

## The genus *Canthium* (Rubiaceae, Vanguerieae) in Thailand, with a note on the typification of the genus

WILLEM J.J.O. DE WILDE<sup>1,†</sup> & BRIGITTA E.E. DUYFJES<sup>1,\*</sup>

### ABSTRACT

*Canthium* s.s. comprises sixteen species in Thailand. They are described and annotated, and placed in a key to the species. The type species of the genus is *Canthium parviflorum*, from India, but this name is not antedated by *C. coromandelicum*, which is a different species. *Canthium parviflorum* is lectotypified. For Thailand three new species, *Canthium flavovirens*, *C. grandiflorum*, and *C. rotundum* are described, and thirteen lectotypes are designated.

KEYWORDS: keys, lectotypes, morphology, new species, *Psydrax*, *Pyrostria*, taxonomy.

Accepted for publication: 22 November 2022. Published online: 29 November 2022

### INTRODUCTION

Vanguerieae Dumort. is a well-recognisable tribe of Rubiaceae (mainly African), and comprises a fair number of much resembling, still poorly defined and difficult to recognise genera, characterised by, among other characters, the presence of a stigmatic knob, a 2–5-loculed ovary, with one sub-apical ovule in each locule (Robyns, 1928; Bridson, 1985). Morphological characters which define the tribe are summarised by Davis *et al.* (2007).

The genus *Canthium* Lam. in the present article is treated in the narrow sense, as explained and accepted by Wong *et al.* (2018), with the main characteristics including the presence of two (sub)serial axillary

buds, the upper one producing a spine, the lower one developing into a brachyblast (sometimes leafy) producing flowers axillary to minute scales. For Thailand, the only existing comprehensive treatments are by Craib (1932a, 1932b), but in Craib's work the limits of the genus are much wider and includes, besides *Canthium* in the present narrow sense, species which are now considered to belong to three separate genera: *Psydrax* Gaertn., *Canthiumera* K.M.Wong & Mahyuni and *Pyrostria* Comm. ex A.Juss. Among Craib's 26 enumerated species, 16 species among which one with a new name, and three here described as new species, belong to *Canthium* in the present narrow sense (*Canthium* s.s.).

### Recognition of *Canthium* Lam. s.s. in Thailand

#### KEY TO FIVE RESEMBLING AND CONFUSED GENERA IN THAILAND

1. Shrub with spines. Ovary with (4–)5 locules **Meyna** Roxb. ex Link
1. Shrub or treelet with or without spines. Ovary with 2 locules
  2. Shrub with spines (spines in the twigs, sometimes only on main stem, or not collected or overlooked). Twigs slender, 1.5–2 mm diam. Inflorescence a 2–5(–8)-flowered fascicle. Corolla tube inside only with a single row of downwards directed straight hairs from near the throat **Canthium**
  2. Treelet (or shrub) lacking spines. Twigs stouter, (3–)4–5 mm diam. Inflorescence (8–)10–30-flowered, cyme-like or subumbellate, or rather paniculate. Throat of corolla tube visibly hairy or not, with or without a single row of downwards directed simple hairs within the corolla tube
  3. Inflorescence panicle-like branched (largely racemose). Foliage drying dull and mostly darkish, brittle when dry. Corolla tube more-or-less constricted at the throat, with moniliform hairs protruding in 5 bundles; tube inside with downwards directed hairs. Pyrene smooth, shouldered, and with a dorsal crest all along the pyrene **Canthiumera**

<sup>1</sup> Naturalis Biodiversity Center, section Botany, P.O. Box 9517, 2300 RA Leiden, The Netherlands.

\* Corresponding author: B.dewilde-duyfjes@Naturalis.nl

3. Inflorescence cyme-like, umbellate or fasciculate. Foliage drying not dull, sometimes glossy, not brittle when dry. Corolla tube not constricted, with or without protruding hairs, moniliform or non-moniliform; tube inside glabrous or hairy. Pyrene verrucose or furrowed
4. Flowers bisexual, 5-merous. Corolla throat with non-moniliform hairs, tube inside sparsely or densely hairy. Style long-exserted, stigmatic knob longer than wide, at base deeply recessed, i.e. mitriform **Psydrax**
4. Flowers (functionally) unisexual, 4-merous. Corolla throat with a continuous band of moniliform hairs, tube inside glabrous. Style not or shortly exserted, stigmatic knob about as long as wide, solid **Pyrostria**

## Notes.

1. The genus *Pyrostria* (here comprising the Asian species of *Pyrostria*) is “group B” of Bridson (1987: 613), see also Utteridge & Davis (2009).

2. The presence of the genus *Dibridsonia* K.M.Wong in Thailand is doubtful and the genus is not included in the key here. We have not seen specimens from Thailand, but it is mentioned for Thailand by Wong in Wong *et al.* (2019: 61).

3. The distinction between *Psydrax* and *Pyrostria* in South-East Asia is not easy. The holotype of the genus *Psydrax* (L 0076334, in herbarium van Royen) consists only of fruits, and Gaertner’s figure (1788: 125, tab. 26, fig. 6) depicts only fruits. As epitype we propose the flowering specimen *Kostermans 24428*, Sri Lanka (L [L.2961732]).

4. For the distinction between *Psydrax* and *Pyrostria*, characters for *Psydrax* are the presence (partly) or absence of bracts below the flowering part(s) of the inflorescence, summarised by Utteridge & Davis (2009: 751), the shape and morphology of the stigmatic knob (longer than broad, and with a deep basal recess), the long style and the presence of hairs in the corolla tube. In *Psydrax* species, bracts at the base of the inflorescence or at the distal end of the peduncle can be either absent (but leaving scars), or small and caducous, or small or medium sized and persistent. In *Pyrostria* (type from Madagascar) those bracts are large and persistent, and in a younger stage are spathe-like and connate, enclosing the young inflorescence. The stigmatic knob is about as long as broad.

## Look-alike genera

*Canthium s.s.* species have spines, but there are several spiny look-alikes in other genera of Rubiaceae (Puff & Chamchumroon, 2003). In Thailand, to facilitate the placement of a specimen to *Canthium s.s.* it should comply with the following distinctive (spot-)characters:

Subscandent or erect shrub (or treelet) with axillary spines. *Twigs* when young hairy at apex, slender, 2 mm diam. or less. *Inflorescences* situated below the spines, axillary to leaves (never terminal), consisting of one few-flowered axillary brachyblast or of 1 or 2 axillary flowers. *Flowers*: pedicel with 2 opposite bracteoles; ovary 2-celled, each containing one ovule attached near the top; calyx tube short or long, at margin with lobes minute, triangular, not elongate; corolla tube mostly constricted at apex, inside (mostly) with a single row of deflexed hairs from near the throat; corolla lobes valvate in bud; style short, in open flower not more than 4 mm exserted. *Fruit* a drupe, ripening green-yellow, pink or red, or rarely (?) purple, with 2 pyrenes, each pyrene containing one seed.

## TAXONOMY

### On the typification of *Canthium* Lam.

The lectotype of *Canthium* is *Canthium parviflorum* Lam. (Lamarck, 1785). When Alston (1931) recombined *Gmelina coromandelicum* Burm.f. into *Canthium coromandelicum* (Burm.f.) Alston, it was believed that *Gmelina coromandelicum* Burm.f. (Burman, 1768) was an older synonym of *C. parviflorum* Lam., but we do not agree. We find that Roxburgh (1795, 1824, 1832), Gaertner (1806) and De Candolle (1830) erroneously applied Lamarck’s name for a different species with 4-merous flowers, distributed in the Coromandel (south-eastern coastal India) and the dry parts of Sri Lanka, to be cited as *C. parviflorum* auct. non Lam.: Roxburgh, 1795. The name *C. parviflorum* Lam. (syn. *C. rheedii* DC.; Candolle, 1830) concerns a species with 5-merous flowers, endemic to Malabar (south-western coastal India) and possibly the wet part of Sri Lanka (see Ridsdale, 1998). *Canthium parviflorum* Lam. is the same as *Tsjeru-Kara* in Rheede (1685: tab. 37).

The type of *Canthium parviflorum* Lam. is a specimen collected by Pierre Sonnerat in Malabar.

We studied photos of possible type material of *Canthium parviflorum* in the Historical Lamarck Collection in P. There is one sheet with three mounted twig fragments: the left-hand fragment, marked in pencil 'A', with barcode [P00307286], and with 5 glued identification slips partly in Lamarck's handwriting, is chosen here as lectotype of *C. parviflorum* Lam. The middle fragment, marked in pencil 'B' and the right-hand fragment, marked in pencil 'C' (together with barcode [P00308518] possibly belong to *C. coromandelicum* (Burm.f.) Alston.

### Morphology

With the description of the flowers, various authors used different terms for naming the lowermost part comprising the hypanthium which contains the ovary. For clarity, we present a drawing of the mature flower bud and a scheme of a longitudinal section of the flower of *Canthium obscurum* W.J.de Wilde & Duyfjes, in which the terms used in the present paper are given.— Fig. 1a, 1b.

In the key to the species, *Canthium berberidifolium* Geddes is keyed out on the position of its leaves, mostly arranged in a dense clusters, on the brachyblasts. However, this is a practical character. In the alternative lead it is stated that the leaves are in discrete pairs on the twigs, but quite often also

some leaves developed from the brachyblasts can be found in addition.

### Paucity of specimens

It will be seen from the species treatments that in Thailand the majority of species are known from only one or few collections, mostly made by Kerr, and that the intensified collecting in the last decades (for Flora of Thailand) yielded comparatively few collections of *Canthium*. Most species seem to have a restricted distribution, and few are distributed outside Thailand. One would expect that species described from outside Thailand, including those from Peninsular Malaysia could be found within Thailand, e.g. *Canthium aciculatum* Ridl., described from upper Perak, near southern Peninsular Thailand (Ridley, 1911). This latter species strongly resembles *C. quadratum* Craib in general aspect, but in details, in particular the cuneate base and sharp finely reticulate venation of the lamina in the dried type specimen, it is quite different.

A strange case is *Canthium depressinerve* Ridl., described from the northern Malayan state of Kelantan (Ridley, 1920), and which was later recorded by Wong (1989) as occurring in all states of Peninsular Malaysia (specimens not seen by the authors), and one would suspect that it must occur in southern Peninsular Thailand as well; but we have

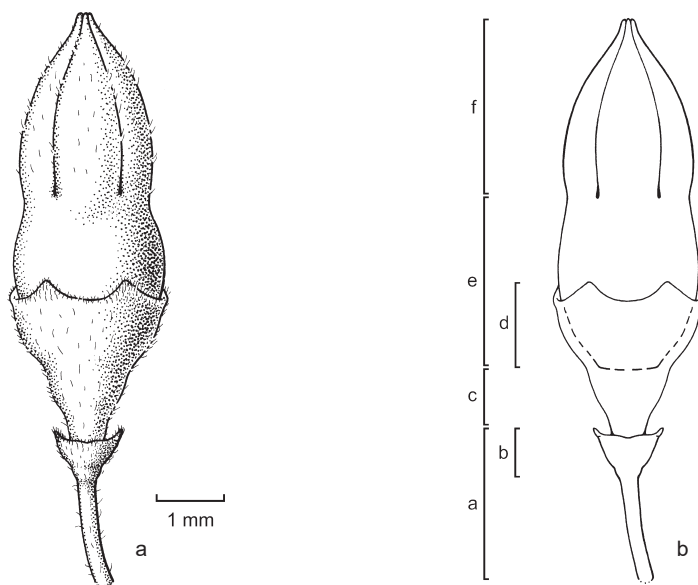


Figure 1a. *Canthium obscurum* W.J.de Wilde & Duyfjes: a. Flower bud.— fig. 1b. idem, schematically: a. pedicel; b. two fused bracteoles; c. ovary; d. calyx limb with lobes; e. corolla tube; f. corolla lobes. Drawn by Esmée Winkel (L).

not found specimens from Thailand. According to its description (brief and incomplete, describing the glabrous upper surface of lamina and lateral veins and the thickly hairy veins on the lower surface, spines not recorded) and detailed image of the type in K [K001129443 - photo seen], the specimen apparently concerns a true *Canthium s.s.* and it easily keys out in the key to the Thai species besides *C. subaureum* Craib. However, *C. depressinerve* was never previously recorded for Thailand.

## TAXONOMIC TREATMENT

### CANTHIUM

Lam., Encycl. (J. Lamarck *et al.*) 1, 2: 602. 1785; Bridson, Kew Bull. 47(3): 353. 1992; Ridsdale, Revised Handb. Fl. Ceylon 12: 213. 1998; Puff *et al.*, Rubiaceae Thailand: 122. 2005; S. Gardner *et al.*, Forest Trees Southern Thailand 3: 1895. 2018; K.M. Wong in K.M. Wong *et al.*, Fl. Singapore 13: 30. 2019. Type: *Canthium parviflorum* Lam. (lecto-type, designated by De Candolle, Prodr. 4: 475. 1830, by exclusion of *Canthium coromandelicum* Lam.).

Scramblers or shrubs to 6 m tall, shoots slender, at apex ca 1.5 mm diam. or less; leaves axillary with two serial buds, the upper developing into a straight or recurved spine, the bud below the spine developing either into a lateral vegetative shoot or into a brachyblast (short-shoot) not longer than 0.5 cm, the latter either leafy, or with few flowers in the axils of minute bracts. *Stipules* triangular, not keeled, apex acute or acuminate. *Leaves* on the shoots, in some species also (or only) in bunches developing from axillary

brachyblasts. *Inflorescences* axillary, consisting of a solitary flower or of few-flowered fascicles, or of few-flowered brachyblasts with the flowers in the axils of minute bracts (rarely, in *C. longipes*, few-flowered, slenderly few-branched). *Flowers* bisexual, 4- or 5-merous, greenish white or yellowish white; pedicel short or long, with (1 or) 2 opposite minute bracteoles, free or connate forming a cup; calyx at base grown together with the ovary (fig. 1a, 1b), calyx limb (calyx tube) free, mostly short, calyx lobes (sub)triangular, short (not elongate); corolla tube long (*C. grandiflorum*) or mostly short, broad, mostly constricted at the throat just below the lobes (or in *C. grandiflorum* halfway the tube), inside with one ring of downwards directed straight hairs; corolla lobes valvate, spreading, at last usually reflexed; stamens inserted in the throat, between the corolla lobes, patent or reflexed, exserted; filaments short; disc usually present; style short, exserted, the basal part mostly thickened and hairy; stigma (stigmatic knob) 2-lobulate, more-or-less mitriform with mostly a basal recess at its insertion; ovary small, usually obconical, 2-locular; ovules 1 per locule, inserted towards the apex of the locule. *Fruit* few, scattered along the twigs (never clustered), ripening yellow-green or (orange-)red, or occasionally(?) purple-black, juicy or fleshy, subglobose, drupaceous; pyrenes 2, rugulose, each with 1 seed, seed dorsiventrally flattened.

*Distribution*.— Tropical Africa (no material studied), India, Sri Lanka, continental SE Asia, West and central Malesia, east to the Philippines. In Asia about forty species. In Thailand sixteen species.

### KEY TO THE SPECIES

1. Spines curved 7. *C. horridulum*
1. Spines straight
  2. Pedicel (including brachyblast if present) short, 1–4 mm long, shorter than the length of the perianth in bud; flower or fruit held within 3 mm from the twig
  3. Leaves predominantly in bunches on brachyblasts along the twigs
  4. Lamina gradually narrowed to the base, not petiolate 1. *C. berberidifolium*
  4. Lamina cuneate at base, petiole distinct 2. *C. calvum*
  3. Leaves discrete, opposite along twigs; lamina petiolate
  5. Young twigs and leaves glabrous. Lamina drying yellowish, chartaceous or thinly coriaceous, 1–2 cm long, apex broadly rounded 2. *C. calvum*
  5. Young twigs and leaves hairy. Lamina drying green, membranous or chartaceous
  6. Indumentum (twigs, leaves) dense; conspicuous
  7. Indumentum strigose. Leaves large, lamina 6–9(–15) cm long. Flowers 5-merous 14. *C. strigosum*
  7. Indumentum velutinous, hairs not strigose, shorter, ferruginous. Leaves smaller. Flowers 4-merous
  8. Pedicel ca 1 mm long, with two 0.5 mm long densely hairy bracteoles; ovary densely hairy. Fruit ca 2.5 cm diam. 4. *C. ferrugineum*
  8. Pedicel 2–4 mm long, towards apex with two ca 1 mm long connate almost glabrous bracteoles; ovary almost glabrous. Fruit ca 1.5 cm diam. or smaller 12. *C. sarmentosum*

- 6. Indumentum more-or-less inconspicuous
- 9. Lamina drying yellowish
  - 10. Bracteoles on pedicels connate into a shallow, broad cup, with margin entire, smooth, only tips of each bracteole visible by one minute thickish short brown hair **11. *C. rotundum***
  - 10. Bracteoles on pedicel connate into cup with margin somewhat irregular and more-or-less finely hairy
    - 11. Lamina (almost) glabrous above; petiole glabrous, 2–3 mm long **16. *C. subaureum***
    - 11. Lamina hairy above; petiole hairy, 5–7 mm long **5. *C. flavovirens***
- 9. Lamina not drying yellowish
  - 12. Lamina 2–4 cm long, drying blackish, sparsely hairy on both surfaces. Pedicel less than 4 mm long **9. *C. obscurum***
  - 12. Lamina 4–8 cm long, drying green, glabrous. Pedicel ca 4 mm long **3. *C. coffeoides***
- 2. Pedicel (including brachyblast if present) more than 4 mm long; flower or fruit held more than 4 mm away from the twig; flowers mostly few (1–3), sometimes hanging
  - 13. Perianth in bud larger, ca 10 mm long or more
    - 14. Pedicel 10–15 mm long. Calyx limb short (ca 0.5 mm long) **6. *C. grandiflorum***
    - 14. Pedicel 5–8 mm long. Calyx limb long (ca 5 mm long) **15. *C. strychnoides***
  - 13. Perianth in bud smaller, less than 10 mm long
    - 15. Inflorescence usually few-branched; branches (peduncle and pedicels) slender, thread-like **8. *C. longipes***
    - 15. Inflorescence of 1–2 (or few) flowers in a fascicle
      - 16. Pedicel ca 13 mm long **13. *C. stellulatum***
      - 16. Pedicel 5–7 mm long **10. *C. quadratum***

**1. *Canthium berberidifolium*** Geddes, Bull. Misc. Inform., Kew 1928(6): 244. 1928; Craib, Fl. Siam. 2: 135. 1932a; Puff *et al.*, Rubiaceae Thailand: 122, Plate 3.1.39: C–D. 2005; Sangratt., Stud. Canthium: 9, fig. 2.1: A, D. 2013. Type: Thailand, Chon Buri, Sriracha (Ao Ka Siu), 9 Apr. 1920, *Kerr 4183* (lectotype **K** [K000763651] photo seen, designated here; isoelectotype **BM** [BM000945465] photo seen).—Fig. 2a–b.

Shrubs (0.5–)2(–3) m tall; twigs short hairy, slender, ca 1.5 mm diam., sometimes flaky; spines straight, to 2 cm long. *Stipules* inconspicuous, falling early. *Leaves* in fascicles developed on brachyblasts; petiole hairy, to 0.2 cm long; lamina chartaceous, drying (yellow-)green, glossy, glabrous above, (sparsely) hairy beneath, obovate, 1.2–1.8 × 0.5–0.8

cm; base cuneate, decurrent to the very short petiole; margin revolute, ciliate; apex obtuse; midrib flat or impressed above, prominent beneath; lateral veins 2 or 3 on each side. *Inflorescence* composed of 1 to 3 flowers in axillary fascicles, brachyblast inconspicuous or absent. *Flowers* (creamy-)yellow, 5-merous; bud ca 4 mm long; pedicel ca 1 mm long, at apex with two connate ciliate bracteoles; ovary finely hairy, small; calyx limb finely hairy, ca 0.75 mm long, with 5 triangular acute; calyx lobes ca 0.75 mm long; corolla tube urceolate, ca 2 × 2.5 mm; corolla lobes glabrous, ovate-lanceolate, acute, 3.5 × 1.25 mm; filaments ca 0.75 mm long; anthers ca 1.25 mm long; style ca 5 mm long, ca 1 mm exserted, hairy at base; stigma green, globose, 2-lobed, ca 1 mm diam. *Fruit* ripening bright red, depressed globose, ca 1 cm diam.; fruiting pedicel 1–2 mm long.



Figure 2. *Canthium berberidifolium* Geddes: Fruit.— fig. 2b. flower buds and one flower, note stigma green and twigs hairy. Photos Brigitta Duyfjes.



Thailand.— NORTHERN: Chiang Mai [Doi Sutep-Pui NP, 16 Dec. 2009, *Maxwell & Waju* 9 (L)]; NORTH-EASTERN: Nong Khai [Chet Si waterfalls, 20 May 2004, *Pooma et al.* 4121 (BKF)]; Maha Sarakham [3 May 1917, *Kasan et al.* 37 (QBG)]; Khon Kaen [Khon Kaen, 24 May 1966, *Phengnaren & Smitinand* 549 (BKF, L)]; Ban Nam Niang, 27 Aug. 1976, *Rogers* 2 (BK)]; EASTERN: Chaiphaphum [Chaiphaphum, 11 Aug. 1984, *Tirvengadum & Nanakorn* 1819 (P)]; Dat Don, 13 Aug. 1972, *Larsen et al.* 31778 (BKF, L)]; Nakhon Ratchasima [Bua Yai, 31 Oct.–3 Nov. 1931, *Put* 4282 (TCD)]; Korat, 23 Jan. 1931, *Kerr* 19928 (BK)]; Pak Chong, 15 May 1931, *Kerr* 20458 (BK, TCD)]; Loong village, 17 Oct. 2003, *Maxwell* 03-343 (L)]; SOUTH-WESTERN: Ratchaburi [Rajburi, 4 Dec. 1918, *Winit* 517 (BK, BKF)]; SOUTH-EASTERN: Chon Buri [Sriracha, 9 Apr. 1920, *Kerr* 4183, type (BM, K)]; PENINSULAR: Trang [Huai Yot, 27 Jan. 1958, *Smitinand* 4129 (BKF)].

Distribution.— Laos.

Ecology.— In open scrub, and in open deciduous dry dipterocarp forest, in sandy places and on granite bedrock; from sea level to 500 m altitude; most flowering collections are from April and May, and fruiting collections from August and October.

Vernacular.— Ngiang duk (เงี้ยวตุก), ka sang khok (กะสังโคก) (Nakhon Ratchasima).

**2. *Canthium calvum*** Craib, Fl. Siam. 2: 136. 1932a; Craib, Bull. Misc. Inform. Kew. 1932(7): 331. 1932b; Sangratt., Stud. Canthium: 10. 2013. Type: Thailand, Sakon Nakhon, (Wa Nawn Sakon), 18 Feb. 1924, *Kerr* 8506 (lectotype **K** [K000763650] photo seen, designated here; isoelectotypes **A** [A01154726] photo seen, **BK** [BK257324!], **BM** [BM000945463] photo seen, **L** [L0057964!], **TCD** [TCD0017732] photo seen).

Shrubs to 3 m tall; twigs glabrous (glabrescent), slender, 1–2 mm diam.; spines straight, 0.5–0.7 cm long. *Stipules* falling early. *Leaves* in distinct pairs along the twigs as well as on axillary short-shoots; petiole ca 0.3 cm long; lamina chartaceous, drying grey-green or pale yellowish green, lighter below, glabrous on both surfaces, broadly elliptic or obovate, 1–1.7 × 0.8–1.3 cm; base short-cuneate; apex rounded, somewhat retuse; midrib somewhat impressed above, prominent beneath; lateral veins

3–4 on each side, anastomosing near the margin, the finer veins hardly visible. *Inflorescence* composed of 1–3 flowers on short axillary brachyblasts. *Flowers* 5-merous, green; bud ca 1.5 mm long; pedicel glabrous, ca 2 mm long, with 2 connate bracteoles near the apex; ovary ca 1.25 mm long, calyx limb 0.5(–1) mm long, calyx lobes inconspicuous; corolla tube hardly 2 mm long; corolla lobes glabrous, ca 2 × 1.25 mm, acuminate; filaments short; anthers slightly more than 1 mm long, with the connective somewhat lengthened; style ca 2.5 mm long, at base thickened and hairy; stigma ca 0.75 mm long, ribbed. *Fruit* (?immature) globose, slightly didymous, ca 0.4 cm diam. with persistent calyx rim at apex; fruiting pedicel ca 1 mm long.

Thailand.— NORTH-EASTERN: Sakon Nakhon (Wa Nawn Sakon).

Distribution.— Endemic to Thailand, only known from the type.

Ecology.— In evergreen forest by rivers at 200 m altitude; flowering in February.

Notes.— Resembling in various aspects other yellow-green drying species with broad hairy leaves (see key to the species), notably *Canthium rotundum*.

**3. *Canthium coffeoides*** Pierre ex Pit., Fl. Indo-Chine 3: 296. 1924; Craib, Fl. Siam. 2: 137. 1932a; Puff *et al.*, Rubiaceae Thailand: 122, Plate 3.1.39: A, B, E. 2005; Sangratt., Stud. Canthium: 11, fig. 2.2: C, D. 2013; S. Gardner *et al.*, Forest Trees Southern Thailand 3: 1895, fig. 2302. 2018. Type: Laos, between Hué and the Mekong, 1877, *Harmand s.n.* in herb. *Pierre* 1916 (lectotype **P** [P03843807!] designated here; isoelectotype **P** [P03843804] photo seen).

Shrubs or treelets (1–)3–6(–9) m tall; twigs hairy, grey, slender, 1(–2) mm diam., older twigs glabrous; spines usually present (see note), straight, 0.5–1(–3) cm long. *Stipules* hairy, lanceolate, acuminate, ca 3 mm long. *Leaves* in distinct pairs along the twigs; petiole hairy, 0.5–0.7(–0.9) cm long; lamina subcoriaceous, drying green, glabrous on both surfaces, elliptic-oblong, 6–9 × 2.5–3 cm, base cuneate, margin smooth or somewhat hairy, apex acute(-acuminate) or obtuse; midrib flat (or slightly sunken) above, raised beneath; lateral veins 3 or 4

on each side. *Inflorescence* composed of 2–5 flowers axillary to leaves. *Flowers* pale greenish, 5-merous; bud ca 6 mm long; pedicel ca 1 mm long, with two minute (connate at base) bracteoles at apex; ovary hairy, urceolate, ca 1.5 mm long; calyx limb ca 0.5 mm long; calyx lobes ca 0.2 mm long, with some hairs at apex; corolla tube ca 2.5 mm long; corolla lobes glabrous, oblong-lanceolate, ca 2.5 mm long; filaments ca 0.5 mm long; anthers ca 1.25 mm long; disc hairy; style hairy and thickened at base, ca 4 mm long, stigma ca 0.8 × 0.6 mm. *Fruit* ripening yellow, glabrous, globose or ovoid, ca 1.5 × 1.2 cm when dry, fleshy, somewhat flattened, pyrene (1 or 2, warty; fruiting pedicel ca 1 mm long.

Thailand.—NORTHERN: Lampang [Mae Yom, 9 June 1926, *Winit* 1696 (**BK**, **BKF**)]; Phitsanulok [Thung Salang Luang, 23 Dec. 1966, *Prayad* 629 (**BK**); *ibid.*, 19 July 1966, *Larsen et al.* 492 (**BKF**, **L**, **P**)]; Kamphaeng Phet [Chong Yen, 23 Apr. 2004, *Pooma et al.* 3907 (**BKF**)]; Nakhon Sawan [Mae Wong NP, 2 Aug. 2000, *Chamchumroon V.C.* 1009 (**BKF**)]; NORTH-EASTERN: Phetchabun [Lom Kao, 7 May 1955, *Smitinand* 2657 (**BKF**)]; [Phu Luang WS, 15 June 1994, *Santisuk et al. s.n.* (**BKF**)]; Na Hao, 28 Apr. 1995, *Nanakorn et al.* 3283 (**BKF**)]; Nong Khai [Phu Wua WS, 29 Aug. 2001, *Pooma et al.* 2786 (**BKF**, **L**)]; EASTERN: Chaiyaphum [Ban Nam Phrom, 23 May 1974, *Geesink et al.* 6842 (**BKF**, **L**)]; Phu Khiao WS, 13 Aug. 1984, *Tirvengadam & Nanakorn* 1830 (**P**)]; Nakhon Ratchasima [Khao Yai NP, 19 July 1973, *Murata et al. T-16359* (**L**); *ibid.*, 25 July 1973, *Murata et al.* 17076 (**L**); *ibid.*, 9 May 2001, *Boonkongchart* 63 (**BKF**, **L**)]; SOUTH-WESTERN: Kanchanaburi [Sri Sawat, 27 June 1974, *Larsen & Larsen* 33864 (**BKF**, **L**); Saneh Pawng, 9 May 2003, *Kansuntisukmongkol* 314 (**L**); Kritee, 7 July 1973, *Geesink & Phenklai* 6150 (**BKF**, **L**, **P**); Dongyai, 8 Apr. 1975, *Somruay et al.* 169 (**BKF**); Khao Yai, 28 Mar. 1968, *van Beusekom & Phenklai* 162 (**BKF**); Thong Pha Phum, *Sakol* 2571 (**BK**)]; SOUTH-EASTERN: Sa Kao [Khao Takrup, Apr. 1997, *Puff* 970430 1/5 (**BKF**)]; Chachoengsao, [Khao Ang Rua Nai WS, 4 June 2008, *Phonsena & Chusithong* 6037 (**BK**, **BKF**)]; Chon Buri [Khao Kieo, 5 Mar. 1975, *Maxwell* 75-199 (**BK**, **L**); *ibid.*, 23 May 1975, *Maxwell* 75-561 (**BK**, **L**); *ibid.*, 14 Mar. 1976, *Maxwell* 76-148 (**BK**, **L**); *ibid.*, 6 June 1976, *Maxwell* 76-380 (**BK**, **L**); *ibid.*, 2 Mar. 1970, *van Beusekom & Santisuk* 3261 (**BKF**, **L**)]; Rayong

[Rayong, 25 Aug. 1977, *Phengklai* 3859 (**BKF**); Khao Cha Mao NP, 12 Aug. 1989, *Puff et al.* 890812 1/4 (**BKF**); *ibid.*, 27 June 2001, *Chamchumroon & Puff VC* 1071 (**BKF**)]; Chantaburi [3 June 2011, *Sawangsawat* 462 (**QBG**); Khao Soi Dao, 29 June 2001, *Chamchumroon & Puff VC* 1111 (**BKF**); *ibid.*, 13 July 2008, *Phonsena et al.* 6145 (**BKF**); *ibid.*, 25 May 2013, *Tagane et al. T-1602* (**BKF**)]; Trat [Ko Chang, 5 Mar. 2003, *Phengklai* 14477 (**BKF**)]; PENINSULAR: Surat Thani [Khao Sok, 9 June 1992, *Larsen et al.* 42768 (**PSU**); Khao Sok NP, *Gardner et al. ST* 1730 (**BKF**)]; Trang [Chong, 16 May 1970, *Phusomsaeng* 364 (**L**), Khao Chong, Feb. 2001, *Sinbumroong & Davies* 297 (**BKF**); *ibid.*, 11 Mar. 1976, *Chermsirivathana & Prayad*, 2223 (**BK**); Khao Banthat WS, 4 Mar. 2004, *Gardner & Sidisunthorn ST* 163 (**BKF**)]; Narathiwat [Bacho, 18 July 1993, *Puff & Sridith* 930718 1/4 (**PSU**)].

Distribution.— Cambodia, Laos, Vietnam.

Ecology.— Evergreen mixed forest, on hill-sides and along rivers; sandy soil, also on limestone; flowering and fruiting presumably all year through; from low altitudes to, as exception, 1,500 m.

Vernacular.— Kot khao (คตข้าว) (Trang).

Notes.— 1. Sometimes treelets lack thorns on the branches, but on the stem they are present.

2. *Gardner et al. ST* 730 from Surat Thani mentioned that the wood is very hard.

3. According to *Pooma et al.* 2786 ripe fruits are pulpy, depressed globose, ca 4 cm diam. and smelling like apple.

**4. *Canthium ferrugineum*** Craib, Fl. Siam. 2: 138. 1932a; Craib, Bull. Misc. Inform. Kew: 1932(7): 332. 1932b; Sangratt., Stud. Canthium: 14. 2013. Type: Thailand, La-un, Ranawng, 30 Dec. 1918, *Kerr* 16438 (lectotype **K** [000763644] photo seen, designated here; isolectotypes **BK** [BK257325!], **BM** [BM000945460] photo seen).

Straggling shrubs or trees 3–6 m tall; twigs at first densely rusty brown appressed hairy, hairs ca 0.5 mm long, late glabrescent; spines straight, to 1 cm long. *Stipules* appressed hairy, triangular, ca 3 mm long, acute, falling early. *Leaves* in distinct pairs along the twigs; petiole densely hairy, 0.2–1 cm long; lamina chartaceous, drying yellowish-green, rusty hairy all over, especially veins conspicuously

densely hairy on both surfaces, elliptic to oblong-lanceolate,  $3\text{--}6.5 \times 1.3\text{--}3$  cm, base rounded or broadly cuneate, margin hairy, apex rounded to acute (-acuminate); midrib impressed above, raised beneath; lateral veins 3–4 on each side. *Inflorescence* composed of 1–3 subsessile flowers axillary to the leaves or on short hairy brachyblast. *Flowers* 4-merous; bud ca 5 mm long, constricted in the middle, short hairy at apex; pedicel to 1 mm long, bracteole(s) densely hairy, ca 0.5 mm long; ovary densely hairy, ca 1 mm long; calyx limb cup-shaped, ca 1 mm long, calyx lobes minute; corolla tube oblong, 2(–3) mm long; corolla lobes oblong, 3–4 mm long, acute-acuminate, apiculate part outside hairy; filaments short, ca 0.5 mm long; anthers ca 1 mm long; style ca 4 mm long, exerted for ca 1.5 mm, at base somewhat thickened and hairy; stigma ca 0.7 mm long. *Fruit* broadly ellipsoid,  $2.5\text{--}3.2 \times 2.2\text{--}3$  cm.; fruiting pedicel ca 1 mm long.

Thailand.—PENINSULAR: Chumphon [Phato watershed conservation and management unit, 11 Apr. 2008, *Wessumritt* 128 (QBG)]; Ranong [La-un, 30 Dec. 1918, *Kerr* 16438, type (BK, BM, K), Khlong Yan WS, 15 May 2006, *Gardner & Sidisunthorn*, ST2742 (BKF)].

Distribution.—Endemic to Thailand.

Ecology.—In scrub and evergreen forest at 10–150 m altitude; flowering in December; fruiting in April and May.

##### 5. *Canthium flavovirens* W.J.de Wilde & Duyfjes, sp. nov.

This species is distinct from the most similar species *Canthium subaureum* in its shorter petiole 0.5–0.7 mm long, vs petiole 2–3 mm long, lamina surface above hairy, vs glabrous above, and from *C. obscurum* in its yellow-green drying colour of the lamina, vs blackish. Type: Thailand, Northern, Nan, Na Kwang village, without date, *Pantarod* 20 (holotype QBG [QBG71876!]).

Shrubs or small trees (1–)2–3 m tall; twigs slender, finely appressed hairy when young, 1.5–2 mm diam.; spines straight, 0.3–1 cm long. *Stipules* small, falling early. *Leaves* in distinct pairs along the twigs (and often few smaller ones on short brachyblasts); petiole slender, 0.5–0.7 cm long; lamina membranous or thin-chartaceous, drying green or yellowish green, variously fine-hairy on

both surfaces, especially midrib and lateral veins above, somewhat scabrous on upper surface, ovate or elliptic,  $2.5\text{--}4.5 \times (1\text{--})1.5\text{--}3$  cm, base attenuate (cuneate), margin smooth or slightly hairy, apex rounded or narrowed with blunt tip; midrib flat or slightly sunken above, raised beneath; lateral veins 3 on each side. *Inflorescence* composed of 1 or few flowers on short brachyblast. *Flowers* not seen, presumably 5-merous. *Fruit* solitary, scattered, dull dark (blackish) brown, glabrous, obovoid or globose, 1.5–2 cm diam.; fruiting pedicel ca 1 mm long, at apex with 2 minute irregular connate bracteoles appressed to the fruit base.

Thailand.—NORTHERN: Mae Hong Son [towards Mae Surin Waterfall, 24 Sept. 1995, *Larsen et al.* 46888 (BKF, L); Doi Huai Puling, 24 Sept. 1995, *Nanakorn et al.* 4782 (QBG); Doi Pui, 16 Dec. 2007, *Tanake et al.* HN8535 (QBG)]; Nan [Na Kwang village, *Pantarod* 20, type (QBG); Toon Village, 30 July 2009, *Sridith* 299 (QBG)].

Distribution.—Laos, Phongsaly [Ban Houay Pee, 24 Aug. 2005, *Ochiai & Yokohama* 28474 (QBG)].

Ecology.—Evergreen hill side forest with Lauraceae Theaceae and Ericaceae, on hill slopes and ridges; 200–1,500 m altitude; fruiting from July to December.

Vernacular.—Nam-ma-ket (หนามมะเค็ด) (Nan).

Etymolog.—Latin, *flavus* means pale yellow, *virens* means green, referring to the yellowish green leaves.

Provisional conservation assessment.—Data Deficient (DD). *Canthium flavovirens* is known from five collections in Northern Thailand, but there is not enough information for a direct assessment.

Notes.—1. Fruits yellow, fleshy, or with spongy mesocarp.

2. The three yellow-green drying species *Canthium subaureum*, *C. flavovirens* and *C. rotundum* closely resemble each other. Of these, especially *C. flavovirens* comes vegetatively close to the black-drying *C. obscurum*. In this yellow-green drying group also belongs *C. calvum*, a glabrous species.

3. The oldest name in this complex is *Canthium subaureum*, known from one collection from Peninsular Thailand at sea level, with flowers and one small fruit. We have refrained of using this name



for the vegetatively much resembling specimens all with larger fruit only, and without flowers, from montane northern Thailand. More collections of both species are needed for a final assessment of their status.

4. The blackish-drying *Canthium obscurum* is known from many collections as well with flowers as with fruit, and comes close in details to *C. flavovirens*, known from fruit only. However, the general facies of the blackish-drying *C. obscurum* is so obviously different that we cannot unite them.

**6. *Canthium grandiflorum* W.J.de Wilde & Duyfjes, sp. nov.**

Distinct from all other Thai *Canthium* species in its flowers pendent, vs flowers erect, flower bud long, 17–20 mm long, vs flower bud 1.5–5(–16) mm long. Type: Thailand, Northern, Nan, Doi Phu Kha National Park, 18 Sept. 2003, *Phonsena, de Wilde & Duyfjes 3948* (holotype **BKF** [189879!]; isotypes **BKF** [174775!], **L** [L.2902240!]). Fig. 3.

Shrubs 2–4 m tall; twigs appressed hairy in apical part, 1–2 mm diam.; spines straight, 1–2(–3) cm long. *Stipules* densely appressed setose, elliptic, long-acuminate, ca 3 mm long, falling early. *Leaves* in distinct pairs along the twigs; petiole appressed hairy, (0.3–)0.4–0.5 cm long; lamina membranous, drying green, largely glabrous but veins (midrib) at both sides (glabrous or) hairy, narrowly (ovate-) elliptic, 4–11 × 1.5–4.5 cm, base (cuneate or) rounded, margin sparsely hairy, apex acute-acuminate; veins little raised above, much raised beneath; reticulation flat, faint or distinct; lateral veins 4–6 on each side. *Inflorescence* composed of 1 or 2 flower(s) from inconspicuous or to 2 mm long densely hairy brachyblast. *Flowers* greenish creamy or yellow-creamy, 5-merous, pendent; bud ca 20 mm long; pedicel glabrous, slender, 11–17 mm long, with 2 minute somewhat connate bracteoles at or below the middle; ovary glabrous, urceolate, tapering at base, 1–1.5 mm long, calyx limb ca 0.5 mm long with 4 or 5 acute-acuminate, calyx lobes 0.5–1 mm long; corolla tube subcylindrical with a thickening (or narrowing) about halfway (not constricted at apex), 7–8 × 2–3 mm, hairs inside 0.8–1 mm long, inserted at the thickened part and directed downwards towards the style; corolla lobes glabrous, 7–9 mm long, ca 1 mm apiculate; filaments ca 1 mm long;

anthers 2–2.5 mm long; style seemingly glabrous, but densely very finely hairy, ca 12 mm long, 5–6 mm exserted; stigma about as long as wide, 1–1.5 mm diam.; disc prominent, glabrous. *Fruit* green, ripening blackish [*Pooma 1256*], glabrous, when containing 2 pyrenes broadly ellipsoid, ca 1 × 1.5 cm, when containing only one pyrene then skewed of shape, ca 1.2 × 1.2 cm, with the calyx remnant lateral; fruiting pedicel 15–20 mm long.

Thailand.— NORTHERN: Nan [Doi Phu Kha NP, *Phonsena et al 3948*, type (**BKF**, **L**); *ibid.*, 12 Nov. 1995, *Pooma 1256* (**BKF**); *ibid.* 24 Sept., 2000, *Srisanga 1683* (**BKF**, **QBG**); *ibid.*, 14 Sept. 2001, *Srisanga 2251* (**QBG**); *ibid.*, 15 Jan. 2002, *Srisanga 2329* (**QBG**)].

Distribution.— Endemic to Thailand.

Ecology.— Hill evergreen forest; scattered in shaded gallery montane forest by streams; 1,300–1,500 m altitude; flowering and fruiting in September, November, and January.

Etymology.— Latin, *grandis* means large, *floris* means flower, referring to the large flowers.

Provisional conservation assessment.— Data Deficient (DD). *Canthium grandiflorum* is endemic to Thailand and is known from five collections from a single location in a protected area in Northern Thailand, but there is not enough information for a direct assessment.

Notes.— *Canthium grandiflorum* deviates from all other species of *Canthium* in Thailand in its long corolla tube with the ring of deflexed hairs inserted about the middle, not at or close to the throat.

**7. *Canthium horridulum* Craib, Fl. Siam. 2: 139. 1932a; Craib, Bull. Misc. Inform. Kew: 1932(7): 332. 1932b; Sangratt., Stud. Canthium: 15. 2013.** Type: Thailand, Tapa, Songkla, 23 Mar. 1928, *Kerr 14717* (lectotype **K** [K000763643] photo seen, designated here; isolectotypes **BK** [**BK257327!**], **BM** [**BM000945459**] photo seen).

— *Canthium malayense* K.M.Wong, Gard. Bull. Singapore 70(2): 278, fig. 1. 2018; K.M.Wong in K.M.Wong *et al.*, Fl. Singapore 13: 31. 2019. Type: Singapore, Nee Soon freshwater swamp forest, 29 Mar. 2018, *Lua SING2018-320* (holotype **SING** [**SING0238285**] photo seen; isotypes **A** not seen, **K** not seen).

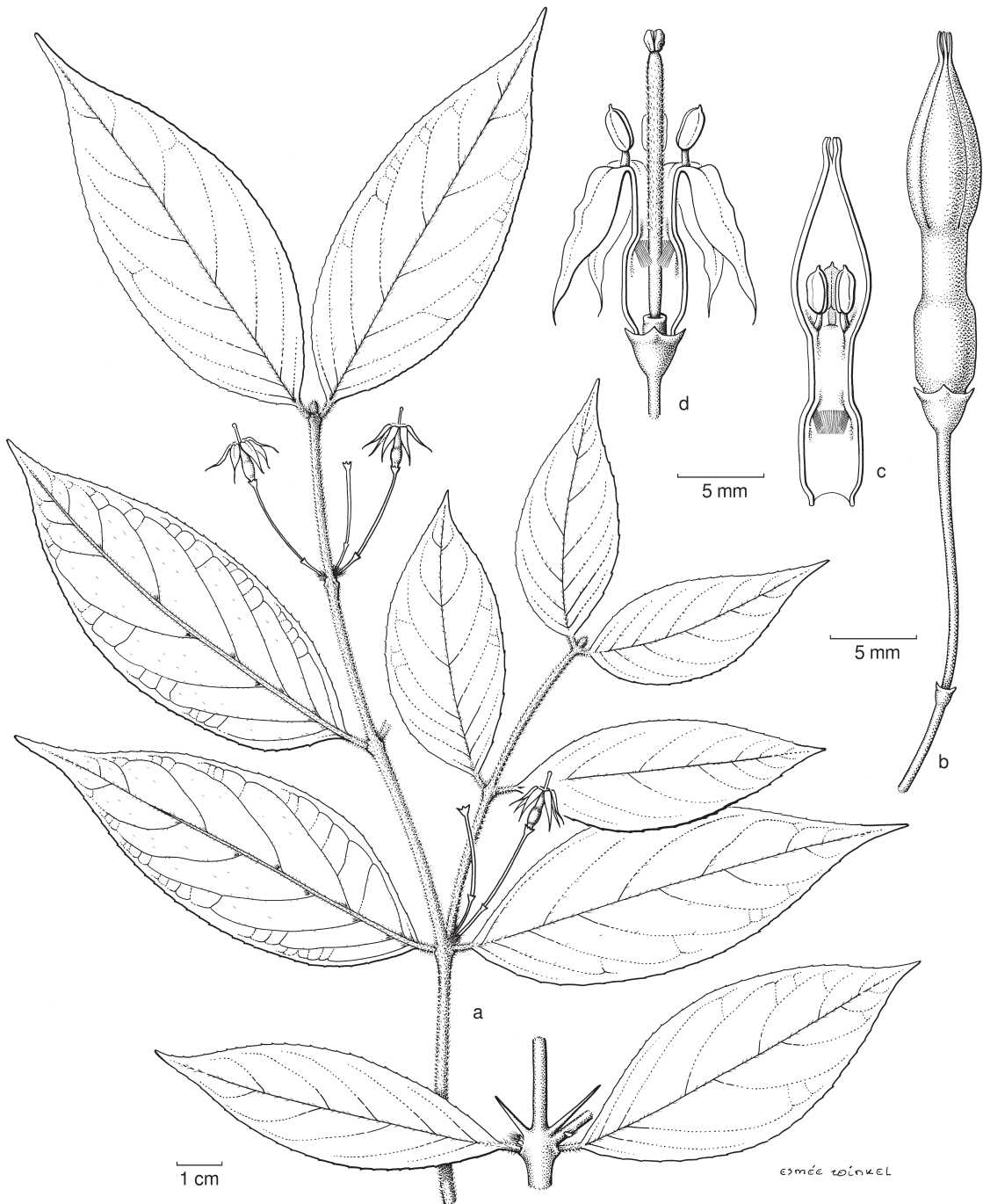


Figure 3. *Canthium grandiflorum* W.J.de Wilde & Duyfjes: a. Portion of flowering twig, drawn from; b. pedicel and flower bud, note fused bracteoles; c. opened flower bud; d. opened flower, note downwards directed hairs halfway the tube (a–d *Phonsena et al.* 3948 (L), note in living plants the flowers are pendent). Drawn by Esmée Winkel (L).

— *Canthium zizyphinum* Wall., Numer. List [Wallich] no. 8288 A. 1847, **nom. nud.**

— *Canthium horridum* auct. non Blume: Ridl., Fl. Malay Penins. 2: 123. 1923; Craib, Fl. Siam. 2: 141. 1932a; S. Gardner *et al.*, Forest Trees Southern Thailand 3: 1895, fig. 2303. 2018.

Subscandent or erect shrubs (1–)3(–7) m tall; twigs hairy, 1–2 mm diam.; spines curved, 0.5(–1) cm long. *Stipules* hairy, triangular, ca 1.5 mm long, falling early. *Leaves* mostly in distinct pairs along the twigs; petiole 0.2–0.3 cm long; lamina thinly coriaceous, drying green, with appressed hairs or glabrescent, ovate, 1.2–4.7 × 0.8–2.5 cm, base cuneate or rounded, margin hairy, apex acute or acuminate; midrib impressed above, somewhat raised beneath; lateral veins 3–4(–5) on each side. *Inflorescence* composed of 1–2(–3) flowers, either 1 in the leaf axil, or 1 (or 2) on short brachyblast to 1.5 mm long. *Flowers* greenish yellow, 5-merous; bud 4–5.5 mm long; pedicel with few hairs, ca 1 mm long, with 2 minute connate bracteoles towards the apex; ovary obconical, subglabrous, 1–1.5 mm long; calyx limb ca 0.5 mm long; calyx lobes triangular, minute, with short hairs; corolla tube urceolate to broad-cylindric, ca 2 × 2 mm; corolla lobes glabrous, oblong, 2–3 mm long, with the apex short-apiculate; style ca 4 mm long, exserted for ca 2 mm from the corolla throat, lower half thickened and short-hairy; stigma ca 1 × 0.5 mm; filaments ca 2 mm long; anthers ca 1.8 mm long. *Fruit* green, ripening yellow or orange, (depressed) globose, to ca 1.5 cm diam. when fresh; fruiting pedicel ca 1 mm long.

Thailand.— **PENINSULAR:** Chumphon [Chumphon, 21 Feb. 1968, *Vacharapong* 102 (**BK**); Lang Suan, 4 June 1969, *Jaray* 115 (**BK**); Ranong [Boon Ya Ban, 26 Apr. 1967, *Sakol* 2467 (**BK**); Surat Thani [Kao Jao, 18 Sept. 1928, *Kerr* 16021 (**BK, L**); Khlong Yan WS, 31 Aug. 2002, *Middleton et al.* 1515 (**BKF, L, P**); Khao Tha Phet, 18 Dec. 2006, *Pooma et al.* 6394 (**BKF**); Ko Samui, 28 May 1927, *Put* 717 (**BK**); Phangnga [Ampo Kao Kao, 5 Aug. 1929, *Rabil* 375 (**BK**); Krabi [Krabi, 13 Mar. 1929, *Kerr* 17477 (**BK**); *ibid.*, 19 Mar. 1930, *Kerr* 18613 (**BK**); Nakhon Si Thammarat [Ta Samet, 28 Jan. 1928, *Kerr* 14282 (**BK**); Walailak University, 28 May 1995, *Nanakorn et al.* 3475 (**QBG**); Tha Sala, 18 Mar. 2012, *Sirimongkol et al.* 351 (**BKF, L**); Phatthalung [Tha Mot, 5 June 1992, *Larsen et al.*

42663 (**PSU**); Trang [Trang, 25 Oct. 1993, *Larsen et al.* 44012 (**BKF**); Khao Pap Pa, 13 Mar. 1974, *Larsen & Larsen* 33269 (**BKF, L**); Thung Khai Arboretum, 16 Sept. 1990, *Puff et al.* 700916 1/8 (**BKF**); Satun [La-ngu, 21 Aug. 1987, *Puraboot* 5 (**PSU**); Songkhla [Tepa, 23 Mar., 1928, *Kerr* 14717, type (**BK, BM, K**); Khao Choom Sak, 12 June 1992, *Larsen et al.* 42835 (**BKF**); *ibid.*, 22 Oct. 1993, *Larsen et al.* 43901 (**BKF**); *ibid.* 22 Oct. 1993, *Larsen et al.* 43903 (**BKF**); Ko Hong Hill, 13 Oct. 1984, *Maxwell* 84-324 (**BK, PSU**); *ibid.*, 15 Dec. 1984, *Maxwell* 84-522 (**BKF**); Hat Yai, 6 June 1985, *Maxwell* 85-576 (**BKF, L, PSU**); *ibid.*, 1 Jan. 1979, *Hamilton & Congdon* 171 & 179 (**BKF, PSU**); *ibid.*, 29 Jan. 2018, *Sangrattananaprasert* 481/18 (**BKF, L**); Khao Reng Hill, 19 Apr. 2009, *Inuthai* 489 (**PSU**); *ibid.*, 20 June 2009, *Inuthai* 505 (**PSU**); *ibid.*, 8 Aug. 2009, *Inuthai* 533 (**PSU**); *ibid.*, 1 Nov. 2009, *Inuthai* 559 (**PSU**); Suan Toon Waterfall, 16 Sept. 1980, *Sirirugsa* 345 (**PSU**); *ibid.*, 11 Oct. 1984, *Sirirugsa* 884 (**PSU**); Tapha, 28 May 1970, *Sakol* 1752 (**BK**); Ton Nga Chang Waterfall, 4 Aug. 1993, *Puff et al.* 930804 1/8 (**PSU**); Ton Nga Chang WS, 11 Apr. 1998, *Puangpen* 436 (**QBG**); *ibid.*, 2 June 2001, *Pooma et al.* 1909 (**BKF**); *ibid.*, Mar. 2004, *Gardner & Sidisunthorn* ST286 (**BKF**); Pattani [To Mo, 14 Apr. 1931, *Lakshnakara* 580 (**BK, L**).

**Distribution.**— Peninsular Malaysia, Singapore, Sumatra (Asahan) and Borneo.

**Ecology.**— In primary and secondary lowland evergreen forest, rocky secondary forest, and rocky crevices, also in swamp forest; on granite bedrock; from sea level to 250 m altitude.

**Vernacular.**— Khlet nu (เคล็ดหนู), let lok (เล็ดรอก) (Songkhla); nam lep rok (หนามเล็ดรอก) (Krabi); lep rok (เล็ดรอก) (Pattani).

**Notes.**— Fruits are soft when ripe (*Puff* 930804 1/8).

**8. *Canthium longipes*** Geddes in Craib, Fl. Siam. 2: 140. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 333. 1932b; Sangratt., Stud. Canthium: 16. 2013. Type: Thailand, Lampang, Mae Sung, 26 June 1926, *Winit* 1727 (lectotype **K** [K000763647] photo seen, designated here; isolectotypes **BK** [BK257328!], **BKF** [124976!]).

Shrubs 3–5 m tall; twigs at first short hairy, slender, ca 1 mm diam.; spines straight, to 1.2 cm long. *Stipules* ca 3 mm long, long-attenuate, falling early. *Leaves* in distinct pairs along the twigs; petiole short-hairy, 0.2–0.4 cm long; lamina membranous, drying somewhat blackish, hairy all over at both sides, more densely so on veins and in vein axils, elliptic or ovate-elliptic, 2–4 × 1–2 cm, base cuneate, margin setulose-ciliate, apex acuminate with obtuse tip; midrib slightly raised above, prominent beneath; lateral veins 4 on each side. *Inflorescence* either in the leaf axil or on very short brachyblast, glabrous or sparsely hairy, with flowers solitary, but mostly composed of 1 or 2 slender peduncles, 3–12 mm long, each branching into 2–3 flowers. *Flowers* 4-merous; bud ca 5 mm long; pedicel with 2 bracteoles at about one third from the base when flower solitary, or bracteoles absent when branching into slender, sparsely hairy pedicels to 11 mm long; ovary sparsely minutely hairy, ca 0.8 mm long; calyx limb short, ca 0.4 mm long with minute narrow calyx lobes; corolla tube not conspicuously constricted at apex, ca 3.5 × 1 mm; corolla lobes glabrous, ovate-lanceolate, 1.5–2 mm long, acute; stamens not investigated; style hairy, ca 4 mm long, stigma small, about as long as wide. *Fruit* not seen.

Thailand.— NORTHERN: Lampang (Mae Sung).

Distribution.— Endemic to Thailand, only known from the type.

Ecology.— In evergreen forest at 150 m altitude; flowering in June.

Notes.— 1. *Canthium longipes* is characterised by the slenderly branched inflorescences. The morphology of these branched inflorescences deviates within the rest of *Canthium* and is yet to be explained. The two minute bracteoles on the pedicel, present in most other *Canthiums*, are not seen in the present species. Possibly, the slenderly branched 2- or 3-flowered inflorescences are explained by assuming branching from the bracteoles as present in the other species of *Canthium*.

2. The collection Tsang 29992 (L) from Vietnam presumably could belong to *Canthium longipes*.

**9. *Canthium obscurum*** W.J.de Wilde & Duyfjes, Blumea 66: 93. 2021. Type: Thailand, Chiang Rai, Payapri, 20 May 1997, Gardner & Sidisunthorn 2098 (holotype BKF [117727!]).— Fig. 4a–b, 5.

— *Canthium parvifolium* auct. non Roxb.: Hook.f., Fl. Brit. India 3: 135. 1882; Pit., Fl. Indo-Chine 3: 298. 1924; Craib, Fl. Siam. 2: 142. 1932a; S. Gardner *et al.*, Forest Trees of Northern Thailand: 224, fig. 493. 2000; Sangratt., Stud. Canthium: 17, fig. 2.3: D. 2013.

— *Canthium horridum* auct. non Blume: Chen *et al.*, Fl. China 19: 84. 2011.

Shrubs 1.5–4 m, or treelets to 6(–8) m tall, older stem with or without straight spines to 7 cm long; twigs slender, appressed hairy when young, 1–2(–2.5) mm diam.; spines usually present, straight, 0.5–1 cm long. *Stipules* hairy, long-triangular, 2–3 mm long, acute-acuminate. *Leaves* in distinct pairs along the twigs; petiole slender, 0.3–0.7 cm long; lamina membranous, drying blackish, (variously) sparsely hairy on both surfaces, somewhat scabrous above, (obovate-)elliptic, 2–6 × 1.5–3 cm; base (more or less rounded or) cuneate, narrowed into the petiole, margin sparsely hairy, apex rounded, bluntish or acute or acute-acuminate; midrib flat, hairy above; lateral veins 2–4 on each side. *Inflorescence* composed of 2–5-flowers close together, on short brachyblast. *Flowers* creamy-greenish, 5-merous; bud 4–5 mm long; pedicel sparsely hairy, slender, 1–2(–3) mm long, with 2 membranous, more-or-less saucer-shaped connate bracteoles at apex, the margin irregularly fine-hairy; ovary glabrous, broadly obconical, 1–1.5 mm long, calyx limb ca 0.5 mm long; calyx lobes short-triangular; corolla tube urceolate, ca 1.5 × 1.5 mm; corolla lobes glabrous, acute-acuminate, about as long as the tube; filaments ca 0.5 mm long; anthers ca 1 mm long; style 2–3 mm long, lower half thickened and densely hairy; stigma green, ca 0.7 × 0.5 mm. *Fruit* sparsely scattered, close to the twigs, ripening greenish-yellow, blackish when dry, subglobose, 1.5–3 cm diam.; fruiting pedicel ca 1 mm long.

Thailand.— NORTHERN: Mae Hong Son [Pang Tawn, May 1931, Put 3847 (BK, L)]; Chiang Mai [Mae Tang, 18 Oct. 1995, Nanakorn *et al.* 5014 (QBG); Ban Ang Ka Noi, 1 June 1979, Vidal *et al.*



6289 (**BKF, L**); Ban Mae Klang Luang, 2 Sept. 2003, *Hara et al.* *PJ* 55 (**BKF**); *ibid.*, 30 May 1979, *Vidal et al.* 6173 (**BKF**); Chiang Dao, 27 Sept. 1994, *Nanakorn et al.* 1864 (**QBG**); *ibid.*, 29 Apr. 1997, *Nanakorn et al.* 9393 (**QBG**); *ibid.*, 14 May 2001, *Norsaengsri et al.* 1470 (**QBG**); Doi Angka, 13 June 1927, *Garrett* 372 (**L, P**); Doi Chiang Dao, 3 May 1940, *Garrett* 1179 (**L**); *ibid.*, 8 Nov. 1928, *Kerr* 6646 (**BK**); Doi Intanon NP, 12 July 1987, *Phengklai et al.* 6205 (**BKF**); *ibid.*, 22 July 1988, *Phengklai et al.* 6793 (**BKF**), Doi Mawn Angget, 15 May 1993,

*Maxwell* 93-426 (**BKF**); Doi Meun, 18 Apr. 1995, *Maxwell* 95-327 (**BKF**); Doi Suthep, 23 June 2002, *Chamchumroon et al.* *VC*1651 (**BKF**); *ibid.*, 1 Aug. 1987, *Maxwell* 87-757 (**BKF, L**); *ibid.*, 15 May 1988, *Maxwell* 88-635 (**BKF, L**); *ibid.*, 12 Aug. 1988, *Maxwell* 88-982 (**BKF, L**); *ibid.*, 22 Sept. 1998, *Pongamornkul* *WP* 331 (**QBG**); *ibid.*, 27 Apr. 1958, *Sørensen et al.* 3068 (**BKF**); *ibid.*, May 1941, *Vanpruk s.n.*, (**BKF**); *ibid.*, 22 Oct. 1971, *Pooma* 344 (**BKF**); Fang, 27 May 2009, *Pongamornkul* 2632 (**QBG**); Huai Nam Dang, 27 May 1977,

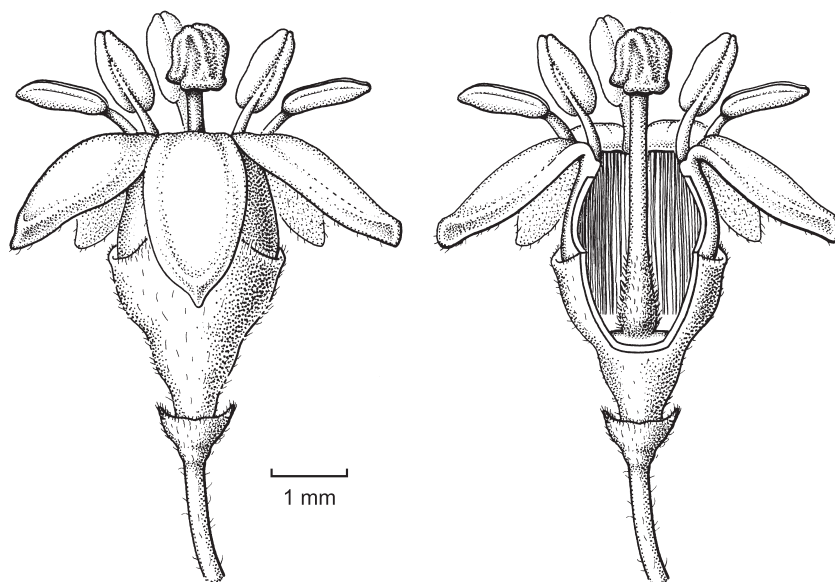


Figure 4a. *Canthium obscurum* W.J.de Wilde & Duyfjes: a. Flower from outside; b. opened flower, note downwards directed hairs from the throat (a, b *Maxwell* 97-485 (**L**)). Drawn by Esmée Winkel (**L**).



Figure 5. *Canthium obscurum* W.J.de Wilde & Duyfjes: Fruiting twigs. Photo Phongsak Phonsena (*Phonsena et al.* 7486).

*Santisuk 1055 (BKF)*; *ibid.*, 15 June 2010, *Karaket et al. 153 (BKF)*; Huai Yah Dtai, 11 June, 1998, *Maxwell 98-638 (BKF, L)*; Mae On, 22 Apr. 1999, *Pongamornkul et al. WP406 (QBG)*; Mae Pan Waterfalls, 29 July 1988, *Fukuoka T-62307 (BKF)*; Mae Rim, 18 Nov. 1993, *Nanakorn et al. 153 (QBG)*; *ibid.*, 1 June 2016, *Glamwaewwong 120-60 (QBG)*; *ibid.*, 4 Sept. 2015, *Glamwaewwong 261-58 (QBG)*; *ibid.*, 11 Apr. 2005, *Glamwaewwong 960 (QBG)*; *ibid.*, 21 June 2012, *Nguanchoo 254 (BK, QBG)*; *ibid.*, 25 Mar. 2012, *Norsaengsri et al. 9176 (QBG)*; *ibid.*, 7 June 2016, *Seepacha YJ1 (QBG)*; *ibid.*, 31 Mar. 1998, *Serm 48 (QBG)*; Mae Sruai, 21 June 1967, *Prayad 930 (BK)*; Mawn Kia, 22 July 1988, *Smitinand & Alsterlund 6733 (BKF)*; Mom Lhong, 20 May 1998, *Pongamornkul WP95 (QBG)*; Pha Mawn, 2 Oct. 1971, *Murata et al. T-15637 (BKF)*; Pong Yen, 23 Aug. 1994, *Nanakorn et al. 1379 (QBG)*; Samoeng, 24 June 2008, *Jatupol K.08 283 (QBG)*; Chiang Rai [Doi Luang NP, 7 May 1997, *Maxwell 97-485 (BKF, L)*; *ibid.*, 24 May 1966, *Maxwell 98-563 (BKF, L)*; *ibid.*, 7 Oct. 1998, *Palee 436 (BKF, L)*; Doi Tung, 21 June 2002, *Chamchumroon et al. VC1537 (BKF)*; *ibid.*, 18 Aug. 1997, *Chayamarit 905 (BKF)*; *ibid.*, 24 Sept. 1967, *Iwatsuki et al. T-10969 (BKF, L)*; *ibid.*, 29 Apr. 2005, *Maxwell 05-309 (BKF)*; *ibid.*, 25 May 2006, *Maxwell 06-332 (L, QBG)*; *ibid.*, 22 July 2012, *Van de Bult 1254 (BKF)*; *ibid.*, 25 June 1999, *Wattana 315 (QBG)*; Mae Fah Luang, 31 Aug. 2018, *Phaosrichai et al. 984 (QBG)*; Chiang Rai, 10 Apr. 2006, *Maxwell 06-291 (QBG)*; Payapri, 20 May 1997, *Gardner & Sidisunthorn 2098*, type (**BKF**); Phayao [Doi Luang NP, 4 Nov. 2015, *Muangyen 273 (QBG)*; *ibid.*, 6 May 2015, *Norsaengsri 12280 (QBG)*; Doi Pha Mon Noi, 30 Apr. 2013, *La-ongsri et al. 2852 (QBG)*; Doi Pha Tang, 19 May 2017, *Pongamornkul 6164 (QBG)*; Nan [Phu Ka, 19 May 2006, *Niyomdham & Puudja 7686-1 (BKF)*; Doi Phu Kha NP, 4 Sept. 2019, *Phonsena et al. 7486 (BKF, L)*; Ban Kew Num, 29 Nov. ?, *Nguanchoo 971 (QBG)*; Ban Pong Kham, 22 June 2007, *Trisonthi et al. PK182 (QBG)*; Bo Klua, 28 May 2014, *Sirimongkol et al. 645 (BKF)*; Doi Tiu, 23 July 1992, *Larsen et al. 43510 (BKF)*; Lampang [Chae Son NP, 22 Sept. 1996, *Maxwell 96-1251 (BKF)*].

Distribution.— Laos, China (Yunnan).

Ecology.— In mixed evergreen hardwood forest or deciduous forest, also with bamboo, also

scattered in pine forest and in dry dipterocarp-deciduous forest; on granite bedrock; 700—2,100 m altitude; flowering from April to June, fruiting from May to November.

Vernacular.— Khao chi (ข้าวจี), nam ma khet (หนามมะเค็ด) (Chiang Mai); maeo-ka (แมวกอ), to-chi (ตอชี), pho-lo-so (โพละโซ), se-ta-chu (เซตาชู), se-po-sa (เซโปสะ) (Karen-Chiang Mai); po-kao-cha (โปกาวชะ) (Hmong-Chiang Mai); ma khao niao (มะข้าวเหนียว) (Chiang Rai); nam maket (หนามมะเค็ด), kong kaep (ก้องแกบ) (Nan).

Notes.— 1. *Canthium obscurum* is a common species of northern Thailand, known from about 30 collections.

2. The ripe fruit is recorded as not juicy, yellowish green or yellow, globose or obovate, 3–3.5 × 2.5–3 cm, with spongy white endocarp. The majority of the specimens overall dry conspicuously blackish.

3. According to *Jatupol K.08-283 (QBG)* the fruit is edible and the root has medicinal properties.

**10. *Canthium quadratum* Craib**, Fl. Siam. 2: 142. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 334. 1932b; Sangratt., Stud. Canthium: 17. 2013. Type: Thailand, Ranong, Kao Pawta Chongdong, 20 Jan. 1929, *Kerr 16760* (lectotype **K** [K000763642] photo seen, designated here; isoelectotypes **BK** [BK257330!], **BM** [BM000945456] photo seen).

Straggling shrubs or shrubs 1–3 m tall; twigs brown, finely hairy, early glabrescent, 0.5–1.5 mm diam.; spines straight, 0.5–1 cm long. *Stipules* hairy, ovate, 1–2 mm long, long-acuminate, falling early. *Leaves* in distinct pairs along the twigs; petiole hairy, 0.1–0.3 cm long; lamina membranous or chartaceous, drying grey-green, lighter beneath, sparsely short-hairy, especially on midrib above, ovate-elliptic, narrowed (acuminate) in upper half, 2–6(–9) × 1–2(–3.5) cm, base rounded or somewhat cordate, margin with some hairs; lateral veins 4–5(–6) on each side. *Inflorescence* a short brachyblast, 1- or 2-flowered. *Flowers* green, 5-merous; bud rounded at apex, ca 5 mm long; pedicel subglabrous, 5–7 mm long, with 2 connate bracteoles about halfway; ovary subglabrous, cup-shaped, 1–1.5 mm long, ca 1.5 mm wide; calyx limb short with inconspicuous calyx lobes; corolla tube, 2(–2.5) × ca 2 mm; corolla lobes

glabrous, ca 4 mm long; filaments ca 1 mm long; anthers ca 1.5 mm long, connective at apex with a hair-like appendage; style ca 5 mm long, at base somewhat thickened and hairy; stigma ribbed, ca 1 mm diam. *Fruit* somewhat didymous, subglobose, 10–12 mm diam.; fruiting pedicel ca 10 mm long.

Thailand.— NORTH-EASTERN: Loei [Phu Luang, 3 Dec. 1965, *Tagane et al. T-1045* (BKF, P)]; PENINSULAR: Ranong [Kao Pawta Chongdong, 20 Jan. 1929, *Kerr 16760*, type (BK, BM, K)]; Phangnga [Khao Pawta Luang Keow, 29 Nov. 1974, *Geesink et al. 7711* (BKF, L)]; Nakhon Si Thammarat [Khao Luang, 31 Oct. 1951, *Smitinand 1020* (BKF); *ibid.*, 17 Oct. 1953, *Attakorn 129* (BKF); *ibid.*, 24 Aug. 1995, *Larsen et al. 45942* (BKF, L)]; Khao Ram Room, 26 Dec. 2007, *Chamchumroon VC2394* (BKF)]; Trang [Phu Pha Mek, 7 Apr. 2003, *Middleton et al. 1965* (BKF, L, P)]; Songkhla [Ton Nga Chang, 21 Aug. 1992, *Niyomdham & Puudja 3102* (BKF); *ibid.*, 13 Sept. 2003, *Attakorn 5* (PSU)].

Distribution.— Endemic to Thailand.

Ecology.— Primary evergreen forest, on hill slopes, along streamsides, and on ridges; on sandstone; 500–900 m altitude; flowering from July to October; fruiting in January, October and November.

Notes.— Craib (1932b: 334) mentioned that the connective is somewhat angular at apex, but in fact the apex bears a hair-like appendage.

**11. *Canthium rotundum* W.J.de Wilde & Duyfjes, sp. nov.**

This species is distinct from the most similar species *Canthium calvum* in leaves hairy, vs leaves glabrous, and lateral veins beneath conspicuously raised, vs lateral veins beneath somewhat raised. Type: Thailand, Mukdahan, Phu Sa Dok Bua NP, 27 June 2010, *Tanaros 565* (holotype QBG [QBG45162!]). Fig. 6.

Shrubs ca 1 m tall; twigs finely appressed brown-hairy when young, slender, 1.5–2 mm diam.; spines straight, 0.5–1 cm long. *Stipules* hairy, small, ca 2 mm long, triangular, falling early. *Leaves* in distinct pairs along the twigs; petiole appressed sparsely hairy, ca 3 mm long; lamina coriaceous, drying yellowish green, somewhat scabrous above, variously finely somewhat bristly hairy on both surfaces, especially on midrib, obovate or broadly elliptic, or subcircular, 3–3.5 × 2.5–3 cm; base broadly cuneate, decurrent on the petiole; margin smooth;

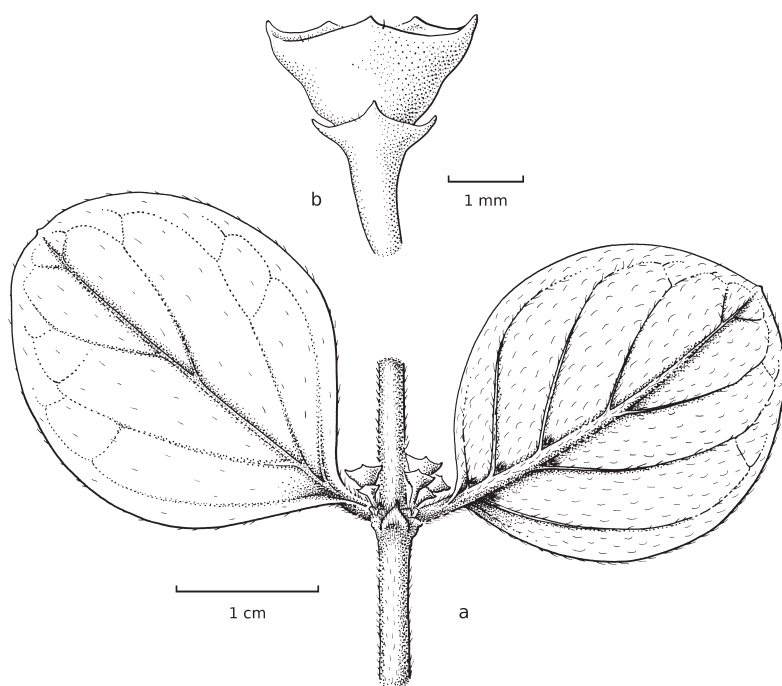


Figure 6. *Canthium rotundum* W.J.de Wilde & Duyfjes: a. Portion of twig showing upper and lower surface of leaves; b. part of pedicel with at apex two saucer-shaped connate bracteoles and calyx (all: *Tanaros 565* (QBG). Drawn by Esmée Winkel (L).

apex broadly rounded (or shortly narrowed); midrib impressed above, conspicuously raised beneath; lateral veins 2 or 3 on each side, the lowermost ones reaching to over two-thirds the blade. *Inflorescence* composed of short brachyblast with 1–4 flowers. *Flowers* 5-merous; bud not seen; pedicel glabrous, thickish, 1.5–2 mm long, at apex with two bracteoles connate into a saucer-shaped cup, 2–3 mm wide, margin entire except for two minute teeth representing the apices of the bracteoles, the cup together with the pedicel forming an infundibular body clasping the base of the ovary; ovary glabrous, broadly obconical, ca  $1 \times 1.2$  mm; calyx limb ca 0.5 mm long; calyx lobes spreading, ca 0.5 mm long, broad-triangular, acute; disc flat, hairy; corolla and fruit not seen (but see notes).

Thailand.—NORTH-EASTERN: Mukdahan (Phu Sa Dok Bua NP).

Distribution.—Endemic to Thailand, only known from the type.

Ecology.—Flowering in June.

Etymology.—Latin, *rotundus* means round, referring to the subcircular leaves.

Provisional conservation assessment.—Data Deficient (DD). *Canthium rotundum* is endemic to Thailand and is known from one collection in a protected area in NE Thailand.

**12. *Canthium sarmentosum*** Craib, Fl. Siam. 2: 143. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 335. 1932b; Sangratt., Stud. Canthium: 18. 2013. Type: Thailand, Pattani (Yala), Betong, 23 Aug. 1923, *Kerr 7638* (lectotype **K** [K000763641] photo seen, designated here; isoelectotype **BK** [BK257331!]).

Shrubs 1.5–4 m tall, or tree 14 m tall (see Notes); twigs densely appressed rusty hairy, later on glabrous, slender, 1–1.5 mm diam.; spines straight, to 0.5 cm long. *Stipules* small, falling early. *Leaves* in distinct pairs along the twigs; petiole densely hairy, 0.2–0.5 cm long; lamina subchartaceous, drying green, densely hairy, especially beneath, ovate-oblong,  $1.5\text{--}6 \times 0.7\text{--}2.2$  cm, base broadly cuneate, apex acute or subobtuse; midrib impressed above; lateral veins 3 or 4 on each side. *Inflorescence* composed of 1 (or 2) flowers axillary to leaves. *Flowers* 4-merous; bud ca 5 mm long; pedicel sparsely hairy, ca 2 mm long, with 2 conspicuous

small connate bracteoles towards the apex; ovary subglabrous, 0.75–1 mm long; calyx limb minutely hairy, ca 0.5 mm long, with 4 minute teeth; corolla tube ca 1.75 mm long; corolla lobes narrowly ovate, 2–2.5 mm long, acute-acuminate, with few hairs towards the apex; filaments short; anthers ca 0.6 mm long; style short hairy in the basal part, ca 1.75 mm long. *Fruit* ripening yellow, subglobose, 0.8–1.8  $\times$  0.8–1.5 cm; fruiting pedicel ca 2 mm long.

Thailand.—PENINSULAR: Songkhla [Khao Nam Khang NP, 18 May 2004, *Gardner & Setsin ST562* (**BKF**)]; Yala [Betong, 3 Aug. 1923, *Kerr 7638*, type (**BK, K**)]; Bang Lang NP, 18 July 2004, *Pooma et al. 4349* (**BKF**)].

Distribution.—Endemic to Thailand.

Ecology.—Semi-open area in lowland evergreen forest and in scrub, to 200 m altitude, flowering in August; fruiting in May.

Notes.—The habit was circumscribed on the herbarium labels by *Kerr 7638* as a shrub of 2 m tall, by *Pooma et al. 4349* as a shrub of 4 m tall, and by *Gardner & Setsin ST562* as a tree of 14 m tall.

**13. *Canthium stellulatum*** Craib, Fl. Siam. 2: 143. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 335. 1932b; Sangratt., Stud. Canthium: 18. 2013. Type: Thailand, Ban Kram, Patalung, 18 Apr. 1928, *Kerr 15299* (lectotype **K** [K000763646] photo seen, designated here; isoelectotypes **BK** [BK257332!], **BM** [BM000945455] photo seen).

Shrubs or shrubby treelets 2–5 m tall; twigs finely hairy, glabrescent, 0.8–2 mm diam.; spines straight, 0.6–1.5 cm long. *Stipules* densely hairy, ca 1 mm long with a ca 2 mm long apiculum, falling early. *Leaves* (1 or 2) attached on the brachyblasts; petiole appressed hairy, 0.2–0.3 cm long; lamina membranous, drying darkish, (sparsely) hairy, especially on veins, at both surfaces, ovate-elliptic to oblong,  $2\text{--}6 \times 0.8\text{--}2.5$  cm, base rounded or (broadly) cuneate, margin short-hairy, apex obtusely acuminate; midrib above slightly sunken; lateral veins 4–6 on each side. *Inflorescence* composed of 1 or 2 flower(s) on top of a thickish brachyblast to 7 mm long. *Flowers* 4-merous; bud acute-acuminate, ca 5.5 mm long, the apices of the corolla lobes each with a free apiculum to ca 0.5 mm long (“stellulate”); pedicel sparsely hairy or (sub)glabrous, slender,



10–13 mm long; bracteoles narrow, inserted towards base of pedicel; ovary sparsely hairy or glabrous, ca 1 mm long; calyx limb ca 0.5 mm long; calyx lobes small, triangular, long-acuminate; corolla tube ca 4 mm long, corolla lobes glabrous, ca 3 mm long, apex acute, apiculate; filaments ca 0.7 mm long; anthers not observed; style somewhat longer than the tube, ca 5.5 mm long; stigma ca 0.5 mm diam. *Fruit* ripening red, glabrous, subglobose, ca 0.6 cm diam.; fruiting pedicel ca 12 mm long.

Thailand.—SOUTH-EASTERN: Sa Kao [Wang Nam Yen, 25 Mar. 2011, *Sawangsawat* 415 (QBG)]; PENINSULAR: Krabi [Khao Phanom Bencha NP, 17 June 2006, *Williams* 1818 (BKF)]; Phatthalung [Ban Kram, 18 Apr. 1928, *Kerr* 15299, type (BM, K)]; Pattani [Betong, 7 Aug. 1928, *Kerr* 7498 (BK)].

Distribution.—Endemic to Thailand.

Ecology.—Dry evergreen forest and forest near limestone; 50–200 m altitude; flowering in March; fruiting in June and August.

**14. *Canthium strigosum*** Craib, Fl. Siam. 2: 143. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 336. 1932b; Wong, Tr. Fl. Malaya 4: 341. 1989; Sangratt., Stud. Canthium: 18. 2013; S. Gardner *et al.*, Forest Trees Southern Thailand 3: 1895, fig. 2299. 2018. Type: Thailand, Trang, Kao Sung, 17 Apr. 1928, *Kerr* 15268 (lectotype K [K000763645] photo seen, designated here; isoelectotype BM [BM000945454] photo seen).

Shrubs 0.75–4 m tall; twigs when young with strigose indumentum, i.e. densely set with erect 1–1.5 mm long yellow-brown hairs, 2–4 mm diam.; spines (absent) or present, straight, 0.5–1 cm long. *Stipules* hairy (strigose), triangular, acuminate, falling early. *Leaves* in distinct pairs along the twigs; petiole hairy as the twigs, 0.2–0.4 cm long; lamina membranous, drying green, both surfaces sparsely long-hairy, hairs 1–1.5 mm long, elliptic-oblong, 6–9(–15) × (2–)2.5–3.5(–5) cm, base rounded or slightly cordate, margin short-hairy, apex acute-acuminate; midrib raised above; lateral veins 5–7 on each side. *Inflorescence* composed of 4–6(–8) densely crowded flowers on a short brachyblast. *Flowers* greenish, 5-merous; bud rounded at apex, ca 5 mm long; pedicel hairy, ca 1 mm long; bracteoles not observed; ovary hairy, cup-shaped, ca 1.5 mm high, 2–2.5 mm wide; calyx limb ca 0.5 mm long; calyx lobes minute,

acute; corolla tube inflated, ca 2.5 × 2.5 mm; corolla lobes glabrous, ca 3 mm long, acute; filaments less than 1 mm long; anthers ca 1 mm long; style glabrous but hairy at base, ca 2 mm exserted; stigma subglobose, ca 0.5 mm diam. *Fruit* 1 or 2 at the nodes, glabrous, didymous, ca 1 × 1.8 cm, the two parts subglobose, ca 1 × 0.9 cm (*Maxwell* 86-1093); fruiting pedicel 3–4 mm long, with ca 0.5 mm long bracteoles below the middle.

Thailand.—SOUTH-EASTERN: Chon Buri [Ban Bueng, 10 Feb. 1966, *Phengnaren* 195 (BKF)]; Trang [Kao Sung, 17 Apr. 1928, *Kerr* 15268, type (BM, K)]; Narathiwat [Waeng, 29 June 1972, *Nitrasirirak* 113 (BKF)]; Chatwarin Falls, 18 Dec. 1986, *Maxwell* 86-1093 (L, PSU); *ibid.*, 15 Aug. 1995, *Larsen et al.* 45574 (BKF, L)].

Distribution.—Peninsular Malaysia (Langkawi).

Ecology.—Primary evergreen forest, also along rivers; granite bedrock; 100–900 m altitude; flowering in April and August, fruiting in December.

**15. *Canthium strychnoides*** Craib, Fl. Siam. 2: 144. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 337. 1932b; Wong, Tr. Fl. Malaya 4: 342. 1989; Sangratt., Stud. Canthium: 19. 2013. Type: Thailand, Bacho, 11 June 1930, *Kiah SFN* 24305 (lectotype K [K000763640] designated here; isoelectotypes BK [BK257333!], SING [SING0059271] photo seen). Fig. 7.

—*Canthium strychnoides* auct. non Craib, S. Gardner *et al.*, Forest Trees Southern Thailand 3: 1895, fig. 2301. 2018.

Shrubs or treelets 2–4(–5) m tall. Twigs hairy, ca 2 mm diam., later on glabrous. *Spines* straight, 0.7–2.5 cm long. *Stipules* hairy, acuminate, ca 3 mm long, falling early. *Leaves* in distinct pairs along the twigs as well as some attached on brachyblasts; petiole to 1.2 cm long; lamina chartaceous, drying green, glabrous, except hairs in nerve axils beneath, oblong-elliptic or subovate, 6–10 × 2.5–4.7 cm, base cuneate or rounded, margin smooth, apex obtuse-acuminate; midrib impressed above, prominent beneath; lateral veins 4–6 on each side, anastomosing before the margin. *Inflorescence* consisting of 1 or 2 flowers on short brachyblast. *Flowers* pale yellow-green, 5-merous; bud acuminate, 12–16 mm long; pedicel glabrous, 5–8 mm long, with two connate

bracteoles below the apex; ovary obconical or cup-shaped, hardly 2 mm long; calyx limb broadly cup-shaped, 5–6 mm long, the truncate or minutely dentate margin 5–6.5 mm diam.; corolla tube 6.5–7 × 4 mm; corolla lobes glabrous, thickish, 5–6 × 3 mm, acute; filaments ca 1.5 mm long; anthers 2.5–4 mm long, connective short cuneate at apex; style 7–9 mm long, hairy and thickened at base; stigma green, nearly 2 mm long. *Fruit* ripening greenish yellow, glabrous, subglobose, ca 1.5 × 1.4 cm (when dry), with a ca 3 mm long and 7 mm wide remnant of the calyx limb; fruiting pedicel not seen.

Thailand.—PENINSULAR: Yala [Ban Chulaphon Phattana 10 area, 21 Apr. 2005, *Pooma et al.* 5107 (BKF); Betong, 14 June 2013, *Sangrattanaprasert 106/13* (BKF)]; Narathiwat [Bacho, 11 June 1930, *Kiah SFN 24305*, type (BK, K, SING); *ibid.*, 4 May 1961, *Sangkachand 118* (BKF, L); Bachaw, 13 July 1923, *Kerr 7169* (BK); Waeng, 28 Apr. 1972, *Sangkachun et al.* 1122 (BKF, L); Hala Bala WS, 21 Apr. 2004, *Chongko 325* (L); *ibid.*, 2 May 2004, *Poopath 16* (BK)].

Distribution.—Peninsular Malaysia (Kelantan, Terengganu).

Ecology.—In evergreen (moist) forest, along streams, and on ridges in shady areas; 100–650 m altitude; flowering from March to June, fruiting in July. Flowers fragrant.

**16. *Canthium subaureum* Craib**, Fl. Siam. 2: 144. 1932a; Craib, Bull. Misc. Inform. Kew 1932(7): 337. 1932b; Sangratt., Stud. Canthium: 19. 2013. Type: Thailand, Prachuap Khiri Khan, Hui Yang, 15 July 1926, *Kerr 10733* (lectotype K [K000763639] photo seen, designated here; isolectotypes BK [BK257334!], BM [BM000945453] photo seen).

Shrubs ca 3 m tall; twigs hairy, glabrescent, slender, ca 2 mm diam.; spines straight, 0.5–1.8 cm long. *Stipules* narrowly triangular, ca 2 mm long, falling early. *Leaves* in distinct pairs along the twigs; petiole glabrous, 0.2(–0.3) cm long; lamina chartaceous, drying yellowish green, glabrous above, sparsely hairy beneath on veins and in vein axils, ovate or broadly elliptic, 2–3.5 × 1.3–2 cm, base rounded, margin smooth, apex obtuse or (somewhat) rounded (or somewhat narrowed); midrib and veins impressed above; lateral veins 3 on each side, fading towards the margin. *Inflorescences* consisting of 1–2(–3) flowers on short brachyblast. *Flowers* white,

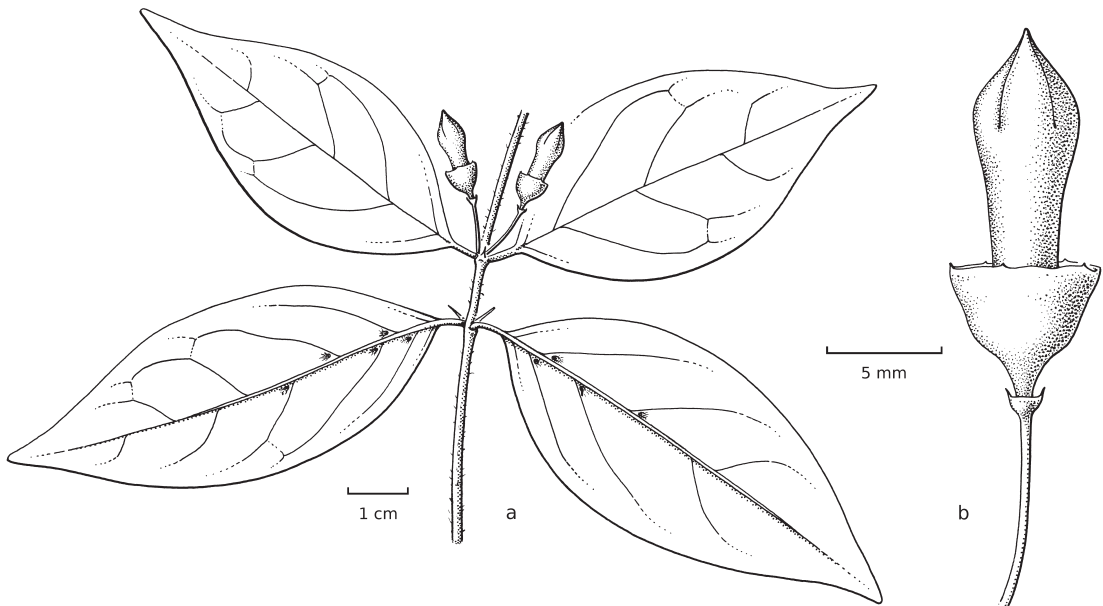


Figure 7. *Canthium strychnoides* Craib: a. Portion of twig with two flowers, note hairy domatia on lower leaf surface; b. flower bud (*Sangrattanaprasert 106/13* (BKF)). Drawn by Esmée Winkel (L).

glabrous, 5-merous; bud (immature), ca 2.5 mm long; pedicel glabrous, less than 1 mm long, with 2 minute bracteoles at apex; ovary ca 1.5 mm long; calyx limb short, minutely toothed; corolla tube ca 2.5 mm long; corolla lobes glabrous, broadly lanceolate, ca 3.5 mm long, subacute; filaments short; anthers ca 1 mm long; style at base slightly thickened and finely hairy, ca 2 mm exerted; stigma ca 1 mm long, longitudinally ribbed. *Fruit* not seen.

Thailand.— SOUTH-WESTERN: Prachuap Khiri Khan (Hui Yang).

Distribution.— Endemic to Thailand, only known from the type.

Ecology.— In scrub at sea level; flowering in July.

### EXCLUDED AND IMPERFECTLY KNOWN TAXA

*Canthium angustifolium* Roxb., Fl. Ind., ed. Carey & Wall. 2: 169. 1824; Craib, Fl. Siam. 2: 135. 1932a; Sangratt., Stud. Canthium: 9. 2013.

This is a species described from Chittagong and Sylhet and does not occur in Thailand. The collection *Kerr 12236*, cited by Craib is a scanty specimen without thorns, which we cannot identify.

*Canthium* sp.

The illustrations in Puff *et al.* (2005: 123, pl. 3.1.39) are apparently not vouchered by specimens. A, B possibly depict *C. coffeoides*; C, D depict *C. berberidifolium*; E depicts *C. coffeoides*; F depicts possibly a new species or a new record for Thailand, but it cannot be investigated further because of absence of a herbarium voucher.

*Canthium trachystyle* Ridl., J. Fed. Malay States Mus. 10: 95. 1920; Craib, Fl. Siam. 2: 135. 1932a. Type: Thailand, Phuket, Tapli, *Kloss 6760* (holotype **K** [K000763648] photo seen).

This species, described from Thailand (Tapli), looks similar to *Canthium* but has to be excluded because of absence of spines, in the presence of axillary as well as terminal inflorescences, subulate stipules, and hairs in the corolla throat. Its leaves are 7–10 cm long. We have seen only a photo-image of the specimen, and cannot guess to what genus it actually belongs, but certainly not to *Canthium* or *Psydrax*.

*Canthium tavoyanum* (R.Parker) Craib var. *glabrius* Craib, Fl. Siam. 2: 144. 1932a; Sangratt., Stud. Canthium: 20. 2013. Type: Thailand, Ranong, Kao Pawta, Luang Keo, *Kerr 17536* (**K** not seen).

The nominal variety, clearly a *Canthium* in the present sense, was described by Parker (1925) as *Plectronia tavoyana* from Myanmar. The var. *glabrius* was described by Craib as “quite closely related” to Parker’s species but differing in (sub)glabrous upper side of the lamina. We cannot trace *Kerr 17536*, the type of the variety, and awaiting additional material we regard this name as doubtful. *Canthium tavoyanum* according to its description has large flowers (bud ca 14 mm long) and small red fruit (8 mm diam.) with a fruiting pedicel of ca 10 mm long.

*Plectronia schmidtii* C.B.Clarke, Bot. Tidsskr. 24: 335. 1902 = *Petunga schmidtii* (C.B.Clarke) Craib, Fl. Siam. 2: 125. 1932a.

### ACKNOWLEDGEMENTS

We acknowledge the curators of BK, BKF, L, P, PSU, and QBG for allowing us to study the collections in their care. We thank Jiroat Sangrattanasratt (KKU) for fruitful discussions. We are grateful to Cécile Aupic (P) who found the type of *Canthium parviflorum* in Herbarium Lamarck and to Bérangère Offroy (P) for the photo of the type. We are indebted to Esmée Winkler (L) who made the beautiful drawings, and we like to thank Nannapat Patharahirantricin (BKF), who is always helpful with advice and action.

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