

PRECURSOR TO A TAXONOMIC REVISION OF CEYLON DIPTEROCARPACEAE

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SUMMARY

The taxonomy of the largely endemic dipterocarp flora of Ceylon is brought into line with that of the rest of the Asiatic subfamily, and a new species is described.

Stemonoporus lewisianus Trimen ex Hook. f. finds its correct place at last in *Cotylelobium*. *Balanocarpus brevipetiolaris* (Thw.) Alston is transferred to *Hopea*. *Shorea pallescens* Ashton (sect., subsect., *Shoreae*) is described for the first time. *Shorea stipularis* Thw. is ascribed to sect. *Anthoshorea* Heim. *Doona* Thw. is reduced, as a separate section, to *Shorea* Roxb. ex Gaertn. f., necessitating 7 new combinations and 3 new names. *Doona oblonga* Thw. is united with *Doona disticha* (Thw.) Pierre under the name *Shorea disticha* (Thw.) Ashton. *Doona nervosa* Thw. is reduced to *Doona cordifolia* Thw., now named *Shorea cordifolia* Ashton. The description of the genus *Stemonoporus* is amplified; a key is provided to all species. *Stemonoporus acuminatus* (Thw.) Bedd. is further defined. *Stemonoporus nervosus* Thw. is reduced to *Stemonoporus lancifolius* (Thw.) Ashton. *Shorea reticulata* Thw. and *Stemonoporus moonii* Thw. (= *Vateria moonii* Thw.) are excluded from the family.

INTRODUCTION

Of the 45 dipterocarp species found in Ceylon, all but one are endemic; of the 7 genera found on the island one is endemic, another confined to Ceylon, southern India, and the Seychelles. Apart from Alston's notes (Supplement to A Handbook to the Flora of Ceylon, 1931, 22—27), in which the formerly endemic genus *Monoporandra* Thw. is reduced to the remaining endemic *Stemonoporus* Thw. and four other name changes are made, and a note on *Shorea lissophylla* Thw. by Livera (Ann. Perad. 9, 1924, 93), no other taxonomic revision has followed the publication of Trimen's 1893 Handbook; in this the dipterocarps are treated in Volume 1: 112—138, with corrections and additions in Volume 5: 383—384 largely as a result of Brandis' monograph of the family (J. Linn. Soc. Bot. 31, 1895, 1—148). That monograph remains to this day the only one to appear.

Since that time major changes have taken place in our understanding of the genera within Brandis' tribe *Shoreae*: in particular the absence of aliform fruit sepals is not now considered a reliable indicator of phyletic affinities; and of the genera based on this character *Balanocarpus* Bedd. and *Isoptera* Scheff., now reduced to *Hopea* Roxb. and *Shorea* Roxb. ex Gaertn. f. respectively, were both recognised from Ceylon (see Ashton, Gard. Bull. Sing. 20, 1963, 256—257, 261—264 for a fuller discussion). Further, the genus *Shorea* is now considered as a larger entity including 10 more or less well-defined sections, based on characters of the flowers and particularly the stamens, though often also with characteristic wood and bark anatomy, and sometimes leaf morphology (defined in Ashton, id.: 265—271). By these criteria, the only diagnostic characters by which *Doona* Thw. is defined, and which are entirely characters of the stamens, do not exclude it from the

present generic definition of *Shorea*, though they maintain it as a distinct section endemic to Ceylon.

These notes form a precursor to my revision of the family for the new Flora of Ceylon being undertaken by the Smithsonian Institution of Washington. I wish to thank Dr. F. R. Fosberg, co-ordinator of the project, for sanctioning the funds for me to visit Ceylon for three months in 1970, where I was able to rediscover all but two of these rarely collected trees and to work in the herbarium of the Royal Botanic Gardens, Peradeniya, with the material from which the original descriptions were prepared. I also wish to thank Mr. T. B. Worthington of Kandy for providing facilities for me to work in his remarkable herbarium with its magnificent dipterocarp collection, and the Directors of the National Botanic Gardens at Brussels and the Royal Botanic Gardens, Kew, for allowing me to examine their Ceylon material.

KEY TO THE CEYLON GENERA

1. Base of the calyx fused into a tube at least half enclosing the nut; 2 calyx lobes prolonged and aliform; leaves plicately folded in bud; stipules amplexicaul **Dipterocarpus**
1. Base of calyx not united into a tube; leaves not plicate in bud; stipules not amplexicaul.
 2. Fruit sepals imbricate, with a thickened saccate base appressed to the nut.
 3. Fruit with 3 aliform sepals, or all short and flower with more than 20 stamens . . . **Shorea**
 3. Fruit with 2 aliform sepals, or all short and flower with 15 stamens **Hopea**
 2. Fruit sepals valvate, without thickened base.
 4. Anthers end-porous. **Stemonoporus**
 4. Anthers latrorse.
 5. Anthers broadly oblong; stigma prominently conical **Vatica**
 5. Anthers linear; stigma obscure.
 6. Stamens c. 50, anthers prolonged apically into a recurved awn **Vateria**
 6. Stamens less than 30; anthers not as above **Cotylelobium**

COTYLELOBIUM Pierre

KEY TO CEYLON SPECIES

1. Fruit sepals equal, shorter than the nut, becoming reflexed at maturity; lamina undersurface densely pale ochereous puberulent; main nerves c. 10 pairs, hardly raised below **C. lewisianum**
1. Fruit sepals unequal, erect, 2 long, oblong to spatulate and 3 short, more or less ovate; lamina undersurface sparsely puberulent; nerves c. 20 pairs, distinctly raised. **C. scabriusculum**

Cotylelobium lewisianum (Trim. ex Hook. f.) Ashton, *comb. nov.* — *Stemonoporus lewisianus* Trimen ex Hook. f., *Handb. Fl. Ceylon* 5 (1900) 383; Lewis, *Trees and Fl. Pl. of W. and Sab. Prov.* (1902) 37. — *Vatica lewisiana* Livera, *Ann. Perad.* 9(1924)97. — *Vateria? lewisiana* Alston, *Handb. Fl. Ceylon, Suppl.* (1931) 25. — Lectotype: *Lewis s.n.*, —4—1893 (PDA).

Large unbuttressed tree, —35 m tall, —4 m girth, with irregular open crown pale yellow from below; bark surface pale-grey, becoming irregularly flaky. Twigs, buds, petioles, midrib below, inflorescences, and parts of perianth exposed in bud densely buff puberulent; ovary and nut fulvously so; base of style villous; lamina undersurface pale buff cinereous. *Leaf buds* minute, ovoid, acute. *Twig* c. 2 mm diam. apically, slender, smooth, terete. *Lamina* 4—12.5 × 2—6.5 cm, ovate to lanceolate, coriaceous, with broadly cuneate to obtuse base and —6 mm long, slender, tapering acumen; nerves c. 8—10 pairs, unraised above, obscurely elevated beneath. *Petiole* 8—11 mm long. *Panicle* —10 cm long, —2 mm diam. at base in fruit, terminal or axillary, rigid, with —2 cm long cymose branches bearing —5 flowers. *Flower buds* —8 × 4 mm; staminal appendage almost $\frac{1}{2}$ as long as

abaxial anther cells, anthers glabrous, flowers otherwise typical. *Fruit* pedicel —8 mm long, slender; nut (immature?) *c.* 6 × 6 mm, globose, verruculose, subtended by —4 × 2 mm, subequal, deltoid, reflexed sepals. *Sapling* lamina —20 × 7 cm, with subcordate base, —2 cm long acumen, and —18 pairs of nerves; petiole —2 cm long.

CEYLON. Hunawal Kande, near Pelmadulla, *Lewis s.n.*, Jan. 1893 (PDA, K), *Lewis s.n.*, Apr. 1893 (PDA); Kiribatgalle, near Katawatte, *Livera s.n.*, *Ashton 2116, 2117* (PDA).

The previous incorrect placing of this species was partially because undue emphasis was placed on the value of characters of the fruit calyx, and partially because the number of stamens was miscounted as 25 in the original description.

HOPEA Roxb.

The type section and subsection is the only one representel in Ceylon.

KEY TO CEYLON SPECIES

1. Fruit sepals not accrescent in fruit, shorter than the nut; intercostals reticulate **H. brevipetiolaris**
1. 2 fruit sepals accrescent in fruit, aliform.
 2. Lamina base cordate or peltate; intercostals reticulate. **H. cordifolia**
 2. Lamina base cuneate, intercostals scalariform.
 3. Nerves at least 5 pairs; lamina undersurface coppery lepidote. **H. discolor**
 3. Nerves 3 or pairs; lamina undersurface glabrous. **H. jucunda**

Hopea brevipetiolaris (Thw.) Ashton, *comb. nov.* — *Shorea brevipetiolaris* Thw., in Trimen, *J. Bot.* 23 (1885) 205; Worthington, *Ceylon Trees* (1959) 69. — *Balanocarpus ? zeylanicus* Trim., *J. Bot.* 27 (1889) 161, *nom. illeg.*; *Handb. Fl. Ceylon* 1 (1893) 130. — *Balanocarpus brevipetiolaris* Alston, *Suppl.* (1931) 26. — Type: *CP 4008*.

Young parts densely buff puberulent, fugaceous except on panicles and fruit. *Twigs* *c.* 1—2 mm diam. apically, slender. *Leaf bud* minute. *Lamina* 5—14 × 3—7 cm, coriaceous, lustrous, drying tawny-brown, with subequal obtuse to typically cordate base and —3 cm. long slender acumen; nerves 5—7 pairs, slender, arched, somewhat sinuate and frequently bifurcating apically, slender but prominent beneath, obscurely depressed above; intercostals reticulate, more or less obscure; midrib prominent beneath, evident but shallowly depressed above; petiole 4—13 mm long, *c.* 2 mm diam., typically short. *Panicles* —18 cm long, *c.* 1 mm diam. at base, slender, terminal or axillary, singly branched, spreading, the branches —5 cm long bearing —8 small pale yellow flowers. *Flower buds* —3 × 3 mm, ovoid; sepals subequal, broadly ovate, subacute; corolla at anthesis —6 mm diam., petals oblong-ovate; stamens 10 or 15 (on the same plant), anthers subglobose, connectival appendage slender, as long as the anther; ovary ovoid-conical, tapering into the short style. *Fruit pedicel* —3 mm long, slender; fruit —13 × 10 mm, ovoid, apiculate, subtended by —6 × 5 mm subequal, elliptic, obtuse sepals. *Sapling* twigs and petiole densely persistently buff pubescent; lamina somewhat bullate between the nerves; petiole as short as 2 mm, stout.

CEYLON. Doluwe Kande, *C.P. 4008* (PDA, K), *s.n.*, Sept. 1888 (PDA), *Ashton 2053*; Royal Botanic Gardens, Peradeniya, *de Silva s.n.*, 26—8—18 (PDA), *s.n.*, April 1884 (K), *de Silva 49, 51* (PDA), *s.n.*, Jan. 1888 (PDA), *Livera s.n.*, June 1923 (PDA), *Worthington 6821, Ashton 2105*, (cultivated).

The type is from a young plant, hence Trimen's caution in identifying it with material collected later, presumably by himself. The name *Balanocarpus zeylanicus* was coined by Trimen when he transferred the species from *Shorea*, presumably on the basis of the

unnumbered fruiting material collected in 1888, in the Peradeniya herbarium. The new combination is necessitated by Bole's (Kew Bull. 1951, 146) correct reduction of the genus *Balanocarpus* Bedd. to *Hopea*.

SHOREA Roxb. ex Gaertn. f.

KEY TO CEYLON SPECIES

1. Petals falling separately; stamens at least 20; connectival appendage setose; style shorter than ovary; inner bark not laminated; flushes of young leaves pale green Section, Subsection *Shoreae*
2. Fruit sepals subequal, shorter than fruit *S. lissophylla*
2. Fruit sepals unequal, aliform, exceeding fruit.
 3. Lamina white lepidote beneath, with minute pore-like domatia *S. pallescens*
 3. Lamina lustrous beneath.
 4. Lamina oblong-ovate, with cordate base and prominent nerves below *S. oblongifolia*
 4. Lamina lanceolate, with broadly cuneate to obtuse base and very slender nerves hardly raised below *S. dyeri*
1. Petals falling in a loose rosette; stamens 15; connectival appendage glabrous; style and stylopodium columnar, at least twice as long as ovary; flushes of young leaves red to violet; inner bark more or less distinctly laminated.
 5. Connectival appendage acicular, at least thrice as long as anthers; corolla prominently imbricate and contorted, urceolate at base; stipules large, subpersistent. Section *Anthoshoreae*: *S. stipularis*
 5. Connectival appendage clavate, shorter than anther; corolla hardly imbricate or contorted, base not urceolate; stipules fugaceous in mature trees. Section *Doonae*
 6. Midrib in mature tree raised above *S. cordifolia*
 6. Midrib in mature trees obscure, depressed above.
 7. Leaf margin prominently revolute at base.
 8. Lamina ovate, with obtuse to cordate base (if unrolled) and tapering acumen; nerves with single short intercalated veins intercostals scalariform; twigs ascending *S. gardneri*
 8. Lamina lanceolate, with cuneate base (if unrolled) and slender caudate acumen; nerves with 1 long and 2 short intercalated veins between each pair; intercostals reticulate, twigs pendent *S. zeylanica*
 7. Leaf margin, if revolute, not more so at the base than elsewhere.
 9. Lamina lanceolate; nerves very slender, with many intercalated veins the longer ones of which almost equal to nerves; intercostals subreticulate *S. affinis*
 9. Lamina ovate to elliptic; nerves, if slender, with not more than 3 short intercalated veins between each pair; intercostals scalariform.
 10. Lamina chartaceous, broadly ovate, caudate *S. ovalifolia*
 10. Lamina more or less coriaceous, not caudate.
 11. Lamina distinctly trapeziform, with very slender but distinctly elevated nerves and the intercalated veins almost equally elevated on both surfaces; midrib below slender but sharply ribbed; sapling petiole and twigs prominently pubescent. *S. trapezifolia*
 11. Lamina elliptic-oblong, nerves not as above; midrib stout, more or less terete, not sharp below; saplings glabrous.
 12. Mature tree lamina exceeding 12 × 5.5 cm *S. megistophylla*
 12. Mature lamina—11 × 4.5 cm.
 13. Young twigs and inflorescences persistently golden pubescent *S. disticha*
 13. Young twigs and inflorescences glabrescent.
 14. Leaf drying coppery brown; inner bark pale brown *S. worthingtonii*
 14. Leaf drying purplish brown; inner bark meat red *S. congestiflora*

Section *Shorea*

Subsection *Shoreae*

Shorea pallescens Ashton, *spec. nov.* — Typus: *Worthington 4869* (K; dupl. in L, US).
S. dealbata Alston, *nomen in herb., non* Foxw.; de Rosayro, Ceylon Forester 1, 2(1953)80.
 Ramuli laminae subtus petiolique alutaceo-lepidoti; gemmae stipulae paniculae fructus-

que conferte persistente pallide badio-puberulentes; lobi calycis basim versus conferte, apices versus sparsim eidem. *Ramuli* apices versus c. 1 mm. diam. graciles ramosi leves fusco-brunnescentes. *Gemma* c. 4×2 mm. lanceolato-falcata acuta. *Lamina* 7—13 \times 3.4—8 cm. ovato-falcata coriacea basi late cuneata subaequali apice —1.3 cm. longum angustum attenuata; costis lateralibus utrinsecus 8 vel 9 subtus angusti vix elevatis supra applanatis domatiis axillaribus minutis foraminiferis ornatis; intercostis conferte scalariformibus applanatis costa media 90° exorientibus; costa media gracili nihilominus utrinsecus elevata. *Petiolus* 15—20 mm. longus gracilis sicco niger. *Paniculae floresque* ignoti. *Pedicellus* in fructu c. 1 mm. longus brevis. Lobi calycis in fructu longiores 3, —7 \times 2 cm. spatulati obtusi basim versus —6 mm. lati attenuati partibus basalibus —12 \times 8 mm. ovatis saccatis incrassatis; lobi breviores 2, —4 \times 0.4 cm. lorati acuti basim versus ut in lobis longioribus. *Nux* —15 \times 10 mm. ovoidea stylopodia praestanti attenuata.

Note. The wood, bark, and leaf characters serve at once to place this species in the type section and subsection. The pale lepidote lamina undersurface distinguishes it from other Ceylon species; its affinities appear to be with *S. domatiosa* Ashton of Borneo and *S. astylosa* Foxw. of the Philippines, though this cannot be confirmed until flowers are collected. The species is represented by a magnificent tree, E.321, in the Royal Botanic Gardens at Peradeniya, which well shows the unusual (for this section) closely square-section fissured purplish brown bark.

CEYLON. Royal Botanic Gardens, Peradeniya, *Worthington 4869*, de *Silva 88* (PDA), cultivated; Tetugalla Kande, Kegalla, *Ferguson s.n.* (PDA); Mondeleta Kanda, de *Silva 254* (PDA); Ingiriya forest, near Labugama, *Broun s.n.* (PDA); Bambarabotuwe Forest Reserve, *Ashton 2012*; Kanneliya Forest Reserve, *Ashton 2047*; Yagirella Forest Reserve, *Ashton 2099*; Indikada Mukalana, Wagga, *Worthington 3548*.

A further collection, Kutapitiya jungle, Pelmadulla, *Worthington 6444*, has the leaf shape of *S. oblongifolia* and could be a hybrid.

Section Anthoshoreae

Heim, Rech. Dipt. (1892)41; Ashton, Gard. Bull. Sing. 20(1963)268.

Shorea stipularis Thw., Enum. Pl. Zeylan. (1858)36; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)307; Thw. in Trim., J. Bot. 23(1875)205; Trimen, Handb. Fl. Ceylon 1(1893)118; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)29; Alston, Suppl. (1931)23; Worthington, Ceylon Trees (1959)53. — Type: C.P. 3408.

CEYLON. Cassewitha Kanda, Sinha Raja forest, C. P. 3408 (PDA, K); Royal Botanic Gardens, Peradeniya, de *Silva s.n.*, 20-3-29 (PDA), *Worthington 4409*, cultivated; Uluwindawa F. R., *Worthington 3658*, 3704, 3705; Naunkita Ella, Kanneliya Forest Reserve, *Worthington 3674*; near Anningkande, Morowe Korale, *s.n.*, March 1881 (PDA); Tutta Weraluwa Kothe, *s.n.* 27-3-1919 (PDA); below Capt. Bayley's Estate, Morowaka, C. P. 3987 (PDA, K); Bambarabotuwe Forest Reserve, *Ashton 2011*; Sinha Raja forest at Veddagalla, *Ashton 2030*; Sinha Raja forest at Nellowe, Hiniduma, *Ashton 2084*; Malariyana Reserve, de *Silva 1344*; Kanneliya Forest Reserve, *Forest Dept. 1195*.

Note. *Worthington 4409* possesses fallen corollae with attached stamens, thus confirming the section to which this species belongs; this section is thus recorded from Ceylon for the first time.

NEW COMBINATIONS IN SHOREA, SECT. DOONAE

1. *Shorea affinis* (Thw.) Ashton, *comb. nov.* — *Doona affinis* Thw., Enum. Pl. Zeylan. (1858)35; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)311; Trimen, Handb. Fl. Ceylon 1(1893)120. — Lectotype: C.P. 3409 (PDA).

2. *Shorea congestiflora* (Thw.) Ashton, *comb. nov.* — *Doona congestiflora* Thw., Enum. Pl. Zeylan. (1858)35; Dyer in Hook. *f.*, Fl. Brit. Ind. 1(1872)313; Trimen, Handb. Fl. Ceylon 1(1893)123; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)32; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)54. — Type: C.P. 3411.

3. *Shorea disticha* (Thw.) Ashton, *comb. nov.* — *Vateria disticha* Thw., Enum. Pl. Zeylan. (1864)404. — *Vatica disticha* A.DC., Prod. 16(1868)620; Dyer in Hook. *f.*, Fl. Brit. Ind. 1(1872)303. — *Sunaptea disticha* Trim., Syst. Cat. Ceyl. Pl. (1885)9; Handb. Fl. Ceylon 1(1893)127; 5(1900)383. — *Doona disticha* Pierre, Fl. For. Cochinch. fasc. 15(1890) t. 237. — Type: C.P. 3707.

Doona oblonga Thw. in Trim., J. Bot. 23(1885)206; Handb. Fl. Ceylon 1(1893)123; Alston, Suppl. (1931)24. — Type: C.P. 3986.

CEYLON. loc. incert., C. P. 3986 (K, PDA); Lanegal Kande, C.P. 3707 (K, PDA); Kanneliya Forest Reserve, Ashton 2090.

N o t e s. The sterile type of *Vateria disticha* is undoubtedly to be associated with C.P. 3986 (with fruit), the type of *Doona oblonga*, as the dense, short, subpersistent, ochereous, velvinate indumentum is unique among Ceylon dipterocarps.

Trimen (1893) described the young, expanding, stipulate shoots of C.P. 3707 as panicles. This species is imperfectly known and, especially when mature, is difficult to distinguish from *S. worthingtonii*, differing principally from it in the compressed tomentose twig. The C.P. numbers of these two species differ greatly for the type of *S. worthingtonii* possesses foliage typical of immature trees.

4. *Shorea cordifolia* (Thw.) Ashton, *comb. nov.* — *Doona cordifolia* Thw., Enum. Pl. Zeylan. (1858)35; Dyer in Hook. *f.*, Fl. Brit. Ind. 1(1872)313; Trimen, Handb. Fl. Ceylon 1(1893)144; Alston, Suppl. (1931)24. — Type: C.P. 3340.

Doona nervosa Thw., loc. cit.; Dyer, id: 311; Trimen, id.: 121; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)31; Alston, loc. cit.; Worthington, Ceylon Trees (1959)57. — Type: C.P. 3410.

N o t e s. One sheet of the type of *Doona nervosa* at Peradeniya has 3 twigs, one of which represents *S. worthingtonii*. The type of *Doona cordifolia* is a galled sapling of this species; that name was confused by Trimen and Lewis with *S. dyeri*. The collection of Walker cited by Trimen under *D. nervosa* belongs to *S. affinis*.

The name *Shorea nervosa* is preoccupied by *Shorea nervosa* Kurz, For. Fl. Brit. Burma 1(1877)119, a synonym of *Anisoptera oblonga* Dyer.

5. *Shorea gardneri* (Thw.) Ashton, *comb. nov.* — *Doona gardneri* Thw., Enum. Pl. Zeylan. (1858)35; Dyer in Hook. *f.*, Fl. Brit. Ind. 1(1872)313; Trimen, Handb. Fl. Ceylon 1(1893)121; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)30; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)55. — Type: C.P. 1919.

6. *Shorea megistophylla* Ashton, *nom. nov.* — *Doona macrophylla* Thw., Enum. Pl. Zeylan. (1864)402; Dyer in Hook. *f.*, Fl. Brit. Ind. 1(1872)313; Trimen, Handb. Fl. Ceylon 1(1893)124; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)32; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)56. — Type: C.P. 3713.

N o t e. The name *Shorea macrophylla* is preoccupied by *S. macrophylla* (De Vr.) Ashton of Borneo.

7. *Shorea ovalifolia* (Thw.) Ashton, *comb. nov.* — *Doona ovalifolia* Thw., Enum. Pl. Zeylan. (1864)404; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)313; Trimen, Handb. Fl. Ceylon 1(1893)123; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)32; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)59. — Type: C.P. 3711.

8. *Shorea trapezifolia* (Thw.) Ashton, *comb. nov.* — *Doona trapezifolia* Thw., Enum. Pl. Zeylan. (1858)35; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)311; Trimen, Handb. Fl. Ceylon 1(1893)121; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)31; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)60. — Type: C.P. 3341.

9. *Shorea worthingtonii* Ashton, *nom. nov.* — *Doona venulosa* Thw., Enum. Pl. Zeylan. (1864) 402; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)123; Trimen, Handb. Fl. Ceylon 1(1893)123; Alston, Suppl. (1931)24; Worthington, Ceylon Trees (1959)61. — Type: C.P. 3675.

Note. The combination *Shorea venulosa* is preoccupied by *S. venulosa* Meijer, Acta Bot. Neerl. 12(1963)342.

10. *Shorea zeylanica* (Thw.) Ashton, *comb. nov.* — *Doona zeylanica* Thw., Hook. J. Bot. 4(1852)7; Enum. Pl. Zeylan. (1858)34; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)311; Trimen, Handb. Fl. Ceylon 1(1893)119; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902)30; Alston, Suppl. (1931)23; Worthington, Ceylon Trees (1959)62. — Type: C.P. 2423.

EXCLUDED SPECIES

Shorea reticulata Thw. in Hook. f., Fl. Brit. Ind. (1872)307. — Type: C.P. 3884, Morowak Korale, Sept. 1865 (PDA).

This, the only specimen, consists of the fallen fruit of a species of *Shorea* in the type section, possibly *S. dyeri*, that are unidentifiable, and a sterile leafy twig which does not belong to this family and which I am unable to identify.

STEMONOPORUS

Thwaites, Hook. J. Bot. 6(1854)67. — Lectotype: *S. gardneri* Thw.

Monoporandra Thw., id.: 69.

Vesquella Heim, Rech. Dipt. (1892)90.

Sunapteopsis Heim, id.: 92.

Kunckelia Heim, id.: 92.

Small understorey, or main canopy, trees with smooth bark surface, no buttresses, and clear resin; habit and crown variable; inner bark pale brown; wood pale yellow, even grained, hard. Young parts typically densely puberulent. Twigs smooth, with very small obscure stipule scars. Buds small, obtuse, typically depressed within the twig apex; lateral buds more or less supra-axillary, apical buds borne on a more or less prominent prolongation of the axis above the first leaf. Stipules minute, linear, fugaceous. Leaves spiral, usually elliptic to oblong, very variable, with reticulate intercostals (excl. *S. cordifolius*) and prominent geniculate petiole. Flowers in subterminal axillary racemes or panicles, or inflorescence more or less ramiflorous and reduced to a shortly pedunculate subcymose cluster or single flower. Flowers pale or dark lime yellow, or white with chrome yellow anthers, nodding, with patent perianth exposing the stamina closely appressed in a cone round the style; sepals imbricate, lanceolate, acuminate or acute; petals oblong, falling in a connate ring leaving the stamens attached to the receptacle; stamens 5 and equal or 10

or 15 and more or less unequal; filaments very short; anthers linear, tapering, the outer pair longer than the inner pair, end-porous, completely concealing the style; appendage shorter than, or only slightly exceeding, apex of outer anthers; ovary ovoid, dense pubescent, small, without stylopodium; style 2—3 times length of ovary, with obscure stigma. *Fruit* sepals short, equal, patent or reflexed; nut globose to ovoid, pale brown verrucose, with thick corky fibrous pericarp and distinct loculicidal sutures; germination hypogeal, the plumule becoming freed by elongation of the cotyledonary petioles; cotyledons subequal, ruminant, fleshy, reddish, eventually expanding and abscising while the first 2 pairs of opposite true leaves are opening.
 Endemic: 15 species.

Note. This genus started life hesitantly, for Thwaites himself reduced it again in his *Enumeratio Plantarum Zeylanicae* of 1864 to *Vateria*, in which genus the earliest described species, *S. ceylanicus*, had originally been placed by Wight. The same had happened to his genus *Monoporandra*, differing from *Stemonoporus* in having 5 stamens, the anthers of which were said to terminate in a large pore, and in the 2-celled ovary. Trimen (*Handbook to the Flora of Ceylon* 1, 1893) resurrected the two genera, while Alston (*Handbook Supplement* 1931) reduced *Monoporandra* to *Stemonoporus*, which he continued to maintain. I accept Alston's generic delimitations, and include here an amplified generic description. *Vateria*, with its many stamens and linear latrose anthers the abaxial cells of which are pronouncedly awned, comes closer to *Cotylelobium* and should remain distinct. *Monoporandra*, however, differs consistently only in the number of stamens, a character which is not considered of importance in indicating generic differences in this family and which varies greatly within most genera. The large terminal pore referred to by Trimen and Thwaites is a mystery, for there is no appreciable difference between those of *Monoporandra* and *Stemonoporus*; further, the ovary is not consistently 2-celled in *Monoporandra*. *Stemonoporus* as at present recognised is characterised not only by its distinct anthers, but by the unique supra-axillary leaf buds as well as by wood anatomy.

KEY TO THE SPECIES

- 1. Stamens 5.
 - 2. Nerves prominent below, shallowly depressed above; intercostals very slender, densely scalariform; midrib obscurely depressed above **S. cordifolius**
 - 2. Nerves very slender and hardly more elevated than the reticulate intercostals on either surface; midrib evident and elevated above **S. elegans**
- 1. Stamens (10—)15.
 - 3. Flowering inflorescence exceeding 5 cm, axillary, bearing at least 6 flowers.
 - 4. Nerves 20—23 pairs, prominent beneath; lamina large, oblong; fruit ovoid, acute, ribbed. **S. ceylanicus**
 - 4. Nerves less than 15 pairs; lamina not as above; fruit globose, smooth.
 - 5. Lamina broadly ovate, with subcordate base and obscure midrib above in mature trees **S. gardneri**
 - 5. Lamina lanceolate, with obtuse base and midrib evident above in mature trees **S. acuminatus**
 - 3. Flowering inflorescences not exceeding 4.5 cm, bearing at most 5 flowers; generally ramiflorous at least in fruit.
 - 6. Mature tree lamina acute to retuse.
 - 7. Midrib narrowly keeled above **S. oblongifolius**
 - 7. Midrib obscurely depressed above.
 - 8. Nerves narrowly depressed above, prominent below **S. rigudus**
 - 8. Nerves hardly raised on either surface, though more so below. **S. revolutus**
 - 6. Lamina prominently acuminate.
 - 9. Lamina ovate, typically less than twice as long as broad **S. affinis**
 - 9. Lamina oblong to lanceolate.
 - 10. Nerves and intercostals depressed above; nerves more or less anastomosing within margin.

11. Nerves not exceeding 9 pairs; midrib prominent above **S. lanceolatis**
 11. Nerves typically more than 12 pairs (saplings excluded).
 12. Midrib raised above; medium-sized tree **S. petiolaris**
 12. Midrib depressed above; understorey tree. **S. canaliculatus**
10. Nerves elevated above, not anastomosing within the margin.
 13. Fruit large, ovoid, acute, ribbed; nerves at least 9 pairs; lamina acuminate . . **S. reticulatus**
 13. Fruit small, globose, obtuse, smooth; nerves c. 6 pairs; lamina caudate.
 14. Large tree; intercostals densely reticulate, almost as prominent as nerves below **S. nitidus**
 14. Shrub or small tree; intercostals very slender, laxly reticulate, hardly raised below **S. lancifolius**

Stemonoporus acuminatus (Thw.) Bedd., Fl. Sylv. (1870) 100; Trimen, Handb. Fl. Ceylon 1 (1893) 133; id. 5 (1900) 383; Lewis, Trees and Fl. Pl. of W. and Sab. Prov. (1902) 37; Alston, Suppl. (1931) 26. — *Vateria acuminata* Thw., Enum. Pl. Zeyl. (1864) 403. — *Vesquella acuminata* Heim, Rech. Dipt. (1892) 90. — Lectotype: C.P. 3687 (PDA).

[*Vateria jucunda* Thw. ex Trim., Syst. Cat. Ceyl. Pl. (1885) 10; Dyer in Hook. f., Fl. Brit. Ind. 1 (1872) 314, nomen. — *Sunapteopsis jucunda* Heim, Rech. Dipt. (1892) 92].

CEYLON. Ambagamuwa, C.P. 3687 (B, K, PDA); 'between Medamahanuwara and Alutnuwara', C.P. 3595 (K, PDA); 'Badulla', C.P. 3474, 3595 (in part) (PDA); Lauderdale, Rakwana, *Worthington* 6072; Kurulugala, Rakwana, *Ashton* 2125, 2126; Kiribatgala, Pelmadulla, *Ashton* 2121, 2122, 2123, 2124, 2133.

Note. Trimen confused this species with *Vatica obscura* Thw.; C.P. 3595 is a mixture with that species and was wrongly cited by him as from Badulla. He correctly recognised two forms: *a.* with prominent oblique nerves, and *b.* with hardly elevated spreading nerves. Though his further distinguishing character, the number of nerves, merely reflects that one collection was from a sapling, *Ashton* 2125, 2126 (form *b.*) confirm that these forms are distinct, form *b.* apparently occurring in the intermediate zone and form *a.* only in the wet zone part of the species range. Trimen described form *b.* from C.P. 3595, annotated 'between Medamahanuwara and Alutnuwara', in other words somewhere along the main Kandy-East coast road as it crosses south of the Knuckles massif but before it finally crosses east of the Mahaweli Ganga at Mahayangana. Scrutiny of the maps suggested that the only forested site in that area, at least at present, is on the hill Kurulugala, which is 'by the Mahaweli' as Trimen describes the locality. Patient search failed to reveal any dipterocarps in this forest, indeed it appeared far too dry for *Stemonoporus*. It seems extraordinary, that the only other locality for form *b.* is a hill of exactly the same name east of the Sinha Raja, and I suggest that the present annotations on C.P. 3595, made after Thwaites' death when his collections were being sorted and sold, represents a misunderstanding of the collecting locality.

Stemonoporus lancifolius (Thw.) Ashton, *comb. nov.* — *Monoporandra lancifolia* Thw., Enum. Pl. Zeylan. (1858) 39. — *Vateria lancifolia* Thw., Enum. Pl. Zeylan. (1864) 404. — *Stemonoporus nitidus* ssp. *lancifolius* Dyer in Hook. f., Fl. Brit. Ind. 1 (1874) 316; Trim., Handb. Fl. Ceylon 1 (1893) 136. — Type: C.P. 3412.

St. nervosus Thw. in Trim., J. Bot. 23 (1885) 206; Trim., Handb. loc. cit. — Type: C.P. 3885.

Note. *Stemonoporus nervosus* is reunited here for the first time. Apparently a variable species; the few collections all differ in certain leaf characters: C.P. 3885 possesses relatively more prominent nerves on the undersurface, whereas the Kitulgala collection is the only one with a depressed midrib above.

EXCLUDED SPECIES

Stemonoporus moonii Thw., Enum. Pl. Zeylan. (1858)39; Trimen, Handb. Fl. Ceylon 1 (1893) 137; Alston, Suppl. (1931)27. — *Vateria moonii* Thw., Enum. Pl. Zeylan. (1864)403; Dyer in Hook. f., Fl. Brit. Ind. 1(1872)316. — Type: C.P. 1792.

This extraordinary, now sterile, collection, with its persistent, long, linear stipules and narrowly oblanceolate leaves with relatively short geniculate petioles clustered round the stout twig apex, is unlikely to be a dipterocarp; the leaf arrangement, the terminal bud, and the stipules at once exclude it from this genus. Without fertile material it is impossible to identify, but could belong to *Tiliaceae*, *Bombacaceae*, or *Sterculiaceae*, or even *Euphorbiaceae*.