

THE MOLUCCAN DAMMARS (AGATHIS, ARAUCARIACEAE)

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There has been a notable divergence of opinion in the recent literature concerning the number of species of dammar (*Agathis*) that might occur in the general area of the Moluccas. Even early literature presents a tangled nomenclatural trail. Perhaps the difficulty in obtaining good representative collections from these huge rainforest emergents may explain the general lack of careful diagnostic descriptions that bedevils most contributions. Among the hundreds of specimens I have been able to study, however, I have found enough data to support a clear conclusion.

The important dammar tree was among those described in the early work by Rumphius (1741) that dealt with Ambon. Meijer Drees (1940) reports that natives in the Moluccas recognize two types of dammar, the 'white dammar' (*dammar putih*) with abundant resin production and the 'brown dammar' (*dammar merah*) with poor resin production (the 'white' or clear resin does turn brown upon aging about a year). Presumably, Rumphius, who spoke of abundant resin, had in mind the 'white dammar' when he referred to this tree as *Dammara alba*.

All of the various names applied to the dammars from the Moluccas as far as the Philippines before 1898 are synonyms. In every case the author makes reference to the work by Rumphius. Foxworthy (1910) credited Lamarck (Encyclop. 2: 259. 1786) to have evaluated *Dammara alba* of Rumphius. In this he was followed by Merrill (Interpr. Rumph. Herb. Amb.: 76. 1917). However, both the generic name *Dammara* and the specific name *D. alba* are invalid.

The first post-Linnean description was given by Lambert in 1803 based on material from Ambon. Various new names and combinations then followed based on Lambert. Hasskarl presented a new description in 1842 under the name *Dammara alba* of Rumphius. In 1849 Presl honored Rumphius with the name *Dammara rumphii* based on a Philippine specimen. He considered this to represent the plant referred to by Rumphius, which Lambert had already validated, and his type specimen is indeed conspecific with that of Lambert.

Starting in 1898, a variety of new species were described for the general area under discussion but not equated with the description by Rumphius when Koorders described his *Dammara celebica*. Warburg added two more species in 1900 for a total of four. Foxworthy in 1910 concluded that these four and several more all belonged to a single species. Meijer Drees, for his part, in 1940 added two more species and recognized six for the area under consideration. Whitmore, finally, suggested (1977) that this same area supports but one subspecies of the grand species first envisioned by Foxworthy.

My studies indicate that there are just two clearly distinct species in the area

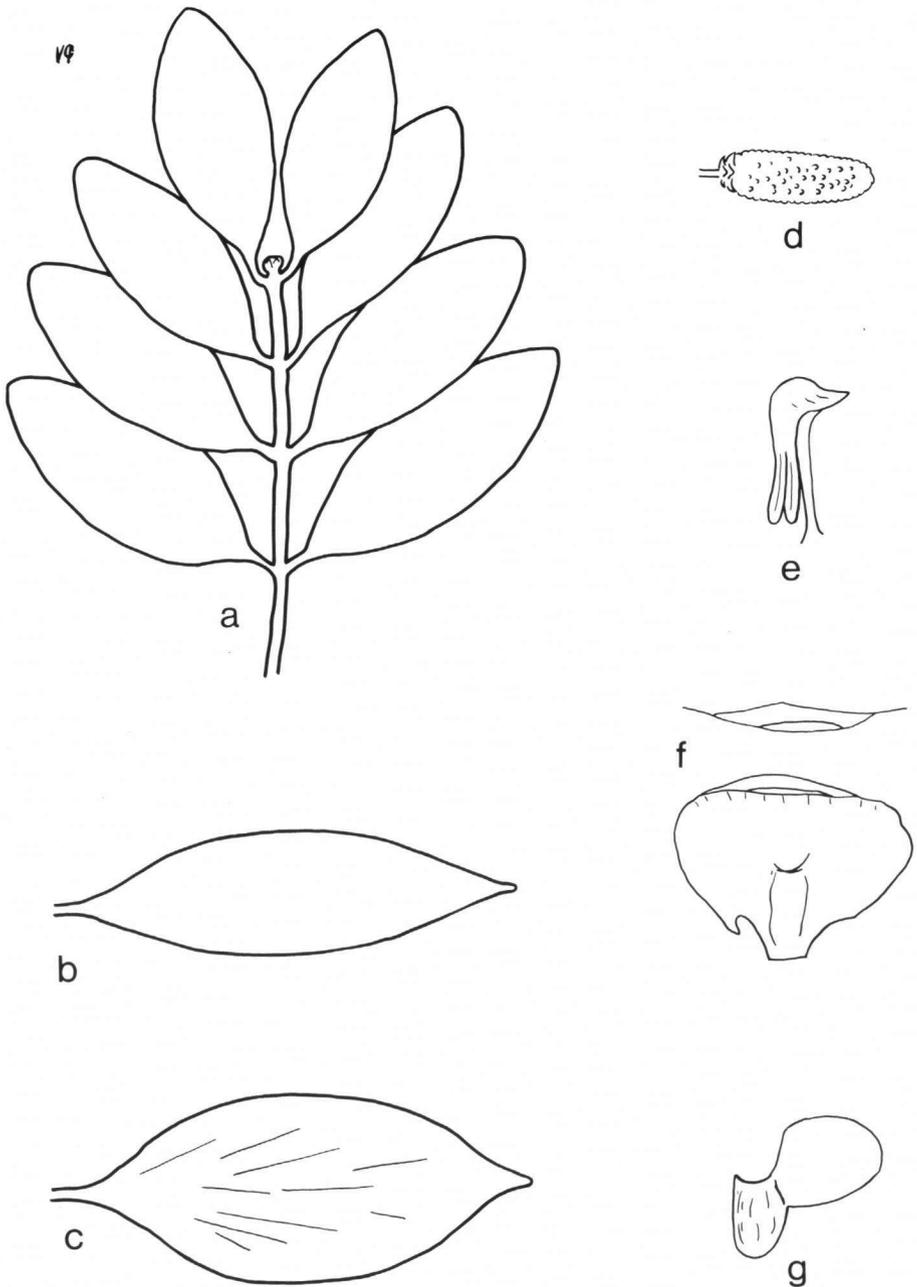


Fig. 1. *Agathis dammara* (Lambert) Richard. — a. mature foliage leaves of exposed shoot; b. shade type leaf; c. juvenile leaf form; d. pollen cone, all $\times \frac{3}{4}$; e. lateral view of microsporophyll enlarged about $\times 9$; f. seed cone scale end view and facial view; g. seed, both $\times \frac{3}{4}$.

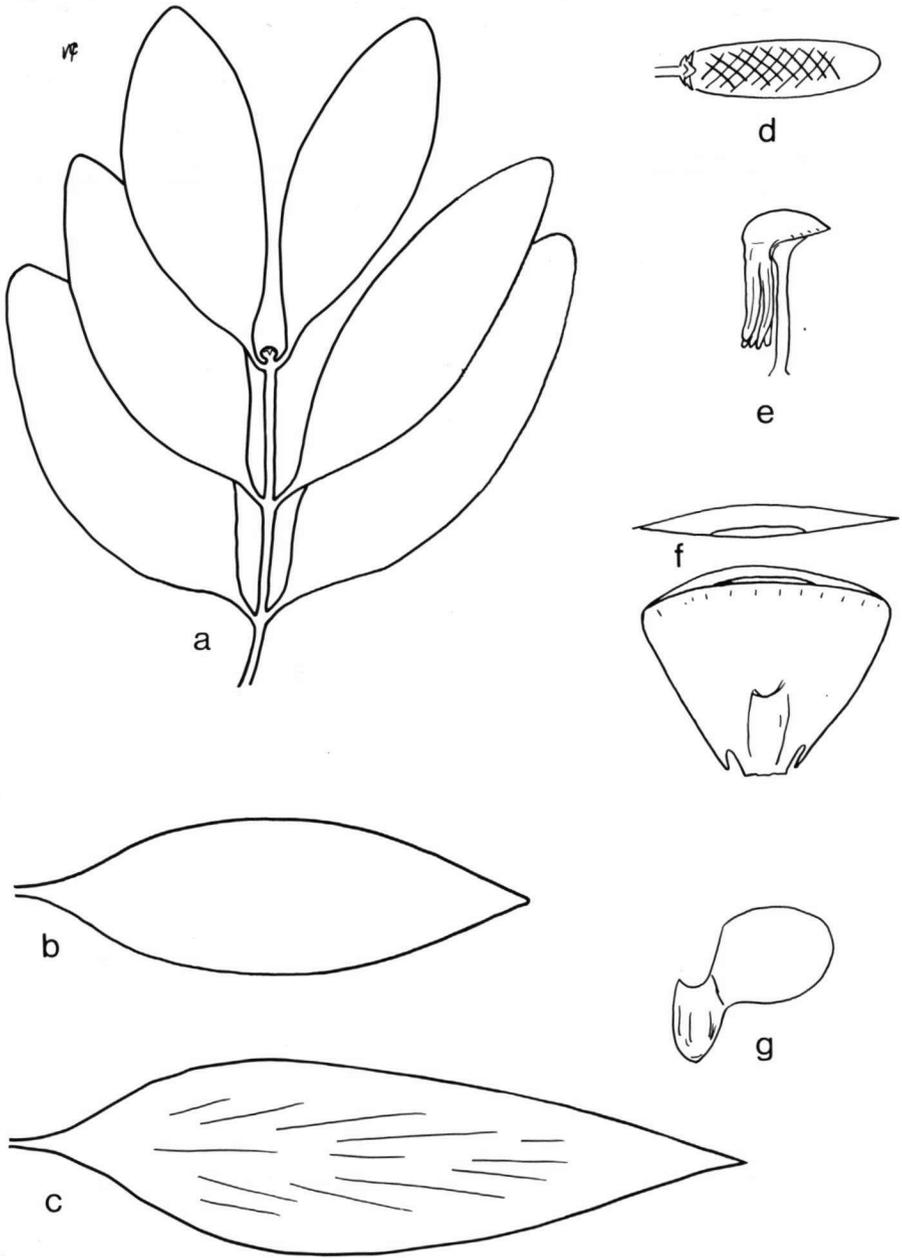


Fig. 2. *Agathis celebica* (Koord.) Warb. — a. mature foliage leaves of exposed shoot; b. shade type leaf; c. juvenile leaf form; d. pollen cone, all $\times \frac{3}{4}$; e. lateral view of microsporophyll enlarged about $\times 9$; f. seed cone scale end view and facial view; g. seed, both $\times \frac{3}{4}$.

including the Moluccas, Celebes, and the Philippines, both widely distributed. None of the descriptions heretofore have recognized and properly described the distinctive traits that separate these two species. Furthermore, most of the descriptions apply only to the commoner of the two species. Distinct characteristics of the seed cone and of the pollen cone, nevertheless, are consistently correlated with one another where complete collections with mature forms are made and these also correlate with weak distinctions in leaf shape. The vast majority of collections, to be sure, are either sterile or include immature reproductive structures and are useless for defining a species.

The common Moluccan, Celebes, and Philippine dammar is the one described by Lambert (Fig. 1) and is now known as *Agathis dammara* (Lambert) Richard. The seed cone scales in *Agathis* are tightly packed with only a thickened and flanged external edge exposed in the unopened cone. For this species the exposure is much less than the total width of the scale whose unexposed upper corners are broadly rounded and quite thin (nearly membranous). A variable but prominent scallop decorates the lower third of each scale margin with generally the one on one edge cut deeply to form a downward projection distant from the base. The typical scale is about 3 cm high. The microsporophyll presents a rather distinctive figure which can be described as a 'hump' formed on the exposed dorsal side of the scale above the pollen sacs. This is caused by a broad depressed flange that occupies a good half of the exposed surface. Meijer Drees suggests that the number of pollen sacs ranges between 3 and 6. The whole pollen cone without the short peduncle is normally about $2\frac{1}{2}$ cm long. Juvenile leaves are about 3 cm wide and at least 7 cm long with an acute apex. Characteristically they are oval and distinctly acuminate. On more mature branches the leaves are narrower and not acuminate, the width falling to 2 cm or slightly less (as on all *Agathis*, vigorous shoots and fertile branches may display narrow and imperfectly formed leaves). Leaves from fully exposed branches are slightly reduced in size and well rounded at the apex. Such leaves are 4—5 cm long and 1.5—2 cm broad. Abundant resin has been recorded for many individuals of this species.

The second species of dammar of the Moluccas to Philippine region appears to be less common (Fig. 2). In this species the exposed part of the seed cone scale extends the entire width of the scale. The upper corners of the scale are more or less angular and rigid. The lateral margins of the scale are nearly straight giving the whole scale a markedly triangular appearance. The variable small scallop at the base of each side extends about one sixth of the total length. Usually both scallops form downward projections which approach the base of the scale. The typical fully developed scale is nearly 4 cm high. The exposed dorsal side of the microsporophyll above the pollen sacs is broadly rounded with a narrow flange no more than one tenth as wide as the whole exposed surface. Meijer Drees suggests that the number of pollen sacs ranges between 7 and 12. The whole pollen cone without the short peduncle is normally about $3\frac{1}{2}$ cm long. Juvenile leaves reach $3\frac{1}{2}$ cm wide and 13 cm long and are distinctly lanceolate. On more mature branches the leaves are narrower and more oval but still acute and roughly 3 cm wide and 9 cm long. Leaves from fully exposed branches are slightly reduced in size and well-rounded at the apex. Such leaves are 6—8 cm long and 2—3 cm broad. Meijer Drees suggests that this species is a poor producer of resin.

The major distinctions between these two species have to do with the shape of the seed cone scale and the shape of the exposed part of the microsporophyll. The number of microsporophylls may be diagnostic, a factor which I have been unable to confirm. Differences in leaf dimensions when carefully related to overall shape are suggestive. Reliable data on resin production with respect to these two types is not available but might be correlated. The first description of a dammar by Lambert does not mention any of these specific differences but they are all clearly displayed in the accompanying figures showing the seed cone scales and microsporophylls (b-f, h). The type material confirms these characters. The text indicates a melange of material and the illustrated shoot with an immature seed cone (a) may well be the second species. The description by Koorders of his species does not clearly differentiate the truly diagnostic characters although he does list as one of the distinctions that the scales are 'differently cut into'. The dimensions he gives for the leaf and the seed cone apply to the less common species. The type specimens confirm that he was dealing with the second species which is now known as *Agathis celebica* (Koorders) Warburg. His reference to resin production, as in many publications, applies to the general region and is not specifically related to his specimens. The new species described by Warburg were distinguished by variations in the length and diameter of the pollen cone and shape of the leaf. Meijer Drees set apart his new species on the basis of various obscure distinctions such as imbricate or not imbricate bracts of young male spikes and bracts of young female cones, the presence of a membranous border on laminal part of bracts of young male spikes, variation in the length of pollen cells and variation (here overlapping) of the number of pollen cells. Groupings of Meijer Drees' species, however, can be equated with the two species recognized here and general dimensions agree with my observations. Even here, the critical distinctions fail to appear. Nothing in the descriptions of Warburg and Meijer Drees can be taken to justify additional taxa in my opinion.

The synonymy for these two species should be as follows:

***Agathis dammara* (Lambert) Richard, Conif. (1826) 83, t. 19.**

Pinus dammara Lambert, Genus Pinus ed. 1 (1803) t. 38 (b-f, h).

Agathis loranthifolia Salisbury, Trans. Linn. Soc. 8 (1807) 311, *nom. illeg.* (*P. dammara* given as a synonym).

Dammara loranthifolia (Salisbury) Link, Enum. 2 (1822) 411.

Dammara orientalis Don in Lambert, Pinus ed. 2 (1832) 70, *nom. illeg.* (*P. dammara* given as a synonym).

Dammara alba Rumph. ex Hasskarl, Tijdschr. Nat. Geschied. Physiol. 9 (1842) 179.

Dammara rumphii Presl, Epimeliae Bot. (1849) 236.

Agathis regia Warburg, Monsunia 1 (1900) 183.

Agathis philippinensis Warburg, *ibid* 185.

Agathis alba (Rumph.) Foxworthy, Philip. J. Sc. 44 (1909) 422 (Lmk. given as the original author).*

Agathis beckingii Meijer Drees, Bull. Jard. Bot. Buitenz. Sér. 3, 16 (1940) 463 (synonymy based on type specimen, description corresponds to *A. celebica*).

* Attribution to Jeffrey, Annals Bot. 20, 1906: 387, is invalid inasmuch as no authority is given nor any indications whatever as to any synonymy for the name *Agathis alba* which is merely mentioned.

Agathis celebica (Koorders) Warburg, *Monsunia* 1 (1900) 195.

Dammara celebica Koorders, *Med. Lands Plant.* 19 (1898) 264.

Agathis hamii Meijer Drees, *Bull. Jard. Bot. Buitenz. Sér.* 3, 16 (1940) 462.

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MEIJER DREES, E., The Genus *Agathis* in Malaysia. *Bull. Jard. Bot. Buitenz. Sér.* 3, 16 (1940) 455—474.
RUMPHIUS, *Herbarium Amboinense* 2 (1741) 174, t. 57.
WHITMORE, T. C. A First Look at *Agathis*. *Trop. Forestry Papers* 11, Oxford 1977).

CORRECTION

Page 503, 3rd sentence, for 'microsporophylls' read 'pollensacs per microsporophyll'.