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# Notes on Malesian *Fabaceae* (*Leguminosae-Papilionoideae*) 17. The genus *Dalbergia*

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**Key words**

*Dalbergia*
*Leguminosae* (*Fabaceae*)
Malesia
new species
*Papilionoideae*

**Abstract** A systematic treatment of the genus *Dalbergia* for the Flora Malesiana (FM) region is presented. The treatment includes a genus description, two keys to the species, an enumeration of the species present in the FM-area with names and synonyms, details of distribution, habitat and ecology and where needed some notes, three new species (*D. minutiflora*, *D. pilosa*, *D. ramosii*) are described. A new name for *D. polyphylla* is proposed (*D. multifoliolata*). The paper also contains an overview of the names, a list of collections seen and references to the literature.

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## INTRODUCTION

*Dalbergia* L.f. is a large genus (c. 185 species) belonging to the tribe *Dalbergieae* of the subfamily *Papilionoideae* of the family *Leguminosae*. The genus is widespread in the old and new world tropics. *Dalbergia* and the *Dalbergieae* are members of the monophyletic 'Dalbergioid' clade (Lavin et al. 2001). According to the analyses of Lavin et al. (2001) *Dalbergia* is related to i.e. *Machaerium* and species of *Aeschynomene*. A first attempt of a molecular phylogeny resulted in a well-resolved and mostly well-supported phylogram (Vatanparast et al. 2013). *Dalbergia* is clearly monophyletic and related to *Machaerium* and *Aeschynomene*, as was shown by Lavin et al. (2001). The species of *Dalbergia* found in the FM-area are found in several clades: clade III (b, c), clade IV (a, b), clade V. Geographically these clades are all mixed: in clade III Asian species show relationships with African, Australia and S American species, in clade IV with African species and in clade V with African, N and S American species. Of the subclades parts of clade IVa and IVb are wholly Asian and related to small groups of African species. Several *Dalbergia* species produce valuable wood ('Rosewood') used for musical instruments and other luxury goods. These species are threatened by illegal logging and deforestation. Hartvig et al. (2015) tested barcoding technics for identification. Their study showed good results: The standard *rbcL* + *matK* barcoding yielded c. 90 % discrimination rates. Barcoding of *Dalbergia* species can be used as support of conservation of so-called rosewoods.

For several Asian areas revisions, enumerations of species or flora treatments are available: S. Asia (Prain 1901, 1904), India (Thothathri 1987, Sanjappa 1992), Cambodia, Laos and Vietnam (Niyomdham et al. 1997), Thailand (Niyomdham 2002), Java (Backer & Bakhuizen van den Brink 1964), Borneo (Sunarno & Ohashi 1997), Philippines (Merrill 1910, 1923) and Sulawesi (Sunarno & Ohashi 1996). Here we present the results of our revision of *Dalbergia* for the whole Flora Malesiana region.

Characteristic for *Dalbergia* are the usually alternate leaflets, the often small inflorescences (panicles or racemes), the generally small flowers and the very small anthers opening by short slits that slowly enlarge. The wings are usually sculpted outside (see also Stirton 1981), at least in the species that are known in flower. As far as we know now only *D. junghuhnii* Benth. and *D. bintuluensis* Sunarno & H.Ohashi have non-sculpted wings (Fig.1). There are either nine or ten stamens, fused in an open sheath or in two bundles of five each (or one bundle of four and one of five stamens). However, open sheaths may show a short split at the carinal side that in aging may enlarge downwards and finally there will be also two bundles of five stamens. Pods are always indehiscent. There are at least three types of pods in *Dalbergia*:

1. ± leathery, valves 0.4–2.3 mm thick, not transparent, sometimes with lenticels. When more than one seed develops the pods become articulate;
2. ± woody, valves 0.6–3.0 mm thick, not transparent. When more than one seed develops the pods become articulate;
3. ± leathery or membranous, valves 0.1–0.4 mm thick, transparent (Fig. 2, 3).

The fruits of the *Dalbergieae* of S America were studied by De Lima (1989). He divided the fruits in three categories called 'drupe', 'samara' and 'nutlet'. The so-called drupes (his fig. 1a) are usually called drupe-like (drupaceous) pods. The 'samaras' (his fig. 1b, c) include two different types: 1b, representing a rather common type of pod, that has been called samaroid pods elsewhere. It is just a very thin, flattened pod with often only one seed, the pod is mostly thickened over the seeds (= our type c). His fig. 1c represents either a true samara or a samara-like pod. The 'nutlet' (his fig. 1d, e) again includes two different types: 1d, a winged one-seeded pod and 1e, that represents the same fruit type as fig. 1b. According to De Lima (1989: table 1, fig. 4) there are two types of fruits in S American *Dalbergia* species: 'samaras' and 'nutlets'. However, his fig. 4 shows that there are no real difference between the 'samaras' (4a, *D. variabilis*) and the 'nutlets' (4g, *D. ecastophylla*, 4j, *D. riedelii*) other than in the shape and size of the pods and the room taken by the seeds in the pods. In our grouping of the *Dalbergia* pods the pods of *D. variabilis* Vogel and *D. ecastaphylla* (L.) Taub. fit in our type c.; the fruit of *D. riedelii* (Benth.) Sandwith fits in our type b.

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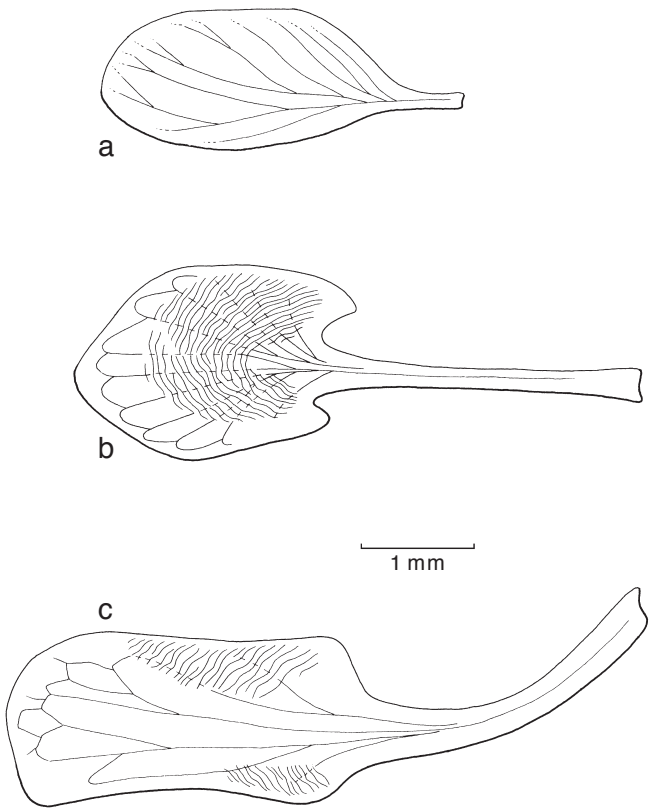


**Fig. 1** Wings of *Dalbergia* species. a. *D. junghuhnii* Benth., not sculpted; b. *D. candenatensis* (Dennst.) Prain, sculpted; c. *D. pinnata* (Lour.) Prain, sculpted (a: *SFN 38891 (Sinclair)*; b: *Purseglove & Shah 4633*; c: *KL 3221*). — Drawing by Manon Zuurmond.

For the Flora Malesiana treatment we recognise 33 species. In the following sections a genus description, two keys to the Malesian species, notes on species and typification, one new name and the description of three new species will be given.

### Dalbergia

*Dalbergia* L.f. (1781) 52, nom. cons.; Benth. (1852) 254; Miq. (1855) 127; Benth. (1860) 28; Taub. (1894) 333; Ridl. (1922) 588; Corner (1940) 365; Backer & Bakh.f. (1964) 613; Verdc. (1979) 291; O.N.Allen & E.K.Allen (1981) 213; Niyomdham (2002) 124; Klitgård & Lavin (2005) 327. — Type: *Dalbergia lanceolaria* L.f.

*Ecastaphyllum* P.Browne (1756) 299; Benth. (1860) 50. — Type: *Ecastaphyllum brownei* Pers.

*Amerimnon* P.Browne (1756) 288. — Type: *Amerimnon brownei* Sw.

*Endespermum* Blume (1825) 132. — Type: not indicated.

Trees, erect or scandent shrubs to woody climbers, sometimes spiny, with or without red sap. *Leaves* imparipinnate, rarely unifoliolate; stipules present, caducous, very rarely persistent; stipellae absent; leaflets usually alternate. *Inflorescences* axillary, terminal or raminascent, racemes or panicles. *Bracts* subpersistent or caducous. *Bracteoles* present, caducous or (sub)-persistent. *Calyx* bell-shaped, bilabiate, upper lip 2-toothed, lower lip 3-toothed, median (lowest) tooth usually longest. *Corolla*: standard without callosities; wings usually sculpted, adhering to the keel petals; keel petals slightly shorter than or as long as the wings. *Stamens* 9–10, monadelphous, than usually an open sheath, or diadelphous than usually 2 bundles of 5 (or 1 of 5 and 1 of 4); anthers all equal, fertile. *Ovary* stipitate; ovules few; stigma terminal. *Fruits* indehiscent, (strongly) flattened, often thickened around the seeds or less flattened, ± leathery or woody, sometimes articulate. *Seeds* flattened bean-shaped to flattened ellipsoid, hilum usually eccentric.

Distribution — C. 185 species, pantropic, in Malesia 33 species.

Note — Corolla parts are usually glabrous. Only in very few specimens hairs at the standard were observed: *PPI 1294 (Stone et al.)*: some hairs at the outside of the standard, this specimen is included in *D. canescens*, *S. 23493 (Anderson)*: some hairs at the standard. This specimen has also diadelphous stamens (9 + 1). It may represent a new species. For several species the annotations of the habit are at first confusing. Label information gives for the same species: (scandent) shrub, tree or climber. Probably plants of the species start live as shrub or small tree with long supple and ± climbing branches. Later on or when good support is present they may develop into large lianas. Problems with identification are, in part, due to uncertainties of the true habit when fully mature. In many species not all ovules develop into seeds.

## KEY TO THE SPECIES OF DALBERGIA IN MALESIA

### A. Bracketed key to the species of *Dalbergia* in Malesia

Note — Some species are very variable and occur several times in the key. However, specimens belonging to *D. junghuhnii*, *D. pinnata* and *D. velutina* may not always key out properly. When in doubt check the descriptions for additional characters and, if possible, compare specimens with herbarium material. For number of leaflets, always count more than one leaf per collection.

1. Trees or treelets . . . . . 2
1. Lianas, woody climbers or shrubs . . . . . 8
2. Leaves with 3–7 leaflets . . . . . 3
2. Leaves with 7–41 leaflets . . . . . 4
3. Terminal leaflets elliptic, c. 24 by 9 mm, apex acute, both sides densely tomentose. Inflorescences 2–4 cm long. Calyx 3.5–4 mm long, outside thinly sericeous. Standard blade 3 by 2–2.2 mm. Ovules 1–2. Pods 4–6 by 1–1.5 cm. Deciduous, flowering when new leaves appear . . . . . 12. *D. hullettii*
3. Terminal leaflets elliptic or obovate to ± orbicular, 65–120 by 25–80 mm, apex obtuse or rounded, both sides glabrous. Inflorescences 4.5–15 cm long. Calyx 6–7 mm long, outside glabrous. Standard blade 4–5 by 3–3.5 mm. Ovules 3–5. Pods 4–11 by 1.5–2 cm . . . . . 17. *D. latifolia*
4. Terminal leaflets elliptic to obovate, apex obtuse to rounded, emarginate or truncate. Pedicels 0.5–3.5 mm long. Stamens 9–10, usually in 2 bundles of 5, rarely in an open sheath 5
4. Terminal leaflets broadly elliptic or ± orbicular to transversely elliptic, apex cuspidate. Pedicels c. 0.5 mm long. Stamens 9, in an open sheath. — Java, also cultivated 31. *D. sissoo*
5. Pulvinus of leaflets (petiolule) 0.2–2 mm long. Standard blade 2.5–4 by 2.5–4 mm. Pods 1.4–2.5 cm wide . . . . . 6
5. Pulvinus of leaflets (petiolule) 3–5 mm long. Standard blade 4–7 by 2.5–6 mm. Pods 0.4–1.5 cm wide. Pedicels 1–3 mm long. Calyx 4–5 mm long . . . . . 19. *D. mimosella*
6. Pulvinus of leaflets (petiolule) 0.2–1.0 mm long. Pedicels 0.5–1.5 mm long. Ovary glabrous or with some hairs at the sutures, stipe 0.6–3.0 mm long. Stipe of pods 4–15 mm long . . . . . 7
6. Pulvinus of leaflets (petiolule) 1–2 mm long. Pedicels 2.5–3.5 mm long. Ovary sericeous at the sutures, stipe c. 1.5 mm long. Stipe of pods 4–5 mm long . . . 9. *D. ferruginea*
7. Leaves with 7–19 leaflets. Leaflets flat when dry. Bracts to the flowers elliptic to triangular ovate, 0.5–3.0 by 0.5–0.7 mm. Calyx 1.5–3.0 mm long. Ovary with some hairs at the sutures, stipe 0.6–0.8 mm long. Pods 4–10 by 1.5–2.5 cm, stipe 4–10 mm long . . . . . 15. *D. junghuhnii*
7. Leaves with 11–41 leaflets. Leaflets usually curling upwards when dry. Bracts to the flowers broadly ovate, 0.9–2.0 by 0.7–1.0 mm. Calyx 3.5–5 mm long. Ovary glabrous, stipe 2.5–3.0 mm long. Pods 3–8 by 1–2 cm, stipe 4–15 mm long . . . . . 24. *D. pinnata*

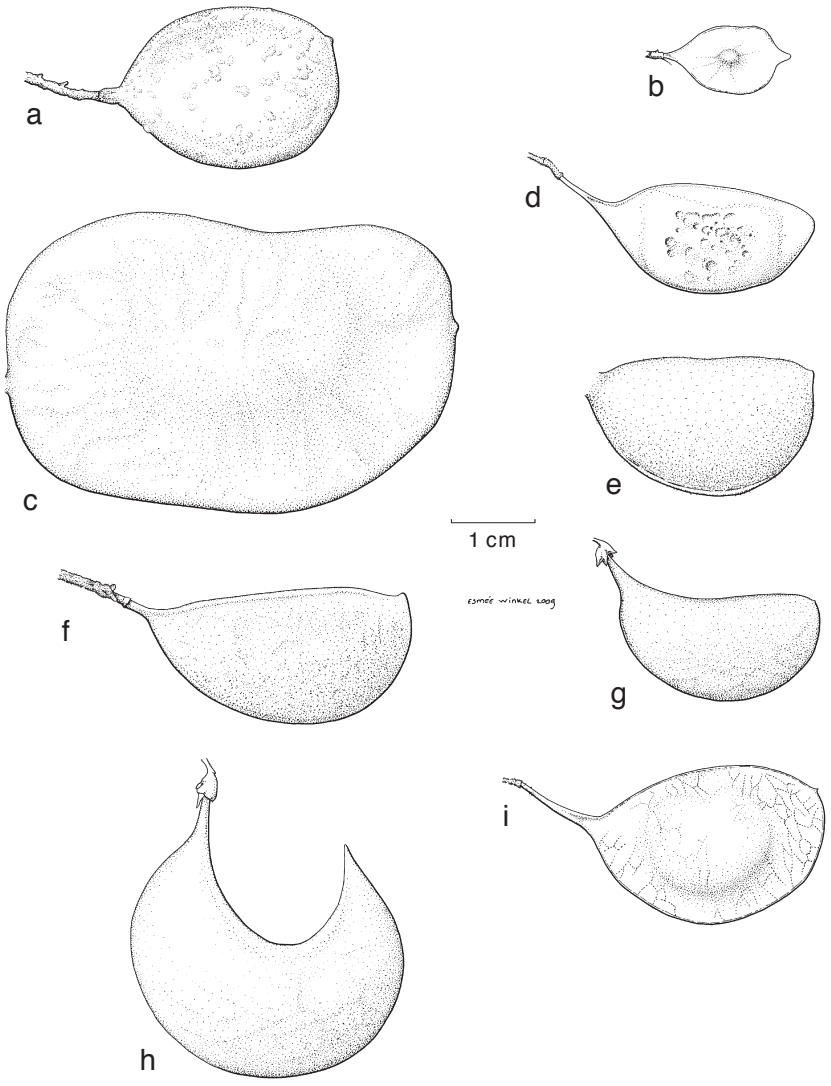


**Fig. 2** Pods of *Dalbergia* species. — Type a: a. *D. albertisii* Prain; b. *D. beccarii* Prain; c. *D. bintuluensis* Sunarno & H.Ohashi; d. *D. cumingiana* Benth.; e. *D. kunstleri* Prain; f. *D. parviflora* Roxb. — Type b: g. *D. candenatensis* (Dennst.) Prain; h. *D. menoeides* Prain. — Type c: i. *D. ferruginea* Roxb. (a: *NGF 37165 (Womersley)*; b: *Versteeg 1117*; c: *S 15593 (Ilias Paie)*; d: *BS 18872 (McGregor)*; e: *Hallier 1170*; f: *SAN 98760 (Amin Sigun)*; g: *Zippelius 70/b*; h: *Lam 250a*; i: *SAN102075 (Lee et al.)*). — Drawing by Esmée Winkel.

8. Leaves with 1–5 leaflets . . . . . 9
8. Leaves with 5–65 leaflets . . . . . 19
9. Apex of leaflets acute or acuminate . . . . . 10
9. Apex of leaflets obtuse to rounded or truncate, rarely acuminate . . . . . 15
10. Apex of leaflets acuminate, leaflets above glabrous, rarely with some hairs or thinly sericeous . . . . . 11
10. Apex of leaflets acute, leaflets above tomentose. Calyx 3.5–4 mm long. Deciduous, flowering when new leaves appear . . . . . 12. *D. hullettii*
11. Terminal leaflets (broadly) ovate, 2.5–7.5 by 1.5–4 cm. Inflorescences 4–20 cm long. Stipe of ovary glabrous . 12
11. Terminal leaflets elliptic to obovate or ovate, 4–16 by 2–9 cm. Inflorescences 0.7–13 cm long. Stipe of ovary sericeous in upper part or glabrous . . . . . 13
12. Leaflets below glabrous or with few appressed hairs; pulvinus of leaflets (petiolule) 2–3 mm long. Pedicels 0.5–1 mm long. Calyx c. 2 mm long. Standard blade 2.2–2.5 by 2.0 mm. Stipe of ovary c. 0.4 mm long. Pods 3–6 by 2–4 cm . . . . . 3. *D. bintuluensis*
12. Leaflets below sericeous; pulvinus of leaflets (petiolule) 0.4–0.5 mm long. Pedicels 1–2 mm long. Calyx c. 4 mm long. Standard blade 2.5–3 by 2.5 mm. Stipe of ovary c. 2 mm long . . . . . 14. *D. johorensis*
13. Terminal leaflets 4–16 by 2–9 cm. Inflorescences 1.0–13 cm long. Calyx 1.5–5.0 mm long. Stipe of ovary sericeous in upper part . . . . . 14
13. Terminal leaflets 3–10 by 2–6 cm. Inflorescences 0.7–1.0 cm long. Calyx 5 mm long. Stipe of ovary glabrous. — Sarawak . . . . . 27. *D. richardsii*
14. Inflorescences 1–6 cm long. Calyx 2.3–3 mm long. Standard blade 2.0–2.5 by 2.0 mm. Stipe of ovary 1.0–1.5 mm long. — Papua . . . . . 20. *D. minutiflora*
14. Inflorescences 2–13 cm long. Calyx 3.5–5 mm long. Standard blade 2.3–3 by 2.1–3.5 mm. Stipe of ovary 1.4–2.5 mm long. Pods 5–10 by 1.5–2.5 cm . . . . . 29. *D. rostrata*
15. Inflorescences 0.7–15 cm long. Stipe of ovary 0.5–4 mm long . . . . . 16
15. Inflorescences up to 1 cm long. Stipe of ovary 2–2.5 mm long. Leaflets below thinly sericeous. Ovules 2–3. Pods falcate to semilunar, 2.7–3.0 by 1.5–2.0 cm . . . . . 18. *D. menoeides*
16. Leaflets above glabrous or hairy at midrib. Inflorescences up to 3 cm or 8–15 cm long. Pedicels 0.5–1 mm long. Pods falcate, semilunar or broadly ellipsoid, valves 0.6–1.6 mm thick . . . . . 17
16. Leaflets above glabrous or with scattered hairs to puberulous or (thinly) sericeous or tomentose. Inflorescences

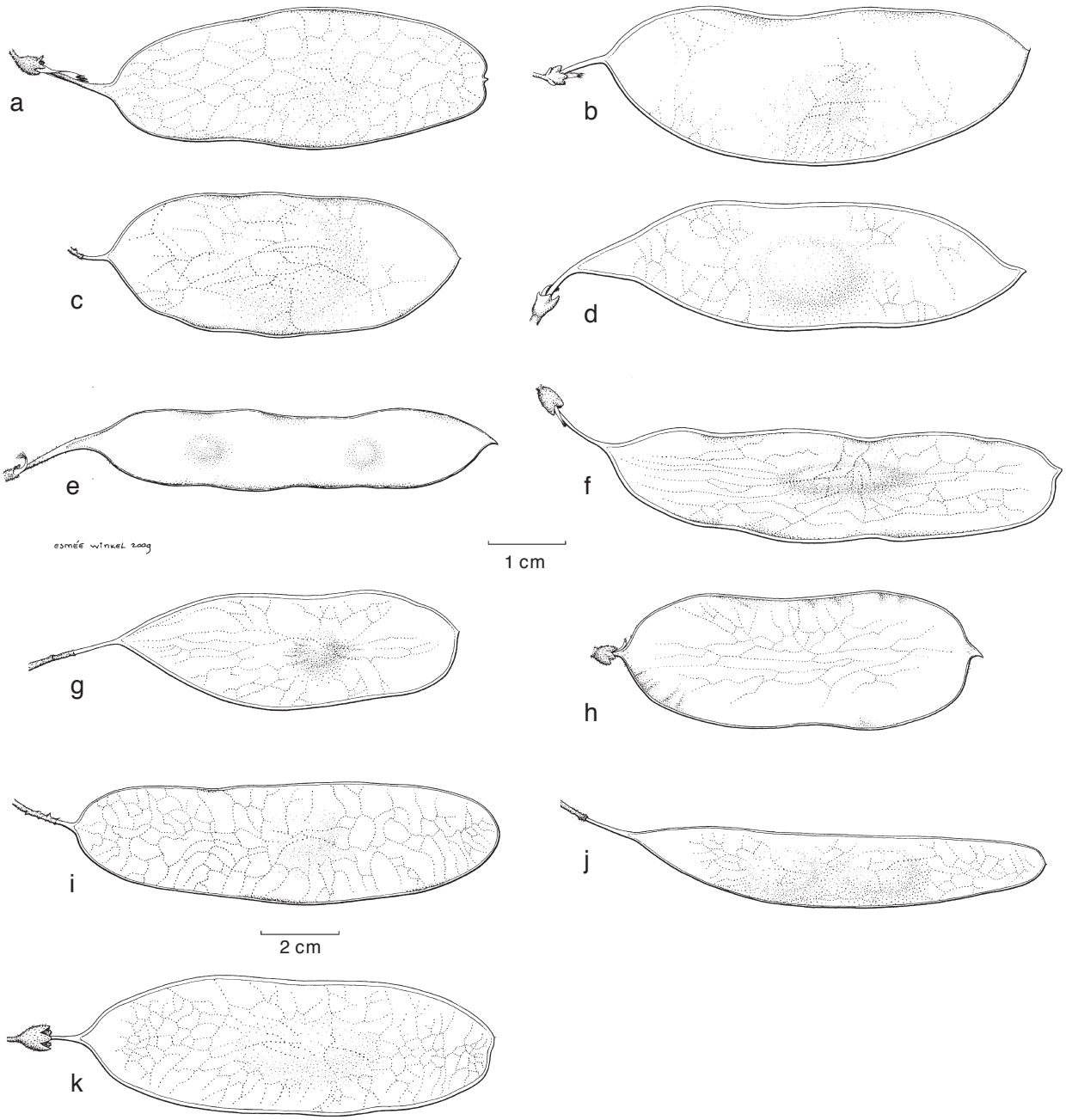


**Fig. 3** Pods of *Dalbergia* species. — Type c: a. *D. borneensis* Prain; b. *D. densa* Benth.; c. *D. junghuhnii* Benth.; d. *D. latifolia* Roxb.; e. *D. mimosella* (Blanco) Prain; f. *D. pinnata* (Lour.) Prain; g. *D. rimosa* Roxb.; h. *D. rostrata* Hassk.; i. *D. sandakanensis* Sunarno & H.Ohashi; j. *D. sissoo* Roxb.; k. *D. velutina* Benth. var. *maingayi* Prain (a: *Haviland 2889*; b: *BW 9464 (Schram)*; c: *King's coll. 3562*; d: *Boschproefst. Tj 377*; e: *Sidiyasa 1408*; f: *Rahmat si Boeea 5943*; g: *BNBFD 5404 (Umbol)*; h: *Shah & Shukor 2665*; i: *BS 1883 (Ramos)*; j: *Popta 929*; k: *Maxwell 80-132*). Scale bar with i only for i; scale bar for all other drawings in the middle. — Drawing by Esmée Winkel.

0.7–5 cm long. Pedicels 1–5 mm long. Pods strap-like, valves 0.4 mm thick . . . . . 18

17. Terminal leaflets 1.7–8 by 1.2–5.5 cm. Inflorescences up to 3 cm long. Calyx 3–3.5 mm long. Ovary glabrous, stipe 1–1.5 mm long; ovules 1–2. Pods 2–3.5 by 1–1.5 mm, valves 0.6–1 mm thick. . . . . 5. *D. candenatensis*

17. Terminal leaflets 5–16 by 2–7 cm. Inflorescences 8–15 cm long. Calyx 1.5–2.5 mm long. Ovary puberulous at sutures, stipe 0.5–0.6 mm long; ovules 3–4. Pods 2.5–4.5 by 1–2.5 cm, valves 0.8–1.6 mm thick . 22. *D. parviflora*

18. Leaflets below densely puberulous. Inflorescences 2.5–5 cm long. Pedicels 1–2 mm long. Ovary glabrous to sericeous outside, stipe 0.8 mm long; ovules 2–3. Pods 3.5–8 by 0.8–2 cm . . . . . 8. *D. densa*

18. Leaflets below (thinly) sericeous to tomentose. Inflorescences 0.7–3.5 cm long. Pedicels 2.5–5 mm long. Ovary sericeous outside, stipe c. 4 mm long; ovules 2. Pods 5.0–5.5 by 1.2–1.8 cm . . . . . 10. *D. havilandii*

19. Apex of leaflets acuminate . . . . . 20

19. Apex of leaflets obtuse to rounded or truncate, rarely acute . . . . . 23

20. Leaflets below glabrous to sericeous. Pods falcate to (broadly) elliptic or semilunar or flattened ellipsoid, 2.5–6 by 1–4 cm . . . . . 21

20. Leaflets below thinly strigose. Pods flattened ellipsoid or discoid, 1.5–3.7 by 1.2–2.0 cm. Calyx 2–3 mm long . . . . . 1. *D. albertisii*

21. Leaflets below glabrous or with few scattered hairs. Calyx 1.5–2.5 mm long. Ovary 1.0–1.6 mm long, stipe 0.4–0.6 mm long . . . . . 22

21. Leaflets below sericeous. Calyx 3–4.5 mm long. Ovary 2–3 mm long, stipe 2–3 mm long. Pods falcate or semilunar, 2.5–7 by 1.5–2 cm . . . . . 16. *D. kunstleri*

22. Calyx c. 2 mm long. Ovary 1.5–1.6 mm long, thinly sericeous, stipe c. 0.4 mm long, ovules 1–2. Pods elliptic, 3–6 by 2–4 cm . . . . . 3. *D. bintuluensis*
22. Calyx 1.5–2.5 mm long. Ovary 1.0–1.2 mm long, puberulous along upper suture, stipe 0.5–0.6 mm, ovules 3–4. Pods falcate or broadly elliptic, 2.5–4.5 by 1–2.5 cm . . . . . 22. *D. parviflora*
23. Base of lateral leaflets (slightly) oblique . . . . . 24
23. Base of lateral leaflets equal-sided . . . . . 31
24. Leaves with 3–41 leaflets. Terminal leaflet 0.4–6 by 0.2–3 cm. Ovary glabrous or hairy along the sutures, stipe 0.6–3.1 mm long. Pods discoid, strap-like or elliptic in outline . . . . . 25
24. Leaves with 25–65 leaflets. Terminal leaflet 0.5–0.9 by 0.2–0.3 cm. Ovary glabrous, stipe 2.5–3 mm long. Pods (narrowly) elliptic in outline. — Philippines (Luzon) . . . . . 21. *D. multifoliolata*
25. Terminal leaflets 0.4–4.6 by 0.2–2.5 cm. Inflorescences 0.4–6 or 4–35 cm long . . . . . 26
25. Terminal leaflets 4–6.5 by 1.5–3 cm. Inflorescences 5–15 cm long . . . . . 33. *D. velutina*
26. Inflorescences 1–35 cm long. Standard blade 2.5–4 by 2–4 mm. Stipe of ovary 0.6–3.1 mm long. Pods (broadly) strap-like or elliptic in outline, 2.5–10 by 1–2.5 cm . . . 27
26. Inflorescences 0.4–0.6 cm long. Standard blade 2–3 by 1.5–2 mm. Stipe of ovary 0.2 mm long. Pods ± discoid, obovate to orbicular in outline, 1–2.5 by 0.7–1 cm. Calyx 2–3 mm long . . . . . 2. *D. beccarii*
27. Pedicels 1–4 mm long. Calyx 3.5–6 mm long. Ovary glabrous, with very few hairs or sericeous along the sutures, stipe 1–3.1 mm long . . . . . 28
27. Pedicels 0.5–1.2 mm long. Calyx 1.5–3 mm long. Ovary with some hairs at the sutures, stipe 0.6–0.8 mm long. Standard blade 2.5–4 by 2.5–3 mm. Pods 4–10 by 1.5–2.5 cm . . . . . 15. *D. junghuhnii*
28. Leaves with 9–27 leaflets. Leaflets flat, terminal 0.5–4.5 by 0.3–2 cm, pulvinus (petiolule) 1–2 mm long. Stipe of ovary 1.5–3.1 mm, of pods 4–9 mm long . . . . . 29
28. Leaves with 11–41 leaflets. Leaflets flat or curling upwards when dry, terminal 0.6–2.1 by 0.3–1.1 cm, pulvinus (petiolule) 0.2–1.0 mm long. Stipe of ovary 2.5–3 mm, of pods 4–15 mm long. — Stipules (very) narrowly ovate, 4–6 by 0.8–1.5 mm. Ovary glabrous . . . . . 24. *D. pinnata*
29. Inflorescences 1–5 cm long. Pedicels 1–4 mm long. Ovary glabrous or with very few hairs, stipe 1–3.1 mm long. Pods 1.5–2 cm wide . . . . . 30
29. Inflorescences 4–35 cm long. Pedicels 2.5–3.5 mm long. Ovary sericeous along the sutures and with few hairs at the base, stipe 1.5 mm long. Pods 2–2.5 cm wide. Leaves with 9–25 leaflets. Stipules broadly obovate to broadly falcate, 3–6 by 3–4 mm . . . . . 9. *D. ferruginea*
30. Stipules linear to ovate, 5–10 by 2–4 mm. Leaflets both sides villous to ± sericeous. Calyx 4–5.1 mm long. Standard blade 2.5–3.5 by 2–3.5 mm. Stipe of ovary 1–3.1 mm long . . . . . 6. *D. canescens*
30. Stipules narrowly ovate, 2–3 by 0.5–0.8 mm. Leaflets both sides thinly sericeous. Calyx 3.5–4 mm long. Standard blade 4 by 2–2.5 mm. Stipe of ovary c. 2 mm long . . . . . 13. *D. jaherii*
31. Terminal leaflets 0.4–16 by 0.2–7 cm. Inflorescences 0.5–15 cm long. Pedicels 0.5–5 mm long . . . . . 32
31. Terminal leaflets 0.3–1 by 0.2–0.5 cm. Inflorescences 0.6–1.0 cm long. Pedicels c. 0.5 mm long. Leaflets above sparsely puberulous, below sericeous. Calyx 1.5–1.8 mm long, outside glabrous or puberulous . . . . 25. *D. ramosii*
32. Leaves with 15–35 leaflets . . . . . 33
32. Leaves with 3–17 leaflets . . . . . 36
33. Leaflets above glabrous to sericeous, below thinly to densely sericeous. Pedicels 0.5–2 mm long . . . . . 34
33. Leaflets above and below villous to ± sericeous. Pedicels 1–4 mm long. Inflorescences 1–5 cm long. Calyx 4–5.1 mm long, outside with few hairs to thinly sericeous. Pods strap-like, 5–7 by 1.5–2 cm . . . . . 6. *D. canescens*
34. Calyx 3–4 mm long. Pods (broadly) strap-like, 4–7 by 1.5–2 or 9–12 by 3–3.5 cm . . . . . 35
34. Calyx 1.5–3 mm long. Pods strap-like, elliptic in outline, 4–10 by 1.4–2.5 cm. Inflorescences 2.5–10 cm long . . . . . 15. *D. junghuhnii*
35. Inflorescences 3–4.5 cm long. Pods 4–7 by 1.5–2 cm. — Moluccas, Key Islands . . . . . 13. *D. jaheri*
35. Inflorescences c. 8 cm long. Pods 9–12 by 3–3.5 cm. — Borneo, Sabah . . . . . 30. *D. sandakanensis*
36. Leaflets above glabrous or with some hairs, or with hairs at the midrib. Ovary glabrous or with hairs at one or both sutures, rarely sericeous . . . . . 37
36. Leaflets above thinly to densely villous, thinly pubescent, sericeous, tomentose or puberulous. Ovary glabrous to sericeous . . . . . 46
37. Inflorescences in the axils of mature leaves or terminal. Pedicels 0.3–2 mm long. Seeds kidney- or bean-shaped or flattened ellipsoid . . . . . 38
37. Inflorescences in the axils of newly emerging leaves. Pedicels 2–5 mm long. Seeds C-shaped . . . 4. *D. borneensis*
38. Leaves with (9–)13–17 leaflets . . . . . 39
38. Leaves with 1–13 leaflets . . . . . 40
39. Terminal leaflets 0.4–4.6 by 0.2–2.5 cm. Ovary 1.2–1.7 mm long, ovules 1–4 . . . . . 40
39 Terminal leaflets 4–6 by 1.5–3 cm. Ovary 2–3 mm long, ovules 1 or 2. — Valves of pods 0.3–0.6 mm thick. Seeds kidney- or bean-shaped . . . . . 33. *D. velutina*
40. Calyx glabrous or with some scattered hairs. Ovary 1.3–1.7 mm long, with some hairs at the sutures, ovules 2–4. — Valves of pods 0.1–0.2 mm thick. Seeds flattened ellipsoid . . . . . 15. *D. junghuhnii*
40. Calyx sericeous. Ovary 1.2–1.4 mm long, glabrous, ovules 1 or 2 . . . . . 32. *D. teysmannii*
41. Leaflets below sericeous. Ovary with some hairs to puberulous at the sutures. Pods 2–10 by 1–3 cm, valves 0.1–0.3 mm thick . . . . . 42
41. Leaflets glabrous or with some hairs to sparsely to densely puberulous, (very) thinly sericeous or strigose. Ovary glabrous to very thinly sericeous, rarely hairy at the sutures. Pods 2–9 by 1–2.6 cm, valves 0.6–1.6 mm thick . . . 43
42. Terminal leaflets 0.4–4.6 by 0.2–2.5 cm. Calyx outside glabrous or with scattered hairs. Ovary 1.3–1.7 mm long; ovules 2–4. Pods 4–10 by 1.4–2.5 cm, valves 0.1–0.2 mm thick . . . . . 15. *D. junghuhnii*
42. Terminal leaflets 2–8 by 1.5–6 cm. Calyx outside sericeous. Ovary 2–2.5 mm long; ovules 1–3. Pods 2–6 by 1–3 cm, valves 0.2–0.3 mm thick . . . . . 28. *D. rimosa*
43. Pedicels 0.5–1 mm long. Calyx glabrous or with few hairs to thinly sericeous at least at the teeth. Pods falcate, semilunar or broadly ellipsoid, valves 0.6–1.6 mm thick . . 44
43. Pedicels 1–2 mm long. Calyx sericeous. Pods flattened ellipsoid, valves 1.1 mm thick (or 'very thin'). — Philippines . . . . . 45
44. Terminal leaflets 1.7–8 by 1.2–5.5 cm, below with very few appressed hairs to strigose. Inflorescences up to 3 cm long. Calyx glabrous or with few hairs. Ovary glabrous, ovules

1–2. Valves of pods 0.6–1.0 mm thick. — Coastal . . . . . 5. *D. candenatensis*

44. Terminal leaflets 5–16 by 2–7 cm, below glabrous or with scattered appressed hairs. Inflorescences 0.8–1.5 cm long. Calyx thinly sericeous at least at teeth. Ovary hairy at the sutures, ovules 3–4. Valves of pods 0.8–1.6 mm thick . . . . . 22. *D. parviflora*

45. Leaflets below (very) thinly sericeous or with some hairs. Inflorescences 4–14.5 cm long. Pedicels 1.0–1.1 mm long. Ovary very thinly sericeous. Pods 2–3 by 1 cm, valves 1.1 mm thick . . . . . 7. *D. cumingiana*

45. Leaflets below sparsely to densely puberulous. Inflorescences 2.4–7 cm long. Pedicels c. 2 mm long. Ovary glabrous. Pods 6–9 by 2–2.6 cm, valves 'very thin' . . . . . 26. *D. reticulata*

46. Inflorescences terminal or in the axils of mature leaves. Pedicels 0.3–5 mm long. Calyx 1.5–5.1 mm long, outside glabrous or with some hairs to sericeous, or with some hairs at the sutures . . . . . 47

46. Inflorescences in the axils of just emerging leaves or raminascent. Pedicels 5–7 mm long. Calyx 4.5–5.5 mm long, outside tomentose. Leaflets below tomentose. — Borneo . . . . . 23. *D. pilosa*

47. Leaflets below sparsely to densely sericeous or villous 48

47. Leaflets below densely puberulous, thinly pubescent, velutinous or strigose . . . . . 50

48. Pedicels 0.3–1.2 mm long. Calyx 1.5–3 mm long . . . 49

48. Pedicels 1–4 mm long. Calyx 4–5.1 mm long . . . . . 6. *D. canescens*

49. Leaves 0.4–4.6 by 2–2.5 cm. Calyx glabrous or with scattered hairs. Ovary 1.3–1.7 mm long, with some hairs at the sutures. Pods 4–10 by 1.4–2.5 cm, valves 0.1–0.2 mm thick . . . . . 15. *D. junghuhnii*

49. Leaves 2–9 by 1.5–6 cm. Calyx sericeous. Ovary 2–2.8 mm long, puberulous at the sutures. Pods 2–6 by 1–3 cm, valves 0.2–0.3 mm thick . . . . . 28. *D. rimosa*

50. Leaflets below thinly pubescent or densely puberulous. Inflorescences 0.5–5 cm long. Calyx glabrous to sparsely puberulous or thinly sericeous at the teeth. Ovary glabrous to sericeous . . . . . 51

50. Leaflets below velutinous or strigose. Inflorescences 5–15 cm long. Calyx sericeous. Ovary with some hairs at the sutures. . . . . 33. *D. velutina*

51. Terminal leaflets 1.5–12 by 0.6–7 cm, below densely puberulous. Inflorescences 2.5–5 cm long. Pedicles 1–2 mm long. Calyx 2.5–4 mm long. Ovary 1.5–2 mm long, glabrous to sericeous; ovules 2–3 . . . . . 8. *D. densa*

51. Terminal leaflets 1–2.2 by 0.6–1.1 cm, below thinly pubescent. Inflorescences 0.5–1.6 cm long. Pedicels 3–5 mm long. Calyx 5 mm long. Ovary 2–3 mm long, glabrous; ovules 1 . . . . . 11. *D. hoseana*

### B. Multi entry key

B**old**: two or more character states present ; ?: character state unknown.
Always count the number of leaflets for several leaves of a specimen; always measure more than one terminal leaflet per specimen.

| | | | | | |
|---|---|---|---|---|---|
| 1. | *D. albertisii* | 12. | *D. hullettii* | 23. | *D. pilosa* |
| 2. | *D. beccarii* | 13. | *D. jaherii* | 24. | *D. pinnata* |
| 3. | *D. bintuluensis* | 14. | *D. johorensis* | 25. | *D. ramosii* |
| 4. | *D. borneensis* | 15. | *D. junghuhnii* | 26. | *D. reticulata* |
| 5. | *D. candenatensis* | 16. | *D. kunstleri* | 27. | *D. richardsii* |
| 6. | *D. canescens* | 17. | *D. latifolia* | 28. | *D. rimosa* |
| 7. | *D. cumingiana* | 18. | *D. menoeides* | 29. | *D. rostrata* |
| 8. | *D. densa* | 19. | *D. mimosella* | 30. | *D. sandakanensis* |
| 9. | *D. ferruginea* | 20. | *D. minutiflora* | 31. | *D. sissoo* |
| 10. | *D. havilandii* | 21. | *D. multifoliolata* | 32. | *D. teysmannii* |
| 11. | *D. hoseana* | 22. | *D. parviflora* | 33. | *D. velutina* |

1. Habit:
   a. trees: **15**, 17, 19, 23?, **24**, 31, 32?
   b. treelets: **9**, **12**, **15**, 23?, 32?
   c. (scandent) shrubs: **1**, **3**, **4**, **5**, **8**, **9**, **11**, **12**, **15**, **21**, **22**, 23?, 25, 28, 32?, **33**
   d. lianas: **1**, 2, **3**, **4**, **5**, 6, 7, **8**, 10, **11**, **12**, 13, 14, **15**, 16, 18, 20, **21**, **22**, 23?, **24**, 26, 27, 28, 29, 30, 32?, **33**

2. Number of leaflets:
   a. 1 or 3: **3**, **5**, **8**, **10**, **12**, 14, **17**, **18**, **20**, **22**, **27**, **29**
   b. 5 or 7: **1**, **3**, **4**, **5**, **7**, **8**, **10**, **11**, **12**, **15**, **16**, **17**, **18**, **20**, **22**, **23**, **25**, **27**, **28**, **29**, **31**
   c. 9–21: **1**, 2, **4**, **6**, **7**, **8**, **9**, **11**, **13**, **15**, **16**, **19**, **22**, **23**, **24**, **25**, **26**, **28**, **30**, **31**, 32, 33
   d. 23 or more: **6**, **9**, **13**, **19**, 21, **23**, **30**

3. Length of terminal leaflet:
   a. 0.3–1.5 cm: 2, **6**, **7**, **8**, **9**, **11**, **15**, 21, **24**, **25**
   b. 1.6–4.5 cm: **3**, 4, **5**, **6**, **7**, **8**, **9**, **10**, **11**, 12, 13, **15**, **18**, **19**, **24**, **25**, **26**, **27**, **28**, **29**, 30, **31**, **33**
   c. 4.6–8 cm: **1**, **3**, **5**, **7**, **8**, **10**, 14, **15**, **16**, **17**, **18**, **19**, **20**, **22**, **26**, **27**, **28**, **29**, **31**, **33**
   d. 8.1–18 cm: **1**, **8**, **10**, **16**, **17**, **18**, **20**, **22**, 23, **27**, **29**, 32

4. Base of lateral leaflets:
   a. equal-sided: 1, 3, 4, 5, **6**, 7, 8, 10, 11, 12, **13**, 14, **15**, 16, 17, 18, **19**, 20, 22, **23**, 25?, 26, 27, 28, 29, 30, 31, 32?, **33**
   b. (slightly) oblique: 2, **6**, 9, **13**, **15**, **19**, 21, **23**, 24, 25?, 32?, **33**

5. Apex of leaflets:
   Note — the states listed here refer to the general outline of the leaflet, at the extreme apex leaflets may be minutely apiculate or emarginate.
   a. obtuse: **4**, **5**, **7**, **8**, **9**, **10**, **13**, **15**, **17**, 18, **19**, **22**, **23**, **24**, **25**, **26**, **28**, **30**, **33**
   b. rounded: 2, **4**, **5**, **6**, **7**, **8**, **9**, **10**, **11**, **13**, **15**, **17**, **19**, 21, **23**, **24**, **25**, **26**, **28**, **30**, 32, **33**
   c. truncate: **6**, **11**, **24**
   d. acute: **7**, 12
   e. acuminate or cuspidate: 1, 3, 14, 16, 20, **22**, 27, 29, 31

6. Indumentum of leaflets above
   a. glabrous: **1**, **3**, 5, **7**, **8**, 14, **15**, **16**, 17, 18, 20, **21**, **22**, **24**, 26, 27, **28**, **29**, 31, 32, **33**
   b. with few, scattered hairs: **3**, 4, **8**, 9, **10**, **15**, **16**, **21**, **24**, **28**, **29**, **33**
   c. hairy along the midrib: **1**, **7**, **22**, **33**
   d. hairy: 2, 6, **8**, **10**, 11, 12, 13, **15**, 19, **21**, 23, **24**, 25, **28**, **29**, 30, **33**

7. Indumentum of leaflets below:
   a. glabrous: **3**, 17, **22**
   b. with some hairs: **3**, 4, **5**, **9**, **22**
   c. hairy: 1, 2, **5**, 6, 7, 8, **9**, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33

8. Inflorescences, location:
   a. axillary: **1**, 2, **3**, 4, **5**, **6**, **7**, **8**, **9**, 10, 11, **12**, 13, **14**, **15**, **16**, **17**, 18, 19, **20**, **21**, **22**, **24**, 25, 26, 27, **28**, **29**, **30**, 31, 32, 33
   b. terminal: **1**, **3**, **5**, **7**, **9**, **14**, **15**, **17**, **20**, **21**, **22**, **24**, **28**, **29**, **30**
   c. raminascent or flowering at or just before the appearance of new leaves: **6**, **8**, **12**, **16**, 23, **28**

9. Inflorescences, kind:
   a. racemes: 2, **5**, **6**, **8**, **9**, **10**, 11, **12**, **14**, **15**, **18**, **20**, **21**, **23**, **26**, **27**, **29**
   b. panicles: 1, 3, 4, **5**, **6**, 7, **8**, **9**, **10**, **12**, 13, **14**, **15**, 16, 17, **18**, 19, **20**, **21**, 22, **23**, 24, 25, **26**, **27**, 28, **29**, 30, 31, 32, 33

10. Length pedicels:
    a. 0.3–2 mm: 1, 2, 3, 5, **6**, 7, 8, **12**, 13, 14, 15, 16, 18, **19**, **20**, 21, 22, 24, 25, **26**, 28, **29**, 30, 31, 32, 33
    b. 2–7 mm: 4, **6**, 9, 10, 11, **12**, 17, **19**, **20**, 23, **26**, 27, **29**

11. Calyx length:
    a. 1.5–3 mm: 1, 2, 3, 7, **8**, 15, 20, 22, 25, 28, 32, **33**
    b. 3–4 mm: **4**, 5, **8**, **10**, 12, 13, **14**, **16**, 18, **19**, **21**, **24**, **26**, **29**, 30, **31**, **33**
    c. 4–7 mm: **4**, 6, 9, **10**, 11, **14**, **16**, 17, **19**, **21**, 23, **24**, **26**, 27, **29**, **31**, **33**

12. Calyx, indumentum outside:
    a. glabrous: 1, **3**, **5**, **8**, 13?, **15**, 17, **21**, **25**, **30**
    b. teeth ciliate: **3**, **11**, 13?, **15**, **18**, **21**, **22**, 24
    c. few hairs: **3**, **5**, **6**, **8**, **11**, 13?, **15**, **18**, **21**, **22**, 31
    d. hairy: 2, 4, **6**, 7, **8**, 9, 10, 12, 13?, 14, 16, 19, 20, 23, **25**, 26, 27, 28, 29, **30**, 33

13. Calyx, indumentum inside:
    a. glabrous: 1, 2, 3, 4, 5, **6**, 7, 8, 9, 10, 11, 13?, 14?, 15, 16, 17, 18, 19, 20, 21, 22, **23**, 24, 25?, 26?, 27, 28, 29, 30, 31, 32?
    b. few hairs: **12**, 13?, 14?, 25?, 26?, 32?
    c. hairy at least at the teeth: **6**, **12**, 13?, 14?, **23**, 25?, 26?, 32?, 33

14. Standard, shape of blade:
    a. (sub)orbicular or transverse elliptic: **6**, **9**, **11**, **15**, 16, **17**, **18**, **19**, **21**, 23, **24**, 27, **29**, 30?, **33**
    b. (broadly) obovate: 1, 2, 3, **6**, 7, **8**, **9**, **12**, 13, 14, **15**, **18**, 22, 25, 26, 28, 30?, 31, 32
    c. (broadly) ovate: 4, **5**, **11**, **12**, **17**, **29**, 30?, **33**
    d. (broadly) elliptic: **5**, **8**, 10, **17**, **19**, 20, **21**, **24**, 30?, **33**

15. Length standard blade:
    a. 1.5–3 mm: 1, 2, 3, **6**, 7, **8**, **12**, 14, **15**, 20, 22, 23, 25, 27, 28, 29, 30?, 32
    b. 3–4 mm: 4, 5, **6**, **8**, 9, **10**, 11, **12**, **13**, **15**, 21, 24, 26, 30?, 33
    c. 4–7 mm: **10**, **13**, 16, 17, 18, 19, 30?, 31

16. Wings, sculpting (Fig. 1):
    a. sculpted: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13?, 14?, 16, 17, 18?, 19, 20, 21, 22, 23, 24, 25?, 26?, 27, 28, 29, 30?, 31, 32?, 33
    b. not sculpted: 3, 13?, 14?, 15, 18?, 25?, 26?, 30?, 32?

17. Stamens, number:
    a. 9: **3**, **4**, **6**, 8, 10, **11**, **12**, **13**, 14, **15**, 17, **20**, **22**, 23, **25**, 26, **27**, **28**, 29, 30, 31, **33**
    b. 10: 1, 2, **3**, **4**, 5, **6**, 7, 9, **11**, **12**, **13**, **15**, 16, 18, 19, **20**, 21, **22**, 24, **25**, **27**, **28**, 32, **33**

18. Stamens adnate:
    a. monadelphous, open sheath: 1, 2, **3**, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, **28**, 29, 30, 31, 32, 33
    b. diadelphous, 2 bundles of 5 or 1 of 5 and 1 of 4: **3**, 9, 19, **28**

19. Ovary, indumentum:
    a. glabrous: 4, 5, **6**, **8**, 11, 13, 17, 18, 21, **23**, 24, 26, 27, 30?, 32
    b. hairy at one or both sutures: 1, 9, 12, 15, **16**, 22, **23**, 28, 30?, 31, 33
    c. hairy all over or towards the apex: 2, 3, 7, **8**, 10, 14, **16**, 19, 20, 25, 29, 30?
    d. some hairs: **6**, **8**

20. Ovary, number of ovules:
    a. 1–2: **1**, **2**, 3, 4, 5, 6, 7, **8**, **9**, 10, 11, 12, **13**, 14, **15**, **16**, 18, **19**, 20, **21**, 23, **24**, 25, **26**, 27, **28**, **29**, 30?, 32, 33
    b. 3–4: **1**, **2**, **8**, **9**, **13**, **15**, **16**, **17**, **19**, **21**, 22, **24**, **26**, **28**, **29**, 30?, **31**
    c. 5–6: **17**, **19**, 30?, **31**

21. Pods, type (Fig. 2, 3):
    a. ± leathery, valves 0.4–2.3 mm thick, not transparent: 1, 2, 3, 7, 11?, 14?, 20?, 22, 25?, 27?, 32?
    b. ± woody, valves 0.6–3.0 mm thick, not transparent: 5, 11?, 14?, 16, 18, 20?, 25?, 27?, 32?
    c. ± leathery or membranous, valves 0.1–0.4 mm thick, transparent: 4, 6, 8, 9, 10, 11?, 12, 13, 14?, 15, 17, 19, 20?, 21, 23, 24, 25?, 26, 27?, 28, 29, 30, 31, 32?, 33

22. Length of pods:
    a. 1–2.5 cm: **1**, 2, **5**, **7**, 11?, 14?, 20?, 21, 25?, 27?, **28**, **31**, 32?
    b. 2.5–7 cm: **1**, 3, 4, **5**, 6, **7**, **8**, **9**, 10, 11?, 12, 13, 14?, **15**, 16, **17**, 18, **19**, 20?, 22, **24**, 25?, **26**, 27?, **28**, **29**, **31**, 32?, **33**
    c. 7–14 cm: **8**, **9**, 11?, 14?, **15**, **17**, **19**, 20?, 23, **24**, 25?, **26**, 27?, **29**, 30, **31**, 32?, **33**

23. Pods, indumentum:
    a. glabrous: 1, 2, 4, 5, 7, **8**, **9**, **10**, 11?, 12?, 13, 14?, **15**, 17, 18, 20? 21, 22, 23, 24, 25?, 26, 27?, **28**, 30, 31, 32?
    b. hairy along the sutures only: 11?, 12?, 14?, **15**, 20?, 25?, 27?, **28**, 32?, 33
    c. with few hairs: 3, 6, **8**, **9**, **10**, 11?, 12?, 14?, 20?, 25?, 27?, 32?
    d. (thinly) sericeous: 11?, 14?, 16, 19, 20?, 25?, 27?, 29, 32?

24. Seeds, shape:
    a. flattened, kidney- or bean-shaped: 1, 5, **6**, 7, 8, 9, 10?, 11?, 12?, 13, 14?, 15, 16, 17, 18, 19, 20?, 22, 23?, 25?, 26, 27?, **29**, 30?, 32?
    b. flattened, ellipsoid: 2, 10?, 11?, 12?, 14?, 20?, 21, 23?, 24, 25?, 27?, 28, **29**, 30?, 31, 32?, 33
    c. lenticular: 3, 10?, 11?, 12?, 14?, 20?, 23?, 27?, 30?, 32?
    d. c-shaped: 4, 10?, 11?, 12?, 14?, 20?, 27?, 30?, 32?
    e. crescent- or halfmoon-shaped: **6**, 10?, 11?, 12?, 14?, 20?, 27?, 30?, 32?

25. Seeds, hilum:
    a. eccentric: 1, 2, 4, 5, 6, 7, 8, 9, 10?, 11?, 12?, 13?, 14?, 15, 16, 17, 18?, 19, 20?, 21, 22, 23?, 24, 25?, 26?, 27?, 28, 29, 30?, 31, 32?, 33
    b. central: 3, 10?, 11?, 12?, 13?, 14?, 18?, 20?, 23?, 25?, 26?, 27?, 30?, 32?

26. Distribution:
    a. Peninsular Malaysia: **2**, **5**, **12**, 14, **15**, **16**, **18**, **22**, **24**, **29**, **33**
    b. Singapore: **5**, **10**, **12**, **15**, **19**, **29**, **33**
    c. Sumatra: **5**, **10**, **15**, **19**, **22**, **24**, **29**
    d. Java: **5**, **15**, 17, **18**, **24**, **28**, **29**, 31
    e. Borneo: **2**, 3, 4, **5**, **6**, **9**, **10**, 11, **12**, **15**, **16**, **19**, **22**, 23, **24**, 27, **28**, **29**, 30, **33**
    f. Philippines: **5**, **6**, 7, **8**, **9**, **19**, 21, **24**, 25, 26, **29**
    g. Celebes: **5**, **15**, **18**, **19**, **24**, **28**, 32
    h. Moluccas: **2**, **5**, **8**, **9**, 13, **15**, **29**
    i. Lesser Sunda Islands: **5**, **24**
    j. New Guinea: 1, **2**, **5**, **8**, **9**, 20, **29**

## ENUMERATION OF SPECIES

### 1. *Dalbergia albertisii* Prain — Fig. 2a

*Dalbergia albertisii* Prain (1901) 62; Verdc. (1979) 293, f. 65D. — Type: *D'Albertis s.n.* (n.v.), Papua New Guinea, Fly River.
*Dalbergia papuana* Pulle (1910) 378. — Type: *Versteeg 1012* (holo L L0772557; iso BO, K, U), Papua, Noord River, in *Rhizophora* forest.

Distribution — *Malesia*: New Guinea: Papua (Mimika, Digul), Papua New Guinea (E Sepik, Western, Gulf Prov.). Also in the Solomon Islands.

Habitat & Ecology — Primary forest, swamp forest, secondary forest at river bank or *Rhizophora* forest near sea shore. Altitude up to 50 m. Flowering: February to May; fruiting: March, May, July, October.

Note — *Dalbergia albertisii* is vegetatively very similar to the Bornean species *D. bintuluensis*, but differs in the number of lateral nerves of the leaflets and in the fruits. When more than one seed develops the pods become articulate; articles ± similar to 1-seeded pods.

### 2. *Dalbergia beccarii* Prain — Fig. 2b

*Dalbergia beccarii* Prain (1901) 64; Verdc. (1979) 293; Sunarno & H.Ohashi (1997) 201. — Type: *Beccarii 566* (holo K), Borneo, Sarawak.
*Dalbergia insularis* Pulle (1910) 377. — Type: *Versteeg 1117* (holo L L0281366; iso BO, K), Papua, Bivak.
*Dalbergia novoguineensis* Merr. & L.M.Perry (1942) 402. — Type: *Brass 1031* (holo A n.v.; iso K, L), Papua New Guinea, Maira, Vailala River.

Distribution — *Malesia*: Peninsular Malaysia, Borneo, Moluccas, New Guinea; Solomon Islands.

Habitat & Ecology — Usually in swampy forest on river edges, margins of monsoon forests on river bank, beach and mangrove forest along tidal rivers, roadsides. Soil: alluvial soils, dark grey silt. Altitude up to 30 m. Flowering: January to October; fruiting: January to November.

Note — The fruits are rather similar to those of *D. albertisii*, only somewhat thinner. Sometimes the fruits of *D. beccarii* have lenticels just like those of *D. albertisii*.

### 3. *Dalbergia bintuluensis* Sunarno & H.Ohashi — Fig. 2c

*Dalbergia bintuluensis* Sunarno & H.Ohashi (1997) 202. — Type: *S 15593 (I. Paie)* (holo L L0599660; iso BO, K), Sarawak, Bintulu, Segan Forest Reserve, Nov. 1961.
*Dalbergia kostermansii* Sunarno & H.Ohashi (1997) 209. — Type: *Kostermans 6129* (holo L; iso BO, K), Borneo, Central Kutei.

Distribution — Borneo: Brunei, Sarawak, Kalimantan.

Habitat & Ecology — Primary forest, primary heath forest, secondary forest. Soil: grey silt, loam or yellow rich soil. Altitude up to 250 m. Flowering: October, November; fruiting: Augustus, November.

Note — Structure of mesocarp of the pods ± parenchymatous. According to Sunarno & Ohashi (1997) *D. bintuluensis* and *D. kostermansii* are different in the number of leaflets (3 or 5/5 or 7), the apex of the acumen (retuse/slightly apiculate) and the size of the pods (5–6 cm/3–4 cm). However, the number of leaflets overlap, the apex of the acumen is variable in shape: in both species ± retuse to ± apiculate. The pods of *D. kostermansii* seem to be young without developed seeds, mature pods may be longer than 3–4 cm. The differences are too small to keep the two apart.

### 4. *Dalbergia borneensis* Prain — Fig. 3a

*Dalbergia borneensis* Prain (1901) 44; (1904) 75, t. 57; Sunarno & H.Ohashi (1997) 203. — Lectotype (here designated): *Haviland 2889* (K K000264322; iso L L05999659), Borneo, Sarawak, Kuching.

Distribution — Borneo: Brunei, Sarawak, Kalimantan.

Habitat & Ecology — Rubber plantation along road, secondary forest. Altitude up to 80 m. Flowering: March, August; fruiting: April.

Note — Inflorescences and new leaves appear simultaneously. *BRUN 16776* probably belongs to this species, but has slightly wider pods (c. 3 cm wide) than the other fruiting specimens (*Brooke 8306*, *Haviland 2884*: pods 1–1.7 cm wide).

### 5. *Dalbergia candenatensis* (Dennst.) Prain — Fig. 1b, 2g

*Dalbergia candenatensis* (Dennst.) Prain (1901) 49; Merr. (1910) 97; (1923) 294; Backer & Bakh.f. (1964) 614; Verdc. (1979) 295; Sunarno & H.Ohashi (1996) 243; Nyomdham et al. (1997) 45; Sunarno & H.Ohashi (1997) 203; Niyomdham (2002) 130. — *Cassia candenatensis* Dennst. (1818) 32. — Karin-Tagera, Rheede (1686) 45, t. 25. — Type: Rheede (1686) 45, t. 25.
*Dalbergia monosperma* Dalzell (1850) 36; Benth. (1852) 256; Miq. (1855) 132; Benth. (1860) 48; Naves & Fern.-Vill. (1880) 67; Perkins (1904) 82. — Type: *Dalzell s.n.* (K), East India, Malvan Province, Bombay.
*Dalbergia torta* Graham ex A.Gray (1854) 458, nom. nud.
*Dalbergia torta* Graham ex Prain (1897a) 120; (1904) 64, t. 42; Ridl. (1922) 591. — Syntypes: *Wall. Cat. 5873A* (CAL, K), Penang & Singapore; *Wall. Cat. 5873B* (K), Hb, Finlayson, without locality.

Distribution — India, Ceylon to S China, Cambodia, Vietnam, Thailand, throughout *Malesia*, N Australia, Solomon Islands, Fiji Islands, New Caledonia.

Habitat & Ecology — Mostly coastal: mangrove, beaches, beach forest, river banks, along roads. Soil: sand, limestone, yellowish soil. Altitude up to 200 m. Flowering: throughout the year; fruiting: February to October, December.

Notes — *Dalbergia torta* Graham was used by Gray (1854) for a specimen from Fiji, however, without describing the species. Gray gives *Wall. Cat. 5789* as the specimen bearing this name. This is, however, according to Prain (1904) an uncorrected typographical error. *Wall. Cat. 5789* is the number given to a set of specimens named *Bauhinia* spec. None of these specimens is associated with *D. torta*.

*Dalbergia torta* was described by Prain (1897) who attributed the name to Graham and gives as specimen *Wall. Cat. 5873*. This specimen clearly was given the name *Dalbergia torta*. As Prain (1897) indicates the wrong catalogue number was used by Bentham (1852, 1860), Miquel (1855) and Baker (1879). For *D. torta* Graham ex Prain *Wall. Cat. 5873* is the only candidate as type specimen. However, this Wallich Catalogue number consists of several parts coming from at least two localities. *Wall. Cat. 5873* consists of two parts labelled a (A) and b (B). *Wall. Cat. 5873A* consists of four sheets (3 in K, 1 in CAL) with in total 13 twigs coming from two localities: Penang and Singapore; *Wall. Cat. 5873B* consists of a single sheet from the herbarium of Finlayson (K) without a locality. For *Wall. Cat. 5873* Bentham (1860, sub. *D. monosperma*) and Prain (1897,

as *D. torta*) give Penang as locality, while Ridley (1922, as *D. torta*) gives Singapore as locality. It is, however, impossible to tell which twigs were collected in Penang and which in Singapore. We refrain from selecting a lectotype.

### 6. *Dalbergia canescens* (Elmer) Merr.

*Dalbergia canescens* (Elmer) Merr. (1923) 294; Sunarno & H.Ohashi (1997) 203. — *Derris canescens* Elmer (1919) 3087; Adema (2003b) 408. — Type: *Elmer 17883* (BO, CAL, K, L L0475194, U), Philippines, Luzon, Laguna, Los Baños, Mt Maquiling, 1917.

Distribution — *Malesia*: Borneo (Sabah), Philippines (Luzon, Palawan).

Habitat & Ecology — Forests. Altitude up to 1000 m. Flowering: June, July, September; fruiting: September.

Note — The indumentum is scraggy, ± villous to pubescent or sericeous, with sinuous hairs from ± patent to ± appressed, rusty brown when dry. Young fruits have thinly puberulous stipes and sometimes some hairs at the valves. *BNBFD 9202 (Keith)* probably belongs here. Young flowers have calyces 2–2.5 mm long. *Soejarto & Fernando 7479* is mostly similar to *D. canescens*. Most obvious differences are in the size of calyx and calyx teeth, however, this specimen is in fruit and the calyx is probably slightly larger than that of flowering specimens. *PPI 1294 (Stone et al.)* probably belongs here. However, this specimen has some hairs at the outside of the standard and some hairs at ovary and stipe.

### 7. *Dalbergia cumingiana* Benth. — Fig. 2d

*Dalbergia cumingiana* Benth. (1852) 255; Miq. (1855) 129; Naves & Fern.-Vill. (1880) 67; Prain (1904) 34, t. 7; Merr. (1910) 98; (1923) 294. — *Dalbergia cumingii* Benth. (1860) 32. — Type: *Cuming 1244* (holo ?; iso E, L, K00264318, 00264319, L 0773660, 0774661, 0773662, 0773663, OXF), Philippines, Luzon, North Ilocos, Albay Prov.

Distribution — Philippines (Luzon, Leyte, Mindanao, Samar).

Habitat & Ecology — Edge of mangrove. Soil: clayey loam. Flowering: January, March, April, June, Augustus; fruiting: May to Augustus.

Note — Bentham (1860) repeated the description of 1852 accidentally naming the species *D. cumingii*. *PPI 2054* belongs here, however, on the label it is described as a 4 m high tree. A specimen identified by Fernandez-Villar (in Naves & Fernandez-Villar 1880) as *D. zollingeriana* Miq. probably belongs here (see also the notes under *D. parviflora*).

### 8. *Dalbergia densa* Benth. — Fig. 3b

*Dalbergia densa* Benth. (1843) 217; (1852) 255; Miq. (1855) 123; Benth. (1860) 43; Prain (1904) 73, t. 53, 54; Merr. (1923) 295; Verdc. (1979) 295. — Lectotype (here designated): *Hinds s.n.* (BM? n.v.; iso K), New Guinea.
*Dalbergia densa* Benth. var. *typica* Prain (1904) 73, t. 53, nom. illeg.
*Dalbergia densa* Benth. var. *australis* Prain (1904) 73, t. 54. — Type: not indicated.

Distribution — *Malesia*: Philippines, Moluccas, New Guinea; N Australia.

Habitat & Ecology — Primary or secondary forests, in fringe vegetation, in sago palm swamp along rivers, in drier areas usually in woodland or eucalyptus savannah, *Castanopsis-Auracaria* forest. Altitude up to 1000 m. Flowering: February, March, June to Augustus; fruiting: March, October, November.

Uses — In the Philippines the bark is applied to relieve internal pains.

Notes — Bentham (1843) based his species on two specimens: *Hinds s.n.* and *Barclay s.n.* In 1860 he only cites the Hinds specimen. Verdcourt (1979) took this specimen for the type. Here we select *Hinds s.n.* as the lectotype.

Prain (1904) distinguished two varieties, one ('*typica*') with few, larger leaflets and hairy ovaries, one ('*australis*') with more, smaller leaflets and glabrous ovaries. In a note he remarks: "The specimens from German New Guinea are, however, very nearly intermediate between those of Australia and those of the Moluccas." Bentham (1860) described the Australian specimens of *D. densa* in a similar way as he did when he described the species in 1843 and notes: "The Australian specimens have rather more leaflets than the New Guinea ones, but do not otherwise differ". Verdcourt (1979) give both varieties of Prain for New Guinea with only the number and size of the leaflets as differences. In these characters there is a large overlap. *Dalbergia densa* is a rather variable species, especially in number and size of leaflets and in the indumentum of various organs: the upper surface of leaflets may be glabrous to rather densely sericeous, calyces may be glabrous or ciliate at the teeth or with few to several hairs mainly in the middle part of the teeth, ovaries and stipes are usually sericeous, but may be glabrous, pods are often glabrous, but may have some hairs at stipe and sutures. However, there is no constant combination of characters and specimens with larger leaflets occur here and there in the distribution range. It is better to see this taxon as a variable species and forget about the varieties.

### 9. *Dalbergia ferruginea* Roxb. — Fig. 2i

*Dalbergia ferruginea* Roxb. [(1814) 98]; (1832) 228; Miq. (1855) 133; Prain (1901) 55; (1904) 101, t. 86; Merr. (1923) 295; Verdc. (1979) 296; Sunarno & H.Ohashi (1996) 243; (1997) 208. — Type (see Forman 1997): *Roxburgh 276/2584* (BR, BR511085), Malay Island.
*Dalbergia luzoniensis* Vogel (1843) 33; Miq. (1855) 133; Benth. (1860) 48. — *Dalbergia limonensis* [Vogel (1843) 33]; Benth. (1852) 256. — Type: *Meyen s.n.* (n.v.), Philippines, Luzon.
*Dalbergia rivularis* Merr. & L.M.Perry (1942) 402. — Type: *Brass 14080* (iso K, L L0773483), Papua, Idenburg River, Bernhard Camp, Apr. 1939.
*Dalbergia ferruginea* Roxb. var. *daronensis* Elmer (1910) 699. — Type: *Elmer 11030* (iso L L0773552), Philippines, Mindanao, Todaya, May 1909.
*Dalbergia lanceolaria* auct. non L.: Span. (1841) 197.
*Dalbergia stipulacea* auct. non Roxb.: Baker (1879) 237; Fern.-Vill. (in Naves & Fern.-Vill. 1880) 67; S.Vidal (1886) 111; Warb. (1891) 329.

Distribution — *Malesia*: Borneo (Sabah), Philippines, Moluccas, New Guinea; Carolines (Yap), N Australia, Solomon Islands.

Habitat & Ecology — Primary, secondary, disturbed, or savannah forest, sometimes beach forest, thickets, along rivers or paths, in river plains or flooded forest. Altitude up to 600 m. Soil: limestone, yellow clay, clayey soil, loam. Flowering and fruiting: throughout the year.

Note — Thinner branches are sometimes twisted into hooks. Flowering and fruiting may happen at the same plant at the same time (the specimens with larger inflorescences?).

### 10. *Dalbergia havilandii* Prain

*Dalbergia havilandii* Prain (1901) 45; (1904) 60, t. 35B; Sunarno & H.Ohashi (1997) 208. — Lectotype (Sunarno & Ohashi 1997): *Haviland 2894* (K000555796; iso K000555795), Borneo, Sarawak, near Kuching, Apr. 1893.

Distribution — *Malesia*: Sumatra, Singapore, Borneo.

Habitat & Ecology — Kerangas forest or swamp forest. Altitude up to 100 m. Soil: sand, sandstone, peat. Flowering: April, June; fruiting: March.

Note — Prain described the species as a tree. However, most specimens that probably belong here are lianas. The lower surface of the leaflets has rather obvious papillae. Sunarno & Ohashi (1997) named *Haviland 2894* as lectotype of *D. havilandii*. However, in the Kew Herbarium Sunarno put a type label on *Haviland 2895*. This mistake has been corrected by labelling *Haviland 2894* as lectotype and *Haviland 2895* as paratype.

**11. *Dalbergia hoseana*** Prain

*Dalbergia hoseana* Prain (1904) 67, t. 45; Sunarno & H.Ohashi (1997) 208. — Lectotype (designated here): *Haviland & Hose 3375* (K K000680040; iso K, 2 sheets, L L0018907, L0018908, P03105312), Borneo, Sarawak.

Distribution — Borneo (Sarawak).

Note — Only known from the type collection. Usually 1–2 racemes per axil.

**12. *Dalbergia hullettii*** Prain

*Dalbergia hullettii* Prain (1897) 119; (1904) 59, t. 35A; Ridl. (1922) 590; Sunarno & H.Ohashi (1997) 208. — Type: *Hullett 626* (SING? n.v.), Singapore.

Distribution — Peninsular Malaysia, Singapore, Borneo (Sarawak, Kalimantan).

Habitat & Ecology — Heath or swamp forest. Soil: rocky sandstone. Flowering: February, September; fruiting: March.

Note — The inflorescences are often clustered. Only young leaves are present in the known specimens. Ashton collected old leaves (leaflets) from below the specimen *S 21455 (P.S. Ashton)*: ovate or broadly elliptic, 40–50 by 25–27 mm, index 1.0–1.6, base broadly cuneate, apex rounded, ± emarginate, above glabrous, below thinly sericeous (and with papillae), midrib flat or slightly sunken, nerves flat, 6 per side, 3–10 mm apart. These leaves (leaflets) may not belong to *D. hullettii*.

**13. *Dalbergia jaherii*** Burck ex Prain

*Dalbergia jaherii* Burck ex Prain (1901) 47; Prain (1904) 71, t. 50. — Lectotype (here designated): *Jaheri 294* (BO), Key Isl.

Distribution — *Malesia*: Moluccas, Key Islands.

**14. *Dalbergia johorensis*** Sunarno & H.Ohashi

*Dalbergia johorensis* Sunarno & H.Ohashi (2002) 117. — Type: *Teruya 1192* (holo BO; iso SING), Peninsular Malaysia, Johore.

Distribution — *Malesia*: Peninsular Malaysia (Johore), Borneo (Sarawak).

Habitat & Ecology — Roadside thickets. Flowering: February, September.

**15. *Dalbergia junghuhnii*** Benth. — Fig. 1a, 3c

*Dalbergia junghuhnii* Benth. (1852) 254; (1860) 33; Prain (1897) 115; (1904) 40, t. 14; Backer & Bakh.f. (1964) 614; Sunarno & H.Ohashi (1997) 209. — Type: *Junghuhn 233* (holo K K000827952; iso L), Sumatra.

*Dalbergia frondosa* Roxb. forma *minor* Miq. (1855) 134. — *Dalbergia phyllanthoides* Blume ex Prain (1901) 60; (1904) 44, t. 19; Ridl. (1922) 590. — Lectotype (here designated): *Blume s.n.* (L L0773379), Java.

*Dalbergia subsympathetica* Prain (1897) 116. — Lectotype (here designated): *King's coll. 3562* (K K000827943; iso L L0773398), Perak, Larut.

*Dalbergia junghuhnii* Benth. var. *scortechinii* Prain (1897a) 115; (1897b) 444. — *Dalbergia scortechinii* (Prain) Prain (1901) 57; Prain (1904) 40, t. 15; Ridl. (1922) 589; Sunarno & H.Ohashi (1997) 218. — Lectotype (here designated): *Scortechini 1830* (K K000680046), Malacca.

*Dalbergia curtisii* Prain (1901) 58; (1904) 41, t. 16; Ridl. (1922) 589. — Lectotype (here designated): *Curtis 812* (K K000680047), Penang.

*Dalbergia stercoracea* Maingay ex Prain (1901) 58; (1904) 42, t. 17; Ridl. (1922) 589. — Lectotype (here designated): *Maingay 547/2* (K K000827944 left-hand specimen), Malacca.

*Dalbergia frondosa* auct. non Roxb.: Miq. (1855) 133.

Distribution — Thailand; *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Java, Borneo, Celebes, Moluccas (Aru islands).

Habitat & Ecology — Primary or secondary forest, along rivers, forest margins, grass fields, dry area, or top of limestone hills. Soil: sandy loam, sandstone, limestone. Altitude up to 800 m. Flowering: January to September, December; fruiting: June, July, October, November.

Notes — In open areas often a scandent shrub or small tree, usually not taller than 10 m, in denser vegetation a large climber up to 35 m high. A rather variable species, especially variable in size and indumentum of leaflets and size of inflorescences. Although fruiting specimens may have well developed pods, the seeds are often not mature.

*Dalbergia junghuhnii* var. *scortechinii* was based on *Curtis 1437*, *Scortechini 1830*, *Maingay 549* and *Ridley 6406*. *Scortechini 1830* is chosen as the lectotype. All specimens belong to *D. junghuhnii*. *Dalbergia stercoracea* was described on specimens collected by Maingay, Mueller, Derry, Hullett, Ridley and Korthals, all cited without numbers. In Kew *Maingay 547/2* was labelled as type specimen. Here we select this specimen as lectotype. However, *Maingay 547/2* consists of several specimens, only those with small leaflets belong to *D. junghuhnii*; those with large leaflets belong to an unidentified species. The lectotype is the left-hand specimen mounted on a sheet together with *Maingay 1622* (right-hand specimen also *D. junghuhnii*).

Several specimens with obcordate or obcordate-elliptic leaflets with deeply emarginate apices have been included in *D. junghuhnii*: *Kostermans s.n.*, Java, Udjung kulon, Peutjang Isl.; *Maxwell 81-22*, Singapore, Lazarus Isl.; *Maxwell 81-94*, Singapore. The last two specimens are almost totally glabrous. *Nooteboom 6113*, Aru Archipelago, Kobroor, has been included here.

Spines were observed in the specimens *SAN 44057*, *48584*, *122728*.

**16. *Dalbergia kunstleri*** Prain — Fig. 2e

*Dalbergia kunstleri* Prain (1897a) 121; (1904) 104, t. 90; Ridl. (1922) 592. — Lectotype (here designated): *King's coll. 4736* (K K000555797), Peninsular Malaysia, Perak.

*Dalbergia falcata* Prain (1901) 65; (1904) 104, t. 89; Sunarno & H.Ohashi (1997) 206, f. 5. — Lectotype (here designated): *Beccari 4027* (K K000827987), Borneo, Sarawak, Bintulu.

Distribution — Peninsular Malaysia (Perak), Borneo.

Habitat & Ecology — Primary forest along rivers. Altitude up to 300. Soil: limestone. Flowering: January, April, September; fruiting: February, Augustus.

Notes — Prain based *D. kunstleri* on two specimens (*King's coll. 4736*, *7067*). In Kew *King's coll*. *4736* was noted as 'type specimen', however, a lectotype should have been chosen. Here we select this collection as lectotype of *D. kunstleri*. Sunarno & Ohashi (1997) give *Beccari 4027* as the type of *D. falcata*, however, they should have selected a lectotype. This is corrected here.

The differences between the Bornean *D. falcata* and the Malaysian *D. kunstleri* are very small. They are mainly found in some measurements. We think that these differences are too small to keep the species apart. Sunarno & Ohashi (1997) remarked that the flowers of *D. falcata* (*Hose 578*, *BRUN 5556*) are similar to the flowers described by Prain for *D. kunstleri*.

**17. *Dalbergia latifolia*** Roxb. — Fig. 3d

*Dalbergia latifolia* Roxb. (1799) 7; (1832) 221; Benth. (1852) 254; Miq. (1855) 128; Benth. (1860) 38; Prain (1904) 80, t. 62; Backer & Bakh.f. (1964) 615. — Type: *Roxburgh s.n.* (BR BR519457), India.

*Dalbergia javanica* Miq. (1855) 132; Benth. (1860) 38. — Type: *Horsfield s.n.* (L31, K K000827985 ), Java, Soerakarta.

Distribution — India; *Malesia*: Java. Also cultivated in Java, Borneo, Philippines (Luzon), Lombok, Sumbawa.

Habitat & Ecology — Djati forests. Altitude up to 500 m. Soil: loam on limestone. Flowering: February, September to November; fruiting: October.

Uses — The wood is used for furniture, flooring, panelling, sporting goods, musical instruments, carving, etc. In Java the

wood is classified as a luxury wood just after teak wood. *Dalbergia latifolia* is suitable as a wayside tree or as an ornamental. It also provides good fuel wood.

Note — Bracts and bracteoles are very early caducous. Bracteoles may have a few cilia at the apex.

### 18. *Dalbergia menoeides* Prain — Fig. 2h

*Dalbergia menoeides* Prain (1897a) 120; (1897b) 453; (1904) 64, t. 41; Ridl. (1922) 591; Backer & Bakh.f. (1964) 614; Niyomdham (2002) 145. — Type: *Scortechini 1392* (K), Perak, Krian.

Distribution — Thailand; *Malesia*: Peninsular Malaysia (Perak), Java, Celebes (Talaud).

Habitat & Ecology — Mangrove or fresh water swamps, along rivers, near sea, in brackish water in muddy places. Altitude up to 1 m. Flowering and fruiting: February, April, May.

Note — The fruits are similar to those of *D. candenatensis*. The latter species differs greatly in its leaflets and the size of the fruits. A rare species with a disjunct distribution. The specimen from Talaud (*Lam 2510a*) differs in its more patent indument (twigs, petioles, rachises, midribs). Its pods, however, are very similar to those of the type specimen as depicted by Prain (1904, t. 41). Niyomdham (2002) records the species for Central Thailand, Bangkok.

### 19. *Dalbergia mimosella* (Blanco) Prain — Fig. 3e

*Dalbergia mimosella* (Blanco) Prain (1904) 42; Merr. (1918) 184; (1923) 295; Sunarno & H.Ohashi (1996) 244; (1997) 211. — *Amerimnon mimosella* Blanco (1837) 563; (1845) 393; (1879) 358. — Neotype (here designated): *PNH 28968 (Ramos & Edaño)* (L L0773264), Luzon, Prov. Tayabas, Umiray.
*Dalbergia minahassae* Koord. (1898) 430; (1922a) pl. 15; (1922b) 9. — Type: *Koorders 17701β* (holo BO?; iso L L0773258), Celebes, Minahasa.
*Dalbergia davaoensis* Elmer (1910) 700. — Lectotype (here designated): *Elmer 10551* (L L0773269; iso K, U), Mindanao, Distr. Davao, Todaya (Mt Apo).
*Dalbergia lanceolaria* auct. non L.f.: Llanos (1858) 502; Fern.-Vill. (in Naves & Fern.-Vill. 1880) 67, 103.

Distribution — *Malesia*: Singapore, Sumatra, Borneo, Philippines, Celebes.

Habitat & Ecology — Primary or secondary forests, disturbed riverine forest, river banks. Altitude 200–1200 m. Flowering: January, April to July, October to November; fruiting: May to September.

Uses — The wood is used as building material. The roots are used for handles of balos and other tools.

Notes — As far as we know there is no extant material of this species collected or seen by Blanco. Merrill (1918) did not collect a representative specimen. A neotype has been chosen collected on Luzon, the same general area from where Blanco described his *Amerimnon mimosella*. Koorders (1898) indicated a specimen he collected in the Minahasa in his original description of *D. minahassae*. Later on he gave the number of this collection as *Koorders 17710β* (Koorders 1922b). Elmer (1913) gives a flowering and a fruiting specimen as 'Type specimen' of *D. davaoensis* (*Elmer 10551*, *11925*) suggesting that they came from the same tree. *Elmer 10551*, the flowering one, has been selected as the lectotype. Gray (1854) named a specimen collected by the U.S. Exploring Expedition '*Dalbergia cassioides* Wall.', citing Bentham (1852) as a reference. According to Merrill (1923) this specimen belongs to *D. mimosella*. Neither Wallich nor Bentham (1852) described *D. cassioides*.

The stipules are early caducous. Specimens with very young leaves (*De Wilde & De Wilde-Duyfjes 12479*, *13883*, *FB 27481*, *PNH 12142*, *17734*, *PPI 18760*) clearly show peltate stipules.

### 20. *Dalbergia minutiflora* Sunarno & H.Ohashi, *sp. nov.* — Fig. 4

Similar to *D. rostrata*, but with much smaller flowers. Standard: claw 1.1–2.0 mm long; blade 2–2.5 by 2 mm. Wings: claw 1.4–2.0 mm long; blade 2.0–2.2 by 1.0–1.5 mm. Keel petals: claw 1.7–2.0 mm long; blade 2.0–2.9 by 1.0–1.5 mm. — Type: *Sunarno 621* (holo BO; iso TUS), Irian Jaya, Upwapa district, Topo area, Nabire, Feb. 1986.

*Dalbergia simplicifolia* auct. non Merr.: Kaneh. & Hatus. (1942) 364; Verdc. (1979) 297.
*Dalbergia rostrata* auct. non Hassk.: Verdc. (1979) 297.

Woody climber up to 25 m high. *Twigs* c. 3 cm diam, sparsely white pubescent, glabrescent. *Stipules* falcate, c. 1 by 1 mm, outside sericeous, inside glabrous, very early caducous. *Leaves* with 1–5 leaflets. *Petiole* 1–3 cm long, terete, striate, thinly sericeous; rachis mostly as the petiole, up to 7 cm long; pulvinus 2–4 mm long. *Leaflets*: terminal elliptic to ovate, 6–15.5 by 3–7 cm, index 1.7–2.2, base cuneate to slightly cordate or truncate, apex acuminate, acumen 5–20 mm long, above glabrous, below thinly sericeous, glabrescent, midrib slightly sunken or flat above, nerves flat above, 5–13 per side, 1–20 mm apart; lateral mostly as the terminal, 3–8 by 2–4.5 cm, index 1.6–1.9, base equal-sided; pulvinus 3–5 mm long. *Inflorescences* axillary or terminal, racemes or panicles, 1–6 cm long, peduncle up to 5 mm long, sericeous, branches 3–30 mm long. *Bracts* to the flowers broadly ovate, 1.1–2 by 0.3–1.5 mm, outside sericeous, inside glabrous, caducous. *Pedicels* 1–3 mm long, pubescent. *Bracteoles* narrowly ovate to linear or acicular, 0.3–1 by 0.1 mm, outside sericeous, inside glabrous. *Calyx* bell-shaped, 2.3–3 mm long, tube 1.7–2 mm long; teeth of upper lip triangular, 0.4–0.5 by 0.8–1.2 mm, lateral teeth triangular, 0.7 by 0.6–0.8 mm, median tooth triangular, 0.8 by 0.7 mm; outside sericeous, inside glabrous. Corolla white. *Standard*: claw 1.1–2 mm long; blade broadly elliptic, 2–2.5 by 2 mm, rounded to emarginate, both sides glabrous. *Wings*: claw 1.4–2 mm long; blade elliptic, 2–2.2 by 1–1.5 mm, rounded, both side glabrous, outside sculpted. *Keel petals*: claw 1.7–2.0 mm long; blade boat-shaped, 2–2.9 by 1–1.5 mm, rounded, both sides glabrous. *Stamens* 9–10, monadelphous, open sheath, tube 2.5–3 mm long, free part of filaments 1.0–1.5 mm long, glabrous; anthers 0.2 by 0.2 mm, glabrous. *Ovary* 1–1.5 mm long, sericeous, stipe 1–1.5 mm long, sericeous in upper part; ovules 1 or 2; style c. 1.5 mm long, glabrous.

Distribution — *Malesia*: New Guinea: Irian Jaya.

Habitat & Ecology — Lowland and lower mountain forest, usually primary forest, fringe vegetation, river banks. Soil: loam. Flowering: February, April, July, September.

Note — Older branches have leaves with 3 or 5 leaflets, most flowering twigs have unifoliolate leaves. Leaflets often dry blackish or brown. Up to now only known from flowering specimens. Rather similar to *D. rostrata*, especially different in sizes of flowers and flower parts.

### 21. *Dalbergia multifoliolata* Adema, *nom. nov.*

*Dalbergia polyphylla* Benth. (1852) 256, nom. illeg., non Poir. (1812); Miq. (1855) 132; Benth. (1860) 44; Fern.-Vill. (in Naves & Fern.-Vill. 1880) 67; Prain (1901) 48; (1904) 70, t. 49; Merr. (1923) 296. — Type: *Cuming 1164* (holo K K000680044; iso BM, K K000680044, L, OXF), Philippines, Luzon.

Distribution — Philippines (Luzon).

Habitat & Ecology — Thickets or secondary forests. Flowering: February, March; fruiting: March, April, June.

Note — *Dalbergia polyphylla* Benth. (1852) is antedated by *D. polyphylla* Poir. (1812 = *Sesbania platycarpa* Pers.). This necessitates a new name. Bentham (1852) gives a Cuming specimen from the Philippines and a Champion specimen from China for his *D. polyphylla*. Later he moved the Champion

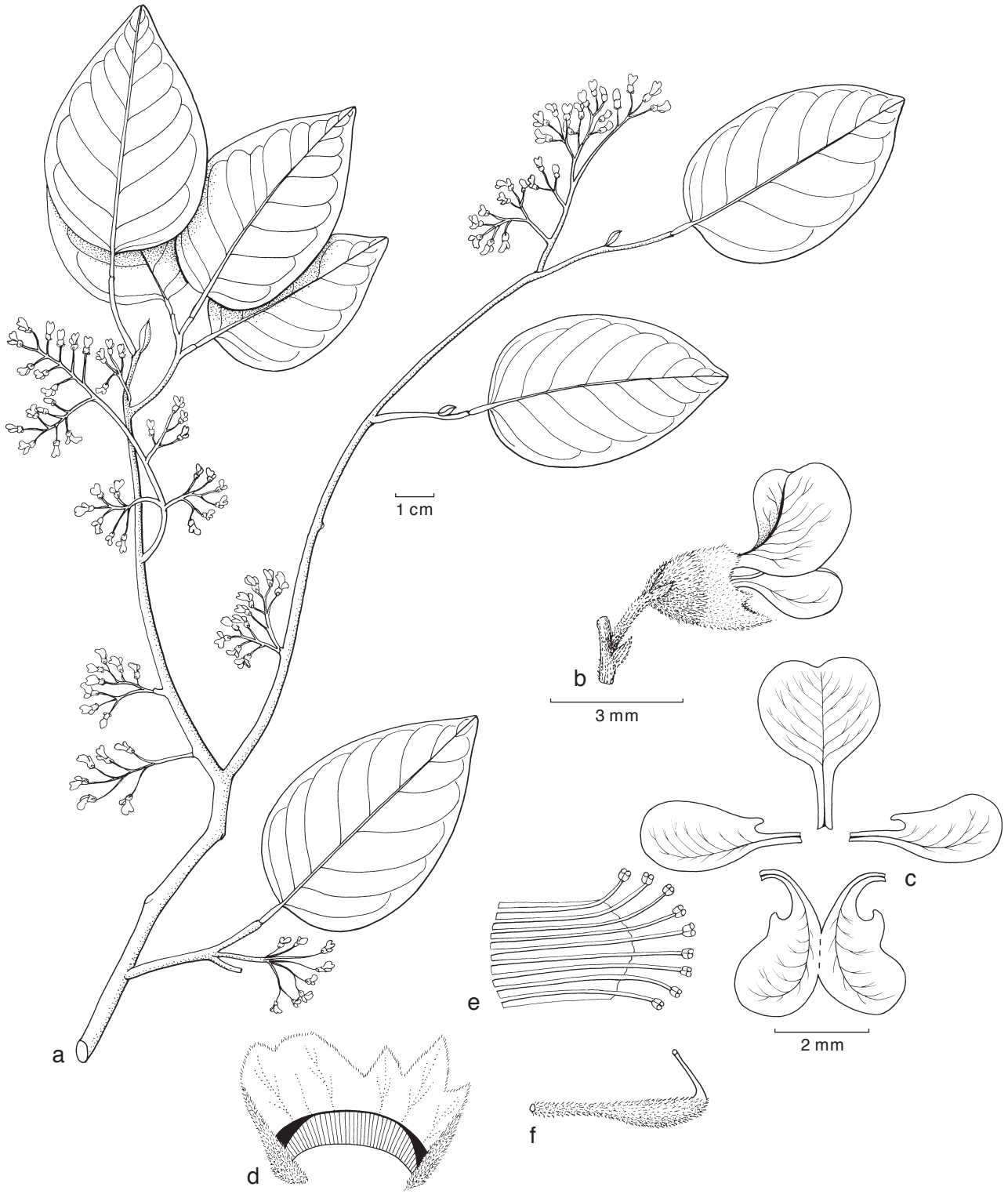


**Fig. 4** *Dalbergia minutiflora* Sunarno & H.Ohashi. a. Habit; b. flower; c. opened calyx; d. corolla parts (top to bottom: standard, wings, keel); e. stamens; f. pistil (all: *Sunarno 621*). — Drawing by Bambang Sunarno.

specimen to his new species *D. millettii* Benth. (Bentham 1860) effectively making the Cuming specimen (*Cuming 1164*) the type of *D. polyphylla*. The venation at the lower surface of the leaflets is blackish in colour.

### 22. *Dalbergia parviflora* Roxb. — Fig. 2f

*Dalbergia parviflora* Roxb. [(1814) 98]; (1832) 225; Miq. (1855) 132; Benth. (1860) 33; Prain (1897a) 121; (1904) 34, pl. 8; Ridl. (1922) 589; Sunarno & H.Ohashi (1997) 211. — Type: *Roxburgh s.n.* (BR BR511913, ?Moluccas?) [*Lacca lignum* Rumph. (1750) 17, t. 13] See Merr. (1917) 270.

*Dalbergia zollingeriana* Miq. (1855) 130. — *Dalbergia cumingii* Benth. var. *zollingeriana* (Miq.) Benth. (1860) 32. — *Drepanocarpus cumingii* (Benth.) Kurz (1876) 282. — Type: *Zollinger 3041* (holo BM), Sumatra.

*Dalbergia forbesii* Prain (1901) 61; (1904) 38, pl. 12. — Type: *Forbes 3216* (K, BM, L L0281326), Sumatra.

Distribution — Thailand; *Malesia*: Sumatra, Peninsular Malaysia, Borneo.

Habitat & Ecology — Primary and secondary forest, dry hill forest, along rivers and sea shores, fresh water swamp. Soil: rich yellow soils, clay, loam and alluvial soils. Altitude up to 900 m. Flowering: February to June, October, November; fruiting: January, April to November.

Notes — In more open vegetation often a shrub, in denser vegetation when enough support is available it develops into a large liana. In the pods some kind of 'seed chamber' seems to be present. In L there is one collection from Java, however, this may be a mislaid part of the Teysmann collection of Sumatra.

*Dalbergia zollingeriana* was mentioned by Fernandez-Villar (in Naves & Fernandez-Villar 1880) for the Philippines. *Dalbergia parviflora*, of which *D. zollingeriana* is a synonym, does not occur in the Philippines. The specimen mentioned by Fernandez-Villar probably belongs to *D. cumingiana*.

Spines were observed in the specimens *FMS 29607; SAN 22932*, *128781*, *Van Balgooy 7174*.

### 23. *Dalbergia pilosa* Adema, *sp. nov.*

In some aspects similar to other rather hairy species, like *D. canescens*, *D. densa*, *D. velutina*. However, *D. pilosa* differs in the inflorescences, that are raminascent or in the axils of just emerging leaves, the pedicels that are rather long (5–7 mm) and the slightly larger calyces (4.5–5.5 mm long) that are tomentose outside. — Type: *Ridley 12266* (holo K; iso SING), Sarawak, Matang, Aug. 1890.

*Twigs* terete, 3–5 mm diam, tomentose. *Leaves* with 7–9 leaflets. *Stipules* ovate, 9–11 by 4–4.5 mm, outside tomentose, inside glabrous. *Petiole* terete, 2.8–3 cm long, tomentose; rachis mostly as the petiole, 10–14.2 cm long; pulvinus 4–6 mm long. *Leaflets*: terminal elliptic, 8.2–9 by 3.1–3.2 cm, index 2.6–2.8, base cuneate, apex obtuse or rounded, apiculate, above thinly sericeous, below tomentose, midrib slightly sunken above, nerves flat above, 6–9 per side, 1–2 mm apart; lateral mostly as the terminal, ovate or elliptic, 4.8–7.7 by 1.8–3.4 cm, index 2.2–2.6, slightly oblique or equal-sided; pulvinus 2–5 mm long. *Inflorescences* raminascent, racemes or panicles, 4.5–7.5 cm long, peduncle 0.7–1.5 cm long, tomentose, branches 2–2.5 cm long. *Bracts* to the branches ovate, 3–5 by 2 mm, outside (thinly) tomentose, inside glabrous. *Bracts* to the flowers elliptic or narrowly ovate, 3.5–3.9 by 0.9–1.0 mm, outside tomentose, inside glabrous. *Pedicels* 5–7 mm long, ± tomentose. *Bracteoles* ± linear, 2.0–2.3 by 0.3–0.5 mm, outside tomentose, inside glabrous. *Calyx* 4.5–5.5 mm long, tube 3.5–4.5 mm long; teeth of upper lip triangular, 0.6–1.1 by 1.5–2.0 mm, lateral teeth triangular, 0.6–1.0 by 0.6–1.0 mm, median tooth triangular, 1.0–1.4 by 1.0–1.4 mm; outside tomentose, inside mostly glabrous, teeth inside with some hairs to tomentose. *Standard*: claw 2.5–3.0 mm long; blade ± orbicular, 2.5 by 2.5–3.0 mm, rounded, both sides glabrous. *Wings*: claw 3 mm long; blade broadly elliptic, 2.5 by 1.5–2.0 mm, rounded, auricles 0.2–0.6 mm long, both sides glabrous, outside sculpted. *Keel petals*: claw 2.5–2.7 mm long; blade boat-shaped, 2.5 by 1.5–1.6 mm, rounded, auricles 0.5 mm long, both sides glabrous. *Stamens* 9, monadelphous, open sheath, 5.2–6 mm long, tube 3.3–4.0 mm long, free part of filaments1–2 mm long, glabrous; anthers c. 0.1 by 0.2 mm, glabrous. *Ovary* glabrous or with few hairs at the upper suture, stipe glabrous; ovules 2; style glabrous. *Pods* broadly strap-like, ± membranous, transparent, 6.8 by 1.7 cm, valves 0.1 mm thick, glabrous. *Seeds* immature.

Distribution — Borneo: Sabah (Mt Kinabalu), Sarawak (Matang).

Habitat & Ecology — Altitude c. 1000 m. Flowering: March; fruiting: Augustus.

*Specimens studied*. Borneo, *SF 26652 (Carr)*, Sabah, Mt Kinabalu, Menetdok, c. 3000 ft, 20 Mar. 1933; *Ridley 12266*, Sarawak, Matang, Aug. 1890.

Note — The label information is rather scanty, details about habit and (flower) colours are lacking. The Ridley specimen has rather young leaves and old flowers, the Carr specimen has not fully developed fruits with immature seeds.

### 24. *Dalbergia pinnata* (Lour.) Prain — Fig. 1c, 3f

*Dalbergia pinnata* (Lour.) Prain (1904) 48; Merr. (1910) 96; (1923) 296; Backer & Bakh.f. (1964) 614. — *Derris pinnata* Lour. (1790) 432. — Type: *Loureiro s.n.* (BM BM000958709 n.v.), Cochinchina.

*Dalbergia tamarindifolia* Roxb. [(1814) 53, nom. nud.]; (1832) 233; Wight (1840) t. 242; Miq. (1855) 131; Benth. (1860) 44; Fern.-Vill. (in Naves & Fern.-Vill. 1880) 67; Prain (1897a) 117; (1904) 69, pl. 48; Ridl. (1922) 591; Gagnep. (1916) 485. — Type: *M.R. Smith s.n.* (BM BM00095868), Silhet.

*Dalbergia blumei* Hassk. (1844) 284; (1848) 400. — Neotype (here designated by Adema): *Anon. s.n.* (L L.0988314), Java, Hortus Botanicus Bogor.

*Dalbergia dubia* Elmer (1915) 2731. — Type: *Elmer 13733* (K K000827982; iso BM, L, U), Philippines, Mindanao, Prov. Agusan, Cadbadbaran.

*Dalbergia pinatubensis* Elmer (1934) 3198. — Type: *Elmer 22094* (K K000680045; iso L L0773077, P), Philippines, Luzon, Prov. Pampanga, Mt Pinatubo.

*Dalbergia pinnata* (Lour.) Prain var. *badia* Merr. (1910) 96; (1923) 296. — Type: *FB 9649 (Curran)* (n.v.), Philippines, Luzon, Prov. Tabayas, Pitogo.

Distribution — India, Bangladesh, Burma, China, Laos, Vietnam, Thailand; *Malesia*: Peninsular Malaysia, Sumatra, Java, Borneo, Philippines, Celebes, Lesser Sunda Islands (Flores), Moluccas (Ambon).

Habitat & Ecology — Primary or secondary forests, forest edge, roadside, along rivers, also along coasts. Soil: red soil, (coral) limestone, black or yellow sandy soil. Altitude up to 1400 m. Flowering: January to April, June to December; Fruiting: February to November.

Note — The blade of the standard is bent backwards; the margins of the blade are raised, forming a cup. Hasskarl in his description of *D. blumei* cited no specimens, no specimen were found with his handwriting. We designate the L specimen L.098314 as neotype.

### 25. *Dalbergia ramosii* Sunarno & H.Ohashi, *sp. nov.* — Fig. 5

Rather similar to *D. beccarii* differing in the smaller stipules that are elliptic to falcate and the smaller flowers: calyx 1.5–1.8 mm long, median tooth c. 0.8 mm long, in *D. beccarii* 2–3 resp. 2 mm long; standard blade 1.5 by 1.5–2 mm, in *D. beccarii* 2.5–3 by 2 mm. — Type: *BS 1367 (Ramos)* (holo BO; iso K), Philippines, Luzon, Rizal Prov., Morong.

Erect or scandent shrub. *Twigs* striate, densely to sparsely pubescent, glabrescent. *Stipules* elliptic to falcate, 2.5–3 by 1 mm, outside sericeous. *Leaves* with 5–17 leaflets. *Petioles* 2–5 mm long, puberulous; rachis mostly as the petioles, 15–45 mm long. *Leaflets*: terminal elliptic to obovate, 3–10 by 2–5 mm, chartaceous, base obtuse or rounded, apex rounded, slightly emarginate, above sparsely puberulous, glabrescent, below densely sericeous, midrib above, nerves above, 4–6 per side; lateral mostly as the terminal; pulvinus 0.4–0.5 mm long, glabrous. *Inflorescences* axillary, panicles, 6–10 mm long, peduncles 2–3 mm long, sparsely puberulous. *Bracts* to the flowers ovate, 0.7–0.8 mm long, outside sparsely puberulous. *Pedicels* c. 0.5 mm long, puberulous. *Bracteoles* ovate, c. 1 mm long, outside glabrous or puberulous in middle part. *Calyx* bell-shaped, 1.5–1.8 mm long, tube c. 1 mm long, median tooth obovate, c. 0.8 mm long; outside glabrous or puberulous. *Standard*: claw c. 0.3 mm long; blade obovate, 1.5 by 1.5–2 mm, rounded, emarginate. *Wings*: claw 0.3–0.4 mm long; blade elliptic to obovate, 1.2–1.3 by 0.7–0.8 mm, rounded. *Keel petals*: claw 0.3–0.4 mm long; blade broadly obovate to suborbicular, c. 1.2 by 1.2 mm, rounded. *Stamens* 9–10, monadelphous, open sheath, tube 0.8–0.9 mm long, free part of filaments alternately short, c. 0.4 mm long, and longer, c. 0.6 mm long. *Ovary* c. 1 mm long, sericeous, stipe 0.3–0.4 mm long, glabrous; ovules 1–2; style c. 0.1 mm long.

Distribution — Philippines, Luzon. Only known from the type.

Note — *Dalbergia ramosii* is very similar to *D. beccarii* and *D. teysmannii*. It is easily distinguished by the smaller falcate stipules, the flower size and the shape of the lowest calyx tooth.

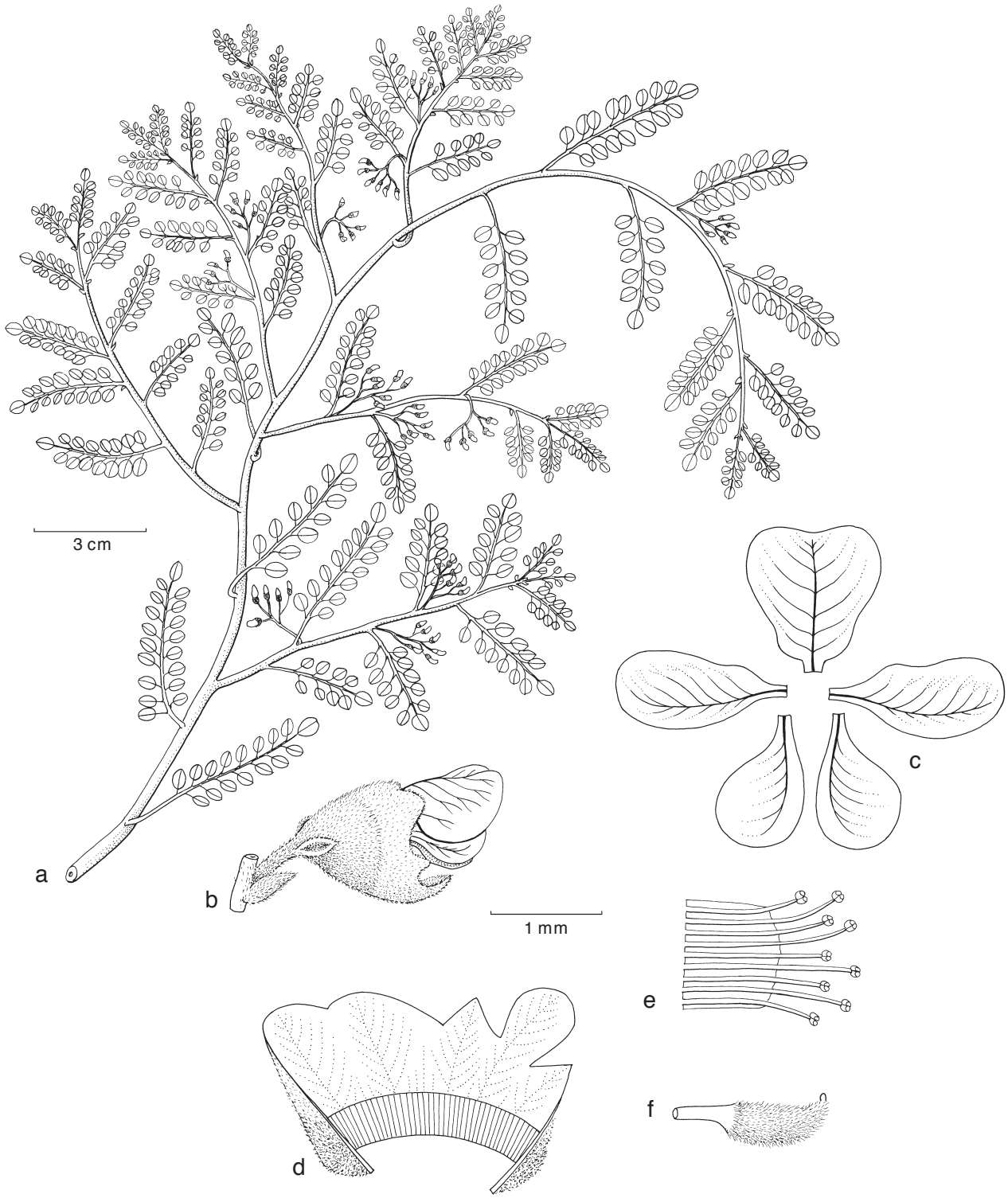


**Fig. 5** *Dalbergia ramosii* Sunarno & H.Ohashi. a. Habit; b. flower; c. opened calyx; d. petals (top to bottom: standard, wings, keel); e. stamens; f. pistil (all: *BC 1367 (Ramos)*). — Drawing by Bambang Sunarno.

### 26. *Dalbergia reticulata* Merr.

*Dalbergia reticulata* Merr. (1915) 14; (1923) 296. — Type: *FB 21406 (Villamil)* (n.v., holo destroyed?), Philippines, Luzon, Laguna Prov., Maquiling.

Distribution — Philippines, Luzon, Jolo.

Habitat & Ecology — Forests. Altitude c. 500 m. Flowering: May, June, July; fruiting: April, September.

### 27. *Dalbergia richardsii* Sunarno & H.Ohashi

*Dalbergia richardsii* Sunarno & H.Ohashi (1997) 212, f. 7. — Type: *Richards 1527* (holo L L0773059; iso BO, K), Borneo, Sarawak, IV Div., Ulu Tinjar, near Long Kapa, Mt Dulit.

Distribution — Borneo, Sarawak. Only known from the type collection.

Habitat & Ecology — Primary forest. Altitude c. 700 m.

Note — Probably rather rare. The information on several characters is missing.

**28. *Dalbergia rimosa*** Roxb. — Fig. 3g

*Dalbergia rimosa* Roxb. (1832) 233; Benth. (1852) 255; (1860) 32; Niyomdham et al. (1997) 12. — Type: *Roxburgh s.n.* (BM BM000958676), India, Sylhet.
*Dalbergia discolor* Blume ex Miq. (1855) 130, f. III, c; Benth. (1860) 41; Prain (1901) 61; (1904) 36, t. 10; Sunarno & H.Ohashi (1996) 243; (1997) 205. — Type: *Korthals s.n.* (holo L L0773613), Borneo.

Distribution — India, Burma, Vietnam, Thailand, Laos; *Malesia*: Java, Borneo (Sabah, Kalimantan), Philippines (Balabac Isl.), Celebes.

Habitat & Ecology — Primary or secondary forest, often along rivers, swamps, roadsides. Altitude up to 400 m. Soil: ultrabasic, sand, limestone. Flowering: March to November; fruiting: April to September.

Notes — Sunarno & Ohashi (1996) indicated a Blume specimen in L as the type of *D. discolor*. However, Blume never collected in Borneo and did not collect any specimen of this species. The specimen used by Miquel as basis for his description was collected by Korthals and annotated in Blume's handwriting with *D. discolor* Blume. The synonym *D. discolor* was mentioned by Fernandez-Villar (in Naves & Fernandez-Villar 1880) for the Philippines. *Dalbergia rimosa* is found in the Philippines only on Balabac Isl. (*BS 406*). Without the specimen it is impossible to give the true identification.

Spines were observed in the specimen *Maxwell 93-82*.

**29. *Dalbergia rostrata*** Hassk. — Fig. 3h

*Dalbergia rostrata* Hassk. (1842a) 53; (1842b) 79; (1848) 398; Backer & Bakh.f. (1964) 615; Verdc. (1979) 296; Sunarno & H.Ohashi (1996) 245; (1997) 215. — *Millettia rostrata* (Hassk.) Miq. (1855) 155. — Type: *Hasskarl s.n.* (BO n.v.), Java (see note).
*Dalbergia pseudosissoo* Miq. (1855) 128; Prain (1897a) 118. — Lectotype (here designated): *Hasskarl s.n.* (L L0773027)), Java, Tjietjieriengien.
*Dalbergia rostrata* Graham ex Prain (1901) 45, nom. illeg.; (1904) 60, t. 36; Ridl. (1922) 590; Niyomdham (2002) 159. — Type: *Wallich 5867* (n.v.), Singapore.
*Dalbergia championii* Thwaites (1859) 94; Benth. (1860) 39. — Type: *Thwaites 761* (holo K; iso BO), Ceylon, Hantam.
*Derris subalternifolia* Elmer (1913) 1801. — *Dalbergia subalternifolia* (Elmer) Merr. (1915) 15; (1923) 296. — Type: *Elmer 12965* (L L0773000; iso BO, CAL, K), Philippines, Palawan, Puerto Princesa (Mt Pulgar).
*Dalbergia simplicifolia* Merr. (1916) 87. — Type: *Hose 678* (BM, BO, E, K, L L0549658), Borneo, Sarawak, Miri.
*Dalbergia sissoo* auct. non Roxb.: Miq. (1855) 128.

Distribution — India, Ceylon, Thailand; *Malesia*: Sumatra, Peninsular Malaysia, Singapore, Java, Borneo, Philippines (Palawan), Moluccas, Irian Jaya.

Habitat & Ecology — Primary and secondary, disturbed or logged forests, sago swamp forest, kerangas, mangroves, along rivers and logging roads. Soil: loam, sandstone, ultramafic. Altitude up to 1200 m. Flowering: January, March to November; fruiting: March to May, Augustus, October, November.

Notes — Verdcourt (1979: 297) accepted Hildebrand's identification of *BW 5986 (Schram)* and *Aet 447* as *D. simplicifolia*, restricting his description to the New Guinean material, while noting that these specimens might well be a form of *D. rostrata*. *Dalbergia sissoo* is only cultivated in Indonesia (see also notes with *D. sissoo*).

In the diagnosis of his new species *D. rostrata* Hasskarl (1842a) mentioned no material on which he based his description. Hasskarl repeated this diagnosis several times, each time elaborating on it, however, never citing any specimen (Hasskarl 1842b, 1848). There is no Hasskarl material in L that bears evidence of being used by Hasskarl for the description of *D. rostrata*. Original or type material may be present in BO, but was certainly not recognised as such by the first author. The specimen *Hasskarl s.n.* (L 908.114-1385) given as type by Sunarno & Ohashi (1996) is not the type of *D. rostrata*. Sunarno & Ohashi (1996) cited the same specimen also as type for *D. pseudosissoo* Miq. The annotations on the label clearly show that this specimen was used by Miquel when he described *D. pseudosissoo*. As Miquel gives Java and Borneo as localities he clearly used more than one specimen as basis for his description. Instead of pointing out the 'type' Sunarno & Ohashi should have selected a lectotype. Here we select as lectotype of *D. pseudosissoo* Miq, the specimen *Hasskarl s.n.* (barcode L 0773027 (= L 908.114-1385)). The type of *D. rostrata* is probably a Hasskarl specimen in Bogor (*Hasskarl s.n.*) not seen by Adema.

*Dalbergia rostrata* is in many aspects very similar to *D. minutiflora*, but differs in the size of bracts, bracteoles and flower parts. *Dalbergia rostrata* has a wide distribution in Malesia, while *D. minutiflora* is endemic in Papua Barat (Irian Jaya).

Spines were observed in the specimens *SAN 69005.*

**30. *Dalbergia sandakanensis*** Sunarno & H.Ohashi — Fig. 3i

*Dalbergia sandakanensis* Sunarno & H.Ohashi (1997) 217, f. 8. — Type: *Ramos 1883* (holo L L0599657; iso BO, K), Borneo, Sandakan and vicinity.

Distribution — Borneo (Sabah, Kalimantan).

Habitat & Ecology — Lowland primary forest.

Note — Similar to *D. canescens* in number of leaflets and pods. *Dalbergia sandakanensis* differs from *D. canescens* in shape and size of stipules and bracteoles, size of leaflets and pods. Some of the flower parts are preserved under the fruits. The description of calyx and stamens is based on these parts (see Sunarno & Ohashi 1997).

**31. *Dalbergia sissoo*** Roxb. ex DC. — Fig. 3j

*Dalbergia sissoo* Roxb. ex DC. (1825) 416; Benth. (1852) 254; Miq. (1855) 128; Benth. (1860) 40; Prain (1901) 40; (1904) 57, t. 34; Backer & Bakh.f. (1964) 615. — Type: *Roxburgh s.n.* (K K000264286), India.

Distribution — India; *Malesia*: Java. Also widely cultivated in Asia.

Habitat & Ecology — Primary forest, edge of forest. Altitude up to 850 m. Flowering: November; fruiting: October, November.

Uses — A valuable timber wood. See Prawirohatmodjo et al. 1993: 160.

Notes — The species was collected at least twice on Java in supposedly natural habitats: *Mangsaed Ja. 6466*, Central Java, Grobogan, 1954, primary forest, not planted; *Popta 922*, Java, Dago, 1949, edge of forest. However, it is difficult to determine the status of specimens when the species is also (widely) cultivated. At the base of the stipules or between the stipules and the twigs 'colleters' may be found. Bracts may have some gland-like structures at the base of the margins.

Most of the references to literature or specimens given by Miquel (1855) concern *D. rostrata*.

**32. *Dalbergia teysmannii*** Sunarno & H.Ohashi

*Dalbergia teysmannii* Sunarno & H.Ohashi (1996) 246, f. 2. — Type: *Teysmann HB 12287* (holo BO; iso BO), Celebes, Pangkajene.

Distribution — Sulawesi. Only known from the type.

Habitat & Ecology — Rocky area.

Note — Very similar to *D. beccarii* from which it differs in the narrowly ovate, persistent stipules, longer petiole and rachis, leaflets glabrous above, with longer pulvini, inflorescences longer, panicles, smaller calyx, slightly larger corolla parts and glabrous ovary.

**33. *Dalbergia velutina*** Benth. — Fig. 3k

*Dalbergia velutina* Benth. (1852) 255; (1860) 43; Prain (1897a) 116; (1901) 43; (1904) 74, t. 55, 56; Ridl. (1922) 592; Sunarno & H.Ohashi (1997) 218; Niyomdham et al. (1997) 48; Niyomdham (2002) 161. — *Dalbergia velutina* Benth. var. *typica* Prain (1897a) 117, nom. illeg.; (1904) 74, t. 55. — Type: *Wallich 5868B* (holo K K000264303; iso CAL, LE), India, Silhet.

*Dalbergia abbreviata* Craib (1926) 166; (1928) 473. — Type: *Kerr 3554* (n.v.), Thailand, Doi Sutep.

*Dalbergia velutina* Benth. var. *maingayi* Prain (1897a) 117; (1901) 44; (1904) 75, t. 56; Ridl. (1922) 592; Sunarno & H.Ohashi (1997) 218. — Lectotype (here designated): *Maingay 612* (K K000264333), Malacca.

Distribution — India, Burma, Thailand; *Malesia*: Peninsular Malaysia (Trengganu, Negri Sembilan, Johore), Singapore, Borneo (Kalimantan).

Habitat & Ecology — Forest, along river. Altitude up to 150 m. Flowering: March, July; fruiting: March, July.

Note — In the Flora Malesiana area var. *velutina* and var. *maingayi* are found. In Thailand, Vietnam, Cambodia and Laos three more varieties occur (Niyomdham et al. 1997, Niyomdham 2002). Prain, Niyomdham et al. and Niyomdham use different characters to distinguish the varieties. A more thorough study is needed to evaluate these varieties.

**KEY TO THE VARIETIES**

1. Upper surface of leaflets with few scattered appressed hairs, midrib sericeous, lower surface ± strigose a. var. *maingayi*
1. Upper surface of leaflets glabrous to velutinous, lower surface velutinous . . . . . b. var. *velutina*

**a.** var. ***maingayi*** Prain — Fig. 3k

Distribution — *Malesia*: Peninsular Malaysia (Negri Sembilan), Singapore, Borneo (Kalimantan).

Habitat & Ecology — Forest, river side. Altitude up to 60 m. Flowering: March; fruiting: March

**b.** var. ***velutina***

Distribution — India, Burma, Thailand; *Malesia*: Peninsular Malaysia (Trengganu).

Habitat & Ecology — Altitude up to 150 m. Flowering: July; fruiting: July.

**NOTES ON SPECIMENS**

1. *PNH 79619 (Conklin & Buwaya)*, Philippines, Mt Province, Bayninan, Banau, Ifugoa. Altitude 400 ft

Liana, 25 m high, almost leafless. *Twigs* striate, ± tomentose, 7–13 mm diam. *Leaflets* with rounded apex, both sides sericeous. *Inflorescences* axillary, racemes or panicles. *Pedicels* 3 mm long. *Calyx* 6 mm long, tube 4 mm long; teeth of upper lip triangular, 2 by 2 mm, lateral teeth triangular, 2 by 1 mm; outside sericeous, inside teeth sericeous. Corolla white. *Standard*: claw 3 mm long; blade orbicular, 3 by 3.5 mm, emarginate, both sides glabrous. *Wings*: claw 3.2 mm long; blade obliquely ovate, 3.0 by 1.8 mm, rounded, upper auricle 0.2 mm long, both sides glabrous, outside sculpted. *Keel petals*: claw 3.2 mm long; blade ± boat-shaped, 2.8 by 1.8 mm, rounded, auricles inconspicuous, both sides glabrous. *Stamens* monadelphous, open sheath, tube 5 mm long, free part of filaments 2 mm long, glabrous; anthers 0.2 by 0.3 mm, glabrous. *Ovary* 3.8 mm long, with some hairs at upper suture near the base, stipe 3 mm long, puberulous; ovules c. 4.

Note — Not identified or matched in the herbarium.

2. *S 23492 (Anderson)*, Sarawak, 3 miles S of Kuching, beyond uplands

Liana. *Twigs* angular. *Leaves* just emerging, with 7 or 9 leaflets. Young *leaflets* above and below with hairs along midrib and margin, also some scattered hairs at the surfaces. *Inflorescences* with very few patent hairs. *Bracts* to the flowers elliptic or linear, 2.3–2.8 by 0.5–1.0 mm, outside ± sericeous at margin and apex to thinly sericeous, inside glabrous. *Pedicels* 3 mm long, thinly sericeous. *Bracteoles* acicular, 0.9 by 0.2 mm, outside thinly sericeous, inside glabrous. *Calyx* 4 mm long, tube 3 mm long; teeth upper lip triangular, 1.2 by 1.2 mm, lateral teeth triangular 1.3 by 0.9 mm, median tooth triangular, 1.5 by 1.2 mm; outside thinly sericeous, inside thinly sericeous at teeth. *Standard*: claw 3.0 mm long; blade orbicular, 2.6 by 2.8 mm, rounded, outside glabrous, inside with few hairs above the claw. *Keel petals*: claw 3.0 mm long; blade ± boat-shaped, 2.9 by 2.5 mm, obtuse, both sides glabrous. *Stamens* 10, diadelphous (9 + 1), tube 5 mm long, free parts of filaments 2.5 mm long, glabrous, free stamen 5 mm long; anthers 0.2 by 0.2 mm, glabrous. *Ovary* 2 mm long, glabrous, stipe 5 mm long, glabrous; ovules 2; style 1.2 mm long, glabrous.

Note — Hairs at (one of) the petals and diadelphous stamens (9 + 1) are very rare in *Dalbergia*. *Dalbergia hullettii* flowers at leafless twigs, but differs in indumentum and number of leaflets. *Dalbergia junghuhnii* has not sculpted wings, but is otherwise very different.

3. *Ambri*, *Arifin & Arbainsyah AA 1411*, East Kalimantan, along road Lojanan to Tenggarzon at km 8, Riverbank

Liana. *Twigs* with 3–8 cm long spines. *Leaves* with 7 or 9 leaflets. *Terminal leaflets* 5.5 by 3 cm, above with some appressed hairs, below thinly sericeous. *Inflorescences* terminal, 6 cm long. *Pedicels* up to 0.3 mm long. *Calyx* 2.9 mm long, outside with some hairs. *Wings* ± obscurely sculpted. *Ovary* 1.1 mm long, some hairs at sutures, stipe 1.3 mm long, hairy.

Note — Pedicels very short, flowers small. In those aspects somewhat similar to *D. rimosa*. Spines are known for *D. horrida* (Dennst.) Mabb., *D. vietnamensis* P.H.Hô & Niyomdham and other species.

4. *Dransfield et al. 6525*, Brunei, Belait district, Stateland, 8 miles along Labi road from Sungai Liang junction

Liana. *Leaves* with 1 (or 3) leaflets. *Leaflets* rather thin, apex cuspidate. *Pods* strap-like, 52 by 18 mm, valves 0.4 mm thick, with few appressed hairs, stipe c. 5 mm long, sericeous.

Note — In some aspects similar to *D. havilandii*. However, *Dransfield et al. 6525* differs in its much thinner leaflets that are obtuse to rounded, apiculate at apex and the slightly smaller pods (c. 4.5 by 1.5 cm vs 5.0–5.5 by 1.2–1.8 cm in *D. havilandii*).

5. *bb 32443 (NIFS)*, Borneo, Pontianak, Kuala Memperigan

*Leaves* with 3 or 5 leaflets. *Terminal leaflets* 120–145 by 44–50 mm, apex acuminate, above puberulous at midrib and veins, with scattered appressed hairs elsewhere, below with scattered appressed hairs.

Note — The large acuminate leaflets point to *D. parviflora* or *D. rostrata*. However, the thinner leaflets makes this specimen different from both.

6. *Kostermans & Van Woerden 144*, Java, Banjamas, Nusa Kambangan Isl., SW point, between Babaka and Kananganjan

Beach tree. *Leaves* with 13 leaflets. *Leaflets*: terminal c. 24 by 12 mm, above glabrous, below thinly sericeous. *Calyx* (below pod) 3.5–4 mm long, outside hairy at teeth. *Pods* c. 33 by 20 mm, valves thin, ± transparent, thinly sericeous, stipe c. 4 mm long.

Note — Vegetatively rather similar to *D. junghuhnii*, but very different in pods.

7. *Endert 1893*, Central East Borneo, W Koetai, no. 5, near Lahoen, on tree at riverbank; altitude 10 m

Liana 5 m high. *Leaves* with 5 leaflets. *Pods* elliptic to falcate in outline, 23–45 by 9–14 mm, valves 0.2–0.3 mm thick, glabrous, seed chamber present. *Seeds* bean-shaped 6 by 4 by 1.1 mm; hilum ± eccentric, 0.4 mm long.

Note — A fruiting specimen with mainly loose leaflets. The specimen is somewhat similar to *D. rimosa*, which has longer and wider pods. The pods are ± similar to those of *D. cumingiana*.

8. Several specimens are in many aspects similar to *D. junghuhnii*, but have sericeous ovaries. None of these specimens have been identified or matched in the herbarium

a. *Maingay 547/2*, Malaya: *Leaves* with c. 11 leaflets. *Calyx* c. 2 mm long. *Ovary* sericeous. [*Maingay 547/2* is a mixed collection. See also notes with *D. junghuhnii*.]
b. *Jacobs 5452*, Sarawak, Kapit distr., Belagu subdistr., left bank of Rajang river, 10 km below Belagu, Segaham Range, near Belagu airfield: Liana 20–25 m. *Leaves* with 7 or 9 leaflets. *Terminal leaflet* obovate, 3.2 by 2 mm, apex rounded, emarginate, pulvinus 2–3 mm long. *Pedicels* 0.6 mm long. *Calyx* 2.5 mm long. Corolla green-white. *Standard* blade 3 by 3 mm. *Wings* not sculpted. *Stamens* 9. *Ovary* 1.0 mm long, sericeous, stipe 0.9 mm long, sericeous.
c. *SAN 139225 (Fidilis Krispinus)*, Sabah, Tenom, Tinutadan, Melalap: Climber to c. 5 m. *Leaves* with 9 leaflets. *Terminal leaflets* obovate, 45 by 21 mm, apex rounded. *Pedicels* 0.7–1.0 mm long. *Calyx* c. 2.5 mm long, mostly glabrous. *Ovary* 0.7 mm long, sericeous, stipe 0.5 mm long, sericeous.

## EXCLUDED AND DUBIOUS SPECIES

1. *Dalbergia acuminata* Hassk. (1842a) 53; (1844) 283. — Type: not indicated.

According to Prain (1904) 109: ***Derris trifoliata*** Lour.

2. *Dalbergia angustifolia* Hassk. (1842a) 53; (1844) 284; (1848) 399. — Type: not indicated.

= ***Millettia sericea*** (Vent.) Wight & Arn. ex Hassk. See Prain (1904) 109, Adema (2000) 405.

3. *Dalbergia lanceolaria* L.f. (1781) 316; Benth. (1860) 45; Prain (1901) 52; (1904) 93. — Type: *König s.n.* (holo BM n.v.), Ceylon.

A species of India, Ceylon, Burma, Cambodia, Laos, Vietnam and Thailand. Once collected in Java (*Boschproefst. Ja 1986*, Oost-Java, Modjokerto, Djaloeng, c. 250 m, 1930). Probably cultivated in a teak plantation or accidentally introduced. Also once collected in Singapore (*Shah & Nur 945*), roadsides along Fort Canning Road. Probably cultivated as an ornamental tree.

4. *Dalbergia pubinervis* Span. (1841) 197. — *Derris pubinervis* (Span.) Benth. (1860) 109. — Type: *Spanoghe s.n.* (n.v.), Timor, Koepang.

According to Bentham a *Derris* species. However, Spanoghe described *Dalbergia pubinervis* with flowers with diadelphous stamens. Up to now the type has not been traced. Probably this species is not a *Derris* species (see Adema 2003b).

5. *Dalbergia purpurea* Reinw. ex Hassk. (1842a) 53; (1844) 284; (1848) 399. — Type: *Blume s.n.* (L), Java.

= ***Derris elliptica*** (Wall.) Benth. (*Paraderris elliptica* (Wall.) Adema). See: Prain (1904) 109, Adema (2003a), Sirichamorn et al. (2012).

6. *Dalbergia spinosa* Roxb.

This species was mentioned by Fernandez-Villar (Naves & Fernandez-Villar 1880). Merrill (1923) doubted the occurrence in the Philippines. Spines are known for more species of *Dalbergia*.

7. *Dalbergia timorensis* DC. (1825) 417; Decne. (1835) 148; Span. (1841) 197. — Type: not indicated.

= ***Solori scandens*** (Roxb. ex DC.) Sirich. & Adema (*Derris scandens* (Roxb.) Benth.). See Prain (1904) 109, Sirichamorn et al. (2014).

8. *Dalbergia venusta* Zipp. ex Span. (1841) 197. — Type: *Zippelius s.n.* (L L908.114-1737), Timor.

= ***Solori scandens*** (Roxb.) Sirich. & Adema (*Derris scandens* (Roxb.) Benth.). See Prain (1904) 109, Sirichamorn et al. (2014).

9. *Dalbergia volubilis* Llanos (1858) 502, non Roxb. (1799).

No specimen seen. Fernandez-Villar (Naves & Fernandez-Villar 1880) gave no comments on this name, neither did Merrill (1923).

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## IDENTIFICATION LIST

Species numbers are the same as in the text. See list on p. 191.

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