

A REVISION OF ANODENDRON A. DC. (APOCYNACEAE)

DAVID J. MIDDLETON

Department of Botany, Trinity College, Dublin 2, Ireland¹

SUMMARY

The genus *Anodendron* A. DC. is revised. *Formosia* Pichon is included in synonymy. Seventeen species are recognised including two new species and two new combinations.

INTRODUCTION

Anodendron was first described by De Candolle (1844) based on *Echites paniculata* from Wallich's Catalogue, published by Roxburgh (1832). A number of other species were subsequently added from India, Japan, China and South-East Asia to the Solomon Islands.

Formosia was described by Pichon (1948) who separated it off from *Anodendron*. This has not been accepted by later authors. The single species, *Anodendron benthamianum*, differs from the other species of *Anodendron* primarily in its large flowers which, although unusual, is no basis for a separate genus.

Dendrocharis was published by Miquel (1857) with two species, *D. inflata* and *D. myrtifolia*. These two species turn out to be synonyms of *Anodendron candolleianum* and a species of *Trachelospermum* respectively. A third species of *Dendrocharis*, *D. rubescens* Teijsm. & Binnend., is also a synonym of *Anodendron candolleianum*. Bentham & Hooker (1876) synonymised *Dendrocharis* under *Ecdysanthera* based on its description. If one lectotypifies the genus by *Dendrocharis inflata* then the genus becomes a synonym of *Anodendron*.

Two species have been removed from *Cleghornia* to *Anodendron*. *Cleghornia* was revised as recently as 1988 (Xu, 1988) and included four species. Two of the species, however, clearly show the characters of *Anodendron*, including the beaked seed, a character lacking in the other two species of *Cleghornia*, including the type species *C. acuminata*. The only difference between the two species to be removed from *Cleghornia*, *C. borneensis* and *C. gracilis*, and the species traditionally included in *Anodendron* is in the relatively short corolla lobes. This allows for a very limited twisting of the lobes in the corolla head, a character clearly found in most other species. *Anodendron tubulosum*, recently moved into *Anodendron* (Middleton, 1994), and the new species *A. seramense* are most closely related to these two species.

De Candolle (1844) placed *Anodendron* in tribe Echiteae along with many other genera now forming subfamily Apocynoideae. Bentham & Hooker (1876) also placed *Anodendron* in tribe Echiteae (as Echitideae) and constructed the new subtribe Ich-

1) Present address: Royal Botanic Garden, Edinburgh EH3 5LR, Scotland, United Kingdom.

nocarpinae (as Ichnocarpeae). This subtribe also contained a large number of other genera. Hooker (1882), dealing only with Asian genera, placed *Anodendron* in subtribe Euechitideae (= Echitinae in modern nomenclature) with a number of other clearly related genera. Schumann (1895) elevated these two taxa to subfamily and tribe as Echitoideae (= Apocynoideae in modern nomenclature) and Echitideae (= Apocynaceae) respectively. The most comprehensive subclassification of subfamily Apocynoideae has been by Pichon (see Pichon, 1950). He split *Anodendron* into two genera (Pichon, 1948) and subdivided *Anodendron sensu stricto* into two sections, *Micranodendron* and *Macranodendron* (Pichon, 1950). In a similar way to his distinction between *Anodendron* and *Formosia* these two sections were based solely on flower size and are unsupportable. Both *Anodendron* and *Formosia* were placed in tribe Ecdysanthereae, subtribe Anodendrinae with no other genera. Pichon's scheme for the Apocynoideae, unlike his remarkable treatment of the Plumerioideae, has been shown to be unsatisfactory on a number of occasions (Ngan, 1965; Middleton, 1994; Leeuwenberg, 1994). Lý (1986) constructed a new tribe, Anodendreae, although, as he gave no Latin diagnosis or suggested it was a new combination based on Pichon's Anodendrinae, it has not been validly published. This tribe was based on those genera with a beaked seed. Unfortunately, he misinterpreted a number of the genera he included in this tribe.

Anodendron would appear to be most closely related to *Papuechites* and possibly to *Ixonoderium*.

MATERIALS AND METHODS

Herbarium material was studied from the following herbaria: A, AAU, ABD, B, BK, BKF, BM, BO, BR, BRI, BRUN, C, CGE, E, G, GH, H, IBSC, K, KEP, KLU, K-W, KYO, L, LAE, M, MEL, MO, NSW, NY, P, PE, S, SING, TCD, TI, U, UPS, US, W, WRSL, Z (Holmgren et al., 1990).

The dimensions given in the descriptions are for dried material except for the gynoecium and androecium characters which are for flowers rehydrated with water. The descriptions for the two new species are based on all the collections examined. Any type specimens associated with taxa described by Tsiang previously cited for LU or SYS now appear to be housed in IBSC and the holotypes are, therefore, cited IBSC.

SYSTEMATIC TREATMENT

ANODENDRON

- Anodendron* A.DC., Prod. 8 (1844) 443. — *Anodendron* sect. *Micranodendron* Pichon, Mém. Mus. Nat. Hist. Nat. Paris, sér. B, Bot. 1 (1950) 92. — Type species: *Anodendron paniculatum* A.DC.
- Dendrocharis* Miq., Versl. Meded. Kon. Akad. Wet. Amsterdam 6 (1857) 194. — Type species: *Dendrocharis inflata* (Hassk.) Miq. (= *Anodendron candolleianum* Wight).
- Formosia* Pichon, Bull. Mus. Nat. Hist. Nat. Paris, sér. 2, 20 (1948) 300. — Type species: *Formosia benthamianum* (Hemsl.) Pichon (= *Anodendron benthamianum* Hemsl.).
- Anodendron* sect. *Macranodendron* Pichon, Mém. Mus. Nat. Hist. Nat. Paris, sér. B, Bot. 1 (1950) 92. — Type species: *Anodendron affine* (Hook. & Arn.) Druce.

Climbers or scramblers; producing latex. Branches lenticellate or not; branchlets glabrous or, rarely, pubescent. *Leaves* opposite, those of a pair equal; petiolate; coriaceous to papery, entire. *Inflorescence* of axillary and/or terminal cymes, often forming panicles. *Flowers* 5-merous, actinomorphic. *Sepals* free; colleters axillary. *Corolla* consisting of a narrow cylindrical tube which widens slightly at the point of stamen insertion into the upper tube and then with spreading lobes which are usually narrow oblong or narrow elliptic, rarely ovate, falcate and overlapping to the right in bud. *Stamens* included in the corolla tube, attached in a ring to the pistil head; anthers subsessile (except in *A. benthamianum*), narrow triangular, apex acuminate, base sagittate, sterile at apex and base. *Disk* annular, 5-dentate or 5-crenate. *Ovary* of 2 separate carpels united into a common style, superior, ovoid, glabrous; ovules numerous; style glabrous, short; pistil head ovoid with a short sharp projection on top. *Fruit* of paired follicles; divergent or sub-divergent; wide at base, narrowing to end; longitudinally dehiscent. *Seeds* beaked, grain narrow ovate or elliptic, flattened; glabrous; coma pointing towards end of fruit.

Distribution — 17 species from India and China westwards to Japan and southwards and eastwards through Indochina to the Solomon Islands and Vanuatu.

KEY TO THE SPECIES

- 1a. Corolla tube > 11 mm long, lobes > 11 mm long. Taiwan . **3. *A. benthamianum***
- b. Corolla tube < 9 mm long, lobes < 10 mm long; widespread 2
- 2a. Corolla lobes in bud strongly twisted to the left, 1.8–9.5 × as long as wide . 3
- b. Corolla lobes in bud not strongly twisted, 0.9–1.8 × as long as wide 17
- 3a. Leaves minutely punctate beneath 4
- b. Leaves not minutely punctate beneath 9
- 4a. Inflorescences mostly axillary, shorter than subtending leaves, often minutely puberulent 5
- b. Inflorescences terminal panicles, usually longer than subtending leaves, glabrous **1. *A. affine***
- 5a. Corolla tube ≥ 5 mm long, lobes > 6 mm long; 7–11 strong pairs of lateral nerves **12. *A. pauciflorum***
- b. Corolla tube < 5 mm long, lobes ≤ 5 mm long; 7–23 pairs of lateral nerves, if ≤ 13 then only weakly distinct from tertiary venation 6
- 6a. Leaves puberulent beneath; corolla tube 1.6–1.7 mm long, lobes 2.1–2.7 mm long **8. *A. howii***
- b. Leaves glabrous beneath; corolla tube 2.2–4.8 mm long, lobes 2.9–5 mm long 7
- 7a. Leaf venation not prominent. Indochina and China **13. *A. punctatum***
- b. Leaf venation prominent. Malaysia to the Solomon Islands 8
- 8a. Inflorescences 1–3.7 cm long; disk 0.6–0.8 × as long as ovary; tube densely pubescent inside **2. *A. axillare***
- b. Inflorescences 3.9–13.2 cm long; disk 0.3–0.6 × as long as ovary; tube glabrous or sparsely pubescent only at top inside **16. *A. whitmorei***
- 9a. Inflorescences minutely puberulent, mostly axillary **10. *A. oblongifolium***
- b. Inflorescences glabrous, axillary or terminal 10

- 10a. Inflorescences mostly axillary, if terminal not forming large panicles 11
 b. Inflorescences terminal, sometimes also axillary, forming panicles 13
 11a. Leaves thickly coriaceous; petiole (1.5–)2–5.2 cm long; corolla lobes 1.7–2.9 mm long **5. A. candolleanus**
 b. Leaves coriaceous to subcoriaceous; petiole 0.5–2.1 cm long; corolla lobes 2.7–8.5 mm long 12
 12a. Inflorescence robust; leaves mostly narrow elliptic **1. A. affine**
 b. Inflorescence delicate; leaves broad elliptic, oblong or obovate
 **10. A. oblongifolium**
 13a. Bracts on flower pedicels 14
 b. Bracts at base of flower pedicels 15
 14a. Inflorescence delicate; anthers 1–1.3 × 0.3–0.4 mm. Peninsular Thailand to Indonesia **6. A. coriaceum**
 b. Inflorescence robust; anthers 1.1–4 × 0.4–0.8 mm. Japan and China to Indochina and the Philippines **1. A. affine**
 15a. Corolla tube 4.7–8 mm long; leaf apex rounded to apiculate . . . **17. A. wrayii**
 b. Corolla tube 1.2–4.1(–4.7) mm long; leaf apex acuminate, very rarely to apiculate. 16
 16a. Leaves glaucous beneath, nerves thin and not prominent . . . **9. A. nervosum**
 b. Leaves not glaucous beneath, nerves prominent or not . . **11. A. paniculatum**
 17a. Corolla tube > 5 mm long; leaves 8–14 cm long **4. A. borneense**
 b. Corolla tube < 2 mm long; leaves 2.6–10.7 cm long 19
 18a. Inflorescence < 2 cm long; pedicels ≤ 1.2 mm long **15. A. tubulosum**
 b. Inflorescence > 3 cm long; pedicels ≥ 2 mm long 18
 19a. Leaf nerves arcuate ascending. Seram and Ambon **14. A. seramense**
 b. Leaf nerves ± straight, almost perpendicular to midrib. Malay Peninsula and Borneo **7. A. gracile**

1. *Anodendron affine* (Hook. & Arn.) Druce — Map 1

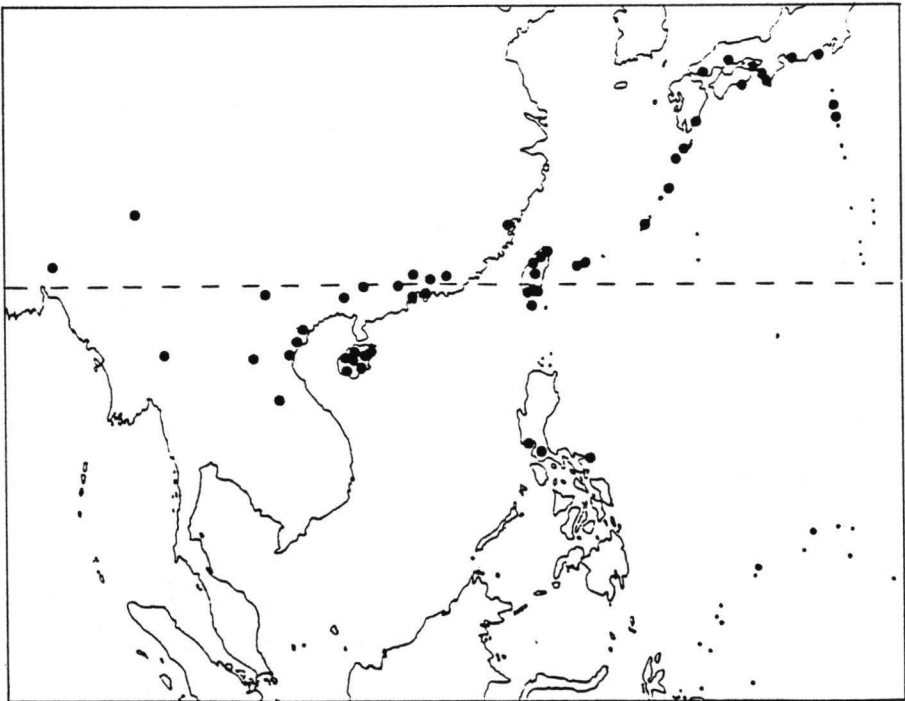
- Anodendron affine* (Hook. & Arn.) Druce, Rep. Bot. Exch. Cl. Brit. Isles 1916 (1917) 605; Tsiang, Sunyatsenia 2 (1934) 127; Sunyatsenia 3 (1936) 140; Guangdong Coll. Agric. For. (P.T. Li?), Fl. Hainanica 3 (1974) 241; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 175; J. Ying & P.T. Li, Fl. Yunnanica 3 (1983) 534; Huang, Taiwanica 31 (1986) 92; Lý, Feddes Rep. 97 (1986) 649; P.T. Li, J. S. China Agric. Univ. 11 (1990) 30. — *Holarrhena affinis* Hook. & Arn., Bot. Beech. Voy. (1836) 198. — Type: Untraced. Neotype: *Tsang 20357* (US neo, designated here; BO, K, MO, W isoneo).
- Aganosma laevis* Champion ex Benth., Hook. Kew J. 4 (1852) 335. — *Anodendron laeve* (Champion ex Benth.) Maxim. ex Franch. & Sav., Enum. Pl. Jap. 1 (1875) 315; Pitard in Lecomte, Fl. Gén. Indo-Chine 3 (1933) 1230. — Type: *Champion 198* (K lecto, designated here; K iso).
- Epigynum laevigatum* Hook. f., Fl. Brit. India 3 (1882) 666. — *Echites laevigata* Wall., Num. List (1829) 1669, nom. nud. — Type: *Wallich 1669* (K-W lecto, designated here; K iso).
- Anodendron loheri* Merr., Philipp. J. Sc., Bot. 7 (1912) 332; Enum. Philipp. Flow. Pl. 3 (1923) 333. — Type: *Loher 6494* (US lecto, designated here; K, M iso).
- Anodendron suishaense* Hayata, Ic. Pl. Formos. 6 (1916) 29. — Type: *Hayata s.n.*, May 1916 (TAI holotype, n.v.; A photo).
- Anodendron affine* var. *effusum* Tsiang, Sunyatsenia 2 (1934) 128; Guangdong Coll. Agric. For. (P.T. Li?), Fl. Hainanica 3 (1974) 242; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 176. — Type: *How 70620* (IBSC holotype).

Anodendron affine var. *pingpienense* Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 379; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 176; J. Ying & P.T. Li, Fl. Yunnanica 3 (1983) 534.

— Type: *Feng 5062* (IBSC holo). I have been unable to obtain type material of this variety but from the description it is probably a synonym of *A. affine*.

Anodendron fangchengense Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 378; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 176. — Type: *Chun 4848* (IBSC holo).

Branchlets glabrous. *Leaves*: petiole 0.5–1.8 cm long; blade elliptic, rarely slightly obovate, apex acuminate or apiculate, base cuneate, rarely to rounded, 3–16.6 × 0.7–5.4 cm, (1.9–)2.3–6.3 × as long as wide, 6–12 pairs of lateral nerves, tertiary venation largely obscure, rarely somewhat prominent, glabrous, rarely obscurely punctate beneath. *Inflorescences* axillary and terminal forming panicles, glabrous, 3.2–19.2 cm long, bracts usually on the pedicel; pedicels 1.5–5.8 mm long. *Sepals* ovate, apex acute to acuminate, 1.1–3.4 × 0.5–1.5 mm, 1.1–3.6 × as long as wide, glabrous, sparsely ciliate or not. *Corolla* white to greenish yellow; tube 2.4–6.8 mm long; lobes 2.7–8.5 mm long, 0.7–2.2 × as long as tube, 0.9–2.3 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–1.9 mm from corolla base, which is 0.1–0.3 of tube length; anthers 1.1–2(–4) × 0.4–0.8 mm, 2.2–4.3(–5) × as long as wide. Disk annular to 5-crenate, 0.3–0.7 mm long, 0.5–1.4 × as long as ovary. *Ovary* 0.5–0.9 mm long; style + pistil head 0.8–2 mm long. *Fruit* 7.3–12.5 cm long, 1.4–2.3 cm wide. *Seed* grain 11.8–17 × 4.3–7.1 mm; beak 2.4–7.8 mm long; coma 4–5.6 cm long.



Map 1. Distribution of *Anodendron affine* (Hook. & Arn.) Druce (●).

Distribution — Bangladesh, Burma, China, Vietnam, Laos, Thailand, Taiwan, Japan, Philippines.

Note — The Thai collection *Maxwell 90-413* and, to some extent, the Laotian collection *Kerr 21140* as well as the few collections from further west in Yunnan, Burma and Bangladesh are unusual in this species in having larger, broader leaves and more robust and somewhat larger flowers. The type of *Epigynum laevigatum* from Bangladesh falls into this category and there may be an argument for making a new combination in *Anodendron* for this species. However, this would be to overstate the differences and ignores the overwhelming similarities between all the specimens.

Selection of the c. 170 collections studied:

BANGLADESH. Sylhet: *Wallich 1669* (K — type of *Epigynum laevigata*).

BURMA. Kachin: *Kingdon Ward 20718* (BM).

CHINA. s.l.: *Chun 4848* (IBSC — type of *Anodendron fangchengense*). Fujian: Kushan, *Chung 7590* (A). Guangdong: Naam Kwan Shan, Tsengshing district, *Tsang 20287* (A, K, MO, US). Guangxi: Yao Shan, Ping Nan, *Wang 39090* (A). Hainan: Ngai Yuen, *How 70620* (IBSC — type of *Anodendron affine* var. *effusum*). Hong Kong: *Champion 198* (K — type of *Aganosma laevis*). Hupeh: Ichang, *Henry s.n.* (P). Macao: *Callery 280* (P). Yunnan: Ma-Kuan-Hsien: Ching-kou, *Feng 13640* (A).

VIETNAM. Ha Tuyen: Yen Minh, *Bon 1247* (P).

LAOS. Kham Mouan: Nape, *Spire s.n.* (P). Xiang Khoang: Phu Muten, *Kerr 21140* (BM, K, L).

THAILAND. Mae Hong Son: Pai District, Doi Sahn Mean, summit of Doi Chang, *Maxwell 90-413* (A, MO).

TAIWAN. Suisha: *Hayata s.n.* (A photo — type of *Anodendron suishaense*); Taipei county, Mucha, *Chen 1955* (BISH, L, MO, Z); Taitung, Lanyu, Swasy Rock, *Huang et al. 10634* (MO); Tamsuy, *Oldham 322* (BM, G, K, MO, P, W).

JAPAN. Aoga-shima, *Mizushima 2652* (A, TI); Hachijio-jima, *Yokohama Nursery co. s.n.* (E); Honshu, Tomogashima, Wakayam Pref., Nonaura, *Muroi 6839* (A); Iriomote-jima, Ootomi, *Tateishi & Murata 4769* (A, TI); Ishigaki shima, Maishi Take, *Fosberg 37704* (BISH, L, TI, US); Kyushu, Mt Kirishima, *Tashiro s.n.* (K); Okinawa Isl., *Conover 1291* (BISH, US); Ryuku, Ishigaki, Mt Omoto, *Furuse 317* (S).

PHILIPPINES. s.l.: *Loher 6494* (K, M, US — type of *Anodendron loheri*). — Luzon: Bataan, Lamao River, Mt Mariveles, *Meyer 2607* (K, SING). Laguna: Makiling National Park, Alipasyan ridge, *Sulit PNH 81941* (K, L).

2. *Anodendron axillare* Merr. — Fig. 1; Map 2

Anodendron axillare Merr., Philipp. J. Sc., Bot. 7 (1912) 331; Enum. Philipp. Flow. Pl. 3 (1923) 333. — Type: *Meyer & Foxworthy 13572* (US lecto, designated here)

Branchlets glabrous. *Leaves*: petiole 5–11 mm long; blade elliptic, oblong or weakly obovate, apex acuminate, base cuneate to obtuse, 5.5–12.3 × 1.1–4.5 cm, 2–5 × as long as wide, 13–16 pairs of axillary nerves, fairly straight and prominent with weaker intercalated tertiary veins, glabrous, punctate beneath. *Inflorescence* of short congested axillary cymes, occasionally also terminal; minutely dense puberulent to almost glabrous, 1–3.3 cm long, with bracts at base of pedicels; pedicels 1.7–3.3 mm long. *Sepals* ovate, apex acute, 0.9–1.6 × 0.6–1.1 mm, 1.2–1.8 × as long as wide, glabrous, ciliate. *Corolla* yellow; tube 3.4–4.8 mm long; lobes 4–5 mm long, 1–1.3 × as long as tube, 0.8–1.5 mm wide; glabrous outside, pubescent on inside of lobes

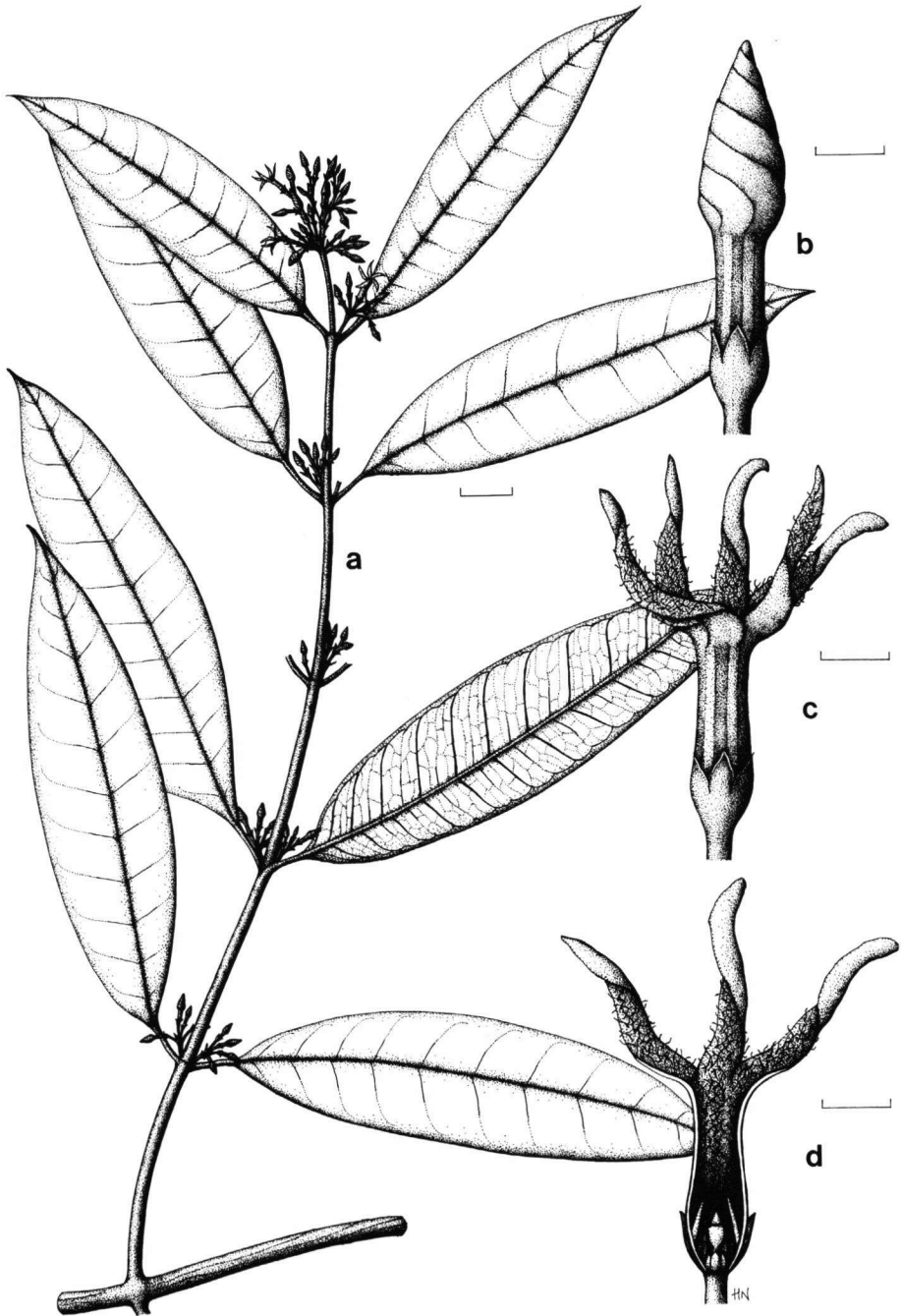
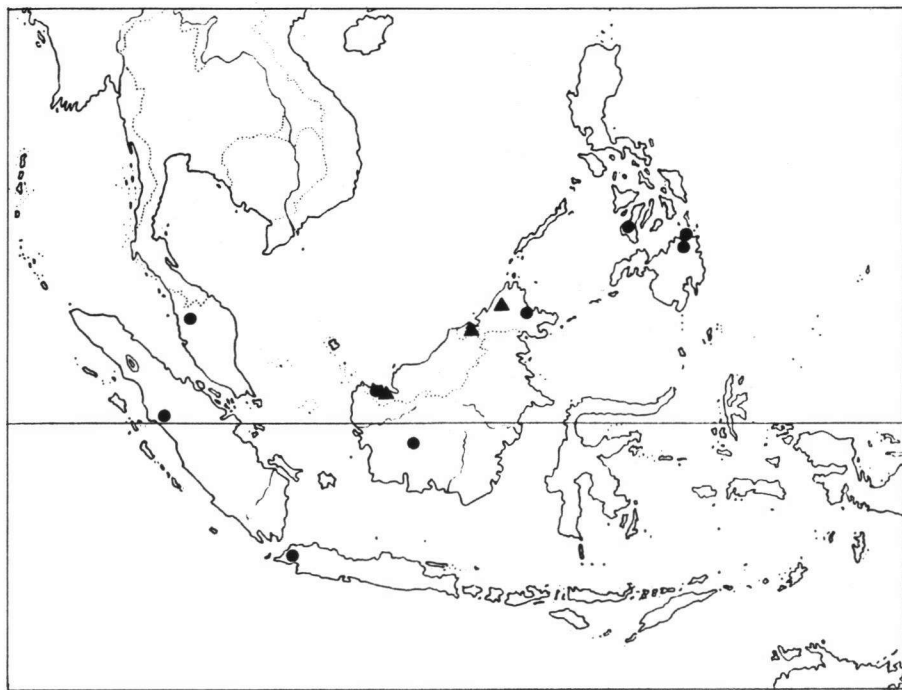


Fig. 1. *Anodendron axillare* Merr. a. Habit; b. flower in bud; c. open flower; d. flower dissection (a–d: Wenzel 3086, B). Scale bars: a = 1 cm, b–d = 1 mm.



Map 2. Distribution of *Anodendron axillare* Merr. (●) and *A. borneense* (King & Gamble) D.J. Middleton (▲).

and in tube. *Stamens* inserted at 0.6–0.7 mm from corolla base, which is 0.1–0.2 of tube length; anthers 1.3–1.5 × 0.4–0.6 mm, 2.3–3.3 × as long as wide. *Disk* annular or 5-dentate, 0.3–0.5 mm long, 0.6–0.8 × as long as ovary. *Ovary* 0.5–0.7 mm long; style + pistil head 0.7–1.2 mm long. *Fruit* unknown.

Distribution — Malay Peninsula, Sumatra, Java, Borneo, Philippines.

Note — A number of specimens of this species from Borneo have been labelled by Ridley with unpublished names. These have not been reproduced here to avoid adding unnecessary confusion to the literature.

Collections studied:

MALAYSIA. Peninsular: Perak, Sungei Krian, *Spare 33264* (SING). — Borneo: Sabah, Sandakan District, Kebun China F.R., *Meijer 37463* (K, L, SING). Sarawak, Kuching, *Hewitt s.n.* (K); near Kuching, *Haviland & Hose 3498* (BM, BO, GH, K, L, SING, W), *Haviland 3049* (K, SING), *Haviland s.n.* (SING).

INDONESIA. Java: s.l., *Zollinger s.n.* (P); Nirmala, *Backer 11159* (BO). — Kalimantan Barat: Sintang, Bukit Baka National Park, slope NE of camp, *Church et al. 176* (BO). — Sumatra Barat: Kelok Sembilan, c. 30 km N of Payakumbuh, *Hotta & Okada 1638* (BO).

PHILIPPINES. Mindanao: Agusan del Norte, Tungao, drainage of Agusan River, 26 km S of Butuan, *Stern 2115* (L). — Surigao s.l.: *Wenzel 3086* (A, B, BO, BR, G, K, M, MO, Z). — Negros Occidental, Faraon, *Meyer & Foxworthy 13572* (US — type of *Anodendron axillare*).

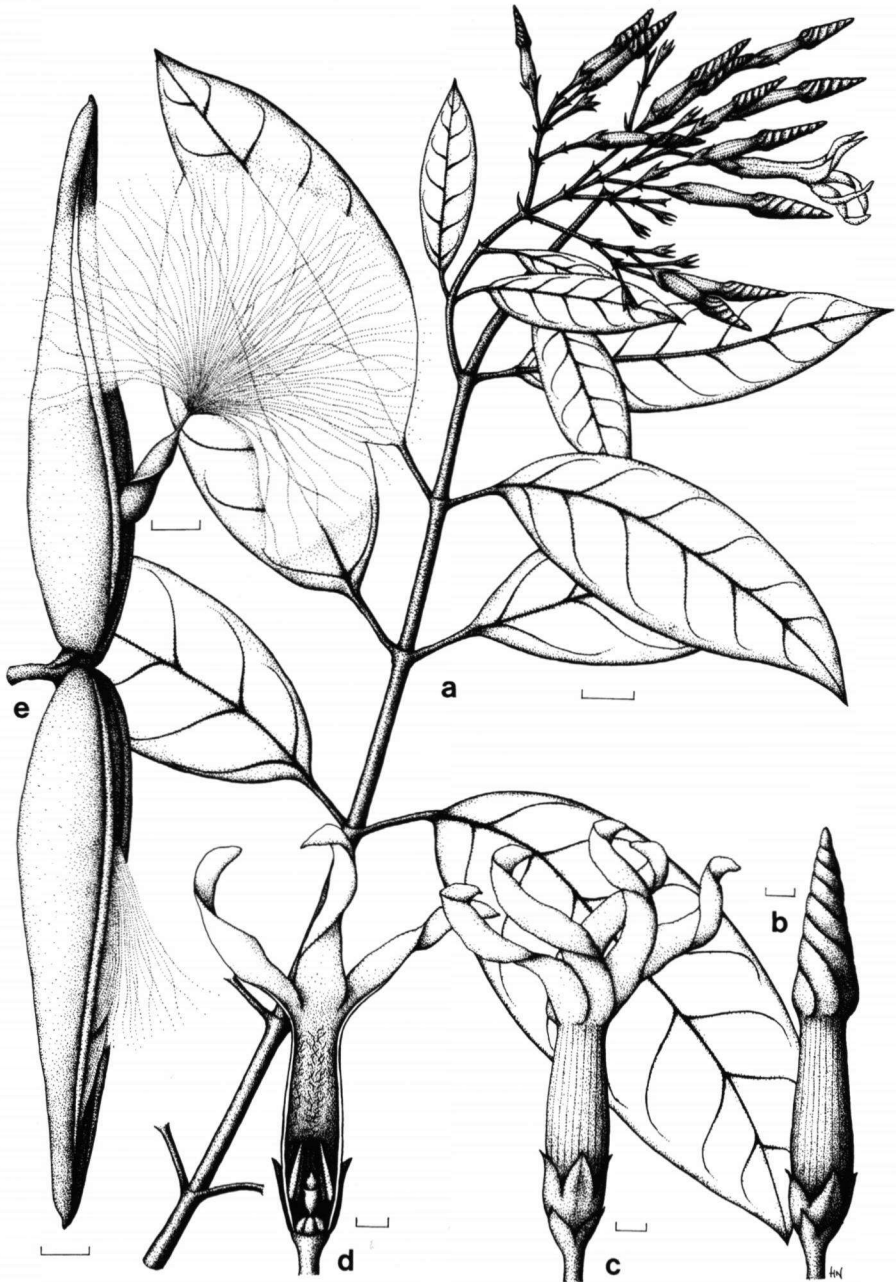


Fig. 2. *Anodendron benthamianum* Hemsl. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit with seeds (a–d: Peng 4740, A; e: Unknown s.n., Feb. 1948, A). Scale bars: a, e = 1 cm, b–d = 1 mm.

3. *Anodendron benthamianum* Hemsl. — Fig. 2

Anodendron benthamianum Hemsl., J. Linn. Soc. 26 (1889) 98; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 177; Huang, Taiwania 31 (1986) 92. — *Formosia benthamianum* (Hemsl.) Pichon, Bull. Mus. Nat. Hist. Nat. Paris, sér. 2, 20 (1948) 301. — Type: *Oldham 324* (K lecto, designated here; BM iso).

Branchlets glabrous. *Leaves*: petiole 6–14 mm long; blade elliptic to weakly obovate, apex acuminate, base cuneate to rounded, 3.6–15.3 × 11–24 cm, 2.6–3.9 × as long as wide, 7–11 pairs of lateral nerves, tertiary venation largely obscure, glabrous, sometimes punctate beneath. *Inflorescence* a robust terminal panicle, glabrous, 7–10.6 cm long, bracts on pedicels; pedicels 2.7–10 mm long. *Sepals* ovate, acuminate to acute, 2.2–5.2 × 1.3–2.1 mm, 1.2–3.6 × as long as wide, glabrous, eciliate. *Corolla* tube 11.9–21.5 mm long; lobes 11.2–18 mm long, 0.7–1.1 × as long as tube, 2–4.2 mm wide; glabrous outside, sparsely pubescent on inside of lobes and pubescent in tube. *Stamens* inserted at 1.2–1.9 mm from corolla base, which is 0.1 of tube length; filament 0.6–1.2 mm long; anthers 4.1–4.8 × 1–1.3 mm, 3.4–4.8 × as long as wide. *Disk* 5-crenate, 0.3–0.5 mm long, 0.7–1 × as long as ovary. *Ovary* 0.5–1 mm long; style + pistil head 3.1–3.5 mm long. *Fruit* 11–11.5 cm long, 1.7 cm wide. *Seed* grain 17.5 × 5 mm; beak 5.2 mm long; coma 4.5 cm long.

Distribution — Taiwan.

Collections studied:

TAIWAN. *Faurie 248* (G, P), *8318* (A); *Henry 185* (K, MO, US), *801* (K, MO); Miaoli, Shih-tan, *Peng 4740* (A); Taihokushu, Agyoku, *Ohwi 634* (K, UPS); Taipei city, Yang-ming-shan, *Chen 4131* (Z); Taipei Co., Suangchikou, *Kuo 10854* (Z); Taipei Hsien, Hsintien, from Hualin to mt.-hiking entrance of Tantungshan, *Wang 1299* (E); Taipei Hsien, Shih-ting, *Yang 921* (L); Tam-suy, *Oldham 324* (BM, K – type of *Anodendron benthamianum*); Kusukusu, *Sata s.n.* (MO); Dai-buron, Kiirun, *Sasaki s.n.* (MO); Taihoku, *Wilson 10193* (K).

4. *Anodendron borneense* (King & Gamble) D.J. Middleton, *comb. nov.* — Map 2

Cleghornia borneensis King & Gamble, J. As. Soc. Beng. 74 (1907) 492. — *Microchites borneensis* (King & Gamble) P.T. Li, J. S. China Agric. Univ. 11 (1990) 34. — Type: *Haviland & Hose 2169* (SING lecto, designated by Xu, 1988; BM, K, L, SING iso).

Branchlets glabrous. *Leaves*: petiole 5–9 mm long; blade elliptic to weakly obovate, apex acuminate, base rounded to obtuse, 8–15.2 × 2.4–6.8 cm, 2.1–3.8 × as long as wide, 9–19 pairs of lateral nerves, somewhat prominent, glabrous, punctate beneath. *Inflorescences* axillary and/or terminal cymes, glabrous, 4.4–10.5 cm long, bract position variable; pedicels 2.2–4.4 mm long. *Sepals* ovate, apex acute to obtuse, 1.2–1.8 × 0.7–1 mm, 1.4–2.1 × as long as wide, glabrous. *Corolla* yellow or cream; head ovoid, acute in bud, not strongly twisted; tube 5.3–6.1 mm long; lobes oblong, rounded, 2.5–2.6 mm long, 0.4–0.5 × as long as tube, 1.4–1.5 mm wide; glabrous outside, densely pubescent inside. *Stamens* inserted at 0.3–0.6 mm from corolla base, which is c. 0.1 of tube length; anthers 1.4–1.8 × 0.3–0.5 mm, 2.8–5.3 × as long as wide. *Disk* 5-crenate, 0.4–0.5 mm long, 1–1.3 × as long as ovary. *Ovary* 0.4–0.5 mm long; style + pistil head 0.4–0.9 mm long. *Fruit* of almost parallel follicles, somewhat stipitate, 9–19 cm long, 5–6 mm wide. *Seed* grain 22–24 × 3.1–3.2 mm; beak 8–10.5 mm long; coma 3.4–3.7 cm long.

Distribution — Found in Brunei, Sarawak and Sabah.

Ecology — In forest to 900 m altitude.

Note — This species would appear to be most closely related to *A. tubulosum*. *Anodendron borneense* is well illustrated (as *Cleghornia borneensis*) in Xu (1988: 17).

Collections studied:

MALAYSIA. Borneo: Sabah, Penibukan ridge, *Clemens & Clemens 50382* (BM, G, K). Sarawak, Kuching, *Haviland 2169* (BM, K, L, SING – type of *Cleghornia borneensis*).

BRUNEI. Bukit Belalong, *Dransfield 7205* (BRUN, K); Ulu Belalong, Temburong subdistrict Amo, *Kirkup 873* (BRUN, K).

5. *Anodendron candolleianum* Wight — Map 3

Anodendron candolleianum Wight, Ic. 4 (1848) t. 1309; Hook. f., Fl. Brit. India 3 (1882) 669; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400; King & Gamble, J. As. Soc. Beng. 74 (1907) 487; Merr., Enum. Born. Pl. (1921) 501; Ridley, Fl. Malay Penins. 2 (1923) 362; Kerr, Fl. Siam. Enum. 2 (1939) 472. — Type: *Wight s.n.* (K lecto, designated here; K iso).

Ecdysanthera scandens Hassk., Cat. Hort. Bogor. alt. (1844) 309; Boerl., Handl. Fl. Ned. Indië 2 (1899) 398. — *Anodendron inflatum* Hassk., Flora Bot. Zeit. 28, 19 (1845) 301 (but incorrectly as 269); Koord.-Schum., Syst. Verz. 1 (1912) 180. — *Dendrocharis inflata* (Hassk.) Miq., Versl. Meded. Kon. Akad. Wet. Amsterdam 6 (1857) 194. — *Anodendron scandens* (Hassk.) Pichon, Bull. Mus. Nat. Hist. Nat. Paris, sér. 2, 20 (1948) 191. — Type: *Hasskarl s.n.* (BO holo; P scrap).

Dendrocharis rubescens Teijsm. & Binnend., Nat. Tijdschr. Ned.-Indië 25 (1863) 403. — *Anodendron rubescens* (Teijsm. & Binnend.) Teijsm. & Binnend., Cat. Hort. Bogor. (1866) 127. — *Ecdysanthera rubescens* (Teijsm. & Binnend.) Boerl., Handl. Fl. Ned. Indië 2 (1899) 398; Merr. Enum. Born. Pl. (1921) 500. — Type: *Binnendijk s.n.* (K lecto).

Anodendron sp. A Koord.-Schum., Syst. Verz. 1 (1912) 181, p.p.

Anodendron tenuiflorum auct. non (Miq.) Miq.: Backer & Bakh. f., Fl. Java 2 (1965) 236.

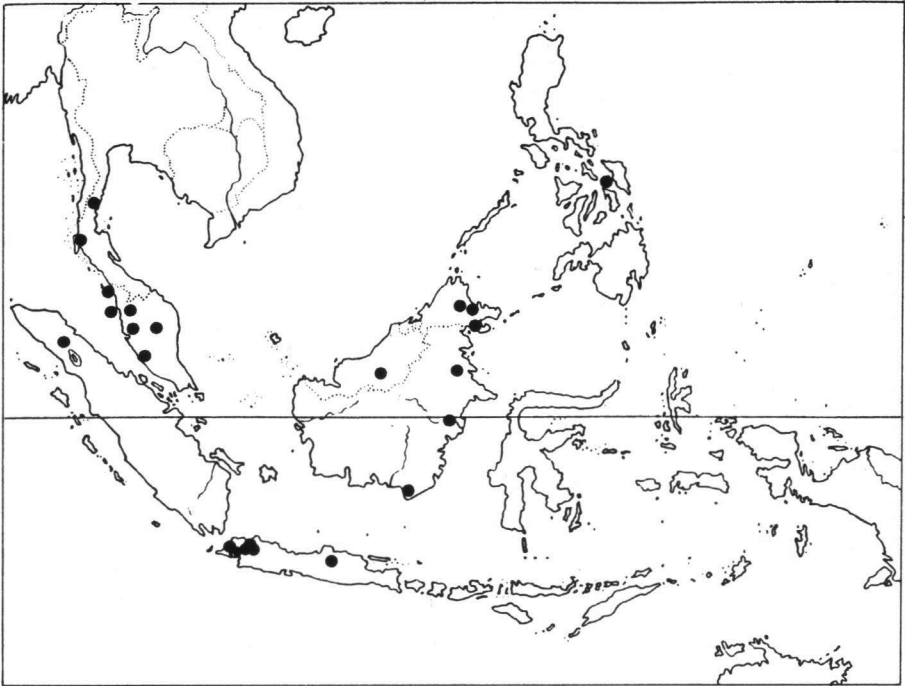
Branchlets glabrous. *Leaves:* petiole 1.5–5.2 cm long; blade elliptic or oblong, apex acuminate to abruptly acuminate or apiculate, base rounded to obtuse, thickly coriaceous, 4.6–25 × 1.7–11.6 cm, 1.6–3.1 × as long as wide, 8–12 strong pairs of lateral nerves, tertiary venation oblique to midrib, glabrous. *Inflorescences* mostly axillary delicate cymes, sometimes also terminal, glabrous, 3–23 cm long, bracts at base of pedicels; pedicels 2.1–4 mm long. *Sepals* ovate, apex acute to rounded, 0.6–1 × 0.3–0.6 mm, 1.2–3 × as long as wide, glabrous. *Corolla* pinkish or cream coloured; tube 1.4–2.3 mm long; lobes 1.7–2.9 mm long, 0.9–1.9 × as long as the tube, 0.5–1 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.7 mm from corolla base, which is 0.3–0.4 of tube length; anthers 0.6–0.8 × 0.3–0.4 mm, 1.8–2.7 × as long as wide. *Disk* 5-dentate or 5-crenate, 0.4 mm long, 0.7–0.8 × as long as ovary. *Ovary* 0.5–0.6 mm long; style + pistil head 0.7–0.8 mm long. *Fruit* 10.7–19.8 cm long, 0.9–1.5 cm wide.

Distribution — Thailand, Malaysia, Indonesia, Philippines.

Selection of the 44 collections studied:

THAILAND. Chumphon: Langsuan, *Kerr 12137* (BM, K). Phangnga: Khao Toi, *Kerr 17243* (BM, K, P).

MALAYSIA. Peninsula: s.l., *Maingay 1087* (GH, K, L); *Wight s.n.* (K – type of *Anodendron candolleianum*). Kedah: Pulau Langkawi, Goa Chinta, *Curtis 2802* (BM). Pahang: Sungai Mai Est. near railway, *Kadim & Mahmood KM 66* (A, K, L, SING). Penang: West Hill, *Curtis 2258* (K, SING). Perak: Larut, King's Collector 6516 (MEL, SING). Selangor: Alvins 375 (SING). —



Map 3. Distribution of *Anodendron candolleianum* Wight (●).

Borneo: Sabah, Tawau Dist., Quoin Hill road, *Gibot* 36965 (K, L); Pengkalan Kubuh, *Keith* 9084 (K); Bukit Garam, Kinabatangan, *Linggohun A* 1814 (K); Sandakan, Lagsikan, *Hassan Ghani A* 4098 (K, KEP, L, SING). Sarawak: Kapit Dist., Belaga Subdist., 10 km below Belaga, *Jacobs* 5192 (B, G, K, L, US).

INDONESIA. Sumatra: Aceh, Gunung Leuser National Park, Batu Hitam, *de Wilde & de Wilde-Duyffes* 20079 (L). — Java: Barat, cultivated at Bogor, *Binnendijk s.n.* (K – type of *Anodendron rubescens*); *Hasskarl s.n.* (BO, P, fragm. – type of *Anodendron inflatum*); Bogor, Pasir Honje by Leuwiliang, *Bakhuizen van den Brink* 3767 (BO, L); vicinity of Bogor, Hadjere, Janlapa, *Alston* 13021 (BM, BO); Depok, *Beumée* 6077 (BO); Pandeglang-Labuhan road near Menes, *Bisset* 757 (BO, K, L). Tengah: Juwana, *Koorders* 37225 (L). — Kalimantan: Timur, Berau, Tanjong. Redeb, Kelai River, *Kostermans* 21106 (BO, G, K, L); near Tanjong Isoei, *Endert* 1966 (BO, L).

PHILIPPINES. Biliran Island: Mt Surro, *Sulit PNH* 21682 (A, K, L, LAE).

6. *Anodendron coriaceum* (Blume) Miq. — Map 4

Anodendron coriaceum (Blume) Miq., Fl. Ind. Bat. 2 (1857) 455; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400; Merr., Enum. Born. Pl. (1921) 501; Backer & Bakh.f., Fl. Java 2 (1965) 236. — *Echites coriacea* Blume, Bijdr. (1826) 1039. — *Chonemorpha coriacea* (Blume) G. Don, Gen. Syst. 4 (1837) 76. — Type: *Blume* 1760 (L lecto, designated here; C, L, W iso).

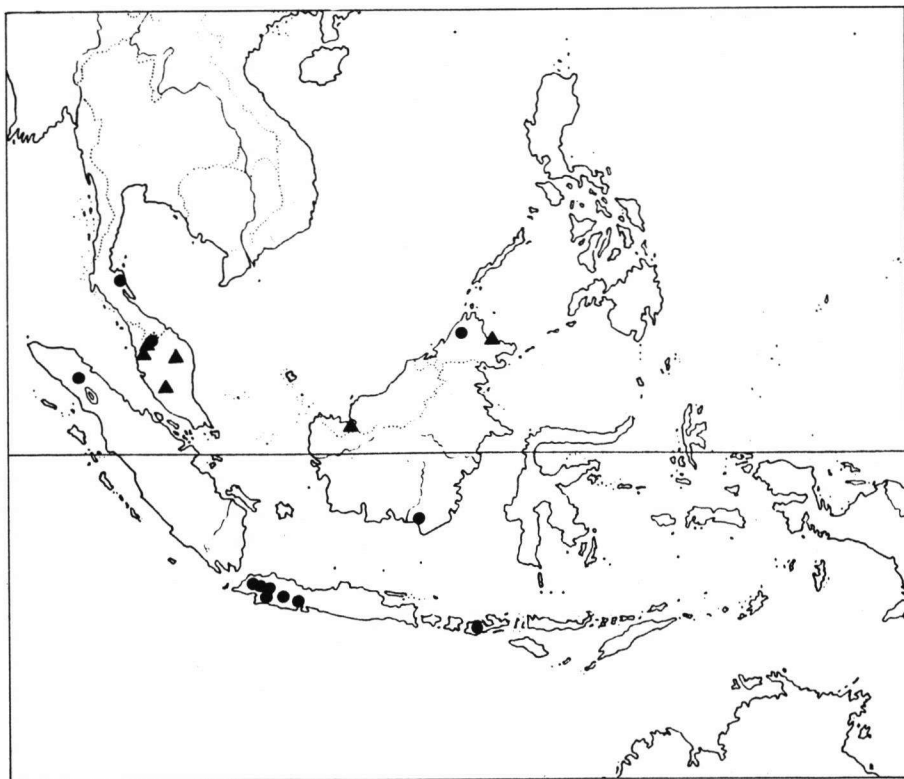
Anodendron coriaceum var. *salaccense* Hochr., Candollea 5 (1934) 182. — Type: *Hochreutiner* 1713 (G lecto, designated here; G, L, MO, Z iso).

Anodendron gracilentum Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 26. — Type: *Clemens & Clemens* 32148 (M lecto; A, B, BM, BO, CANB, K, L, MO, NY iso).

Branchlets glabrous. *Leaves*: petiole 5–19 mm long; blade elliptic, apex acuminate, base cuneate, $2.2\text{--}10 \times 0.4\text{--}3.9$ cm, $2.7\text{--}5.3 \times$ as long as wide, 6–13 pairs of lateral nerves, tertiary venation obscure, glabrous. *Inflorescence* of delicate axillary and terminal cymes often forming a terminal panicle, glabrous, 3.6–9.5 cm long, bracts on the pedicel; pedicels 0.5–3.5 mm long. *Sepals* ovate, apex acute or acuminate, $1.1\text{--}1.9 \times 0.4\text{--}0.9$ mm, $1.6\text{--}3 \times$ as long as wide, glabrous, ciliate or eciliate. *Corolla* cream coloured or greenish; tube (1.8–)2.7–4.1 mm long; lobes 3.9–6.3 mm long, $1.1\text{--}3.2 \times$ as long as tube, 0.6–1.3 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.9 mm from corolla base, which is 0.2–0.3 of tube length; anthers $1\text{--}1.3 \times 0.3\text{--}0.4$ mm, $2.8\text{--}4 \times$ as long as wide. *Disk* 5-dentate or 5-crenate, 0.3–0.6 mm long, $0.8\text{--}1 \times$ as long as ovary. *Ovary* 0.3–0.6 mm long; style + pistil head 0.8–1.1 mm long. *Fruit* 6.8–8 cm long, 1.2 cm wide. *Seed* grain $15.5\text{--}17.6 \times 4.5\text{--}10$ mm; beak 2.6–11 mm long; coma 3.4–4 cm long.

Distribution — Thailand, Malaysia, Indonesia.

Note — The collection from Sumbawa only has immature fruits and differs from the Javanese and Bornean specimens in its somewhat wider leaves. Flowering collections are needed to place this collection with certainty.



Map 4. Distribution of *Anodendron coriaceum* (Blume) Miq. (●) and *A. gracile* (King & Gamble) D.J. Middleton (▲).

Collections studied:

THAILAND. Nakhon Si Thammarat: Khao Luang, *Phloenchit 416* (K, BKF).

MALAYSIA. Peninsula: Perak, Larut, Bukit Maxwell, G. Hijau, *Stone 15485* (KLU, L). — Borneo: Sabah, Mt Kinabalu, *Clemens 31229* (BO, L); *Clemens & Clemens 50514* (B, BM, K, L, MO); Mt Kinabalu, main spur above Tenompok, *Carr SFN 26982* (SING); Mt Kinabalu, Penibukan, *Clemens & Clemens 31578* (A, B, BM, BO, CANB, G, L, K, MO, NY, SING – syntype of *Anodendron gracilentum*), *32148* (A, B, BM, BO, CANB, K, L, MO – syntype of *A. gracilentum*).

INDONESIA. s.l., *Bünnemeijer 4008* (BO). — Sumatra: Utara, Sibolangit, *Lörzing 4939* (BO). — Java: s.l., *Forbes 277* (BM); *Blume 1046, 2018* (L); *Unknown 241* (L); *Zippelius 1760* (L); *Blume s.n.* (C, K, L, W – type of *Anodendron coriaceum*); Gunung Limoes, *Bakhuizen van den Brink 4396* (BO). Barat, s.l., *Winckel 66* (BO), *686* (BO, L, U); Cidada, Cibeber, Gunong Goong, *Winckel 12* (L), *741* (BO, K, L, U); Cidada, Cisokan, *Bakhuizen van den Brink 2838* (BO, L, U); Gegerbintang ridge, *Meijer 2702* (BO, K, L); Mt Salak, Suka Mantri, *Hochreutiner 1713* (G, L, MO – type of *Anodendron coriaceum* var. *salaccense*). — Kalimantan: s.l., *Korthals s.n.* (L). — Lesser Sunda Islands: Sumbawa, Batulante Mts, trail from Batudulang to summit, *Kostermans 18237* (A, BO, K, L).

7. *Anodendron gracile* (King & Gamble) D.J. Middleton, *comb. nov.* — Map 4

Cleghornia gracilis King & Gamble, J. As. Soc. Beng. 74 (1907) 491; Xu, Agric. Univ. Wagenin-gen Papers 88-6 (1988) 16. — *Micrechites gracilis* (King & Gamble) P.T. Li, J. S. China Agric. Univ. 11 (1990) 34. — Type: *Scortechini 384* (K holotype).

Branchlets glabrous. *Leaves*: petiole 4–9 mm long; blade elliptic to ovate, apex acuminate to caudate, base cuneate to rounded, 2.6–7.1 × 0.6–2.6 cm, 1.9–5.5 × as long as wide, 9–18 pairs of lateral nerves almost perpendicular to midrib, somewhat obscure, glabrous. *Inflorescence* paniculate, glabrous, 3.2–8.5 cm long, bracts at base of pedicel; pedicel 2–7.5 mm long. *Sepals* ovate, apex rounded, 0.5–0.9 × 0.4–0.7 mm, 0.8–1.8 × as long as wide, glabrous. *Corolla* yellow; head rounded in bud, not twisted; tube 1.1–1.8 mm long; lobes rounded or obtuse, 0.7–2.1 mm long, 0.4–1.3 × as long as tube, 0.7–1 mm wide; glabrous outside, pubescent inside. *Stamens* inserted at 0.2–0.5 mm from corolla base, which is 0.1–0.2 of tube length; anthers 0.9–1.1 × 0.4 mm, 2.3–2.8 × as long as wide. *Disk* 5-crenate or 5-dentate, 0.4–0.5 mm long, 1–1.7 × as long as ovary. *Ovary* 0.3–0.4 mm long; style + pistil head 0.8–1 mm long. *Fruit* unknown.

Distribution — Peninsular Malaysia, Borneo (Sabah, Sarawak).

Note — This species is closely related to *A. seramense*. *Sinanggol SAN 53670*, a collection from Sabah, was mentioned by Xu (1988) in his revision of *Cleghornia*. He suggested it may be a new species closely related to *Cleghornia gracilis* (= *Anodendron gracile*) but declined to describe it as it was only known from the one collection. I have found one other collection from Borneo which only bears immature flowers. These two collections are somewhat different to most of the Peninsula collections but are not distinct enough to warrant being described as a separate taxon. *Anodendron gracile* has been illustrated (as *Cleghornia gracilis*) in Xu (1988).

Collections studied:

MALAYSIA. Peninsula: SE Kelantan, Ulu Sungei Aring, Sungei Tapah, *Cockburn FRI 7177* (A, K, KEP, L). Pahang: Fraser Hill, *Burkill & Holtum 8407* (SING). Perak: s.l., *Wray 3209* (K); Gunung Hijau, *Nur 2465* (K, SING); Lawfield's Hill, *Scortechini 384* (K – type of *Anodendron gracile*); Larut, *King's collector 6351* (BO, K). — Borneo: Sabah, Sandakan, S of Agricultural station, *Sinanggol SAN 53670* (K, L). Sarawak, 2nd Div., path to Gunong Silantek, Ulu Sungei Silantek Kiri, *Paie S 42521* (K, KEP, L).

8. *Anodendron howii* Tsiang

Anodendron howii Tsiang, Sunyatsenia 3 (1936) 141; Guangdong Coll. Agric. For. (P.T. Li?), Fl. Hainanica 3 (1974) 242; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 179. — Type: *How 72721* (IBSC holo; A, BISH, S iso).

Stems brown puberulent, especially around nodes. *Leaves*: petiole 8–10 mm long; blade broad elliptic to weakly obovate, apex acuminate, base rounded, blade 14.8–17.5 × 6–7.7 cm, 2.2–2.4 × as long as wide, 14–16 strong pairs of lateral nerves, prominent beneath, tertiary venation oblique, prominent beneath; petiole and blade puberulent beneath. *Inflorescences* axillary cymes, puberulent, 3–4.2 cm long, bracts at base of pedicel; pedicels 1.5–2.6 mm long. *Sepals* ovate, apex obtuse, 1.1 × 0.7 mm, 1.6 × as long as wide, glabrous, ciliate. *Corolla* whitish yellow; tube 1.6–1.7 mm long; lobes 2.1–2.7 mm long, 1.3–1.6 × as long as tube, 0.8–0.9 mm wide, rounded; glabrous outside, pubescent on inside of lobes and inside. *Stamens* inserted at 0.6 mm from corolla base, which is 0.2 of tube length; anthers 0.7 × 0.4 mm, 1.8 × as long as wide. *Disk* 5-crenate, 0.4 mm long, 1 × as long as ovary. *Ovary* 0.4 mm long; style + pistil head 0.9 mm long. *Fruit* 10.9–11.2 cm long, 1.4–1.6 cm wide. *Seed* grain 12–15 × 5.4–5.7 mm; beak 6–7.8 mm; coma 3.9–4.1 cm long.

Distribution — China.

Note — This species is close to *A. oblongifolium* but instantly distinguishable by the larger leaves, prominent venation and puberulent branchlets and leaves. It is known only from the type collection. The collection which was cited for Vietnam by Lý (1986) actually belongs to *A. paniculatum*.

Specimen studied:

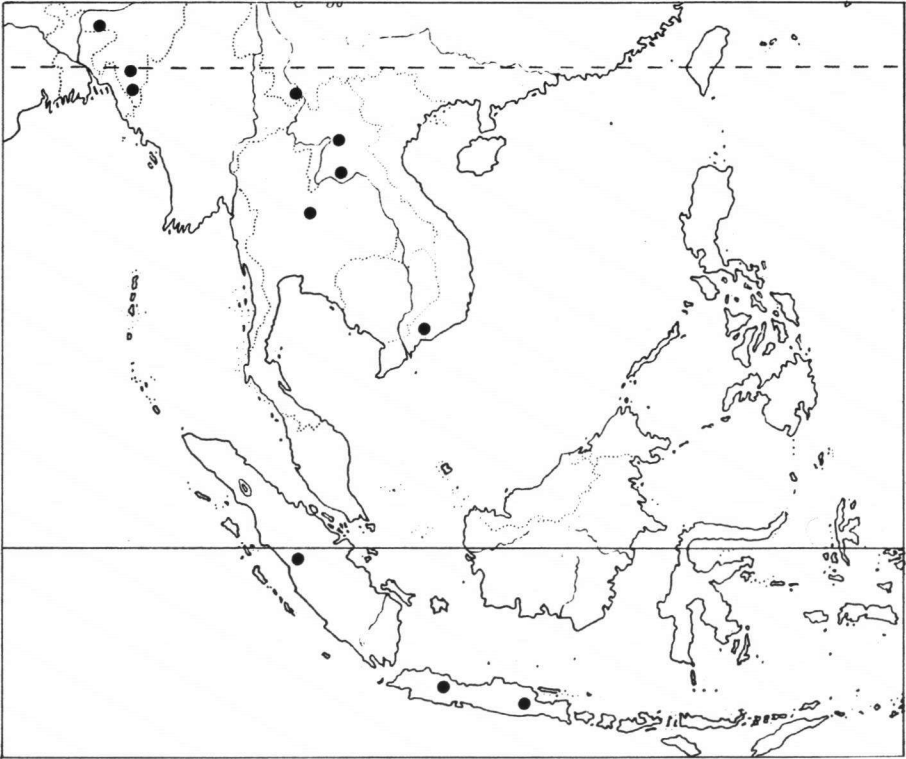
CHINA. Hainan: Po-ting, *How 72721* (A, BISH, IBSC, S – type).

9. *Anodendron nervosum* Kerr — Map 5

Anodendron nervosum Kerr, Kew Bull. 1937 (1937) 93; Fl. Siam. Enum. 2 (1939) 472. — Type: *Kerr 5784* (K lecto, designated here; BK, BM, K, P, TCD iso).

Microchites formicina Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 385; Fl. Reip. Pop. Sin. 63 (1977) 189; J. Ying & P.T. Li, Fl. Yunnanica 3 (1983) 540. — *Anodendron formicina* (Tsiang & P.T. Li) D.J. Middleton, Novon 4 (1994) 152. — Type: *Wang 73452* (PE holo; A, IBSC iso).

Branchlets glabrous. *Leaves*: petiole 7.5–17 mm long; blade elliptic to oblong, rarely obovate, apex acuminate, base rounded to cuneate, 4.6–16.9 × 1.6–5.2 cm, 2.4–5.1 × as long as wide, 11–29 pairs of lateral nerves, not prominent, tertiary venation obscure, glabrous, glaucous beneath. *Inflorescence* of large terminal panicles, glabrous, 9–22 cm long, bracts at pedicel base; pedicels 2.1–7 mm long. *Sepals* ovate, apex obtuse to acute, 0.8–1.6 × 0.5–0.8 mm, 1.3–2.8 × as long as wide, glabrous. *Corolla* yellow-green; tube 1.9–4(–4.7) mm long; lobes strap-shaped, falcate, 3–8.5 mm long, 1.3–2 × as long as tube, 0.7–1.8 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.4 mm from corolla base, which is 0.2 of tube length; anthers 1.2–1.6 × 0.4–0.5 mm, 2.4–3.2 × as long as wide. *Disk* 5-crenate or 5-dentate, 0.4–0.6 mm long, 1–1.2 × as long as ovary. *Ovary* 0.4–0.6 mm long; style + pistil head 0.6–1.2 mm long. *Fruit* thin-walled; 8.3–11.5 cm long, 1–1.2 cm wide. *Seed* grain 16–20 × 4.5–6 mm; beak 7–22 mm long; coma 3.5–4.5 cm long.



Map 5. Distribution of *Anodendron nervosum* Kerr (●).

Distribution — China (Yunnan), India, Thailand, Laos, Vietnam, Indonesia.

Selection of the 17 collections studied:

CHINA. Yunnan: Fo-Hai, Wang 74794 (A); Nan-Chiao, Wang 73452 (A, IBSC – type of *Anodendron formicina*).

INDIA. Assam: s.l., King's collector s.n. (ABD, BO, P, Z). Meghalaya: Khasia, Mambro, Clarke 43820 A (BM, K). Mizoram: S Lushai Hills, Helio Hill, Gage 97 (G, M, MEL), 81 (A, G, M, TCD); Lushai Hills, Hmuntha, Koelz 27528 (L).

THAILAND. Phetchabun: Phu Lom Lo, Dan Sai, Kerr 5784 (BM, K, P, TCD – type of *Anodendron nervosum*).

LAOS. Louang Prabang: between Nam Ho & M. Long Nam, Poilane 26189 (P). Vientiane: Nam Yuak, Kerr 21267 (BM, K, L, P).

VIETNAM. Dong Nai: Canton Laouan, delegation de Djiring, Poilane 22554 (P).

INDONESIA. Java: Barat, Panjalu, Koorders 47907 β (BO). Timur, Kediri, G. Pandan, Thorenaar 93 (BO). — Sumatra: Barat, Pajakumbuh, N slope of Mt Sago, Meijer 3483 (BO, L).

10. *Anodendron oblongifolium* Hemsl. — Map 6

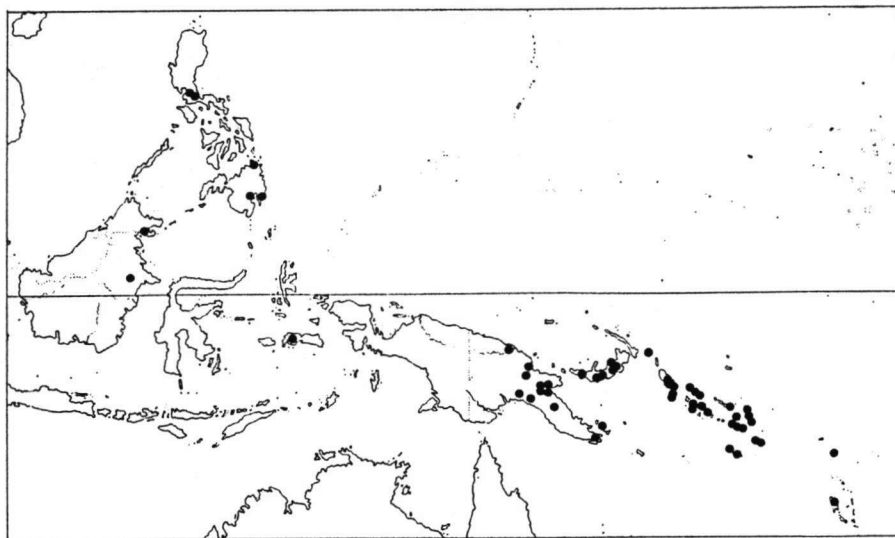
Anodendron oblongifolium Hemsl., Ann. Bot. 5 (1891) 504. — Type: *Comins 40* (K lecto, designated by Forster, 1993).

Anodendron paniculatum auct. non A. DC.: Markgr., Bot. Jahrb. 61 (1927) 208; Forster, Kew Bull. 48 (1993) 139.

Branchlets glabrous. *Leaves*: petiole 0.6–2.1 cm long; blade elliptic, oblong or obovate, apex acuminate, base cuneate to rounded, 6.1–16.1 × 2.6–7.6 cm, 2.1–3.8 × as long as wide, 9–13 strong pairs of lateral nerves, tertiary venation weaker, oblique when visible, glabrous. *Inflorescence* of axillary cymes, sometimes also terminal, minutely puberulent, rarely glabrous, 1.8–10.2 cm long, bracts at base of pedicels; pedicels 1.1–3.8 mm long. *Sepals* ovate, apex rounded to acute, 1.1–2.4 × 0.6–1.2 mm, 1.4–2.7 × as long as wide, glabrous, ciliate. *Corolla* white or yellowish; tube 1.6–3.4 mm long; lobes 3–6.2 mm long, 1.5–2.6 × as long as tube, 0.7–1.7 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.5–0.9 mm from base, 0.2–0.3 of tube length; anthers 0.9–1.2 × 0.3–0.4 mm, 2.8–3.3 × as long as wide. *Disk* 5-crenate, 0.3–0.5 mm long, 0.6–1 × as long as ovary. *Ovary* 0.4–0.5 mm long; style + pistil head 0.7–1 mm long. *Fruit* 11.1–15 cm long, 1.1–1.8 cm wide. *Seed* grain 12.5–17.6 × 5.4–7.4 mm; beak 6–9 mm long; coma 5.4–9 cm long.

Distribution — Malaysia, Borneo, Philippines, Moluccas (Seram), Papua New Guinea, Solomon Islands, Vanuatu.

Note — This species has usually been included within *A. paniculatum* to which it is closely related. It is, however, distinguishable by its generally shorter, more frequently axillary and puberulent inflorescences and somewhat larger flowers.



Map 6. Distribution of *Anodendron oblongifolium* Hemsl. (●).

Selection of the 81 collections studied:

MALAYSIA. Borneo: Sabah, Tawau District, Balong area, 13 miles NE of Tawau, Wood SAN 16457 (A, BO, K, L, SING); Meraba, Pascual 233 (W).

INDONESIA. Borneo: Kalimantan Timur, near Long Petak, Endert 3340 (BO, K, L). — Moluccas: Seram, NW, Riring, Rutten 1817 (BO, L, U).

PHILIPPINES. Luzon: Laguna, Mt Makiling, Canicosa 9657 (A). Rizal, Ahern's coll. 2452 (BO, G, K, P, SING, US). — Mindanao: Surigao, Wenzel 2973 (A, B, BO, BR, G, K, M, MO, Z). Davao Oriental: Mati, Ramos 48932 (BO, BR).

PAPUA NEW GUINEA. Bougainville: Nissan Island, Buka Passage Subdistrict, *Nachman* 295 (LAE). D'Entrecasteaux Islands: Fergusson Isl., Iamele no. 1, *Brass* 25925 (A, K, L, LAE). East New Britain: Pomio, Pakia, *Panoff* 146 (LAE). Gulf: 2 miles NE of junction of Vailala & Lohiki Rivers, *Schodde* 4380 (A, L, LAE). Madang: Djamu River, *Schlechter* 17547 (A, BM, C, G, K, L, MO, US). Milne Bay: Raba Raba, Junction Ugat & Mayu Rivers, *Streimann NGF* 28820 (BO, L, SING). Morobe: Bulolo Valley, *Floyd NGF* 7500 (A, K, LAE). Northern: Kokoda, *Carr* 16530 (B, BM, G, K, L, SING). Sepik: *Ledermann* 6681 (SING). West New Britain: Nuau, Hoskins Subdist., *Lelean LAE* 51219 (BISH, K, L, LAE, SING). Western: Kiunga, *Streimann NGF* 46811 (BO, K, L, LAE).

SOLOMON ISLANDS. Bellona: *Christiansen* 3414 (C). Choiseul: SE, west of Oaka River, *Gafui BSIP* 18983 (L, LAE, SING). Fauro Island: *Guppy* 189 (K). New Georgia Group: Gizo Island, *Whitmore BSIP* 5622 (K, L, LAE); Vangunu Island, inland from Merusu Islet, *Whitmore BSIP* 1235 (L). Guadalcanal: SW, Wanderer Bay area, *Mauriasi BSIP* 12238 (K, L, LAE); Vulolo, Tutuve Mountain, *Kajewski* 2675 (A, BISH, BM, BO, G, L, P). Kolombangara: SE, east of Vila River, *Gafui BSIP* 8445 (K, L, LAE, SING). Nggela Island: Sole area, *Mauriasi BSIP* 18224 (K, L, LAE, SING). Rennel Island: *Christiansen* 3516 (C). Rob Roy Island: *Whitmore BSIP* 5344 (K, L, LAE, SING). San Cristobal: *Comins* 40 (K - type of *Anodendron oblongifolium*). Santa Isabel: ridge inland from Tatamba, *Whitmore BSIP* 4070 (K, L, LAE, SING). Savo Island: Vensu River area, Pokilo Dist., *Gafui BSIP* 14586 (K, L, LAE, SING). Shortland Island: NE, Haleta Ridge, *Runikera BSIP* 12946 (K, L, LAE, SING). Treasury Island: Maloaini area, *Mauriasi BSIP* 14212 (K, L, LAE, SING). Santa Cruz Islands: Vanikoro Island, E side of Saboe Bay, *Whitmore BSIP* 1735 (K, L, LAE, SING).

VANUATU. Nuenuk, Hog Harbour, *Baker* 335 (BM).

11. *Anodendron paniculatum* A. DC. — Fig. 3; Map 7

Anodendron paniculatum A. DC., Prodr. 8 (1844) 444; Thwaites, Enum. Pl. Zeyl. (1860) 194; Dalzell & Gibson, Bombay Fl. (1861) 147; Kurz, J. As. Soc. Beng. 46 (1877) 255; Fl. Brit. Burma 2 (1877) 188; Hook. f., Fl. Brit. India 3 (1882) 668; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400; King & Gamble, J. As. Soc. Beng. 74 (1907) 486; Cooke, Fl. Bombay 2 (1908) 141; Ridley, Fl. Lower Siam (1911) 134; Koord.-Schum., Syst. Verz. 1 (1912) 180; Ridley, Fl. Malay Penins. 2 (1923) 361; Parkinson, For. Fl. Andaman Isl. (1923) 207; Pitard in Lecomte, Fl. Gén. Indochine 3 (1933) 1230; Backer & Bakh. f., Fl. Java 2 (1965) 236; Lý, Feddes Rep. 97 (1986) 650; Gangopadhyay & Chakraborty, J. Econ. Tax. Bot. 16 (1992) 33. — *Echites paniculata* [Wall., Num. List (1829) 1663, nom. nud.] Roxb., Fl. Ind. 2 (1832) 17, non Poir.; G. Don, Gen. Syst. 4 (1837) 75. — *Echites manubriatum* Wall., Num. List. (1829) 1663, nom. nud. — *Anodendron manubriatum* Merr., Philipp. J. Sc., Bot. 7 (1912) 333; Enum. Philipp. Flow. Pl. 3 (1923) 333; Tsiang, Sunyatsenia 2 (1934) 131; Kerr, Fl. Siam. Enum. 2 (1939) 472; Huber, Fl. Ceylon 4 (1983) 69. — Type: *Wallich* 1663 (K-W [as 1663.1] lecto, designated here; BR, G-DC, P iso).

Echites polyantha Wall., Num. List (1829) 1664, nom. nud.

Echites coriacea Wall., Num. List (1829) 1664a, non Blume, nom. nud.

Anodendron rhinosporum Thwaites, Enum. Pl. Zeyl. (1860) 194; Hook. f., Fl. Brit. India 3 (1882) 669; Huber, Fl. Ceylon 4 (1983) 69. — Type: *Thwaites* 2579 (K lecto, designated here; B, BM, BO, BR, G, GH, K, P, TCD, UPS, W iso).

Tabernaemontana tenuiflora Miq., Fl. Ind. Bat., Suppl. (1861) 554. — *Anodendron tenuiflorum* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 140; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400. — Type: *Diepenhorst* 2234 (U lecto, designated here; L iso).

Anodendron moluccanum Miq., Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 140; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400. — Type: *Teijsmann s. n.* (U lecto, designated here; L iso).

Anodendron sp. A Koord.-Schum., Syst. Verz. 1 (1912) 181, p. p.

Anodendron sp. B Koord.-Schum., Syst. Verz. 1 (1912) 181.

Anodendron sutepanse Kerr, Kew Bull. 1937 (1937) 94; Fl. Siam. Enum. 2 (1939) 472. — Type: *Kerr* 1748 (K lecto, designated here; BM, E, K, L, P, TCD iso).

Parsonsia bulusanensis Elmer ex Merr., Enum. Philipp. Flow. Pl. 3 (1923) 333, nom. illeg. in synonymy of *Anodendron manubriatum* (= *A. paniculatum*).

Anodendron howii auct. non Tsiang: Lý, Feddes Rep. 97 (1986) 648.

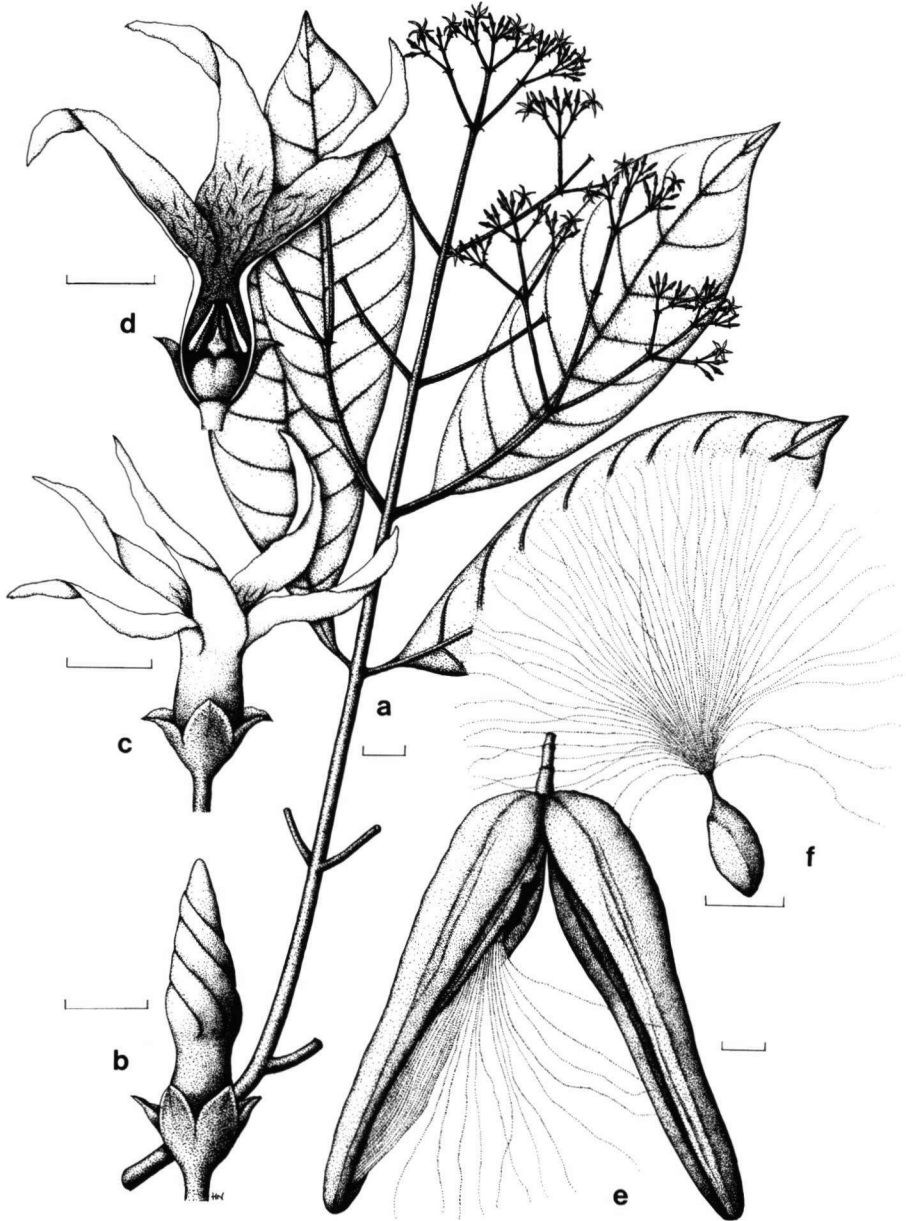
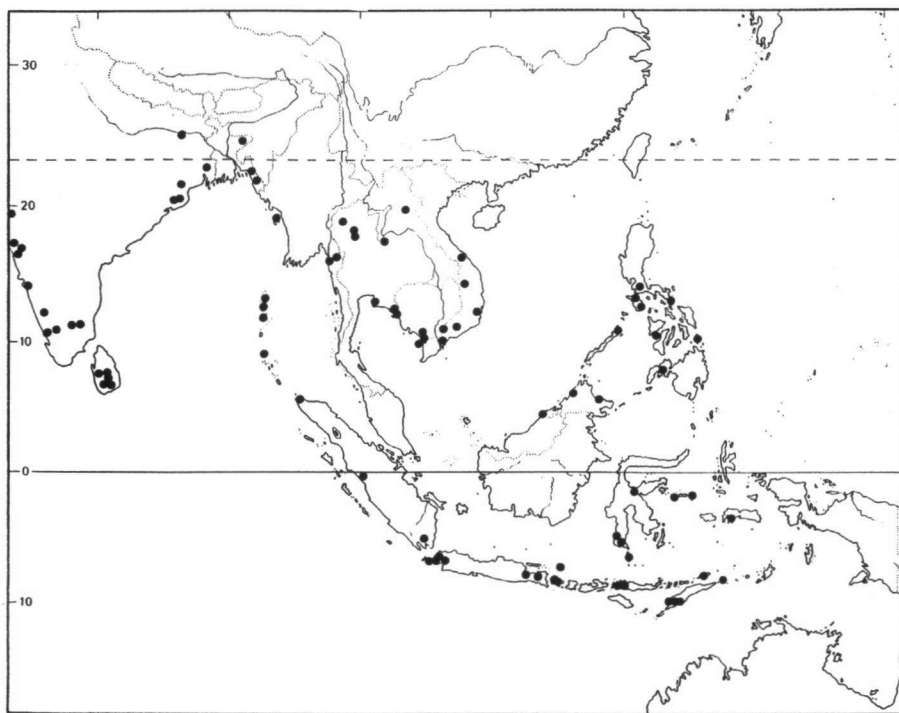


Fig. 3. *Anodendron paniculatum* A. DC. a. Habit; b. flower in bud; c. open flower; d. flower dissection; e. fruit; f. seed. (a–d: Kloss 6798, K); e, f: Kloss 6669, K). Scale bars: a, e, f = 1 cm, b–d = 1 mm.

Branchlets glabrous. *Leaves*: petiole 0.7–2.6 cm long; blade elliptic, oblong or ovate, apex acuminate, more rarely apiculate, base cuneate to rounded, 13.9–28.5 × 1.3–10.4 cm, 1.7–4.6 × as long as wide; 8–18 pairs of lateral nerves, usually slightly prominent beneath, tertiary venation obscure, glabrous. *Inflorescences* axillary and terminal, usually forming a panicle, glabrous, 5.5–15.2 cm long, bracts at base of pedicels; pedicels 1.4–3.3 mm long. *Sepals* ovate, apex rounded to acute, 0.7–1.3 × ish yellow; tube 1.2–2.7 mm long; lobes 1.7–4.4 mm long, 0.7–2.8 × as long as tube, 0.6–1 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.3–1 mm from corolla base, which is 0.2–0.4 of tube length; anthers 0.7–1.3 × 0.2–0.4 mm, 2.3–3.7 × as long as wide. *Disk* annular, 5-dentate or 5-crenate, 0.3–0.4 mm long, 0.7–1.3 × as long as ovary. *Ovary* 0.3–0.6 mm long; style + pistil head 0.6–0.8 mm long. *Fruit* 8–15.5 cm long, 1–3 cm wide. *Seed* grain 14–22 × 6–9 mm; beak 6–17 mm long; coma 5.2–9 cm long.

Distribution — Sri Lanka, India, Bangladesh, Burma, Thailand, Cambodia, Laos, Vietnam, Malaysia, Indonesia, Philippines.

Note — Markgraf (1927) has rather confusingly included *Strophanthus aambe* Warb. as a synonym of this species and *Anodendron aambe*, a new combination based on this name and with the same type, as a synonym of *Papuechites aambe*. Forster (1993) has also included *Strophanthus aambe* as a synonym of *Anodendron paniculatum*. Warburg 21307 is the type specimen of *Strophanthus aambe* and the



Map 7. Distribution of *Anodendron paniculatum* A.D.C. (●).

basis of Markgraf's new genus *Papuechites* (Markgraf, 1927) where it is pointed out that the fruits on the specimen are from an *Anodendron* but that the rest of the plant is *Papuechites aambe* (Warb.) Markgr. This specimen is, unfortunately, now lost although it is quite possible that Markgraf was mistaken in his belief that it was a mixed collection as the fruits and seeds of *P. aambe* do bear a remarkable similarity to those of *A. paniculatum*.

Selection of the c.160 collections studied:

SRI LANKA. s.l.: *Thwaites 2579* (B, BM, BO, BR, G, GH, K, P, TCD, UPS, W – type of *Anodendron rhinosporum*). Central: Matale Dist., Rattota-Illukkumbura, *Jayasuriya et al. 415* (US). Kandy, *Moon 596* (BM). NW: Kurunegala Dist., Dunkanda, Arankele, *Jayasuriya & Balasubramanium 529* (US).

INDIA. Andamans: South Andaman, Dhanikhari, *Nair 3637* (L). Bihar: Singbhum, *Haines 665* (K). Karnataka: Salem, Namakkal, Kolli hills, Gundar shola, *Matthew & Venugopal RHT 18459* (L). Maharashtra: Khandala, *Santapau 13008* (MO). Nicobars: Car Nicobar, Kakana, *Nair 4446* (L). Orissa: East Bonai, Soso, *Mooney 3790* (K). Tamil Nadu: Coimbatore, Aliyar Submergible area, *Ramamurthy 16097* (L).

BANGLADESH. Chittagong: Cox's Bazaar, Kurishkool, Baghkali River, *Sinclair 3844* (E, US); Sylhet, *Wallich 1663 A* (K-W, BR, P – type of *Anodendron paniculatum*).

BURMA. Arakan: Ramree Island, near Kyaukpyu, *Wallace 71* (BM). Tenasserim: Mergui, *Griffith s.n.* (K); Mayinngge, *Parkinson 2004* (K).

THAILAND. Chanthaburi Sawan Luang, *Tentisewie s.n.* (L). Chiang Mai: Doi Sutep, *Kerr 1748* (BM, E, K, L, P, TCD – type of *Anodendron sutepense*). Chon Buri: Na Kati, near Si Racha, *Collins 1798* (AAU, BM, E, K, L, US). Krabi Khao: Sataw, *Kerr 12431* (BM, E, K, L, P, TCD). Lampang: Kang Kampang, *Winit 1892* (BKF, K). Loei: Tali, *Kerr 8808* (BM, K, P). Phangnga: Tapput, *Kerr 18372* (A, ABD, BM, K, P, TCD). Phuket: *Curtis 2933* (K, SING). Ranong: Naka, *Kerr 16846* (A, ABD, BM, K, P, SING). Songkhla: Klong Rhang Hill, *Maxwell 86-233* (A, L). Surat Thani: Ban Kok Yai, *Ruengenim 23* (BKF). Trang: Khao Chong, *Phusomsaeng 270* (AAU, BKF, C, E, L). Trat: Khao Saming, *Put 590* (BM, CGE, K, SING).

CAMBODIA. Kampot: Cam Chai, *Poilane 22851* (P).

LAOS. Savannakhet: *Poilane 12050* (P).

VIETNAM. Tay Ninh: *Mueller 747* (P). Dong Nai: Bien Hoa, Gia-ray, *Poilane 2523* (A, K, P). Lauy-Thom, *Thorel 1066* (B, BO, K, P). Thua Thien-Hue: Road from Suoi Trai hang to Khe ao, Bach ma National Park, *Newman 195* (E).

MALAYSIA. Peninsula: Penang, Waterfall, *Curtis 1740* (SING). Perlis: Kanga, *Ridley 14953* (BM, K, SING). — Borneo: Sabah, Sandakan, *Ramos 1921* (A, P). Sarawak, Baram District, *Hose 679* (BM, K).

INDONESIA. Moluccas: Ambon, *Teijsmann s.n.* (L, U – type of *Anodendron moluccanum*). — Lesser Sunda Islands: Bali, Gilimanok, *van Steenis 11498* (BO). Flores:, Pulau Rintja, *Sakov 101* (BO); Manggarai, *Schmutz 4300* (L). Timor, Kupang, *Teijsmann 8809* (BO, L). Wetar, *Elbert 4433* (A, BISH, BO, G, K, L, MO, P, SING, US). — Java: Barat, Ujung Kulon National Reserve, Pulau Peucang, *Wirawan 437* (K, LAE). Timur, Pasuruan, *Koorders 23559* (L); Kangean, Sambakati, *Dommen 129* (BO). Kalimantan: Sungei Sandak, *Teijsmann 11344* (BO). Kepulauan Sula, Mangole, Oelipola, *Atjeh 381* (BO, L). — Sulawesi: Selatan, Pangkajene, *Teijsmann 12084* (BO). Tenggara: Landongi, Tirawuta, Kolaka, Prawiroatmodjo & Maskuri 1341 (BM, BO, K, L). — Sumatra: Barat, Pariaman, *Diepenhorst 2234* (L, U – type of *Anodendron tenuiflorum*). Lampung: *Bruinsma 19* (BO).

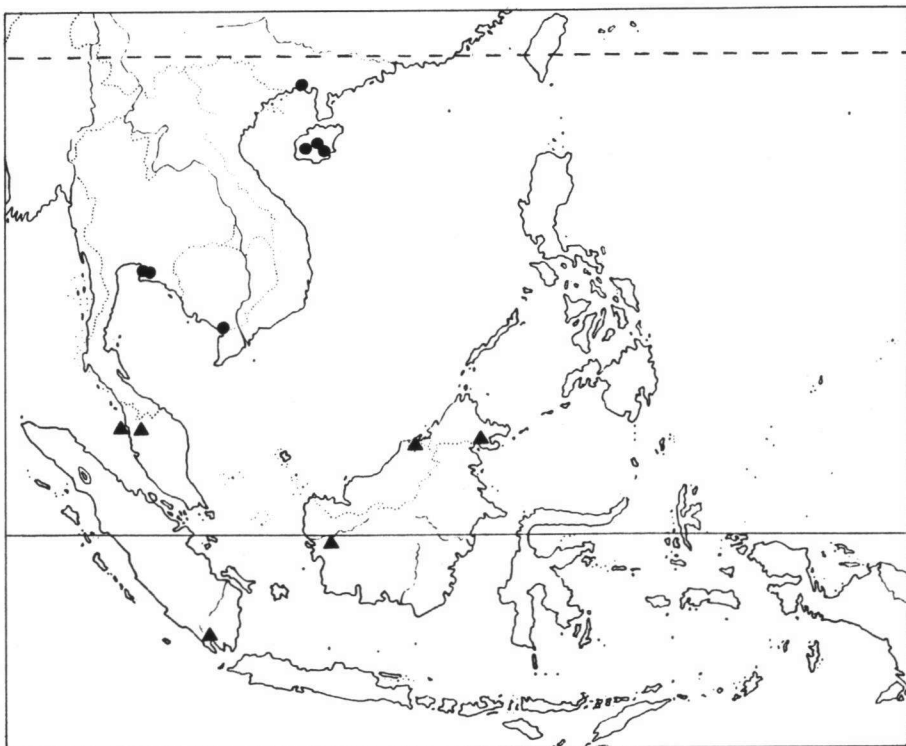
PHILIPPINES. Guimaras: *Sulit 11791* (A, L). — Luzon: Laguna, above Pansal, *Mabesa 886* (US). Sorsogon, Irosin, Mt Bulusan, *Elmer 17362* (BM, BO, C, K, L, MO, NY, P, S, US, Z). — Mindanao: Surigao del Norte, Dinagat Island, *Ramos & Convocar 83940* (A). Zamboanga, Malangas, *Ramos & Edaño 37354* (A, BM, BO, K, L, P, Z). — Mindoro: Oriental, Mt Yagaw, Mansalay, *Conklin 17468* (A, L, US). Occidental: Abra de Ilog, *Sulit 13761* (A, L). — Palawan: Taytay, *Merrill 9625* (BM, BO, K, L, P, US).

12. *Anodendron pauciflorum* Hook. f. — Map 8

Anodendron pauciflorum Hook. f., Fl. Brit. India 3 (1882) 669; Boerl., Handl. Fl. Ned. Indië 2 (1899) 400; King & Gamble, J. As. Soc. Beng. 74 (1907) 488; Ridley, Fl. Malay Penins. 2 (1923) 362.
— Type: *Maingay 1101* (K lecto, designated here; BM, G, GH, K, L iso).

Branchlets glabrous or minutely puberulent. *Leaves*: petiole 4–25 mm long; blade elliptic or weakly obovate, apex acuminate or apiculate, base acute to rounded, 3.8–12.6 × 1.8–4.7 cm, 1.8–3.6 × as long as wide, 7–11 strong pairs of lateral nerves, tertiary venation obscure, glabrous, usually obscurely punctate beneath. *Inflorescence* of congested axillary cymes, sometimes also terminal, densely minutely puberulent, 2–4 cm long, bracts only at base of pedicels; pedicels 1.4–3.3 mm long. *Sepals* ovate, apex acute to obtuse, 1.6–2.7 × 0.8–1.2 mm, 1.6–2.3 × as long as wide, glabrous or minutely puberulent, ciliate. *Corolla* greenish yellow; tube 5–8 mm long; lobes 6.1–9.2, 1–1.6 × as long as tube, 1.3–2 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 0.8–1.4 mm from corolla base, which is 0.1–0.2 of tube length; anthers 1.4–1.9 × 0.5–0.6 mm, 2.8–3.6 × as long as wide. *Disk* annular, 5-dentate or 5-crenate, 0.5–0.6 mm long, 0.6–0.9 × as long as ovary. *Ovary* 0.7–0.9 mm long; style + pistil head 1.1–1.3 mm long. *Fruit* 10.2–14 cm long, 1.3–1.8 cm wide. *Seed* grain 8.5–13.5 × 3.5–6 mm; beak 6–7.9 mm long; coma 5–9.5 cm long.

Distribution — Malaysia, Indonesia, Brunei.



Map 8. Distribution of *Anodendron pauciflorum* Hook. f. (▲) and *A. punctatum* Tsiang (●).

Collections studied:

MALAYSIA. Peninsula: Penang, s.l., *Maingay 1101* (BM, G, GH, K, L – type of *Anodendron pauciflorum*); Waterfall, *Curtis 663* (K, P, SING, US, W); Government Hill, *Curtis 1457* (BM, K, MO, SING), *Curtis s.n.* (SING); *Burkill 6254* (SING); Penang Hill, *Ridley 11943* (SING). Perak: Larut, *King's collector 5587* (SING), *5599* (BM, BO, K, L, P, SING). — Borneo: Sabah, Tawau District, Quoin Hill Road, *Gibot 34072* (BO, K, L, SING).

INDONESIA. Sumatra: Sumatera Lampung, NW of Kota Agung, *Jacobs 8369* (BO, K, L, SING).

BRUNEI. Belait District: Kampong Sq. Liang road, *van Niel 4592* (L, Z).

13. *Anodendron punctatum* Tsiang — Map 8

Anodendron punctatum Tsiang, *Sunyatsenia* 2 (1934) 129; *Sunyatsenia* 3 (1936) 140; Metcalfe, J. Arnold Arbor. 26 (1945) 202; Guangdong Coll. Agric. For. (P.T. Li?), Fl. Hainanica 3 (1974) 242; Tsiang & P.T. Li, Fl. Reip. Pop. Sin. 63 (1977) 179. — Type: *Ko 52105* (IBSC holo; A, B, E, K, P iso).

Branchlets glabrous or minutely puberulent. *Leaves*: petiole 0.6–1.8 cm long; blade elliptic or oblong, apex acuminate, base cuneate to obtuse, 4.8–14.4 × 1.6–4.7 cm, 2.5–4.8 × as long as wide, 7–13 pairs of lateral nerves, tertiary venation obscure, glabrous, punctate beneath. *Inflorescences* axillary and terminal, minutely puberulent, 2.2–6 cm long, bracts only at base of pedicels; pedicels 0.8–3.9 mm long. *Sepals* ovate, apex acute to obtuse, 1–1.7 × 0.7–1 mm, 1.2–1.7 × as long as wide, glabrous or minutely puberulent at base, ciliate. *Corolla* greenish or yellow; tube 2.2–3 mm long; lobes 2.9–4 mm long, 1–1.6 × as long as tube, 1.2–1.5 mm wide; glabrous outside, pubescent on inside of lobes, glabrous in tube or sparsely pubescent at top of tube. *Stamens* inserted at 0.5–0.6 mm from corolla base, which is 0.2–0.3 of tube length; anthers 0.9–1.1 × 0.4 mm, 2.3–2.8 × as long as wide. *Disk* annular, 5-dentate or 5-crenate, 0.4–0.6 mm long, 0.7–1 × as long as ovary. *Ovary* 0.4–0.7 mm long; style + pistil head 0.9–1 mm long. *Fruit* 7.5–13.6 cm long, 8.5–12.5 mm wide. *Seed* grain 12–16 × 3–5.8 mm; beak 3.5–5.8 mm long; coma 2–5.8 cm long.

Distribution — China, Cambodia, Thailand.

Collections studied:

CHINA. s.l.: *Tsang 30071* (BO, E). Guangxi: Fang Ch'eng District, T'aaan Faan, Kung P'ing Shan, *Tsang 26724* (A, C, E, K, P). Hainan: s.l., *Liang 66045* (P, US); Tun Shan Lin, Manyun, *Ko 52105* (A, B, E, IBSC, K, P – type of *Anodendron punctatum*); Bak Sa, *Lau 26631* (A); Ch'ang Kiang District, Ka Chik Shan, *Lau 1481* (K, P); Po-ting, *How 71961* (BO, G), *73138* (A, BO, G, P).

CAMBODIA. Kompong Smach: *Poilane 22897* (P, TCD).

THAILAND. Chon Buri, Si Racha District, Khao Kieo, *Maxwell 76-138, 76-485* (AAU, L).

14. *Anodendron seramense* D. J. Middleton, *spec. nov.* — Fig. 4; Map 9

Anodendron gracile affine sed foliorum nervis arcuatis ascendentibus. — Typus: *Burley, Turkin & Ismail 4397* (holo L; iso A, BISH, BO, E, K, KEP, S, SING).

Branchlets glabrous. *Leaves*: petiole 5–16 mm long; blade elliptic, apex acuminate, base cuneate to acute, 5–10.7 × 1.8–3.6 cm, 2.5–4.5 × as long as wide, 7–12 pairs of lateral nerves, tertiary venation oblique to midrib, glabrous. *Inflorescence* a delicate terminal cyme, glabrous, 4–9.1 cm long, with bracts on the pedicel; pedicel

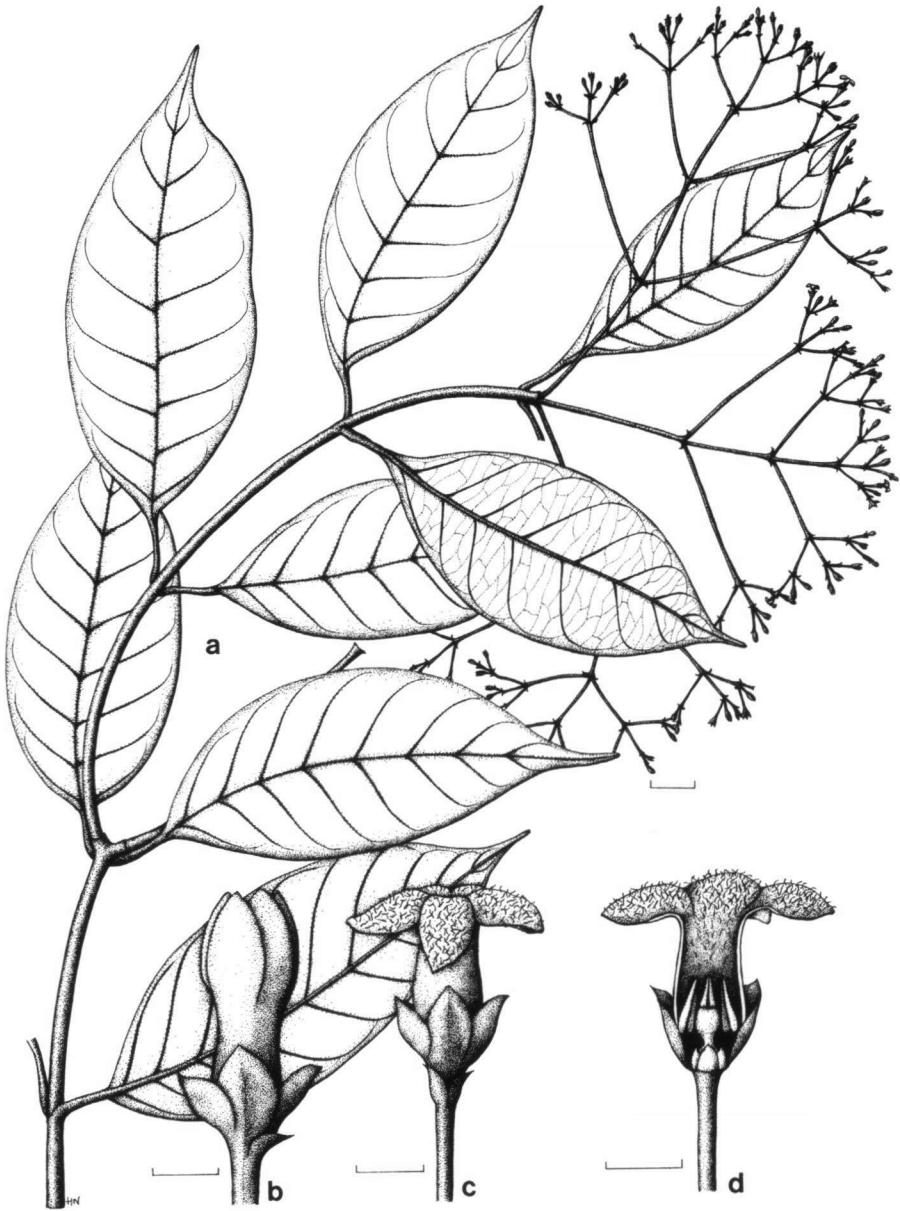


Fig. 4. *Anodendron seramense* D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection (a-d: *Burley et al. 4397, A*). Scale bars: a = 1 cm, b-d = 1 mm.

2.1–6.2 mm long. *Sepals* ovate, apex rounded to obtuse, 0.8–1.2 × 0.6–1 mm, 1.1–1.8 × as long as wide, glabrous, eciliate. *Corolla* pale yellow or yellow-green; tube 1.6–1.9 mm long; lobes 1.1–1.7 mm long, 0.7–0.9 of tube length, 1.2–1.4 mm wide, ovate, obtuse; glabrous outside, pubescent on inside of lobes and sparsely

in tube. *Stamens* inserted 0.4–0.7 mm from corolla base, which is 0.2–0.3 of tube length; anthers 0.7–0.9 × 0.4 mm, 1.8–2.3 × as long as wide. *Disk* 5-dentate, 0.4–0.5 mm long, 1–1.3 × as long as ovary. *Ovary* 0.4 mm long, style + pistil head 0.7–1 mm long. *Fruit* unknown.

Distribution — Moluccas (Ambon, Seram).

Habitat — In primary evergreen forest to 70 m altitude.

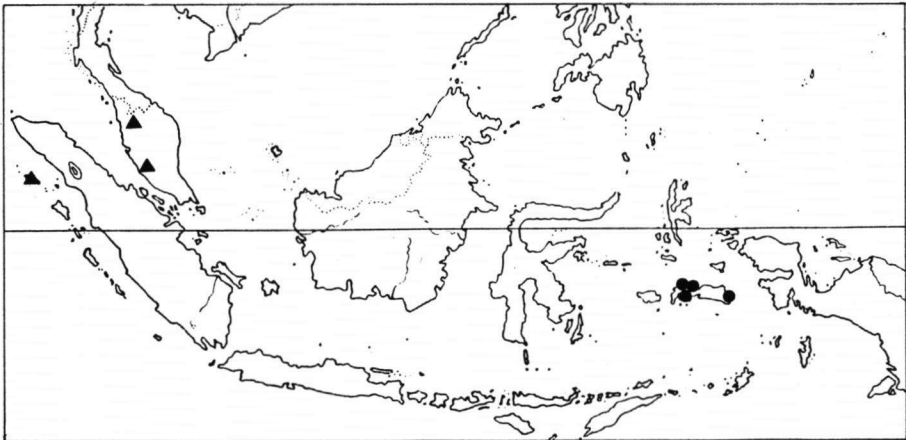
Collections studied:

INDONESIA. Ambon: s.l., *de Vriese s.n.* (U); Kampong Waai, *Buwalda 6123* (BO, L); Gelala, *Robinson 1919* (BO, K, L, P, US); Hoetoemoeri, *Teijsmann s.n.* (BO). — Seram: Kanihi, *Kornassi 532* (BO, L, U); 5 km ENE of Mahakiri on River (Wae) Noa, *Burley, Turkin & Ismail 4397* (A, BISH, BO, E, K, KEP, L, S, SING – type of *Anodendron seramense*); Kampong Kiandarar, Gunong Kilia, *Buwalda 5617* (BO, K, L), *5635* (BO, L); Manoesa-Rembatoo-Honitetoe, *Eyma 2681* (BO).

15. *Anodendron tubulosum* (Ridley) D.J. Middleton — Map 9

Anodendron tubulosum D.J. Middleton, *Blumea* 39 (1994) 89. — *Micrechites tubulosa* Ridley, *Fl. Malay Penins.* 5 (1925) 321. — Type: *Burkill & Haniff 12785* (K lecto; SING iso).

Branchlets glabrous. *Leaves*: petiole 5–7 mm long; blade elliptic, apex acuminate, base cuneate, 5–7.2 × 1.7–2.6 cm, 2.8–3.4 × as long as wide, 8–10 pairs of lateral nerves, tertiary venation obscure, glabrous. *Inflorescences* of short axillary cymes, glabrous, 1.3–1.8 cm long, with bracts at middle of short pedicel; pedicel 1–1.5 mm long. *Sepals* ovate, apex acute, 0.8–0.9 × 0.5–0.7 mm, 1.3–1.6 × as long as wide, glabrous. *Corolla* tube 1.9–2 mm long; lobes oblong, rounded, 0.9–1.6 mm long, 0.5–0.8 × as long as tube, 1.2 mm wide; glabrous outside, densely pubescent inside. *Stamens* inserted at 0.3 mm from corolla base, which is 0.1 of tube length; anthers 1.2 × 0.3 mm, 4 × as long as wide. *Disk* 5-dentate, 0.4 mm long, 1 × as long as ovary. *Ovary* 0.4 mm long; style + pistil head 0.8 mm long. *Fruit* narrow, tapering; 5.2–8 cm long, 4–5 mm wide. *Seed* grain 11 × 3–4 mm; beak 3–4 mm long; coma 2.1–4.2 cm long.



Map 9. Distribution of *Anodendron seramense* D.J. Middleton (●) and *A. tubulosum* (Ridley) D.J. Middleton (▲).

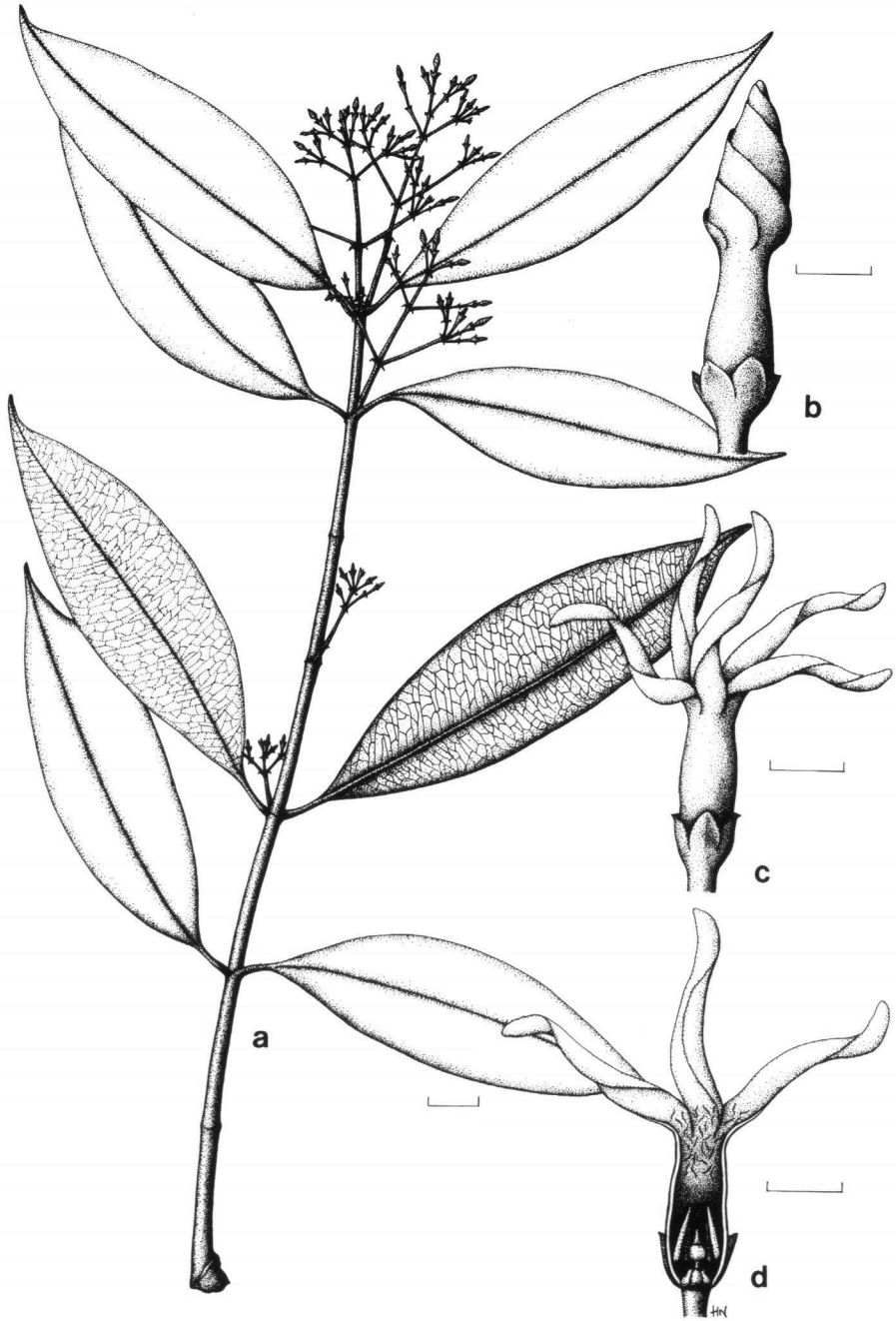


Fig. 5. *Anodendron whitmorei* D.J. Middleton. a. Habit; b. flower in bud; c. open flower; d. flower dissection (a–d: *Whitmore BSIP 3898*, L). Scale bars: a = 1 cm, b–d = 1 mm.

Distribution — Malay Peninsula, Sumatra.

Note — This species is closely related to *A. borneense* from which it differs in its considerably smaller flowers.

Collections studied:

INDONESIA. Sumatra: Sumatera Aceh, Simeulue, *Achmad 1793* (BO, L).

MALAYSIA. Peninsula: Perak, Maxwell's Hill, *Burkill & Haniff 12785* (K, SING – type of *Anodendron tubulosa*). Selangor: Bukit Lagang Forest Reserve, near Kepong, *Sow KEP 94547* (K, KEP).

16. *Anodendron whitmorei* D.J. Middleton, *spec. nov.* — Fig. 5; Map 10

Anodendron paniculatum auct. pro parte non A.DC.: Forster, Kew Bull. 48 (1933) 139.

Anodendron axillare affine sed inflorescentia longioribus et corollae tubo glabro vel tantum sparse pubescenti. — Typus: *Whitmore BSIP 3898* (K holo; L iso).

Branchlets glabrous or minutely puberulent. *Leaves*: petiole 5–12 mm long; blade elliptic, apex acuminate, base cuneate to obtuse, 5.7–13.5 × 1.5–6.1 cm, 2.2–4.1 × as long as wide, 12–23 pairs of lateral nerves, not particularly distinct from tertiary venation, prominent above and beneath, glabrous, punctate beneath. *Inflorescences* mostly axillary robust cymes, sometimes also terminal, glabrous or minutely puberulent, 3.9–13.2 cm long, with bracts at base of pedicel; pedicel 1.9–4 mm long. *Sepals* ovate, apex obtuse, 0.9–1.6 × 0.7–1.2 mm, 0.8–1.6 × as long as wide, glabrous, ciliate. *Corolla* yellow; tube 3–3.7 mm long; lobes 3–4.6 mm long, 0.9–1.3 × as long as tube, 0.9–1.1 mm wide; glabrous outside, pubescent on inside of lobes, glabrous or sparsely pubescent at top of tube inside. *Stamens* inserted at 0.6–0.9 mm from corolla base, which is 0.2–0.3 of tube length; anthers 1.3–1.6 × 0.5–0.6 mm, 2.3–2.7 × as long as wide. *Disk* annular or 5-crenate, 0.2–0.4 mm long, 0.3–0.6 × as long as ovary. *Ovary* 0.6–0.7 mm long; style + pistil head 1–1.2 mm long. *Fruit* unknown.

Distribution — Moluccas (Morotai), Papua New Guinea, Solomon Islands.

Collections studied:

INDONESIA. Moluccas: Morotai, Gunong Sangowo, *Kostermans 1079* (BO, K, L, SING).

PAPUA NEW GUINEA. Sepik: s.l., *Ledermann 10215* (L). Morobe: Markham Point, *van Royen 20128* (L, LAE). Southern Highlands: near Waro airstrip, 20 km SSW of Kutubu, *Jacobs 9265* (BO, L).

SOLOMON ISLANDS. Malaita: Central, Are Are District, Mota, 5 miles from Kiu, *Whitmore BSIP 3898* (K, L – type of *Anodendron whitmorei*); North East, Fa'arodo *BSIP 13490* (K, L, LAE, SING).

17. *Anodendron wrayii* King & Gamble — Map 10

Anodendron wrayii King & Gamble, J. As. Soc. Beng. 74 (1907) 489; Ridley, Fl. Malay Penins. 2 (1923) 362. — Type: *Wray 3836* (K lecto, designated here).

Trachelospermum obtusifolium Ridley, J. Bot. 62 (1924) 298. — Type: *Burkill & Holttum 8898* (K lecto, designated here; SING iso).

Branchlets glabrous. *Leaves*: petiole 5–12 mm long; blade obovate, apex rounded or apiculate, base cuneate to obtuse, 4.2–7 × 2–4.1 cm, 1.7–2.9 × as long as wide, 10–15 weak pairs of lateral nerves, tertiary venation obscure, glabrous, glaucous beneath.

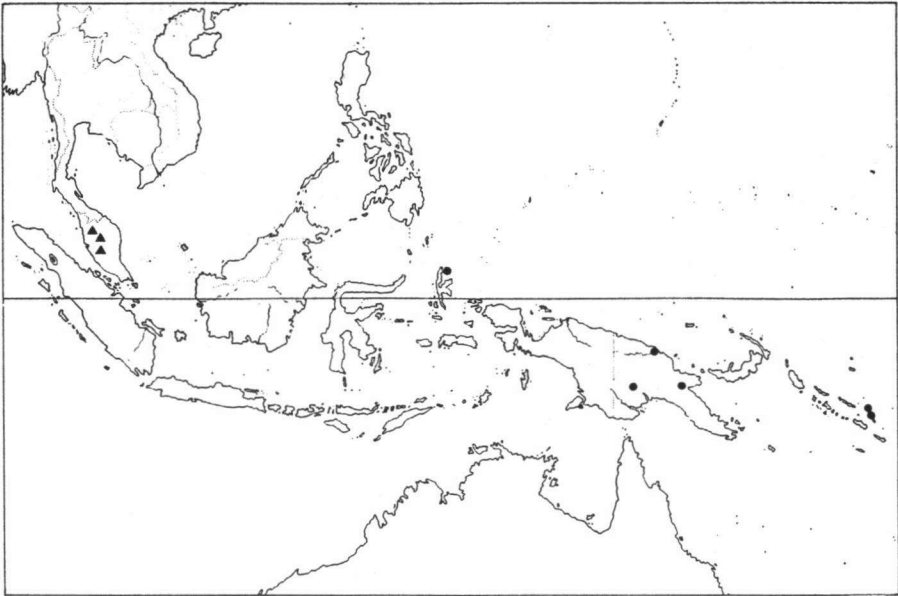
Inflorescence a terminal panicle, glabrous, 6.5–11.8 cm long, bracts at base of pedicels; pedicels 3.5–11 mm long. *Sepals* ovate, apex acute, 1.6–2.6 × 1–1.8 mm, 1.1–1.6 × as long as wide, glabrous, eciliate. *Corolla* yellow-green; tube 4.7–8 mm long; lobes falcate; 4–6.8 mm long, 0.7–0.9 × as long as tube, 2.6 mm wide; glabrous outside, pubescent on inside of lobes and in tube. *Stamens* inserted at 1.1 mm from corolla base, which is 0.2 of tube length; anthers 3.2 × 1 mm, 3.2 × as long as wide. *Disk* annular, 0.5 mm long, 0.6 × as long as ovary. *Ovary* 0.9 mm long; style + pistil head 1.2 mm long. *Fruit* 10–11 cm long, c. 1 cm wide. *Seed* grain 16.5–17 × 5.5–6.5 mm; beak 7.5–11 mm long; coma 5–5.9 cm long.

Distribution — Malaysia.

Habitat — In forest from 1200–1600 m altitude.

Collections studied:

MALAYSIA. Peninsula: Pahang: Fraser's Hill, *Burkill & Holtum 8898* (SING – type of *Trachelospermum obtusifolium*); Cameron Highlands, Trail to Gunong Jasar, *Ng 5959* (K, SING). Perak: Gunong Buleu, *Wray 3836* (K – type of *Anodendron wrayii*).



Map 10. Distribution of *Anodendron whitmorei* D.J. Middleton (●) and *A. wrayii* King & Gamble (▲).

INSUFFICIENTLY KNOWN TAXA

Anodendron lanceolatum King & Gamble, J. As. Soc. Beng. 74 (1907) 490.

I have only found one specimen of this species which is only of a dissected flower in Kew. It is impossible to ascertain its status from this specimen although it would appear to be close to *A. paniculatum*.

Anodendron salicifolium Tsiang & P.T. Li, Acta Phytotax. Sin. 11 (1973) 379; Fl. Reip. Pop. Sin. 63 (1977) 177. — Type: *Masamune 2604* (IBSC holo).

I have been unable to obtain type material of this species. It is likely to be a synonym of *A. affine*.

Echites parviflora Roxb., Fl. Ind. 2 (1832) 20; G. Don, Gen. Syst. 4 (1837) 75. — *Epigynum parviflorum* (Roxb.) Hook. f., Fl. Brit. India 3 (1882) 666. — Type: Drawing 2465 in the Roxburgh collection in Kew library.

It is undoubtedly an *Anodendron* but of uncertain species. G. Don included both *Wallich 1663* and *1664*, both *A. paniculatum*, within this species but as there is no actual plant material which is verifiable its status is uncertain. This name is not taken up to avoid the confusion which would be caused by replacing *A. paniculatum* with this older name.

Gymnema nepalense J. Graham, Cat. Pl. Bomb. (1839) 120.

Hooker (1882) has suggested that this species is a synonym of *A. paniculatum*. There is, however, no material to confirm or deny this.

SPECIES EXCLUSAE

Anodendron aambe (Warb.) Warb., Bot. Jahrb. 13 (1891) 454 = *Papuechites aambe* (Warb.) Markgr. — Type: *Warburg 21307* (untraced – probably destroyed in B). Neotype: *Hartley TGH 11841*.

Anodendron corymbosum Elmer, Leafl. Philipp. Bot. 2 (1908) 512 = *Streptocaulon cumingii* Fern.-Vill. (Asclepiadaceae). — Type: *Elmer 8468*.

ACKNOWLEDGEMENTS

I would like to thank the directors of the herbaria that provided material or hospitality during visits; John Parnell for his comments; Holly Nixon for the illustrations and Marcella Campbell for help with the curation of material. This work was carried out with the financial support of the European Union Human Capital and Mobility Programme.

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INDEX OF EXSICCATAE

Only specimens with a collector and a collection number are here listed. The letters in brackets refer to the first three letters of the species to which the specimen belongs.

- Achmad 1793 (tub) — Ahern's coll 2452 (obl) — Alston 13021 (can) — Alvins 375 (can) — Ampuria 41311, 41315 (pan) — Andrews A 318 (pan) — Atjeh 381 (pan).
- Backer 11159 (axi) — Baker 335 (obl) — Bakuhuizen van den Brink 2838 (cor), 3765, 3767 (can), 4396 (cor), 5178 (can) — Beddome 5, 5149 (pan) — Beer BSIP 6483 (obl) — Bermejós 352 (pan) — Beumée 6077, 6823 (can) — Bisset 757 (can), 767 (pan) — Blume 1046, 2018 (cor) — Bodinier 1081, 1430 (aff) — Bon 270, 1000, 1247, 1454, 3351, 4299 (aff) — Boraule BSIP 9390 (obl) — Brass 2713, 24211, 25925 (obl) — Brodie 168 (pan) — Bruinsma 19 (pan) — Bunnab 393 (pan) — Bünneimeijer 4008 (cor) — Burkill 6254 (pau) — Burkill & Haniff 12785 (tub) — Burkill & Holttum 8407 (gra) — Burley, Turkin & Ismail 4397 (ser) — Buwalda 5617, 5635, 6123 (ser).
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- Haines 665, 4879 (pan) — Hall et al. GC 45862 (pan) — Hance 237 (aff) — Harmand 278, 321 (pan) — Hartley 10256 (obl) — Hassan Ghani A 4098 (can) — Hatue 283 (pan) — Haviland 2169 (bor), 3049 (axi) — Haviland & Hose 3498 (axi) — Henry 19 (aff), 185 (ben), 262 (aff), 801 (ben) — Henty & Frodin NGF 27354 (obl) — Hiroe 14801 (aff) — Hochreutiner 1713 (cor) — Hohenacker 555 (pan) — Hose 679 (pan) — Hotta & Okada 1638 (axi) — How 70620 (aff), 71961 (pun), 72721 (how), 73056 (aff), 73138 (pun) — Hsu 4317 (aff) — Hu 5103, 6627, 6903, 7730, 8644, 9766, 9935, 12583, 13028, 13078 (aff) — Huang 237, 4473, 9577, 10580, 10634, 10656 (aff) — Huber 700 (pan).
- Jacobs 5192 (can), 8369 (pau), 9265 (whi) — Jayasuriya et al. 415, 529 (pan).

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- Ohba 662647 (aff) — Ohwi 634 (ben) — Oldham 322 (aff), 324 (ben).
- Paie S 42521 (gra) — Panoff 20, 146 (obl) — Parkinson 381, 2004 (pan) — Pascual 233 (obl) — Peng 4740 (ben) — Pételot 6006 (aff) — Phloenchit 416 (cor) — Phusomsaeng 270 (pan) — Pierre 1430 (pan) — Poilane 388, 2523, 12050, 13276 (pan), 22554 (ner), 22851 (pan), 22897 (pun), 26189 (ner) — Prawiroatmodjo & Maskuri 1341 (pan) — Price 651 (ben) — Pukel 86 (obl) — Put 590 (pan).
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- Vanpruk 673 (pan) — Vesterdal 5 K (pan) — de Voogd 2864 (pan).

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 Zippelius 44 d (pan), 1760 (cor).

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The letters and numbers in brackets are the first three letters and the number of the species under which each name can be found; accepted names are in Roman type, synonyms, excluded species and insufficiently known species in italics, new species and combinations in bold type; (x) = species exclusae; (ik) insufficiently known species.

- Aganosma *laevis* Champion ex Benth. (aff 1)
 Anodendron A. DC.
aambe (Warb.) Warb. (x)
 affine (Hook. & Arn.) Druce (aff 1)
 var. *effusum* Tsiang (aff 1)
 var. *pingpienense* Tsiang & P.T. Li (aff 1)
 axillare Merr. (axi 2)
 benthamianum Hemsl. (ben 3)
borneense (King & Gamble) D. J. Middleton
 (bor 4)
 candolleianum Wight (can 5)
 coriaceum (Blume) Miq. (cor 6)
 var. *salaccense* Hochr. (cor 6)
corymbosum Elmer (x)
fangchengense Tsiang & P.T. Li (aff 1)
formicina (Tsiang & P.T. Li) D. J. Middleton
 (ner 9)
gracile (King & Gamble) D. J. Middleton
 (gra 7)
gracilentum Markgr. (cor 6)
 howii Tsiang (how 8)
inflatum Hassk. (can 5)
laeve (Champ. ex Benth.) Maxim. ex Franch.
 & Sav. (aff 1)
lanceolatum King & Gamble (ik)
loheri Merr. (aff 1)
manubriatum Merr. (pan 11)
moluccanum Miq. (pan 11)
 nervosum Kerr (ner 9)
 oblongifolium Hemsl. (obl 10)
 paniculatum A. DC. (pan 11)
 pauciflorum Hook. f. (pau 12)
 punctatum Tsiang (pun 13)
rhinosporum Thwaites (pan 11)
rubescens (Teijsm. & Binn.) Teijsm. & Binn.
 (can 5)
salicifolium Tsiang & P.T. Li (ik)
scandens (Hassk.) Pichon (can 5)
seramense D. J. Middleton (ser 14)
suishaense Hayata (aff 1)
sutepense Kerr (pan 11)
tenuiflorum Miq. (pan 11)
 tubulosum (Ridley) D. J. Middleton (tub 15)
whitmorei D. J. Middleton (whi 16)
 wrayii King & Gamble (wra 17)
 Chonemorpha *coriacea* (Blume) G. Don (cor 6)
 Cleghornia *borneensis* King & Gamble (bor 4)
gracilis King & Gamble (gra 7)
Dendrocharis inflata (Hassk.) Miq. (can 5)
rubescens Teijsm. & Binn. (can 5)
Ecdysanthera rubescens (Teijsm. & Binn.) Boerl.
 (can 5)
scandens Hassk. (can 5)
 Echites *coriacea* Blume (cor 6)
coriacea Wall. (pan 11)
laevigata Wall. (aff 1)
manubriata Wall. (pan 11)
paniculata Roxb. (pan 11)
parviflora Roxb. (ik)
polyantha Wall. (pan 11)
 Epigynum *laevigatum* Hook. f. (aff 1)
parviflorum (Roxb.) Hook. f. (ik)
Formosia benthamiana (Hemsl.) Pichon
 (ben 3)
Gymnema nepalense J. Graham (ik)
 Holarthra *affinis* Hook. & Arn. (aff 1)
Microchites borneensis (King & Gamble) P.T. Li
 (bor 4)
formicina Tsiang & P.T. Li (ner 9)
gracilis (King & Gamble) P.T. Li (gra 7)
tubulosa Ridley (tub 15)
 Papuechites *aambe* (Warb.) Markgr. (x)
 Parsonsia *bulusanensis* Elmer (pan 11)
 Streptocaulon *cumingii* Fern.-Vill. (x)
 Tabernaemontana *tenuiflora* Miq. (pan 11)
 Trachelospermum *obtusifolium* Ridley (wra 17)