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Taxonomic studies on Malagasy Dalbergia (Fabaceae). II. A new name for *D. mollis* and the reinstatement of *D. chermezonii*

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Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). II. A new name for *D. mollis* and the reinstatement of *D. chermezonii*

Nicholas Wilding, Peter B. Phillipson & Simon Cramer

Abstract

WILDING, N., P.B. PHILLIPSON & S. CRAMERI (2021). Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). II. A new name for *D. mollis* and the reinstatement of *D. chermezonii*. *Candollea* 76: 251–257. In English, English and French abstracts. DOI: <http://dx.doi.org/10.15553/c2021v762a5>

The two varieties of *Dalbergia mollis* Bosser & R. Rabev., recognised by Bosser & Rabevohitra, have been recently shown on the basis of molecular data to be distinct at species level. This distinction is supported by a number of clear differences in the morphology of the two species that we discuss here in detail. Nomenclatural problems have beset these taxa: the name *Dalbergia mollis* was established by Bosser and Rabevohitra as a replacement for the later homonym *Dalbergia stenocarpa* R. Vig., however, the name was superfluous because the name *Dalbergia chermezonii* R. Vig. was available for this species as circumscribed in Bosser and Rabevohitra's article, but was treated by the authors incorrectly, as a synonym of one of the varieties. We re-establish *Dalbergia chermezonii*, provide the new name, *Dalbergia bemarivensis* Phillipson & N. Wilding, as a replacement for *Dalbergia stenocarpa* R. Vig. and propose an amended description of both species. While the former species occurs only in the southern half of the country, the latter occurs only in the north-west. Both species can become large trees and are known to be a source of valuable rosewood.

Résumé

WILDING, N., P.B. PHILLIPSON & S. CRAMERI (2021). Études taxonomiques sur les *Dalbergia* (Fabacées) malgaches. II. Un nouveau nom pour *D. mollis* et le rétablissement de *Dalbergia chermezonii*. *Candollea* 76: 251–257. En anglais, résumés anglais et français. DOI: <http://dx.doi.org/10.15553/c2021v762a5>

Il a été récemment démontré sur la base de données moléculaires que les deux variétés de *Dalbergia mollis* Bosser & R. Rabev. reconnues par Bosser & Rabevohitra doivent être considérées comme distinctes au rang spécifique. Cette distinction est confirmée par des différences morphologiques que nous discutons en détail. Nous mettons par ailleurs en évidence divers problèmes nomenclaturaux autour des noms de ces deux taxa. Le nom *Dalbergia mollis* qui avait été proposé par Bosser et Rabevohitra en remplacement de *Dalbergia stenocarpa* R. Vig. (homonyme postérieur) est cependant superflu car le nom *Dalbergia chermezonii* R. Vig., donné en synonymie d'une des variétés, était disponible pour cette espèce dans la circonscription qu'en avaient les auteurs. Nous rétablissons donc le nom de *Dalbergia chermezonii*, proposons *Dalbergia bemarivensis* Phillipson & N. Wilding comme nouveau nom pour *Dalbergia stenocarpa* R. Vig. et donnons une description détaillée des deux espèces. Alors que la première espèce n'est présente que dans la moitié sud du pays, la seconde est limitée au nord-ouest. Les deux espèces peuvent devenir de grands arbres et sont connues pour être exploitables comme bois précieux sous le nom générique de «bois de rose».

Keywords

FABACEAE – *Dalbergia* – Madagascar – New name – Precious wood – Rosewood

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Introduction

René Viguier (1880–1931) described 11 new species of *Dalbergia* L. f. (Fabaceae) from Madagascar based on collections made by Perrier de la Bâthie, Louvel and Humbert between 1902 and 1926, and which were eventually published some 20 years after his death (VIGUIER, 1952). Among these he described *D. stenocarpa* R. Vig., a species with two varieties: the typical variety recorded from five Perrier de la Bâthie collections made in Ambongo and Boïna, near the north-western coast, and the second variety, *D. stenocarpa* var. *menabeensis* R. Vig., recorded from a single Perrier collection from Belo sur Tsiribihina, further south in the Menabe Region. In the same article, VIGUIER (1952) published *D. chermesonii* R. Vig., also based on a Perrier de la Bâthie collection, but from the valley of the Fandramanana River in the Ihorombe Region, even further to the south and in the interior of the country. However, unknown to Viguier, KURZ (1875) had already published the name *D. stenocarpa* Kurz for a species based on material from India (now treated as a synonym of *D. sericea* G. Don; POWO, 2021), thus, rendering *D. stenocarpa* R. Vig. illegitimate under Art. 53.1 of the ICN (TURLAND et al., 2018), and the combination *D. stenocarpa* var. *menabeensis* is not illegitimate but is unavailable for use (TURLAND et al., 2018: Art. 55.2).

Forty-five years later, BOSSER & RABEVOHITRA (1996), who had at their disposal a wealth of additional material with which to review the species and varieties described by VIGUIER (1952), essentially retained the concept of *Dalbergia stenocarpa* R. Vig. as a species comprising two varieties. They provided a replacement name, *D. mollis* Bosser & R. Rabev., for this species and made the new combination *D. mollis* var. *menabeensis* (R. Vig.) Bosser & R. Rabev. to account for the non-autonymic variety. However, in the same article, these authors included *D. chermesonii* R. Vig. as a synonym of their new combination, *D. mollis* var. *menabeensis*. This was an error, the authors should have adopted the name *D. chermesonii* as the name for this species instead of publishing *D. mollis* as a replacement name. The name *D. mollis* was therefore a superfluous name, and is illegitimate according to the Code (TURLAND et al., 2018: Art. 52.1).

Next-generation sequencing data and phylogenomic analyses (CRAMERI, 2020) indicate that material referable to the two varieties of *Dalbergia mollis* recognised by BOSSER & RABEVOHITRA (1996, 2002), does not form a monophyletic group and their recognition is therefore inconsistent with the hypothesis that they represent two varieties of a single species. Species tree analyses, involving over 2300 nuclear genetic loci, resolve *D. mollis* var. *menabeensis* as sister to a clade that includes both *D. mollis* var. *mollis* and *D. hirticalyx* Bosser & R. Rabev. All three taxa are morphologically and genetically distinct (CRAMERI, 2020), and we consider them to be best treated as distinct species. A fourth, morphologically and phylogenetically distinct entity is known that is sister to the

clade including the three taxa mentioned above, but is as yet undescribed and will be the subject of a future contribution.

In this note we resurrect the name *Dalbergia chermesonii* for the taxon that occurs across a large portion of southern Madagascar and that was treated as *D. mollis* var. *menabeensis* by BOSSER & RABEVOHITRA (1996, 2002). The plants from north-west Madagascar assigned to *D. mollis* var. *mollis* by BOSSER & RABEVOHITRA (1996, 2002) and originally, but illegitimately, described by VIGUIER (1952) as *D. stenocarpa* R. Vig. are provided with the new name *D. bemarivensis* Phillipson & N. Wilding.

Dalbergia chermesonii and *D. bemarivensis* are known to develop into large trees, up to 16 m and 35 m tall, respectively, and both have a long history of being exploited for their desirable, dark heartwood, commonly known as rosewood. Both species possess a similar dense tomentose indument on young shoots and leaves, but the fruits of *D. chermesonii* are smaller than those of *D. bemarivensis* and in both taxa the pericarp is densely, longitudinally ribbed (more visible in dry fruits). A similarly ribbed pericarp is observed in only three other Malagasy species: (1) *Dalbergia hirticalyx*; (2) *Dalbergia* sp. (mentioned above); and to a lesser extent (3) *Dalbergia abrahamii* Bosser & R. Rabev., which is only distantly related (CRAMERI, 2020). Leaflet shape is especially variable in *D. chermesonii* and *D. bemarivensis* (Fig. 1), from broadly ovate or elliptic to obovate in *D. chermesonii* and elliptical to broadly elliptical, lanceolate or oblong in *D. bemarivensis*. The two species are, however, easily distinguished by the number of leaflets, which typically varies from 7 to 11 in *D. chermesonii* and from 13 to 19 in *D. bemarivensis*. These two species are distinguished from all other Malagasy *Dalbergia* by their leaves, which have fewer than 20 non-linear leaflets that possess a persistent velvety indument on their undersides.

Amended descriptions and photographic illustrations (Fig. 2) are provided for the two species, as well as an assessment of their conservation status according to the IUCN Red List Categories and Criteria (IUCN, 2012). For the assessments we adopt an integrated approach, combining past and projected forest decline together with an ecological niche model for the species, as outlined in WILDING et al. (2021). Since *Dalbergia bemarivensis* and *D. chermesonii* can develop into sufficiently large trees to be potential sources of valuable wood, geo-coordinates and detailed locality data have been withheld for them in this article, and public access to this information through the MADAGASCAR CATALOGUE (2021) has been restricted.

Taxonomic treatment

Dalbergia bemarivensis Phillipson & N. Wilding, **nom. nov.**

- = *Dalbergia mollis* Bosser & Rabev. in Bull. Mus. Natl. Hist. Nat., B, Adansonia 18: 211. 1996 [nom. illeg.].
- = *Dalbergia stenocarpa* R. Vig. in Notul. Syst. (Paris) 14: 182. 1952 [nom. illeg.] [non *D. stenocarpa* Kurz, 1875].

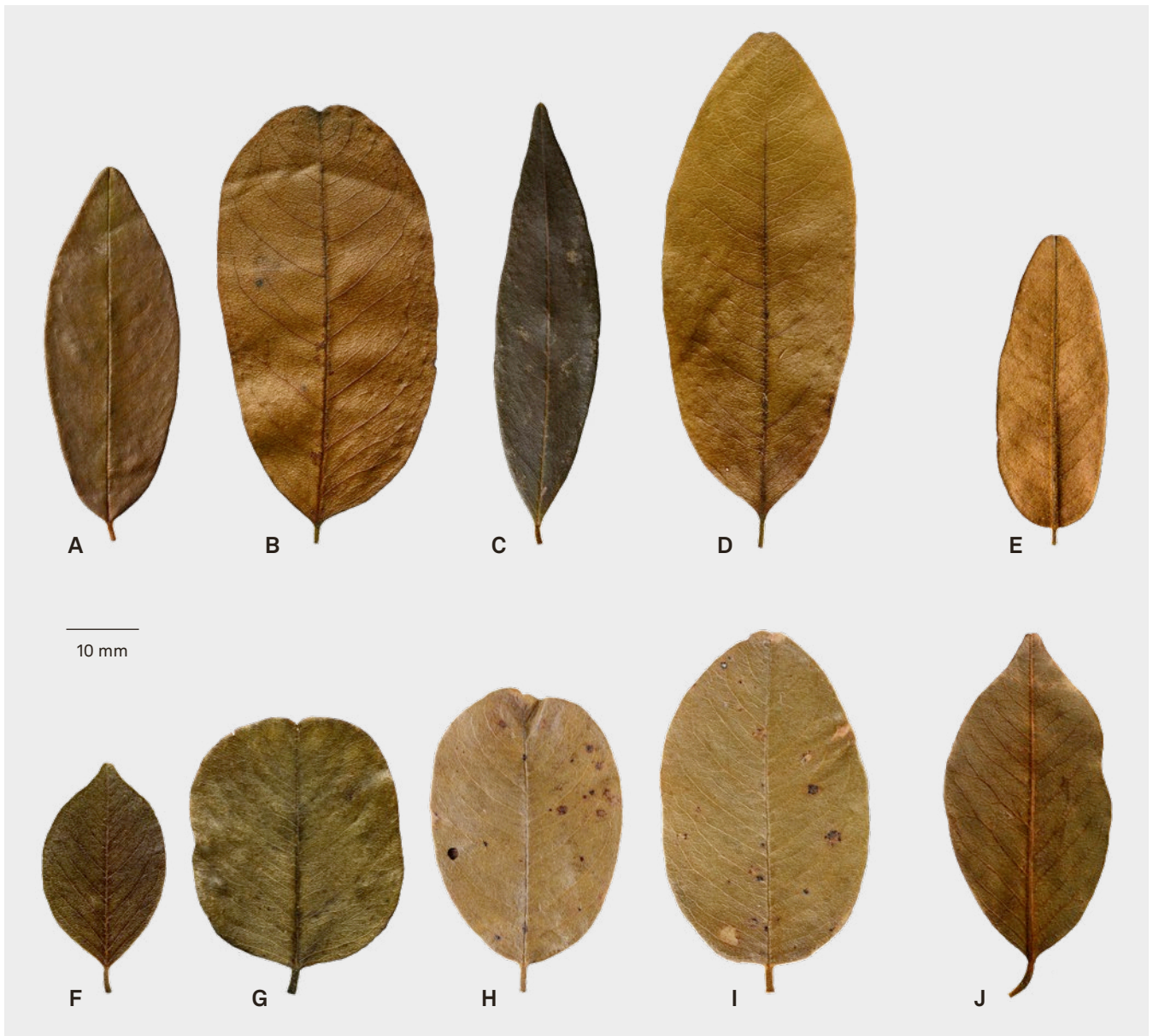


Fig. 1. – Variation in shape and size of leaflets. *Dalbergia bemarivensis* Phillipson & N. Wilding: **A–D.** Upper surface; **E.** Lower surface. *Dalbergia chermezonii* R. Vig.: **F–I.** Upper surface; **J.** Lower surface. [**A:** Service Forestier 109-R-130; **B, D:** Bernard & Randrianaivo 2749; **C:** Ramamonjarisoa 54; **E:** Ramananjahary 104; **F:** Du Puy et al. M422; **G:** Rakotovo & Ravolomanana 7460; **H–I:** Service Forestier 29081; **J:** Service Forestier 2681].

Lectotypus (first step designated by BOSSER & RABEVOHITRA, 1996: 211; second step designated here): **MADAGASCAR. Reg. Melaky [Prov. Mahajanga]:** Boina, bassin du Haut Bemarivo, 400 m, X.1906, *Perrier de la Bâtie* 4355 (P [P00060377]!; isolecto-: P [P00060376, P00060378, P00060379]!; K [K000379264]!).

Trees to c. 35 m tall or shrubs; bole to 15 m high, DBH to 102 cm. *Branches* densely covered in a whitish or yellow-brown to golden, or less frequently reddish, tomentose indument,

yellow-green *in vivo* (black *in sicco*) when young, becoming glabrous, pale grey-brown when old, lenticels present. *Leaves* alternate, (12–)15–30 cm long, with (11–)13–19 alternate leaflets; petiole and rachis pale yellow-green *in vivo*, light to dark brown *in sicco*, tomentose at first, glabrescent; petiole 1.8–3.5 cm long; stipules caducous, 8–12 × 2–3 mm; leaflets (20–)30–80(–95) × (8–)15–32 mm, decreasing in size towards the proximal part of the leaf, the distal leaflet slightly longer than the rest; petiole 2–4 mm long, pale brown to yellow-green *in vivo*, light to dark brown *in sicco*, tomentose; lamina elliptical to broadly

elliptical, lanceolate, oblong or rarely obovate, at times orbicular in smaller proximal leaflets, thinly coriaceous, base rounded or narrowly to broadly cuneate, margin plane to slightly revolute, apex obtuse or acute, weakly retuse or sometimes emarginate, venation eucamptodromous, with c. 6–12 lateral veins per side; upper and lower surface bright mid-green *in vivo*, dull green to brown *in sicco*, upper surface matt, glabrescent, the midrib forming a groove, the lower surface matt, tomentose, higher-order veins forming a fine network, midrib prominent. *Inflorescences* terminal, a panicle, 5–11 cm long, composed of 1 to many compact, sparsely branched paniculate units, each subtended by a well-developed pinnate leaf-like bract or reduced, caducous, scale-like bract, terminal axes of the inflorescence usually long, curved, secundiflorous and sub-spicate, with flowers in 2 adjacent rows with alternating insertion, the axes densely yellowish-brown pubescent; peduncle to 5 cm long. *Flowers* subtended by a caducous, puberulous, triangular scale-like bract, 0.6–1.2 × 0.3–0.4 mm; pedicel 0.1–1 mm long, puberulous; bracteoles ovate to elliptic, 1–1.2 × 0.3–0.4 mm, apex acute, sparsely puberulous, yellow to orange-brown *in sicco*, caducous; calyx yellow-green, sometimes dark purple at the base *in vivo*, becoming yellow to reddish-brown or black *in sicco*, sparsely puberulous, persisting on fruits, 3–4 mm long, fused in the lower $\frac{2}{3}$, the 2 upper lobes fused to form a single, rounded unit, c. 1.5 × 3 mm, the apex shallowly emarginate, the 2 lateral lobes acute-triangular, c. 1.3 × 1.2 mm, the lowest lobe acute-triangular, keeled, c. 1.8 mm × 1.5 mm; petals glabrous, white *in vivo* becoming orange *in sicco*; standard petal pandurate, 3.5–6(–7) × 2.5–3.5(–5) mm, claw 1–1.5 mm long, apex notched; wing petals 4–5.5(–6.7) × 1.5–2(–2.7) mm, claw 1–1.3 mm long; keel petals 4–5(–5.8) × 1.6–2(–2.3) mm, claw 1.5–2 mm long; androecium glabrous, monadelphous, 4–5(–6) mm long; stamens 9–10, filaments free for upper $\frac{1}{5}$ – $\frac{1}{3}$; gynoecium 4–6 mm long, sparsely covered in long yellowish hairs; stipe 2–3 mm long; ovary c. 2 mm long, with up to 3 ovules; style c. 1 mm long. *Fruits* pale-yellow green *in vivo*, red-brown *in sicco*, the body elongate-elliptical, 7.5–12 × 1.5–3.0 cm when single-seeded, or 15–16 cm long when multi-seeded, base cuneate, apex acute or rounded, surface densely longitudinally ribbed, glabrous; stipe 4–10 mm long, glabrescent; style caducous; seeds (immature) sub-reniform, flattened, brown, 8–9 × 5 mm.

Vernacular names and uses. – “Hazotana” (*Réserve Naturelles 5371*), “Manary” (*Karatra et al. 286, Réserves Naturelles 6646, Service Forestier 109-R-130*), “Manary Bomby” (= “Manari-bomby”) (*Service Forestier 3350, 19241*), “Manary Mavo” (= “Manarimavo”) (*Hassold et al. 729, Service Forestier 6849*), “Manary Toloho” (= Manaritoloho) (*Service Forestier 5518, 52-R-78*), “Manary Vazanomy” (*Ramamonjiarisoa 54*), “Manary Voraka” (*Réserve Naturelles 2014, 2540*), “Sandraza” (*Service Forestier 3468*).

Dalbergia bemarivensis is reportedly used in the making of furniture and the production of charcoal.

Distribution, ecology and phenology. — *Dalbergia bemarivensis* is known from the dry and subhumid bioclimatic zones in the northwest, throughout the Boeny Region, in the northern part of the Betsiboka Region and in the southern part of the Sofia Region, especially in the interior, and as far east as Mandritsara, at elevations from 0–900 m. Its range does not appear to overlap with that of *D. chermesonii*, and neither species is known from the Melaky Region, which separates their known ranges. The species grows on sandy and rocky substrates in seasonally dry forest and woodland. Flowering occurs from August to October.

Conservation status. — Based on an integrated approach (WILDING et al., 2021), combining past and projected forest decline together with an ecological niche model for the species, we estimate the decline in habitat quality for *Dalbergia bemarivensis*, over the period 1990–2089 and based on a generation time of 33 years, to be 89%, assuming no habitat is lost within protected areas (IUCN Categories I–IV). *Dalbergia bemarivensis* is therefore assigned a preliminary conservation status of “Critically Endangered” [CR A4(c)] following IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. — Bosser & Rabevohitra did not designate a single sheet among the five separately mounted duplicates of *Perrier de la Bâthie 4355* at P to serve as the lectotype. We select the only specimen of this collection at P annotated “Vig. det.” and “[envoyé] à Vig. 3/18” to serve as the lectotype of *D. bemarivensis*. Based on these annotations, this specimen is the most likely to have been seen by René Viguiier. The species has been collected twice recently at Marotandrano at c. 900 m, contrasting with older records, which are all from below 400 m.

Dalbergia chermesonii R. Vig. in *Notul. Syst.* (Paris): 14: 182. 1952.

Lectotypus (designated here): **MADAGASCAR. Reg. Ihorombe [Prov. Fianarantsoa]:** vallée de la Fandra-manana [E d’Ihoso], III.1912, *Perrier de la Bâthie 4202* (P [P00064116]!, isolecto-: P [P00064115, P00064117]!).

= *Dalbergia stenocarpa* var. *menabeensis* R. Vig. in *Notul. Syst.* 14: 182. 1952 = *Dalbergia mollis* var. *menabeensis* (R. Vig.) Bosser & R. Rabev. in *Bull. Mus. Natl. Hist. Nat.*, B, Adansonia 18: 211. 1996 [nom. illeg.]. **Holotypus:** **MADAGASCAR. Reg. Menabe [Prov. Mahajanga]:** Belo sur Tsiribihina, bois sablon-neux près de la mer. X.1913, *Perrier de la Bâthie 4795* (P [P00064091]!, iso-: P [P00064092]!).



Fig. 2. –*Dalbergia bemarivensis* Phillipson & N. Wilding: **A.** Young leafy fruiting branch; **B.** Leafy branch with mature fruit, showing lanceolate leaflets. *Dalbergia chermesonii* R. Vig.: **C.** Inflorescence, flowers and young leaves showing the tomentose indument on the leaves and inflorescence axes; **D.** Mature leaves and young fruit, showing ovate leaflets.

[**A:** Rakotovao et al. 7412; **B:** Razakamalala & Andrianarivelo 8749; **C:** Bernard & Andrianarivelo 2819; **D:** Rakotovao 6678]
[Photos: **A, D:** C. Rakotovao; **B, C:** S. Andrianarivelo]

Trees to c. 16 m tall or shrubs; bole to 10 m, DBH to 40 cm. *Branches* densely covered in a yellow-brown to golden, or less frequently reddish, tomentose indument, yellow-green *in vivo* (black *in sicco*) when young, becoming glabrous, pale grey-brown when old, lenticels present. *Leaves* alternate, (5.5–)9–18 cm long, with (3–)7–11(–13) alternate leaflets; petioles and rachis pale green *in vivo*, light to dark brown *in sicco*, tomentose, glabrescent; petiole 9–25 mm long; stipules caducous, 8–12 × 2–3 mm; leaflets (12–)17–66(–80) × 9–39(–45) mm, decreasing in size towards the proximal part of the leaf, the distal leaflet longer than the rest; petiolule 1.5–3(–7) mm long, pale green-brown

in vivo, light to dark brown *in sicco*, tomentose; lamina broadly ovate, obovate, broadly elliptic, rarely obcordate or suborbicular, at times orbicular in smaller proximal leaflets, thinly coriaceous, base rounded to cuneate, margin plane to revolute, apex cuspidate to rounded, acute to obtuse, sometimes shallowly emarginate, venation eucamptodromous, with c. 6–12 lateral veins per side; upper and lower surface bright mid-green *in vivo*, dull green to brown *in sicco*, upper surface matt or glossy, glabrescent, the midrib forming a groove, the lower surface matt, tomentose, higher-order veins forming a fine network, midrib prominent. *Inflorescences* terminal, a compact panicle,

4–10 cm long, composed of 4–6 racemose branches, subtended by a well-developed pinnate leaf-like bract or reduced, caducous, scale-like bract, terminal axes of the inflorescence usually long, curved, secundiflorous and sub-spicate, with flowers in 2 adjacent rows with alternating insertion, the axes densely yellowish-brown pubescent; peduncle to 5 cm long. *Flowers* subtended by a caducous, puberulous, triangular scale-like bract, 0.9–1.1 × 0.6–0.7 mm; pedicel 0.1–1.5 mm long, puberulous; bracteoles ovate to elliptic, 1.2–1.8 × 0.6–0.7 mm, apex acute, sparsely puberulous, yellow to orange-brown *in sicco*, caducous; calyx yellow-green, sometimes dark purple at the base *in vivo*, becoming yellow to reddish-brown or black *in sicco*, sparsely puberulous, persisting on fruits, 3–4.5 mm long, fused in the lower $\frac{1}{3}$ – $\frac{2}{3}$, the 2 upper lobes fused to form a single, rounded unit, c. 1.3 × 1.9 mm, the apex shallowly emarginate, the 2 lateral lobes acute-triangular, c. 1.5 × 1.4 mm, the lowest lobe acute-triangular, keeled, c. 1.8 mm × 1.3 mm; petals glabrous, white to yellow *in vivo* becoming orange *in sicco*; standard petal pandurate, (4–)5–6 × 3–3.5(–4) mm, claw 1–1.5 mm long, apex notched; wing petals 4–6 × (1.3–)1.6–1.8 mm, claw 1–1.5 mm long; keel petals 3.6–4(–5.5) × 1.7–2 mm, claw 1.5–2 mm long; androecium glabrous, monadelphous or diadelphous, 2.5–5 mm long; stamens 9–10, or more rarely 9+1, filaments free for upper $\frac{1}{3}$ – $\frac{1}{2}$ or rarely completely free; gynoeceum 3.5–5(–5.7) mm long, sparsely covered in long yellowish hairs; stipe 1.2–2 mm long; ovary c. 2 mm long, with up to 3 ovules; style 0.5–1.7 mm long. *Fruits* pale-yellow green *in vivo*, red-brown *in sicco*, the body elongate-elliptical, 4.5–7 × (0.9–)1.2–1.9 cm when single-seeded, or 8.5–10 cm long when multi-seeded, base cuneate, apex acute or rounded, surface densely longitudinally ribbed, glabrous; stipe 2–7 mm long, glabrescent; style caducous; seeds not seen.

Vernacular names and uses. — “Behoditra” (*Service Forestier 11-R-180*), “Manary” (= “Magnary”) (*Bernard & Andrianarivelo 2802, 2818, 2819, Ravelonarivo et al. 4575, Service Forestier 8390, 9333*), “Manary Toloho” (= “Manery toloho”, “Manarin toloho”, “Manarintoloho”, “Magnary Toloho”) (*Josso et al. 7, Herb. Jard. Bot. Tan. 6311, Rabarimanarivo et al. 238, Service Forestier 9254, 11936, 12700, 12952, Seyrig 325b*), “Manary Tomboditotse” (*Service Forestier 15025*), “Manary Fotsy” (*Service Forestier 13246*), “Manary ravimboanjo” (*Rakotovaovao 6678, 6697*), “Manary Vato” (*Service Forestier 13249*), “Voamboana” (*Service Forestier 45-R-222*).

Dalbergia chermезонии is reported to have medicinal value post-pregnancy, however, no further information is available regarding precisely what it is used to treat. It is also reportedly used for carpentry, notably to make furniture. Its use for charcoal production is also strongly suspected.

Distribution, ecology and phenology. — *Dalbergia chermезонии* is known from the subhumid, dry and subarid bioclimatic zones in the south and southwest of Madagascar, from Belo

sur Tsiribihina at the north of its range in the Menabe Region to Antanimora in the south in the Androy Region, and as far east as the Horombe Plateau in the Ihorombe Region, at elevations to c. 1350 m, but it appears to be largely absent from the driest areas at low elevations in the subarid zone from Toliara to Ambovombe. The species grows on sandy and rocky substrates in seasonally dry forest and woodland. Flowering occurs from October to February.

Conservation status. — Based on an integrated approach (WILDING et al., 2021), combining past and projected forest decline together with an ecological niche model for the species, we estimate the decline in habitat quality for *Dalbergia chermезонии*, over the period 1990–2089 and based on a generation time of 33 years, to be 88%, assuming no habitat is lost within protected areas (IUCN Categories I–IV). *Dalbergia chermезонии* is therefore assigned a preliminary conservation status of “Critically Endangered” [CR A4(c)] following IUCN Red List Categories and Criteria (IUCN, 2012).

Notes. — Among the three duplicates of *Perrier de la Bâthie 4202* at P, we select the only specimen of this collection annotated “[envoyé] à Vig. 3/18” to serve as the lectotype of *D. chermезонии*. Based on these annotations, this specimen is the most likely to have been seen by René Viguier.

Acknowledgments

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