



Taxonomic revision of the *Vitex trifolia* complex (*Lamiaceae*)

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Key words

Lamiaceae
morphology
new species
taxonomy
Vitex negundo
Vitex rotundifolia
Vitex trifolia complex

Abstract The *Vitex trifolia* complex is a well-circumscribed and monophyletic group. However, the species of the group are morphologically very similar and therefore, taxonomic boundaries within the group are uncertain. In addition, these medicinal plants have been cultivated and naturalised in many areas across the world and therefore their natural geographical distributions are not well known. A taxonomic account of the complex is presented in which nine species are recognized: *Vitex agnus-castus*, *V. benthamiana*, *V. bicolor*, *V. negundo*, *V. pseudonegundo*, *V. rotundifolia* and *V. trifolia*; a new species, *Vitex collium* Sengun, is described from frost prone regions of northern and Central China and an obscure name, *V. hybrida* Moldenke, is recognised for the Indian specimens previously recognized as *V. negundo*. In addition, *Agnus-castus*, *V. cannabifolia*, *V. chinensis*, *V. latifolia*, *V. negundo* f. *alba*, *V. negundo* f. *intermedia*, *V. negundo* f. *laxipaniculata*, *V. rotundifolia* and *V. trifolia* var. *acutifolia* are lectotypified, and *V. leucoxydon* Blanco has been neotypified. Also, many names have been placed in synonymy for the first time.

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INTRODUCTION

Vitex L. is a genus within the subfamily *Viticoideae* of the *Lamiaceae* (Zhao et al. 2021). There are c. 250 species mostly in the tropics and a few in temperate areas. The genus is defined by having leaves that are digitately compound, occasionally unifoliolate; inflorescence terminal or axillary; corolla with (4–)5(–6) lobes; fruit 1–4-seeded (Bramley et al. 2009). Although species of the *Lamiaceae* are mostly aromatic herbs in temperate regions, species of *Vitex* are shrubs and trees (Harley et al. 2004).

A revision of *Vitex* as a whole is lacking, but there are several regional treatments. The important recent treatments in Asia and the Pacific are for: India (Rajendran & Daniel 2002), Sri Lanka (Moldenke & Moldenke 1983, Singhakumara 1990), China (Chen & Gilbert 1994), Thailand (Chantaranothai 2011), New Caledonia (Mabberley & De Kok 2004), Flora Malesiana area (De Kok 2007, 2008, De Kok & Sengun 2019), Tree Flora of Sabah and Sarawak (Bramley et al. 2011), the Pacific (De Kok 2007) and Australia (Munir 1987). In Europe and in the Middle East, *Vitex* is covered by individual floras, such as, e.g., floras of Greece (Rechinger 1943), Turkey (Davis 1965, 1982), Iran (Zamjad 2012), Iraq (Townsend 1980). Most of these treatments are part of larger regional projects and usually are based on herbarium and literature studies. Therefore, they do not give a clear overall picture of the *V. trifolia* complex.

The *V. trifolia* complex was proposed for the first time by De Kok in 2004 in a Flora Malesiana Symposium and consisted of six taxa, namely *V. agnus-castus* L., *V. benthamiana* Domin,

V. negundo L., *V. pseudonegundo* (Hausskn. ex Bornm.) Hand.-Mazz., *V. trifolia* L. subsp. *trifolia* and *V. trifolia* subsp. *littoralis* Steenis. De Kok (2007) defined the complex by its taxa having a white waxy undersurface of the leaf blades, which is the result of its unique hairs. Whilst most species of *Vitex* have appressed to erect multicellular hairs, which may have a gland at the apex, in the species of the complex, the conical apical cell of the hairs is covered with wax plates, which often become powdery when dry (De Kok 2007).

Although the *Vitex trifolia* complex is a well-circumscribed and a monophyletic group (Bramley et al. 2009), the taxonomic boundaries within the group are uncertain as the species are morphologically very similar. In flora accounts the taxa belonging to this complex are distributed from Greece eastwards through Asia to Japan and south-eastwards to Australia and Oceania. However, the natural geographical distribution of the individual species within the complex are not well known as their biogeographic patterns were obscured by the naturalization of species cultivated as medicinal plants.

The *Vitex trifolia* complex was studied for a doctorate by Sengun (2017) as there were several outstanding taxonomic problems within the complex. *Vitex pseudonegundo* was often confused with *V. agnus-castus* due to their very similar morphology. *Vitex negundo* showed a high degree of morphological variation in the leaf margin and the inflorescence, which resulted in many synonyms. The status of *V. bicolor* Willd. was uncertain as it was treated at different levels and finally placed under *V. trifolia* subsp. *trifolia* (De Kok 2007). *Vitex benthamiana*, the endemic Australian species, needed to be confirmed as part of the complex. Finally, there was still a debate whether *V. trifolia* has two subspecies (Van Steenis 1957, De Kok 2007), namely, subsp. *trifolia* and subsp. *littoralis*, or that the latter subspecies is a distinct species, *V. rotundifolia* (Munir 1987).

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METHODS AND MATERIALS

This article is based on the findings of a doctorate study by Sengun (2017). For the study, detailed analyses of morphological, molecular and chemical data were carried out. During the study extensive fieldwork was carried out in Bodrum, Turkey; Sabah, Malaysia; Beijing and Badaling, Northern China; Guangxi and Guangdong, Southern China; and Queensland coast and Cloncurry region, Australia, with the aim of validating the observations made on herbarium specimens and collecting fresh material. Loans and type material were obtained from B, BH, BRI and W. In addition, more than 1 500 specimens were seen in BM, BO, BRI, E, IBK, ISTE, K, LINN, PE, SAN and W. For on-line specimen information JStor Plants was consulted (<https://plants.jstor.org>). Specimens seen only as image are denoted with an asterisk (*). The cited specimens represent not only the typical form of the species but also more extreme forms (sometimes previously formally described) and the intermediates between them.

RESULTS

The overall results of the study, as published in the thesis (Sengun 2017), showed nine distinct species, which were supported by statistical morphological and the chemical analyses. However, the molecular analysis was inconclusive. The main results of the morphological analysis are as follow:

Despite their very similar morphology, *V. agnus-castus* and *V. pseudonegundo* are two different taxa. They are separated by *V. agnus-castus* having a corolla lip with only a few hairs on the corolla ridges and a glabrous ovary as well as shorter, mainly 7-foliolate leaves and bigger flowers as opposed to *V. pseudonegundo* having a semi-circular area of hairs at the corolla mouth, a hairy ovary, longer and 5–7-foliolate leaves and smaller flowers.

It has been established by statistical analyses and field and herbarium observations that *V. negundo* sensu lato (s.lat.) consists of two species: a lowland species, *V. hybrida* Moldenke, from the Indian subcontinent and *V. negundo* sensu stricto (s.str.) from China. The former *V. hybrida* has entire leaflets, ovate and often caducous bracteoles and the apex of the calyx lobes is acute to acuminate. In contrast, *V. negundo* s.str. has mostly dentate, occasionally entire leaflets, linear, persistent bracteoles that dry black and the apex of the calyx lobes is acuminate to aristate. In addition, *V. negundo* var. *heterophylla*, endemic to China, is distinct from *V. negundo* s.str. as it has a lobed leaf margin, much smaller leaves and bigger flowers.

Vitex bicolor, which was formerly placed in the synonymy of *V. trifolia*, is a distinct taxon. It has bigger leaves, that are mainly 5-foliolate, sometimes trifoliolate, with a long terminal petiolule as opposed to *V. trifolia*, that has mainly trifoliolate, sometimes unifoliolate leaves with either a sessile or a very shortly petiolulate terminal leaflet. *Vitex bicolor* also has smaller flowers.

Two subspecies of *V. trifolia*, subsp. *littoralis* (syn: *V. rotundifolia*) and subsp. *trifolia*, are two distinct taxa separated by vegetative and reproductive characters. *Vitex rotundifolia* has much smaller vegetative and inflorescence characters and clearly bigger flowers. In addition, *V. rotundifolia* roots from the nodes, which is not always visible in herbarium specimens, *V. trifolia* never does.

Despite its similar appearance to *V. agnus-castus* and being sympatric with *V. trifolia*, *V. benthamiana* is distinct from both taxa in terms of vegetative and floral characters.

The data on *V. bicolor*, *V. negundo*, *V. rotundifolia* and *V. trifolia* was published as part of the Flora Malesiana account of the family *Lamiaceae* (De Kok & Sengun 2019). However, in the

printed form of the account Sengun was erroneously omitted (<https://floramalesiana.org/new/families-treated/>) and will subsequently be added in the online version of the flora as well as in the copy for the Biodiversity Heritage Library.

MORPHOLOGICALLY IMPORTANT CHARACTERS

Earlier treatments of the complex often relied on leaflet numbers and shape. However, these characters are correlated (Sengun 2017) and were not enough to distinguish various taxa from each other. For this study a new set of characters was used:

Habit

All species are shrubs or small trees, except *V. rotundifolia* and the beach populations of *V. trifolia*, which are prostrate shrubs. In addition, *V. rotundifolia* roots at the nodes and forms mats on the beach.

Leaf morphology

The leaf serration character was important for dividing the previously broadly circumscribed *V. negundo* into *V. negundo* s.str., *V. hybrida* and *V. collum*.

In addition to the character of leaf margin, i.e., entire or serrate, a new character was introduced for the shape of the serration with character states either dentate or lobed. In dentate serrations the apex of the dentation is acuminate and the tertiary venation arches back and anastomoses with other veins before reaching the apex (see Fig. 11). In lobed serrations, the apex of the lobe is sometimes acuminate but often aristate and the tertiary venation continues all the way to the apex (see Fig. 7). The length of the terminal petiolules was used to distinguish between *V. bicolor* (long) and *V. trifolia* (short or absent).

Inflorescences and flowers

The inflorescences are lateral cymes in dense or lax clusters. This is a taxonomic character used in the past and it proved to be helpful here too. The inflorescence axis is smooth except for *V. hybrida*, which often has a pitted axis due to the scarring caused by lower caducous flowers (i.e., flowers are persistent in all other species).

Other new characters used here are the shape, colour when dried and persistence of the bracteole; shape of the apex of the calyx lobe; as well as hairs on the corolla mouth and ovary.

TAXONOMIC TREATMENT

Vitex trifolia complex

Vitex L. sect. *Euagnus* subsect. *Paniculatae* Schauer (1847) 683, comb. illeg. — *Vitex* L. sect. *Euagnus* subsect. *Terminales* Briq. (1895) 172, nom. superfl. — Type: *Vitex agnus-castus* L.

Agnus-castus Carrière (1870–1871) 415. — *Vitex* L. sect. *Agnus-castus* (Carrière) Briq. (1895) 172. — Lectotype (designated here): *Agnus-castus vulgaris* Carrière (= *Vitex agnus-castus* L.).

Shrubs or small trees. Leaves opposite, (1–)3–5(–7)-foliolate; leaflets: venation pinnate, glabrous above or with only hairs on the veins, velutinous below; hairs whitish, occasionally purple in *V. trifolia* and *V. hybrida*, appressed, with a powdery exudate on apical cell, sessile glands absent; petiolules round in cross-section, with minutely curled hairs. Inflorescence an indeterminate thyrse consisting of lateral cymes in lax or dense clusters, terminal or axillary; axis square in cross-section, appressed pubescent; bracts usually 1-foliolate; bracteoles ovate to linear, appressed or patent, persistent or caducous, velutinous. Calyx erect in flower, patent to erect in fruit, 5-lobed, zygomorphic; calyx tube 5-ribbed; lobes clearly developed, ac-crescent, persistent, velutinous; glands absent to many. Corolla

5-lobed, lobes basally fused up to 10 % of length, margin entire, covered outside with appressed hairs; anterior lip orbicular to ovate or spatulate, apex round to acute, reflexed, two clear ridges and a semi-circular area of hairs at the corolla mouth (except in *V. agnus-castus*); lateral lobes erect or patent, apex rounded; posterior lip 2-lobed, erect or reflexed, apex acute or rounded. *Stamens*: filaments slightly didynamous, with anterior pair longer to equal than posterior pair, with a tuft of erect simple multicellular hairs at base, otherwise glabrous except in some *V. pseudonegundo* in which occasional hairs along the filament, inserted half to 1/3 of the way on the corolla tube, clearly exceeding the corolla tube; anthers beige to purple, thecae mostly parallel, occasionally divergent. *Ovary* globose, glabrous (except in *V. pseudonegundo*), glands few to many; style glabrous; stigma 2-lobed. *Fruit* drupaceous, 4-seeded, broadly obovoid to globose or ellipsoid, glabrous except in *V. pseudonegundo*, smooth, glaucous.

Distribution — The species of the complex are distributed from the Mediterranean, east to Japan and Hawaii and south to northern Australia and the Pacific.

Notes — 1. The *V. trifolia* complex was first defined by De Kok (2007) based on the species' unique hair type. It then only included the species *V. agnus-castus*, *V. benthamiana*, *V. negundo* s.lat., *V. pseudonegundo* and *V. trifolia* s.lat. This is expanded here to nine species, to include *V. bicolor*, *V. collium*, *V. hybrida* and *V. rotundifolia*. However, at this point in time, it would not be appropriate to formally recognise the *V. trifolia* complex as a section within *Vitex*. This is because it would require the complex being defined against other groups within the genus; however, not enough is known about the rest of the genus to do so.

2. Within the genus *Vitex*, section *Euagnus* was illegitimately described by Schauer (1847: 683) as having an erect corolla upper lip and a calyx that is bell-shaped with a short tube and with five lobes. Within this section, the species of the *V. trifolia* complex were part of a subsection *Paniculatae* Schauer. This subsection was based on the character of an inflorescence consisting of panicles with terminal cymes. The type of this group was *V. agnus-castus* and the rest of the species included were *V. alata* B.Heyne, *V. altissima* L.f., *V. bahiensis* Schauer, *V. bicolor*, *V. heterophylla* Roxb., *V. incisa* Lam., *V. loureirii* Wight ex C.B.Clarke, *V. negundo*, *V. peduncularis* Wall. ex Schauer, *V. pubescens* Vahl, *V. punctata* Schauer, *V. timoriensis* Walp., *V. trifolia* and *V. umbrosa* Sw.

3. Carrière (1870–1871) described a genus (*Agnus-castus* Carrière) based on a series of species, which are now considered to be synonyms of *V. agnus-castus*, *V. collium* and *V. negundo*. In 1895, Briquet (1895: 172) changed it to section *Agnus-castus*. He also changed the name of Schauer's subsection *Paniculatae* to *Terminales* Briq., a superfluous name. He kept the type species *V. agnus-castus*, but included a smaller number of species, namely, *V. alata*, *V. altissima*, *V. bahiensis*, *V. limonifolia* Wall. and *V. trifolia*.

KEY TO THE SPECIES

1. Anterior corolla lip with only a few hairs on the corolla ridges 1. *V. agnus-castus*
1. Anterior corolla lip with a semi-circular area of hairs at the corolla mouth 2
2. Ovary hairy; leaves 5–7-foliolate. — Only naturally occurring from Eastern Turkey to Afghanistan and Pakistan. 7. *V. pseudonegundo*
2. Ovary glabrous; leaves 1–7-foliolate. — Naturally occurring from Pakistan to Japan and south to Australia and parts of the Pacific 3

3. Leaflet margins mostly dentate or lobed, though occasionally entire on some leaves; bracteoles linear, persistent and drying black; apex of calyx lobes acuminate to aristate 4
3. Leaflet margins entire; bracteoles ovate to linear, often caducous and drying the same colour as the inflorescence, not black; apex of calyx lobes acute to acuminate 5
4. Leaflet margins lobed; apex of the lobe sometimes acuminate but often aristate and the tertiary venation continuing all the way to the apex 4. *V. collium*
4. All or some leaflet margins dentate; apex of the dentation acuminate and the tertiary venation arching back and anastomosing with other vein before reaching the apex 6. *V. negundo*
5. Leaves 1-foliolate; apex of leaflets rounded (sometimes subacute); shrubs, always prostrate, rooting at the nodes 8. *V. rotundifolia*
5. Leaves (1–)3–5-foliolate; apex of leaflets acute to acuminate; small trees or shrubs, rarely prostrate and never rooting at the nodes 6
6. Inflorescences lateral cymes in dense clusters often with lower caducous flowers, which give the cyme axis a pitted appearance due to scarring 5. *V. hybrida*
6. Inflorescences lateral cymes in dense or lax clusters with persistent flowers, cyme axis smooth 7
7. Leaflet blades narrowly elliptic to lanceolate, never unifoliate; cymes in dense clusters. — Australia (Queensland) 2. *V. benthamiana*
7. Leaflet blades ovate to ovate-lanceolate or obovate to oblanceolate, if unifoliate then elliptic to lanceolate; cymes in lax clusters. — Widely distributed from India and Japan to Australia 8
8. Leaves 3–5-foliolate, very rarely unifoliate; terminal leaflet ovate to ovate-lanceolate in trifoliate leaves, apex acuminate, base cuneate; terminal petiolules long, (0.4–)0.9–2 cm long, lateral leaflets mostly petiolulate 3. *V. bicolor*
8. Leaves (1–)3-foliolate; terminal leaflet obovate to oblanceolate in trifoliate leaves (elliptic to lanceolate in unifoliate leaves), apex acute, rarely acuminate, base attenuate (rounded or cuneate in unifoliate leaves); terminal petiolules absent or short, 0.1–0.9(–1.4) cm long, lateral leaflets sessile 9. *V. trifolia*

1. *Vitex agnus-castus* L. — Fig. 1, 2; Map 1

Vitex agnus-castus L. (1753) 638; C.C.Towns. (1972) 148. — *Vitex lupinifolia* Salisb. (1796) 106, nom. superfl. — *Vitex agnus-castus* L. var. *agnus-castus*: Kurz (1877) 269. — Lectotype (designated by Moldenke 1955a: 170): LINN 811.4 (LINN), 'ex herb. Clifford'.

Vitex verticillata Lam. (1779) 363, nom. inval.

Vitex robusta Lebas (1869) 30. — *Agnus-castus robusta* (Lebas) Carrière (1870–1871) 416. — Type: not indicated, syn. nov.

Agnus-castus vulgaris Carrière (1870–1871) 415. — Type: not indicated, syn. nov.

Agnus-castus vulgaris Carrière var. *diversifolia* Carrière (1870–1871) 415. — Type: not indicated, syn. nov.

Agnus-castus vulgaris Carrière var. *alba* Carrière (1870–1871) 415. — *Vitex agnus-castus* f. *alba* (Carrière) Rehder (1902) 1947. — Type: not indicated, syn. nov.

Agnus-castus vulgaris Carrière var. *compacta* Carrière (1870–1871) 415. — Type: not indicated, syn. nov.

Vitex agnus-castus L. var. *laciniosa* Ces. (1874) 327. — *Vitex agnus-castus* L.f. *laciniosa* (Ces.) Moldenke (1979b) 342. — Type: not indicated.

Vitex agnus-castus L. var. *caerulea* Rehder (1902) 1947. — *Vitex agnus-castus* L.f. *caerulea* (Rehder) Moldenke (1979a) 134. — Type: not indicated.

Vitex agnus-castus L. var. *serrata* Moldenke [(1939) 40, nom. nud.] (1940) 753. — Type: *Abelevia* s.n. (holo L n.v.), The Netherlands, Botanical Garden Nijmegen.

Vitex agnus-castus L. var. *pseudo-negundo* Hausskn. f. *albiflora* Moldenke (1952) 59. — Type: *Dinsmore* 172f (holo S [S-G-6381]*), Israel, Jesr-ul-Ghazir.

[*Vitex agnus-castus variegata* Hort. ex Beissn., Schelle & Zabel (1903) 426, nom. inval.]. — *Vitex agnus-castus* Carrière f. *variegata* Moldenke (1967) 87, nom. inval. (no type). — Type: not indicated

Shrub or small tree, 1–3 m high, deciduous. *Bark* smooth, grey. *Leaves* 5(–7)-foliolate; petioles 1.6–6.2 cm long. *Leaflets*: blades elliptic to lanceolate, apex acuminate, base cuneate, margin

entire, upper surface dull green, lower surface whitish green; secondary veins 11–15 per side, slightly prominent, visible on both surfaces; terminal leaflets 3–10 by 0.5–1.7 cm; terminal petiolules 0.1–1.2 cm long; lateral leaflets 1–8.4 by 0.3–3.9 cm; lateral petiolules 0–1 cm long; basal leaflets 0.4–4.5 by 0.1–2.2 cm; basal petiolules 0–0.6 cm long. *Inflorescence* terminal,

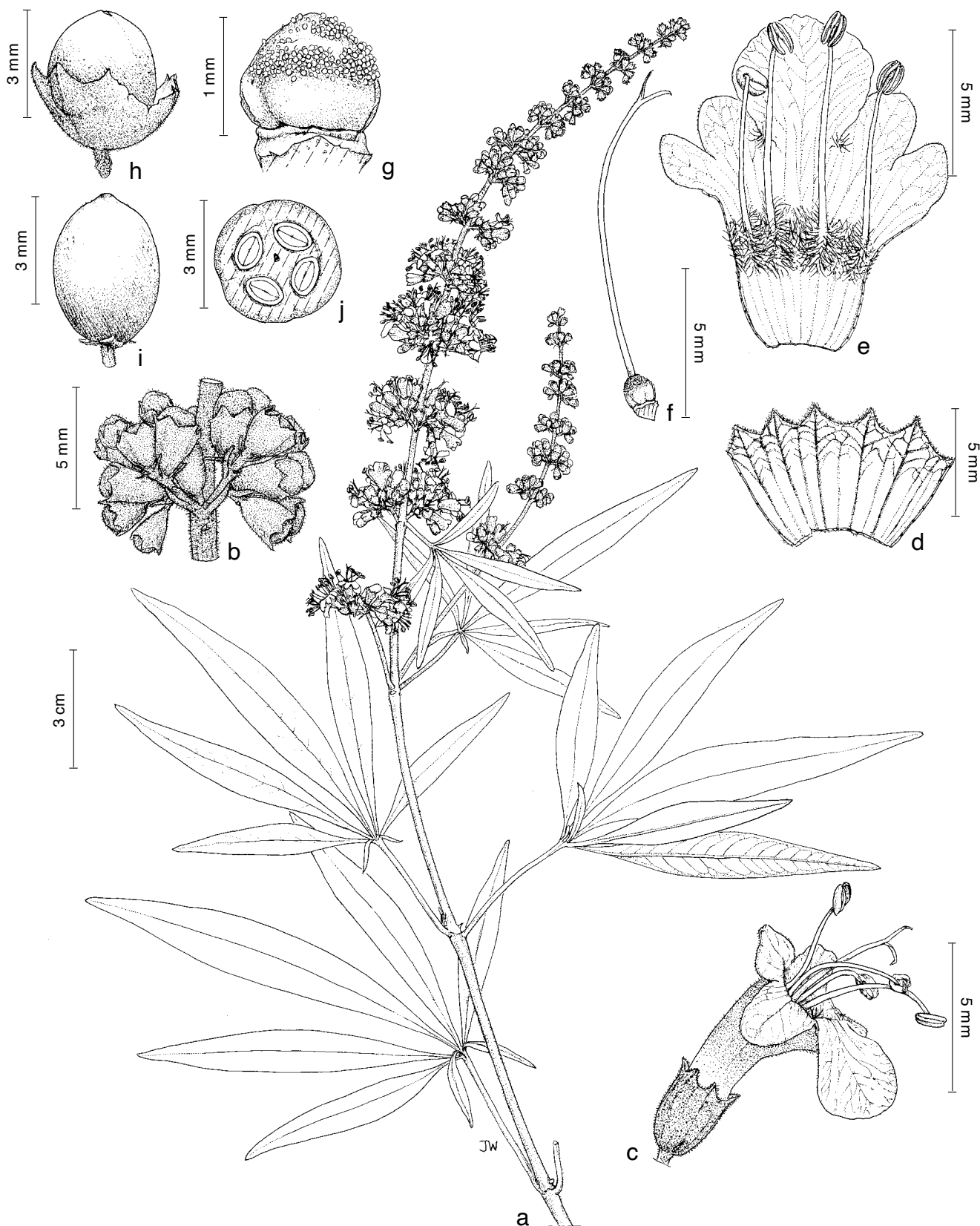


Fig. 1 *Vitex agnus-castus* L. a. Habit; b. inflorescence; c. flower, side view; d. calyx open, adaxial; e. corolla open, adaxial; f. style and young ovary; g. young ovary; h. fruit in calyx; i. fruit with calyx removed; j. fruit in cross-section (a, b: *Syngrossides* 397; c–g: *Balls* 3365, sheet III; h–j: *Balls* B1204B; all K). — Drawing by Juliet Beentje.

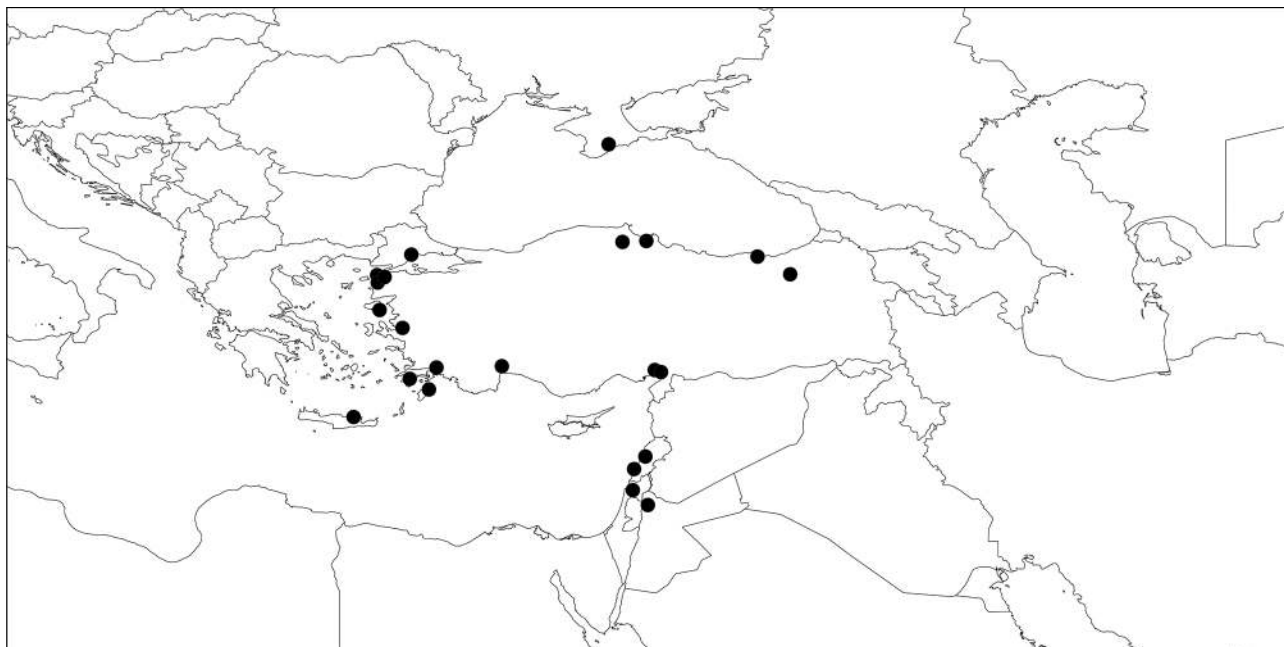
consisting of lateral cymes in dense clusters with persistent flowers; axis 7–35 cm long, smooth; bracteoles to 3 mm long, patent to appressed, caducous, drying the same colour as inflorescence. *Calyx* glands many; tube 1.5–3 mm long; lobes 5–10 by 3–5 mm, lobe apex acute; flowering calyx 3–3.6 mm diam; fruiting calyx 2.8–3.4 mm diam, patent to erect, covering half to most of the mature fruit. *Corolla* pale lilac to blue, rarely white or whitish; glands few; tube 4.2–7 mm long; anterior lip spatulate, 2.4–4.1 by 2.1–3.9 mm, apex round to acute, with a few hairs on the corolla ridges; lateral lobes 1.3–1.7 by 1.6–1.8 mm, apex round, erect; posterior lip lobes 1.8–2.5 by

1.4–1.9 mm, apex acute, erect. *Stamens*: filaments 3.1–6.7 mm long, slightly didynamous to equal, inserted at half to basal/upper 1/3 of the corolla tube; anthers c. 1 mm long. *Ovary* c. 1 mm diam, glabrous, glands many, sometimes covering the apex; style 6–10 mm long; stigma lobes 0.1–1.2 mm long. *Fruit* broadly obovoid to globose, when fresh 3–4 mm diam, dried 2.2–3.3 by 2.5–3.5 mm, glabrous, black to reddish when mature.

Distribution — Greece (Crete, Chios, Samos, Kos, Rhodes and Lesbos), Turkey (throughout the Aegean and the Mediterranean coast, the Black Sea coast up to Trabzon), Ukraine



Fig. 2 *Vitex agnus-castus* L. a. Deciduous shrub in riverine habitat; b. inflorescence detail with butterfly feeding; c. leaves; d. mature inflorescence erect above the leaves; e. flower; f. stems and bark. — Photos by R. de Kok.



Map 1 Natural distribution of *Vitex agnus-castus* L.

(the Crimea), coastal areas of Syria, Lebanon, Israel, Jordan. Cultivated and escaped from cultivation in many western and central Asian countries and around the Mediterranean.

Habitat & Ecology — Often along seasonally dry or permanently flowing rivers and creeks, in open vegetations. Soil: sandy and alluvial soils, sometimes on limestone, 0–750 m altitude. Flowering: June to December; fruiting: July to December.

Uses — Ornamental shrub and used medicinally in Europe and North America for the irregularities of the menstrual cycle, premenstrual syndrome (PMS) and painful breasts (mastodynia) (Sengun 2017).

Vernacular names — Abraham's balm, Chase tree, Chaste berry, Hemp tree or Monk's pepper (English); Gattilier (French); Hayit (Turkish); Mönchspfeffers (German).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

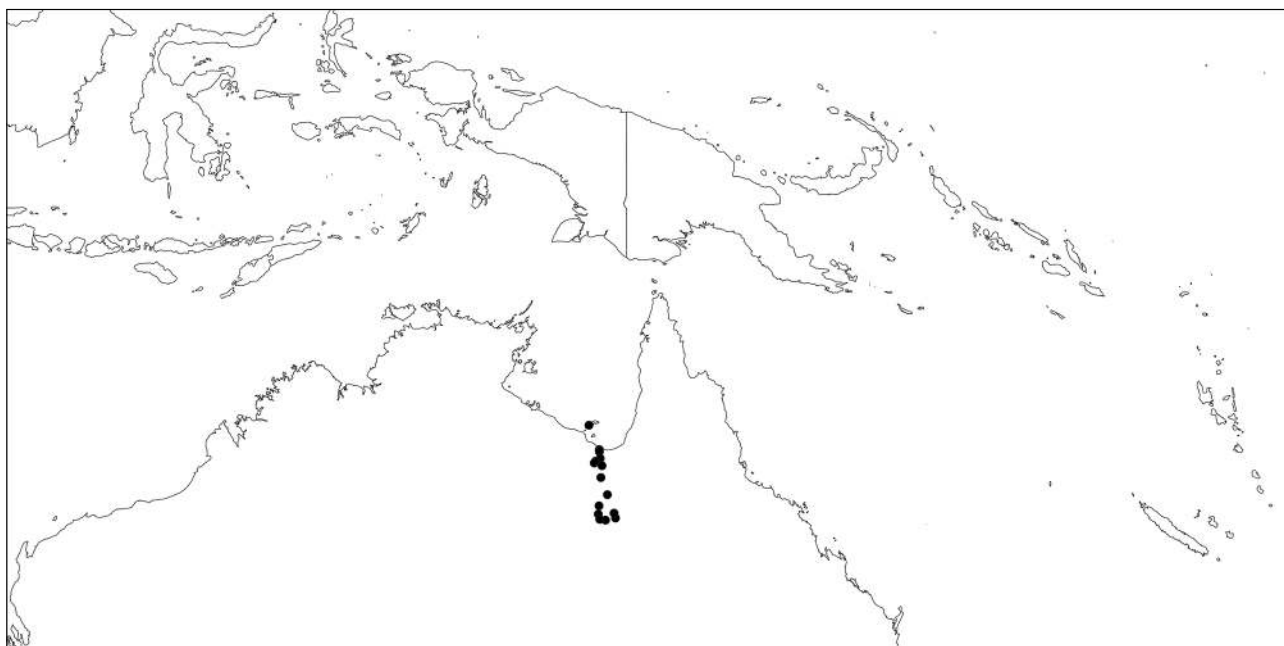
Notes — 1. Several forms and varieties of this species have been described, which are all based on plants growing in cultivation and are only different from the wild populations in flower colour or leaf variegation. None of these variants warrant formal recognition and therefore are placed in synonymy.

2. *Vitex agnus-castus* is often confused with *V. pseudo-negundo* from which it differs in having a glabrous corolla lip and ovary, while the latter has a hairy corolla lip and ovary.

2. *Vitex benthamiana* Domin — Fig. 3, 4; Map 2

Vitex benthamiana Domin (1928) 560; Munir (1987) 61. — Lectotype (designated by Munir 1987): *Domin 8164* (PRA n.v.), Australia, Queensland, Cloncurry.

Vitex trifolia L. var. *parviflora* Benth. (1870) 67; Munir (1987) 61. — Type: *Landsborough s.n.* (holo K [K000223177]; iso MEL [MEL 98012]), Australia, Queensland, Gulf of Carpentaria, possibly near Albert River.



Map 2 Natural distribution of *Vitex benthamiana* Domin.

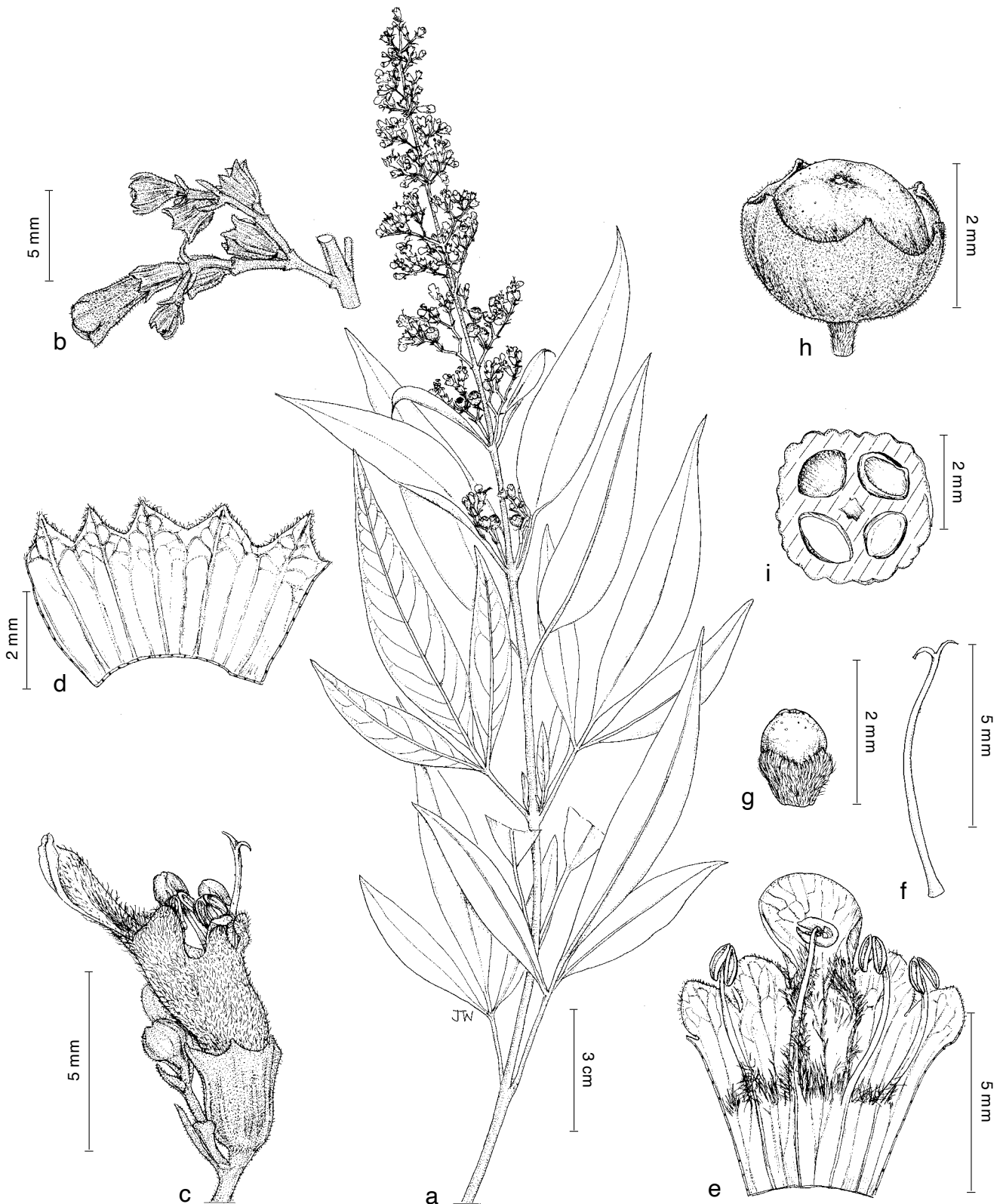


Fig. 3 *Vitex benthamiana* Domin. a. Habit; b. part of inflorescence; c. flower, side view; d. calyx open, adaxial; e. corolla open; f. style; g. ovary; h. fruit in calyx; i. fruit in cross-section (a: Perry 1061; b–d: Gittins s.n.; e, f: Puttock 14410; g: Gittins s.n.; h, i: Halliday 428; all K). — Drawing by Juliet Beentje.

Shrub or small tree, 1.6–4 m high. *Bark* smooth to slightly fissured, grey. *Leaves* (1- or 3-foliate; petioles 0.4–5.5 cm long. *Leaflets*: blades narrowly elliptic to lanceolate, apex acuminate, rarely acute, base attenuate when trifoliate, rounded or cuneate when unifoliate, margin entire, upper surface green, lower surface whitish; aromatic when bruised; secondary veins 9–14 per side, slightly prominent, visible on both surfaces; terminal leaflets 2.2–10.1 by 0.7–3.1 cm; terminal petiolules (0–)0.1–0.9(–1.9) cm long; lateral leaflets 1.4–9.3 by 0.3–

2.6 cm, sessile. *Inflorescence* terminal, consisting of lateral cymes in dense clusters with persistent flowers; axis 5.4–18 cm long, smooth; bracteoles ovate to linear, up to 2(–3.8) mm long, patent, usually persistent, drying the same colour as inflorescence. *Calyx* glands many; tube 1.7–2.5 mm long; lobes 2–7 by 1–9 mm, lobe apex acute; flowering calyx 2–3 mm diam; fruiting calyx 5–6 mm diam, patent to erect, covering most of the mature fruit. *Corolla* light or pale mauve to lilac; glands few; tube 1.7–7 mm long; anterior lip spatulate, 2–5.5 by 2.5–5 mm,



Fig. 4 *Vitex benthamiana* Domin. a. Habitat; b. flower; c. mature inflorescence; d. leaves; e. infructescence detail with dried fruits; f. detail of bark. — Photos by R. de Kok.

apex round to acute, anterior corolla lip with a semi-circular area of hairs at the corolla mouth; lateral lobes 2–3 by 2–2.5 mm, apex round, erect; posterior lip lobes 1.2–2.2 by 1–2 mm, apex acute, erect. *Stamens*: filaments 3–5.8 mm long, slightly didynamous to equal, glabrous, inserted at half to lower 1/3 of the corolla tube; anthers c. 1 mm long. *Ovary* 1–1.5 mm diam, glabrous, glands many, covering the apex; style 3.6–7 mm long; stigma lobes 0.2–0.7 mm long. *Fruit* dried broadly obovoid to globose, 2.2–6 by 2.2–6.2 mm, glabrous.

Distribution — Australia (Queensland: from Cloncurry and Mt Isa along several rivers to Burketown on the Gulf of Carpentaria).

Habitat & Ecology — Along seasonally dry or permanently flowing rivers and creeks, in *Eucalyptus* woodland with an understory of *Acacia hemsleyi* Maiden (*Fabaceae*), *Eucalyptus camaldulensis* Dehnh. (*Myrtaceae*), *E. microtheca* F.Muell., *Melaleuca argentea* W.Fitzg. (*Myrtaceae*), *M. trichostachya* Lindl. and *Pandanus aquaticus* F.Muell. (*Pandanaceae*). Soil: sandy or alluvial black soils or brown clay, at 125–300 m altitude. Flowering: April to August, fruiting: April to August.

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).



Fig. 5 *Vitex bicolor* Willd. a. Habit; b. habit; c. habit; d. infructescence; e. upper and lower leaf surface; f. inflorescence; g. inflorescence, detail (a: Awa & Othman S 48714; b, g: Ismael IS 472; c: Loher 4433; d: Adaire 161; e: Sengun aus 3; all K). — Photos by Seda Sengun.

Notes — 1. This Queensland endemic species has the most restricted range of all species in the complex, but where it occurs it is reported to be common. Its leaves are mostly trifoliolate like *V. trifolia*, but it differs from *V. trifolia* by its narrow lanceolate leaflets and cymes in dense clusters.

2. It has not been possible to see the type or an image of *V. benthamiana*, which is housed at PRA. However, Munir (1987) reports to have seen it when he selected it as a lectotype.

3. *Vitex bicolor* Willd. — Fig. 5, 6; Map 3

Vitex bicolor Willd. (1809) 660; Munir (1987) 66; De Kok & Sengun (2019) 400. — *Vitex negundo* L. var. *bicolor* (Willd.) H.J.Lam (1919) 191. — *Vitex trifolia* L. var. *bicolor* (Willd.) Moldenke (1942) 79; (1958) 174. — Type: *Herb. Willd.* 11709 (holo B-W [B11709-010]*), 'Habitat in India Orientale', cult. Hort. Berlin from seeds sent by Klein ('Ind. 1797').

Vitex arborea Desf. (1829) 391, nom. illeg., not *Vitex arborea* Roxb. ex Jack (1820). — Type: *Anonymous s.n.* (iso MPU [MPU013116]*).

Vitex leucoxydon Blanco (1837) 516, nom. illeg., not *Vitex leucoxydon* L.f. — Type: *Merrill Sp. Blanc.* 440 (neo L [L.2768327]*), Philippines, Luzon, Rizal Province, Antipolo.

Vitex neocaledonia Gand. (1918) 64; Mabb. & De Kok (2004) 37; De Kok (2007) 597. — Type: *Debeaux s.n.* (holo LY n.v.), New Calédonia, Nouméa.

Vitex petiolaris Domin (1928) 561; Munir (1987) 67. — Type: *Domin 8167* (holo PR n.v.), Nordost-Queensland, an der Küste bei Cairns.

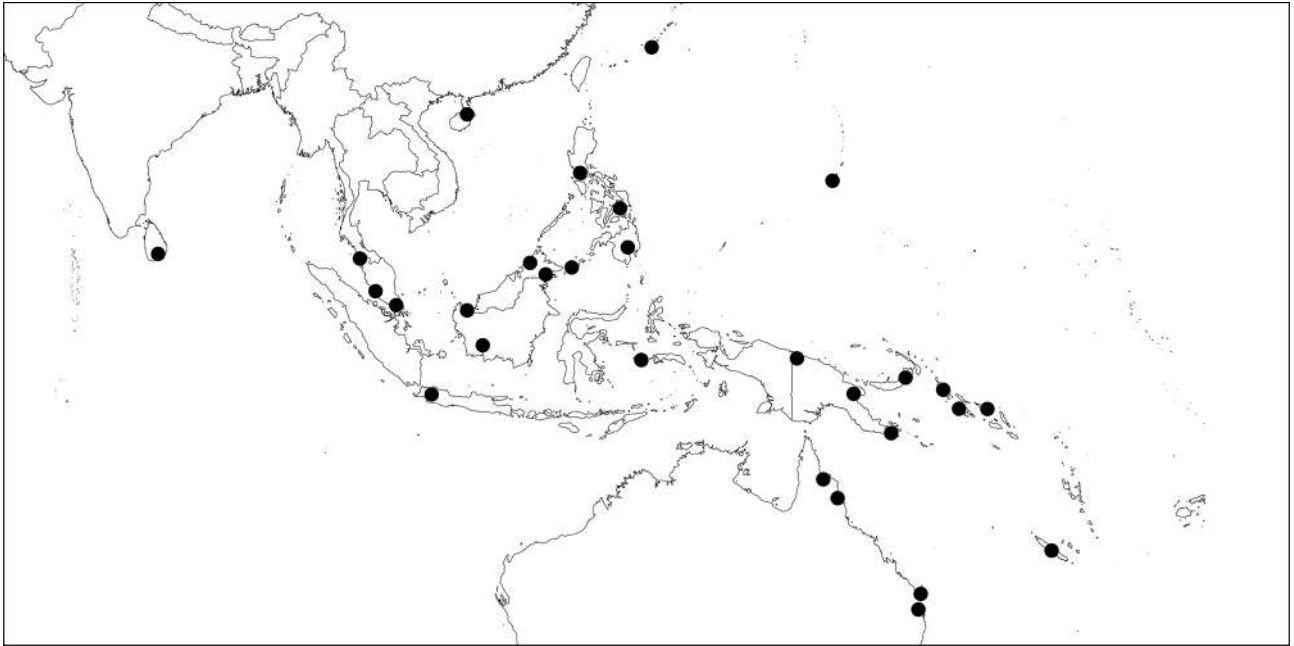
Vitex trifolia L. var. *bicolor* f. *albiflora* Moldenke (1961) 86; De Kok (2007) 597. — Type: *Parks 16178* (holo UC [UC297255]*; iso K, NY [NY01043251]*), Tonga Islands, Eua, Ohonua.

Vitex negundo L. var. *philippinensis* Moldenke (1978) 308; De Kok (2008) 32. — Syntypes: *Elmer 8125* (K, NY [NY00138511]), Luzon, Laguna Province, Los Baños.

Shrub or small tree, up to 1.5–5 m high. **Leaves** (1)3–5-foliolate; petiole 1.5–5.2 cm long. **Leaflets**: blades ovate to ovate-lanceolate, apex acuminate, base cuneate, margin entire, upper surface dark dull green, drying dark brown or black, lower surface pale green; secondary veins 6–16 per side, not prominent, usually not very visible; terminal leaflets 3.8–9.6 by 1.2–4 cm long; terminal petiolules (0.4–)0.9–2 cm long; lateral leaflets 2.6–8.2 by 1–2.9 cm; lateral petiolules (0.4–)0.8–1.5(–1.8) cm long in 5-foliolate leaves and sessile in trifoliolate leaves; basal leaflets in 5-foliolate leaves 1.4–4.5 by 0.4–1.6 cm; basal petiolules 0(–0.1) cm long. **Inflorescences** terminal, consisting of lateral cymes in lax clusters with persistent flowers; axis 5.9–15 cm long, smooth; bracteoles ovate to linear, up to 2 mm long, patent, usually persistent, drying the same colour as inflorescence. **Calyx** glands absent to few; tube 1.4–2.3 mm long; lobes 0.2–0.8 by 0.3–0.8 mm, lobe apex acute, rarely acuminate; flowering calyx 1–1.5 mm diam; fruiting calyx 2–2.5 mm diam, erect, covering up to 1/3 of the mature fruit. **Corolla** pale lilac, blue to violet; glands few or absent; tube 3.2–6.2 mm long; anterior lip orbicular to ovate, 2.3–3.2 by 2.3–3.3 mm, apex round, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 1.2–1.5 by 1–2 mm, apex round, patent; posterior lobes 1.2–1.5 by



Fig. 6 *Vitex bicolor* Willd. a. Habitat; b. old inflorescence; c. leaves; d. detail of branching pattern. — Photos by R. de Kok.



Map 3 Natural distribution of *Vitex bicolor* Willd.

1–1.2 mm, apex round, erect. *Stamens*: filaments 2.6–4.1 mm long, slightly to strongly didynamous, inserted halfway to lower 1/3 of the corolla tube; anthers c. 0.8 mm long. *Ovary* 0.6–0.8 by 0.5–0.7 mm, glabrous, glands few at apex; style 3.6–7 mm long; stigma lobes 0.2–0.7 mm long. *Fruits* ellipsoid when dried, 2.6–5.1 by 2.8–5.8 mm, glabrous, black or purple when mature.

Distribution — Sri Lanka; South China (Hainan); Japan (Okinawa); throughout Malaysia; Australia (Queensland); W Pacific (Tonga, Samoa and Marianas).

Habitat & Ecology — Beaches and low hills, growing in sand, at 0–20(–300) m altitude. Flowering: August to May; fruiting: September to May.

Vernacular names — Andami (Bajawa language, Indonesia), Lagundi (Brunei-Malay).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Notes — 1. It was not possible to see the types of *V. petiolaris* or *V. neocaledonica*; however, the descriptions in the original publications clearly belong to *V. bicolor*.

2. The name *V. leucoxylon* Blanco (1837) may refer to this species. The illustrative specimen for *V. leucoxylon* selected by Merrill (1918) in his Species Blancoanae series is *V. bicolor*. The name is already occupied by *V. leucoxylon* L.f (1782); therefore, Blanco's name is illegitimate.

3. *Vitex bicolor* can be confused with *V. trifolia* if there are no 5-foliolate leaves in the herbarium specimen (Fig. 6b). However, it can be distinguished by its ovate to ovate-lanceolate terminal leaflet with a cuneate base and a distinct petiolule as opposed to *V. trifolia* that has an obovate or oblanceolate terminal leaflet with an attenuate base, sessile or very shortly petiolulate.

4. *Vitex collium* Sengun, sp. nov. — Fig. 7, 8; Map 4

This taxon differs from *V. negundo* L. in having lobed leaflet margins in which the tertiary venation continues to the apex of the lobe and the apex is often aristate and, very rarely and only its basal leaflets entire; as opposed to *V. negundo* that has a dentate margin with tertiary venation arching back before reaching the apex of the dentation and the apex acuminate and, frequently and any of the leaflets can be entire. In addition, it differs in its specific distribution that is in the frost prone regions of Central and Northern China as opposed to *V. negundo* occurring in Southern China as well as North India and Nepal. — Type: *Sengun 53a* (holo PE; iso K), China, Beijing.

Agnus-castus incisa (Lam.) Carrière var. *multifida* Carrière (1870–1871) 416. — *Vitex incisa* Lam. var. *multifida* (Carrière) C.K.Schneid. (1911) 594. — *Vitex negundo* L. var. *incisa* (Lam.) C.B.Clarke f. *multifida* (Carrière) Rehder (1917) 3481. — *Vitex negundo* L. var. *heterophylla* (Franch.) Rehder f. *multifida* (Carrière) Rehder (1947) 258. — Type: not indicated. Syn. nov. *Vitex incisa* Lam. var. *heterophylla* Franch. (1883) 112. — *Vitex negundo* L. var. *heterophylla* (Franch.) Rehder (1947) 258. — Type: *Herbier Drake del Castillo s.n.* (holo P [P02888194]), (China,) environs de Pékin. *Vitex negundo* L. var. *heterophylla* (Franch.) Rehder f. *albiflora* H.W.Jen & Y.J.Chang (1991) 2. — Type: *Jen 88654* (holo BFUH n.v.), China, Beijing, Songshan. Syn. nov. *Vitex negundo* L. var. *sichuanensis* J.L.Liu (1995) 501. — Type: *J.L.Liu 505* (holo XIAS n.v.; iso PE [01477359]), (China,) Sichuan, Xichang. Syn. nov.

Shrub or small tree, up to 2 m high. *Bark* smooth, grey. *Leaves* 5–7-foliolate; petiole 1.1–7.3 cm long. *Leaflets*: blades oblong-elliptic to narrowly elliptic, apex acuminate, base cuneate, margin lobed in which the tertiary venation continues to the apex of the lobe and often forms an aristate tip, rarely basal leaflet(s) entire, upper surface dark green, lower surface light green; secondary veins 3–6 per side, slightly prominent, visible on both surfaces; terminal leaflets 2.3–13.4 by 1.1–4.8 cm; terminal petiolules 0.3–2.9 cm long; lateral leaflets 1.8–8.6 by 0.8–3.5 cm; lateral petiolules 0.1–1.7 cm long; basal leaflets 0.5–5.6 by 0.2–2.7 cm; basal petiolules 0–0.6 cm long. *Inflorescence* terminal, consisting of lateral cymes in dense clusters with persistent flowers; axis 8.5–14 cm long, smooth; bracteoles linear, up to (0.7–)1.4–3(–8.1) mm long, patent, persistent, drying black. *Calyx* glands absent to few; tube 1.1–2.1 mm long; lobes 0.5–1.1 by 0.3–1 mm, lobe apex sometimes acuminate but often aristate; flowering calyx 1.8–2.5 mm diam; fruiting calyx 2.7–3 mm diam, erect, covering most of the mature fruit. *Corolla* white or light purple to blue-violet; glands few or absent; tube 3.5–5.4 mm long; anterior lip orbicular, 2.7–5 by 2.9–4.9 mm, apex rounded, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 2.4–2.5 by 1.6–3 mm, apex round, patent; posterior lip: lobes 2.1–2.6 by 1.7–2.1 mm, apex round, reflected to erect. *Stamens*: filaments 3.2–4.8 mm long, slightly to strongly didynamous, inserted at half to lower 1/3 of the corolla tube; anther c. 1 mm long, pale brown to violet. *Ovary* c. 1 mm diam, glabrous, glands sometimes present; style 3.8–7.2 mm long; stigma lobes 0.4–1 mm long. *Fruit* when dried ellipsoid, 2.5–3.5 by 2–3 mm, apex truncate, glabrous.

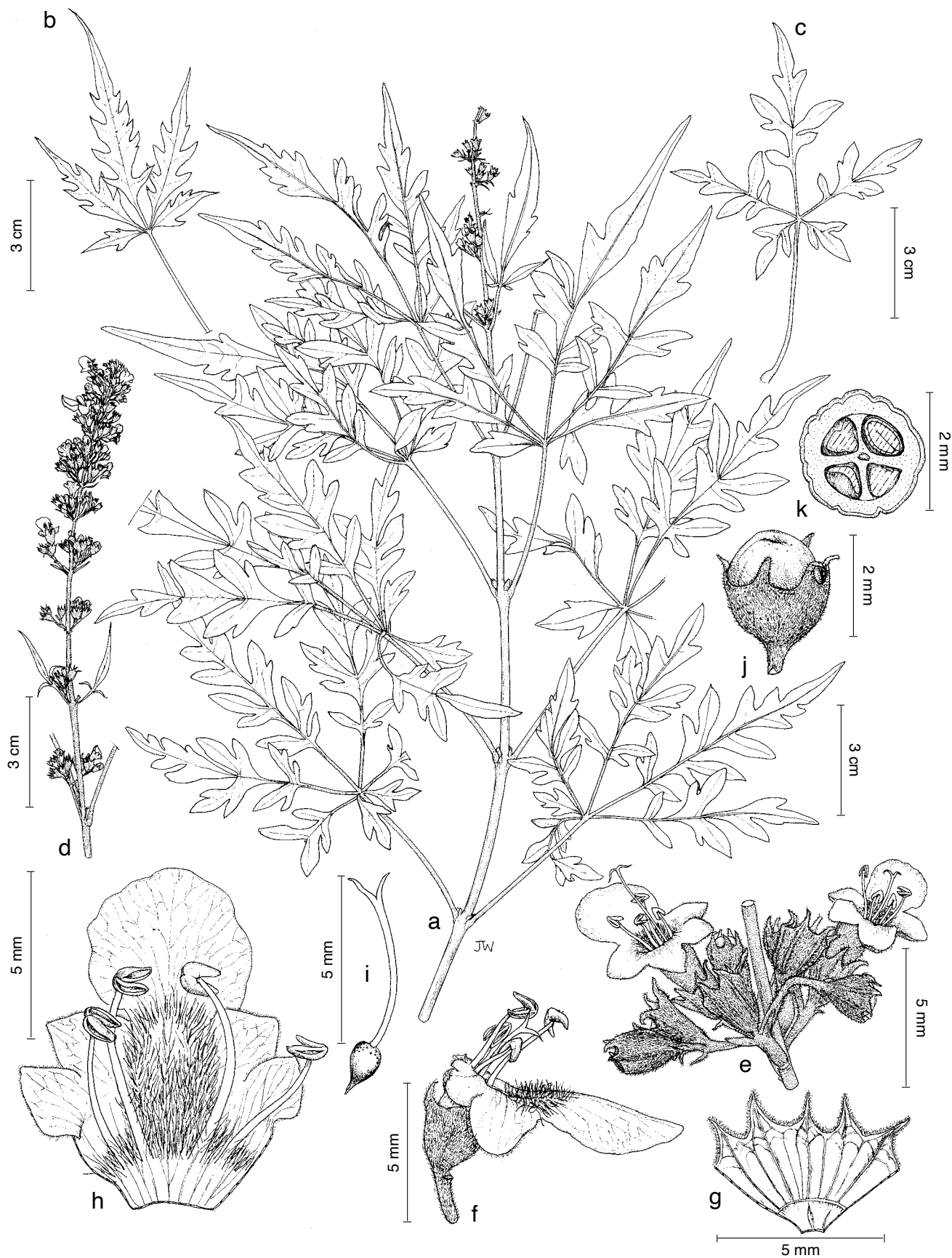
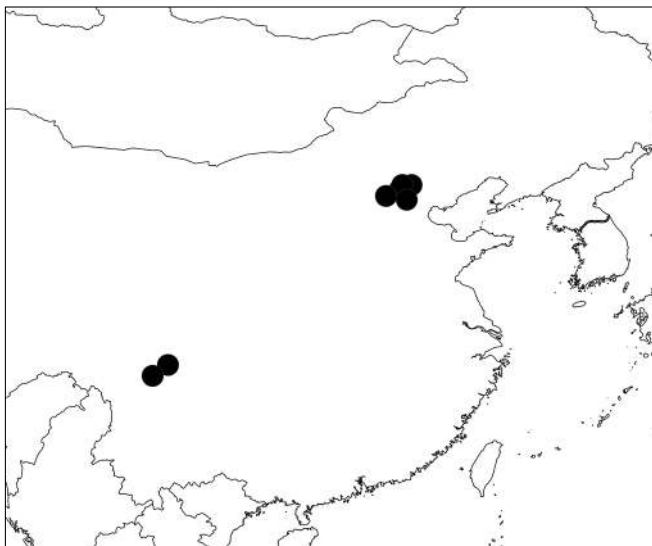


Fig. 7 *Vitex collium* Sengun. a. Habit; b. lobed leaflet; c. lobed leaflet; d. part of inflorescence; e. inflorescence detail; f. flower, side view; g. calyx open, adaxial; h. corolla open; i. ovary & style; j. fruit in calyx; k. fruit in cross-section (a: Zhao & Wenbin s.n.; b, d, g–h: Sengun 53; c, e–f: Zhou et al. 7; i: Sengun 53; j–k: Sengun 50; all K). — Drawing by Juliet Beentje.



Fig. 8 *Vitex collium* Sengun. a. Habit; b. infructescence and young fruit; c. leaves; d. flower (♂ phase); e. leaves; f. leaf detail. — Photos a–e by R. de Kok; f by Zhao Xue-li & Ju Wen-bin.



Map 4 Natural distribution of *Vitex collium* Sengun.

Distribution — North China (Beijing Municipality, the provinces of Hebei and Shanxi, an isolated population in Luding County in Sichuan Province).

Habitat & Ecology — Pine forests and mixed thickets on mountain slopes in frost prone regions at 160–1800 m altitude. Flowering and fruiting: August.

Vernacular name — Jing tiao (Chinese).

Conservation status — IUCN assessment gives the extent of occurrence (EOO) as greater than the threshold for a threatened category, thus the status would be least concern (LC) but the area of occurrence (AOO), meets the threshold for the Endangered (E) category. Unfortunately, we have found no data on the threats facing the localities or on the status of the populations. Therefore, we have categorised this species as Data Deficient (DD).

Note — This taxon has never been recognised at species level before. It has been named here *V. collium* Sengun for it translates to English as the ‘*Vitex* of the hills’ in recognition of its native habitat in the hills of China.

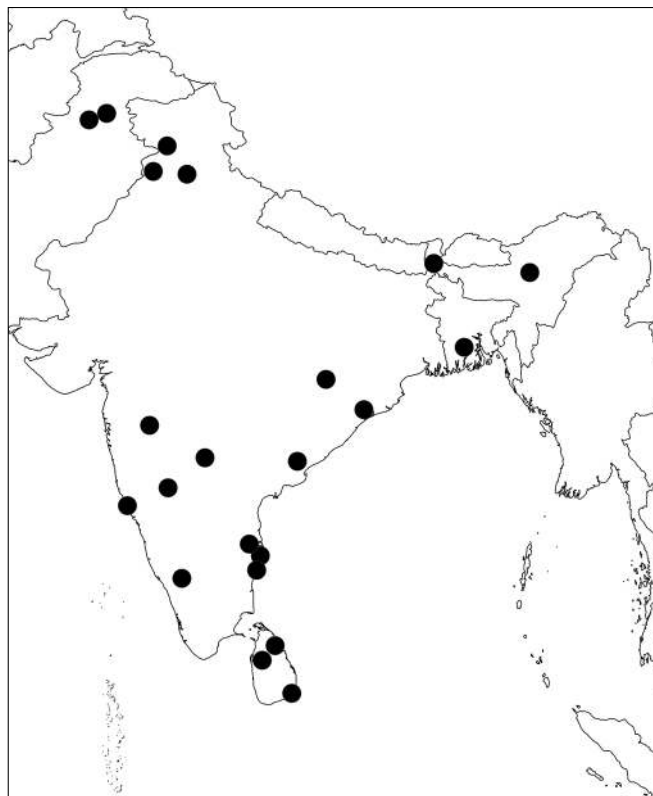
5. *Vitex hybrida* Moldenke — Fig. 9, 10; Map 5

Vitex hybrida Moldenke (1941) 29. — Type: *Anonymous s.n.* (holo MICH [1108448]*), India (Pakistan), Sindh, Bhola.

Vitex negundodes Kuntze f. *albiflora* Kuntze (1891) 510, nom. inval. — Type: Kuntze 7367 (holo NY (n.v.); iso K [K000222901]*), [South India] Dekkan.

Vitex negundo L. var. *purpurascens* Sivar. & Moldenke (1974) 404. — Type: Sivarajan 1849 (holo LL [LL00375281]*), (India, Kerala,) Calicut University campus. Syn. nov.

Shrub, 1–6 m high. *Leaves* 3–5-foliate; petiole 1–6.7 cm long. *Leaflets*: blades lanceolate, apex acuminate, base cuneate, margin entire, upper surface dark green, lower surface light green to grey or purple; secondary veins 13–16 per side, slightly prominent, visible on both surfaces; terminal leaflets 4.7–13.3 by 1–2.9 cm; terminal petiolules 0.5–2 cm long; lateral leaflets 3.2–11.6 by 0.6–2.5 cm; lateral petiolules 0–2.1 cm long; basal leaflets 0.9–8.1 by 0.5–2.1 cm; basal petiolules 0–0.5 cm long. *Inflorescence* axillary or terminal, consisting of lateral cymes in dense clusters, lower flowers caducous; axis 8–27.4 cm long, often pitted due to aborted flowers, sometimes mauve tinged or purple; bracteoles ovate, up to 2 mm long, patent, caducous, drying the same colour as inflorescence. *Calyx* glands absent to few; tube 1.1–2.4 mm long; lobes 0.3–1 by 0.5–1 mm, apex acute to acuminate; flowering calyx 3–3.5 mm diam; fruiting calyx 1.4–2.4 mm diam, erect, covering most of



Map 5 Natural distribution of *Vitex hybrida* Moldenke.

the fruit. *Corolla* dull or pinkish purple to violet or white; glands few or absent; tube 3–6.1 mm long; anterior lip orbicular, 1.5–4 by 1.6–3.7 mm, apex round, semi-circular area of hairs at the corolla mouth; lateral lobes 2–2.4 by 1.8–2 mm, apex round, patent; posterior lobes 1.2–1.7 by 1.7–1.9 mm, apex round, reflected to erect. *Stamens*: filaments 3–4.5 mm long, slightly to strongly didynamous, inserted at half to lower 1/3 of the corolla tube; anther c. 0.8 mm long, pale brown to violet. *Ovary* c. 1 mm diam, glabrous, glands sometimes present; style 5.1–8.6 mm long; stigma lobes 0.3–0.6 mm long. *Fruit* ellipsoid, when dried 3–4 by 3–3.8 mm, apex truncate, glabrous, black when mature.

Distribution — Pakistan, India, Sri Lanka, Bangladesh. It is also known to be grown for horticultural purposes in Peninsular Malaysia, Singapore and Vietnam.

Habitat & Ecology — Growing in secondary (dry) forest, mixed thickets and along roadsides, streams and in wastelands, often cultivated. Soil: Laterite, from sea-level up to 1200 m altitude. Flowering: June to February; fruiting: July to December.

Uses — Used medicinally for many ailments throughout the Indian subcontinent.

Vernacular names — Mārṡān (Punjabi); Nalla vavili (Telugu); Nika (Sinhala); Nirgudi (Hindi); Nishinda, Samalu (Bengali); Nochi (Tamil); Pushto (Urdu); Senduar (Nagpur).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Notes — 1. This species has never been recognised as a distinct species before. Even Moldenke (1941), who published the oldest name at species level for this taxon, thought that he was dealing with a hybrid between *V. negundo* and *V. pseudo-negundo*. According to the nomenclature rules (Turland et al. 2018) even though it is misleading and never been used, the name *V. hybrida* has to be adopted for this species.

2. It is the common species from the *V. trifolia* complex in India, Pakistan and Sri Lanka but known and studied as *V. negundo*. *Vitex hybrida* can easily be distinguished from the latter



Fig. 9 *Vitex hybrida* Moldenke. a. Habit; b. part of inflorescence; c. flower, side view; d. calyx open, adaxial; e. corolla open; f. style and ovary; g. fruit in calyx; h. detail of inflorescence; i. cross section of fruit (a: Rich 571; b–f, h: Worthington 6378; g, i: Gamble 3623A; all K). — Drawing by Juliet Beentje.



Fig. 10 *Vitex hybrida* Moldenke. a. Habit; b. young inflorescence; c. flower; d. young fruits; e. leaves and flower; f. old inflorescence detail — Photos a–d by Jagan Gadpayale; e–f by Seda Sengun.

taxa by its purely entire leaflets, long, pitted cyme axes due to the scarring caused by aborted flowers, short (up to 2 mm), ovate bracteoles, often caducous, drying the same colour as the rest of the inflorescence and acute to acuminate calyx lobe apices as opposed to *V. negundo* that has dentate leaflets (all or some), short, smooth cyme axes with flowers regularly disposed, long (3–7 mm) linear bracteoles, persistent, drying black and acuminate to often aristate calyx lobe apices.

3. Some specimens are known to have purple undersides of the leaves and twigs as a result of purple hairs. However, this is not visible in herbarium specimens.

4. The name described by Kuntze (1891) *V. negundodes*, does not seem to be a typographical error for *negundoides* as he uses it consistently throughout his publication. The species *V. negundodes* has never been validly published and therefore the form *albiflora* is also invalid. From the description and locality, it is clear that *V. negundodes* f. *albiflora* sensu Kuntze must be *V. hybrida*.

5. *Vitex hybrida* can be confused with *V. bicolor*. However, it can be distinguished by its dense cymes on a pitted axis (due to aborted flowers) as opposed to *V. bicolor* having lax cymes on a smooth axis.

6. *Vitex negundo* L. — Fig. 11, 12; Map 6

Vitex negundo L. (1753) 638 (page number printed erroneously as 938); H.J.Lam (1919) 189; De Kok & Sengun (2019) 407. — *Agnus-castus negundo* (L.) Carrière (1870–1871) 416. — *Vitex agnus-castus* L. var. *negundo* (L.) Kuntze (1891) 511. — Lectotype (designated by Moldenke 1955b: 490): *Herb. Linnaeus LINN 811/8* (lecto LINN), India.

[*Vitex incisa* Wall. (1829) no. 1746, nom. nud. — Based on: *Wallich no. 1746* (K-W).]

Vitex latifolia Mill. (1768). — *Vitex agnus-castus* L. var. *latifolia* (Mill.) Loudon (1830) 246. — Lectotype (designated here): De l'Obel, Pl. Icon 139, tome 2 (1591) t. 161.

Vitex chinensis Mill. (1768). — Lectotype (designated here): *Miller s.n.* (BM [BM000757489]; islecto BM [BM000757490]), ex Hort. (unknown which).

Vitex incisa Lam. (1786) 612. — *Agnus-castus incisa* (Lam.) Carrière (1870–1871) 416. — *Vitex negundo* L. var. *incisa* (Lam.) C.B.Clarke (1885) 584. — Type: *Jardin du Roi, 'originaire de la Chine'* (holo P–Lam.; Micofiche LM-509/2, Picture at K), originally from China.

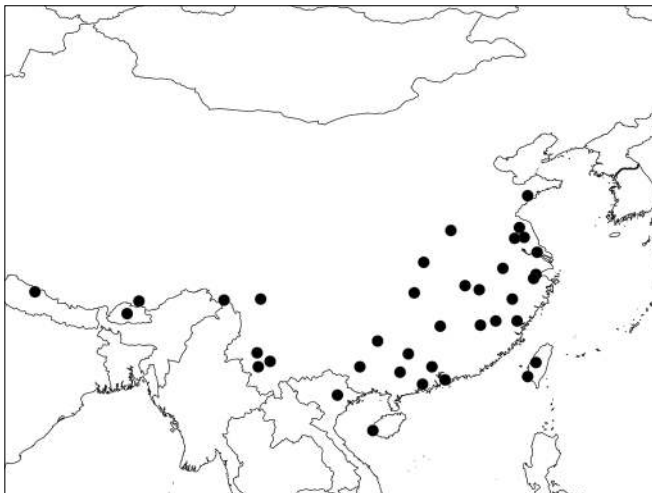
Vitex spicata Lour. (1790) 475. — Type: *de Loureiro s.n.* (n.v.), Cultaque in Cochinchina et China.

Vitex gracilis Salisb. (1796) 107, nom. illeg., in synonymy.

Vitex cannabifolia Siebold & Zucc. (1846) 152. — *Vitex negundo* L. var. *cannabifolia* (Siebold & Zucc.) Hand.-Mazz. (1934) 67. — Lectotype (designated here): *Siebold s.n.* (W [W0022974]; islecto: M [M0111716, M0111717]*, W [W0022975, W0285058]), Japan. Syn. nov.

Agnus-castus incisa (Lam.) Carrière var. *alba* Carrière (1870–1871) 416. — Type: not indicated. Syn. nov.

Vitex negundo L.f. *alba* C.Pei (1932) 104. — Lectotype (designated here): *Forrest 10123* (PE [PE0095990]; islecto K), (China,) Yungpeh. Syn. nov.



Map 6 Natural distribution of *Vitex negundo* L.

Vitex negundo L.f. *laxipaniculata* C.Pei (1932) 104. — Lectotype (designated here): *Henry 13210* (NY [NY00138480]; islecto K), (China,) Yunnan. Syn. nov.

Vitex negundo L.f. *intermedia* C.Pei (1932) 105; De Kok (2008) 25. — *Vitex negundo* L. var. *intermedia* (C.Pei) Moldenke (1937) 2. — Lectotype (designated here): *Wright s.n.* (NY [NY00076777]; islecto L), (China,) Hong Kong. Syn. nov.

Vitex negundo L. var. *microphylla* Hand.-Mazz. (1936) 906. — *Vitex microphylla* (Hand.-Mazz.) C.Pei ex C.Y.Wu (1977) 452, nom. superfl., non Moldenke. — Type: *von Handel-Mazzetti 8781* (holo W; iso A [A00143801]*, E [E00284233], WU [WU0060375]*), (China,) in regionis subtropicae vallis fluvii Dijnscha-dijang ("Yangtse") ad occid urbis Lidjiang ('Likiang') dumetis supra vicum Ahsi. Syn. nov.

Vitex negundo L. var. *macrophylla* Moldenke [(1939) 40, nom. nud.] (1940) 753. — *Walther 174* (holo BH [BH000 046 022, BH000 046 023]), USA, California, Los Angeles, Huntington Botanic Garden.

Vitex negundo L. var. *sessilis* Moldenke [(1939) 40, nom. nud.] (1940) 754. — *Heuer [F.P.I. 63649]* (holo BH [BH000 046 021]), USA, Florida, Dade County.

Vitex elmeri Moldenke (1978) 307; De Kok (2008) 25. — Type: *Elmer 5611* (holo NY [NY00138505]), Philippines, Luzon, Union Province, Bauang.

Vitex negundo L. var. *thyrsoides* C.Pei & S.L.Liou (1982) 212. — Type: *Dai Tianlun 104763* (holo NAS [NAS 00218250]*), China, Sichuan province, Chengkou County. Syn. nov.

Vitex simplicifolia B.N.Lin & S.W.Wang (1994) 209, nom. superfl., non Oliv. — *Vitex negundo* L. var. *simplicifolia* (B.N.Lin & S.W.Wang) D.K.Zang & J.W.Sun (2009) 22. — Type: *Bingham 9007* (holo JSBI n.v.), China, Shandong, Jinan, Shi, Changqing Xian, Suzhuang. Syn. nov.

Shrub or small tree, up to 4 m high. *Leaves* 3–5(–7)-foliolate; petioles 1.8–5.5 cm long. *Leaflets*: blades oblong-elliptic to narrowly elliptic to lanceolate, apex acuminate, base cuneate, margin entire to dentate (always some leaflets dentate), dentations with the tertiary venation arching back before reaching the apex of the tooth, upper surface dark green, lower surface light green, aromatic when crushed; secondary veins 4–7(–9) per side, slightly prominent, visible on both surfaces; terminal leaflets 3.7–11.8 by 0.7–3.3 cm; terminal petiolules (0.2–)0.8–1.4(–2.4) cm long; lateral leaflets 2.9–9 by 0.3–3.1 cm; lateral petiolules (0–)0.2–1(–1.8) cm long; basal leaflets absent (trifoliolate) or 1.3–5 by 0.3–1.4 cm; basal petiolules 0–0.5 cm long. *Inflorescences* terminal, consisting of lateral cymes in dense clusters with persistent flowers; axis 6–20 cm long, smooth; bracteoles linear, up to (0.6–)2.5–5 mm long, patent, persistent, drying black. *Calyx* glands absent to few; tube 0.9–2.1 mm long; lobes 5–10 by 4–10 mm, lobe apex sometimes acuminate but often aristate; flowering calyx 1–1.5 mm diam; fruiting calyx 2–2.5 mm diam, erect, covering most of the mature fruit. *Corolla* white or light purple to blue-violet; glands few or absent; tube 2.6–3.6 mm long; anterior lip orbicular, 1.5–3 by 1.3–2.7 mm, apex rounded, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 1.2–1.5 by 1–2 mm, apex rounded, patent; posterior lip: lobes 1.2–1.5 by 1–1.2 mm, apex rounded, reflected to erect. *Stamens*: filaments 2–3.8 mm long, slightly to strongly didynamous, inserted halfway to lower 1/3 of the corolla tube; anther c. 0.8 mm long. *Ovary* 0.6–0.8 by 0.5–0.7 mm, glabrous; style 1.9–5.6 mm long; stigma lobes 0.4–0.7 mm long. *Fruit* ellipsoid, when dried 1.5–2.7 by 1.1–2.2 mm, apex truncate, glabrous, black when mature.

Distribution — Nepal, Bhutan, China and Vietnam. Reported to be introduced and cultivated in at least Peninsular Malaysia, Singapore, Borneo, Sumatra, Java, the Philippines and possibly in the whole of the Flora Malesiana area.

Habitat & Ecology — Growing in secondary forest (rarely in primary), mixed thickets and along roads and in wastelands, from sea-level up to 3200 m altitude. Flowering: June to April; fruiting: July to November in more temperate regions; reported to be flowering and fruiting throughout the year in the tropics.

Uses — The species is grown for ornamental purposes and in China as a source of fibre. It is used medicinally throughout the region.

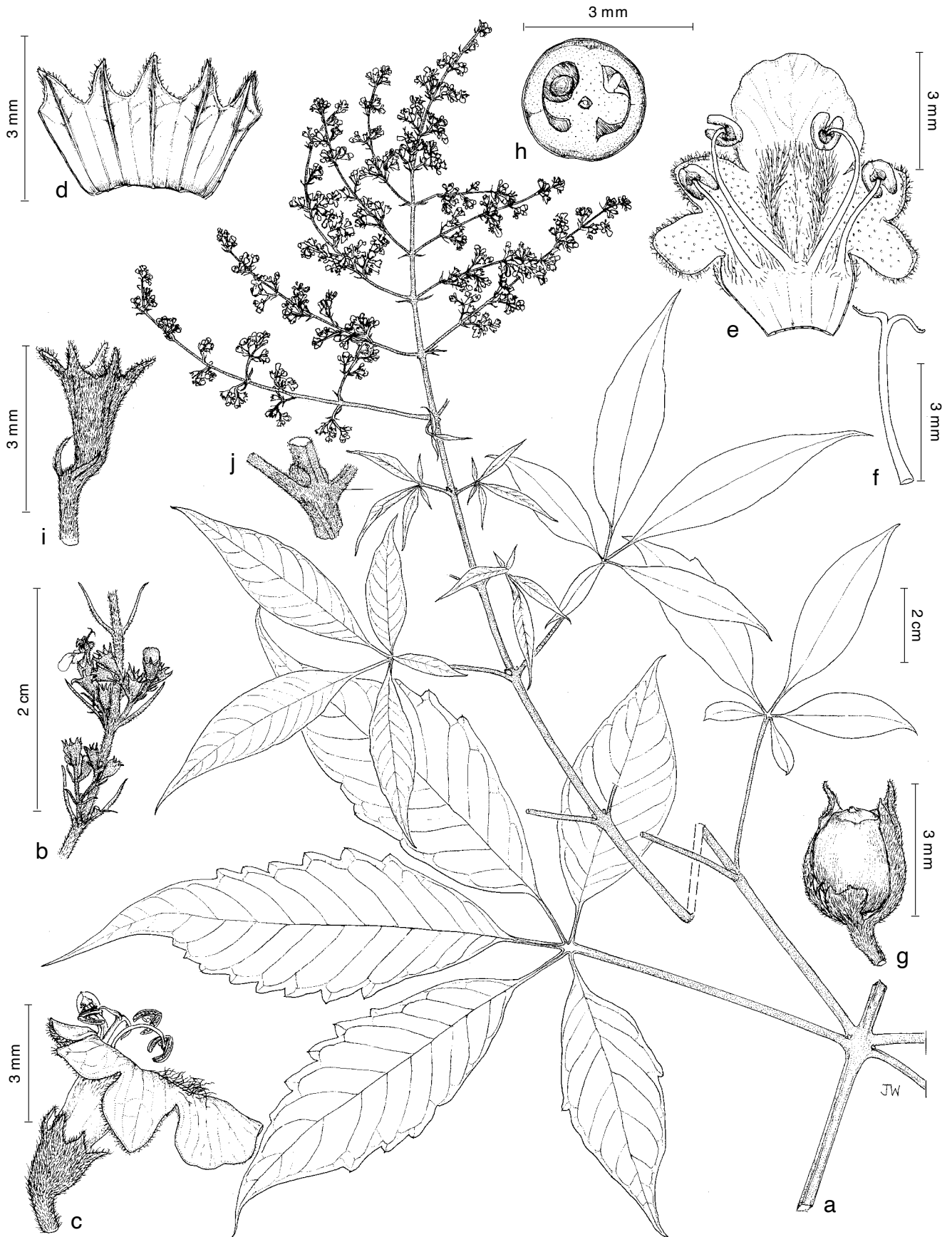


Fig. 11 *Vitex negundo* L. a. Habit; b. part of inflorescence; c. flower, side view; d. calyx open, adaxial; e. corolla open; f. style; g. fruit in calyx; h. fruit in cross-section; i. calyx; j. inflorescence axis in cross-section (a, c, e–f, j: Sengun 31; b, d, g–i: Xiao Bai-Zhong 3849; all K). — Drawing by Juliet Beentje.



Fig. 12 *Vitex negundo* L. a. Habit; b. inflorescence; c. flower (♀ phase); d. infructescence; e. thyrsoid inflorescence; f. serrated leaves; g. serrated leaves; h. entire leaves. — Photos by R. de Kok.

Vernacular names — Five-leaved chaste tree (English); Huang jing, Mu jing, Ni huang jing, Xiao ye jing (China); Lagundi (Philippines); Merbok (Malaysia); Talaun mohou (Malaysia, Sabah).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Notes — 1. Although some specimens on herbarium sheets have entire leaflets, in situ, all plants have some dentate leaflets.

2. The name *V. latifolia* Mill. with as the type the illustration De l'Obel (1591: t. 161) (rather than t. 139 as was mentioned in Miller 1768), is clearly *V. negundo*. The information given in Miller agrees with the De l'Obel t. 161 plate including the text: '*Vitex folio latiore ferrato*'. Plate 139 clearly shows a monocotyledonous herb.

3. The type of *V. spicata* Lour. may not even be extant as many of De Loureiro's specimens did not survive. However, Merrill (1918) states that the 'excellent description applies unmistakably to *V. negundo*'.

7. *Vitex pseudonegundo* (Hausskn. ex Bornm.) Hand.-Mazz. — Fig. 13; Map 7

Vitex pseudonegundo (Hausskn. ex Bornm.) Hand.-Mazz. (1913) 408; C.C.Towns. (1972) 148. — *Vitex agnus-castus* L. var. *pseudonegundo* Hausskn. ex Bornm. (1907) 117. — Lectotype (designated by Townsend 1972): Strauss s.n. (JE [JE00000041]*), Iran, Burujird.

Vitex hausknechtii Bornm. (1907) 118. — Type: *Haussknecht s.n.* (holo JE (not found); iso B [B 10 0365967]), Syria, Marasch, prope Dschilan-Köprü. *Vitex negundo* L. var. *trifoliolata* Moldenke (1973) 432. — Type: *Rechinger 29984* (holo US [US00119275]), (Pakistan,) Sulaiman Mountains, 100 km east of Fort Sandeman, between Mughal Kot and Daraban.

Vitex agnus-castus auct. non L.: Boiss. (1879) 535, p.p.

Shrub or small tree, 1–3 m high, deciduous. *Bark* smooth, grey. *Leaves* 5–7-foliolate; petioles 1–6.1 cm long. *Leaflets*: blades lanceolate, apex acuminate, base cuneate, margin entire, upper surface dull green, lower surface whitish; side veins 11–15 per side, slightly prominent, visible on both surfaces; terminal leaflets 4–12.5 by 0.5–2.7 cm; terminal petiolules 0–1.2 cm long; lateral leaflets 2.5–10.4 by 0.5–2.1 cm; lateral petiolules 0(–0.9) cm long; basal leaflets 1.2–7 by 0.1–2.2 cm; basal

petiolules 0–0.3 cm long. *Inflorescences* terminal, consisting of lateral cymes in dense clusters with persistent flowers; axis 15–25 cm long, smooth; bracteoles ovate to linear, up to 2 mm long, appressed, caducous, drying the same colour as inflorescence. *Calyx* glands many; tube 1.3–2.4 mm long; lobes 0.5–0.7 by 0.5–1 mm, apex acute; flowering calyx 2.8–3.2 mm diam; fruiting calyx 2.7–4.2 mm diam, patent to erect, covering half to most of the mature fruit. *Corolla* pale lilac to blue; glands

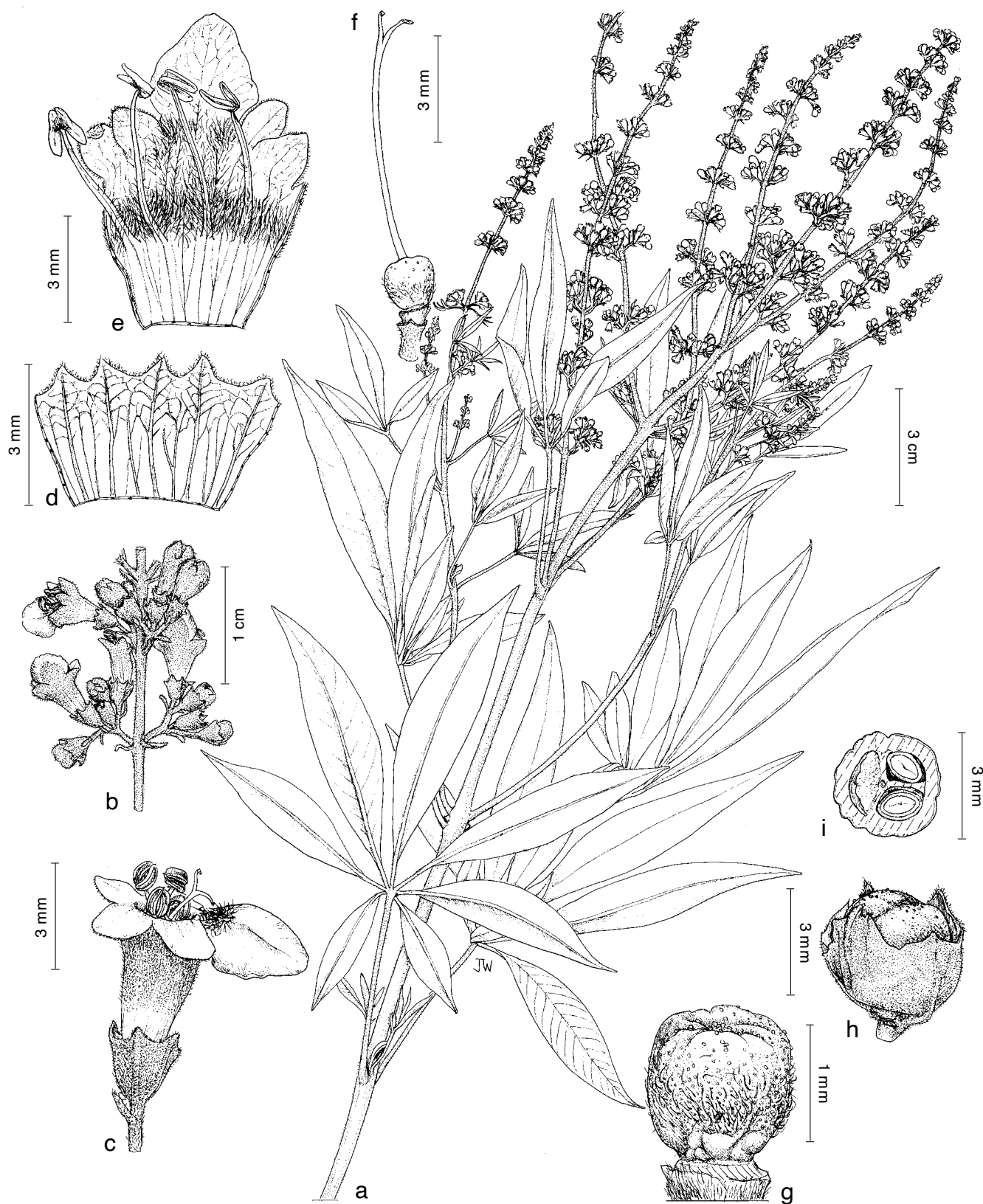
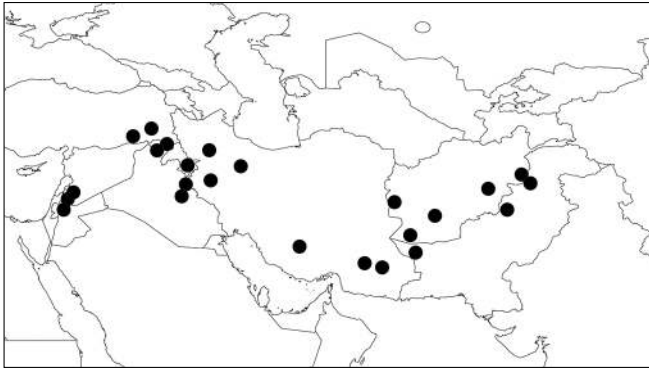


Fig. 13 *Vitex pseudonegundo* (Hausskn. ex Bornm.) Hand.-Mazz. a. Habit; b. inflorescence detail; c. flower, side view; d. calyx open; e. corolla open; f. ovary & style; g. ovary detail; h. fruit side view; i. fruit in cross-section (a: Köle 2090; b–c, h: Andursky 280; d–g: Furse 8226; i: Jones 2; all K). — Drawing by Juliet Beentje.



Map 7 Natural distribution of *Vitex pseudonegundo* (Hausskn. ex Bornm.) Hand.-Mazz.

few; tube 3.3–4.9 mm long; anterior lip spatulate, 2–4.3 by 2.1–4 mm, apex rounded to acute, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 1.3–1.5 by 1.2–1.5 mm, apex rounded, erect; posterior lip lobes 1.3–1.6 by 1.7–1.8 mm, apex acute, erect. *Stamens*: filaments 2.2–5 mm long, slightly didynamous to equal, glabrous to hairy, inserted halfway to lower 1/3 of the corolla tube; anthers c. 1 mm long. *Ovary* c. 1 mm diam, hairy, glands absent to many covering the apex; style 2.7–6.9 mm long; stigma lobes 0.1–0.7 mm long. *Fruit* broadly obovoid to globose, when fresh 3–4 mm diam, dried 2.5–3.1 by 2.3–3 mm, glabrous to few hairs on top, black to reddish when mature.

Distribution — Southeast Turkey, Syria, Israel, Lebanon, Jordan, Iraq, Iran, Afghanistan and Pakistan.

Habitat & Ecology — Along rivers and creeks, in open vegetations. Soil: clay, sandy or gravel, at 5–750 m altitude. Flowering and fruiting: March to September.

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Note — Often confused with *V. agnus-castus*, see notes under this taxon.

8. *Vitex rotundifolia* L.f. — Fig. 14, 15; Map 8

Vitex rotundifolia L.f. (1782) 294; Munir (1987) 52; De Kok et al. (2016) 189; De Kok & Sengun (2019) 413. — Lectotype (designated here): *Thunberg s.n.* (*Hb. Thunb.* 14619) (lecto UPS-THUNB*; isolecto LINN-SM), Japan. *Vitex ovata* Thunb. (1784) 578. — *Vitex trifolia* L. var. *obovata* (Thunb.) Benth. (1870) 67. — *Vitex agnus-castus* L. var. *ovata* (Thunb.) Kuntze

(1891) 511, nom. superfl. — *Vitex trifolia* L. var. *ovata* (Thunb.) Makino (1903) 92, nom. superfl. — Type: *Bladh s.n.* (*Hb. Thunb.* 14618) (holo UPS-THUNB*), China, Macao.

Vitex trifolia L. var. *simplicifolia* Cham. (1832) 107; De Kok (2008) 32. — Type: *Chamisso s.n.* (holo LE n.v.).

Vitex repens Blanco (1837) 513; Merr. (1918) 332. — Neotype (designated by Sengun in De Kok et al. 2016): *Merrill 814* (neo K [K000182650]), Philippines, Luzon, Batangas.

Vitex trifolia L. var. *unifoliata* Schauer (1847) 683. — Lectotype (designated by Sengun in De Kok et al. 2016): *Thunberg s.n.* (lecto UPS [UPS-THUNB 14619]*), Japan.

Vitex trifolia L. var. *repens* Ridl. (1923) 631; Munir (1987) 53. — Lectotype (designated by Sengun in De Kok et al. 2016): *Ridley s.n.* (lecto K; isolecto SING), Malaya, Kelantan.

Vitex rotundifolia L.f. f. *albescens* Hiyama (1948) 56. — Type: *Makino s.n.* (n.v.). Syn. nov.

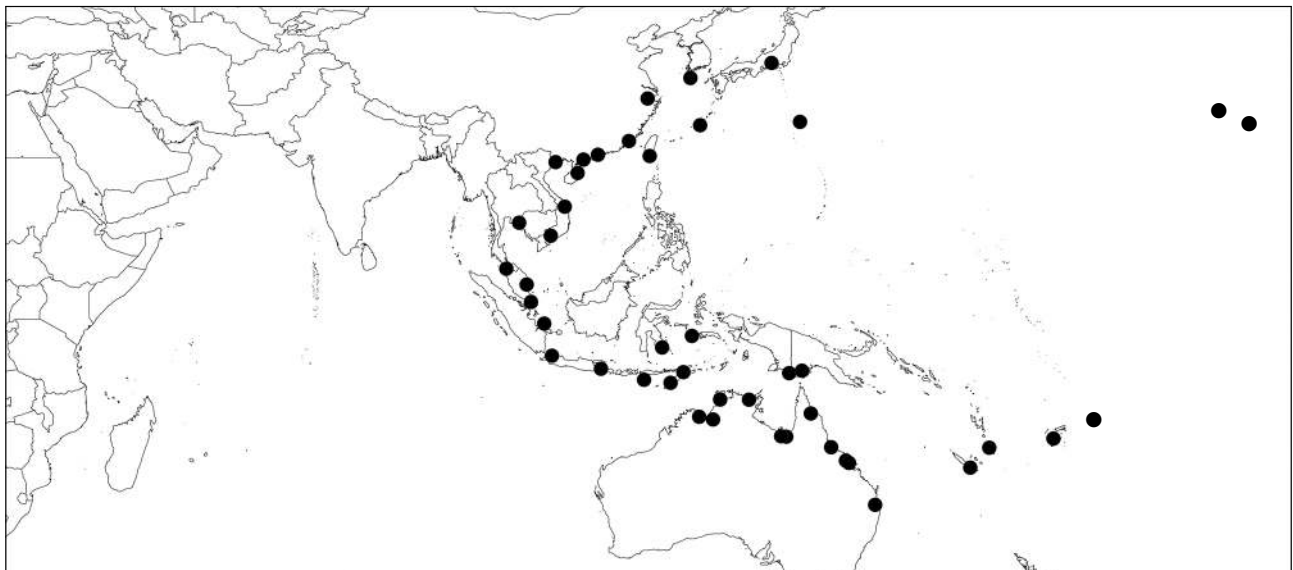
Vitex trifolia L. subsp. *littoralis* Steenis (1957) 516. — Type: *Bloembergen 3894* (holo L [L0003970]; iso BRI [BRI-AQ0430200]*), Lesser Sunda Islands, Kisar, E of Wonorei.

Vitex rotundifolia L.f. f. *rosea* Satomi (1983) 30. — Type: *Satomi s.n.* (holo KANA n.v.), Japan, Honshu, Shuonya, Kaga city, Ishikawa Prefecture. Syn. nov.

[*Vitex rotundifolia* L.f. f. *albiflora* S.S.Ying (1987) 504, nom. inval., type lacking].

Vitex rotundifolia L.f. f. *albiflora* Y.N.Lee in Y.N.Lee & Y.S.Kim (2005) 26. — Type: *Kim You Sung s.n.* (holo Korean Plant Research Institution Seoul n.v.), Korea, Daebudo, Gyeonggi-do.

Prostrate to small erect shrub, 10–60 cm high, sometimes forming dense mats of several meters diam, rooting at stem nodes. *Leaves* 1-foliolate; petioles 3–12 mm long. *Leaflets*: blades round to obovate or obovate-spathulate, apex mostly rounded, sometimes subacute, base cuneate, margin entire, upper surface green, lower surface pale green to grey-green or silvery, aromatic when crushed; secondary veins 4–7(–9) per side, slightly prominent, visible on both surfaces; terminal leaflets 1.4–5.3 by 0.8–3.3 cm. *Inflorescences* terminal and axillary, consisting of lateral cymes in dense clusters with persistent flowers; axis 4–12 cm long, smooth; bracteoles ovate to linear, up to 2 mm long, appressed, usually caducous, drying the same colour as inflorescence. *Calyx* glands few; tube 2.3–4.4 mm long; lobes 2–6 by 3–11 mm, apex acute, rarely acute to acuminate; flowering calyx 3–4 mm diam; fruiting calyx 3.5–4.5 mm diam, erect, covering most of the mature fruit. *Corolla* purplish blue to white; glands many; tube 5.3–8.3 mm long; anterior lip spatulate, 3.9–7 by 3.3–7.4 mm, apex round to truncated, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 3–4.2 by 2–3 mm, apex rounded, reflexed; posterior lip lobes 3–3.5 by 3–3.5 mm, apex



Map 8 Natural distribution of *Vitex rotundifolia* L.f.

acute, reflexed to erect. *Stamens*: filaments 5.2–8.2 mm long, slightly to strongly didynamous, inserted halfway to lower 1/3 of the corolla tube; anthers 1.5–2 mm long. *Ovary* 1–1.5 mm diam, glabrous, glands many, covering the apex; style 9.8–14.6 mm long; stigma lobes 6–13 mm long. *Fruit* globose, when dried 4.4–5.3 by 4.3–5 mm, glabrous, turning first purplish, then black when mature.

Distribution — Widespread from Japan, Korea and China to Australia (from the north of Western Australia to Southern

Queensland) and into the Pacific to Samoa and Fiji. The species is apparently absent from most of the central Pacific, but an isolated population occurs in Hawaii.

Habitat & Ecology — Growing on sandy seashores, coastal dunes and on sandbars along rivers up to 10 km from the coast. Growing just above the high-water mark to 200 m altitude. Flowering and fruiting: June to January.

Uses — Medicinal uses, particularly in Chinese and Japanese medicine systems.

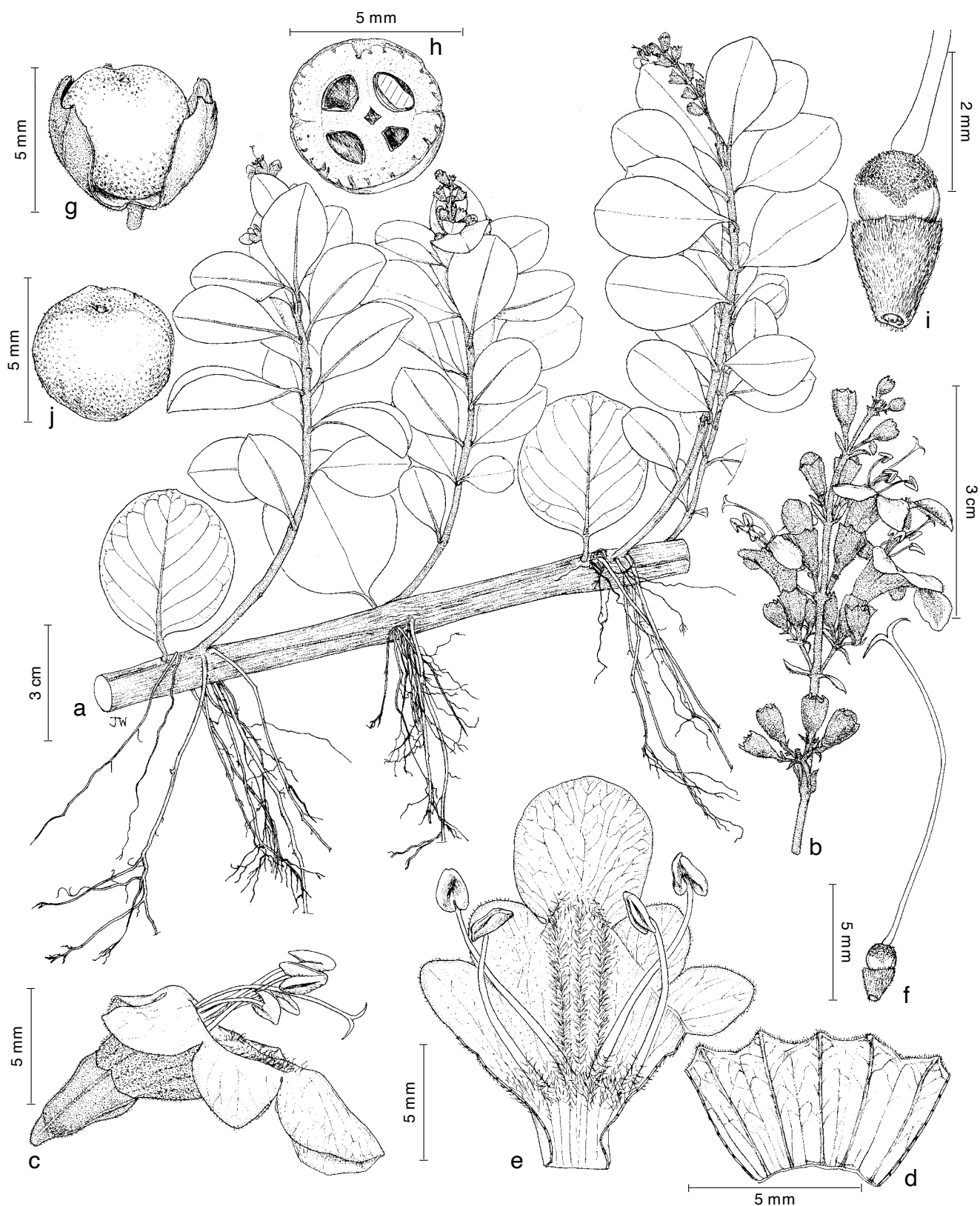


Fig. 14 *Vitex rotundifolia* L.f. a. Habit; b. part of inflorescence; c. flower, side view; d. calyx open, adaxial; e. corolla open; f. ovary & style; g. fruit in calyx; h. fruit in cross-section; i. detail of ovary; j. fruit (a: Corrick 1409; b–f, i: Larsen & Larsen 33723; g–h, j: Sinclair 39805; all K). — Drawing by Juliet Beentje.



Fig. 15 *Vitex rotundifolia* L.f. a. Habitat with first author; b. flower (♂ phase); c. habit and leaves; d. rhizomes with roots; e. inflorescences; f. habit. — Photos by R. de Kok.

Vernacular names — Beach Vitex (English); Dēmuna, Gunong pantai, Lagundi, Lagundi Laud (Malay); Hamago (Japanese); Wora tach (local language in Western Flores, Indonesia).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Notes — 1. The whole plant has a pungent smell despite the flowers being reported to smell as lavender.

2. It can be confused with *V. trifolia*, see notes under this taxon.

3. From Blanco's original description it is clear that *V. repens* is indeed *V. rotundifolia*. However, what Merrill suggested as the

example specimen for *V. repens* (Merrill *Species Blancoanae* 814, Philippines, Luzon, Batangas Province, Bauang Is.), is *V. trifolia*. Therefore, a different specimen, which exhibits all the characteristics of the species, is designated here as the neotype.

4. The type materials of *V. rotundifolia* L.f. f. *albescens* and *V. rotundifolia* L.f. f. *rosea* Satomi were not seen, but from the original descriptions it is clear that they are a flower colour variation within this species and, therefore, they were placed in synonymy.

9. *Vitex trifolia* L. — Fig. 16, 17; Map 9

Vitex trifolia L. (1753) 638 ('trifoliis'), 938; Royle (1836) 299 ('triphylla'); H.J.Lam (1919) 180; Munir (1987) 65; De Kok (2007) 596; De Kok & Sengun (2019) 416. — *Vitex trifolia* L. var. *trifoliolata* Schauer (1847) 683. — *Vitex integerrima* Mill. (1768), nom. superfl. — *Vitex indica* Mill. (1768) in Erratum section, nom. superfl. — *Vitex variifolia* Salisb. (1796) 107, nom. superfl. — *Vitex agnus-castus* L. var. *trifolia* (L.) Kurz (1877) 270; De Kok (2008) 32. — Lectotype (designated by Moldenke & Moldenke 1983: 378): *Herb. Linn.* 811/7 (lecto LINN), India.

Vitex paniculata Lam. (1786) 612. — Type: Rumpf (1743) 50, t. 19.

Vitex trifolia L. var. *acutifolia* Benth. (1870) 67. — Lectotype (designated here): *Brown s.n.* (Bennett 2321) (lecto K; isoelecto BM), (Australia,) Queensland, along the coast from Cape York to Moreton Bay.

Vitex agnus-castus L. var. *subtrisetia* Kuntze (1891) 510. — *Vitex trifolia* L. var. *subtrisetia* (Kuntze) Moldenke (1961) 88; Munir (1987) 71; De Kok (2007) 597. — Type: Kuntze 5817 (holo NY n.v.), (Indonesia,) Java, Willisgebirge.

[*Vitex langundi* W.G.Maxwell (1906) 50, nom. nud.]

Vitex iriomotensis Ohwi (1938) 29. — Type: Koidzumi s.n. (holo KYO n.v.), Japan, Riukiu, Iriomote island.

Vitex trifolia L. var. *variegata* Moldenke (1941) 31. — Type: Busell s.n. (holo BH [BH000 046 020]), (USA,) Florida, Dade County, near Miami. Syn. nov.

Vitex rotundifolia L.f. var. *heterophylla* Makino ex H.Hara (1948) 191; De Kok (2007) 597. — *Vitex trifolia* L. var. *heterophylla* (Makino ex H.Hara) Moldenke (1949) 178. — *Vitex rotundifolia* L.f. f. *heterophylla* (Makino ex H.Hara) Kitam. in Kitam. & Murata (1972) 34. — Type: Makino (1948) pl. 558.



Fig. 16 *Vitex trifolia* L. a. Habit; b. habit; c. inflorescence; d. infructescence; e. attenuate terminal leaflet base (a: *Kunstler* 57; b: *Fung* 20500; c: *Du Puy* Cl. 63; d: *van Borssum Waalkes* 1726; e: *Afriastina* 1222a; all K). — Photos by Seda Sengun.

Vitex trifolia L. var. *subtrisetia* L.f. f. *albiflora* Moldenke (1961) 90; De Kok (2007) 597. — Type: *St. John 16705* (holo UC n.v.; iso K), Austral Islands, Rurutu, Peva.

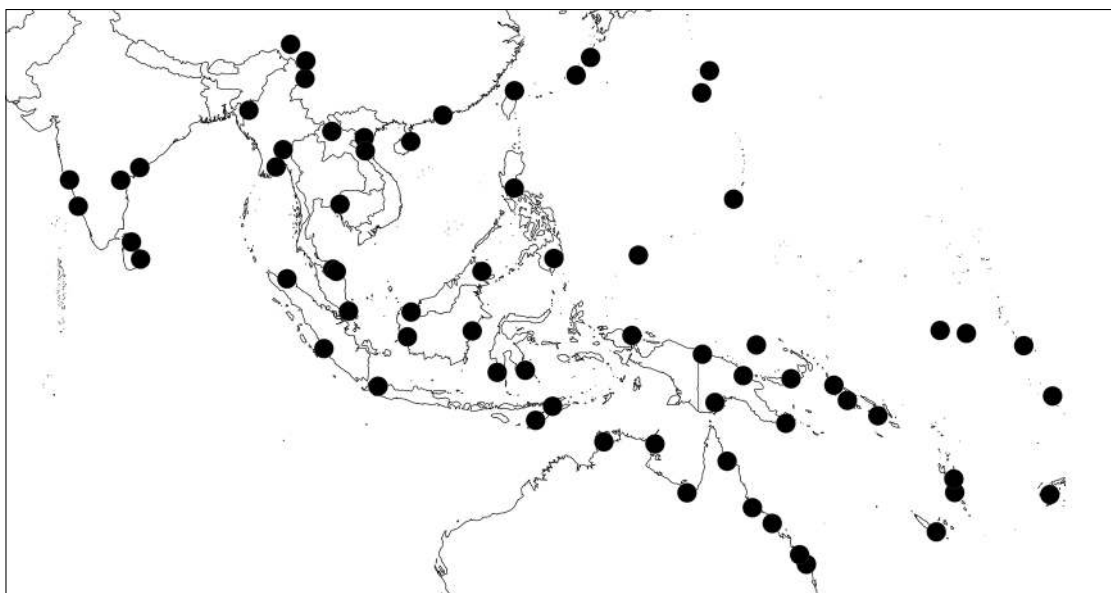
Vitex taihangensis L.B.Guo & A.Q.Zhou (1989) 61. — *Vitex trifolia* L. var. *taihangensis* (L.B.Guo & A.Q.Zhou) S.L.Chen (1991) 58. — Type: *Guo Lan-bin 688* (holo NMFC n.v.), China, Shanxi, Tai Hang Shan. Syn. nov.

Shrub (prostrate on seashore) or small tree, 1–6.5 m high (up to 60 cm when prostrate, then not rooting at nodes). *Bark* smooth to finely fissured, light brown or dark grey. *Leaves* (1- or 3-foliate; petioles 0.4–5.5 cm long. *Leaflets*: terminal blade obovate to oblanceolate in trifoliate leaves, elliptic to lanceolate in unifoliate leaves, apex acute, rarely acuminate, base attenuate in trifoliate leaves, rounded or cuneate in unifoliate leaves, margin entire, upper surface light to dark dull green, lower surface pale

green to silvery/whitish or sometimes purplish, aromatic when bruised; secondary veins 9–14 per side, slightly prominent, visible on both surfaces; terminal leaflets 2.2–9.1 by 1.1–3.1 cm; terminal petiolules 0–0.9 (–1.4) cm long, lateral leaflets 1.4–7.6 by 0.5–2.6 cm, sessile. *Inflorescences* terminal, consisting of lateral cymes in lax clusters with persistent flowers; axis 5.4–18.1 cm long, smooth, sometimes mauve tinged or purple; bracteoles ovate to linear, up to 2 mm long, patent, usually persistent, drying the same colour as the rest of the inflorescence. *Calyx*: glands many; tube 1–2.8 mm long; lobes 2–7 by 3–9 mm, lobe apex acute to acuminate; flowering calyx 2–3 mm diam; fruiting calyx 5–6 mm diam, patent to erect, covering up to most of the mature fruit. *Corolla* pale purplish



Fig. 17 *Vitex trifolia* L. a. Habit (the usual erect form); b. inflorescence; c. flower; d. infructescence; e. habitat and habit (prostrate form on the beach front); f. inflorescence (prostrate plant); g. leaves (prostrate plant). — Photos by R. de Kok.



Map 9 Natural distribution of *Vitex trifolia* L.

to blue, sometimes with sweet smell; glands few; anterior lip spatulate, 2–5.5 by 2.5–5 mm, apex rounded to acute, reflexed, anterior corolla lip with semi-circular area of hairs at the corolla mouth; lateral lobes 2–3 by 2–2.5 mm, apex rounded, erect; posterior lip lobes 1.2–2.2 by 1–2 mm, apex acute, erect; tube 3.1–7 mm long. *Stamens*: filaments 3–5.8 mm long, slightly didynamous to equal, inserted at half to lower 1/3 of the corolla tube; anthers c. 1 mm long. *Ovary* 1–1.5 mm diam, glabrous, apex covered with glands; style 3.6–7 mm long, purple; stigma lobes 0.2–0.7 mm long, acuminate with a whitish appendix at each lobe. *Fruit* broadly obovoid to globose, when dried 2.2–6 by 2.2–6.2 mm, glabrous, purple, turning brown or black as it matures.

Distribution — The species is widespread from India and Sri Lanka to Southern Japan, southeast to the north coast of Australia and into the Pacific to Tahiti. Because of its uses as an ornamental and a medicinal plant, it is also widely cultivated outside its natural distribution area.

Habitat & Ecology — Beaches, inland edge of mangrove swamps, grasslands, littoral forests and in secondary vegetations. Soil: sand or more rarely in clay, often over limestone, coral, volcanic soils or shale, at 0–150(–1500) m altitude. In humid areas the species is usually common at low altitudes, becoming rare higher up. In dryer areas the species can also be common at high elevation. Often a solitary tree but sometimes occurring in thickets. Flowering and fruiting: all year round.

Uses — Various medicinal and horticultural uses.

Vernacular names — Epaskè (local language, South Sumatra), Kajo kemérū (local language, Flores), Kámaling bata (local language, Lesser Sunda Islands), Lamentang, memeongan (Sundanese), O soi (local language, Moluccas, Halmahera Island), Salagundih (Karo language, Sumatra), Tasi (Dawan language, Timor, Indonesia); Kyaung-ban (Burmese); Namulega (local language, Samoa); Nirnochi (Tamil); Mitsuba-hamago, Tachihamago, Yaeyama-hamago (Japanese); Panisamalu (Bengali); Surasa (Sanskrit).

Conservation status — Least concern (LC) as it is common throughout its range and there are no known threats (Sengun 2017).

Notes — 1. *Vitex trifolia* can have a prostrate form on beaches. Then, it can occur together with and look like *V. rotundifolia*, and therefore, the two species can be confused. However, they can be distinguished from each other as *V. rotundifolia* has

only one leaflet and roots at the nodes. *Vitex trifolia* can also be confused with *V. bicolor* or, possibly, *V. benthamiana*; see notes under those species.

2. *Vitex trifolia* L. var. *taihangensis* (L.B.Guo & A.Q.Zhou) S.L.Chen describes a specimen with ‘presence of simple instead of trifoliate leaves’. However, in situ there are no *V. trifolia* plants with only unifoliate leaves. Therefore, this is an ordinary *V. trifolia* specimen, but likely to be cut from a specific part of the plant. Another example of this is shown in Fig. 11b.

DOUBTFUL NAMES

Vitex negundo Noronha (1791) 1, *nom. nud.*

There is no type material associated with this name. It is known to be from Java and its vernacular name is Lagondi-Laut (= Sea-Lagundi) which is a name often ascribed to both *V. rotundifolia* and *V. trifolia*. As it is not possible to know which of these two species is meant, this name remains in doubt.

Vitex agnus-castus L. var. *javanica* Kuntze (1891) 510; De Kok (2008) 32. — Type: *Anonymous s.n.* (n.v.), (Indonesia,) Java, Plabuan.

The original description reads: 3–5 leaflets, petiolulate. This could be either *V. bicolor* or an introduced and naturalised *V. negundo*.

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IDENTIFICATION LIST OF SPECIMENS

- | | | |
|----------------------------------|--------------------------------|--|
| 1 = <i>Vitex agnus-castus</i> L. | 4 = <i>V. collium</i> Sengun | 7 = <i>V. pseudonegundo</i> (Haukskn. ex Bornm.) Hand.-Mazz. |
| 2 = <i>V. benthamiana</i> Domin | 5 = <i>V. hybrida</i> Moldenke | 8 = <i>V. rotundifolia</i> L.f. |
| 3 = <i>V. bicolor</i> Willd. | 6 = <i>V. negundo</i> L. | 9 = <i>V. trifolia</i> L. |
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