CHECKLIST OF THE GENERA OF THAI EUPHORBIACEAE – I

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ABSTRACT. A check-list of the difficult genera of Euphorbiaceae in Thailand is presented.

BRIDELIA[1]

Willd., Sp. Pl. 4: 978. 1806; corr. Spreng., Anleit. Kenntn. Gew. ed. 2, 2: 887. 1818; Müll.Arg. in DC., Prod. 15, 2: 492. 1866; Jabl. in Engl., Pflanzenr. 65: 267. 1887; Airy Shaw, Kew Bull. 26: 227. 1972; G.L.Webster, Ann. Missouri Bot. Gard. 81: 39. 1994; Dressler, Taxon 45: 337. 1996. nom. cons. prop.; Blumea 41: 273. 1996.

About 50 species in the Old World tropics: Tropical Africa, Madagascar, Yemen and in Asia ranging from India and China throughout S.E. Asia and Malesia to N. Australia, the Solomons, and Vanuatu; Ten species in Thailand. Classification: Subfam. Phyllanthoideae, tribe Bridelieae.

KEY TO THE SPECIES

1. Leaves with secondary nerves ending in marginal vein (craspedodroumous; Fig. 1a). Drupes 2-locular. Seeds plano-convex (subg. *Bridelia*)
   2. Flowers large, calyx 6–12 mm diam. Fruits 6–11 mm diam. Branches and leaves tomentose **9. B. stipularis**
   2. Flowers small, calyx up to 6 mm diam. Fruits 4–9 mm diam. Branches and leaves glabrous to tomentose
      3. Inflorescences terminal on mostly leafless twigs, spike-like. Nerves numerous (> 18 pairs). Leaves coriaceous **8. B. retusa**
      3. Inflorescences in the axils of normal leaves. Nerves in less than 18 pairs. Leaves papery to coriaceous
         4. Nerves usually in more than 11 pairs
            5. Leaves glabrous beneath **7. B. ovata**
            5. Leaves puberulous to pubescent beneath **1. B. affinis**
         4. Nerves usually in less than 11 pairs
            6. Leaves densely pubescent to tomentose beneath. Sepals hairy outside **5. B. harmandii**

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6. Leaves glabrous to tomentose beneath, less densely so. Sepals glabrous outside
   7. Leaves stiffly coriaceous, conspicuously narrowly oblong, subglabrous beneath **3. B. curtisii**
   7. Leaves papery to thinly chartaceous, elliptic to obovate, tomentose beneath **10. B. tomentosa**

1. Leaves with secondary nerves arching and connecting near the margin, but not reaching marginal vein (brochidodromous; Fig. 1b). Drupes 1-locular. Seeds ? ellipsoid with a deep longitudinal groove (subg. *Gentilia* (Beille) Jabl.)
   8. Nerves in 6–9 pairs with a narrowly acute angle of divergence especially at base (< 45?). Leaf base mostly acute, apex very shortly acuminate (3–7 mm). Stipules short (1.5–2 mm). Styles not exerted **2. B. cinnamomea**
   8. Nerves in more than 9 pairs with a moderately acute angle of divergence (usually > 45?). Leaf base obtuse to truncate, rarely acute, apex longer acuminate. Stipules longer than 2 mm. Styles (slightly) exerted
      9. Flowers conspicuously pedicelled (2–6 mm), 3–5 mm diam. Young branches with inconspicuous lenticels, bark brownish **4. B. glauca**
      9. Flowers (sub)sessile, 2–3 mm diam. Young branches (one but last generation) with raised lenticels, bark then greyish **6. B. insulana**

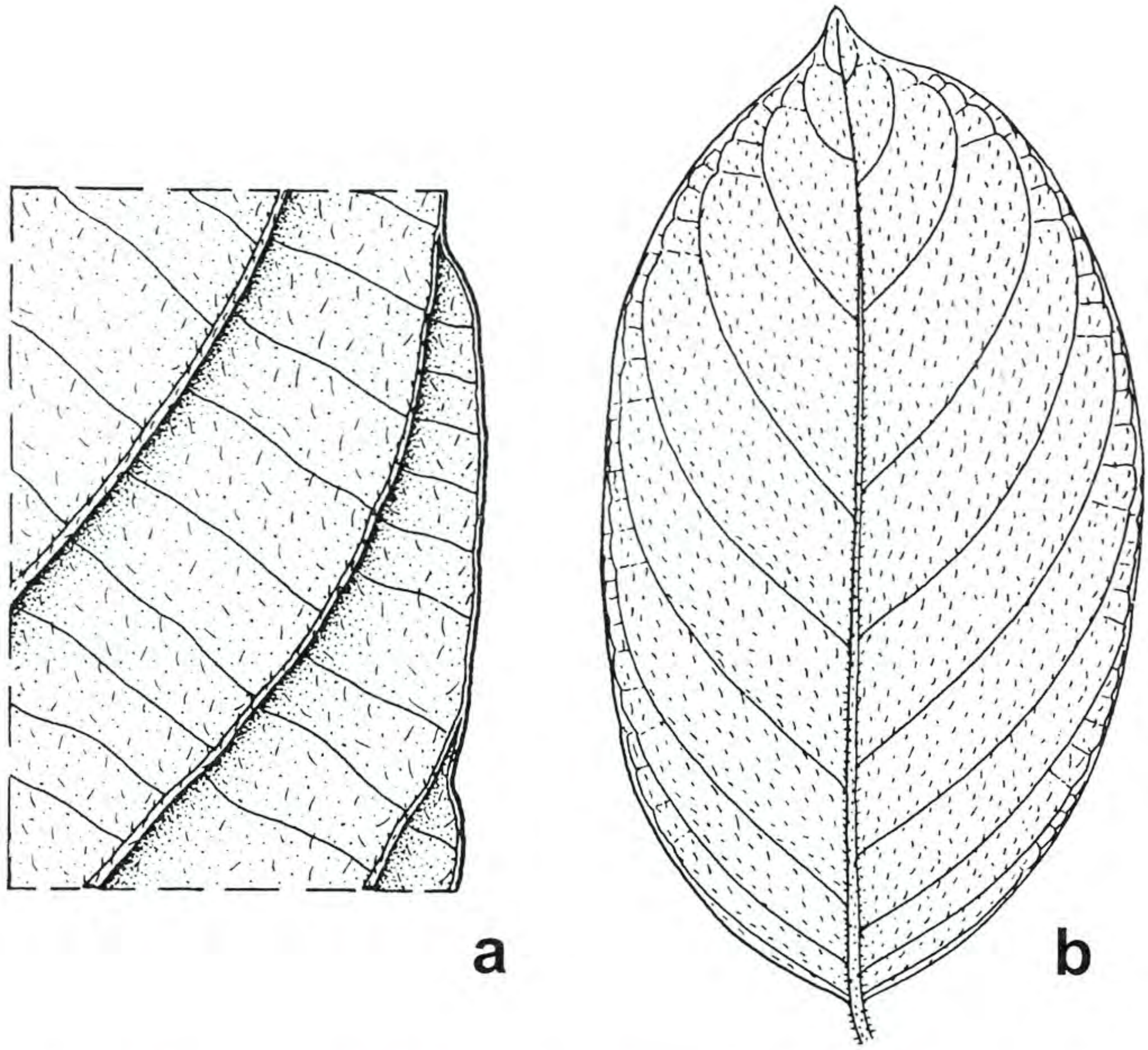

Fig. 1. *Bridelia* Willd.: a. craspedodromous venation, nerves joining into distinct fimbrial (marginal) vein; b. brachidodromous venation, nerves looped near margin and joining with each other, no distinct fimbrial vein.

1. Bridelia affinis Craib, Kew Bull. 1911: 456. 1911; Aberdeen Univ. Stud. 57: 182. 1912; Jabl. in Engl., Pflanzenr. Heft 65: 73. 1915; Airy Shaw, Kew Bull. 23: 65. 1969; Kew Bull. 26: 228. 1972; Dressler, Blumea 41: 276. 1996.— *Bridelia colorata* Airy Shaw, Kew Bull. 23: 66. 1969.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Inthanon, Doi Muang Awn, Doi Sutep (type: *Kerr* 809 (K)), Mae Soi, Pang Noi), Lampang (Doi Khun Tan, Doi Pangla, Jae Sawn, Mae Maw), Phrae (Mae Yom); NORTH-EASTERN: Loei (Pha Nok Khao), Sakon Nakhon (Phu Phan), Khon Kaen (Pha Nok Khao); EASTERN: Buri Ram.

D i s t r i b u t i o n.— China (Yunnan and Hainan), Thailand.

E c o l o g y.— Deciduous and evergreen primary forest, also in disturbed places; probably no preference for soil, on granite bedrock to limestone, 250–750 m. Shade and humidity seemingly required; locally common.

V e r n a c u l a r.— Kangpla (ก้างปลา).

U s e s.— Medicinal tree (Thailand, *Collins* 1588 (K)).

2. Bridelia cinnamomea Hook.f., Fl. Br. Ind. 5: 273. 1887; Whitmore, Tr. Fl. Mal. 2: 74. 1973; Dressler, Blumea 41: 307, fig. 3, map 9. 1996.— *Bridelia griffithii* Hook.f., Fl. Br. Ind. 5: 272. 1887; Jabl. in Engl., Pflanzenr. 65: 74. 1915.— *B. griffithii* Hook.f. var. *cinnamomea* (Hook.f.) Gehrm., Bot. Jahrb. Syst. 41, Beibl. 95: 38. 1908; Airy Shaw, Kew Bull. Add. Ser. 4: 64. 1975; Kew Bull. 36: 273. 1981.— *B. gehrmannii* Jabl. in Engl., Pflanzenr. 65: 73. 1915. Fig. 2.

T h a i l a n d.— PENINSULAR: Narathiwat (Paa Win, Sirindhon).

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, Borneo (Sabah and Sarawak).

E c o l o g y.— Primary and secondary mixed peat swamp forest; occasional; 0–600 m.

3. Bridelia curtisii Hook.f., Fl. Br. Ind. 5: 273. 1887; Boerl., Handl. 3: 271. 1900; Ridl., Fl. Mal. Pen. 3: 184. 1924; Dressler, Blumea 41: 278, map 1. 1996.— *Bridelia ovata* Decne. var. *curtisii* (Hook.f.) Airy Shaw, Kew Bull. 26: 229. 1972.

T h a i l a n d.— NORTHERN: Chiang Mai (Bo Luang, Mae Sa Nam), Mae Hong Son (Mae Taeng-Pai), Lamphun (Doi Kuhn Dahn); CENTRAL: Suphan Buri (U-thong), Bangkok (Thon Buri, Klong Sahn); PENINSULAR: Surat Thani (Ban Tahsae, Khao Nam Rawn), Krabi (Ko Pipi).

D i s t r i b u t i o n.— Vietnam, Cambodia, Thailand, Andaman & Nicobar Islands, Peninsular Malaysia (type), N. Sumatra.

E c o l o g y.— Mangrove, tidal riversides, evergreen forest, open and disturbed areas (savannah), road sides; often on limestone; 10–1000 m.

U s e s.— The fruits are edible and medicinally used in Cambodia (*Martin* 155 (L)).

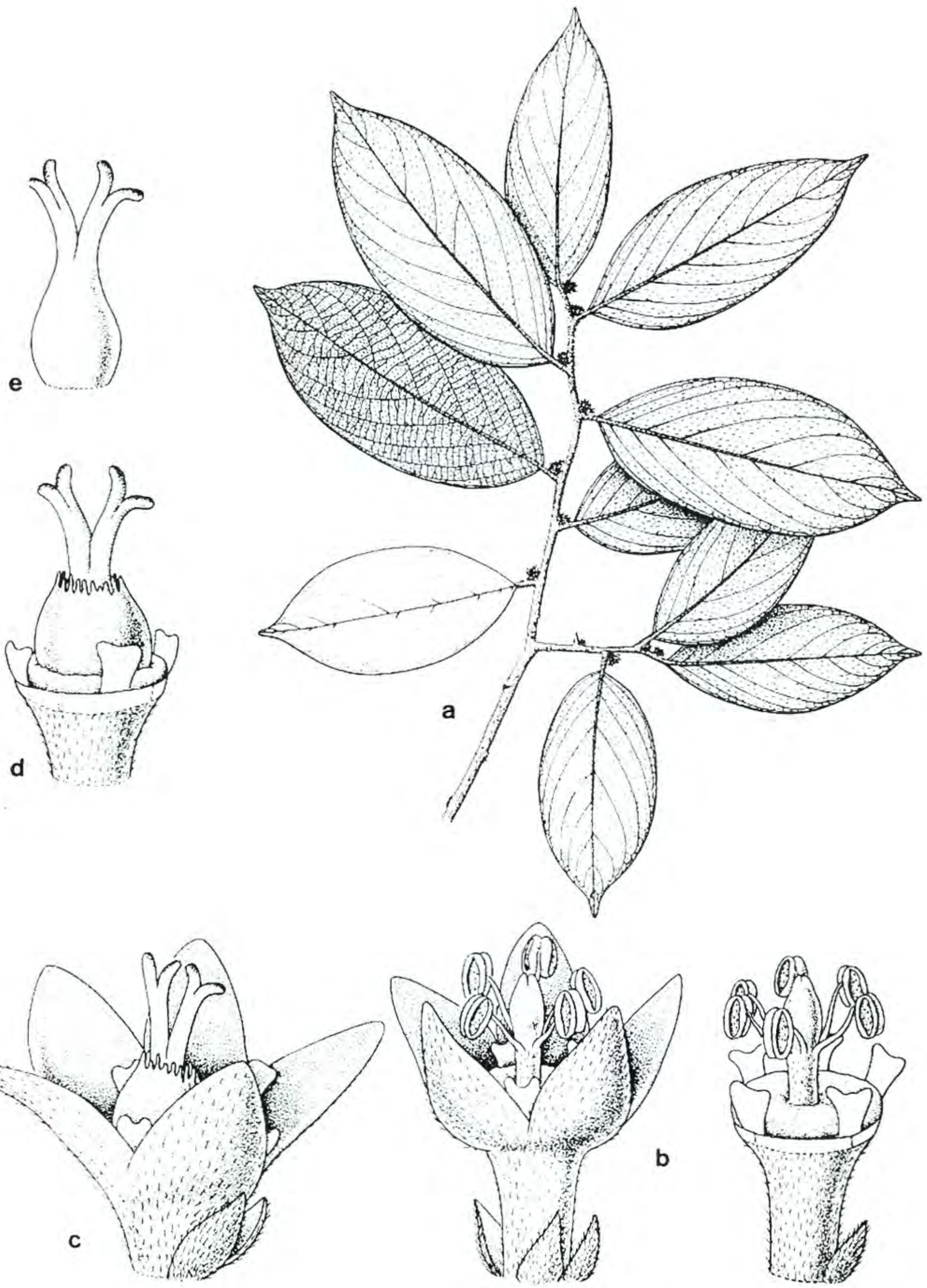

Fig. 2. *Bridelia cinnamomea* Hook.f.: a. habit; b. staminate flowers; c. pistillate flower; d. pistillate flower without sepals; e. isolated ovary.

4. Bridelia glauca Blume, Bijdr.: 597. 1826; Baill., Étude Euphorb.: 584. 1858; Müll. Arg. in DC., Prod. 15, 2: 497. 1866; Jabl. in Engl., Pflanzenr. 65: 74. 1915; Airy Shaw, Kew Bull. Add. Ser. 4: 64. 1975; Dressler, Blumea 41: 311, fig. 4, map 10.— *Bridelia pubescens* Kurz, J. As. Soc. Beng. 42, ii: 241. 1874; Airy Shaw, Kew Bull. 26: 230. 1972.— *B. nooteboomii* Chakrab., J. Econ. Taxon. Bot. 5: 949. 1984.

T h a i l a n d.— NORTHERN: Chiang Mai (Ban Bah Bae, Doi Chiang Dao, Doi Inthanon, Doi Lang Gah, Doi Lohn, Doi Pui, Doi Saket, Doi Sutep, Khun Awn, Mae Sao, Mae Soi, Pang Tawn, Phu Lang Ka), Chiang Rai (Khoon Ghon), Lampang (Jae Sawn), Nan (Doi Phukha National Park), Lampang (Khao Kuntal); NORTH-EASTERN: Phetchabun (Nam Nao), Loei (Phu Kradueng); SOUTH-EASTERN: Chon Buri (Khao Khiao).

D i s t r i b u t i o n.— From E. India, Bhutan, Sikkim, Myanmar and Thailand throughout Malesia (Java, type) except the Lesser Sunda Islands.

E c o l o g y.— Primary and secondary forest, often near rivers; soil: well-drained volcanic, sandy, loamy, clayey, sandstone, limestone, grey schists, granite; scattered to locally common; 0–1500 m.

V e r n a c u l a r.— Chi on (จี้อ้น), pha ni (พานี), si thao (สีเทา), si-thoh-pha-ni (สีเทาะพานี) (Karen-Chiang Mai), si-wa-la-thi (สิวาละที) (Karen-Mae Hong Son) (Northern).

U s e s.— Timber tree, wood hard and durable, used for house and bridge construction in Indonesia, for house posts and fuel in Mindanao (Philippines), and used in an agri-ritual on Mindanao.

5. Bridelia harmandii Gagnep., Bull. Soc. Bot. France 70: 433. 1923; in Fl. Gén. I.-C. 5: 491, f. 63, 2–8. 1926; Airy Shaw, Kew Bull. 26: 228. 1972; P.H. Hô, Cây có Viêtnam 2: 290. 1992; Dressler, Blumea 41: 281. 1996.

T h a i l a n d.— NORTHERN: Nakhon Sawan (Hua Wai); NORTH-EASTERN: Loei (Wang Sa Phung), Udon Thani, Khon Kaen; EASTERN: Nakhon Ratchasima (Ban Chum Saeng, Pak Chong, Pak Thong Chai), Surin (Sangkha), Ubon Ratchathani (Non Ngam); SOUTH-EASTERN: Chon Buri (Khao Khiao).

D i s t r i b u t i o n.— Thailand and Indochina (Laos, type).

E c o l o g y.— Deciduous forest, open dipterocarp forest, open spaces in forest; reported from sandy soil; 0–460 m.

V e r n a c u l a r.— Samsatia (ซำซาเตี้ย) (North-eastern, Loei).

6. Bridelia insulana Hance, J. Bot. 15: 337. 1877; Jabl. in Engl., Pflanzenr. 65: 63. 1915; Dressler, Blumea 41: 315, map 11. 1996.— *Bridelia penangiana* Hook.f., Fl. Br. Ind. 5: 272. 1887; Jabl. in Engl., Pflanzenr. 65: 75. 1915; Airy Shaw, Kew Bull. 26: 229. 1972; Whitmore, Tr. Fl. Mal. 2: 75. 1973; Airy Shaw Add. Ser. 4: 64. 1975; Kew Bull. 31: 382. 1976.— *B. minutiflora* Hook.f., Fl. Br. Ind. 5: 273. 1887.— *B. nicobarica* Chakrab. & Vasudeva Rao, J. Econ. Taxon. Bot. 5: 945. 1984.

T h a i l a n d.— EASTERN: Nakhon Ratchasima (Khao Yai National Park); CENTRAL: Nakhon Nayok (Khao Yai National Park); SOUTH-EASTERN: Prachin Buri (Sa Kaeo), Chon Buri (Khao Khiao); PENINSULAR: Trang (Khao Chong), Songkhla (Boriphat Waterfall), Yala (Nikhom Kua Long), Narathiwat (Phru To Daeng).

D i s t r i b u t i o n.— From Myanmar to Vietnam (type) throughout Malesia to the Solomons and N.E. Australia

E c o l o g y.— Primary and secondary rain forest, often along rivers, but also on dry land; soil: sandy to loamy, clayey, limestone; 0–1500 m.

U s e s.— Timber sometimes used in house-building (Sulawesi), as house posts (Bougainville), for knife handles (Lesser Sunda Islands). Bark used for colouring the saguwer (palm wine) red. The fruits are edible. The plant provides native medicine for headache (Sabah, Borneo) and a decoction of the leaves is applied as a lotion against itch (Malay Peninsular). The leaves provide a wrapping for smoking materials (Papua New Guinea).

7. Bridelia ovata Decne., Nouv. Ann. Mus. Hist. Nat. 3: 484. 1834; Baill., Étude Euphorb.: 583. 1858; Müll.Arg. in DC., Prod. 15, 2: 495. 1866; Hook.f., Fl. Br. Ind. 4: 274. 1887; Jabl. in Engl., Pflanzenr. 65: 61, 63. 1915; Ridl., Fl. Mal. Pen. 3: 184. 1924; Gagnep. in Fl. Gén. I.-C. 5: 489. 1926; Airy Shaw, Kew Bull. 26: 229. 1972; Whitmore, Tr. Fl. Mal. 2: 74. 1973; Dressler, Blumea 41: 285, map 3. 1996.— *Amanoa ovata* (Decne.) Baill., Adansonia 6: 336. 1866.— *Bridelia burmanica* Hook.f., Fl. Br. Ind. 5: 269. 1887.— *B. kurzii* Hook.f., Fl. Br. Ind. 5: 272. 1887.— *B. pedicellata* Ridl., J. Str. Br. Roy. As. Soc. 59: 167. 1911.

T h a i l a n d.— NORTHERN: Tak, Nakhon Sawan; NORTH-EASTERN: Loei; SOUTH-EASTERN: Prachin Buri, Chon Buri; Rayong; SOUTH-WESTERN: Kanchanaburi, Prachuap Khiri Khan; CENTRAL: Saraburi, Nakhon Pathom, Nakhon Nayok, Nonthaburi, Bangkok; PENINSULAR: Surat Thani.

D i s t r i b u t i o n.— Myanmar, Thailand, Andaman & Nicobar Islands, N. Malaysia, Indonesia: E. Java and Lesser Sunda Islands (type).

E c o l o g y.— Sandy beach, savannah, dry evergreen and deciduous forest, moist monsoon forest; on sandy, calcareous soil or limestone; locally common; 0–800 m.

V e r n a c u l a r.— Maka (มะกา), mai maka (ไม้มะกา) (General); kong (กอง), kong kaep (ก้องแกบ) (Northern); sa-lao (ส่าเหล้า), si-wa-la (สิวาลา) (Karen-Mae Hong Son); khilao matka (ขี้เหล้ามาดกา), matka (มัดกา), samsa (ซำซา) (North-eastern); khai maka (ไข่มะกา), som ka (ส้มกา) (Central).

U s e s.— The leaves are used in Thailand for wrapping cigarettes and medicinally against lues (syphilis) and as a purgative.

8. Bridelia retusa (L.) A.Juss., Euphorb. Gen.: 109, t. 7, f. 22. 1824; Baill., Étude Euphorb.: 584, Atlas t. 25, f. 25–34. 1858; Dressler, Blumea 41: 289. 1996.— *Clutia retusa* L., Sp. Pl.: 1042. 1753.— *C. spinosa* Roxb., Pl. Corom. 2: 38, t. 172. 1802.—

Bridelia spinosa (Roxb.) Willd., Sp. Pl. 4: 979. 1806.— *B. retusa* (L.) Spreng., Syst. Veg. 3: 48. 1826, pro comb. nov.; Müll.Arg. in DC., Prod. 15, 2: 493. 1866.; Craib, Kew Bull. 1911: 457. 1911; Airy Shaw, Kew Bull. 23: 67. 1969; Kew Bull. 26: 230. 1972; Kew Bull. 36: 274. 1981.— *B. squamosa* (Lam.) Gehrm., Bot. Jahrb. Syst. 41, Beibl. 95: 30. 1908.— *B. cambodiana* Gagnep., Bull. Soc. Bot. France 70: 432. 1923.— *B. pierrei* Gagnep., Bull. Soc. Bot. France 70: 434. 1923; Airy Shaw, Kew Bull. 26: 229. 1972.

T h a i l a n d.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Lampang, Lamphun, Phrae, Sukhothai; NORTH-EASTERN: Loei, Udon Thani; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi, Ratchaburi; CENTRAL: Lop Buri, Phra Nakhon Si Ayutthaya; PENINSULAR: Narathiwat.

D i s t r i b u t i o n.— India (type?), Sikkim, Bhutan, Sri Lanka, Myanmar, Indochina, S. China, Thailand, Malay Peninsula, Sumatra.

E c o l o g y.— Common in dry evergreen and deciduous forest and open land; soil: sandy-loamy, granite, basalt derived sand; 50–600(–1400) m. Resistant to fire in regularly burnt grass savannah. Leaves turning pinkish brown before falling. Fruits eaten by pigeons in India.

V e r n a c u l a r.— Teng nam (เต็งหนาม) (General); pao nam (เปาหนาม), rang-nam (รังหนาม) (Northern); hang nam (ฮังหนาม) (North-eastern); cha-li luek-puak (จาลีลึกป๊วก) (Khmer-Surin), rang thon (รังโทน) (Eastern); wo-bo (ว้อโบ) (Karen-Kanchanaburi) (South-western).

U s e s.— In India this species has many uses. The dull red wood is used for construction, railway ties, fuel, rafters, posts, floor-boards, cart-shafts, wheels, agricultural implements, tool-handles, and shelves. The bark, which contains tannin (16–40%), is of pharmaceutical use because of its antiviral, hypoglycaemic, hypersensitive properties. The leaves are used as fodder and are said to free cattle of intestinal worms. The fruit is edible but very astringent.

9. Bridelia stipularis (L.) Blume, Bijdr.: 597. 1826; Baill., Étude Euphorb.: 584. 1858; Müll.Arg. in DC., Prod. 15, 2: 499. 1866; Kurz, Fl. Burma 2: 369. 1877; Craib, Kew Bull. 1911: 457. 1911; Jabl. in Engl., Pflanzenr. 65: 55. 1915; Airy Shaw, Kew Bull. 26: 230. 1972; Whitmore, Tr. Fl. Mal. 2: 74. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 65. 1975; Kew Bull. 36: 274. 1981; Kew Bull. 37: 11. 1982; PROSEA 3: 1333. 1992; Dressler, Blumea 41: 293, fig. 1, map 5. 1996.— *Clutia stipularis* L., Mant. Pl.: 127. 1767.— *Bridelia scandens* (Roxb.) Willd., Sp. Pl. 4: 979. 1806.— *B. dasycalyx* Kurz, J. As. Soc. Beng. 42, ii: 241. 1874. Fig. 3.

T h a i l a n d.— NORTHERN: Chiang Mai, Chiang Rai, Lamphun, Lampang, Phrae, Nakhon Sawan; NORTH-EASTERN: Phetchabun, Loei, Sakon Nakhon, Mukdahan; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Kanchanaburi, Prachuap Khiri Khan; CENTRAL: Saraburi, Bangkok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Chachoengsao, Rayong, Chanthaburi, Trat; PENINSULAR: Chumphon.

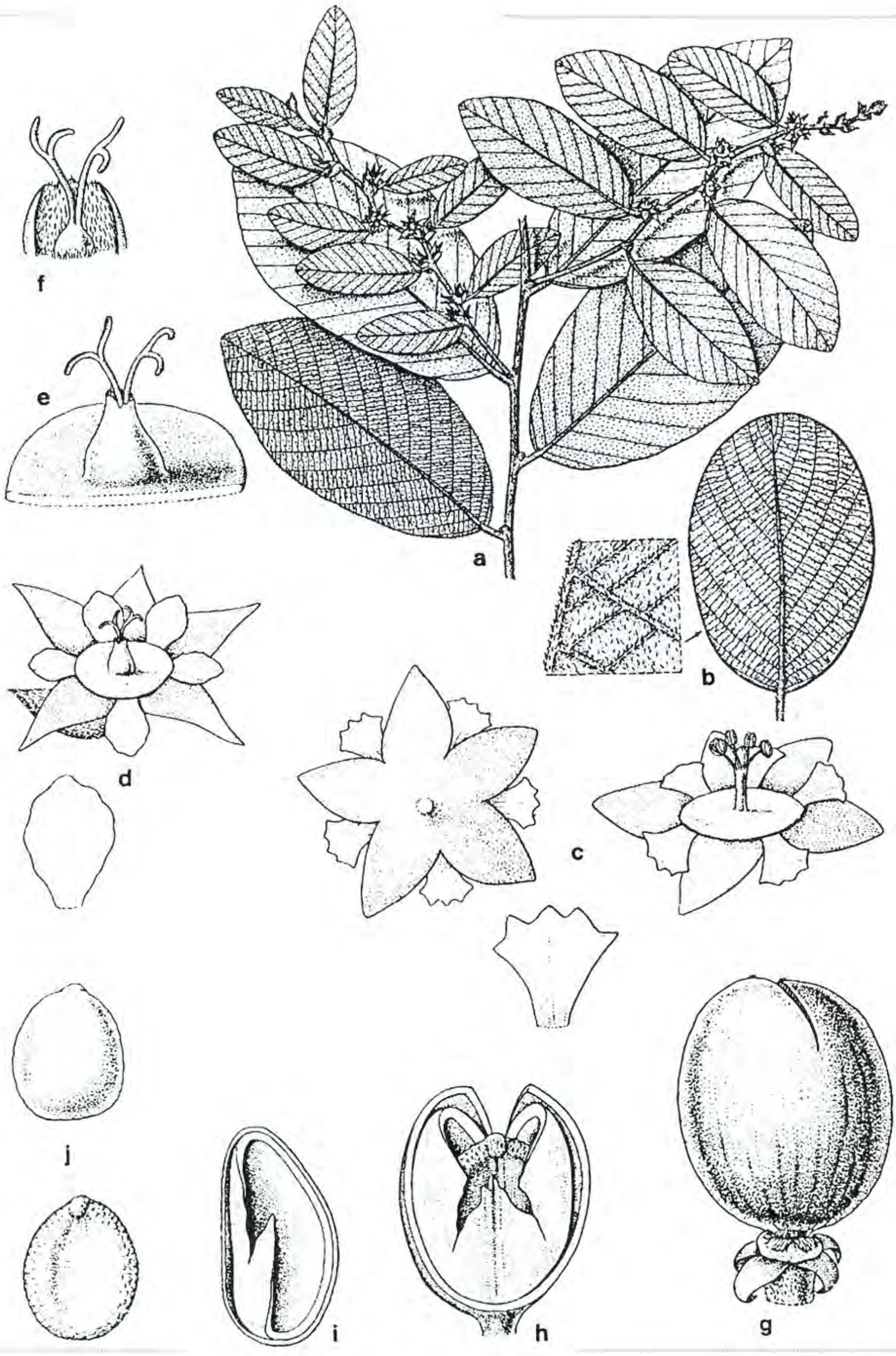

Fig. 3. *Bridelia stipularis* (L.) Blume: a. habit; b. venation; c. staminate clower from benath and sideways, with isolated petal; d. pistillate flower with isolated petal; e. disc and styles of pistillate flower; f. tubular disc and ovary of pistillate flower; g. fruit; h. single valve with endocarp and seed; i. dehisced endocarp; j. seed in ventral and dorsal view.

D i s t r i b u t i o n.— Sri Lanka, India, Nepal, mainland S.E. Asia, Malay Peninsula to Sumatra, Java, Lesser Sunda Islands, Borneo, and the Philippines (unknown for Mindanao).

E c o l o g y.— Primary and secondary forest, often near wet places (rivers, swamps, seashore, mangrove); soil usually sandy, but also limestone or loam; 0–400(–1100) m.

V e r n a c u l a r.— Hat ai (หัสไอ), hat sa ai (หัสสะไอ), hatsa khruea (หัสเครือ) (Northern); ai nuai (ไอหน่วย), ai nuai khai yai (ไอหน่วยไข่ใหญ่) (South-western); hatsa khun phi (หัสคุณผี), maka khruea (มะกาเครือ) (Central); ai nuai (ไอหน่วย), sa ai (สะไอ), sa ai khruea (สะไอเครือ) (Peninsular).

U s e s.— The plant is said to be poisonous. The twigs are used in basketry (India). The bark is used as a medicine against intestinal worms and for tanning; a decoction is used for cough, fever, and asthma and shows hyposensitive hypoglycaemic action (also on animals). An infusion of the leaves is used for colic in Java and for jaundice in India. The fruits are edible, produce a sticky fluid when cut and a black dye. The seeds possess hemaglutinating properties and yield a fatty oil.

10. Bridelia tomentosa Blume, Bijdr.: 597. 1826; Baill., Étude Euphorb.: 584. 1858; Müll.Arg. in DC., Prod. 15, 2: 501. 1866; Kurz, Fl. Burma 2: 367. 1877; Hook.f., Fl. Br. Ind. 5: 271. 1887; Craib, Kew Bull. 1911: 457. 1911; Jabl. in Engl., Pflanzenr. 65: 58, 4. 11A. 1915; Airy Shaw, Kew Bull. 26: 231: 1972; Whitmore, Tr. Fl. Mal. 2: 74. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 65. 1975; Dressler, Blumea 41: 297, fig. 2, map 6.— *Bridelia lancifolia* Roxb., Fl. Ind. ed. Carey, 3: 737. 1832.— *B. loureirii* Hook. & Arn., Bot. Beechey Voy.: 211. 1837.— *B. rhamnoides* Griff., Not. Pl. As. 4: 480. 1854.— *B. tomentosa* Blume var. *lancifolia* (Roxb.) Müll.Arg. in DC., Prod. 15, 2: 502. 1866.

T h a i l a n d.— NORTHERN: Chiang Mai, Chiang Rai, Lampang, Phrae, Phitsanulok, Nakhon Sawan; NORTH-EASTERN: Loei, Nakhon Phanom, Khon Kaen; EASTERN: Chaiyaphum, Nakhon Ratchasima, Surin, Ubon Ratchathani; SOUTH-WESTERN: Kanchanaburi, Prachuap Khiri Khan; CENTRAL: Saraburi; SOUTH-EASTERN: Chon Buri, Chanthaburi; PENINSULAR: Ranong, Surat Thani, Phangnga, Phuket, Nakhon Si Thammarat, Trang, Songkhla, Yala, Narathiwat.

D i s t r i b u t i o n.— From E. India, E. Nepal and Sikkim to S. China and Taiwan, throughout S.E. Asia and Malesia (Borneo only S.E. corner; type: Java) up to N. Australia.

E c o l o g y.— Deciduous to evergreen forest, primary to secondary vegetation; soil: sandy or loamy, limestone, granite bedrock; 0–1000 m. Common on waste land and in secondary forest. Flowers visited by butterflies.

V e r n a c u l a r.— Krabue (กระบือ), sifan krabue (สีฟันกระบือ) (Northern); lo-ko (โล่โก๊ะ) (Suai-Surin); sa lao (สะเหล่า) (Eastern); la-ai (ละไอ), samphanta (สามพันตา) (South-western); makae (มะแก), men true (เมนตรือ) (South-eastern); ai (ไอ), ka-ai (กะไอ), khon non (ขนหนอน), kue fung (กือฟุง), kue nung (กือนุง), ma fang (มะฟาง) (Peninsular).

U s e s.— Timber tree, wood suitable for baskets, carts, wheels, and tool handles. The bark produces tannin and is, therefore, used for tanning, and colouring wood black. The bark, though astringent, and the leaves (as infusion) are used against colic in Java. The fruits are eaten and the seeds are used by children as bullets in bamboo guns. Well known in village medicine and folk tales.

BACCAUREA[2]

Lour., Fl. Cochinch.: 661. 1790; Hook.f., Fl. Br. Ind. 5: 367. 1887; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 45. 1922) 45; Gagnep. in Fl. Gén. I.-C. 5: 547. 1927; Airy Shaw, Kew Bull. 26: 219. 1972; Whitmore, Tr. Fl. Mal. 2: 63. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 43. 1975; G.L. Webster, Ann. Missouri Bot. Gard. 81: 51. 1994.— *Pierardia* Roxb. ex Jack, Trans. Linn. Soc. London, Bot. 14: 119. 1823.— *Adenocrepis* Blume, Bijdr.: 579. 1825.— *Microsepala* Miq., Sum.: 444. 1861.— *Calyptroon* Miq., Sum.: 471. 1861.— *Everettiodendron* Merr., Philip. J. Sci. 4: 279. 1909.— *Gatnaia* Gagnep., Bull. Soc. Bot. France 71: 870. 1924.

D i s t r i b u t i o n.— India, mainland S.E. Asia, Malesia, Pacific.

E c o l o g y.— Primary to secondary rainforest or freshwater swamp forest. Soil: sand to clay to loam; 0–1600(–1800) m, usually in lowland. Flowering and fruiting throughout the year.

U s e s.— Arillode of all and fruit wall of some species edible, sour to sweet.

48 species; 12 species in Thailand, all, except one, present only in the Peninsular region. Classification: Subfam. Phyllanthoideae, tribe Antidesmeae, subtribe Scepinae.

KEY TO THE SPECIES

1. Leaves glabrous except for some very small stellate hairs on lower surface (use high magnification lens, check basal and upper part of midrib on lower side, especially with young leaves)
   2. Staminate flowers scattered along rachis. Fruits 35–73 mm in diam., yellow to brown. Stipules triangular. Stigmas cleft in 2 lobes **4. B. macrocarpa**
   2. Staminate flowers in top of rachis. Fruits 9–15 mm in diam., usually green. Stipules triangular to leaf-shaped. Stigmas not cleft **5. B. macrophylla**
1. Leaves glabrous or hairy below, with or without stellate hairs (long, stellately bundled simple hairs)
   3. (Most) leaves ovate, with black glands along midrib on lower surface or spread over lower leaf surface, also glands along margin (check several leaves)
      4. Terminalia branching pattern weak. Stellate hairs present next to simple ones (difficult to see). Sepals of more or less equal size. Staminate flowers caducous when opening, pedicelled. Fruits glabrescent outside, (sub)glabrous inside **1. B. bracteata**
      4. Terminalia branching pattern obvious. Only simple hairs present. Sepals all of different size. Staminate flowers not caducous, sessile. Fruits densely hairy outside and inside **6. B. minor**
   3. Leaves elliptic to obovate, lower surface without black glands on lower surface or only glands along margin
      5. Plants more or less densely hairy, at least branchlets, petioles and lower surface of leaves hairy
         6. Fruits indehiscent berries, 22–45 mm high when dry. Leaves basally narrowly heart-shaped **7. B. motleyana**

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[2] R.M.A.P. Haegens & P.C. van Welzen

6. Fruits dehiscent capsules or indiscent berries, latter up to 20 mm high. Leaves basally broadly cordate to rounded to cuneate or attenuate, never narrowly heart-shaped
   7. Young branchlets scaly (terminalia branching strong). Leaves basally cuneate (to rounded). Stipules 8–16 mm long. Staminate bracts 1.5–6 mm long. Pistillate sepals 4, 5.6–6.5 mm long. Fruits usually indehiscent berries or tardily splitting capsules **2. B. brevipes**
   7. Young branchlets smooth (terminalia branching weak). Leaves basally round to cordate (to attenuate). Stipules 2.2–10 mm long. Staminate bracts 0.2–1.3 mm long. Pistillate sepals 4 or 5, 0.5–5.9 mm long. Fruits dehiscing capsules **9. B. polyneura**
5. Plants giving a glabrous impression, branchlets, petioles and lower surface not all hairy together, some at most somewhat hairy
8. Leaves greenish grey (or greenish brown) when dry, (sub)glabrous. Inflorescences glabrous **3. B. lanceolata**
8. Leaves brown when dry, somewhat hairy to glabrous. Inflorescences hairy
   9. Staminate flowers crowded in inflorescence apex. Pistillate flowers geniculate (90°) with petiole **13. B. sumatrana**
   9. Staminate flowers along inflorescence. Pistillate flowers straight on petiole
      10. Staminate bracts (1.5–)3–4.5 mm long; bracteoles absent. Fruits indehiscent berries, globose to ovoid (pear-shaped). Pistillate inflorescences up to 10 cm long; flowers yellowish **12. B. ramiflora**
      10. Staminate bracts up to 1.6 mm long; bracteoles present. Fruits indehiscent berries, then with fusiform shape; or fruits with loculicidally dehiscing outer wall, these (sub)globose. Pistillate inflorescences up to 28 cm long, flowers white, greenish yellow, yellow or red
         11. Flowers yellow to white. Staminate inflorescences 3–10 cm long; staminate pedicel 0.4–3 mm long. Pistillate pedicels 1–2.9(–6.7) mm long. Fruits (sub)globose, not winged, outer wall loculicidally dehiscent **11. B. racemosa**
         11. Flowers yellow or white to red. Staminate inflorescences 4–28 cm long; staminate pedicel 0.4–6 mm long. Pistillate pedicel 1.5–6(–9) mm long. Fruits fusiform, usually 6-winged, indehiscent
      12. Inflorescences cauliflorous on basal part of trunk. Flowers yellowish to red **8. B. parviflora**
      12. Inflorescences cauliflorous to axillary. Flowers red **10. B. ptychopyxis**

1. Baccaurea bracteata Müll.Arg. in DC., Prodr. 15, 2: 466. 1866; Hook.f., Fl. Br. Ind. 5: 372. 1887; Airy Shaw, Kew Bull. 26: 219. 1972; Whitmore, Tr. Fl. Mal. 2: 76. 1973; Airy Shaw, Kew Bull. addit. ser. 4: 46. 1975.— *Baccaurea crassifolia* J.J.Sm., Bull. Jard. Bot. Buitenzorg 3, 1: 394. 1920.

T h a i l a n d.— PENINSULAR: Surat Thani (Khao Pu Thong, Ko Samui), Narathiwat (Kok Dan, Sirindhorn, Sungai Padee, To Daeng, Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, Borneo.

E c o l o g y.— Primary, secondary forest, freshwater swamp, peat swamp, heath swamp, kerangas, exceptionally in mangrove forest; soil: usually white sand; 0–40(–900) m. Flowering and fruiting throughout the year.

V e r n a c u l a r.— Kho raeng (ขอแรง), lafai pa (ละไฟป่า), mafai ling (มะไฟลิง) (Peninsular).

U s e s.— Aril and fruit wall edible, sour. In Sarawak and Sabah wood used for building.

2. Baccaurea brevipes Hook.f., Fl. Br. Ind. 5: 372. 1887; Whitmore, Tr. Fl. Mal. 2: 66. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 47. 1975.

T h a i l a n d.— PENINSULAR: Trang (Khao Chong, Khao Phap Pha), Satun (Khuan Kalong), Songkhla (Boriphat Falls, Kho Hong Hill), Pattani (To Mo), Narathiwat (Bannang Sta, Khao Nakharach, Khao Sam Nuk, Khao Shana, Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, N.W. Borneo.

E c o l o g y.— Primary and secondary forest, seasonal swamp forest; soil: sand, clay, granite; 20–700 m. Flowering December–April. Fruiting May, July–November.

V e r n a c u l a r.— Fai tao (ไฟเดา), la mai pa (ละไมป่า), ma fai (มะไฟ), mayom pa (มะยมป่า) (Peninsular).

U s e s.— Locally grown for its edible fruits.

N o t e.— Airy Shaw (Kew Bull. 26: 221. 1972) refers to this species as *Baccaurea velutina* (Ridl.) Ridl.

3. Baccaurea lanceolata (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 457. 1866; Hook.f., Fl. Br. Ind. 5: 368. 1887; Backer & Bakh.f., Fl. Java 1: 454. 1963; Airy Shaw, Kew Bull. 26: 220. 1972; Whitmore, Tr. Fl. Mal. 2: 65. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 49. 1975.— *Hedycarpus lanceolatus* Miq., Fl. Ind. Bat. 1, 2: 359. 1859.— *Pierardia pyrrhodasya* Miq., Sum.: 441. 1861.— *Adenocrepis lanceolatus* (Miq.) Müll. Arg., Linnaea 32: 82. 1863.— *Baccaurea pyrrhodasya* (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 462. 1866.— *B. glabriflora* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 59. 1922.

T h a i l a n d.— PENINSULAR: Nakhon Si Thammarat, Trang (Khao Chong), Pattani (Banang Sta, Kao Kalakiri), Narathiwat (Nikhom Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra, N Java (type), Borneo, Palawan.

E c o l o g y.— Primary and secondary forest, riverine forest, on slopes; soil: sandy clay to loam; 0–1300 m. Flowering March–December. Fruiting throughout the year.

V e r n a c u l a r.— Som huk (ส้มหูก), som lok (ส้มโหลก) (Peninsular).

U s e s.—In bamboo, pounded leaves drunk with water are used against stomach ache. Fruit wall and arillode edible but sour and, therefore, eaten with sugar or salt; particularly with chicken rice. Occasionally cultivated.

4. Baccaurea macrocarpa (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 457. 1866; Hook.f., Fl. Br. Ind. 5: 375. 1887; Airy Shaw, Kew Bull. Add. Ser. 4: 50.— *Pierardia macrocarpa* Miq., Sum.: 441. 1861.— *Mappa borneensis* Müll.Arg., Flora 47: 468. 1864.— *Baccaurea borneensis* (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 460. 1866.— *B. griffithii* Hook.f., Fl. Br. Ind. 5: 371. 1887.

T h a i l a n d.— PENINSULAR: Narathiwat (Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra (type), Borneo, Ambon, Irian Jaya.

E c o l o g y.— Primary rainforest, riverine forest, swamp forest, exceptionally in secondary forest; soil: granitic sand, sandy clay, red clay; 0–1600 m. Flowering and fruiting throughout the year.

V e r n a c u l a r.— Lang khae (ลังแข) (Peninsular).

U s e s.— Arillode edible, sweet to sour. Often cultivated. Fruits sold in markets.

5. Baccaurea macrophylla (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 460. 1866; Hook.f., Fl. Br. Ind. 5: 369. 1887; Airy Shaw, Kew Bull. 26: 220. 1972; Whitmore, Tr. Fl. Mal. 2: 66. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 51. 1975) 51.— *Pierardia macrophylla* Müll.Arg., Flora 47: 516. 1864.— *Baccaurea beccariana* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 62. 1922.

T h a i l a n d.— PENINSULAR.

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, Borneo, Molluccas.

E c o l o g y.— Primary and secondary rainforest, peat swamp forest; 0–650 m. Flowering February–July, October, November; Fruiting March, June–October.

V e r n a c u l a r.— Lam khae (ลำแข), lang khae (ลังแข), ma khae (มะแข) (Peninsular).

U s e s.— Arillode edible, sweet to sour.

6. Baccaurea minor Hook.f., Fl. Br. Ind. 5: 370. 1887; Airy Shaw, Kew Bull. 16: 342. 1963; Whitmore, Tr. Fl. Mal. 2: 66. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 51. 1975.— *Aporosa billitonensis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 97. 1922.— *Baccaurea pendula* Merr., Univ. Calif. Publ. Bot. 15: 152. 1929.

T h a i l a n d.— PENINSULAR: Narathiwat (Bala-Hala).

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, Borneo.

E c o l o g y.— Primary, old secondary, and bamboo forest, on ridges or slopes; soil: granite, yellow sand or yellow sandy loam; 0–1200 m. Flowering March–September. Flowering June–January.

V e r n a c u l a r.— Champu ning (จำปูนิ่ง) (Peninsular).

U s e s.— Arillode edible, sour-bitter. Wood used in house construction.

7. Baccaurea motleyana (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 461. 1866; Hook.f., Fl. Br. Ind. 5: 371. 1887; Backer & Bakh.f, Fl. Java 1: 454. 1963; Airy Shaw, Kew Bull. 26: 220. 1972; Whitmore, Tr. Fl. Mal. 2: 66. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 52. 1975.— *Pierardia motleyana* Müll.Arg., Flora 47: 516. 1864.— *Baccaurea pubescens* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 61. 1922.

T h a i l a n d.— PENINSULAR: Phangnga, Songkhla (Ban Pien), Pattani (Sai Khao waterfall), Narathiwat (Tak Bai).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra, Borneo (type), Moluccas (Halmahera).

E c o l o g y.— Primary and secondary rainforest, exceptionally riverine forest, often cultivated; soil: yellow clay, sand or limestone; 15–500 m. Flowering and fruiting more or less throughout the year.

V e r n a c u l a r.— Mafai farang (มะไฟฝรั่ง) (Central); la mai (ละไม), lam khae (ลำแข) (Pattani); rama ti-ku (รามาตี๊กู๊) (Malay-Narathiwat); rama (ระมะ), ramai (ระไม), ram-bai (รำไม), ram-be (รำแบ) (Malay-Peninsular).

U s e s.— Locally grown for its edible fruits; arillode edible, sour to sweet. Squeezed inner bark used for sore eyes.

8. Baccaurea parviflora (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 462. 1866; Kurz, Fl. Burm. 2: 357. 1877; Hook.f., Fl. Br. Ind. 5: 368. 1887; Airy Shaw, Kew Bull. 26: 220. 1972; Whitmore, Tr. Fl. Mal. 2: 64. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 52. 1975.— *Pierardia dasystachya* Miq., Fl. Ind. Bat. 1, 2: 358. 1859.— *P. parviflora* Müll.Arg., Linnaea 32: 82. 1863.— *Baccaurea dasystachya* (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 458. 1866.— *B. affinis* Müll.Arg. in DC., Prodr. 15, 2: 459. 1866.— *B. scortechinii* Hook.f., Fl. Br. Ind. 5: 368. 1887.— *B. singaporica* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xv: 54. 1922.— *B. rostrata* Merr., Univ. Calif. Publ. Bot. 15: 150. 1929.

T h a i l a n d.— SOUTH-WESTERN: Uthai Thani (Huai Khakhaeng); PENINSULAR: Chumphon (Ta Ngo), Ranong (Khlong Nakha, Khlong Nang Yon, Kraburi, Muang Len), Phangnga (Khao Phra Mi), Krabi (Khao Pra, Ko Lanta Yai), Nakhon Si Thammarat, Trang (Khao Chong, Ko Talibong), Satun, Songkhla (Khao Nam Kang, Kho Hong Hill), Pattani (Bukit), Narathiwat (Nikhom Waeng).

D i s t r i b u t i o n.— India (type), Thailand, Malay Peninsula, Sumatra, Borneo.

E c o l o g y.— Primary and secondary evergreen forest, riverine forest, dipterocarp forest with much bamboo, gingers, and *Donax grandis* in undergrowth; on steep hillsides to dry parts of swamps; soil: sandstone to white sandy soil; 0–1250 m. Flowering September, November–June. Fruiting March–December.

V e r n a c u l a r.— Mafai (มะไฟ), mafai ka (มะไฟกา), mafai tao (มะไฟเต่า), somfai din (ส้มไฟดิน), somfai pa (ส้มไฟป่า), Chinese lantern tree (Peninsular).

U s e s.— Fruit wall and arillode edible, sour-sweet. Wood used as box-wood.

9. Baccaurea polyneura Hook.f., Fl. Br. Ind. 5: 369. 1887; Whitmore, Tr. Fl. Mal. 2: 67. 1973; Airy Shaw, Kew Bull. 36: 265. 1981.— *Baccaurea kunstleri* King ex Gage, Rec. Bot. Surv. India 9, 2: 230. 1922; Airy Shaw, Kew Bull. 26: 219. 1972.— *B. hookeri* Gage, Rec. Bot. Surv. India 9: 232. 1922.— *B. cordata* Merr., Univ. Calif. Publ. Bot. 15: 147. 1929.

T h a i l a n d.— PENINSULAR: Surat Thani (Pachang), Phangnga (Kao Nanghong), Krabi (Kao Panom), Nakhon Si Thammarat (Gahrome Falls, Khao Luang, Yong falls, Wat Kiriwong), Trang (Khao Chong), Satun (Klong Ton).

D i s t r i b u t i o n.— Thailand, Malay Peninsula (type), Sumatra, Borneo.

E c o l o g y.— Primary and secondary forest, swamp forest; soil: sand, clay, loam, granite; 20–600 m. Flowering and fruiting throughout the year.

V e r n a c u l a r.— Chamrai (จำไร), chamri (จำรี), kacham puling (กะจำปูลิง), lam yai khao (รำไยเขา), mafai ling (มะไฟลิง) (Peninsular).

U s e s.— Arillode edible, sweet to sour.

10. Baccaura ptychopyxis Airy Shaw, Kew Bull. 21: 354. 1968.

T h a i l a n d.— PENINSULAR: Chumphon (Tasan), Ranong (Khao Num Kao, Kra Buri), Surat Thani (Khian Sa, Pa-Kiampoa), Nakhon Si Thammarat (Khao Khaichang), Phatthalung (Chong, Klong Hin Kao), Trang (Khao Chong), Satun (Kuan Kalong).

D i s t r i b u t i o n.— Bangladesh, Myanmar (type), Thailand.

E c o l o g y.— Evergreen and swamp forest; 1–200 m. Flowering January–March, December. Fruiting January.

V e r n a c u l a r.— Fai tao (ไฟเตา), mafai ka (มะไฟกา), somfai din (ส้มไฟดิน) (Peninsular).

11. Baccaurea racemosa (Reinw. ex Blume) Müll.Arg. in DC., Prodr. 15, 2: 461. 1866; Backer & Bakh.f, Fl. Java 1: 454. 1963; Whitmore, Tr. Fl. Mal. 2: 64. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 53. 1975; Lemmens et al., Prosea 3: 16. 1991.— *Coccomelia racemosa* Reinw. ex Blume, Cat.: 110. 1823.— *Pierardia racemosa* (Reinw. ex Blume) Blume, Bijdr.: 579. 1825.— *P. racemosa* (Reinw. ex Blume) Miq., Fl. Ind. Bat. 1. 2: 358. 1859.— *Baccaurea wallichii* Hook.f., Fl. Br. Ind. 5: 375. 1887.— *B. bhaswatii* Chakrab. & Gang., J. Econ. Taxon. Bot. 18: 420. 1994.

T h a i l a n d.— PENINSULAR: Trang (Khao Chong), Narathiwat (Nikom Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra, Java (type), Bali, Borneo, Sulawesi.

E c o l o g y.— Primary and secondary rainforest, riverine forest, fresh water swamp forest; soil: yellow or red sandy clay, granite. Flowering March–May, October. Fruiting throughout the year.

U s e s.— Arillode edible, sour to sweet.

12. Baccaurea ramiflora Lour., Fl. Cochinch.: 661. 1790; Gagnep., Fl. Gén. I.-C. 5: 551. 1927; Airy Shaw, Kew Bull. 26: 221. 1972; Whitmore, Tr. Fl. Mal. 2: 65. 1973.— *Baccaurea cauliflora* Lour., Fl. Cochinch.: 661. 1790.— *Pierardia sapida* Roxb., Fl. Ind. ed. 2: 254. 1832.— *Baccaurea sapida* (Roxb.) Müll.Arg. in DC., Prodr. 15, 2: 459. 1866.— *Baccaurea flaccida* Müll.Arg. in DC., Prodr. 15, 2: 459. 1866.— *B. propinqua* Müll.Arg. in DC., Prodr. 15, 2: 463. 1866.— *B. wrayi* King ex Hook.f., Fl. Br. Ind. 5: 374. 1887.— *B. oxycarpa* Gagnep., Bull. Soc. Bot. France 23: 431. 1923.— *Gatnaia annamica* Gagnep., Bull. Soc. Bot. France 24: 870. 1924.

T h a i l a n d.— NORTHERN: Chiang Mai, Phrayao, Lampang, Phrae, Sukothai, Phitsanulok; NORTH-EASTERN: Phetchabun, Loei, Kalasin, Khon Kaen; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Kanchanaburi; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chachoengsao, Chon Buri, Chanthaburi, Trat; PENINSULAR: Chumphon, Ranong, Surat Thani, Phangnga, Nakhon Si Thammarat, Trang, Satun, Songkhla, Narathiwat.

D i s t r i b u t i o n.— India (Assam), Myanmar, Thailand, Laos, China (Yunnan, Hainan), Vietnam (type), Malay Peninsula, Andaman and Nicobar Islands.

E c o l o g y.— Primary rain forest, often cultivated; soul: sand, granite; 50–1700 m. Flowering December–June, September; fruiting throughout theyear.

V e r n a c u l a r.— Mafai (มะไฟ) (General); mafai duean ha, khi mi (ขี้หมี), sae-khuea-sae (แซเครือแซ) (Karen-Mae Hong Son) (Northern); hamkang (หัมกัง) (North-eastern); pha-yiu (ผะยิ้ว) (Khmer-Surin) (Eastern); mafai pa (มะไฟป่า) (Eastern, South-eastern), mafai ka (มะไฟกา), som fai (ส้มไฟ) (Peninsular).

U s e s.— Arillode edible, sweet to sour.; in northern regsions used by hilltribes for medicine. Bark, rood bark and wood are used in a decoction of dried and ground material.

13. Baccaurea sumatrana (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 466. 1866; Whitmore, Tr. Fl. Mal. 2: 65. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 55. 1975; G.L.Webster, Ann. Missouri Bot. Gard. 81: 51. 1994.— *Calyptroon sumatranum* Miq., Sum.: 472. 1861.— *Baccaurea kingii* Gage, Rec. Bot. Surv. India 9: 231. 1922.— *B. bivalvis* Merr., Univ. Calif. Publ. Bot. 15: 148. 1929.

T h a i l a n d.— PENINSULAR: Narathiwat (Tak Bai).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra (type), Borneo.

E c o l o g y.— Primary and secondary forest; soil: sand, sandy clay; 0–1550 m. Flowering March–November. Fruiting throughout the year.

U s e s.— Used as timber wood.

BREYNIA[3]

J.R. & G.Forst., Char. Gen. Pl.: 145. 1776, nom. cons.; Müll.Arg. in DC., Prodr. 15, 2: 438. 1866; Airy Shaw, Kew Bull. 26: 224. 1972; Whitmore, Tr. Fl. Mal. 2: 73. 1973; G.L. Webster, Ann. Missouri Bot. Gard. 81: 46. 1994.— *Melanthesa* Blume, Bijdr.: 590. 1826.— *Melanthesopsis* Müll.Arg., Linnaea 32: 74. 1863.

25 Species from China to New Caledonia and Australia; 6 in Thailand. Classification: Subfam. Phyllanthoideae, tribe Phyllantheae, subtribe Flueggeinae.

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[3] P.C. van Welzen & H.-J. Esser

KEY TO THE SPECIES

1. Plants tomentose **1. B. discigera**
1. Plants glabrous
2. Calyx of pistillate flowers enlarging in fruit, 3.5–14 mm in diam. Leaves (ovate to) elliptic, papery, basally asymmetric, rather small, 0.752(–3.3) by 0.3–1.5 cm. Stigmas usually united into a style **5. B. retusa**
2. Calyx of pistillate flowers not enlarging in fruit, 1.6–6.7 mm diam. Leaves ovate, papery to coriaceous, (usually) symmetric, usually larger, 1.9–7.8 by 1.2–4.3.3 cm. Stigmas separate, not united
3. Androphore 1–1.1 mm long. Stigmas ca. 0.2 mm long, pointing towards each other. Leaves apically obtuse, 1.9–5.5 by 1.2–3.1 cm, papery or coriaceous. (Pistillate flowers usually single)
4. Leaves coriaceous, margin recurved. Pistillate flowers subsessile, pedicel 0.5–1.8 (in fruit) mm long; ovary obconical **4. B. racemosa**
4. Leaves papery, margin flat. Pistillate flowers pedicelled, pedicel 2.5–4 (in fruit) mm long; ovary cylindrical **6. B. vitis-idaea**
3. Androphore 1.8–2.2 mm long. Stigmas 1.1–1.3 mm long, pointing upwards or recurved. Leaves apically acute to acuminate, 2.3–7.8 by 1.3–4.3 cm, coriaceous. (Pistillate flowers usually in groups)
5. Calices outside not glaucous when dry. Styles recurving in older pistillate flowers and fruits. (Leaves shortly acute to acuminate) **2. B. fruticosa**
5. Calices outside very glaucous when dry. Styles straight in older pistillate flowers and fruits. (Leaves relatively long-acuminate) **3. B. glauca**

1. Breynia discigera Müll.Arg. in DC., Prodr. 15, 2: 440. 1866; Hook.f., Fl. Br. Ind. 5: 331. 1887; Airy Shaw, Kew Bull. 26: 225. 1972; Whitmore, Tr. Fl. Mal. 2: 73. 1973.— *Melanthesa racemosa* Blume var. *pubescens* Müll.Arg., Linnaea 32: 73. 1863.— *M. rhamnoides* Blume var. *pubescens* Müll.Arg., Linnaea 32: 74. 1863.— *Breynia rhamnoides* (Blume) Müll.Arg. var. *pubescens* (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 441. 1866.

T h a i l a n d.— PENINSULAR: Songkhla (Hat Yai, Kho Hong Hill).

D i s t r i b u t i o n.— S. Thailand, Malay Peninsula (Singapore, type), Sumatra.

E c o l o g y.— Open thickets and margin of secondary forest; 30–300 m.

2. Breynia fruticosa (L.) Hook.f., Fl. Br. Ind. 5: 331. 1887, *in obs.*; Beille in Fl. Gén. I.-C. 5: 632. 1927; Airy Shaw, Kew Bull. 26: 225. 1972.— *Andrachne fruticosa* L., Sp. Pl.: 1014. 1753.— *Phyllanthus lucens* Poir., Encycl. Méth. Bot. 5: 296. 1804.— *Melanthesa chinensis* Blume, Bijdr.: 592. 1825.— *Phyllanthus turbinatus* Sims, Bot. Mag. 44: t. 1862. 1826.— *Melanthesopsis lucens* (Poir.) Müll.Arg., Linnaea 32: 75. 1863.— *M. fruticosa* (L.) Müll.Arg. in DC., Prodr. 15, 2: 437. 1866, *tantum quoad synon.*

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Sutep), Lampang (Huai Tak); NORTH-EASTERN: Loei (Phu Kradueng, Phu Paek), Mukdahan (Phu Hin Turb); EASTERN: Chaiyaphum (Nong Bua Daeng), Buri Ram, Si Sa Ket (Uthom Phon Phisai); PENINSULAR: Surat Thani (Ko Pangan).

D i s t r i b u t i o n.— China (type), Indochina, and Thailand.

E c o l o g y.— Understorey of evergreen forest, dry deciduous dipterocarp forest, mixed deciduous scrub in savannah, margin of forest, along open roadsides and rivers, thickets; soil: sandstone, granitic bedrock; 300–1300 m.

3. Breynia glauca Craib, Bull. Misc. Inf. Kew: 460. 1911; Aberdeen Univ. Stud. 57: 187. 1912; Beille in Fl. Gén. I.-C. 5: 633. 1927; Airy Shaw, Kew Bull. 26: 226. 1972

T h a i l a n d.— NORTHERN: Chiang Mai, Chiang Rai, Phayao, Nan, Lamphun, Lampang, Phrae, Phitsanulok, Kamphaeng Phet; NORTH-EASTERN: Phetchabun, Loei, Udon Thani, Khon Kaen; EASTERN: Chaiyaphum; SOUTH-WESTERN: Phetchaburi, Prachuap Khiri Khan; SOUTH-EASTERN: Chon Buri, Rayong, Chanthaburi, Trat; PENINSULAR: Chumphon, Surat Thani.

D i s t r i b u t i o n.— Myanmar, Laos, Thailand (type: Doi Suthep, Chiang Mai, KERR 864, BM, K, iso), Borneo (Sabah, Anamba Islands).

E c o l o g y.— Dry deciduous Dipterocarp-oak forest, dry evergreen forest, oak-pine forest, coastal sand dune forest, gallery forest, hill evergreen forest, transition with *Melaleuca* swamp forest, secondary thickets and forest, roadsides; soil: granitic, shale or sandstone bedrock, sandy, even on poor or bare soil. Alt.: sea level to 1300 m.

V e r n a c u l a r.— Cha sisiat (จ้าสีเสียด), dap phit (ด้ับพิษ), phak wan dang (ผักหวานด่าง), ra-ngap phit (ระงับพิษ), phak wan man (ผักหวานมัน) (Northern); prik (ปริก) (South-western).

N o t e.— Airy Shaw (1972) mentioned that *Breynia glauca* is the western vicariant (Myanmar, Thailand, and W. Laos) of the more eastern and north-eastern *B. fruticosa* (China, Indochina, Thailand). This could be confirmed. Both species do not seem to overlap in their range. The styles consitute the main difference, and they are hardly distinguishable otherwise.

4. Breynia racemosa (Blume) Müll.Arg. in DC., Prodr. 15, 2: 441. 1866; Airy Shaw, Kew Bull. Add. Ser. 4: 62. 1975.— *Melanthesa racemosa* Blume, Bijdr.: 592. 1825.— *Phyllanthus reclinatus* Roxb., Fl. Ind. ed. 2, 3: 669. 1832.— *Melanthesa rhamnoides* Blume var. *hypoglauca* Müll.Arg., Linnaea 32: 73. 1863.— *M. reclinata* (Roxb.) Müll. Arg., Linnaea 32: 74. 1863.— *M. acuminata* Müll.Arg., Linnaea 32: 74. 1863.— *Breynia rhamnoides* (Blume) Müll.Arg. var. *hypoleuca* (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 440. 1866.— *B. acuminata* (Müll.Arg.) Müll.Arg. in DC., Prodr. 15, 2: 442. 1866.— *B. reclinata* (Roxb.) Hook.f., Fl. Br. Ind. 3: 331. 1887; Airy Shaw, Kew Bull. 26: 226. 1972; Whitmore, Tr. Fl. Mal. 2: 73. 1973.

T h a i l a n d.— PENINSULAR: Ranong (Kaper), Narathiwat (Kuchum, Sirindhorn).

D i s t r i b u t i o n.— S. Thailand, Malay Peninsula, Sumatra, Java (type), Borneo, Philippines, Lesser Sunda Islands.

E c o l o g y.— In scrub, forest edges, along path near beach forest; 0–2500 m.

V e r n a c u l a r.— Kangpla (ก้างปลา) (Peninsular).

5. Breynia retusa (Dennst.) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 204. 1929; in Trimen, Handb. Fl. Ceylon 6, Suppl.: 261. 1931; Airy Shaw, Kew Bull. 26: 227. 1972; P.T. Li, Fl. Reipubl. Pop. Sin. 44(1): 181, pl. 54 figs. 1, 4. 1994; Chakrab. & Gangopad., J. Econ. Tax. Bot. 20: 505, fig. 3. 1996.— *Phyllanthus retusus* Dennst., Schlüss. Hort.

Malab.: 1. Register: 15; 2. Register: 24; 3. Register: 31. 1818.— *Phyllanthus turbinatus* J. König ex Roxb. [Hort. Bengal.: 104. 1814] Fl. Ind. ed. 1832, 3: 666, Fl. Ind. ed. 2, 3: 666. 1832, *nom. illeg.*— *P. patens* Roxb., Fl. Ind. ed. 2, 3: 667. 1832.— *Melanthesa retusa* (Dennst.) Kostel., Allg. Med.-Pharm. Fl. 5: 1771. 1836.— *M. turbinata* (J. König ex Roxb.) Wight, Icon. Pl. Ind. Orient. 5(2): 26. 1852, *nom. illeg.*— *Melanthesopsis variabilis* Müll. Arg., Linnaea 32: 75. 1863, *nom. illeg.*— *M. patens* (Roxb.) Müll.Arg. in DC., Prodr. 15, 2: 437. 1866.— *Breynia patens* (Roxb.) Rolfe, J. Bot. 11: 859. 1882.— *B. angustifolia* Hook.f., Fl. Br. Ind. 5: 330. 1887; Airy Shaw, Kew Bull. 26: 225. 1972; Whitmore, Tr. Fl. Mal. 2: 73. 1973.— *B. hyposauropus* Croizat, J. Arnold Arb. 21: 493. 1940.— *B. microphylla* (Kurz ex Teijsm. & Binnend.) Müll.Arg. var. *angustifolia* (Hook. f.) Airy Shaw, Kew Bull. 36: 272. 1981.

T h a i l a n d.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Phayao, Nan, Lamphun, Lampang, Phrae, Tak, Phitsanulok, Nakhon Sawan; NORTH-EASTERN: Loei, Nong Khai; EASTERN: Chaiyaphum, Si Sa Ket; SOUTH-WESTERN: Uthai Thani, Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Saraburi; SOUTH-EASTERN: Chon Buri, Chanthaburi, Trat; PENINSULAR: Ranong, Phangnga, Phuket, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla.

D i s t r i b u t i o n.— India (type), Sri Lanka, Bhutan, Nepal, Myanmar, S.W. China, Thailand, Indochina, Peninsular Malaysia.

E c o l o g y.— In oak-pine forest, dry Dipterocarp forest, secondary thickets and forest, also seasonally burned, tea and pine plantations, degraded dry to wet and bamboo-rich evergreen forest, seasonal mixed evergreen/deciduous forest, on rocky places and slopes, along rivers; soil: alluvial, sandy, on shale, phyllite, limestone, granite or sandstone bedrock. Alt.: 100–1360 m.

V e r n a c u l a r.— Khram-nam (คราม น้ำ) (Shan-Mae Hong Son), kao chan (เกาจั่น), na-kho-the (นะฆอที) (Karen-Mae Hong Son) (Northern); la po (ลาโป) (South-western); phong (พอง), ra-ngap (ระงับ) (South-eastern); kangpla khao (ก้างปลาขาว) (Peninsular).

N o t e.— *Breynia angustifolia* and *B. retusa* are certainly synonymous. Airy Shaw (1972) recognised both species, because there is indeed some variation within Thailand. In Chiang Mai, the fruits are slightly smaller and the calyx somewhat more enlarging than elsewhere. There are however no names available to describe this variability.

6. Breynia vitis-idaea (Burm.f.) C.E.C. Fischer, Bull. Misc. Inf. Kew: 65. 1932; Airy Shaw, Kew Bull. 26: 227. 1972; Whitmore, Tr. Fl. Mal. 2: 73. 1973.— *Rhamnus vitis-idaea* Burm.f., Fl. Ind.: 61. 1768.— *Phyllanthus rahmnoides* Willd., Sp. Pl. 4: 580. 1805.— *Breynia rhamnoides* (Willd.) Müll.Arg. in DC., Prodr. 15, 2: 440. 1866.— *B. officinalis* Hemsl., J. Linn. Soc. 26: 427. 1894.— *B. accrescens* Hayata, J. Coll. Sci. Tokyo 20: 22. 1904.— *B. keithii* Ridl., J. Str. Br. Roy. As. Soc. 59: 174. 1911.— *B. microcalyx* Ridl., J. Fed. Mal. States Mus. 10: 114. 1920.

T h a i l a n d.— NORTHERN: Chiang Mai (Ban Pong Noi), Lamphun (Ban Muang Nga); EASTERN: Nakhon Ratchasima (Khao Yai National Park); CENTRAL: Saraburi (Khao Yai National Park), Nakhon Nayok (Khao Yai National Park); SOUTH-EASTERN: Prachin Buri (Khao Yai National Park), Trat (Ko Chang); PENINSULAR: Chumphon (Khao Kapoe), Surat Thani (Ko Pha-ngan), Phangnga (Khalong Nang Yon), Krabi (Krabi), Songkhla (Lake), Satun.

D i s t r i b u t i o n.— India, Sri Lanka (type) to Taiwan, Ryu-Kyu Islands, Malay Peninsula, and the Philippines.

E c o l o g y.— Evergreen forest, edge of forest, clearings in forest and mangrove, swamp forest, bamboo thickets, along rivers and roads, near beach; usually scattered; 0–800 m.

V e r n a c u l a r.— Dap phit (ดับพิษ), phia fan (เพียฟาน) (Northern); kangpla thale (ก้างปลาทะเล), phak wan tua phu (ผักหวานตัวผู้) (Central).

U s e s.— Leaves are used fresh or mashed topically against 'Fii' in the North.

EXCOECARIA[4]

L., Syst Nat. ed. 10: 1288. 1759; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 157. 1912; Airy Shaw, Kew Bull. 26: 268. 1972; Whitmore; Tr. Fl. Mal. 2: 96. 1973; G.L. Webster, Ann. Missouri Bot. Gard. 81: 122. 1994; Esser, Nord. J. Bot. 16: 579. 1996.— *Commia* Lour., Fl. Cochinchin.: 605. 1790.— *Glyphostylus* Gagnep., Bull. Soc. Bot. France 71: 871. 1925; Airy Shaw, Kew Bull. 26: 281. 1972.

According to Webster (1994) a paleotropical genus of 40 species (mainly in Southeast Asia), but according to Chakrabarty (1994) only check species exit; five in Thailand, with two apparent pairs (*E. cochinchinensis* and *E. laotica* and *E. bantamensis* and *E. oppositifolia*; *E. agallocha* is separate). Classification: Subfam. Euphorbioideae, tribe Hippomaneae, subtribe Hippomaninae.

KEY TO THE SPECIES

1. Plants dioecious. Leaves alternate, with basally two glands in the margin at either side of the petiole. Staminate flowers in very dense catkins. Mangrove, littoral **1. E. agallocha**
1. Plants monoecious. Leaves alternate or opposite, without basal glands in the margin. Staminate flowers in open racemes or in heads
2. Flowers in condensed heads, one or two pistillate and many staminate **4. E. laotica**
2. Flowers in racemes, either with basally a few pistillate flowers and apically many staminate ones, or racemes with one type of flower only
3. Leaves alternate or opposite, (elliptic to) obovate. Inflorescences with basally a few pistillate flowers and apically many staminate ones. Staminate sepals 0.6–1 by 0.3–0.4 mm, pistillate ones 1.2–1.5 by 1–1.3 mm. Fruits less than 1 cm broad **3. E. cochinchinensis**
4. Leaves purplish red beneath **3a.** var. **cochinchinensis**
4. Leaves green beneath **3b.** var. **viridis**

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3. Leaves all opposite, elliptic. Inflorescences with one type of flower only. Staminate sepals 1.1–1.2 by 0.8–1.1 mm; pistillate ones 1.4–1.5 by 1.7–2 mm. Fruits more than 2 cm broad
   5. Staminate bracts with two basal glands; pistillate bracts with 2 very large basal glands, continuing over rachis. Fruits several on an inflorescence, 3–4 cm wide **2. E. bantamensis**
   5. Staminate bracts without glands; pistillate bracts not seen. Fruits single per inflorescence, 4-6 cm wide **5. E. oppositifolia**

1. Excoecaria agallocha L., Sp. Pl. ed. 2: 1451. 1763; Müll.Arg. in DC., Prodr. 15, 2: 1220. 1866; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 165. 1912; Airy Shaw, Kew Bull. 26: 268. 1972; Whitmore, Tr. Fl. Mal. 2: 96. 1973.— *Commia cochinchinensis* Lour., Fl. Cochinch.: 606. 1790.— *Excoecaria camettia* Willd., Sp. Pl. 4: 864. 1805.— *E. affinis* Endl., Prod. Fl. Norfolk.: 83. 1833.— *Stillingia agallocha* (L.) Baill., Étude Euphorb.: 518. 1858.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan (Sam Roi Yot); CENTRAL: Samut Sakhon; SOUTH-EASTERN: Chanthaburi (Khung Kra Ben, Tha Chalat), Trat (Ko Chang); PENINSULAR: Trang, Satun (Ko Tarutao), Songkhla (Lake, Yaw Island), Narathiwat.

D i s t r i b u t i o n.— S. India and Sri Lanka to Taiwan and the Ryu-Kyu Islands, and throughout S.E. Asia and Malesia to the Pacific.

E c o l o g y.— Common in mangrove, tidal forest, cleared forest, brackish areas, rice fields; soil: mud, sand; 0(–50) m. Said to be poisonous.

V e r n a c u l a r.— Tatum (ตาตุม), tatum thale (ตาตุ่มทะเล) (General); bù-to (บูตอ) (Malay-Pattani) (Peninsular).

2. Excoecaria bantamensis Müll.Arg., Linnaea 32: 124. 1863; in DC., Prodr. 15, 2: 1219. 1866; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 161. 1912; Airy Shaw, Kew Bull. 26: 269. 1972.— *Excoecaria macrophylla* J.J.Sm., Meded. Dep. Landb. Ned.-Indië 10: 611. 1911.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan (Huai Wa Ton); SOUTH-EASTERN: Chanthaburi (Pong Nam Ron).

D i s t r i b u t i o n.— Thailand, Java.

E c o l o g y.— Evergreen forest. Altitude 20–600 m.

V e r n a c u l a r.— Tatum pa (ตาตุ่มป่า) (South-western); koh-ka-pue (เก๊าะกาปือ) (Khmer-Chanthaburi) (South-eastern).

3. Excoecaria cochinchinensis Lour., Fl. Cochinch.: 612. 1790; Müll.Arg. in DC., Prodr. 15, 2: 1215: 1866; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 160. 1912; Airy Shaw, Kew Bull. 26: 269. 1972; Whitmore, Tr. Fl. Mal. 2: 97. 1973.— *Antidesma bicolor* Hassk., Cat. Hort. Bog.: 81. 1844.— *Excoecaria bicolor* (Hassk.) Zoll. & Hassk., Retzia 1: 158. 1855.— *E. bicolor* (Hassk.) Zoll. & Hassk. var. *purpurascens* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 159. 1912.

a. var. **cochinchinensis**

D i s t r i b u t i o n.— Originally from Indochina, now widely cultivated. No specimens seen from Thailand, but might be present as an ornamental.

V e r n a c u l a r.— Ka buea (กะเบือ) (South-western); kamlang krabue (กำลังกระบือ), lin krabue (ลิ้นกระบือ) (Central).

U s e s.— Used as an ornamental shrub due to its two coloured leaves.

b. var. **viridis** (Pax & K.Hoffm.) Merr., Philipp. J. Sci. 15: 244. 1919.— *Excoecaria quadrangularis* Müll.Arg. in DC., Prodr. 15, 2: 1219. 1866.— *E. bicolor* (Hassk.) Zoll. & Hassk. var. *viridis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 159. 1912.— *E. orientalis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 160. 1912.— *E. bicolor* (Hassk.) Zoll. & Hassk. var. *orientalis* (Pax & K.Hoffm.) Gagnep. in Fl. Gén. I.-C. 5: 406. 1926.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Angka, Doi Inthanon); NORTH-EASTERN: Loei (Phu Kradueng), Nakhon Phanom (Phu Langka), Khon Kaen (Donglen); EASTERN: Chaiyaphum (Nam Phrom), Nakhon Ratchasima (Khao Yai National Park, Salika Forest); SOUTH-WESTERN: Kanchanaburi (Erawan), Prachuap Khiri Khan (Bang Saphan, Huai Hin Chuang); SOUTH-EASTERN: Chanthaburi; PENINSULAR: Phangnga (Luk Sua Cave), Krabi (Khao Pra-Bang Kram), Nakhon Si Thammarat (Yong Waterfall), Pattani (Sai Khao Waterfall).

D i s t r i b u t i o n.— Myanmar, Thailand, Malay Peninsula, S. China and perhaps Taiwan.

E c o l o g y.— Evergreen forest, mixed or deciduous forest or scrub, secondary forest, often by streams; scattered to locally common; soil: sandstone; 0–1520 m.

V e r n a c u l a r.— Tatum kai (ตาตุ่มไก่), tatum nok (ตาตุ่มนก) (South-western); krabue chet tua (กระบือเจ็ดตัว), lin krabue khao (ลิ้นกระบือขาว) (Central, Eastern).

U s e s.— Latex is said to be poisonous, irritating the skin and mucous membranes.

4. Excoecaria laotica (Gagnep.) Esser, Nord. J. Bot. 16: 580. 1996.— *Glyphostylus laoticus* Gagnep., Bull. Soc. Bot. Fr. 71: 871. 1925; Airy Shaw, Kew Bull. 26: 281. 1972.

T h a i l a n d.— EASTERN: Nakhon Ratchasima (Khao Phrik); NORTH-EASTERN: Loei (Phu Kradueng), Khon Kaen (Dong Lan); SOUTH-WESTERN: Kanchanaburi (Erawan National Park); PENINSULAR: Pattani (Sai Khao Falls).

D i s t r i b u t i o n.—Laos (type), Thailand.

E c o l o g y.— Dry evergreen forest, moist deciduous forest, disturbed primary evergreen forest, along streams; locally common; soil: limestone; 50–600 m.

5. Excoecaria oppositifolia Griff., Calcutta J. Nat. Hist. 4: 386. 1844; Müll.Arg. in DC., Prodr. 15, 2: 1219. 1866; Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.v: 161. 1912; Airy Shaw, Kew Bull. 26: 270. 1972; Whitmore, Tr. Fl. Mal. 2: 96. 1973.

T h a i l a n d.— NORTHERN: Nan (Doi Pa Chang), Lampang (Mae Ping, Wang Fen); NORTH-EASTERN: Loei (Pa Pakchom); EASTERN: Nakhom Ratchasima (Khao Yai National Park); SOUTH-EASTERN: Chanthaburi (Khao Soi Dao Tai, Pong Nam Ron).

D i s t r b u t i o n.—Assam (type), Myanmar, Thailand, Indochina.

E c o l o g y.—Evergreen forest, mixed deciduous forest, usually along streams: soil: varying from acid rock to shale to limestone; 80–800 m.

V e r n a c u l a r.—Tang ta bot (ตังตาบอด), yang ron (ยางร้อน) (Northern); fai duean ha (ไฟเดือนห้า) (Peninsular).

GLOCHIDION[5]

J.R. & G.Forst., Char. Gen. Pl.: 113, t.57. 1776, nom. cons.; Hook.f., Fl. Br. Ind. 5: 305. 1887; Beille in Fl. Gén. I.-C. 5: 608. 1927; Airy Shaw, Kew Bull. 26: 271. 1972; Whitmore, Tr. Fl. Mal. 2: 98. 1973; G.L. Webster, Ann. Missouri Bot. Gard. 81: 46. 1994.— *Agyneia* L., Mant. Pl. 2: 161. 1771.— *Bradleja* Banks ex Gaertn., Fruct. 2: 127. 1790.— *Gynoon* A.Juss., Mém. Mus. Hist. Nat. Paris 10: 335. 1823.— *Glochidionopsis* Blume, Bijdr.: 588. 1826.— *Glochisandra* Wight, Ic. 5: 26. 1852.— *Zarcoa* Llanos, Bot. Zeit. 15: 423. 1857.— *Coccoglochidion* K.Schum., Nachtr. Fl. Schutzgeb.: 292. 1905.— *Hemiglochidion* (Müll.Arg.) K.Schum., Nachtr. Fl. Schutzgeb.: 289. 1905.— *Tetraglochidion* K.Schum., Nachtr. Fl. Schutzgeb.: 291. 1905.

200–300 Species, mainly from India to S. China, S.E. Asia, Malesia, Australia, W. Pacific. According to some authors also several species in Madagascar and in South America; 24 species in Thailand. Often regarded as an offshoot of *Phyllanthus*. Classification: Subfamily Phyllanthoideae, tribe Phyllantheae, subtribe Flueggeinae.

KEY TO THE SPECIES

1. Stems glabrous (if in doubt follow one of these leads)
   2. Apex of leaves emarginate to rounded. Ovary 10–14-locular. Fruits not lobed, glabrous, with depressed sutures, wall woody. Seeds superposed. SE, P **14. G. littorale**
   2. Apex of leaves (obtuse to) (bluntly) acute to cuspidate. Ovary 3–7-locular. Fruits lobed or not, glabrous or hairy, with indistinct sutures, wall chartaceous. Seeds next to each other (or superposed: *G. lanceolarium*, then leaves acuminate)
      3. Inflorescences supra-axillary fascicles or cymes on a peduncle
         4. Leaves 7–19.5 by 4–10.5 cm. Staminate sepals not falcate; stamens 6. Ovary 6-locular. Fruits not lobed, 10–11.5 by ca. 6 mm. N, SW **9. G. hongkongense**
         4. Leaves 3.2–9 by 1.1–3.7 cm. Staminate sepals falcate; stamens 3. Ovary 3- or 4-locular. Fruits hardly lobed, 4.8–5.8 by 2.5–5 mm. E, P **10. G. hypoleucum**
      3. Inflorescences axillary, fascicles sessile. Stamens 3. Ovaries 3–5-locular
         5. Stigmas wider than high. If only staminate flowers present:
            - in case leaves (somewhat ovate to) elliptic then either leaf base slightly asymmetric or when very asymmetric petiole up to 3 mm long (*G. glomerulatum* basally very asymmetric leaves, petiole 5–7 mm long)
            - in case leaves ovate (broadest in lower third) then either petiole up to 3 mm long or when petiole 5–5.5 mm long: staminate sepals ovate (*G. sphaerogynum* with 5–8 mm long petioles, obovate sepals)

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6. Leaves ovately elliptic. Staminate sepals ovate to elliptic, outer ones 2.5–3.5 mm long; pedicel 2.5–6.2 mm long. Pistillate pedicel absent to 1.4 mm in fruit; stigmas united into a low, broad cone. Fruits hairy, slightly lobed, ca. 5 mm in diameter—E, P **7. G. glomerulatum**

6. Leaves ovate, often falcate. Staminate sepals obovate, outer ones 1.7–2.2 mm long; pedicel 6–13.5 mm long. Pistillate pedicel 1.2 to 3 mm in fruit; stigmas completely flat. Fruits glabrous, lobed, 9.5–10 mm in diameter N, NE, E **22. G. sphaerogynum**

5. Stigmas higher than wide

7. Leaves elliptic (or when somewhat ovate, widest above lower third)

8. Leaves basally (acroscopic side broader) and apically (basiscopic side broader) clearly asymmetric. Stamens 4. Stigmatic cone apically strongly broadening. P **20. G. santisukii**

8. Leaves mainly basally asymmetric. Stamens 3 or 4. Stigmatic cone apically not or hardly broadening

9. Leaves thick, coriaceous, margin revolute. Stamens 4(–ca .10). Ovary (5–)7-locular. Fruits 12–21 mm in diameter N, NE, E, C, SE, SW **13. G. lanceolarium**

9. Leaves thin, chartaceous, margin flat. Stamens 3. Ovary 3–5-locular. Fruits 6–9 mm in diameter

10. Stipules 2.5–3 mm long. Petiole 3–6.5 mm long. Leaves 1.8–6.4 cm wide. Staminate flowers 4.5–5.5 mm in diameter. Ovary (3)4(5)-locular, stigmatic cone 0.7–1.2 mm long, teeth hardly distinct. Fruits not lobed to somewhat lobed around locules N, NE, E, C, SW **3. G. assamicum**

10. Stipules 3–4 mm long. Petioles 1.5–3 mm long. Leaves 1–3.8(–4.8) cm wide. Staminate flowers 3.5–4.2 mm in diameter. Ovary 3(–5)-locular; stigmatic cone 2.2–2.6 mm long, teeth very distinct, ca. $^{1}/_{3}^{rd}$ of cone. Fruits lobed around seeds (to around locules). N, E, SE, SW, P **19. G. rubrum**

7. Leaves ovate (to falcate), broadest in lower third

11. Stamens 5. Ovary 5- or 6-locular. Fruits hairy, glabrescent, perhaps not dehiscent, seemingly falling off as a whole; wall rather thick, ca. 0.8 mm. P **18. G. perakense**

11. Stamens 3. Ovary 3–5-locular. Fruits hairy or glabrous, dehiscent, seeds falling off after pericarps have fallen; wall thin, less than 0.5 mm thick

12. Fruits 4- or 5-locular, 12–14 mm in diameter. Staminate flowers 4–5.5 mm in diameter; sepals obovate, 2.9–3.2 mm long. Stigmatic cone with equal teeth, no constriction below cone, teeth blunt. Fruits glabrous. N, SW **5. G. daltonii**

12. Fruits 3(–5)-locular, 7.5–9 mm in diameter (*G. khasicum* measures not known). Staminate flowers 3.5–4.2 mm in diameter; sepals strongly ovate to elliptic to obovate, outer ones 2.1–2.5 mm long (*G. khasicum* measures not known). Stigmatic cone constricted or not below cone, teeth blunt (one tooth longer) or acute (all equal). Fruits glabrous or hairy

13. Stigmatic cone not constricted below, one tooth longer than others. Staminate sepals strongly ovate. Fruits glabrous. N **12. G. khasicum**

13. Stigmatic cone constricted or not below, all teeth equal. Staminate sepals elliptic to obovate. Fruits hairy. N, E, SE, SW, P **19. G. rubrum**

1. Stems pilose

14. Fruits not lobed, apically thick-walled, ca. 2 mm thick; sutures often slightly raised. Stamens 4--6. Ovary 6-locular

15. Leaves 3.5–12 by 1.5–4 cm (Indian specimens small-leaved). Stamens 6. Stigmatic cone ca. 1 mm high, teeth obscure. N **16. G. oblatum**

15. Leaves 2.4–6.4 by 1.6–2.4 cm. Stamens 4 or 5. Stigmatic cone 1.2–2 mm high, teeth distinct, coarse. SW, P **17. G. obscurum**

14. Fruits lobed or not, thin-walled to somewhat thick-walled, less than 1 mm thick; sutures indistinct, flat. Stamens 3, (4), 5, or 6. Ovary 3–5, (6), 7–11-locular

16. Leaves 3.6–26.2 by 2.2–9.8 cm. Inflorescences on a pedicel (though often indistinct). Fruits not lobed. Stamens 3 (then staminate pedicel 15.5–20.5 mm long), or stamens 5 or 6 (then leaves very hairy underneath)

17. Leaves 9–26.2 cm long, base strongly oblique, venation impressed above, veins reticulate. Stamens 3. Ovary 3-locular. P **23. G. superbum**

17. Leaves 3.6–19.2 cm long, base not or slightly oblique, venation slightly raised to flat above, veins with tendency to scalariform. Stamens 5 or 6. Ovary 4- or 5-locular

18. Leaves apically mucronate. Flowers usually in groups of 5–10. E, SW, P **2. G. arborescens**
18. Leaves not mucronate. Flowers usually in groups of more than 10. N, NE **8. G. hirsutum**

16. Leaves 2.2–16 by 1.4–8 cm. Inflorescences axillary, never on a pedicel. Stamens 3 (or 4–6: *G. coccineum*; leaves subglabrous underneath); staminate pedicel up to 15 mm long
19. Leaves apically rounded to obtuse (to obtusely acuminate to acuminate), lower surface subglabrous. Stamens (4) 5 or 6. Ovary (6)7–11-locular. N, E, SW **4. G. coccineum**
19. Leaves (obtuse) to acute to cuspidate, lower surface subglabrous to densely pilose. Stamens 3. Ovary 3–5-locular
20. Leaves usually relatively small, 2.2–9(–13.7) cm long. Pistillate flowers with 2 or 6 sepals; stigma more then 2 mm long
21. Indumentum sericeous. Stigmas free. Outer staminate sepals 1.9–2 mm long; androecium ca. 0.7 mm long with 0.1–0.2 mm long teeth-like extensions on the connectives. Pistillate sepals 2. P **21. G. sericeum**
21. Indumentum patent, velutinous to hirsute. Stigmas only in upper third free. Outer staminate sepals 2.1–4 mm long; androecium 0.8–2 mm long with 0.2–0.5 mm long teeth-like extensions on the connectives. Pistillate sepals 2 or 6
22. Outer staminate sepals 3–4 mm long; androecium 1.2–2 mm long with 0.4–0.5 mm long teeth-like extensions on the connectives. Pistillate sepals 2. N, SW **11. G. kerrii**
22. Outer staminate sepals 2.1–2.5 mm long; androecium 0.8–1.3 mm long with 02.–0.3 mm long teeth-like extensions on the-connectives. Pistillate sepals 6. N, E, SE, SW, P **19. G. rubrum**
20. Leaves usually larger 4.2–16 cm long. Pistillate flowers with (3–)6 sepals; stigma less than 2 mm long
23. Leaves underneath (sub)glabrous, not glaucous underneath. Ovary 3-locular. Fruits ca. 5 mm in diameter P **24. G. wallichianum**
23. Leaves underneath (subglabrous, but than glaucous underneath, to) hairy. Ovary 4- or 5-locular. Fruits 5–17 mm in diameter
24. Leaves glaucous underneath (ribs of wax granules). Fruits 5–8 mm in diam. Sexes flowering in different seasons. N, NE, SW **1. G. acuminatum** var. **siamense**
24. Leaves not glaucous underneath (wax absent). Fruits 9–17 mm in diam. Sexes often present at the same time
25. Stigmas without conspicuous free teeth. Leaves always very hairy underneath, also in between veins. Stipules relatively slender, 1.5–3.5 by 1–1.5 mm. N, NE, SW **6. G. eriocarpum**
25. Stigmas with c. 0.4 mm long free teeth. Leaves often only hairy on venation underneath. Stipules relatively broad, 2–4 by 1.2–3.2 mm. N, NE, E **15. G. nubigenum**

1. Glochidion acuminatum Müll.Arg. var. **siamense** Airy Shaw, Kew Bull. 26: 273. 1972.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Chang, Doi Chiang Dao, Doi Inthanon, Doi Pui, Doi Sutep, (type: Me Wan, *Kerr* 675 (K)), Nan (Doi Phukha), Tak (Doi Pae Poe); NORTH-EASTERN: Phetchabun (Phu Miang), Loei (Phu Kradueng); SOUTH-WESTERN: Kanchanaburi (Khao Ngi Yai).

D i s t r i b u t i o n.— S. China (S.E. Yunnan), Thailand.

E c o l o g y.— Scattered to locally common in mainly open, secondary places like pine plantations, along edges of forest, along roads, in thickets, old clearings, open grassland, also in hill evergreen forest, oak forest, and less in deciduous forest; soil: granite bedrock; 1100–1750 m.

V e r n a c u l a r.— Khrai mot (ไคร้มด) (Northern).

U s e s.— Shoots edible, tasting sweet.

N o t e s.— 1. var. *siamense* differs from the typical variety (E. Himalaya, Assam, S.W. Yunnan) in having leaves which are far more velutinous. However, a specimen collected in Kanchanaburi (*van Beusekom & Phengkhlai 333*) is quite glabrous and matches the description of the typical variety. More detailed study of the *G. acuminatum-G. velutinum* Wright complex is needed to resolve specific delimitations.

2. Staminate flowers seemingly appear in March (to May). The leaves then clearly show the wax granules and the dried leaves look very greyish underneath. Fruits are only present on specimens collected in September and October (pistillate flowers are hardly known of which one was collected in May). The wax granules are then far less distinct and the dried leaves look brownish underneath. Perhaps this is related to the season. In March to May, at the end of the dry season and it is very hot in Thailand and the plants may need extra protection against the heat by producing extra wax. The pistillate flowers and especially the fruits appear in the rainy season, when protection against drought is less necessary, hence perhaps the less distinct wax granules.

3. Several plants with pistillate flowers, especially from the North-eastern region, often have fewer sepals. Usually only the outer three sepals are present, although occasionally one or two of the inner sepals are found.

2. Glochidion arborescens Blume, Bijdr.: 584. 1825; J.J. Sm., Meded. Dep. Landb. 10: 114. 1911; Backer & Bakh.f., Fl. Java 1: 461. 1963; Airy Shaw, Kew Bull. 26: 273. 1972; Whitmore, Tr. Fl. Mal. 2: 100. 1973.— *Phyllanthus arborescens* (Blume) Müll. Arg., Flora 48: 370. 1865.— *P. silheticus* Müll.Arg., Flora 48: 377. 1865.— *Glochidion sclerophyllum* Hook.f., Fl. Br. Ind. 5: 313. 1887.— *G. silheticum* (Müll.Arg.) Croizat, J. Arnold Arb. 21: 492. 1940.

T h a i l a n d.— EASTERN: Chaiyaphum (Tunkamang); SOUTH-WESTERN: Prachuap Khiri Khan (Bang Saphan); PENINSULAR: Chumphon, Ranong (Ban Kam Phuan; Had Hin Dam, Kaper), Nakhon Si Thammarat (Klong Bake), Trang (Khao Chong), Songkhla (Khao Kho Hong).

D i s t r i b u t i o n.— Assam, Thailand, Malay Peninsula, Bangka, Borneo, Java, and possibly Sulawesi.

E c o l o g y.— Scattered to common in open areas in beach forest, in disturbed places, secondary growth or secondary forest with evergreen patches, edges of evergreen forest; soil: loamy, granitic bedrock; 10–850 m.

V e r n a c u l a r.— Man pu (มันปู) (Peninsular).

3. Glochidion assamicum (Müll.Arg.) Hook.f., Fl. Br. Ind. 5: 319. 1887; Craib, Bull. Mis. Inf. Kew: 458. 1911; Aberdeen Univ. Stud. 57: 184. 1912; Beille in Fl. Gén. I.-C. 5: 620. 1927; Croizat & Hara, J. Japan. Bot. 16: 320. 1940; Nath, Bot. Surv. S. Shan States: 107. 1960; Airy Shaw, Kew Bull. 26: 274. 1972.— *Phyllanthus assamicus* Müll. Arg., Flora 48: 378. 1865.— *P. andersonii* Müll.Arg., Flora 55: 3. 1872.

T h a i l a n d.— NORTHERN: Mae Hong Son, Chiang Mai (Doi Chiangdao, Doi Pui, Maerim, Teen Tok), Chiang Rai (Doi Tung), Lampang (Jae Sawn, Mae Tank), Lamphun (Doi Kun Tan), Phrae (Huai Rai), Nan (Doi Phukha), Kamphaeng Phet (Klonglan);

NORTH-EASTERN: Phetchabun (Nam Nao), EASTERN: Nakhon Ratchasima (Khao Yai National Park); SOUTH-WESTERN: Kanchanaburi (Pa Phra Thaen), Phetchaburi (Kaeng Kra Chan National Park); CENTRAL: Saraburi (Phu Kae); PENINSULAR: Surat Thani (Khao Sok).

D i s t r i b u t i o n.— W. & E. Himalaya, Assam, Myanmar, Thailand, Indochina, S.W. China, Hainan, Taiwan.

E c o l o g y.— Scattered to locally common, usually in wet places in gallery forest, evergreen forest, mixed evergreen/deciduous forest, secondary forest, degraded, fire-prone deciduous forest with much bamboo, in thickets, along margin of forest and along streams, in open places; soil: granite bedrock, shale bedrock; 100–1200 m.

V e r n a c u l a r.— Khi mot (ขี้มด) (Northern); khamin ton (ขมิ้นต้น), maeng mao chang (แมงเมาช้าง) (Central).

4. Glochidion coccineum (Buch.-Ham.) Müll.Arg., Linnaea 32: 60. 1863; Hook.f., Fl. Br. Ind. 5: 308. 1887; Craib, Bull. Mis. Inf. Kew: 458. 1911; Aberdeen Univ. Stud. 57: 184. 1912; Beille in Fl. Gén. I.-C. 5: 615. 19270; Airy Shaw, Kew Bull. 26: 274. 1972.— *Agyneia coccinea* Buch.-Ham. in Symes, Account Embassy Kingd. Ava: 479. 1800.— *Phyllanthus coccineus* (Buch.-Ham.) Müll.Arg., Flora 48: 370. 1865.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Inthanon, Doi Sutep, Mae Fang, Mae Keng), Chiang Rai (Ban Doi, Ban Mai Phattana), Lamphun (Mae Li), Tak, Nakhon Sawan; EASTERN: Si Sa Ket (Kanthararom); SOUTH-WESTERN: Kanchanaburi (Pompi, Sai Yok, Sangkhla Buri, Tham Pha).

D i s t r i b u t i o n.— Myanmar, Thailand.

E c o l o g y.— Scattered to locally common, in dry to moist places, in dry dipterocarp forest, (dry) mixed deciduous forest, evergreen forest, secondary forest, open marshes, along paths, rivers, rice fields; soil: sand, limestone, granite bedrock. Altitude: 160–600 m.

V e r n a c u l a r.— Khrai mot (ไคร้มด) (Northern); cha na (จานา) (North-eastern); ta na (ตานา) (Eastern); chum set lek (ชุมเสี็ดเล็ก) (Central); ka nam (กาน้ำ), ma yom pa (มะยมป่า), tai-yung-sa (ใต้หยุ่งซะ) (Karen-Kanchanaburi) (South-western).

N o t e s.— 1. In Kanchanaburi (South-western) the leaves are usually more acuminate than in the North. 2. The name *Glochidion multiloculare* from India is often applied to this species, however, *G. multiloculare* Voigt has a very different type of stigma: much broader than high (hardly any stigmatic cone), like *G. glomerulatum* or *G. sphaerogynum* in Thailand.

5. Glochidion daltonii (Müll.Arg.) Kurz, Fl. Burm. 2: 344. 1877; Hook.f., Fl. Br. Ind. 5: 308. 1887; Craib, Bull. Mis. Inf. Kew: 458. 1911; Aberdeen Univ. Stud. 57: 184. 1912; Beille in Fl. Gén. I.-C. 5: 626. 1927; Airy Shaw, Kew Bull. 26: 274. 1972.— *Agyneia daltonii* Müll.Arg. in DC., Prodr. 15, 2: 310. 1866.

T h a i l a n d.— NORTHERN: Chiang Mai (Mae Kang, Mae Pong, Mae Taeng), Mae Hong Son (Mae Sariang); SOUTH-WESTERN: Uthai Thani (Huai Kha Khaeng), Kanchanaburi (Thung Yai Naresuan).

D i s t r i b u t i o n.— E. Himalaya, Assam, Myanmar, Thailand, S. China, Indochina.

E c o l o g y.— Locally common, in disturbed lower montane forest, in old clearing in evergreen forest, in mixed deciduous forest, dry dipterocarp forest, open oak-dipterocarp forest, growing along stream; 500–2000 m.

V e r n a c u l a r.— Se so phae-la (เส่ซอแพละ) (Northern); mueat lueat (เหมือดเลือด) (North-eastern); ta na dong (ตานาดง) (Eastern); khrai (ไคร้) (Central); se-phle-sa (เสเพล้ซ่า) (Karen-Kanchanaburi) (South-western).

6. Glochidion eriocarpum Champ., Hook. J. Bot. Kew Garden Misc. 6: 6. 1854; Benth., Fl. Hongk.: 314. 1861; Croiz. J. Arnold Arbor. 21: 493. 1940; Airy Shaw, Kew Bull. 26: 274. 1972.— *Phyllanthus eriocarpus* (Champ.) Müll.Arg., Linnaea 32: 67. 1863.— *?Glochidion anamiticum* Kuntze, Rev. Gen. Pl.: 601. 1891.— *Glochidion esquirolii* Lévl., Fedde Rep. Sp. Nov. 12: 186. 1913.— *?Glochidion annamense* Beille in Fl. Gén. I.-C. 5: 627. 1927.

T h a i l a n d.— NORTHERN: Chiang Mai (Bo Luang, Doi Inthanon, Doi Maun, Doi Sutep, Hod, Omkoi), Chiang Rai (Mae Suai), Lampang (Doi Khun Tan), Lamphun (Doi Khun Tan), Phrae (Ban Huai Kaet), Nan; NORTH-EASTERN: Loei (Chulaphorn Dam, Nam Nao, Sala Chomview), Nakhon Phanom (Phu Phan), Khon Kaen (Phu Khiao); SOUTH-WESTERN: Kanchanaburi (Huai Bankao, Sri Sawat).

D i s t r i b u t i o n.— Thailand, Indochina, S. China, Taiwan; perhaps also present in Sumatra, Java and the Philippines.

E c o l o g y.— Rare to common in savannah, deciduous (Dipterocarp-oak) forest, hill evergreen forest, *Pinus* forest, open (fire-damaged) clearings, disturbed forest, along streams, roads and in swampy places; soil: limestone, granite bedrock; 350–1700 m.

V e r n a c u l a r.— Khi mot thua mae (ขี้มดตัวแม่), khrai mot (ไคร้มด), phak khi mot (ผักขี้มด) (Northern); chana (จานา) (South-western).

7. Glochidion glomerulatum (Miq.) Boerl., Handl. 3, 1: 276. 1900; Ridl., Fl. Mal. Pen. 3: 209. 1924; Backer & Bakh.f., Fl. Java 1: 463. 1963; Airy Shaw, Kew Bull. 26: 275. 1972; Whitmore, Tr. Fl. Mal. 2: 100. 1973.— *Agyneia ? glomerulata* Miq., Sum.: 447. 1860.— *Phyllanthus glomerulatus* (Miq.) Müll.Arg., Flora 23: 376. 1865.— *P. nanogynus* Müll.Arg., Flora 23: 376. 1865.— *Glochidion nanogynum* (Müll.Arg.) Hook.f., Fl. Br. Ind. 5: 318. 1887; Ridl., Fl. Mal. Pen. 3: 214. 1924; Beille in Fl. Gén. I.-C. 5: 619. 1927.

T h a i l a n d.— NORTHERN: Chiang Mai (Bo Luang); EASTERN: Nakhon Ratchasima (Khao Yai National Park); PENINSULAR: Nakhon Si Thammarat (Chawang), Narathiwat (Sirindhorn).

D i s t r i b u t i o n.— Indochina, Thailand, Malay Peninsula, N. & E. Borneo, Java.

E c o l o g y.— In evergreen forest, disturbed dry dipterocarp forest, edge of peat swamp forest, scrub jungle, along streams; 0–1000 m.

V e r n a c u l a r.— Ka thin (กะทิน), rot nam (รอดน้ำ) (Peninsular).

8. Glochidion hirsutum (Roxb.) Voigt, Hort. Suburb. Calc.: 153. 1845; Müll.Arg., Linnaea 32: 61. 1863; Hook.f., Fl. Br. Ind. 5: 311. 1887; Airy Shaw, Kew Bull. 26: 275. 1972.— *Bradleia hirsuta* Roxb., Fl. Ind. ed. 2, 3: 699. 1832.— *Glochidion dasyphyllum* K.Koch, Hort. Dendr.: 85. 1853.— *G. arnottianum* Müll.Arg., Linnaea 32: 60. 1863.— *Phyllanthus arnottianus* (Müll.Arg.) Müll.Arg., Flora 48: 370. 1865.— *P. hirsutus* (Roxb.) Müll.Arg., Flora 48: 371. 1865.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Inthanon, Doi Sutep), Chiang Rai (Mae Luoy), Mae Hong Son (Khun Yuam, Mae Sariang) Lampang (Mae Li); NORTH-EASTERN: Sakon Nakhon (Phu Phan).

D i s t r i b u t i o n.— E. Himalaya to Thailand, Hainan, Hongkong, and Taiwan.

E c o l o g y.— Locally common, sometimes forming thickets, in low-lying or swampy ground in deciduous forest; 480–1020 m.

V e r n a c u l a r.— An (อัน), kharai pa pin (ไคร้ป่าปิ้น), phak khi mot (ผักขี้มด), pik kreu (ปิกกรือ) (Northern); tan khao (ตานเข้า) (North-eastern).

9. Glochidion hongkongense Müll.Arg., Linnaea 32: 60. 1863; Airy Shaw, Kew Bull. 26: 276. 1972.— *Phyllanthus hongkongense* (Müll.Arg.) Müll.Arg., Flora 48: 371. 1865.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Saket, Doi Suthep), Phitsanulok (Phu Hin Rong Khla); SOUTHWESTERN: Phetchaburi (Kaeng Krachan). The label of *Vanpruk 794* reads Trang (Peninsular) as collecting locality, this must be incorrect.

D i s t r i b u t i o n.— Thailand, Indochina, S. China, Taiwan, Ryukyu Islands, Japan.

E c o l o g y.— Not common, in more open, sometimes somewhat disturbed, wet areas (along streams) in primary evergreen forest or deciduous dipterocarp-oak forest; soil: granite bedrock. Altitude: 400–1100 m.

V e r n a c u l a r.— Khrai mot (ไคร้มด) (Northern).

U s e s.— Leaves are edible, astringent

10. Glochidion hypoleucum (Miq.) Boerl., Handl. 3, 1: 275. 1900; Airy Shaw, Kew Bull. 23: 8. 1969; Kew Bull. 26: 276. 1972; Whitmore, Tr. Fl. Mal. 2: 101. 1973.— *Anisonema hypoleucum* Miq., Sum.: 449. 1860.— *Glochidion glaucifolium* Müll.Arg., Linnaea 32: 65. 1863.— *Phyllanthus laevigatus* Müll.Arg., Flora 48: 374. 1865.— *P. kollmannianus* Müll.Arg., Flora 48: 378. 1865.— *Glochidion laevigatum* (Müll.Arg.) Hook.f., Fl. Br. Ind. 5: 319. 1887.— *G. breynioides* C.B.Rob., Philipp. J. Sci. 4, Bot.: 95. 1909.— *G. kollmannianum* (Müll.Arg.) J.J.Sm.., Meded. Dep. Landb. 10: 166. 1911.— *G. hollandianum* J.J.Sm., Nova Guinea 12: 544, t. 228A. 1917.

T h a i l a n d.— EASTERN: Nakhon Ratchasima (Khao Khiao); PENINSULAR: Nakhon Si Thammarat (Khra Rom, Thung Song), Songkhla (Khao Kho Hong).

D i s t r i b u t i o n.— Myanmar, Thailand, Indochina, S. China, throughout Malesia.

E c o l o g y.— Scattered in evergreen forest and along roads; 50–600 m.

V e r n a c u l a r.— Som set (สมเส็ด) (Peninsular).

11. Glochidion kerrii Craib, Bull. Mis. Inf. Kew: 458. 1911; Aberdeen Univ. Stud. 57: 184. 1912; Beille in Fl. Gén. I.-C. 5: 627. 1927; Airy Shaw, Kew Bull. 26: 277. 1972.

T h a i l a n d.— NORTHERN: Mae Hong Son (Mae Surin Waterfall), Chiang Mai (Ban Pha Mon, Ban Ta Fang, Doi Chang, Doi Chiang Dao, Doi Pacho, Doi Sutep, Samueng), Mae Hong Son (Pai), Lampang (Chae Son), Lamphun (Doi Kun Tan); SOUTH-WESTERN: Kanchanaburi (Huai Mae Kaset).

D i s t r i b u t i o n.— N. and W. Thailand, E. Myanmar.

E c o l o g y.— Locally common understorey plant in deciduous (oak) forest, primary mixed evergreen forest, secondary forest, also in open areas along trails, forest edges, streams and in tea plantations; soil: granite (or limestone) bedrock; 550–1300(–1800) m.

V e r n a c u l a r.— Khrai (ไคร้) (Northern).

12. Glochidion khasicum (Müll.Arg.) Hook.f., Fl. Br. Ind. 5: 324. 1887; Kanjilal et al., Fl. Assam 4: 187. 1940; Airy Shaw, Kew Bull. 26: 277. 1972.— *Phyllanthus khasicus* Müll.Arg., Flora 48: 389. 1865.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Sutep), Chiang Rai (Ban Lang Lat).

D i s t r i b u t i o n.— E. Himalaya, Assam, Thailand.

E c o l o g y.— Hill evergreen forest, on rocky limestone slopes, on ridge below mountain summit; 900–2175 m.

13. Glochidion lanceolarium (Roxb.) Voigt, Hort. Suburb. Calc.: 153. 1845; Müll. Arg., Linnaea 32: 60. 1863; Hook.f., Fl. Br. Ind. 5: 308. 1887; Hosseus, Beih. Bot. Centralbl. 28: 405. 1911; Beille in Fl. Gén. I.-C. 5: 611. 1927; Airy Shaw, Kew Bull. 26: 277. 1972.— *Bradleia lanceolaria* Roxb., Fl. Ind. ed. 2, 3: 697. 1832.— *Glochisandra acuminata* Wight, Ic. 5: 28, t. 1905. 1852.— *Glochidion macrophyllum* Benth., Fl. Hongk.: 315. 1861.— *Phyllanthus lanceolarius* (Roxb.) Müll.Arg., Flora 48: 371. 1865.

T h a i l a n d.— NORTH-EASTERN: Phetchabun (Nam Nao); EASTERN: Chaiyaphum (Tungkamang), Ubon Ratchatani (Dong Phahuan); CENTRAL: Saraburi (Sam Lan); SOUTH-EASTERN: Chanthaburi (Makham); SOUTH-WESTERN: Kanchanaburi (Sai Yok); PENINSULAR: Narathiwat (Waeng).

D i s t r i b u t i o n.— N.W. Himalaya to Assam, Thailand, Indochina, and S.E. China.

E c o l o g y.— Locally common, in evergreen forest with bamboo thickets, in dry *Pinus-Lithocarpus*-dipterocarp forest, open hardwood scrub, on plain in open Attitud: 75–800 m.

V e r n a c u l a r.— Daeng nam (แดงน้ำ) (Central); samset (สามเส็ด) (South-eastern).

N o t e.— *Chitr* 60 (BKF 17957), one of the few specimens of the South-eastern region is exceptional in having much narrower leaves (index 4.7) and 5- or 6-locular fruits instead of 7-locular ones.

14. Glochidion littorale Blume, Bijdr.: 585. 1825; Hook.f., Fl. Br. Ind. 5: 308. 1887 Merr., En. Philipp. 2: 399. 1923; Ridl., Fl. Mal. Pen. 3: 207. 1924; Beille in Fl. Gén. I.-C. 5: 610. 1927; Backer & Bakh.f., Fl. Java 1: 461. 1963; Airy Shaw, Kew Bull. 26: 278. 1972; Whitmore, Tr. Fl. Mal. 2: 101. 1973.

T h a i l a n d.— SOUTH-EASTERN: Chanthaburi (Klung), Trat (Ban Saphan, Ko Chang); PENINSULAR: Songkhla (Ko Tam Haeng, Ko Yo).

D i s t r i b u t i o n.— India, Sri Lanka, S.E. Asia (including Thailand), W. Malesia (Java, type).

E c o l o g y.— Mainly open sandy sea shores, but also in evergreen or logged over forest; 0–5 m.

15. Glochidion nubigenum Hook.f., Fl. Br. Ind. 5: 315. 1887; Airy Shaw, Kew Bull. 26: 278. 1972.

T h a i l a n d.— NORTHERN: Mae Hong Son (Doi Pui), Chiang Mai (Doi Chiang Dao, Doi Sutep, Sri Lanna National Park); NORTH-EASTERN: Phetchabun (Nam Nao, Phu Miang), Loei (Wang Saphung); EASTERN: Chaiyaphum (Tunkamang).

D i s t r i b u t i o n.— E. Himalaya, Thailand.

E c o l o g y.— Scattered to common in deciduous forest, evergreen forest, dry *Pinus-Lithocarpus*-dipterocarp forest, in thickets, along paths, steep slopes and rocky ridges; 300–2175 m.

V e r n a c u l a r.— Khai mot (ไคร้มด), ton khrai (ต้นไคร้) (Northern).

16. Glochidion oblatum Hook.f., Fl. Br. Ind. 5: 312. 1887; Airy Shaw, Kew Bull. 26: 278. 1972.

T h a i l a n d.— NORTHERN: Phrae (Mae Kray).

D i s t r i b u t i o n.— E. Himalaya, Assam, Myanmar, Thailand.

E c o l o g y.— In mountain thicket or grassland clearing in evergreen forest. Altitude: 500–1300 m.

N o t e.— So far, only one specimen, *Larsen, Smitinand & Warncke 2997*, represents this species in Thailand. It differs from the Indian mainly in the longer stipules and perhaps the fruits which dehisce more easily. The characters thicker wall or larger fruits, as used by Airy Shaw, were not observed.

17. Glochidion obscurum (Roxb. ex Willd.) Blume, Bijdr.: 585. 1825; Hook.f., Fl. Br. Ind. 5: 317. 1887; J.J.Sm., Meded. Dep. Landb. 10: 122. 1911 (**full synonymy**); Ridl., Fl. Mal. Pen. 3: 207. 1924; Beille in Fl. Gén. I.-C. 5: 623. 1927; Henderson, J. Malay Br. Roy. As. Soc. 17: 70. 1939; Backer & Bakh.f., Fl. Java 1: 461. 1963; Airy Shaw, Kew Bull. 26: 279. 1972; Whitmore, Tr. Fl. Mal. 2: 99, 101. 1973.— *Phyllanthus obscurus* Roxb. ex Willd., Sp. Pl. 4: 581. 1804; Müll.Arg. in DC., Prodr. 15, 2: 287. 1866.— *Glochidion roxburghianum* Müll.Arg., Linnaea 32: 61. 1863.

T h a i l a n d.— SOUTH-WESTERN: Phetchaburi (Kaeng Kra Chan National Park); PENINSULAR: Ranong (Bang Hin, Ngao Waterfall); Phuket (Kamala Beach), Satun (Ban Tang Yang), Yala (Ban Ramong).

D i s t r i b u t i o n.— Indochina, Thailand, and throughout Malesia except for the Philippines.

E c o l o g y.— Scattered in secondary growths, mainly open thickets (up to light forest), usually along streams, along paths; 10–1500 m.

V e r n a c u l a r.— Khram (คร่ำ), marua (มรัว), ruat (รวด) (Peninsular).

18. Glochidion perakense Hook.f., Fl. Br. Ind. 5: 317. 1887; Airy Shaw, Kew Bull. 26: 279. 1972; Whitmore, Tr. Fl. Mal. 2: 101. 1973.— *?Phyllanthus ferdinandi* Müll. Arg. var. *?supra-axillaris* Benth., Fl. Austral. 6: 96. 1873.— *Glochidion zeylanicum* (Gaertn.) A.Juss. var. *malayanum* J.J.Sm., Meded. Dep. Landb. 10: 118. 1911.— *Glochidion glaberrimum* Ridl., Bull. Misc. Inf. Kew: 363. 1923, nom. illig., later homonym.— *?Glochidion lanceilimbum* Merr.; Philipp. J. Sci., Bot. 26: 462. 1925.— *? Glochidion supra-axillare* (Benth.) Domin, Biblioth. Bot. 22: 872. 1927.

T h a i l a n d.— PENINSULAR: Phuket (Ban Bo Han, Ko Yao Yai), Satun (Thalae Ban).

D i s t r i b u t i o n.— From Peninsular Thailand throughout Malesia to the Bismarck Archipelago and the Solomon Islands.

E c o l o g y.— Common in scrub, also in thickets in open areas in evergreen forest; 0–50 m.

V e r n a c u l a r.— Chum set (ชุมเส็ด), man pu (มันปู), man pu yai (มันปูใหญ่), phung mu (พุงหมู) (Peninsular).

19. Glochidion rubrum Blume, Bijdr.: 586. 1825; J.J.Sm., Meded. Dep. Landb. 10: 149. 1911 (**full synonymy**); Beille in Fl. Gén. I.-C. 5: 621. 1927; Backer & Bakh.f., Fl. Java 1: 464. 1963; Airy Shaw, Kew Bull. 26: 279. 1972; Whitmore, Tr. Fl. Mal. 2: 101. 1973.— *Phyllanthus diversifolius* Miq., Sum.: 448. 1861.— *P. penangensis* Müll.Arg. in DC., Prodr. 15, 2: 310. 1866.— *Glochidion leiostylum* Kurz, Fl. Burm. 2: 345. 1877.— *G. coronatum* Hook.f., Fl. Br. Ind. 5: 326. 1887.— *G. diversifolium* (Miq.) Merr., Philipp. Bur. For. Bull. 1: 29. 1903.— *G. rubrum* Blume f. *longistylis* J.J.Sm., Meded. Dep. Landb. 10: 152. 1911.— *G. thorelii* Beille in Fl. Gén. I.-C. 5: 622. 1927.— *G. penangense* (Müll.Arg.) Airy Shaw, Kew Bull. 23: 6. 1969.

T h a i l a n d.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Tak; EASTERN: Nakhon Ratchasima, Si Sa Ket, Ubon Ratchathani; SOUTH-EASTERN: Trat; SOUTH-WESTERN: Kanchanaburi; PENINSULAR: Ranong, Surat Thani, Phangnga, Krabi, Phuket, Nakhon Si Thammarat, Phatthalung, Trang, Songkhla, Satun, Narathiwat.

D i s t r i b u t i o n.— Myanmar, Thailand, Indochina, throughout Malesia to the Moluccas and Lesser Sunda Islands.

E c o l o g y.— Rare to locally common in evergreen forest, secondary forest, deciduous forest, open *Melaleuca* forest, open thickets; along roads, streams, forest edges, peat swamp edges, ridges; soil: may be silty, rocky, clay shale, sandy podsolic, limestone; 0–500(–2175) m.

V e r n a c u l a r.— Khat na (ขัดนะ), kra dum phi (กระดุมผี), sam set (สามเส็ด) (South-eastern); ma ruat (มะรวด), nok non (นกนอน), ti-mao pa-dong (ตีเม้าป่าดง) (Malay-Peninsula).

N o t e.— The former *Glochidion leiostylum* has a somewhat different appearance because it mainly flowers along the leafless parts of axes.

20. Glochidion santisukii Airy Shaw, Kew Bull. 35: 385. 1980.— *Glochidion cataractarum* Airy Shaw, non Müll.Arg., Kew Bull. 32: 76. 1977.

T h a i l a n d.— PENINSULAR: Nakhon Si Thammarat (Khao Luang, type: *Geesink & Santisuk 5465*, holo in AAU, iso in BKF, L).

D i s t r i b u t i o n.— Endemic to Peninsular Thailand.

E c o l o g y.— Disturbed evergreen forest along waterfalls; 400–500 m.

21. Glochidion sericeum (Blume) Zoll. & Moritzi, Nat. Geneesk. Arch. Neerl. Indie 2: 585. 1845; Hook.f., Fl. Br. Ind. 5: 326. 1887; Ridl., Fl. Mal. Pen. 3: 215. 1924; Backer & Bakh.f., Tree Fl. Java 2: 462. 1963; Whitmore, Tr. Fl. Mal. 2: 101. 1973; Airy Shaw, Kew Bull. 32: 77. 1977.— *Glochidionopsis sericea* Blume, Bijdr.: 588. 1925.

T h a i l a n d.— PENINSULAR: Ranong (Kam Phuan), Yala (Ayer Kuwing); Narathiwat (Nikhom Waeng); Nakhon Si Thammarat (Tung Song).

D i s t r i b u t i o n.— Peninsular Thailand, Sumatra, W. Java (type), Borneo, Philippines (Palawan).

E c o l o g y.— Scattered by trail in evergreen forest, rain forest on granitic rock. 100–1290 m.

22. Glochidion sphaerogynum (Müll.Arg.) Kurz, Fl. Burm. 2: 346. 1877; Hook.f., Fl. Br. Ind. 5: 317. 1887; Airy Shaw, Kew Bull. 26: 280. 1972.— *Phyllanthus sphaerogynus* Müll.Arg., Flora 48: 375. 1865.

T h a i l a n d.— NORTHERN: Chiang Mai (Ban Kong Hae, Bo Luang, Doi Chiangdao, Doi Inthanon, Doi Sutep, Hot, Mae Taeng, Mae Kang, Mon Nang Ket), Phrae, Uttaradit; NORTH-EASTERN: Loei (Phu Kradueng); EASTERN: Nakhon Ratchasima (Khao Yai National Park).

Distribution.— E. Himalaya, Assam, Myanmar, Thailand, Indochina.

Ecology.— Common to scattered in deciduous dipterocarp-oak forest, evergreen forest, secondary forest, old clearings, on steep ridges, and along the road; soil: granite bedrock; 500–1200 m.

Vernacular.— Khai mot (ไค้มอด), khrai (ไคร้), man pla (มันปลา) (Northern).

Uses.— Bark and wood used medicinally: dried, chopped into pieces, heated, applied as skin paints over affected spots; also dried and crushed and used in decoctions.

23. Glochidion superbum Baill., Étude Euphorb.: 638. 1848; Müll.Arg., Linnaea 32: 64. 1863; Hook.f., Fl. Br. Ind. 5: 323. 1887; Ridl., Fl. Mal. Pen. 3: 208. 1924; Backer & Bakh.f., Fl. Java 1: 462. 1963; Airy Shaw, Kew Bull. 26: 280 1972; Whitmore, Tr. Fl. Mal. 2: 99, 100. 1973.— *Phyllanthus superbus* (Baill.) Müll.Arg., Flora 48: 375. 1865.

Thailand.— PENINSULAR: Ranong (Khao Phota Luang Kaeo, Khlong Na Kha, Muang Len, Ngao Waterfall), Phangnga (Takua Pa), Songkhla (Kho Hong).

Distribution.— Peninsular Thailand, Malay Peninsula, Sumatra, Bangka, W. Java, Borneo.

Ecology.— In primary (mixed lowland), secondary, evergreen, and swampy forest on flat to hilly terrain, in (old) clearings, among bamboo, along streams, paths, and edges of forest, in rubber estates, secondary scrub and logged forest; soil: yellow sandy loam, sandy clay, sand, red clay, granitic sand; bedrock tertiary sandstone, shale; 10–1000 m. Flowering and fruiting all year.

Vernacular.— Mok man (โมกมัน) (Peninsular).

24. Glochidion wallichianum Müll.Arg., Linnaea 32: 67. 1863; Hook.f., Fl. Br. Ind. 5: 315. 1887; Airy Shaw, Kew Bull. 26: 280. 1972; Whitmore, Tr. Fl. Mal. 2: 99, 101. 1973.— *Phyllanthus wallichianus* (Müll.Arg.) Müll.Arg., Flora 48: 387. 1865.— *Glochidion desmocarpum* Hook.f., Fl. Br. Ind. 5: 318. 1887.— *G. curtisii* Hook.f., Fl. Br. Ind. 5: 327. 1887.

Thailand.— PENINSULAR: Phangnga (Nai Chong), Nakhon Si Thammarat (Khao Kao), Trang (Khao Chong), Songkhla (Ton Nga Chang). (Yong Waterfall); Narathiwat (Waeng).

Distribution.— Thailand, Malay Peninsula, Sumatra, Bangka, Borneo.

Ecology.— Scattered to locally common in sunny to shaded places in disturbed and primary evergreen forest, along trails and streams; soil: limestone; 75–450 m.

Vernacular.— Man pu (มันปู), man pu bai lek (มันปูใบเล็ก) (Peninsular).

Note.— *Maxwell 84-536* (BKF 82791) is somewhat exceptional in having very short stigmas.

MALLOTUS[6]

Lour., Fl. Cochinch.: 635. 1790; Pax & K.Hoffm. in Engl., Pflanzenr. VI.147.vii: 145. 1914; Airy Shaw, Kew Bull. 26: 292. 1972; Whitmore, Tr. Fl. Mal. 2: 113. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 160. 1975; G.L. Webster, Ann. Missouri Bot. Gard. 81: 89. 1994.— *Rottlera* Roxb., Pl. Corom. 2: 36. 1798, nom. inval., non Willd., 1797.— *Adisca* Blume, Bijdr.: 609. 1826.— *Plagianthera* Rchb.f. & Zoll., Verh. Natuurk. Ver. Ned. Ind. 1: 19. 1856.— *Hancea* Seem., Bot. Voy. Herald: 409. 1857.— *Axenfeldia* Baill., Ét. Gén. Euphorb.: 419. 1858.— *Coelodiscus* Baill., Ét. Gén. Euphorb.: 293. 1858.— *Aconceveibum* Miq., Fl. Ind. Bat. 1: 389. 1859.— *Echinocroton* F. Muell., Fragm. Phytogeogr. Austral. 1: 31. 1859.— *Diplochlamys* Müll.Arg., Flora 47: 539. 1864.

A paleotropical genus with 150 species ranging from Africa and Madagascar through S. and S.E. Asia, Malesia to Australia and the W. Pacific; in Thailand 35 species of which two are new records and three newly described. Classification: Subfam. Acalyphoideae, tribe Acalypheae, subtribe Rottlerinae. The Thai species are are assigned to eight sections: *Axenfeldia* (opposite, pinnately nerved leaves), *Hancea* (opposite, pinnately nerved leaves, one reduced to a bract), *Mallotus* (alternate, trinerved or palmate leaves, echinate capsules, 45–100 stamens), *Oliganthae* (alternate, trinerved leaves, reduced inflorescences, no glandular scales), *Polyadenii* (pinnate leaves with adaxial glandular scales), *Rottlera* (alternate leaves, unarmed fruits), *Rottleropsis* (opposite, trinerved leaves), and *Stylanthus* (alternate to opposite, trinerved to peltate leaves, armed capsules, 15–45 stamens, coumarin/fenucreek smell).

KEY TO THE SPECIES

1. Leaves peltate by more than 0.5 cm
 2. Lower leaf surface and branches distinctly hairy to the touch
  3. Indumentum floccose (among hairs are strap-like enations densely covered with hairs, providing irregular indumentum layer). Upper leaf surface without glandular scales. Plants not smelling of fenucreek **1. M. barbatus**
  3. Indumentum regular layer. Glandular scales on upper leaf surface, mainly near insertion. Plants (usually) smelling of fenucreek **32. M. thorelii**
 2. Lower leaf surface and branches glabrescent, (sub)glabrous
  4. Leaves about as wide as long (index 1.3–1.4). Plant distinctly smelling of fenucreek. Pistillate sepals recurved below ovary, not enclosing ovary and style, persistent **7. M. floribundus**
  4. Leaves much longer than wide (index 1.8–3.8). Plant usually not or slightly smelling of fenucreek. Pistillate calyx urceolate around ovary and style, caducous **20. M. peltatus**
1. Leaves not or slightly peltate by less than 0.5 cm
 5. Leaves ovate, majority of leaves about as wide as long to somewhat longer than wide (index: length divided by width = 1–1.8), with 2 lobes or not (N.B. really measure several leaves, *M. paniculatus* and *M. hymenophyllus* often give impression of being much longer than they really are)
  6. Upper surface of leaves with orangish glandular scales, especially near insertion (use hand lens or microscope) **32. M. thorelii**
  6. Upper surface of leaves without glandular scales (only on lower surface)
   7. Leaves below densely hairy: dense indumentum on veins (and often on epidermis, then leaves whitish beneath)
    8. Leaves slightly peltate by 1–3 mm

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9. Scandent shrub to woody climber. Lower leaf surface not whitish (hairs only on venation, epidermis visible, use microscope or hand lens). Staminate inflorescences mainly axillary, usually not branching, up to 40 cm long; stamens ca. 50. Pistillate inflorescences up to 12 cm long. Ovary and fruits 2-locular, not armed, only hairy **25. M. repandus**

9. Shrubs to trees. Lower leaf surface whitish (epidermis alos densely hairy). Staminate inflorescences mainly terminal, strongly branching, up to 14–101 cm long; stamens 50 to more than 100. Pistillate inflorescences up to 56 cm long. Ovary and fruits (2)3-locular, armed, sparsely to densely set with spines

10. Leaves usually broadest above lower third to middle, base (narrowly emarginate to round to) usually cuneate with two large glandular areas. (1–)3 by (1–)2. Ovary and fruits sparsely armed, covered with up to 30 hard spines **19. M. paniculatus**

10. Leaves broadest below lower third, base truncate to rounded, with 2 horizontal black glandular areas, 1–2.5 by 0.3–1.3 mm. Ovary and fruits densely armed, covered by more than 100 soft spines

11. Leaves peltate up to 1.5 mm, peltation usually folded upwards; lower surface usually with pocket domatia full with hair tufts. Staminate bracts up to 0.9 mm long, bracteoles absent. Ovary in young pistillate flowers as broad as the style. Fruit (and ovary) covered with one continuous layer of soft spines, individual spines nor fruit wall visible **14. M. macrostachyus**

11. Leaves peltate up to 3 mm, peltation usually flat; lower surface without domatia. Staminate bracts 1.8–2.2 mm long, bracteoles usually visible. Ovary in young pistillate flowers broader than style. Fruit (and ovary) covered with far less spines, individual spines (and, in older fruits, fruit wall) visible **16. M. mollissimus**

8. Leaves never peltate

12. Leaves often lobed, alternate (or below inflorescences opposite), lower surface whitish, base (narrowly emarginate to round to) usually cuneate, with two large glandular areas (up to 3 by 2 mm) **19. M. paniculatus**

12. Leaves never lobed, all opposite (one leaf smaller), lower surface not whitish or whitish, base emarginate to rounded (to cuneate), glands much smaller

13. Lower surface of leaves with few, yellow-translucent glandular scales, not whitish (only hairy on venation). Stamens 25–35. Stigmas 1.8–2.3 mm long. Fruits ca. 10 mm in diameter **23. M. pierrei**

13. Lower surface of leaves with many orangish glandular scales, whitish (also hairy on epidermis). Stamens over 100. Stigmas c. 4 mm long. Fruits ca. 15 mm in diameter **33. M. tiliifolius**

7. Leaves below (sub)glabrous to glabrescent, at most few hairs on veins

14. Leaves opposite to alternate, terminally grouped, not or slightly peltate, lower surface densely set with glandular scales. Smelling of fenucreek **8. M. garrettii**

14. Leaves opposite, well spaced along branches, never peltate, lower surface (very) sparsely set with glandular scales. Smell of fenucreek absent

15. Lower surface of leaves only on the very basal edge with a few glandular scales. Staminate sepals 3; stamens ca. 50. Pistillate sepals 5 or 6; stigmas ca. 4.2 mm long **9. M. hymenophyllus**

15. Lower surface of leaves all over with a few glandular scales. Staminate sepals 4 or 5; stamens 25–35. Pistillate sepals 4 or 5; stigmas 1.8–2.3 mm long **23. M. pierrei**

5. Leaves ovate to elliptic to obovate, majority of leaves much longer than wide (index 1.7–4.7), never lobed

16. Leaves opposite, one reduced to a bract or a much smaller orbicular leaf (this is difficult to see, carefully check plants which are apparently alternate, if scars and/or inflorescences opposite to the normal leaf are present, then follow this lead; if any leaves are opposite then follow the other lead). Plants rare, only in the Peninsula

17. Petiole less than 2 cm long

18. Reduced leaf orbicular, 0.8–5.5 by 0.8–4.8 cm **15. M. miquelianus**

18. Reduced leaf stipule-like, triangular, 4–10 × 1.5–2.5 mm **29. M. stipularis**

17. Petiole longer than 2 cm

19. Leaves hairy underneath **11. M. kingii**

19. Leaves glabrous underneath **21. M. penangensis**

16. Leaves opposite or alternate, all same shape, though one of each opposite pair may be smaller

20. Leaves opposite, penninerved (basal nerves not obviously different from others, quite inconspicuous)
21. Petioles 1–4 mm long. Leaves (sub)glabrous, drying dark brown, margin crenulate to denticulate, subbasal glandular areas on upper surface besides midrib, lower surface with very few glandular scales **2. M. brevipetiolatus**
21. Petioles 1–80 mm long (some always longer than 5 mm). Leaves (sub)glabrous to hairy below, drying greenish to brownish, margin crenulate to dentate, subbasal glandular areas on upper surface besides midrib (leaves green) or on nerves (leaves green or brown) or absent, lower surface with few to many glandular scales
22. Leaves drying brownish, (sub)glabrous below except for hair tuft domatia in nerve axils. Staminate inflorescences up to 43 cm long. Pistillate inflorescences up to 28 cm long. N, NE, SW **10. M. khasianus**
22. Leaves drying greenish to brownish (then hairy), (sub)glabrous (without domatia) or hairy below (with or without domatia). Staminate inflorescences up to 6.5 cm long (n.b. those of *M. viridis* seen in bud, but apparently short). Pistillate inflorescences reduced to 1 or 2 subsessile flowers or up to 6.3 cm long.– SE, P
23. Lower surface of leaves (sub)glabrous **34. M. spec. nov. 2**
23. Lower surface of leaves hairy on venation
24. Stipules triangular, 4.5–9 by 1–3 mm. Leaves elliptic, 6.5–29.7 cm long, base attenuate, upper surface with several glandular areas, lower surface with pockets in nerve axils. Ovaries and fruits not armed, without spines. Staminate bracts 3.2–4.2 mm long. SE, P **3. M. calocarpus**
24. Stipules needle-like, 3–6.2 by 0.4–0.5 mm. Leaves strongly ovate, 4.8–18.5 cm long, base emarginate, upper surface apparently without glandular areas, lower surface without domatia. Ovaries and fruits strongly armed with many spines, spines with patent, stiff hairs. (Staminate flowers unknown).– SW **27. M. spec. nov. 1**

20. Leaves opposite to alternate, basally palmately nerved or trinerved (basal nerves very obvious, starting from very base, often under different angle with midrib than other nerves)
25. Leaves on upper surface with orangish glandular scales (use hand lens or preferably a microscope), (sub)glabrous. Fruits winged or not, indehiscent or tardily (late) dehiscent
26. Leaves 9.8–27 cm long, often with hair tufts in nerve axils below. Stamens 26–37, filaments 1.5–3 mm long. Ovary and fruits not winged, tardily dehiscent. Stipules 1.5–2.5 mm long **13. M. leucodermis**
26. Leaves 5.5–16 cm long, without domatia below. Stamens 20–25, filaments 0.5–1.5 mm long. Ovary and fruits with upward pointing wings, indehiscent. Stipules 0.7–0.9 mm long **24. M. plicatus**
25. Leaves on upper surface without glandular scales, only on lower surface or absent, glabrous to densely hairy. Fruits never winged
27. Leaves, at least some, alternate
28. Lower leaf surface whitish, densely hairy on venation and epidermis (= leaf surface). Ovary and fruits unarmed, without spines
29. Glandular scales yellowish. Stipules 3.5–5.5 mm long. Leaves 2.8–14.5 by 1.1–4.7 cm. Stamens 65–70. Ovary and fruits with yellowish glandular scales **18. M. pallidus**
29. Glandular scales red. Stipules 0.5–1.3 mm long. Leaves 4–22 by 2.1–10.5 cm. Stamens 15–20. Ovary and fruits with red glandular scales **22. M. philippensis**
28. Lower leaf surface (sub)glabrous to densely hairy on venation only (not whitish, epidermis visible; use microscope or hand lens to be sure). Ovary and fruits armed or not, with or without spines
30. Leaves ovate, widest basally or below lower third; (sub)glabrous. N **8. M. garrettii**
30. Leaves ovate, widest at lowerst third or higher, (sub)glabrous to hairy on nerves. N, E, SW, C, SE, P
31. Stamens 55–65. Ovary and fruit unarmed, without spines. SW (Sam Roi Yot) **18. M. pallidus**
31. Stamens either 25–35 or 200–250. Ovary and fruits armed with spines.– N, E, SW, C, SE, P
32. Glandular scales sparse, present. Inflorescences terminal to axillary, up to 21.5 cm long. Staminate flowers in groups per node; stamens 25–35. Pistillate flowers with several per inflorescence; calyx urceolate, covering ovary and style; stigmas 3–4.5 mm long. Fruits 10–14 mm in diameter, sparsely set with spines. N, E, SW, C, SE, P **20. M. peltatus**

32. Glandular scales absent. Inflorescences ramiflorous to axillary, up to 1 cm long. Staminate flowers single per node; stamens 200–250. Pistillate inflorescences with single flower; sepals separate, not covering ovary and style; stigmas 13–22 mm long. Fruits 18–25 mm in diameter, densely set with spines. P **31. M. subpeltatus**

27. All leaves opposite

33. All leaves obovate, drying greenish, basally usually with a few very distinct glandular areas, margin very distinctly dentate **26. M. resinosus**

33. Leaves ovate to elliptic (to obovate), when obovate then drying brownish or greenish and with inconspicuous glandular areas, margins (sub)entire to crenulate to denticulate

34. Stipules late caducous (or otherwise, measure width of scars), 6–10.5 by 2.4–3 mm, yellowish when dry, with white hairs outside **6. M. dispar**

34. Stipules early to late caducous, 1.6–7 by 0.3–1.5 mm, usually dark brown when dry, subglabrous to (darker) hairy outside

35. Staminate flowers or buds present

36. Staminate inflorescences up to 2.5 cm long. Leaves strongly ovate to elliptic (N.B. the staminate inflorescence of *M. montanus* is unknown, but leaves are strongly ovate)

37. Staminate inflorescences dichasial, forming dense clumps of flowers. Leaves elliptic **28. M. spodocarpus**

37. Staminate inflorescences racemes. Leaves ovate (to elliptic)

38. Lower surface of leaves densely hairy, base broadly cordate (to truncate), margin laxly serratulate **17. M. montanus**

38. Lower surface of leaves subglabrous to densely hairy, base narrowly cuneate or rounded, margin (sub)entire

39. Young parts densely set with small stellate hairs. Lower surface of leaves subglabrous to hairy, with hair tuft domatia in nerve axils, few glandular scales. Stamens ca. 60. N, NE, E **4. M. clellandii**

39. Young parts densely hairy, also simple hairs. Lower surface of leaves densely hairy on venation, no hair tuft domatia, many glandular scales. Stamens ca. 40.– P **30. M. subcuneatus**

36. Staminate inflorescences up to 19 cm long. Leaves (ovate to) elliptic to obovate

40. Leaves drying greenish. Stamens 25–35 **23. M. pierrei**

40. Leaves drying brownish or greenish-brownish. Stamens 35–60

41. Lower surface of leaves glabrous (except for few hairs on venation). Stamens 35–40 **5. M. cuneatus**

41. Lower surface of leaves densely hairy on venation. Stamens ca. 60 **12. M. leptostachyus**

35. Pistillate flowers or fruits present

42. Ovary and fruits unarmed, no spines present

43. Leaves ovate **17. M. montanus**

43. Leaves elliptic

44. Leaves 9.5–24 by 4.2–11.4 cm long, base cuneate. Pistillate inflorescences up to 6.5 cm long, racemes; sepals ca. 1.8 mm long **12. M. leptostachyus**

44. Leaves 2.2–16 by 1.2–8 cm long, base broadly shallowly emarginate to truncate. Pistillate inflorescences reduced, (1)2(–4)-flowered, up to 2 cm long; sepals ca. 3.3 mm long **28. M. spodocarpus**

42. Ovary and fruits armed, spines (or remnants of them) present

45. Inflorescences racemes

46. Leaves elliptic to obovate, drying brownish, upper surface usually with up to 7 small glands subbasally along the margin, lower surface glabrous (except for few hairs on venation) with usually hair tuft domatia in nerve axils. Fruits 6–7 mm in diameter. Sepals 2.3–2.8 mm long **5. M. cuneatus**

46. Leaves ovate (to obovate), drying greenish, upper surface usually with 1–3 pairs of subbasal glands, lower surface usually hairy or rough because of remaining basal parts of hairs, no hair tuft domatia. Fruits 10–11 mm in diameter. Sepals 2.8–3.2 mm long **23. M. pierrei**

45. Inflorescences (sub)umbelliform
    47. Young parts densely set with small stellate hairs. Lower surface of leaves subglabrous to hairy, with hair tuft domatia in nerve axils, few glandular scales. Pistillate inflorescences only with terminal flowers. N, NE, E **4. M. clellandii**
    47. Young parts densely hairy, also simple hairs. Lower surface of leaves densely hairy on venation, no hair tuft domatia, many glandular scales. Pistillate inflorescences with additional flower halfway. P **30. M. subcuneatus**

1. Mallotus (§ Mallotus) **barbatus** Müll.Arg., Linnaea 34: 184. 1865; Hook.f., Fl. Br. Ind. 5: 418. 1887; Gagnep. in Fl. Gén. I.-C. 5: 357. 1925; Airy Shaw, Kew Bull. 26: 296. 1972; Whitmore, Tr. Fl. Mal. 2: 113. 1973.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Chiang Dao, Doi Saket), Chiang Rai (Chiang Kum, Kua Katan, Kun Chae, Nam Mae Kok), Phayao (Doi Luang), Nan (Doi Tiew, Nuang Pua), Lampang (Chae Son), Phrae (Ban Ko), Phitsanulok (Tung Salaeng Luang); NORTH-EASTERN: Phetchabun (Lom Kao, Phu Miang), Loei (Nam Nao), Nong Khai (Bungkla), Sakon Nakhon, Nakhon Phanom (Phu Langka), Khon Kaen (Chum Phae); EASTERN: Chaiyaphum (Ban Nam Phrom); SOUTH-WESTERN: Uthai Thani (Nong Chang), Kanchanaburi (Huai Ban Kao), Phetchaburi (Kaeng Krachan); SOUTH-EASTERN: Chanthaburi (Makham); PENINSULAR: Chumphon, Surat Thani (Bang Yai), Trang (Thung Khai).

D i s t r i b u t i o n.— India, Myanmar, China, Thailand, Indochina, and the Malay Peninsula.

E c o l o g y.— Pioneer species in open, often very disturbed or burned places in mainly deciduous forest, also in mixed evergreen forest, hill dipterocarp forest, and in light thickets along paths; soil: at base of limestone, bedrock shale or sandstone; 140–1000 m.

V e r n a c u l a r.— Khithao (ขี้เถ้า), mueat tao (เหมือดเต๊า), po tao (ปอเต๊า), tao khon (เต๊าขน), tong tao (ตองเต๊า) (Northern); hu chang (หูช้าง), tong tep (ตองแตบ), ya khi thut (หญ้าขี้ทูด) (North-eastern); po hun (ปอหุน) (South-western); salapang (ละสะป๋าง), salapang bai yai (ละสะป๋างใบใหญ่) (South-eastern); bale a-nging (บาเละอาง๊ิง) (Malay-Narathiwat); kalo khon (กะลอขน), kalo yai thai (กะลอยายทาย), krarok khon (กระรอกขน) (Peninsular); pom-pom tree (English).

2. Mallotus (§ Axenfeldia) **brevipetiolatus** Gage, Rec. Bot. Surv. Ind. 9: 242. 1922; Airy Shaw, Kew Bull. 21: 393. 1968; Kew Bull. 26: 293. 1972; Whitmore, Tr. Fl. Mal. 2: 115. 1973.

T h a i l a n d.— SOUTH-EASTERN: Chanthaburi (Soi Dao, Tha Mai); PENINSULAR: Surat Thani (Nong Wai), Phangnga (Tamnamphut), Trang (Palien), Songkhla (Khao Rup Chang).

D i s t r i b u t i o n.— Thailand, N. Peninsular Malaysia (syntypes).

E c o l o g y.— Shaded area in secondary to evergreen forest on limestone; 10–200 m.

3. Mallotus (§ Axenfeldia) **calocarpus** Airy Shaw, Kew Bull. 21: 395. 1968; Kew Bull. 26: 294. 1972.

T h a i l a n d.— SOUTH-EASTERN: Chanthaburi (Krating Falls, Khao Sabap, Khao Khitchakut, Phrio Waterfall, Phrio Agricultural Station); PENINSULAR: Narathiwat (Bacho), see note.

D i s t r i b u t i o n.— Endemic to Thailand (type: Chanthaburi, Khao Sabap, *Kerr* 17965, holotype (K)).

E c o l o g y.— Scattered along stream in open area, secondary forest, seasonal rain forest or evergreen forest; 135–300 m.

N o t e.— The specimen from the Peninsula (*Phusomsaeng* 5 (BKF 58077)) is tentatively identified as *M. calocarpus*. It has the same long staminate bracts, but longer inflorescences and the leaf base is narrowly heart-shaped and has less glandular areas (only 2 or 3).

4. Mallotus (§ Rottleropsis) **cleilandii** Hook.f., Fl. Br. India 5: 435. 1887; Airy Shaw, Kew Bull. 21: 381. 1968; Kew Bull. 26: 302. 1972.

T h a i l a n d.— NORTHERN: Lampang (Mae Long, Mae Wang); NORTH-EASTERN: Udon Thani (Nong Bua); EASTERN: Ubon Ratchathani (Phu Chong Na-Yoi).

D i s t r i b u t i o n.— Myanmar, Thailand, Indochina.

E c o l o g y.— Mixed deciduous forest, mixed dry dipterocarp forest; soil: sandy; 100–500 m.

V e r n a c u l a r.— Kok kradum (กกกระดุม) (Eastern).

5. Mallotus (§ Rottleropsis) **cuneatus** Ridl., J. Roy. As. Soc. Str. Br. 59: 181. 1911; Airy Shaw, Kew Bull. 21: 389. 1968; Kew Bull. 26: 294. 1972; Whitmore, Fl. Mal. Pen. 2: 115. 1973.— *Coelodiscus lanceolatus* Gagnep., Not. Syst. 4: 50. 1923.— *Mallotus lanceolatus* (Gagnep.) Airy Shaw, Kew Bull. 21: 381. 1968; Kew Bull. 26: 303. 1972.

T h a i l a n d.— NORTHERN: Lampang (Chae Son), Tak (Doi Umphang); NORTH-EASTERN: Loei (Pha Nok Khao), Udon Thani (Nong Bua), Khon Kaen (Dong Lan, Pha Nu Khao, Phu Wieng, Tham Pha Phuang); EASTERN: Chaiyaphum (Nam Phrom, Phu Khiao), Nakhon Ratchasima (Khao Phrik, Khao Yai National Park, Lat Bua Kao, Pak Chong); SOUTH-WESTERN: Phetchaburi (Klong Yang); CENTRAL: Saraburi (Khao Ma Kok, Muak Lek); SOUTH-EASTERN: Prachin Buri (Khao Yai National Park), Chon Buri (Bang Phlat); PENINSULAR: Surat Thani (Khao Sok), Phuket, Yala (Wat Tam).

D i s t r i b u t i o n.— Thailand, Indochina, Malay Peninsula (type).

E c o l o g y.— Often common in dry evergreen and/or deciduous forest, bamboo forest, also in fire-prone thickets and near villages; soil: limestone; 5–650 m.

V e r n a c u l a r.— Pho (โพ) (Central).

N o t e s.— 1. Airy Shaw placed *Mallotus cuneatus* in section *Axenfeldia*, in spite of the trinerved leaf base (for which reason the species never keys out in his treatment of Thai Euphorbiaceae). He notes a western Thai distribution for this species. *M. lanceolatus*, placed in sect. *Rottleropsis* (trinerved leaves), has, according to him, an eastern Thai distribution. Thus the two distributions are complementary. Both species are inseparable and should be united, *cuneatus* being the oldest epithet. The correct section seems to be *Rottleropsis*, because of the trinerved leaf base.

2. Material from the Peninsula tends to have larger, more hairy leaves with more glandular scales on the lower surface.

6. Mallotus (§ Rottleropsis) **dispar** (Blume) Müll.Arg. in DC., Prodr. 15, 2: 971. 1866; Airy Shaw, Kew Bull. 21: 380, 1968; Kew Bull. 26: 303. 1972; Whitmore, Tr. Fl. Mal. 2: 115. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 169. 1975.— *Rottlera dispar* Blume, Bijdr.: 608. 1825.— *Mallotus leucocalyx* Müll.Arg. in DC., Prodr. 15, 2: 970. 1866.— *Coelodiscus dispar* (Blume) Kurz, J. As. Soc. Beng. 42, 2: 244. 1873.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan (Khao Luang); PENINSULAR: Chumphon (Bang Son, Ta Ngo), Surat Thani (Ko Samui, Ko Tan, Ko Wang, Khao Mok, Ko Prap, Tha Khanon), Phangnga (Ao Luk, Ko Surin Nua, Suwana Kuha Cave), Phuket (Khao Tosae), Krabi (Klong Chilat), Nakhon Si Thammarat (Khao Luang), Phatthalung (Khao Pu-Khao Ya), Trang (Ko Libong), Satun (Ban Tan), Songkhla (Boriphat Waterfall), Narathiwat (Bacho).

D i s t r i b u t i o n.— Myanmar, Thailand, Indochina, W. Malesia.

E c o l o g y.— Mainly in shaded places in primary evergreen forest, also along streams, sea shores and in waste places; always limestone bedrock; 0–250 m.

7. Mallotus (§ Stylanthus) **floribundus** (Blume) Müll.Arg., Linnaea 34: 187. 1865; Hook.f., Fl. Br. Ind. 5: 432. 1887; Airy Shaw, Kew Bull. 26: 306. 1972; Whitmore, Tr. Fl. Mal. 2: 113. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 172. 1975.— *Adisca floribunda* Blume, Bijdr.: 610. 1825.— *Rottlera floribunda* (Blume) Hassk., Cat. Hort. Bog.: 238. 1844.— *Mappa floribunda* (Blume) Zoll. & Moritzi, Syst. Verz.: 17. 1855.— *Mallotus amentiformis* Müll.Arg., Flora 42: 468. 1864.— *M. anamiticus* Kuntze, Rev. Gen. Pl. 2: 608. 1891.— *Coelodiscus anamiticus* (Kuntze) Gagnep. in Fl. Gén. I.-C. 5: 375. 1925.— *Mallotus floribundus* (Blume) Müll.Arg. var. *pilosus* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 174. 1914.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan (Huai Tap Sakae); PENINSULAR: Ranong (Kraburi), Surat Thani (Khao Tum, Khlong Saeng, Wang Sai), Phangnga (Bangto), Krabi (Nai Sa), Nakhon Si Thammarat (Krung Ching Falls, Ron Phi Bun), Trang (Khao Chong), Pattani (To Mo), Narathiwat (Waeng).

D i s t r i b u t i o n.— Myanmar, Thailand, Laos, Vietnam, throughout Malesia (Java, type) up to the Solomon Islands.

E c o l o g y.— By streams in evergreen forest; limestone bedrock; 40–300 m.

V e r n a c u l a r.— Prik (ปริก) (South-eastern, Peninsular); ka-bing ba-tu (กาบิงบาตู) (Malay-Narathiwat), lo (ล้อ), lo khon (ลอขน), pik (ปิก) (Peninsular); blue blade (English).

U s e s.— Ornamental in Myanmar. The aromatic staminate flowers are used for scenting medicinal powders and for toilet powder in Java. A decoction of the root is administered in the Malay Peninsula after childbirth, for stomach ache and cholera. On Sumatra the tough wood is used for small objects.

8. Mallotus (§ Stylanthus) **garrettii** Airy Shaw, Kew Bull. 21: 387. 1968; Kew Bull. 26: 306. 1972.

T h a i l a n d.— NORTHERN: Phayao (Doi Luang National Park), Nan (Doi Pha Ngua).

D i s t r i b u t i o n.— Thailand (type: Nan, Doi Pha Ngua, *Garrett* 140 (holotype K; isotype L)) and Laos.

E c o l o g y.— Shaded rocky stream area in mixed, primary evergreen and deciduous forest; shale bedrock; 650–1600 m.

9. Mallotus (§ Rottleropsis) **hymenophyllus** Airy Shaw, Kew Bull. 21: 381. 1968; Kew Bull 26: 303. 1972.

T h a i l a n d.— PENINSULAR: Surat Thani (Ban Tamniap, Khao Sok, Kiensa, Panom, Song Phi Nong), Krabi (Ao Luk, Tan Bok Khorani Arboretum).

D i s t r i b u t i o n.—Endemic in Thailand (type: Surat Thani, Song Phi Nong, *Kerr* 12389 (holotype K; isotype BK)).

E c o l o g y.—Evergreen forest, bamboo forest to in shaded, overgrown places in *Hevea* plantation, often cut back; soil: limestone bedrock; 20–100 m.

10. Mallotus (§ Axenfeldia) **khasianus** Hook.f., Fl. Br. Ind. 5: 438. 1887; Airy Shaw, Kew Bull. 21: 396. 1968 (typification); Kew Bull. 26: 294. 1972.— *Mallotus filiformis* Hook.f., Fl. Br. Ind. 5: 435. 1887.— *M. polyneurus* Hook.f., Fl. Br. Ind. 5: 439. 1887.

T h a i l a n d.— NORTHERN: Mae Hong Son (Doi Chong), Chiang Mai (Chomtong, Doi Angka, Doi Inthanon, Doi Lon, Doi Nang Ka, Doi Sutep, Khun Kong San, Mae Kang), Nan (Doi Phukha), Lampang (Chae Son), Phitsanulok (Phuhin Rongkla), Kamphaeng Phet (Mae Wong); NORTH-EASTERN: Loei (Phu Kradueng); SOUTH-WESTERN: Kanchanaburi (Khao Ri Yai).

D i s t r i b u t i o n.— India (Assam, type), Myanmar, and Thailand.

E c o l o g y.— Usually very common in the understorey of deciduous and hill evergreen forest, also in partly open places and sunny roadsides, often along streams; soil: granite bedrock; 650–2100 m.

V e r n a c u l a r.— Ngao nok (เงานก), ngao-pa (เงาป่า), sipo (สิบ่อ), sipo yang (สิบ่อยาง) (Northern).

11. Mallotus (§ Hancea) **kingii** Hook.f., Fl. Br. Ind. 5: 439. 1887; Airy Shaw, Kew Bull. 26: 295. 1972; Whitmore, Tr. Fl. Mal. 2: 115. 1973.

T h a i l a n d.— PENINSULAR: Yala (Khlong Mu Bo, Thanto), Narathiwat (Waeng).

D i s t r i b u t i o n.— Thailand and Peninsular Malaysia (type).

E c o l o g y.— Evergreen and secondary forest; 300–835 m.

12. Mallotus (§ Rottlera) **leptostachyus** Hook.f., Fl. Br. Ind. 5: 435. 1887; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii: 183. 1914; Airy Shaw, Kew Bull. 26: 300. 1972.

T h a i l a n d.— SOUTH-WESTERN: Kanchanburi (Sangkhla); PENINSULAR: Chumphon (Ban Kraye, Hot Spring Forest Park), Ranong (Khao Phota Luangkaeo, La-un).

D i s t r i b u t i o n.— Lower Myanmar, Thailand.

E c o l o g y.— Evergreen forest by stream; 1.5–600 m.

13. Mallotus (§ Polyadenii) **leucodermis** Hook. f., Fl. Br. Ind. 5: 441. 1887; Airy Shaw, Kew Bull. 16: 350, 352. 1963; Kew Bull. 20: 39. 1966; Kew Bull. 21: 397. 1968; Whitmore, Tr. Fl. Mal. 2: 116, fig. 10. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 167. 1975.

T h a i l a n d.— PENINSULAR: Narathiwat (Phi Ramin). **New record**.

D i s t r i b u t i o n.— Thailand, Peninsular Malaysia, Sumatra, and Borneo.

E c o l o g y.— Primary and secondary forest, peat swamp forest; soil: brown (basalt derived?); 0–45 m.

V e r n a c u l a r.— Ka dongdong (กะดองดอง) (Peninsular).

14. Mallotus (§ Mallotus) **macrostachyus** (Miq.) Müll.Arg. in DC., Prodr. 15, 2: 963. 1966; Hook.f., Fl. Br. Ind. 5: 429. 1887; Gagnep. in Fl. Gén. I.-C. 5: 357. 1925; Airy Shaw, Kew Bull. 26: 297. 1972; Whitmore, Tr. Fl. Mal. 2: 114. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 165. 1975.— *Rottlera macrostachya* Miq., Sum.: 454. 1860.— *Mallotus albus* Müll.Arg. (excl. *Rottlera alba* Roxb. ex Jack, excl. *Rottlera tetracocca* Roxb.), Linnaea 34: 188. 1865.

T h a i l a n d.— PENINSULAR: Chumphon (Pata), Ranong (Pak Chan, Prapad beach), Surat Thani (Khao Habsib), Phuket (Khao Prataeo), Krabi (Nong Le), Nakhon Si Thammarat (Chawang, Khao Luang, Kung Ching Waterfall), Trang (Khao Chong), Songkhla (Ton Nga Chang, Kho Hong, Rattapum), Yala (Bannang Sata, Khlong Mu Bo, Thanto), Narathiwat (Bala-Hala, Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra (Bangka Island), Borneo.

E c o l o g y.— Usually in disturbed habitats in evergreen forest, along roads, edges of forest, open thickets, along rivers; limestone bedrock; 0–500 m.

V e r n a c u l a r.— Fami (ฝามี), lo (หลอ), lo khon (หลอขน), lua (ล้ัว), plao yai (เปล้าใหญ่) (Peninsular); common pom-pom tree (English).

15. Mallotus (§ Hancea) **miquelianus** (Scheff.) Boerl., Handl. 3, 1: 290. 1900; Airy Shaw, Kew Bull. 26: 295. 1972; Whitmore, Tr. Fl. Mal. 2: 114. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 163. 1975.— *Rottlera miqueliana* Scheff., Ann. Mus. Bot. Lugd.-Bat. 4: 124. 1868.— *Mallotus anisophyllus* Hook.f., Fl. Br. Ind. 5: 435. 1887.

T h a i l a n d.— PENINSULAR: Nakhon Si Thammarat (Ta Samet), Songkhla (Khao Soi Dao, Ton Nga Chang).

D i s t r i b u t i o n.— Thailand, Malay Peninsula, Sumatra, Borneo (type), Philippines.

E c o l o g y.— Evergreen forest, but mainly in disturbed sides, often inundated or wet places; soil: wide variety from sandy soils to clayey loam to limestone; up to 700 m.

U s e s.— Wood can be used for walking sticks. Plant can also act as poison.

16. Mallotus (§ Mallotus) **mollissimus** (Geiseler) Airy Shaw, Kew Bull. 26: 297. 1972; Kew Bull. Add. Ser. 4: 165. 1975.— *Croton mollissimus* Geiseler, Croton. Monogr.: 73. Mar. 1807.— *C. ricinoides* Pers., Syn. 2: 586. Sep. 1807.— *Rottlera ricinoides* (Pers.) A.Juss., Euphorb. Gen. Tent.: 33. 1824.— *Adisca zippelii* Blume, Bijdr.: 611. 1825.— *Chrozophora mollissima* (Geiseler) Spreng., syst. 3: 851. 1826.— *Mallotus ricinoides* (Pers.) Müll.Arg., Linnaea 34: 187. 1865.— *Echinus mollissimus* (Geiseler) Baill., Adansonia 6: 316. 1866.

T h a i l a n d.— NORTHERN: Chiang Rai (Doi Tung); NORTH-EASTERN: Nong Khai (Bungkla, Phonphisai); PENINSULAR: Songkhla (Kho Hong).

D i s t r i b u t i o n.— Myanmar?, Thailand, Indochina, throughout Malesia (Malay Peninsula excepted) to Australia and the W. Pacific.

E c o l o g y.— Open areas along road, secondary places in evergreen forest; 350–1200 m.

V e r n a c u l a r.— Plao thong (เปล้าทอง) (North-eastern).

N o t e.— The specimen from the Peninsular part of Thailand is rather exceptional. The dark brown indumentum is lacking and the leaves are more dentate; it is somewhat intermediate with *M. macrostachyus*.

17. Mallotus (§ Rottlera) **montanus** (Müll.Arg.) Airy Shaw, Kew Bull. 32: 78. 1977.— *Coelodiscus montanus* Müll.Arg. in DC., Prodr. 15, 2: 759. 1866.— *Mallotus eriocarpus* auct. non (Thwaites) Müll.Arg.: Whitmore, Tr. Fl. Mal. 2: 115. 1973.

T h a i l a n d.— PENINSULAR: Trang (Khao Chong), Songkhla (Kho Hong Hill), Narathiwat (Bacho, Waeng).

D i s t r i b u t i o n.— Thailand, Malay Peninsula.

E c o l o g y.— Shaded area in secondary or evergreen forest; 150–400 m.

18. Mallotus (§ Rottlera) **pallidus** (Airy Shaw) Airy Shaw, Kew Bull. 32: 78. 1977.— *Mallotus philippensis* (Lam.) Müll.Arg. var. *pallida* Airy Shaw, Kew Bull. 26: 300. 1972.

T h a i l a n d.— SOUTH-WESTERN: Prachuap Khiri Khan (Khao Daeng, Sam Roi Yot).

D i s t r i b u t i o n.— Endemic in Thailand (type: Prachuap Khiri Khan, Sam Roi Yot, *Put* 2489 (holotype K; isotype BK)).

E c o l o g y.— Dry limestone hills near sea; 0–250 m.

19. Mallotus (§ Mallotus) **paniculatus** (Lam.) Müll.Arg., Linnaea 34: 189. 1865; Airy Shaw, Kew Bull. 26: 298. 1972; Whitmore, Tr. Fl. Mal. 2: 114. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 166. 1975.— *Croton paniculatus* Lam., Enc. 2: 207. 1786.— *Echinus trisulcus* Lour., Fl. Cochinch. 2: 633. 1790.— *Mallotus cochinchinensis* Lour., Fl. Cochinch. 2: 635. 1790.— *Trewia tricuspidata* Willd., Sp. Pl. 4: 835. 1805.— *Rottlera alba* Roxb. ex Jack, Mal. Misc. 1: 26. 1820.— *R. paniculata* (Lam.) A.Juss., Euphorb. Gen. Tent.: 33. 1824.— *Mappa cochinchinensis* (Lour.) Spreng., Syst. 3: 878. 1826.— *Mallotus albus* (Roxb. ex Jack) Müll.Arg., Linnaea 34: 188. 1865 (excl. *M. macrostachyus*, *M. tetracocca*).— *M. chinensis* Lour. ex Müll.Arg. in DC., Prodr. 15, 2: 965. 1966.— *Croton appendiculatus* Elm., Leafl. Philip. Bot. 1: 312. 1908.

T h a i l a n d.— NORTHERN: Chiang Mai, Chiang Rai, Lampang, Phrae, Tak, Sukhothai, Phitsanulok; NORTH-EASTERN: Phetchabun, Loei, Nong Khai, Sakon Nakhon, Khon Kaen; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi, Phetchaburi, Prachuap Khiri Khan; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Sa Kaeo, Chon Buri, Rayong, Chanthaburi, Trat; PENINSULAR: Ranong, Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Trang, Pattani, Narathiwat.

E c o l o g y.— Common pioneer in secondary habitat such as grassy clearings in montane mixed oak forest, dipterocarp forest, mixed deciduous forest; also along peat swamp margin, road sides and forest edges; soil: sandsont and granite bedrock; 0–1500 m.

V e r n a c u l a r.— Satinam (สตีน้ำ), satiton (สตีต้น) (North-eastern); salat-pang (สลัดป่าง), soi dao (สอยดาว) (South-eastern); bue-ra kae pu-te (บือราแกปูเตะ) (Malay?), lang khao (หลังคาว), saet (แสด) (Peninsular); turn-in-the-wind (English).

20. Mallotus (§ Stylanthus) **peltatus** (Geisel.) Müll.Arg., Linnaea 34: 187. 1865; Airy Shaw, Kew Bull. 26: 307. 1972; Whitmore, Tr. Fl. Mal. 2: 113. 1973.— *Aleurites peltatus* Geisel., Croton. Monogr.: 81. 1807.— *Adisca acuminata* Blume, Bijdr.: 610. 1826.— *Rottlera acutifolia* Hassk., Cat. Hort. Bog.: 238. 1844.— *Mappa acutifolia* (Hassk.), Zoll. & Moritzi, Syst. Verz.: 17. 1855.— *Rottlera longifolia* Rchb.f. & Zoll., Verh. Natuurk. Ver. Ned. Ind.1: 31. 1856.— *R. acuminata* (Blume) Baill., Ét. Gén. Euphorb.: 46. 1858 (non Juss., 1824).— *R. oblongifolia* Miq., Fl. Ind. Bat. 1, 2: 396. 1859.— *Hancea muricata* Benth., Fl. Hongk.: 306. 1861.— *Rottlera flavigutta* Miq., Sum.: 453. 1862.— *Mallotus porterianus* Müll.Arg., Linnaea 34: 185. 1865.— *M. acuminatus* (Blume) Müll.Arg., Linnaea 34: 187. 1865.— *M. furetianus* Müll.Arg., Linnaea 34: 190. 1865.—

Mallotus helferi Müll.Arg., Linnaea 34: 190. 1865.— *M. lambertianus* Müll.Arg., Linneae 34: 190. 1865.— *M. oblongifolius* (Miq.) Müll.Arg., Linnaea 34: 192. 1865.— *M. longifolius* (Rchb.f. & Zoll.) Müll.Arg. in DC., Prodr. 15, 2: 967. 1866.— *M. longifolius* (Rchb.f. & Zoll.) Müll.Arg. var. *pubescens* Müll.Arg. in DC., Prodr. 15, 3: 967. 1866.— *M. stylaris* Müll.Arg. in DC., Prodr. 15, 2: 973. 1866.— *Rottlera lambertiana* (Müll.Arg.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4: 125. 1968–9.— *R. stylaris* (Müll.Arg.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4: 125. 1868–9.— *Mallotus puberulus* Hook.f., Fl. Br. Ind. 5: 435.1887.— *M. columnaris* Warb., Bot. Jahrb. 13: 349. 1891.— *M. odoratus* Elm., Leafl. Philipp. Bot. 4: 1299. 1911.— *M. alternifolius* Merr., Philipp. J. Sci. 7, ser. C, Bot.: 395. 1912.— *M. camiguinensis* Merr., Philipp. J. Sci. 7, ser. C, Bot.: 397. 1912.— *M. oblongifolius* (Miq.) Müll.Arg. var. *helferi* (Müll. Arg.) Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 194. 1914.— *M. oblongifolius* (Miq.) Müll.Arg. var. *siamensis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 194. 1914.— *M. maclurei* Merr., Philipp. J. Sci. 21: 347. 1922.

T h a i l a n d.— NORTHERN: Chiang Mai, Lampang, Phayao, Phrae, Uttaradit, Sukhothai, Nakhon Sawan; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Kanchanaburi, Prachuap Khiri Khan; CENTRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Prachin Buri, Chon Buri, Rayong, Chanthaburi; PENINSULAR: Ranong, Surat Thani, Pangnga, Phuket, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Satun, Songkhla, Pattani, Yala, Narathiwat.

D i s t r i b u t i o n.— Myanmar, Andaman Islands, Thailand, Indochina, throughout Malesia to New Guinea.

E c o l o g y.— In a large variety of vegetations, varying from deciduous (mixed) forest to evergreen forest, bamboo forest, mixed oak forest, often along water or in rocky areas, also in disturbed places including thickets, forest edges and fields; soil; shale, limestone or granite bedrock; 0–800 m.

V e r n a c u l a r.— Kadat (กะดาษ), mao (เม่า) (Northern); salat (สลัด) (South-eastern); cha lot (ช้าหลอด), duea khi on (เดื่อขี้อ้น), khi tao (ขี้เต่า), lot thuean (หลอดเถื่อน), phak wan chang khlong (ผักหวานช้างโขลง), plik (ปลิก), prik (ปริก) (Peninsular); wild castor oil (English).

N o t e.— Two widespread species in Thailand, *M. oblongifolius* and *M. peltatus*, have been united. The only difference between the two is the absence or presence of a peltate leaf base. In all other characters, though often very variable (as indicated by the large number of synonyms), they are the same. However, specimens with peltate leaves also often have non-peltate leaves (referred to *M. peltatus*), and specimens with non-peltate leaves often have slightly peltate leaves (always referred to *M. oblongifolius*). The peltation seemingly shows a continuum in Thailand and separation into two species is artificial. Unfortunately, both names, of which *peltatus* is the oldest, are inappropriate as many specimens are not peltate and very often the leaves are clearly ovate or elliptic instead of oblong. The combined taxon is highly distinctive due to its long-acuminate staminate sepals, leaves which are almost devoid of hairs and glandular scales, and the high, urceolate pistillate calyx.

21. Mallotus (§ Hancea) **penangensis** Müll.Arg., Linnaea 34: 186. 1865; Whitmore, Tr. Fl. Mal. 2: 116. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 164. 1975.— *Mallotus echinatus* Elmer, Leafl. Philipp. Bot. 3: 925. 1910.— *M. sarawakensis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 201. 1914.— *M. leptophyllus* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 203. 1914.— *M. pseudopenangensis* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 203. 1914.— *M. xylacanthus* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.vii: 203, 397. 1914.— *M. papuanus* (J.J.Sm.) Pax & K.Hoffk. var. *glabrescens* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147.xiii: 19. 1919.— *M. papuanus* (J.J.Sm.) Pax & K.Hoffm. var. *intermedius* Pax & K.Hoffm. in Engl., Pflanzenr. IV.147. xiii: 19. 1919.

T h a i l a n d.— PENINSULAR: Narathiwat (Bala-Hala). **New record**.

D i s t r i b u t i o n.— Thailand, Vietnam, Peninsular Malaysia, Sumatra, Philippines, Sulawesi, Moluccas, New Guinea.

E c o l o g y.— In understorey of evergreen and (late) secondary forest, sometimes in young secondary forest or scrubs, usually along water in mainly well drained terrain; soils very variable, from clay, sand, loam, sandstone, limestone, alluvial; up to 1700 m.

U s e s.— The leaves are used for "sakit kepala" (headache) in Sumatra; the wood has a faint sweet aroma, and is used to light fires and in house construction (Malaysia).

22. Mallotus (§ Rottlera) **philippensis** (Lam.) Müll.Arg., Linnaea 34: 196. 1865; Hook.f., Fl. Br. Ind. 5: 442. 1887; Merr., En. Philipp. 2: 340. 1921; Gagnep. in Fl. Gén. I.-C. 5: 362. 1025; Airy Shaw, Kew Bull. 21: 392. 1968; Kew Bull. 26: 300. 1972; Whitmore, Tr. Fl. Mal. 2: 115. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 168. 1975.— *Croton philippense* Lam., Enc. 2: 206. 1786.— *C. punctatus* Retz., Obs. Bot. 5: 30. 1789.— *C. coccineus* Vahl, Symb. Bot. 2: 97. 1791.— *Rottlera tinctoria* Roxb., Pl. Corom. 2: 36. 1802.— *Croton montanus* Willd., Sp. Pl. 4: 547. 1805.— *Rottlera aurantiaca* Hook. & Arn., Bot. Beech. Voy.: 270. 1841.— *R. affinis* Hassk., Flora 25, Beibl. 2: 41: 1842.— *Mappa stricta* Rchb.f. & Zoll., Verh. Natuurk. Ver. Ned. Ind. 1: 31. 1856.— *Aconceveibum trinerve* Miq., Fl. Ind. Bat. 1, 1: 389. 1859.— *Macaranga stricta* (Rchb.f. & Zoll.) Müll.Arg. in DC., Prodr. 15, 2: 1004. 1866.— *Echinus philippinensis* [Lam.] Baill., Adansonia 6: 314. 1866 (incorrect spelling).— *Rottlera philippinensis* [Lam.] Scheff., Ann. Mus. Bot. Lugd.-Bat. 4: 124. 1868–9 (incorrect spelling).— *Mallotus reticulatus* Dunn., J. Linn. Soc. London 38: 365. 1908.

T h a i l a n d.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Phayao, Lamphun, Lampang, Sukhothai, Phitsanulok, Kamphaeng Phet, Nakhon Sawan; NORTH-EASTERN: Loei, Nakhon Phanom; EASTERN: Chaiyaphum, Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi, Ratchaburi, Phetchaburi, Prachuap Khiri Khan; CENRAL: Saraburi, Nakhon Nayok; SOUTH-EASTERN: Chon Buri, Rayong, Chanthaburi; PENINSULAR: Surat Thani, Phuket, Krabi, Nakhon Si Thammarat, Trang, Songkhla.

D i s t r i b u t i o n.— From W. Himalaya and Sri Lanka to Taiwan, throughout Malesia to Australia and W. Pacific.

E c o l o g y.— In mixed *Phoenix-Cycas* formation, near sea shore, thickets, degraded, fire-prone agricultural margins, along roadsides, rocky streams, disturbed areas

with secondary growth, grassy place by clearings, dry evergreen forest (with much bamboo),dry deciduous dipterocarp forest, dry mixed deciduous forest; shale bedrock, sandy soil, sandstone, limstone, quartzite bedrock, granite bedrock; 0–1225 m.

V e r n a c u l a r.— Kai khat hin (กายขัดหิน), khi nuea (ขี้เนื้อ), kue-bo (กือบอ), ma kai khat (มะกายคัด), sa-bo-se (ซาบอเส่) (Karen-Mae Hong Son); sakkabuea lawa (สากกะเบือละว้า) (Northern); khang poi (ขางปอย), sat pa (ชาดป่า), thong khao (ทองขาว) (North-eastern); ma kai (มะกาย) (North-eastern, Central); thaeng thuai (แทงทวย) (South-western, Central); kham daeng (คำแดง), kham saet (คำแสด), saet (แสด), thong thuai (ทองทวย) (Central); lai tua phu (ลายต้าผู้) (South-eastern); khi tao (ขี้เต่า), min-ya ma-ya (มินยะมายา) (Malay-Yala), mue-ra-kae pu-the (มือราแก้ปูเต๊ะ) (Malay-Narathiwat), phlapphla khi tao (พลับพลาขี้เต่า), phla kwang bai yai (พลากวางใบใหญ่) (Peninsular); monkey-faced tree, red berry (English).

U s e s.— Fruits used for red dye. Wood sometimes used for house-posts of medium construction. Fruits and bark dried and crushed used medicinally against 'khai sai dyan' or 'ja thai' in the north.

23. Mallotus (§ Rottleropsis) **pierrei** (Gagnep.) Airy Shaw, Kew Bull. 21: 380. 1968; Kew Bull. 26: 304. 1972.— *Coelodiscus pierrei* Gagnep., Not. Syst. 4: 51. 1923.

T h a i l a n d.— NORTHERN: Chiang Mai (Ban Bo Luang, Doi Kham, Doi Suthep), Lamphun (Mae Li), Lampang (Ngao), Sukhothai (Sa Wang A Rom Temple); NORTH-EASTERN: Loei (Phu Kradueng); SOUTH-WESTERN: Kanchanaburi (Bongti, Sai Yok), Rachaburi (Huai Yang), Phetchaburi (Kaeng Kachan), Prachuap Khiri Khan (Huai Yang, Pak Tawan); PENINSULAR: Chumphon (Kao Talum); Surat Thani (Ban Nai, Khao Phra Rahu, Khirirat Nikhom), Yala (Thanto).

D i s t r i b u t i o n.— Thailand and Indochina (type).

E c o l o g y.— Mainly in deciduous forest, also open, often burned areas, scrub jungle, open secondary jungle, and open, dry evergreen forest; soil granite, granite-shale bedrock; 15–500 m.

N o t e.— This species is difficult to recognise due to its variability. There is a very distinct geographical cline. In the northern provinces the leaves are large and broadly ovate with an often caudate leaf base. In the north-east the leaves are smaller, but the shape is often the same, though a few leaves have cuneate bases. In the south-west the leaves become much smaller and the shape becomes elliptic with a rounded to almost cuneate leaf base. The leaves are smallest and almost glabrous (in the north quite hairy) in the southern part of the south-west and the northern part of the peninsula, though the peninsula is also the part with the largerst and quite hairy leaves. An further problem is that young shoots can flower, and possess very small, usually hairy leaves.

24. Mallotus (§ Polyadenii) **plicatus** (Müll.Arg.) Airy Shaw, Kew Bull. 16: 351. 1963.— [*Croton eirocarpoides* Wall., Cat. 7728. 1827, nom. nud.].— [*C. castaniofolius* Wall., Cat.: 7760. 1847, nom. nud.].— *Coccoceras plicatum* Müll.Arg., Flora 47: 539. 1864.—

Mallotus eriocarpoides Wall. ex Müll.Arg., Linnaea 34: 185. 1865.— *M. wallichianus* Müll.Arg., Linnaea 34: 196. 1865.— *Hymenocardia plicata* Kurz, Fl. Burm. 2: 395. 1877.— *Coccoceras anisopodum* Gagnep., Bull. Soc. Bot. France 71: 1021. 1925.— *Mallotus anisopodus* (Gagnep.) Airy Shaw, Kew Bull. 16: 351. 1963 & 26: 299. 1972.

T h a i l a n d.— NORTH-EASTERN: Maha Sarakham (Kosum Phisai); CENTRAL: Saraburi (Maenam Pa sak).

D i s t r i b u t i o n.— Myanmar (type), Thailand, Laos, Cambodia, Vietnam.

E c o l o g y.— Evergreen forest; ca. 150 m.

25. Mallotus (§ Rottlera) **repandus** (Willd.) Müll.Arg., Linnaea 34: 197. 1865, Hook.f., Fl. Br. Ind. 5: 442. 1887; Gagnep. in Fl. Gén. I.-C. 5: 365. 1925; Airy Shaw, Kew Bull. 26: 301. 1972; Whitmore, Tr. Fl. Mal. 2: 114. 1973.— *Croton repandus* Willd., Neue Schrift. Naturf. Freunde Berlin 4: 206. 1803.— *C. rhombifolius* Willd., Sp. Pl. 4: 555. 1805.— *?Helwingia populifolia* Spreng., Pl. Pugillus: 89. 1815; Airy Shaw, Kew Bull. 15: 419. 1962.— *Rottlera scabrifolia* A.Juss. Euph. Gen. Tent.: 111, t. 9, fig. 29B. 1824.— *R. viscida* Blume, Bijdr.: 608. 1825.— *R. dicocca* Roxb., Fl. Ind. ed. 2, 3: 829. 1832.— *R. scandens* Span., Linnaea 15: 348. 1841.— *R. trinervis* Zipp. ex Span., Linnaea 15: 348. 1841.— *Adisca timoriana* Span., Linnaea 15: 348. 1841.— *Rottlera laccifera* sec. Voigt, Hort. Suburb. Calc.: 157. 1845 (excl. synon. *Croton laccifer* L.).— *Rottlera (?) cordifolia* Benth., Fl. Hongk.: 307. 1861.— *R. rhombifolia* (Willd.) Thwaites, En. Pl. Zeyl.: 272. 1864.— *Mallotus scandens* (Span.) Müll.Arg. in DC., Prodr. 15, 2: 272. 1864.— *Rottlera repanda* (Willd.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4: 124. 1868–9.

T h a i l a n d.— NORTHERN: Chiang Mai (Doi Chiang Dao), Chiang Rai (Doi Luang), Phrae (Huai Kamui); NORTH-EASTERN: Loei (Phu Luang), Khon Kaen (Pha Braung Cave); EASTERN: Nakhon Ratchasima (Pak Thongchai); SOUTH-WESTERN: Kanchanaburi (Sangkhla Buri), Ratchaburi (Ban Pong), Prachuap Khiri Khan (Pranburi); CENTRAL: Saraburi (Sam Lan), Bangkok (Wat Sing); SOUTH-EASTERN: Sa Kaeo (Wattana), Chon Buri (Sriracha, Tong Brong), Chachoengsao; PENINSULAR: Surat Thani (Kao Nong, Ko Samui), Yala (Be Tong).

D i s t r i b u t i o n.— W. India, Sri Lanka to Taiwan and the Philippines, scattered throughout Malesia (absent from Borneo) to Australia and New Caledonia.

E c o l o g y.— Usually in disturbed places includingthickets, roads, along streams in evergreen and mixed deciduous forests; soil: calcareous, limestone bedrock; 150–550 m.

V e r n a c u l a r.— Ma kai khruea (มะกายเครือ), ma pop khruea (มะปอบเครือ) (Northern); naeo nam (แนวน้ำ) (South-western); pho khan (โพคาน) (Central); kho khlan (โคคลาน) (South-eastern); kue-ko bue-ya (กือเก๊าะบือยะ), ku-ko mu-ya (กูเก๊าะมูยะ) (Malay-Narathĭwat); kurapia (กุระเปี้ยะ), yieo maeo (เยี่ยวแมว), yieo maeo thao (เยี่ยวแมวเถา) (Peninsular).

26. Mallotus (§ Rottleropsis) **resinosus** (Blanco) Merr., Sp. Blanc.: 222. 1918; En. Philipp. 2: 436. 1923; Airy Shaw, Kew Bull. 26: 294. 1972; Airy Shaw, Kew Bull. Add. Ser. 4: 161. 1975.— *Adelia resinosa* Blanco, Fl. Filip. ed. 2: 562. 1845.— *Claoxylon muricatum*

Wight, Ic. 5, 2: 24, t. 1886. 1852.— *Axenfeldia intermedia* Baill., Ét. Gén. Euphorb.: 419. 1858.— *Rottlera muricata* (Wight) Thwaites, En. Pl. Zeyl.: 273. 1864.— *Mallotus dispar* (Blume) Müll.Arg. var. *psiloneurus* Müll.Arg., Linnaea 34: 191. 1865.— *M. muricatus* (Wight) Müll.Arg., Linnaea 34: 191. 1865.— *M. decipiens* Müll.Arg., Linnaea 34: 194, p.p. 1865; Hook.f., Fl. Br. Ind. 5: 434. 1887; Airy Shaw, Kew Bull. 26: 303. 1972.— *Coelodiscus muricatus* (Wight) Gagnep. in Fl. Gén. I.-C. 5: 369, p.p. 1925.

T h a i l a n d.— NORTHERN: Chiang Mai (Huai Bo Ka Lang), Tak (Khao Phra Wa), Lampang (Mae Ping); SOUTH-WESTERN: Ratchaburi (Huai Yang, Khao Nam Tok), Phetchaburi (Ta Duang), Prachuap Khiri Khan (Huai Yang, Kaeng Kajan, Khao Chong Kra Chok, Sam Roi Yot); EASTERN: Chaiyaphum (Ban Lui Lai, Khao Phaya Po), Nakhon Ratchasima (Khao Yai National Park); CENTRAL: Saraburi (Tham Phra Photisat), Nakhon Nayok (Nang Rong Falls); SOUTH-EASTERN: Sa Kaeo (Roi Pi), Prachin Buri (Khao Hua Chang), Chon Buri (Chantaten Falls, Hop Bon, Khao Khieo), Chanthaburi (Khao Soi Dao); PENINSULAR: Chumphon (Bang Son), Surat Thani (Chaiya, Kantuli), Phangnga (Khao Nang Hong, Khao Sam Kob, Khao Tam Thong Lang), Phatthalung (Khao Hua Tak, Khao Oktalu).

D i s t r i b u t i o n.— S. India, Sri Lanka, Andaman & Nicobar islands, Myanmar, Thailand, Indochina, Malay Peninsula (?), Java, Philippines (type), Sulawesi, Lesser Sunda Islands, New Guinea, N. Queensland.

E c o l o g y.— In dry evergreen forest, deciduous forest, disturbed forest with much bamboo, clearings, along streams; soil: mainly on limestone, also on shale; 20–1525 m.

N o t e.— *Mallotus resinosus* and *M. decipiens* have been united. *M. resinosus*, as identified in several herbaria, has mainly glabrous leaves, while *M. decipiens* always has hairy leaves. A further difference should be the presence/absence of trinervation. However, all specimens are trinerved and intermediate stages in hairiness exist. Generally, the more hairy specimens are present in the north (Lampang), east, south-east and northern part of the peninsula. Plants with more glabrous leaves are found in the north (Chiang Mai), south-west, central and peninsula. However, exceptions exist. The distributions of the two former species also complement each other; thus no argument exists to keep them separate.

27. Mallotus (§ Axenfeldia) **spec. nov. 1**

T h a i l a n d.— SOUTH-WESTERN: Kanchanaburi (Huai E-tong, Pilok, Sangkhla Buri).

D i s t r i b u t i o n.— Endemic in Thailand (type: Pilok, Kanchanaburi, PRAYAD 821, holo in BK), perhaps also in Myanmar.

E c o l o g y.— Hill top, evergreen forest; 1100 m.

N o t e.— The staminate flowers are missing and, therefore, it is questionable whether this is a *Mallotus* or a *Macaranga*, because both have the same type of spines on the fruit in some species (e.g., *Mallotus clellandii* and *Macaranga trichocarpa* respectively). The number of thecae of the stamens is decisive for the genus. Moreover,

real stellate hairs are lacking (typical for *Mallotus*, though exceptions seem to exist). However, the needle-like stipules, opposite leaves and short inflorescences are all reminiscent of *Mallotus*.

28. Mallotus (§ Rottleropsis) **spodocarpus** Airy Shaw, Kew Bull. 21: 383. 1968 & 26: 304. 1972.

T h a i l a n d.— NORTHERN: Nakhon Sawan (Hua Wai); EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Kanchanaburi (Ta Salao, Wang Kanai), Phetchaburi (Khao Yoi); CENTRAL: Chai Nat, Saraburi (Maenam Pasak, Saraburi).

D i s t r i b u t i o n.— Thailand, Vietnam (Annam).

E c o l o g y.— Along sunny waysides, in mixed forest, deciduous forest, bamboo forest; soil reported a few times as limestone; 20—250 m.

V e r n a c u l a r.— Phaya rak diao (พระยารักเดียว) (Eastern); takhe khumwang (ตะเข้คุมวัง) (South-western); tao tua mia (เต่าตัวเมีย) (Central).

29. Mallotus (§ Hancea) **stipularis** Airy Shaw, Kew Bull. 21: 398. 1968 & 26: 296. 1972; Kew Bull. Add. Ser. 4: 164. 1975.

T h a i l a n d.— PENINSULAR: Ranong (Khao Phota Luang Kaeo), Satun (Khao Kaeo, Khlong Ton), Pattani (Khao Khalakhiri).

D i s t r i b u t i o n.— Thailand, Sumatra (type), Borneo.

E c o l o g y.— Mainly in evergreen but also secondary forest; along roads, rivers, forest edges, in regrowths; soils: alluvial, basalt derived, clayey or sandy; 400–1100 m.

V e r n a c u l a r.— Nut (นูด) (Peninsular).

30. Mallotus (§ Rottleropsis) **subcuneatus** (Gage) Airy Shaw, Kew Bull. 26: 304. 1972; Whitmore, Tr. Fl. Mal. 2: 115. 1973.— *Coelodiscus subcuneatus* Gage, Rec. Bot. Surv. Ind. 9: 240. 1922.— *C. dispar* sensu Airy Shaw, not (Blume) Müll.Arg., Kew Bull. 21: 380. 1968.

T h a i l a n d.— PENISULAR: Surat Thani (Ko Samui), Phuket (Kamala), Krabi (Ko Lanta).

D i s t r i b u t i o n.— Thailand and Peninsular Malaysia (type).

E c o l o g y.— Locally common (by streams) in evergreen forest; 100–300 m.

31. Mallotus (§ Oliganthae) **subpeltatus** (Blume) Müll.Arg., Linnaea 34: 189. 1865; Hook.f., Fl. Br. Ind. 5: 433. 1887; Airy Shaw, Kew Bull. 21: 390. 1968; Kew Bull. 26: 299. 1972; Whitmore, Tr. Fl. Mal. 2: 116. 1973.— *Adisca subpeltata* Blume, Bijdr.: 610. 1825.— *Rottlera subpeltata* (Blume) Baill., Ét. Gén. Euphorb.: 423. 1858.— *Mappa rhynchophylla* Miq., Fl. Ind. Bat. 1, 2: 394. 1859.— *Rottlera rhynchophylla* (Miq.) Miq., Sum.: 181, 454. 1861.

T h a i l a n d.— PENINSULAR: Chumphon (Khao Pang, Pa To), Ranong (Khao Nam Ron, Kraburi, Phato), Krabi (Ao Luk, Khao Phanom), Nakhon Si Thammarat (Khao Luang), Phatthalung (Khao Pu-Khao Ya), Trang (Khao Chang, Outong), Satun (Nam Ra), Songkhla (Kho Hong), Pattani (Banang Sta), Yala (Kue Long).

D i s t r i b u t i o n.— Lower Myanmar, Peninsular Thailand, Malay Peninsula, Sumatra, Java (type).

E c o l o g y.— From cleared forest, open thickets to secondary forest, to dry to wet evergreen forest, often along forest margin or stream; soil: limestone, granitic bedrock; 0–450 m.

V e r n a c u l a r.— Cha ngo phi (ช้าเงาะผี), dan mi (ดันหมี), han ton (หันต้น), (Peninsular).

32. Mallotus (§ Stylanthus) **thorelii** Gagnep., Not. Syst. 4: 53. 1923; in Fl. Gén. I.-C. 5: 358. 1926; Airy Shaw, Kew Bull. 26: 307. 1972.

T h a i l a n d.— NORTHERN: Nakhon Sawan; EASTERN: Nakhon Ratchasima (Tha Chang), Surin (Tathum), Si Sa Ket (Kantralak); SOUTH-WESTERN: Phetchaburi; CENTRAL: Saraburi (Maenam Sak); SOUTH-EASTERN: Sa Kaeo (Lam Nang Rong), Prachin Buri (Aranya Prathet). Seemingly also in North-eastern, Eastern, and Central.

D i s t r i b u t i o n.— Thailand, Laos, Cambodia, Vietnam (type).

E c o l o g y.— Mixed or evergreen forest or scrub; low altitudes.

V e r n a c u l a r.— Fai nam (ฝ้าขน้ำ) (North-eastern); mai pruek (ไม้ปรึก) (South-eastern).

33. Mallotus (§ Rottleropsis) **tiliifolius** (Blume) Müll.Arg., Linnaea 34: 190. 1965; Airy Shaw, Kew Bull. 26: 305. 1972; Whitmore, Tr. Fl. Mal. 2: 114. 1973; Airy Shaw, Kew Bull. Add. Ser. 4: 170. 1975.— *Croton tiliifolius* Lam. var. *aromaticus* Lam., Enc. 2: 206. 1786.— *Rottlera acuminata* sensu A.Juss. (not (Blume) Müll.Arg.), Euphorb. Gen. Tent.: 33. 1824.— *R. tiliifolia* Blume, Bijdr.: 607. 1825.— *R. blumei* Decne, Nouv. Arch. Mus. [Paris] 3: 486. 1835.— *Mallotus playfairii* Hemsl., J. Linn. Soc. 26: 441. 1894.

T h a i l a n d.— PENINSULAR: Surat Thani (Kanchanadit, Ko Prap, Ko Samui).

D i s t r i b u t i o n.— Thailand, Taiwan, Hainan, throughout Malesia to N. Australia and the W. Pacific to Fiji.

E c o l o g y.— In scrubs, edge of evergreen forest or edge of tidal marsh, in littoral or close to sea.

34. Mallotus (§ Axenfeldia) **spec. nov. 2**

T h a i l a n d.— SOUTH-EASTERN: Chanthaburi (Soi Dao Nua); PENINSULAR: Ranong (Khao Tala); Surat Thani (Ko Samui); Phuket (Ao Sane Beach).

D i s t r i b u t i o n.— Endemic in Thailand (type: Soi Dao Nua, Chanthaburi, SANTISUK 6684, BKF holo).

E c o l o g y.— Uncommon in secondary evergreen forest by roadside to evergreen forest; soil: recorded once from limestone; 0–350 m.

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