Sarasin 232.*

stipe are diagnostic. The larger spadix (11—15 cm) and flat stigmas immediately distinguish *Rhaphidophora balgooyi*.

3. Engler cited two syntypes. The other, *Sarasin 557*, Indonesia, Sulawesi, Mt Maharau, Masarang, October 1894, is not in B and is presumed destroyed.

20. Rhaphidophora sylvestris (Blume) Engl.

Rhaphidophora sylvestris (Blume) Engl. in A. & C., DC. Monogr. Phan. 2 (1879) 239 & in Beccari, Malesia 1 (1882) 268; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 22—25, Fig. 6 ('*silvestris*'); Koorders, Exkursfl. Java, 1 (1911) 254; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 383; Backer, Beknopte Fl. Java, 17 (1957) 14; Backer & Bakh. *f.*, Fl. Java 3 (1968) 106 — *Calla sylvestris* Blume, Catalogus (1823) 62 — *Scindapsus sylvestris* (Blume) Kunth, Enum. pl. 3 (1841) 64; Miq., Flora Ned. Indië 3 (1856) 187—188 — *Scindapsus angustifolius* Hassk., Flora 25 (2), Beibl. 1 (1842) 12, *nom. illeg.* — *Rhaphidophora angustifolia* (Hassk.) Schott in Bonplandia 5 (1857) 45, *nom. illeg.* — based on the type of *Calla sylvestris* Blume — Type: Indonesia, Java, *Blume 178* (L, lecto; L, LE, isolecto, selected by Boyce, 1999).

Scindapsus lingulatus Hassk., Flora 25(2) Beibl. 1 (1842) 12; Schott, Prodr. Syst. Aroid. (1860) 378; Engl. in A. & C., DC, Monogr. Phan. 2 (1879) 248 — *Rhaphidophora lingulata* (Hassk.) Schott, Bonplandia 5 (1857) 45 — *Monstera lingulata* (Hassk.) C. Koch ex Ender, Index Aroid. (1864) 74 — Type: Indonesia, Java, *Hasskarl s.n.* (not traced, see Boyce, 1999). Neotype designated here: Indonesia, Java, East Java, Klakah ('Gebok Klakka'), 5 Nov. 1844, *Zollinger 2500* (BO neo.; LE, P isoneo.) The collection selected as the neotype is fertile and has narrow lingulate leaves, matching well Hasskarl's diagnosis.

Scindapsus aruensis Engl., Bull. Soc. Tosc. Ortic. 4 (1879) 270 — Type: Indonesia, Melaku, Aru Islands, Gabu-lengaw, May 1873, *Beccari s.n.* (FI, holo).

Rhaphidophora wrayi Hook.*f.*, Fl. Brit. India 6 (1893) 544; 42; Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908) 34 — Type: Malaysia, Perak, Larut, Besar, April 1882, *Kunstler 2939* (K, lecto, selected by Boyce, 1999).

Rhaphidophora gratissima Becc., Nelle Foreste di Borneo (1902) 604 — *Rhaphidophora sylvestris* (Blume) Engl. var. *obtusata* Engl., Malesia 1 (1883)

268 — Type: Malaysia, Sarawak, Kuching, Nov.1865, *Beccari PB 952* (FI, holo; FI spirit 423, K, iso).

Rhaphidophora motleyana Engl. & K. Krause in Engler, Pflanzenr. 37 (IV.23B) (1908) 25 — Type: Indonesia, Kalimantan, Bangarmassin, 1857—1858, *Motley 741* (K, holo).

[*Scindapsus lanceolataus* Miq. *nom. nud. in sched.* BO]

[*Pothos cucculata* Zipp. *nom. nud. in sched.* L]

Figure 21

Medium to large, occasionally very large, moderately robust, leptocaul to semi-pachycaul homeophyllous liane to 20 m; *seedling stage* a non-skototropic shingling shoot; *pre-adult plants* very seldom forming small terrestrial colonies of appressed shingling shoots; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems later pendent under their own weight; *stems* smooth, climbing stems rectangular in cross-section, the angles often slightly winged, the surfaces between slightly concave, free stems rectangular to subterete 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 adherent shoots, usually less stout on free shoots, separated by weakly defined, slightly oblique leaf scars, older stems woody; *flagellate foraging stems* frequent, often of great length, ± rectangular in cross-section; *clasping roots* densely arising from the nodes and internodes of clinging stems, pubescent; *feeding roots* very rare, adherent, pubescent; *leaves* distichous on adherent and free shoots, those distal on flowering shoots densely so; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* deeply grooved adaxially, 1—8.5 x 0.15—0.3 cm, smooth, apical and basal geniculа weakly defined; *petiolar sheath* very prominent, extending to and encircling the apical geniculum, briefly ligulate, very swiftly drying and falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, lanceolate-elliptic to falcate-lanceolate, slightly to markedly oblique, 4.5—32 x 1.75—8.5 cm, thinly coriaceous, upper surfaces slightly glossy, lower surfaces semi-matt, base subacute to briefly truncate, apex acute to slightly attenuate, with a prominent apiculate tubule; *midrib* slightly raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries and only slightly less prominent, very slightly raised abaxially and adaxially; *secondary* and *tertiary*

venation ± obscure in fresh material, visible as a faint reticulum in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* compressed-cylindric, 2—8.5 x 0.15—0.5 cm; *spathe* cigar-shaped, stoutly very short-beaked, 4.5—7.5 x 1—3 cm, thinly stiff-fleshy, dull yellow, paler internally, swiftly falling at female receptivity; *spadix* weakly clavate-cylindrical, sessile, inserted ± level on peduncle, 3—6 x 1—2.5 cm; *stylar region* mostly rhombohexagonal, 1—2 x 1.5—2 mm, truncate; *stigma* punctiform, raised, c. 0.25—0.3 mm diam.; *anthers* exserted at anthesis; *infructescence* 6—8 x 2—2.5 cm.

Distribution: Peninsular Malaysia, Sumatera, Java, Nusa Tenggara, throughout Borneo and Maluku.

Habitat: Damp to wet, hill to montane forest, 500—1630 m altitude.

Note: *Rhaphidophora sylvestris* is most similar to *R. montana* and *R. talamauana*. From *R. montana* it can distinguished by the narrower leaves and by the shorter, clavate-cylindrical spadix (3.5—6 cm compared with 9—16 cm in *R. montana*). The flowering shoots with much more prominent leaf scars, scattered leaves, stems ± rectangular (not terete) in cross-section, and the much shorter spathe beak serve to distinguish *R. sylvestris* from *R. talamauana*.

Other specimens seen: SUMATERA. North Sumatera - Sibual-buali via Madurana, Sipirok crater margin, *Afriastini 2399* (BO), Lau Kakar, *Batten Pooll SFN s.n.* (SING), Sibolangit, *Lörzing 8440* (BO); Bohorok, *Schwabe s.n.* (B), Brastagi, *Yates 1457* (BO, UC); Aceh Prov. - G. Leuser N.R., G. Bandahara, track from kampung Seldok north-east to large 'blang' S of summit, c. 25 km NNW of Kutatjane, camp 3, *de Wilde & de Wilde-Duyfjes 13007* (K, KEP, L, US), G. Ketambe, 8 - 15 km SW from the mouth of Lau Ketambe, c. 40 km NW of Kutatjane, camp 2, *de Wilde & de Wilde-Duyfjes 13830* (L); West Sumatera - Bk Gajabuih, Ulu Gadat, about 15 km east from Padang City, *Hotta 25291* (BO, KYO), around Sirah Plot, near pass of Padang - Solek road, *Hotta 26414* (BO, KYO), on route from base camp to Bk Gajabuih plot, about 15 km east of Padang City, *Hotta et al. 157* (BO, KYO), Takenson, *van Steenis 5957* (BO); West Sumatera, Kerinci region, base of G. Tudjuh, *Meijer 6589* (L). JAVA. 'Java' *Anie 244* (L), *de Vriese s.n.* (L), *Horsfield s.n.* (K), *Junghuhn s.n.* (BO), *Korthals 155* (L), *Lobb s.n.* (K), *Reinwardt s.n.* (L), *Zippel 34* (K); *40* (L), *Zollinger 1604* (P); West Java - Nirmala, *Backer 11199* (BO, L), G. Ganisan, east of Bogor, *Bakhuizen van den Brink 6163* (BO, L), *van Leeuwen* 7561 (BO), Sukabumi, G. Gombong, Greimgas, *Dransfield 2055* (BO), Ciapus

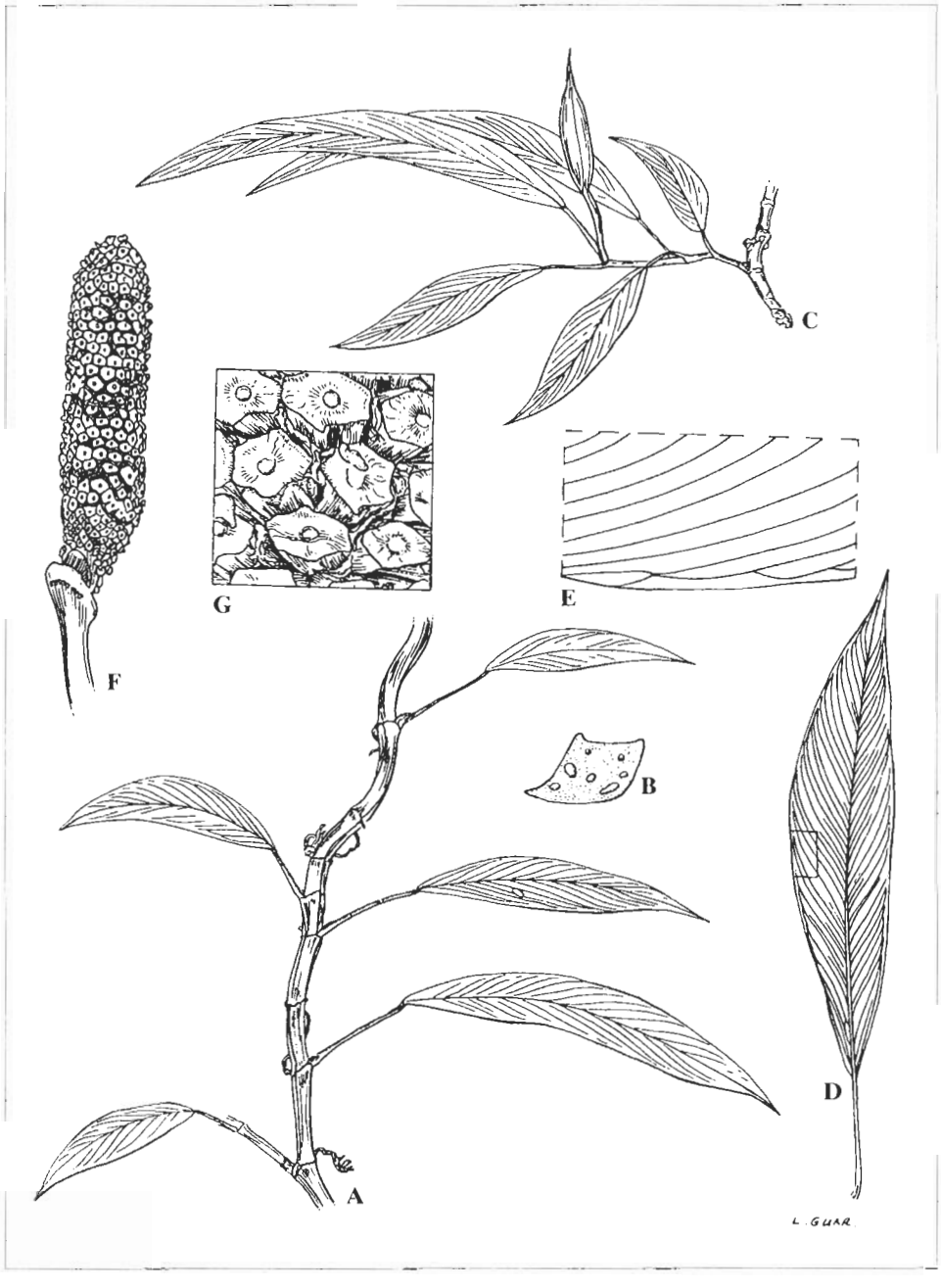

Figure 21. Rhaphidophora sylvestris (Blume) Engl.
A. portion of adult sterile stem x $^1/_3$; B. stem cross-section x 1; C. flowering shoot x $^1/_3$; D. leaf lamina x 1; E. venation detail x 4; F. inflorescence, spathe fallen x 1; G. spadix detail, post anthesis x 4. A & B from *Backer 11199*; C, F & G from *de Wilde & de Wilde-Duyfjes 13830*; D & E from *Afriastini 2399*.

('Tjapoes'), Bogor, *Hallier s.n.* (BO), Cibodas, *Koorders 31545* (BO, L), *Lotsy 364a* (BO), Cibodas B.G., *Nicolson 894* (BO, US), G. Mas Tea plantation, west of Puncak Pass, *van Steenis 12641* (BO); Yogyakarta - Preanger, Bandoeng, Tjigenteng, *Koorders 26437* (BO, L), G. Pangentjangan, *Koorders 26672* (BO, L), G. Goenten, *Wanu* (?) *6778* (BO); Central Java - G. Besar, Tjipang, *Koorders 32899* (BO), Banjaemas Pringambo, *Koorders 39169* (L), G. Moendjoek, G. Karay, *Koorders 40094* (BO, L), G. Oengaran, *van Leeuwen-Reijnvaan 2071* (BO); East Java - Malang, Ranoe Daroengan, *de Groot & Wehlburger 97* (BO);

21. Rhaphidophora talamauana Alderw.

Rhaphidophora talamauana Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 384 — Lectotype selected here: Indonesia, Sumatera, G. Malintang, 18 July 1918, *Bünnemeijer 3592* (BO lecto; L isolecto).

Figure 22

Medium to large, rather robust, semi-pachycaul (?) homeophyllous (?) liane (ultimate height unknown); *seedling stage and pre-adult plants* unknown; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems; *stems* smooth, climbing free stems terete in cross-section, internodes to 1.5—4.5 x 0.3—0.5 cm on free shoots, separated by very well defined, strongly oblique leaf scars; *flagellate foraging stems, clasping roots and feeding roots* not observed; *leaves* scattered, distichous on free shoots; *cataphylls and prophylls* not observed and presumably very swiftly falling; *petiole* grooved adaxially, 3—12 x 0.2—0.3 cm, smooth, apical and basal geniculа well defined; *petiolar sheath* not observed in entirety, presumably very swiftly drying, patches of thick tissue observed and sheath falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, oblique-ovate-lanceolate to obovate-lanceolate, 12—27 x 2—7.5 cm, thinly coriaceous, upper surfaces slightly glossy, lower surfaces matt, base cuneate, apex acute to long-acuminate, with a slender apiculate tubule; *midrib* slightly raised abaxially, slightly sunken adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries and only slightly less prominent, very slightly raised abaxially and adaxially; *secondary and tertiary venation* ± obscure in fresh material, faintly visible as a weak reticulum in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* strongly compressed-cylindric, 3—5 x c. 0.4 cm; *spathe* cigar-shaped, stoutly beaked, 6—6.5 x 1—3 cm, green before

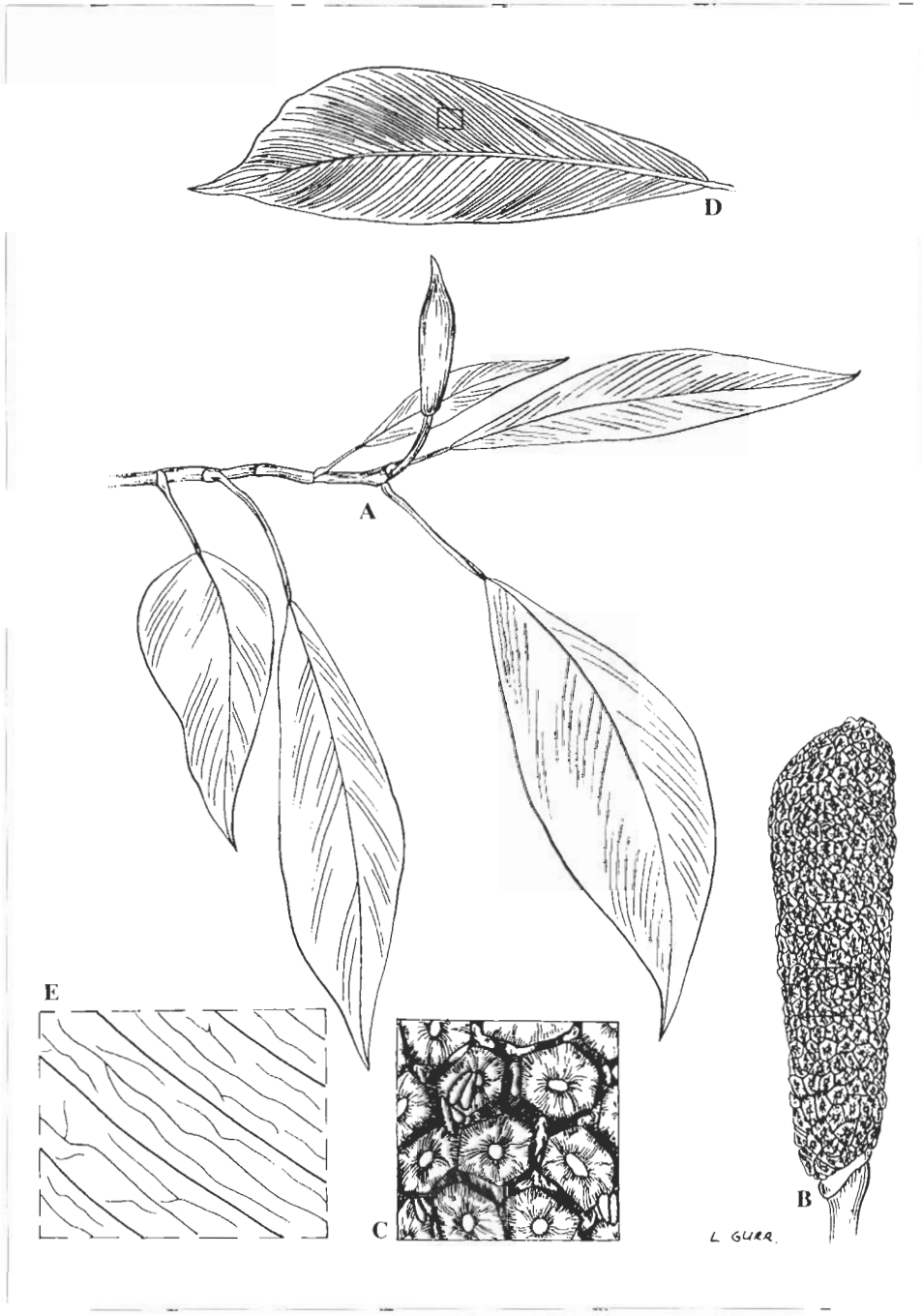

Figure 22. Rhaphidophora talamauana Alderw.
A. flowering shoot x $^1/_3$; B. inflorescence, spathe fallen x 3; C. spadix detail, post anthesis x 6; D. leaf lamina x $^1/_3$; E. venation detail x 4. All from *Bünnemeijer 3592*.

opening; *spadix* weakly clavate-cylindrical, sessile, inserted slightly obliquely on peduncle, c. 6 x 1.5 cm; *stylar region* mostly rhombohexagonal, 1—2 x 1.5—2 mm, truncate; *stigma* punctiform to very slightly elongate, flat, c. 0.25—0.3 mm diam.; *anthers* apparently not exserted at anthesis; *infructescence* c. 10 x 2.5 cm.

Distribution: Sumatera. Endemic. Known only from West Sumatera.

Habitat: Unknown. 1000—1150 m altitude.

Notes 1: *Rhaphidophora talamauana* forms part of the Hongkongensis Group, which typically has climbing and often flowering stems rectangular in cross-section, somewhat thickened, often almost succulent leaves, and flower on free lateral shoots. The species of this group are universally taxonomically intractable and there is still much to be done before they are properly understood.

2. Very similar to *R. sylvestris*, but recognized by the flowering shoots with considerably more prominent leaf scars, scattered leaves, stems terete (not rectangular) in cross-section, and by the much longer spathe beak.

3. In describing *R. talamauana*, Alderwerelt cites two conspecific collections. The other is *Büinnemeijer 657* from West Sumatera, G. Talamau, 9 May 1917 (BO). The collection chosen as the lectotype is in flower (*Büinnemeijer 657* is a fruiting specimen) and is thus more useful for the purposes of identification.

Other specimens seen: SUMATERA. West Sumatera, G. Talamau, *Büinnemeijer 657* (BO).

22. Rhaphidophora ternatensis Alderw.

Rhaphidophora ternatensis Alderw., Bull. Jard. Bot. Buitenzorg III, 4 (1922): 194 — Type: Indonesia, Maluku, Pulau Ternate, Ake Bobtja, 20 Oct. 1920, *Beguin 1004* (BO, holo).

Figure 23

Medium to large, moderately robust, leptocaul to semi-pachycaul homeophyllous liane to 8 m; *seedling stage and pre-adult plants* not observed; *adult shoot* architecture comprised of greatly elongated, clinging, physiognomically monopodial, leafy, non-flowering stems and long, moderately elaborated, free, sympodial, densely leafy, flowering stems

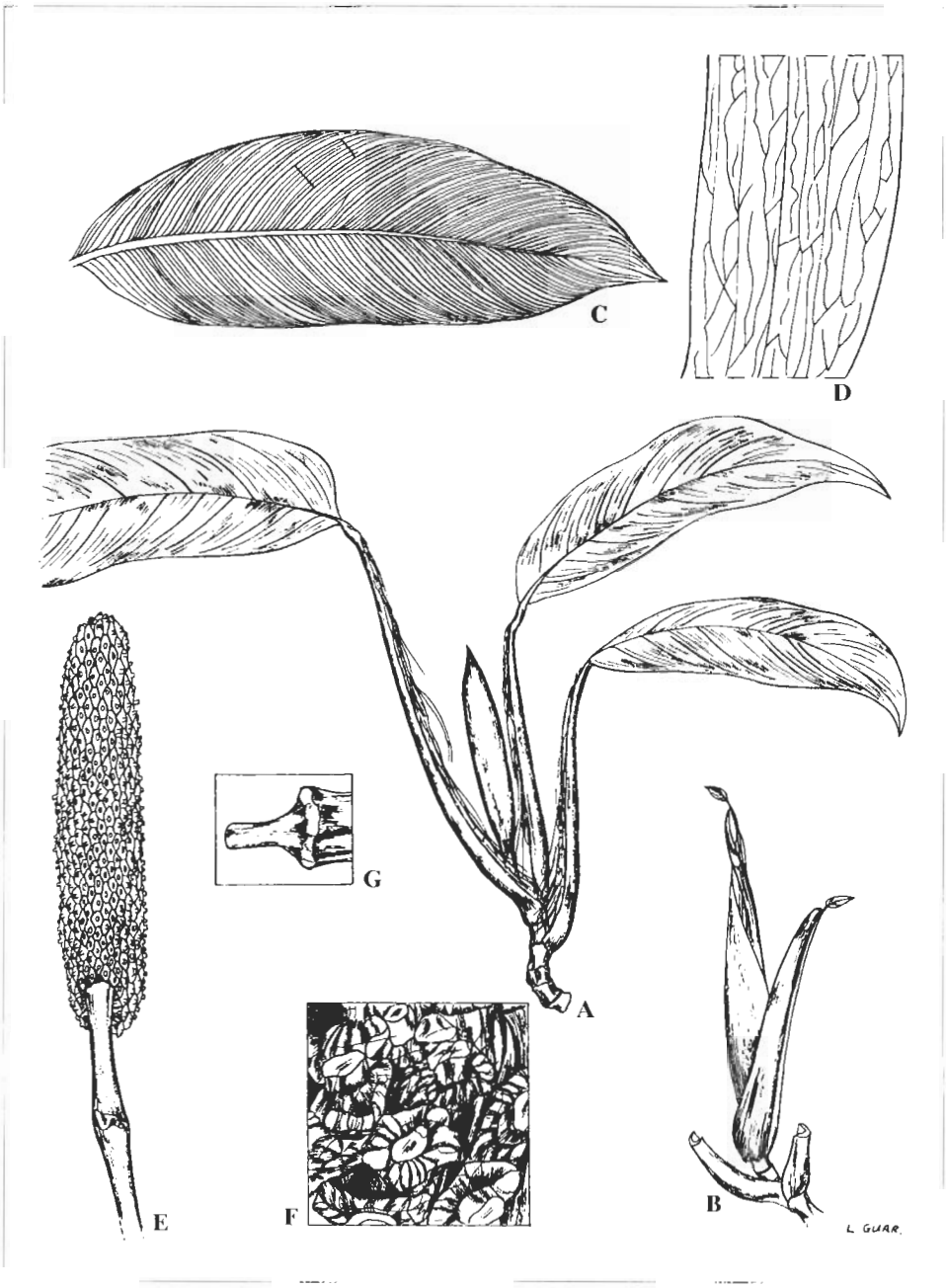

Figure 23. Rhaphidophora ternatensis Alderw.
A. flowering shoot x $^{4}/_{9}$; B. shoot apex with emerging inflorescence x $^{1}/_{3}$; C. leaf lamina x $^{4}/_{9}$; D. venation detail x 3; E. inflorescence, spathe fallen x 1; F. spadix detail, female receptivity x 12; G. gynoecium, side view, female receptivity x 12. All from *Eyma 2726*.

pendent under their own weight; *stems* smooth, longitudinally rugulose when dry, climbing free stems terete in cross-section, with slight prophyll, cataphyll and petiolar sheath fibre, internodes 1—2 cm x 0.5—1 cm on adherent shoots, usually longer and slightly less stout on free shoots, separated by weakly defined, more-or-less straight leaf scars, older stems woody; *flagellate foraging stems* not observed; *roots* not observed; *leaves* spiral-distichous on adherent and free shoots; *cataphylls and prophylls* membranous, drying and degrading into modest fibrous masses; *petiole* deeply grooved adaxially, 7.5—26 x 0.4—1.5 cm, drying with weak longitudinal costate, apical geniculum strongly defined and drying slightly darker than the rest of the petiole; *petiolar sheath* very prominent, extending to and merging with the apical geniculum, lower part strongly sheathing the emerging leaf or inflorescence; *lamina* entire, lanceolate to ovate-lanceolate, slightly falcate very slightly oblique, 19—42 x 6—13 cm, coriaceous, base ovate-cuneate to acute, apex falcate, acute to acuminate, with a prominent apiculate tubule; *midrib* raised abaxially, slightly channelled adaxially; *primary venation* pinnate, slightly raised abaxially and adaxially; *interprimaries* parallel to primaries, considerably less prominent, very slightly raised abaxially and adaxially; *secondary and tertiary venation* reticulate; *inflorescence* solitary, subtended by a fully developed foliage leaf and moderate amounts of fibre; *peduncle* slightly compressed-cylindric, 5—9 x 0.4—0.5 cm; *spathe* canoe-shaped, stoutly very short-beaked, orange, 10—12 x 1.5—3 cm; *spadix* cylindrical, truncate basally, stipitate; *stipe* 6—10 x c. 2 mm; *spadix* inserted ± obliquely on stipe, 5—7.5 x 1—1.5 cm; *stylar region* mostly rhombohexagonal, 1—1.2 x 0.9—1.2 mm, truncate, minutely roughened; *stigma* slightly elongate to rounded, raised, c. 0.25—0.3 mm diam.; *anthers* exserted at anthesis; *infructescence* not observed.

Distribution: Maluku (Ceram, Ternate). Endemic.

Habitat: Unknown.

Note: Similar to *R. balgooyi*, but readily distinguished by presence of cataphyll, prophyll and petiolar sheath fibres, in the significantly more prominent primary lateral leaf venation, the smaller spadix, and the raised styles.

Other specimens seen: MALUKU. West Ceram - Riring to Batu Sore, Sapalewa Cave, *Eyma 2627* (BO, L).

23. Rhaphidophora teysmanniana Engl. & K. Krause

Rhaphidophora teysmanniana Engl. & K. Krause In Engl., Pflanzenr. 37 (IV.23B) (1908) 35, Fig. 13; Alderw., Bull. Jard. Bot. Buitenzorg III, 1 (1920) 387 — Type: Indonesia, Sulawesi, Panghadjeno, *Teysmann 11774* (BO, holo; BO, iso).

Medium slender, leptocaul homeophyllous (?) liane (ultimate height unknown); *seedling stage*, *pre-adult plants* and overall *adult shoot* architecture not observed but adult shoots probably consisting of physiognomically monopodial, leafy, non-flowering stems and long, free, sympodial, moderately leafy flowering stems pendent under their own weight; *stems* smooth, free stems terete to subterete in cross-section, without prophyll, cataphyll and petiolar sheath fibre, internodes to 1.2—1.8 x 0.4—0.6 cm on free shoots, separated by weakly defined, slightly oblique leaf scars; *flagellate foraging stems*, *clasping* and *feeding roots* not observed; *leaves* spiral-distichous on free shoots; *cataphylls and prophylls* membranous, very quickly drying and falling; *petiole* broadly canaliculate, 7—10 x 0.2—0.25 cm, smooth, basal genicula prominent; *petiolar sheath* fallen on all specimens examined, extending to and encircling the apical geniculum, presumably very swiftly drying and falling to leave a continuous conspicuous scar from the petiole base, around the top of the apical geniculum and back to the base; *lamina* entire, oblong-lanceolate, subfalcate, markedly oblique, 25—30 x 6—7 cm, thinly coriaceous, base acute slightly unequal-acute, apex long-acuminate, with a prominent apiculate tubule; *midrib* prominently raised abaxially, slightly sunken adaxially; *primary venation* pinnate, prominently raised abaxially and slightly raised adaxially; *interprimaries* subparallel to primaries, less prominent, very slightly raised abaxially and adaxially; *secondary* and *tertiary venation* ± obscure in fresh material, visible as a very faint reticulum in dried specimens; *inflorescence* solitary, subtended by a fully developed foliage leaf; *peduncle* terete, c. 2.5 x 0.15 cm; *spathe* cigar-shaped, stoutly long-beaked, c. 3.8 x 1 cm, thickly fleshy; *spadix* weakly cylindrical, sessile, inserted ± level on peduncle, c. 3 x 0.8 cm; *stylar region* mostly rhombohexagonal, 1—2 x 1.5—2 mm, truncate; *stigma* punctiform, barely raised, c. 0.25—0.3 mm diam.; *infructescence* unknown.

Distribution: Sulawesi. Endemic. Known only from the type.

Habitat: Unknown.

Note: Similar to *R. novoguineensis* and *R. peekelii* Engl. & K. Krause (both New Guinea, Bismark Archipelago, New Ireland, New Britain, Solomon Is.) but differing in the cylindrical rather than globose to elongate-globose

spathe and the cylindrical (not ellipsoid) spadix.

24. Rhaphidophora ustulata P.C. Boyce, *sp. nov.*

In specimimibus herbarii laminis foliorum manifeste discoloribus, petiolis pallidis, geniculo apicali obscuro insignis est; a *R. montana* spatha minore graciliore, spadice distincte breviore et distincte angustato, a *R. floresensis* spadice gracili plus angustato, spathe minore, stigmate plano differt — TYPUS: Indonesia, Sumatera, Bengkulu Prov., Pulau Enggano, Belowa ('Boca-Boea'), 6 June 1936, *W.J. Lütjeharms 4473* (L, holo; K, iso).

Figure 24

Large, moderately robust, semi-leptocaul (?) homeophyllous (?) liane (ultimate height unknown); *seedling* and *pre-adult plants* unknown; *adult shoot* architecture not fully known but apparently comprised of clinging, physiognomically monopodial, leafy, non-flowering stems and free, sympodial, densely leafy, flowering stems; *stems* smooth, free stems, ± terete in cross-section, without fibre at the tips of active shoots, internodes to 2 x 0.75 cm, separated by large ± straight leaf scars; *roots* unknown; *leaves* scattered-distichous on free shoots; *cataphylls and prophylls* conspicuous, membranous, very quickly drying and falling; *petiole* deeply grooved adaxially, 15—22 x c. 0.2 cm, smooth, apical and basal geniculа well defined, in dry material the apical geniculum drying much darker (dark brown) than the petiole (pale orange-brown); *petiolar sheath* very prominent, extending to the apical geniculum, briefly acute-ligulate, swiftly drying and falling in chartaceous strips to leave a slightly corky scar; *lamina* entire, elliptic to falcate-elliptic-lanceolate, 24—34 x 4—7 cm, thinly coriaceous, drying strongly discolorous, pale yellow-brown abaxially, mid-brown adaxially, base acute, briefly decurrent, apex acuminate with a prominent apiculate tubule; *midrib* slightly raised abaxially, slightly sunken adaxially; *primary venation* pinnate, very slightly raised abaxially and adaxially; *interprimaries* parallel to primaries, less prominent, very slightly raised abaxially and adaxially; *secondary* and *tertiary venation* just visible as an extremely faint reticulum; *inflorescence* solitary, subtended by a fully developed foliage leaf with a greatly expanded petiolar sheath is greatly expanded; *peduncle* strongly compressed cylindric, 2—3 x c. 0.3 cm; *spathe* narrowly canoe-shaped, slender very long-beaked, c. 8 x 1.2 cm, stiff-thinly leathery; *spadix* strongly tapering-cylindrical, sessile, inserted level on peduncle, 7.5—8.2 x c. 1.2 cm; *stylar region* rhombohexagonal, 1—1.2 mm diam., truncate; *stigma* elongate to discoid, ± flat, c. 0.3 mm diam.; *anthers* not exserted at anthesis; *infructescence* unknown.

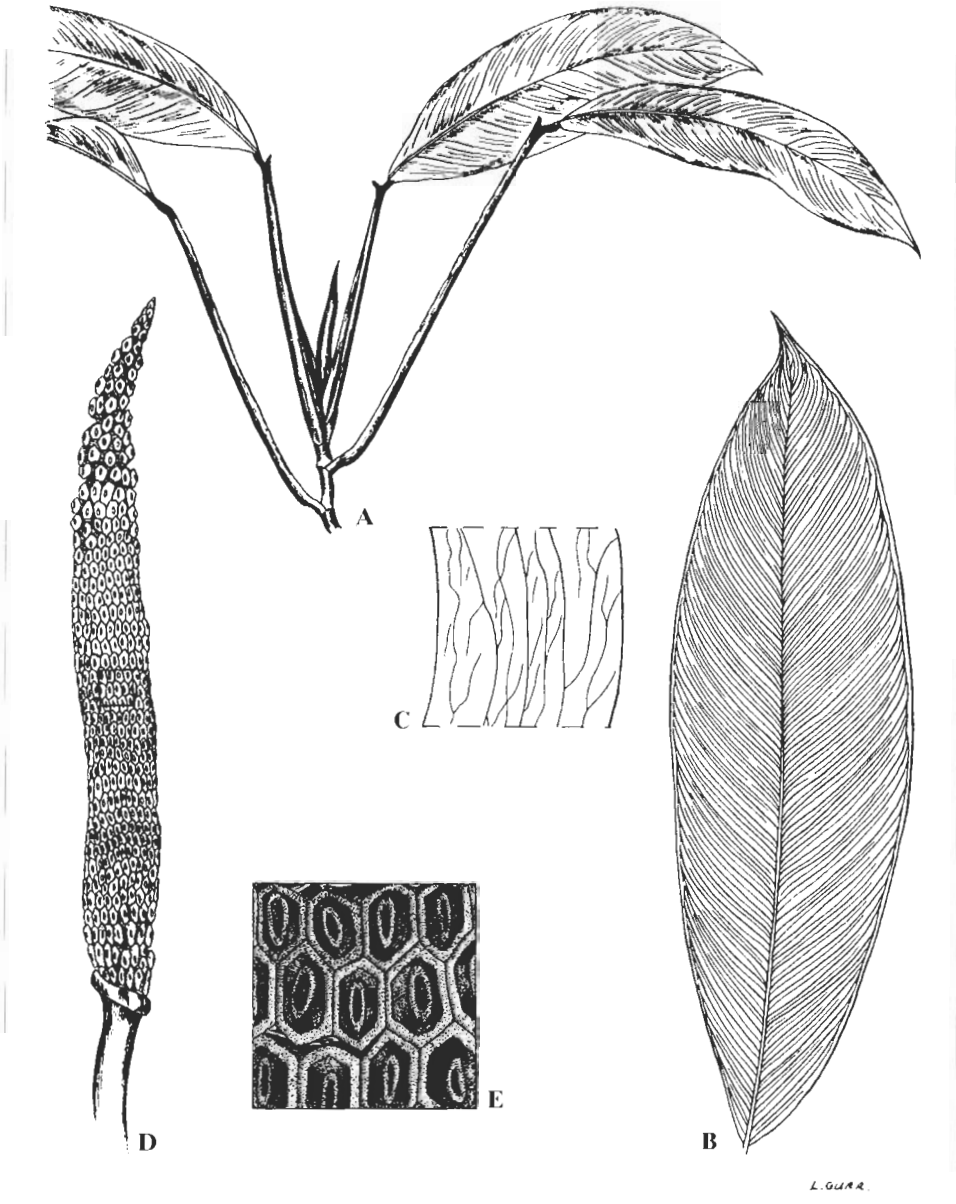

Figure 24. Rhaphidophora ustulata P.C. Boyce
A. flowering shoot x $^1/_4$; B. leaf lamina x 1/2; C. venation detail x 4; D. inflorescence, spathe fallen x 2; F. spadix detail, pre-female receptivity x 14. All from *Lütjeharms 4473*.

Distribution: Sumatera (known only from Pulau Enggano). Endemic

Habitat: Forest. 100 m altitude.

Notes: 1. Distinctive in herbarium specimens by the strongly discolorous leaf lamina, the pale petioles and the dark apical geniculum. *R. ustulata* is most similar to *R. floresensis* from which it differs in its slender, more tapering spadix, the smaller spathe, and the flat stigma. Confusion with *R. montana* is possible. However, *R. ustulata* differs in the smaller, more slender spathe and the much shorter and more distinctly tapered spadix. Herbarium specimens have notably thinner-textured leaf laminas than *R. montana*.

2. The epithet, *ustulata*, Latin for burnt, is in allusion to the diagnostic dark apical geniculum which, compared with the much paler petiole, gives the impression of having been scorched.

Doubtful Species

Rhaphidophora moluccensis Engl. & K. Krause

Rhaphidophora moluccensis Engl. & K. Krause in Engl., Pflanzenr. 37 (IV.23B) (1908): 36, Fig. 21 — Types: Indonesia, Cult. Bogor, ex. Maluku, Wokam, Feb. 1906, *Engler s.n.* (B†); Indonesia: Cult. Bogor, ex. Maluku, Wahai, no voucher cited (B†?).

Medium, moderately robust, semi-pachycaul (?) homeophyllous (?) liane (ultimate height unknown); *seedling stage*, *pre-adult* and *adult shoot* architecture unknown; *stems* smooth, terete in cross-section, internodes 1.5—2.5 cm; *roots* not observed; *petiole* deeply canaliculate adaxially, 12—15 cm long; *petiolar sheath* prominent, extending to c. 1.5 cm from apical geniculum, long persistent; *lamina* entire, falcate-lanceolate-elliptic, 25—30 x 2.5—3.2 cm, thinly coriaceous, base acute, apex acuminate; *primary venation* pinnate, slightly raised abaxially and adaxially; *secondary* and *tertiary venation* ± obscure parallel to primary lateral veins; *inflorescence* unknown.

Distribution: Maluku. Endemic, known only from the type.

Habitat: Unknown.

Note: Known only from two sterile collections, both lost. Based on the illustration that accompanies the protologue, the long, narrowly falcate leaf laminas recall *R. sabit* (*q.v.*) but differ in the primary lateral veins, which are more prominently differentiated than the interprimaries (they are barely differentiated in *R. sabit*). In the absence of a specimen and with no fertile parts described, it is impossible to identify Engler's *R. moluccanum* confidently to any known species.

Acknowledgements

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