Two new species of *Cordia* L. (Boraginaceae) from Madagascar

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**ABSTRACT**

Two new species of Boraginaceae, *Cordia lowryana* J.S. Mill. and *C. schatziana* J.S. Mill., are described from Madagascar. Both species are members of *Cordia* sect. *Myra*. Neither of these species has been collected for more than 30 years and both are provisionally listed as critically endangered.

**KEY WORDS**
*Cordia*,
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Madagascar,
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**RÉSUMÉ**

**MOTS CLÉS**
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The pantropical genus *Cordia* L. is the largest in the Boraginaceae with an estimated 350 species (MILLER 2001a). The genus exhibits tremendous morphological diversity and as many as six sections have been recognized. Sections *Gerasanthus* (Browne) G. Don (c. 20 spp.), *Rhabdocalyx* A. DC. (4 spp.), *Superbiflora* Taroda (7 spp.), and *Varrania* (Browne) G. Don (c. 100 spp.) are all restricted to the New World tropics. Section *Cordia* (c. 20 spp.) has the majority of its species in the Caribbean and adjacent Central America and Mexico, but *C. suicketii* Chiov. occurs in Somalia and adjacent Ethiopia and *C. subcordata* Lam. is a widespread, water-dispersed species from Indian and Pacific Ocean beaches. Section *Myra* (Endl.) DC. is by far the largest and only section well represented in all parts of the tropics, although it is still most diverse in the neotropics. About 40 species of sect. *Myra* occur in Africa and Madagascar, perhaps an additional 15 are known from Asia, and there are more than 100 currently known from tropical America, and with new species still being discovered there at a regular rate, there are probably 200 species in the section.
Given its size and morphological diversity, several authors have suggested dividing the genus into 3-12 segregate genera (MEZ 1899; FRIESEN 1933; NOWICKE & RIDGWAY 1973), but recent authors have chosen to maintain the genus in a broad sense. Also a result of its size and complexity, Cordia has not yet been treated in its entirety for more than 150 years (CANDOLLE 1845). GURKE (1893) provided a sectional overview, but did not describe the individual species. The neotropical species have been covered in a series of floristic treatments (e.g. GIBSON 1970; NASH & MORENO 1981; MILLER 1988, 2001b), and monographic studies of geographical regions (e.g. TARODA & GIBBS 1986, 1987; GAVRIA 1987). In particular, the studies of the great monographer of Boraginaceae, Ivan JOHNSTON, contributed greatly to taxonomic knowledge of the new world species (JOHNSTON 1930, 1935, 1946, 1949a,b, 1950) and the Asian members (JOHNSTON 1951). The Asian species have been addressed only in floristic treatments for the Flora of Ceylon (NOWICKE & MILLER 1991) and China (ZHU et al. 1995). However, studies of the African species have been largely ignored until a series of recent floristic treatments (WARFA 1988; MARTINS 1990; VERDOUT 1991).

The species from Madagascar have never been treated and only a single species, Cordia mairei Humbert has been described from the botanically rich island (HUMBERT 1949), since a series of French botanists conducted massive collecting efforts in the early 1900s. Both of the species described below are endemic and known only from small, currently unprotected, forests that face great threat in the near future. Like most species of Cordia, the wood is hard, so they are probably among the species selectively removed from dry forests for the production of charcoal. Cordia mairei is also endemic and faces a similar threat, as do several members of the Ehretioidae yet to be described. The other seven species of Cordia known from Madagascar are not endemic and are largely common and widespread, although they too are probably facing local extirpation in many sites from charcoal pressure.

Shortly before his untimely death in 1971, Rene CAPURON began to review the specimens of Cordia and Ehretia species from Madagascar. He recognized that some of the collections represented new taxa and annotated some material. In this case, I have chosen not to accept CAPURON's names as was done previously in the genus Campnosperma (RANDRIANASOLO & MILLER 2000) as with further collections, his geographic names are no longer informative about species distribution and his morphological names are not at all unique descriptors of the species. Instead, I have chosen to commemorate CAPURON's contribution to our knowledge of these plants in an upcoming publication. The two species below are named in honor of my friends and research colleagues, Porter P. LOWRY II and George E. SCHATZ, who initially introduced me to Madagascar and have continued to encourage me to study the flora and particularly Malagasy Boraginaceae.

**Cordia schatziana** J.S. Mill., sp. nov.

Arbor usque ad 6-20 m alta, ramusculis dense brunneo tomentulosis, postea glabrescentibus. Folia alterna, decidua; lamina ovata usque late-ovata, 3-9(-17.5) cm longa, 2-6(-10.5) cm lata, apice acuminata, basi rotundata usque obtusa vel cordata, margine leviter serrata usque undulata, adaxialiter glabra usque sparsim puberula vel furrucosa ad bazum, abaxialiter appresso usque dense puberulenta; petiolo (0.5-1-2-7.5) cm longo. Inflorescentiae terminalis, cymosa, 3-6(-8) cm longae, 3-6(-8) cm latae. Flores bisexuales vel uniflori, plura androdioicae; calyce tubuluretus usque tubulatis-campanulato, 4-7 mm longo, inaequaliter 3- ad 5-lobo, dense brunneo tomentulosus; corolla alba; filamenti glabri. Fructus drupaceus, ovoides, 13-19 mm longus, 10-14 mm latus.

**Typus. — Service Forestier: SF (Capuron) 24310.**


Tree to 6-20 m tall, to 50 cm dbh, the twigs densely brown tomentulose on the current season's growth, later glabrescent. Leaves alternate, deciduous; blades ovate to widely ovate, the widest point below the middle, 3-9(-17.5) cm long, 2-6(-10.5) cm wide, the apex acuminat, the base rounded to obtuse or cordate, the margin slightly serrate or undulate to less commonly entire, the adaxial surface glabrous to sparsely puberulent or scurfy veins, the abaxial puberulent, the venation narrowly canalicular to narrowly tomentulose. Inflorescences terminal peduncles to 3-6(-8) cm wide, to 5-10 cm long, the pedicels short, to 1 cm long, the bracts narrowly linear, 5-10 mm long.
collections represent some material. I accept CAPURON'S proposal in the genus AASOLA & MILLER, his geographic information about species' names are not species. Instead, I accept CAPURON'S contribution to these plants in an attempt to encourage me to explore the particular Malagasy

**sp. nov.**

*Cordia densa brunnea* F. J. Miller. Folia alterna, ovata, 3-9(-17.5) cm longa, auriculata, basi rotundata, nervis serratis abaxialiter nematobius, (0.5)-1-2(7.5) cm longa, crenate, 3-6(-8) cm longa, ovata vel elliptica, lobi usque tubulari-adnati, lobi ad 5-lobi, filamentosus, 13-19 mm longus.

_Fig. 1._ *Cordia schatziana* J. S. Miller: A, flowering branch; B, flower; C, open flower. A-C, from Service Forestier SF (Capuron) 24310 (P).

P (Capuron) 24310, sines à Ampazony au p't23'E, fl., 27 Nov.

cm dbh, the twigs on the current season. Leaves alternate, widely ovate, the apex acuminate, 3-9(-17.5) cm wide, 3-6(-8) cm long, cordate, the margins to less commonly abrous to sparsely puberulent or scurfy along the base of the main veins, the abaxial surface evenly to densely puberulent, the venation craspedodromous, with the lowest pair of secondary veins at or just above the leaf base, so appearing 3-veined from the base, the secondary veins 3-5, the tertiary venation reticulate; petioles (0.5)-1-2(7.5) cm long, narrowly canaliculate on the adaxial surface, densely brown tomentulose to puberulent. Inflorescences terminal, cymose, 3-6(-8) cm long, 3-6(-8) cm wide, the branches densely brown tomentulose, Flowers bisexual or male, the plants morphologically dioecious but almost certainly functionally dioecious, male flowers with exerted stamens and a gynoecium reduced to less than 1 mm, bisexual flowers with short stamens borne in the mouth of the corolla tube; calyx tubular to tubular-campanulate, 4-7 mm long, 2.5-3.5 mm wide at the mouth, unevenly 3-5-lobed, the lobes ovate to widely ovate, 0.5-2.5 mm long, densely brown puberulent on the exterior surface; corolla white, tubular with reflexed lobes,
4-5-lobed, the lobes strap-like to oblong, 4-6 mm long, 1.5-2.3 mm wide, the tube 5-6.5 mm long; stamens 4-5(-7), the filaments 5-12 mm long, the upper 1.5-5 mm free, strongly exerted in male flowers, glabrous, the anthers ellipsoid, 1.2-1.8 mm long; ovary reduced to less than 1 mm and completely lacking a style in male flowers, in bisexual flowers narrowly ellipsoid, 2-3.5 mm long, 1-1.5 mm wide, the style 5-7 mm long, divided half to nearly their full length, the stigmatic filiform. Fruits drupaceous, color at maturity unknown, borne in the persistent. 12-15 mm broad, cup-shaped to saucer-shaped calyx, ovoid, 13-19 mm long, 10-14 mm broad, spicate, the endocarp bony. — Fig. 1.

Corolica schatzii is distinctive in its densely brown tormentoluse calyx, a feature that easily separates it from the other species in Madagascar. It also appears to differ from the following species in having glabrous staminaria filaments.

Perron de la Bâtie 1230 differs significantly from the other specimens cited here in the size of the tree noted on the label (10-20 m tall) and the size of the leaves, up to 17.5 × 10.5 cm, significantly larger than any of the uprooted leaves on other available collections. However, it is from a site close to where other collections have been made and the size of the leaves may merely reflect full development, beyond which is seen on other flowering material. The species evidently flowers soon after leaves emerge and they are probably not fully developed in most flowering collections.

Vernacular names. — Varo, varona, varo monto.

Distribution and habitat. — Corolica schatzii is known from two populations in southern Madagascar and along the west coast near Mahajanga.

Conservation status. — Provisional IUCN Red List Category: Critically Endangered. Area of occupancy less than 10 sq. km. Although the extent of occurrence of this species is quite large, it is known only from three subpopulations, none of which occur in the current system of protected areas. The southernmost subpopulation, from Ampandrandava, is an essentially deforested area and most likely is locally extinct. While some forests remain near Sakaraha and Mahajanga, the sites where collections have been made are outside of currently protected areas, are continually reduced in area, and face heavy pressure from local human populations. The probably high value of this species for its wood and for charcoal production may further the pressure if itface. It has not been collected since 1965 and further fieldwork will be necessary to ascertain if viable populations exist in forest remnants near Sakaraha or Mahajanga.

Paratypes. — Madagascar: Herbeur du Jardin Botanique 6271, Prov. Tolera, Ampandrandava, 24°05'S, 45°42'E, fl., s. date (P); Perron de la Bâtie 1230, Prov. Mahajanga, rocher calcaire du bord du mer à Anibaco, près de Majunga, fl., Feb. 1901 (P); Perron de la Bâtie 1814, Prov. Mahajanga, bords du lac Kinkony, 16°08'S, 45°40'E, Oct. 1905 (P); Service Forestier, SF 2822, Prov. Tolera, Marera, Sakaraha, 22°54'S, 44°18'E, fl., 17 Feb. 1951 (P); Servirg 762, Prov. Tolera, terrains secs, pentes de la vallée au Nord d'Ampandrandava, entre Bekily et Tsivory, 800 m, 24°05'S, 45°42'E, fl., Oct. 1943 (P); Servirg 762 B, Prov. Tolera, Andali, à l'Ouest d'Ampandrandava, entre Bekily et Tsivory, 600 m, 24°05'S, 45°42'E, fl., Nov. 1943 (P); Servirg 762 C, Prov. Tolera, Ampandrandava, entre Bekily et Tsivory, 800 m, 24°05'S, 45°42'E, fr., Nov. 1943 (P).

Corolica lowryana J.S. Mill., sp. nov.

Arbor usque ad 12(-25) m alta, ramunculi pilosis, pustis glabrescentibus. Folia alterna, decidua; lamina late-ovata usque late elliptica, (3.5-)5-11(-22) cm longa, (3.5-)4-5-8.3(-15) cm lata, apice acuminata, basi rotundata usque abrussa, marginis inaequaliter undulata vel serrata usque integra, adaxialis glabra, abaxialis leviter vel sparse pubescentes usque glabra; petiolo (6.8-11.5-4.5-8) cm longo. Inflorescentiae terminale, cymosae, 3-7 cm longae, 3-3 cm latae. Flores bisexuales vel staminati, planta androecois; calyce tubularis usque tubulari-compressus, 5-8 mm longus, inaequaliter (2-1) 3 (ad -5)-lobus, glabro usque sparse pilo, corolla alba; filamentos pubescentes. Fructus drupaceus, oblongi vel ovoides, 15-35 mm longus, 10-30 mm latu.

Tree to 12(-25) m tall, the bark finely fissured, the young twigs pilose with erect hairs c. 1 mm long or glabrous, later always glabrescent. Leaves alternate, deciduous; blades widely ovate to less commonly widely elliptic, the broadest point below to at the middle, (3.5-)5-11(-22) cm long, (3.5-)4.5-8.5(-15) cm wide, the apex rounded to obtuse and abruptly acuminate, the acumen usually 6-20 mm long, the base rounded to obtuse, the margin unevenly undulate or serrate to nearly entire, the adaxial surface glabrous or with a few scattered appressed hairs, mostly on the major veins, the abaxial surface evenly to sparsely pubescent to glabrous, the venation craspedodromous, the...
midrib even with or slightly impressed on the adaxial surface, raised on the abaxial surface, the secondary veins 3-4, the lowest pair at or just above the leaf base, so often appearing 3-veined from the base, the tertiary venation reticulate; petioles (0.8-1.5-4.5 cm long, narrowly canaliculate on the adaxial surface, pilose to glabrous. Inflorescences terminal, cymose, 3-7 cm long, 3-9 cm wide, on peduncles, 1.5-5 cm long, pedicules and branches pilose to puberulent or glabrous. Flowers bisexual or male, the plants morphologically androecious; flower buds obloid, apiculate; calyx tubular to tubular-campanulate, 5-8 mm long, 3-4 mm wide at the mouth, unevenly (2-3)-(5)-lobed, the lobes depressed ovate to ovate, 1-3 mm long, glabrous or less commonly sparsely pilose, but usually with evident tufts of hairs at the tips of the lobes; corolla white, tubular with reflexed lobes, (4)-(5)-(7)-lobed, the lobes oblong to strap-like, 3.6 mm long, 1.5-2.5 mm wide, the tube 5-8 mm long; stamens (4)-(5)-(7), the filaments 8-13 mm, strongly exerted in male flowers, less so in bisexual flowers, the upper 4-7 mm free, pubescent at the point of insertion in male flowers, glabrous in bisexual flowers, the anthers ellipsoid, 1.5-2.5 mm long; gynoeccium completely reduced and nearly lacking (less than 1 mm diam.) in male flowers, in bisexual flowers, ovary narrowly ellipsoid, 2-3 mm long, 1.5-2 mm wide, the style c. 7 mm long, the 4 branches divided nearly to the base, the stigmas filiform. Fruits drupaceous, color at maturity unknown, borne in the persistent 18-33 mm broad, cup-shaped calyx, globose to obloid or ovoid, 15-35 mm long, 10-30 mm broad, strongly apiculate, the outer part of the endocarp fibrous, the inner part bony. — Fig. 2.

_Cordia louryanana_ is distinctive and easily recognized from the other Malagasy species of _Cordia_ in its nearly round and then abruptly acuminate leaves. The northern populations of this species have the largest fruits of any species of _Cordia_ sect. _Myopa_ of which I am aware.

**Vernacular Names.** Varo, varonala.

**Distribution and Habitat.** _Cordia louryanana_ is known from three widely dispersed localities in western and northern Madagascar, all in coastal deciduous forest.

**Conservation Status.** Provisional IUCN Red List Category: Critically Endangered. Area of occupancy less than 10 sq. km. Although the extent of occurrence of this species is quite large, it is known only from three subpopulations, none of which are from currently protected areas. While there are a significant number of collections, the species has not been collected since 1969. Like most species of _Cordia_, it is probably valued as a construction timber and as wood for charcoal production so it may be selectively removed from the forests in which it exists. Further field studies will be required to ascertain the conservation status of the subpopulations.


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