

## REVISION OF *PLATHYMENIA* (*LEGUMINOSAE–MIMOSOIDEAE*)

M. C. WARWICK\* & G. P. LEWIS†

*Plathymenia* (*Leguminosae–Mimosoideae*) has been variously regarded as comprising one to three species and one variety. The genus is here considered to be monospecific, containing only *Plathymenia reticulata*. This is in agreement with the conclusion of Ducke in 1925. A full description is given of *P. reticulata* in its emended sense, with notes on ecology, uses, vernacular names and a list of herbarium specimens examined.

*Keywords.* Cerrado, *Fabaceae*, lectotypification, monospecific, neotropics, seasonally dry tropical forest, vinhático.

### INTRODUCTION

*Plathymenia* Benth. (*Leguminosae–Mimosoideae*) is a genus of tropical trees native to South America, found primarily in the Brazilian cerrado, but also in Bolivia, northern Paraguay and Surinam. It was first described by Bentham (1842) who recognized two species: *P. reticulata* Benth. and *P. foliolosa* Benth. Burkart (1939) included three species in the genus, adding *Plathymenia modesta* (Speg.) Burkart, based on *Pirothantha modesta* Speg. which had been described in 1916. In addition, Chodat & Hassler (1904) recognized var. *paraguariensis* Chodat & Hassler under *P. foliolosa* Benth. Ducke (1925), on the other hand, reduced the genus to one species, *P. reticulata*. Lewis (1987) also cast doubt on the distinctness of some of these species and a revision is now appropriate, especially because the Brazilian Institute of Agricultural Research (EMBRAPA) recently classified *P. reticulata* as one of the most useful species in the Brazilian cerrado (Almeida *et al.*, 1998). The main characters used to distinguish it from *P. foliolosa* by Bentham (1842, 1876) and Heringer (1956) were size, habitat, inflorescence indumentum and the numbers of pinnae per leaf and leaflets per pinna. There is, however, no correlation between morphology and geography, and there are no recognizable ecotypes. There is a continuum in size up to 12m and there are no characters to separate the trees in one habitat from those in another. The numbers of pairs of pinnae and leaflets vary continuously; similarly the degree of pubescence on all parts of the plant ranges from almost glabrous to densely hairy. The ovary is always densely hairy, and when the petals open the ovary can give the inflorescence the appearance of being hairy, but examination of the other parts of the flower reveals continuous variation, with flowers very occasionally completely glabrous or densely hairy.

\* Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK.

† Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, UK.

Based on the above observations we consider the genus to be monospecific, a view that has also been expressed by Ducke (1925). Two recent molecular systematic papers by Lacerda *et al.* (2001, 2002) have focused on the genus *Plathymenia*. Their 2002 paper is relevant to our study because the authors recognize two species, *P. reticulata* and *P. foliolosa*. However, they demonstrated that one population of *P. foliolosa*, located in a region where both occur, presented several RAPD markers that were characteristic of *P. reticulata*, suggesting the occurrence of gene flow between the two species. This adds support to our conclusion that *Plathymenia* is monospecific. Lacerda *et al.* (2002) analysed populations only within the state of Minas Gerais. If they had sampled more widely across the whole range of the genus, we predict that gene flow would have been encountered between other populations across the full geographical range of this species.

Bentham (1842) described the genus *Plathymenia* based on specimens he had mentioned earlier (Bentham, 1840). The specimens collected by Gardner in Ceará he named *Plathymenia foliolosa*; those from Minas Geraes (*sic*), which he named *P. reticulata*, were collected by Claussen, Langsdorff and Pohl. Claussen & Delessert 110 is the only specimen collected in Minas Gerais in 1839 that Bentham could have seen before his reference to *Plathymenia* in 1840 and is here designated the lectotype of *P. reticulata*.

The anthers examined under the scanning electron microscope were prepared using techniques described in Warwick & Helfer (1990).

#### TAXONOMY

***Plathymenia* Benth.**, Hook. Journ. Bot. 4: 333 (1842).

Type: *Plathymenia reticulata* Benth.

Deciduous trees. Leaves bipinnate. Inflorescence an axillary raceme. Flowers pedicellate. Bracts caducous. Calyx 5-lobed, valvate in bud; teeth unequal. Corolla with 5 free petals. Androecium of 10 free stamens; anthers dorsifixed. Gynoecium shorter than androecium; ovary stipitate, with 10–12 ovules. Fruit flattened, dehiscent along both sutures, 10–12-seeded.

***Plathymenia reticulata* Benth.**, Hook. Journ. Bot. 4: 334 (1842). **Fig. 1.**

Type: Brazil, Minas Gerais, Claussen & Delessert 110 (lecto. K!, chosen here).

Syn.: *Plathymenia foliolosa* Benth., Hook. Journ. Bot. 4: 334 (1842). Type: Brazil, Ceará, Gardner 1589 (holo. K!, iso. K!).

*Plathymenia foliolosa* var. *paraguariensis* Chodat & Hassler, *Plantae Hasslerianae* 2: 561 (1904). Type: Paraguay, near Concepción, x 1901/02, Hassler 7674 (iso. K!).

*Plathymenia modesta* (Speg.) Burkart, *Darwiniana* 3(3): 466 (1939).

*Pirottantha modesta* Speg., *Anal. Soc. Ci. Arg.* 82: 226 (1916).

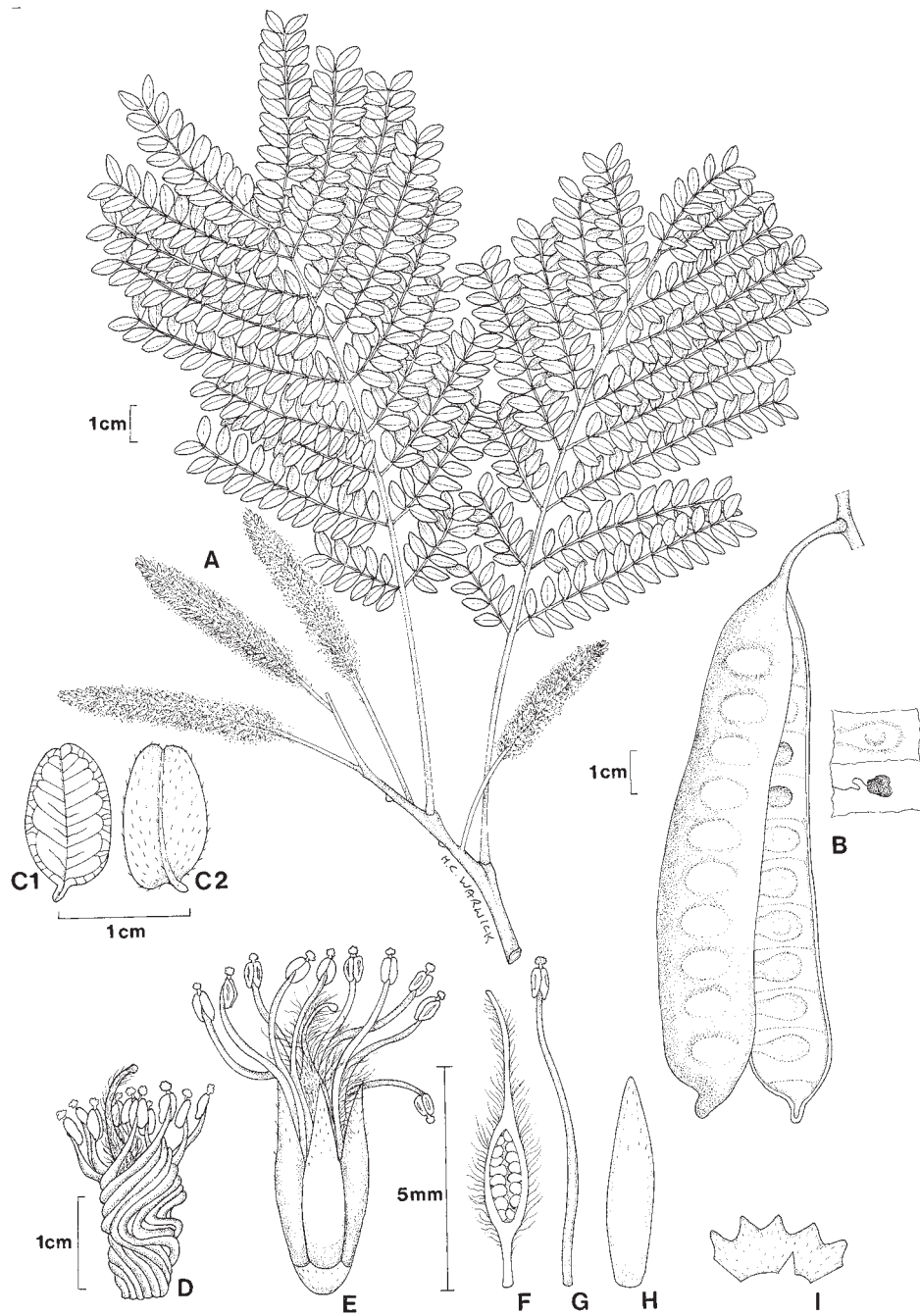


FIG. 1. *Plathymenia reticulata*: A, habit (Ratter *et al.* R2538); B, pod and enlargement of seeds in separate membranous covers (Nee & Coimbra 35848); C1, leaflet upper surface; C2, leaflet lower surface; D, stamens before corolla opens; E, mature flower; F, gynoecium; G, stamen; H, petal; I, calyx. E, F, G, H & I all at same scale. Drawn by Maureen Chisam Warwick.

Slender, straight *tree* to 12(–40)m; dbh 3–30(–90)cm; branching open; crown spreading in forest, gnarled or tortuously branched in open cerrado. *Bark* grey to pale grey, thick, fissured, rough and corky, characteristically exfoliating in irregular plates; wood cream to light straw-coloured, surrounded by red bark, cortex mauve-pink; inner bark pinkish light brown; exudate transparent. *Twigs* grey or dark brown and corky when old; younger twigs ridged, shiny, almost black, lenticellate, glabrous to sparsely hairy with short erect hairs or with long pale hairs evenly distributed, becoming sparsely hairy or glabrous when mature. *Leaves* bipinnate, 8–28cm long, *petiole* 1.6–8.5cm long, glabrous to sparsely hairy, rarely densely hairy; rhachis with long, sparse hairs predominantly on upper surface, occasionally densely hairy or glabrous; *pinnae* 3–12 pairs per leaf, paripinnate, alternate or opposite; *petiolule* 2–10mm long, sparsely to densely hairy; *pinna* rhachis usually more densely hairy than leaf rhachis, rarely glabrous; *leaflets* 6–20 pairs per pinna, alternate or opposite, 4–17 × (0.8–)2–10.5mm, linear to elliptic; apex retuse, sometimes with a small mucro, rarely rounded; base asymmetric; *petiolule* densely hairy, rarely glabrous; *leaflet lamina* glabrous above, occasionally with sparse evenly distributed hairs, glabrous below but with a few long hairs predominantly on mid-vein or near base, or densely hairy; margins with few hairs; venation distinct on upper surface, rarely indistinct, mid-vein flush with lamina surface, raised below; secondary veins 6–10 pairs, at 70–90° to mid-vein and merging with next vein above before reaching margin; tertiary veins reticulate, frequently indistinct. *Inflorescence* 6.5–11cm long, axillary, racemose, erect; pedicel persistent, 0.5–2mm long, glabrous; bracts triangular, with long hairs especially on margin, caducous. *Flowers* 5–10mm long, variously described as dull white, green-white, cream, creamish yellow, creamish pale green, light green and very pale yellow-green, sweetly scented, similar to *Citrus* blossom (G.P. Lewis *et al.* 878) or *Philadelphus coronarius* (R.M. Harley *et al.* 10379); *calyx* 2–4mm long, with triangular lobes 0.5–2mm long, with long hairs predominantly on tube, rarely densely hairy, very pale yellow-green; *petals* 5, free, 3–4.5 × 0.9–1.2mm, usually with a few long apical hairs, rarely completely glabrous or densely hairy throughout their length; stamens 10, 6–8mm long, glabrous, packed tightly around ovary before corolla opens; filaments 5–7mm long, white; anthers 0.5–0.7mm, cream or yellow with a large apical stalked gland (Fig. 2); style 2.5–4mm long, with long pale hairs extending from ovary to within 1mm of stigma; stipe 1–2.5mm, usually with hairs extending down from ovary; ovary 1.8–2.5 × 0.6–1mm, densely hairy, ovules 10–18. *Fruit* a flattened, pendent, stipitate, slightly curved pod, 7.8–16 × 1.4–3.6cm, glabrous, the thin, membranous endocarp separating from the pericarp and splitting between the seeds to enclose each in a subquadrate to rectangular papery envelope; immature pods green, becoming chestnut brown at maturity; seeds laterally compressed, 6–14 per pod, ovate to almost circular, 6–14 × 4–8mm.

*Derivation.* Greek, *platy* = flat, *hymen* = membrane, referring to the membrane within which the seed is enveloped (see Heringer, 1956, p. 3).

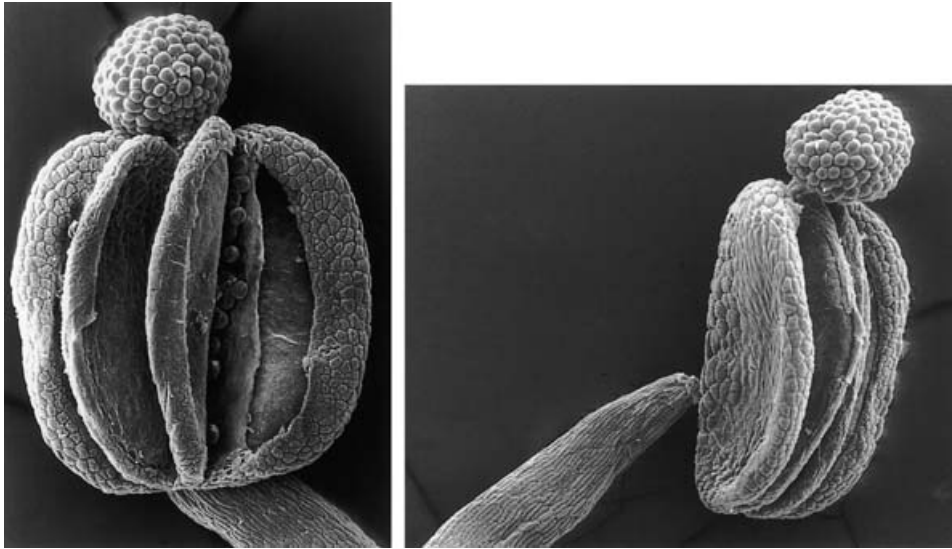


FIG. 2. Scanning electron micrographs of anther of *Plathymenia reticulata* showing apical gland (Fiebrig 4012),  $\times 330$ . Photographs by Maureen Chisam Warwick.

*Distribution.* BRAZIL. Amapá, Bahia, Brasília, Ceará, Distrito Federal, Espírito Santo, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, São Paulo and Transamazônia. SURINAM. Sipaliwini. BOLIVIA. Andrés Ibáñez, Santa Cruz. PARAGUAY. Río Apa and Río Aquidaban. Fig. 3.

*Altitude.* Mainly 300–1075m, one specimen from 30m (H.N. Whitford & F. Silveira 74).

*Flowering.* September–December; Pott & Pott (1997) report pods maturing almost one year later.

*Habitat and ecology.* *Plathymenia reticulata* grows predominantly in Brazilian cerrado vegetation and seasonally dry tropical forest, as defined by Pennington *et al.* (2000); a few specimens occur on rocky ridges (J.A. Ratter *et al.* R813, H.S. Irwin *et al.* 27461) or summits (R.M. Harley *et al.* 21235). The tallest specimens collected are from cocoa (*Theobroma*) plantations and remnants of Atlantic forest where better soils and higher rainfall probably account for their size.

*Vernacular names.* **Brazil** (all states): vinhático, vinhático-branco, vinhático-castanho, vinhático-rajado, vinhático-testa-de-boi, pau-amargo, pau de candeia, oiteira. **Espírito Santo:** vinhático amarella. **Maranhão:** pati, pupunha rana, candeia (firewood). **Minas Gerais:** vinhático do campo, amarelinho. **Pará:** candrea. **Bahia:** vinhático flor de algodão, vinhático testa de burro. **Bolivia, Santa Cruz:** harca, jarca.

*Uses.* An important timber tree producing high quality wood. Pott & Pott (1997) report that smaller trees are used for fence posts which last 50 years and are very

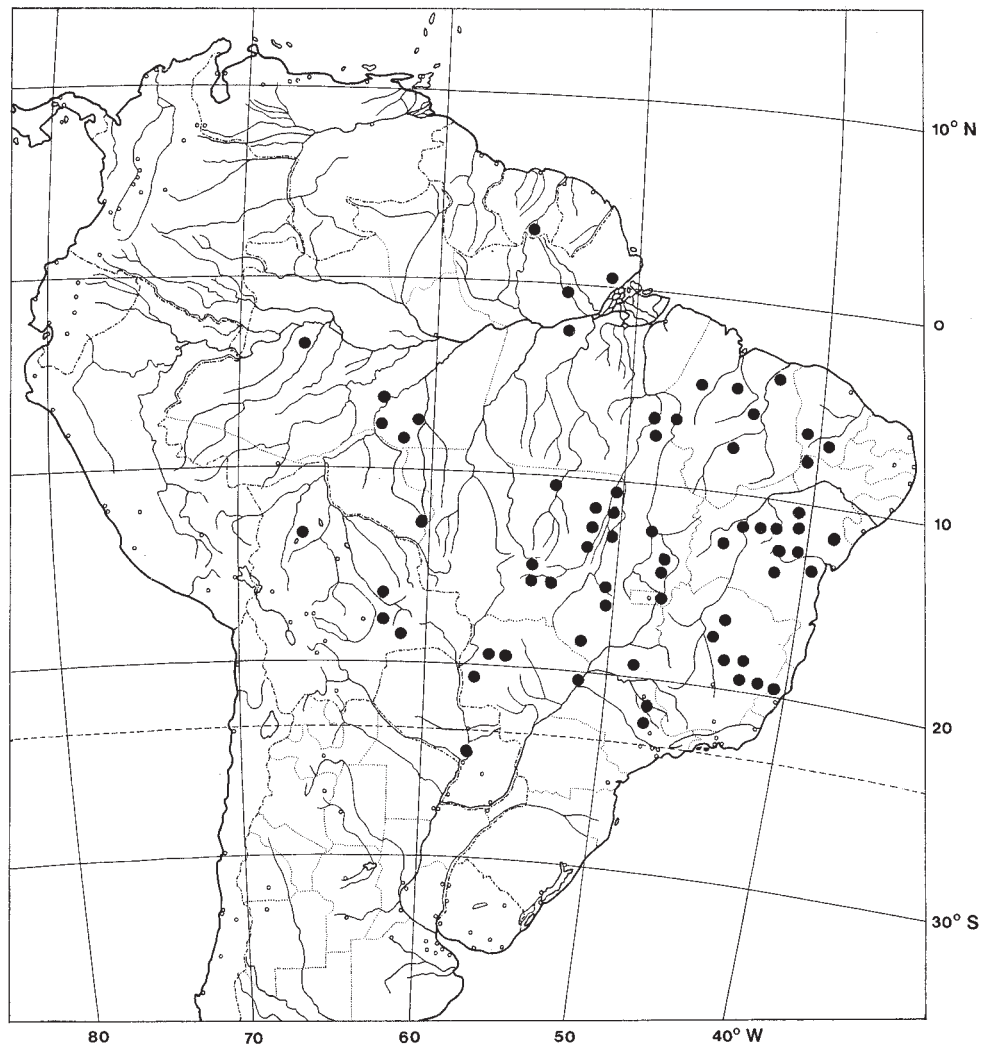


FIG. 3. Map of South America showing distribution of *Plathymenia reticulata*; each dot represents one collection.

resistant to termites; larger trees are used for furniture, floors and in ship building. *Plathymenia reticulata* might be useful in the recovery of degraded areas as it regenerates after being cut and grows well under drought conditions (Pott & Pott, 1997). Ratter *et al.* R1497, R1715 report the wood to be very inflammable but apparently it tolerates light fire (Pott & Pott, 1997). The bark is also used to make a medicinal bath for various ailments (Pott & Pott, 1997). EMBRAPA has classified *P. reticulata* as one of the most important and useful plant species of the Brazilian cerrado, an area rich in biodiversity but endangered by agricultural development (Almeida *et al.*, 1998).

*Selected specimens examined.* **BOLIVIA.** **Santa Cruz.** Parque Nacional Noel Kempff M., Campamento Huanchaca, 13°54'S, 60°48'W, 17 v 1994, *L. Arroyo et al.* 680 (K); Quebrada Seca, road to Camiri, 6km S of junction to highway Santa Cruz – Samaipata, 4 vi 1991, 17°55'S, 63°15'W, *M. Nee* 40792 (K). **Andrés Ibáñez.** 6km NW of Terevinto, 29 viii 1987, 17°41'S, 63°25'W, *M. Nee & G. Coimbra S.* 35848 (K); Buenavista, Prov. Sara, 28 vi 1925, *J. Steinbach* 7161 (E).

**BRAZIL.** **Amapá.** EMBRAPA Research Station, 0°37'N, 51°05'W, 4 viii 1993, *S. Bridgewater et al.* S102 (E); Road to Amapá, km48, coastal region, lowland savanna, 7 vii 1962, *J.M. Pires & P.B. Cavalcante* 51988 (K). **Bahia.** Antiga estrada de Andrai c.5km S de Lençóis, 22 xii 1981, *A.M. de Carvalho et al.* 1081 (K); Serra Geral de Caitité, 1.5km S of Brejinhos das Ametistas, 14°09'S, 42°29'W, 16 vii 1981, *R.M. Harley et al.* 21235 (E); 5km S of Rio Contas on est. de terra to Livramento do Brumado, 13°37'S, 41°49'W, 16 iv 1991, *G.P. Lewis & S.M.M. de Andrade* 1983 (K); Faz Alto da Luzia, Município de Buerarema, km5 Rod. S. José/Una, 7 xii 1979, *D.E. Lobão & A.E. Bonfim* 002 (K); Rodovia Livramento do Brumado/Rio de Contas, 13°36'S, 41°49'W, 19–20 vii 1979, *S.A. Mori et al.* 12316 (K); 7km NW entroncamento para Mundo Novo na BA052 (estrada do feijão), 11°53'S, 40°30'W, 25 vii 1993, *L.P. de Queiroz & N.S. Nascimento* 3450 (K). **Brasília.** Bacia do Rio S. Bartolomeu, 28 iv 1980, *E.P. Heringer et al.* 4515 (K); Adjacências da Cachoeira do Pipiripau, 23 x 1980, *E.P. Heringer et al.* 5674 (K); Granjeiro Taboleiros, Vorberge der Serra do Araripe, 19 x 1933, *P.v. Luetzelburg* 25870 (K). **Ceará.** Near the Villa do Crato, x 1838, *Gardner* 1589 (K); Chapada do Araripe, Tabocas, 29 viii 1971, *D.R. Gifford & S. Fonsêca* G331 (E). **Espírito Santo.** Collantina, Rio Doce, 4 vii 1918, *H.N. Whitford & F. Silveira* 74 (K). **Distrito Federal.** 5km E of Planaltina, on road to Formosa, 11 x 1965, *H.S. Irwin et al.* 9125 (K); Parque Nacional, Brasília, 2 x 1972, *J.A. Ratter et al.* R2538 (E). **Goiás.** Near Goyaz towards river Paranyhuba, *W.J. Burchell* 6089 (K); Cachoeira, Mun. Cristalina, 25 x 1978, *G. Hatschbach & A. Kasper* 41696 (K); c.9km S of Guará, 20 iii 1968, *H.S. Irwin et al.* 21529 (K); Faz. João Gouveia, 12km de Jatá, estrada entre Jatá e Caiaponia, 7 vii 1962, *E. Onishi & S.G. Fonsêca* 206/975 (K); 2km from Macauba, Parque Nacional do Araguaia near HQ, 10°30'S, 50°30'W, 14 ix 1980, *J.A. Ratter et al.* R4423 (E). **Maranhão.** Montes Altos, Mangaba, 20 viii 1982, *U.N. Maciel et al.* 828 (K); Road between Barreirinhas & Urbano Santos, 10km W from Sobradinho, 28 xi 1985, *G.T. Prance & R. Henriques* 29899 (K); Mun. de Grajaú, 20km N of Grajaú, along highway 006, 5°40'S, 46°11'W, 10 iii 1983, *G.E. Schatz et al.* 1007 (K); **Mato Grosso.** Faz. Salina, Pantanal do Rio Negro, 19°30'S, 56°10'W, 18 x 1987, *B. Dubs* 432 (E); c.1km NE of Garapú, 1 x 1964, *H.S. Irwin & T.R. Soderstrom* 6538 (K); Mun. Cuiabá, Véu de Noiva do Rio Coxipozinho, 15°30'S, 55°45'W, 21 x 1985, *J. Pirani* 1336 (K); Faz. Do Senhor Antônio, Serra da Petravina, Mun. de Tatuapé, 16°47'S, 54°06'W, 7 xi 1993, *J.A. Ratter et al.* R7016V (E); Serra Formosa along BR080, 65km E of junction with BR163, 10°27'S, 54°26'W, 4 x 1985, *W. Thomas et al.* 4192 (K). **Mato Grosso do Sul.** Serra de Urucum, near Corumbá, 19°08'S, 57°33'W, 11 xi 1987, *J.A. Ratter* R5924 (E). **Minas Gerais.** Caxoeiras do Campos, 1839, *P. Claussen & B. Delessert* 110 (K, lectotype of *P. reticulata*); Serra do Cabral, Est. para Torre de TV. Joaquim Felício, 17°45'S, 44°11'W, 6 xi 1987, *I. Cordeiro et al.* 11637 (K); Faz. Do Rasgão, 3km de Paraopeba, 25 x 1959, *E.P. Heringer* 7242/32534 (K); c.18km E of Diamantina, 14 iii 1970, *H.S. Irwin et al.* 27461 (K); Ituiutaba, 10 xi 1944, *A. Macedo* 552 (K); Vale da Mae D'água ao longa da rodovia Belo, Mun. de Santana do Riacho, 4 v 1986, *R. Mello Silva et al.* 42453 (K). **Pará.** Serra da Paituna proxima a Pedra do Pilão, 30km de Monte Alegre, 01°55'S, 54°15'W, 6 xi 1987, *C.A. Cid Ferreira* 9477 (K); Palmeirinhas, road S from BR226, Barro do Corda, 5°14'S, 44°28'W, 26 ii 1983, *E.L. Taylor et al.* E1033 (K). **São Paulo.** Moji-Guassú, Reserva Florestal, perto de Padua Sales, 20 xi 1958, *O. Handro* 825 (K); BA-Estrada Mucugê-Andaraí, 18 xii 1984, *G.P. Lewis et al.* SPF 36911 (K). **Transamazônia.** Br 319 Rod. Manaus-Porto Velho, 15km de Humaitá, 7°40'S, 63°00'W, 10

iv 1985, C.A. Ferreira 5391 (K); Km66 da estrada para os campos, 150km SE de Humaitá, 8°27'S, 61°42'W, 22 x 1993, T.M. Sanaiotti 188 (E).

PARAGUAY. Zwischen Río Apa & Río Aquidaban, Centurion, 29 vii 1910, K. Fiebrig 4012 (E, K); Prope Concepción, x 1901–2, E. Hassler 7674 (K).

SURINAM. Sipaliwini area on Brazilian border, 5km W of Morro Grande dome slope, 6 xi 1968, F.H.F. Oldenburger et al. 454 (K).

*Additional specimens examined* – A.M. Amorim et al. 582; R.P. Belém & R.S. Pinheiro 2935; Blanchet 3375; W.J. Burchell 8628; A.M. de Carvalho et al. 2369; T.B. Cavalcanti et al. 1667; T.B. Cavalcanti et al. 1747; C.A. Cid Ferreira 5594; C.A. Cid Ferreira et al. 6391; P. Claussen 1394; P. Claussen 1440; L.V. Costa et al. 212; G. Eiten & L.T. Eiten 4660; R.M. Harley & R. Sousa 10521; R.M. Harley et al. 25613; E.P. Heringer et al. 6272; H.S. Irwin et al. 14731; H.S. Irwin et al. 16823; H.S. Irwin et al. 17472; H.S. Irwin et al. 21244; H.S. Irwin et al. 21653; J.G. Jardim et al. 703; G.P. Lewis et al. 878; G.P. Lewis et al. 971; M.A. Lopes 903; L.A. Mattos Silva et al. 2767; S. Mori 12923; W.B. Mostacedo et al. 1700; F.H.F. Oldenburger et al. 330; R. Quevedo et al. 2593; J.A. Ratter et al. R813; J.A. Ratter et al. R1497; J.A. Ratter et al. R2070; J.A. Ratter et al. R3587; J.A. Ratter et al. R6731; A. Rodriguez & J. Surubi 638; T.M. Sanaiotti 203; T.M. Sanaiotti 308; J. Semir & M. Sazima 4750; J. Steinbach 6633; R.S. Williams 557.

#### ACKNOWLEDGEMENTS

We thank Toby Pennington for providing valuable comments on earlier drafts of this paper, two anonymous reviewers for constructive comments, and the Royal Botanic Gardens, Kew for providing material on loan.

#### REFERENCES

- ALMEIDA, S. P., PROENÇA, C. E. B., SANO, S. M. & RIBEIRO, J. F. (1998). *Cerrado: Espécies Vegetais Úteis* xiii: 280–283. Planaltina: EMBRAPA – CPAC.
- BENTHAM, G. (1840). Enumeration of plants collected by Mr. Schomburgk in British Guiana. *Journ. Bot.* II: 134–135.
- BENTHAM, G. (1842). On *Mimoseae*. *Hook. Journ. Bot.* 4: 333–334.
- BENTHAM, G. (1876). In: MARTIUS, C. F. P. VON (ed.) *Flor. Bras.* 15: 270–271. Leipzig: R. Oldenbourg.
- BURKART, A. (1939). *Plathymenia. Darwiniana* 3(3): 466.
- CHODAT, R. & HASSLER, E. (1904). *Plantae Hasslerianae, Deuxieme Partie*: 561. Geneva: Université de Genève.
- DUCKE, W. A. (1925). As leguminosas do Estado do Pará. *Arch. Jard. Bot. Rio de Janeiro* 4: 253.
- HERINGER, E. P. (1956). O Gênero *Plathymenia*: 1–12. *Anais Reun. An. Soc. Bot. Bras.* [no volume number or place of publication given].
- LACERDA, D. R., ACEDO, M. D. P., LEMOS FILHO, J. P. & LOVATO, M. B. (2001). Genetic diversity and structure of natural populations of *Plathymenia reticulata* (*Mimosoideae*), a tropical tree from the Brazilian Cerrado. *Mol. Ecol.* 10: 1143–1152.
- LACERDA, D. R., LEMOS FILHO, J. P., ACEDO, M. D. P. & LOVATO, M. B. (2002). Molecular differentiation of two vicariant neotropical tree species, *Plathymenia foliolosa* and *P. reticulata* (*Mimosoideae*), inferred using RAPD markers. *Plant Syst. Evol.* 235: 1–4.



- 
- LEWIS, G. P. (1987). *Legumes of Bahia*, p. 112. London: Royal Botanic Gardens, Kew.
- PENNINGTON, R. T., PRADO, D. E. & PENDRY, C. A. (2000). Neotropical seasonally dry forests and Quaternary vegetation changes. *J. Biogeog.* 27: 261–273.
- POTT, A. & POTT, V. J. (1997). *Plathymenia reticulata*, Leguminosae-Mimosoideae. In: *Plants of Pantanal*, p. 155. Brasilia: Brazilian Agricultural Research Corporation.
- WARWICK, M. & HELFER, S. (1990). A scanning electron microscope survey of *Vireya* rhododendrons, 1: Preparation techniques. *Notes Roy. Bot. Gard. Edinburgh* 46(3): 365–374.

*Received 27 August 2002; accepted after moderate revision 10 April 2003*