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Dombeya scorpioides (Malvaceae: Dombeyoideae), a new species from southeastern Madagascar

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Abstract

Dombeya scorpioides, a new endemic species of *Dombeya* (Malvaceae) from southeastern Madagascar, is described. Morphological analysis places this species within *Dombeya* section *Xeropetalum* as defined by Arènes. The species is distinguished by its unique biparous cyme, unusually elongated with mostly scorpioid terminal units. It is further differentiated from other species with similar narrow leaves by its hispid ovary with well-developed stellate hairs. Due to its restricted geographic distribution and past and future threats to its habitat, this species should be classified as Endangered according to IUCN Red List Criteria.

Key words: conservation status, endemism, scorpioid cyme

Introduction

Dombeya Cavanilles (1786: 2) (Dombeyoideae: Malvaceae) is one of the most diverse genera within the Malvaceae, encompassing about 215 species (Bayer & Kubitzki 2003) with approximately 187 of these species endemic to Madagascar (Arènes 1959). Additionally, *Dombeya* species are distributed across the Mozambique channel in Africa, extending to the Arabian Peninsula, and in the Comoros and Mascarene islands in the Western Indian Ocean, highlighting their adaptability and endemism.

The last complete treatment of *Dombeya* in Madagascar was by Arènes (1958, 1959), who created an exceedingly complex artificial classification based on single characters. Applequist (2014) observed in a revisionary study of *Dombeya* sect. *Decastemon* Planchon (1850: 225). that this approach could result in individuals of a single species being placed into multiple infrageneric taxa. The treatment by Arènes (1958, 1959) is obsolete due to the omission of taxa for which material has only later been collected, and the combination of over-description of many taxa and under-description of others makes it almost unusable. While some distinctive subgroups have been subjects of recent herbarium study (Applequist 2014, Jourdain Fievet 2023, Skema 2014) or transferred to other genera as a result of phylogenetic study (Skema 2012, Dorr & Wurdack 2021, and Le Péchon *et al*. 2024 for a Mascarene species), the majority of the genus remains inadequately understood.

In this study, a new species of *Dombeya* discovered in a small area in Atsimo-Atsinanana (in the formerly recognized province of Fianarantsoa), a botanically rich region of southeastern Madagascar, is described. Morphological characteristics assign this new species to *Dombeya* subgenus *Xeropetalum* (Delile in Cailliaud 1827: 374) Schumann (1900: 21), primarily due to the presence of three carpels, a defining feature of this group. The new species also exhibits a distinctive biparous cyme, unusually elongated after anthesis with scorpioid terminal units, setting it apart from almost all other known species of *D.* subg. *Xeropetalum*.

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The limited number of herbarium specimens and the restricted distribution of the species, underscore the importance of formally recognizing and describing this new species. This formal description is a crucial step for its conservation, as it helps raise awareness about its existence and the need for protection. Recognizing *Dombeya scorpioides* contributes to a better understanding of the diversity of the genus and the evolutionary relationships within *D*. subg. *Xeropetalum*. Moreover, it highlights the urgency of continued botanical exploration and conservation efforts in Madagascar, a critical biodiversity hotspot.

Material and methods

This study was based on examination of herbarium collections at MO and P (acronyms follow Thiers 2024) and digital images of specimens. Following a taxonomic species concept (Grant 1981), three morphological differences were considered adequate to recognize a new taxon at species level. The new species was described following botanical terminology by Beentje (2016). Terminology used to categorize stellate and tufted trichomes by size and number of arms follows Skema (2014). Measurements of the vegetative and floral parts were made from herbarium specimens.

The distribution map was prepared using QGIS 3.10.7 (QGIS Development Team 2019) and the Madagascar ecoregions shapefile of Vielledent *et al*. (2016). A preliminary estimate of the conservation status of the new species followed IUCN (2022) categories and criteria, with the area of occupancy (AOO) and extent of occurrence (EOO) estimated using GeoCAT (Bachman & Moat 2012).

Taxonomic treatment

Dombeya scorpioides Jourdain Fievet & Applequist, *sp. nov.* (Fig 1)

Type:—MADAGASCAR. Atsimo-Atsinanana [Prov. Fianarantsoa], Farafangana, forêt de Manombo, 42 m, sur latérite, 27 Sept. 2002 (fl.), *R. Rabevohitra, J. Rabenantoandro & R. Razakamalala 4121bis* (holotype MO [barcode] 3515362!; isotypes P00862084!, TEF n.v.).

Diagnosis:—*Dombeya scorpioides* Jourdain Fievet & Applequist differs from *D. oblongipetala* Arènes (1958: 438) in its longer inflorescences with often scorpioid branches, broader petals, a stellate-hispid ovary, and a longer style.

Description:—*Shrub* 1–3 m tall; bark of large twigs pale brown with remnants of indument persisting. *Young branches* terete; becoming glabrous with age brown with dense indument of short, flattened megaradiate white stellate hairs with large centres. *Stipules* caducous or persistent, narrowly deltoid to narrowly lanceolate, 3.5–9.5 × 0.8–1.5 mm, with dense hairs like that of young twigs, acute. *Leaves* alternate, blade coriaceous, 7.0–17.7 × 2.3–5.4 cm, narrowly elliptical to elliptical with length normally over 2.5 × width (rarely broader, occasionally slightly lanceolate-, oblanceolate-, or oblong-elliptical); apex short-acuminate to long-cuspidate (acute, retuse); base narrowly rounded (sometimes minutely cordate at petiole juncture) to acute (or obtuse); margins entire, sometimes slightly crenate; camptodromous, one basal vein, the lateral weak; adaxial surface glabrate at maturity to pubescent with minute to very short flattish multiradiate stellate hairs; abaxial surface pubescent with minute to very short flattish multiradiate to megaradiate stellate hairs, densely pubescent on basal midrib; petiole short but with a blade ratio highly variable, terete, 6–40 mm, with dense indument like that of young twigs. *Inflorescence* cyme, erect, 10–22 cm long or more, including those in early anthesis, elongating after anthesis, 7–30-flowered; peduncle terete, 3.4–12.0 cm, usually bifurcate, occasionally without a basal division or trifurcate, usually with 1(–2) terminal flower(s), the branches scorpioid (most evident after flowering when branches are extended nearly straight but many flowers are already lost), occasionally with two flowers per node; *pedicels* 8–26 mm long, straight to slightly arcuate; pedicels and bracts densely pubescent with short megaradiate to multiradiate pale flattish stellate hairs and larger (to medium) tufted hairs, often darker centrally, the latter often absent from lower portion of inflorescence. *Bracteoles* caducous, elliptical to lanceolate (ligulate), 2.5–4.3 mm, with hair like that of pedicels. *Flowers* actinomorphic, 5(–3)-merous, pendant. *Sepals* narrowly lanceolate, 5.5–8.8 × 1.4–2.2 mm, rarely two sepals connate as an abnormality, white to pale green, abaxial surface moderately densely pubescent with indument similar to pedicels, the smaller stellate hairs minute to short, adaxial surface glabrous. *Petals* matte whitish to pink or light purple, broadly obovate to obdeltoid, 10.0–13.4 × 9.0–12.0 mm. *Androecium* glabrous, white, with basal corona very short, 0.2–0.3 mm with groups of 3 stamens alternating with staminodes; *stamens* 15, filaments 2.3–4.5

mm; anthers yellow, 0.85–1.20 mm, usually somewhat curved; staminodes 5, narrowly spatulate to ligulate, 3.5–6.5 mm. *Gynoecium* 3-carpellate, white; ovary superior, stellate-hispid with short (to minute) multiradiate to megaradiate hairs; style 2.5–3.0 mm, basally stellate-pubescent, apically glabrous; stigmas 3, 2.0–2.5 mm, curled, glabrous. *Seeds* not seen.

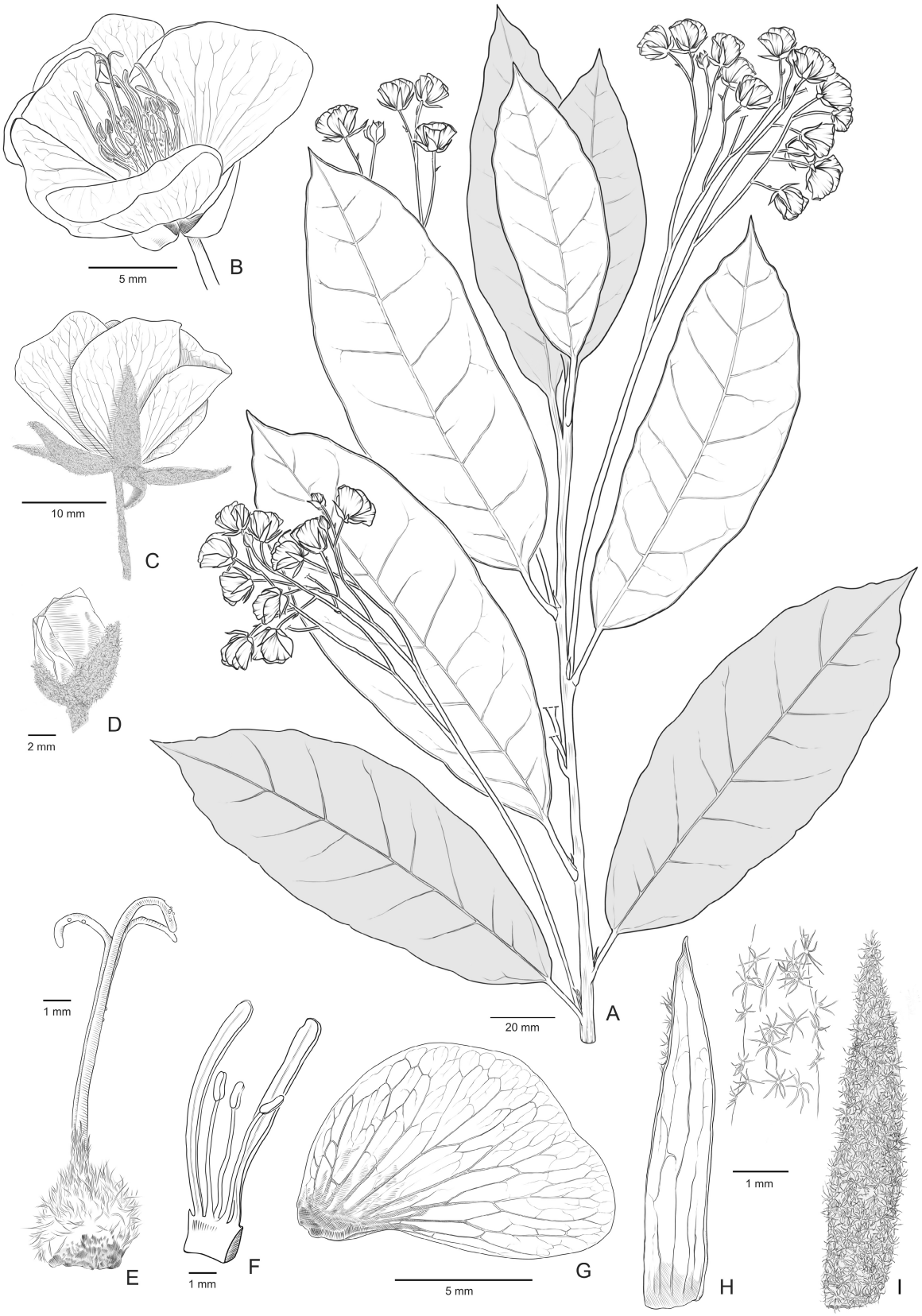

FIGURE 1. Morphological features of *Dombeya scorpioides*. **A.** Habit. **B, C.** Flower. **D.** Flower bud. **E.** Gynoecium. **F.** Part of the androecium. **G.** Petal. **H.** Sepal, adaxial face. **I.** Sepal, abaxial face, with zoom on the hairs on the left. Drawn from *Rabevohitra et al. 4121bis* (P). Illustration by Ludivine Lougou, January 2025.

Distribution, ecology, and habitat:—Collections are from a very restricted area in the southeastern region of Atsimo-Atsinanana, Madagascar (Fig 2). Reported habitat is dense low-elevation (between 5 to 97 m elevation) humid forest near the coast, on lateritic soil. Flowers have been collected in June and post-flowering material with young fruits in September. The species is described as occasional.

FIGURE 2. Known distribution of *Dombeya scorpioides.*

Conservation status:—The three known gatherings of *Dombeya scorpioides* are from two localities very close together near the coast south of Farafangana, the forests of Manombo and Anambotaka. Using GeoCAT (Bachman &

Moat 2012), the Area of Occupancy (AOO) of the species is estimated at 8 km^2, with points in two adjacent grid cells; the Extent of Occurrence (EOO) cannot be calculated because only two points exist, so is set to equal the AOO. The two sites represent two locations with respect to the primary threat of forest cutting. One of the sites, Manombo, is a protected area, though it is in degraded condition due to past disturbances (including cyclone damage, another potential threat in this area) and introduced invasive species (Goodman *et al*. 2018). The other, Anivorano, is not a protected area, and the label of *Ludovic & Ratiana 404* and *405* describe the collection area as "Fortement perturbée par des exploitations (coupes)", indicating that the forest was being cut; its condition has undoubtedly worsened since 2003. The IUCN (2022) guidelines support a preliminary estimate of the conservation status of the species as Endangered [EN B1ab(iii)+B2ab(iii)] based on its small AOO and EOO, two locations, and ongoing damage to the habitat in one location. Additionally, many botanical collections have been made in this area, so the small number of specimens suggests that the species is neither plentiful nor widespread.

Etymology:—The species is named for its distinctive cyme.

Taxonomic discussion:—The complex classification of Arènes (1958, 1959) separated two species of the tricarpellate *D*. subg. *Xeropetalum* into *D*. sect. *Paracapricornua* Arènes (1958: 359) due to their cymose inflorescences with scorpioid branching apically, whereas all other species had small umbels (*D*. sect. *Decastemon*) or non-scorpioid cymes with multiple orders of mostly dichotomous branching or with few flowers (*D*. sect. *Xeropetalum* (Delile) Planchon 1850: 225) or small umbels. The two species in *D*. sect. *Paracapricornua*, namely *Dombeya borraginea* Hochreutiner (1926: 62) and *D. glaberrima* Arènes (1958: 360), had few similarities other than scorpioid inflorescences, and Applequist (unpubl. data) has observed that neither can be clearly distinguished from similar species placed in *D.* sect. *Xeropetalum*. Scorpioid branching may be inconsistent within species, or the character may become less obvious in older inflorescences or specimens in poor condition. Therefore, all of the scorpioid-branched species should be placed within *D*. sect. *Xeropetalum*, as presently recognized; though future phylogenetic studies may support the breakup of that group (Skema 2012).

Using the classification and keys of Arènes (1959), *Dombeya scorpioides* would be placed in his *D*. subsect. *Floribundae* Arènes (1958: 436) (for very sparse leaf indument of small flat-stellate trichomes or long-fimbriate scales) "ser. Pilosae Arènes" (for hispid ovaries) subser. *Dichotomae* Arènes (1958: 446) (sepals [mostly] not reflexed after anthesis). "*Dombeya* series Pilosae" was not validly published because Arènes (1958, 1959) did not specify types for infrageneric groups, which was then a very new requirement, and in some cases, including this one, there was no species included whose epithet allowed it to be treated as the automatic type under Art. 10.8 of the *International Code of Nomenclature* (Turland *et al.* 2018). The species in this series do not otherwise much resemble *D. scorpioides*: they are mostly broad-leaved, and the few with narrower (sometimes rather rhomboidal) leaves generally have conspicuously crenate or wavy leaf margins.

Dombeya scorpioides appears instead to have affinities to a group of species placed in *D*. subsect. *Floribundae* "ser. Epilosae Arènes", another designation that was not validly published. Several of the species in that series have narrow leaves with entire margins. That series was characterized by having lepidote, rather than stellate ovaries, as do two narrow-leaved species previously described by Applequist (2009) that are affiliated with this group. However, indumentum is one of the characters that is conspicuously homoplasious in Malagasy *Dombeya*, and it is evident that transitions between stellate hairs and fimbriate scales were more easily and frequently made than Arènes recognized. The classification of *D*. sect. *Xeropetalum* is badly in need of revision, but we are not prepared to present an alternative at this time.

Within *Dombeya* "ser. Epilosae", *D. scorpioides* may resemble other narrow-leaved species, including *D. floribunda* Baker (1884: 325), *D. gracilicyma* Arènes (1958: 443), *D. oblongifolia* Arènes (1958: 438), *D. oblongipetala* Arènes (1958: 443), *D. rienanensis* Applequist (2009: 291), *D. sahatavyensis* Arènes (1958: 441), *D. trohy* Arènes (1958: 444), and *D. asymmetrica* Applequist (2009: 289). It is not yet clear whether all of those species ought to be recognized as distinct at the species level (Applequist, unpubl. data). Regardless, the material of *D. scorpioides* is not identifiable with any of the existing species as presently circumscribed. None of those species have been reported to have noticeably scorpioid inflorescence branching or stellate ovaries. The leaf shape, size, and often short-acuminate leaf apex of *D. scorpioides* would be unusual in any other species, though potentially found as an uncommon variant. In addition, all of the existing species have other reproductive or vegetative characters that distinguish them from *D. scorpioides*; for example, some have proportionately much narrower petals. *Dombeya oblongipetala* was chosen as the comparator for *D. scorpioides* because the type was collected between Befotaka (inland) and Farafangana, so it might be found in the same area.

Additional specimens examined:—MADAGASCAR. Atsimo-Atsinanana [Prov. Fianarantsoa]: Farafangana, commune Arkarana, fok. Anivorano, env. 9 km à l'ouest du village Anivorano, forêt d'Anambotaka, 93 m, 10 June

2003, *Ludovic & Ratiana 404* (MO [barcode] 3515361!, TAN image!), *Ludovic & Ratiana 405* (MO [barcode] 3515363!, TAN image!).

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