

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

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ABSTRACT

KEY WORDS

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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. *Myxa*. Neither of these species has been collected for more than 30 years and both are provisionally listed as critically endangered.

RÉSUMÉ

Deux nouvelles espèces de *Cordia* L. (Boraginaceae) de Madagascar.

MOTS CLÉS

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Deux nouvelles espèces de Boraginaceae, *Cordia lowryana* J.S. Mill. et *C. schatziana* J.S. Mill., sont décrites de Madagascar. Les deux espèces sont des membres de *Cordia* sect. *Myxa*. Aucun représentant de ces espèces n'a été récolté depuis plus de 30 ans et chacune est provisoirement considérée en danger d'extinction.

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 *Gerascanthus* (Browne) G. Don (c. 20 spp.), *Rhabdocalyx* A. DC. (4 spp.), *Superbiflorae* Taroda (7 spp.), and *Varronia* (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. suckertii* Chiov. occurs in

Somalia and adjacent Ethiopia and *C. subcordata* Lam. is a widespread, water-dispersed species from Indian and Pacific Ocean beaches. Section *Myxa* (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. *Myxa* 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 1890; 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 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; GAVIRIA 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, 1940, 1949a,b, 1950) and the Asian members (JOHNSTON 1951). The Asian species have been addressed only in floristic treatments for the Floras 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; VERDCOURT 1991).

The species from Madagascar have never been treated and only a single species, *Cordia mairiei* 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 mairiei* is also endemic and faces a similar threat, as do several members of the Ehretioideae 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, René 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 *Camptosperma* (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, ramunculis 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 glabrata usque sparse puberula vel furfuracea ad basim, abaxialiter aequaliter usque dense puberulentis; petiolo (0.5-)1-2(-7.5) cm longo. Inflorescentiae terminale, cymosae, 3-6(-8) cm longae, 3-6(-8) cm latae. Flores bisexuale vel staminati, planta androdioica; calyce tubulari usque tubulari-campanulato, 4-7 mm longo, inaequaliter 3- ad 5-loba, dense brunneo tomentuloso; corolla alba; filamentis glabris. Fructus drupaceus, ovoideus, 13-19 mm longus, 10-14 mm latus.

TYPUS. — *Service Forestier: SF (Capuron) 24310*, Madagascar, Prov. Mahajanga, dunes à Ampazonny au Nord de Majunga, 15°37'S, 46°23'E, fl., 27 Nov. 1965 (holo-, P!; iso-, MO!, P!).

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 acuminate, the base rounded to obtuse or cordate, the margin slightly serrate or undulate to less commonly entire, the adaxial surface glabrous to sparsely

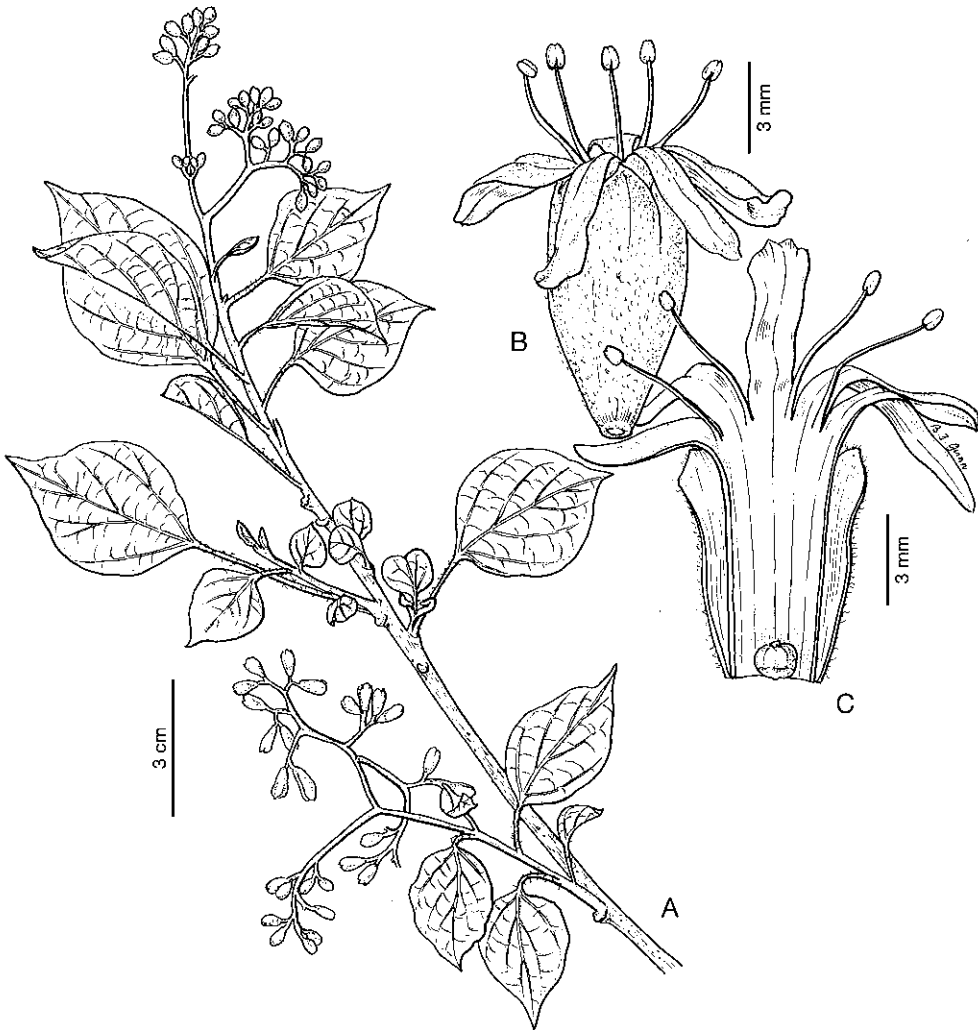


Fig. 1. — *Cordia schatziana* J.S. Mill.: A, flowering branch; B, flower; C, open flower. A-C, from Service Forestier: SF (Capuron) 24310 (P).

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 androdioecious but almost certainly functionally dioecious, male flowers with exserted 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 stigmas 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, apiculate, the endocarp bony. — Fig. 1.

Cordia schatziana is distinctive in its densely brown tomentulose 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 staminal filaments.

Perrier de la Bâthie 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 emerging 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 what 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. — *Cordia 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 it faces. 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: *Herbier du Jardin Botanique 6271*, Prov. Toliara, Ampandrandava, 24°05'S, 45°42'E, fl., s. date (P!); *Perrier de la Bâthie 1230*, Prov. Mahajanga, rocher calcaire du bord de mer à Amboanio, près de Majunga, fl., Feb. 1901 (P!); *Perrier de la Bâthie 1814*, Prov. Mahajanga, bords du lac Kinkony, 16°08'S, 45°50'E, Oct. 1905 (P!); *Service Forestier: SF 2822*, Prov. Toliara, Manera, Sakaraha, 22°54'S, 44°18'E, fr., 17 Feb. 1951 (P!); *Seyrig 762*, Prov. Toliara, terrains secs, pentes de la vallée au Nord d'Ampandrandava, entre Bekily et Tsirovory, 800 m, 24°05'S, 45°42'E, fl., Oct. 1943 (P!); *Seyrig 762 B*, Prov. Toliara, Analali, à l'Ouest d'Ampandrandava, entre Bekily et Tsirovory, 600 m, 24°05'S, 45°42'E, fl., Nov. 1943 (P!); *Seyrig 762 C*, Prov. Toliara, Ampandrandava, entre Bekily et Tsirovory, 800 m, 24°05'S, 45°42'E, fr., Nov. 1943 (P!).

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

Arbor usque ad 12(-25) m alta, ramunculis pilosis, postea glabrescentibus. Folia alterna, decidua; lamina late-ovata usque late elliptica, (3.5-)5-11(-22) cm longa, (3.5-)4.5-8.5(-15) cm lata, apice acuminata, basi rotundata usque obtusa, margine inaequaliter undulata vel serrata usque integra, adaxialiter glabra, abaxialiter leviter vel sparse pubescente usque glabra; petiolo (6.8-)1.5-4.5(-8). cm longo. Inflorescentiae terminale, cymosae, 3-7 cm longae, 3-9 cm latae. Flores bisexuale vel staminales, planta androdioica; calyce tubulari usque tubulari-campanulato, 5-8 mm longo, inaequaliter (2- vel) 3 (ad -5)-lobo, glabro usque sparse piloso, corolla alba; filamentis pubescentibus. Fructus drupaceus, obloideus vel ovoideus, 15-35 mm longus, 10-30 mm latus.

TYPUS. — *Service Forestier: SF (Capuron) 24479*, Madagascar, Prov. Antsiranana, sables, près d'Antsoha, à l'Ouest de la baie de Rigny, 12°29'S, 48°28'E, fl., 27 Jan. 1966 (holo-, P!; iso-, G!, GH!, K!, MO!, P!, TEF!, WAG!).

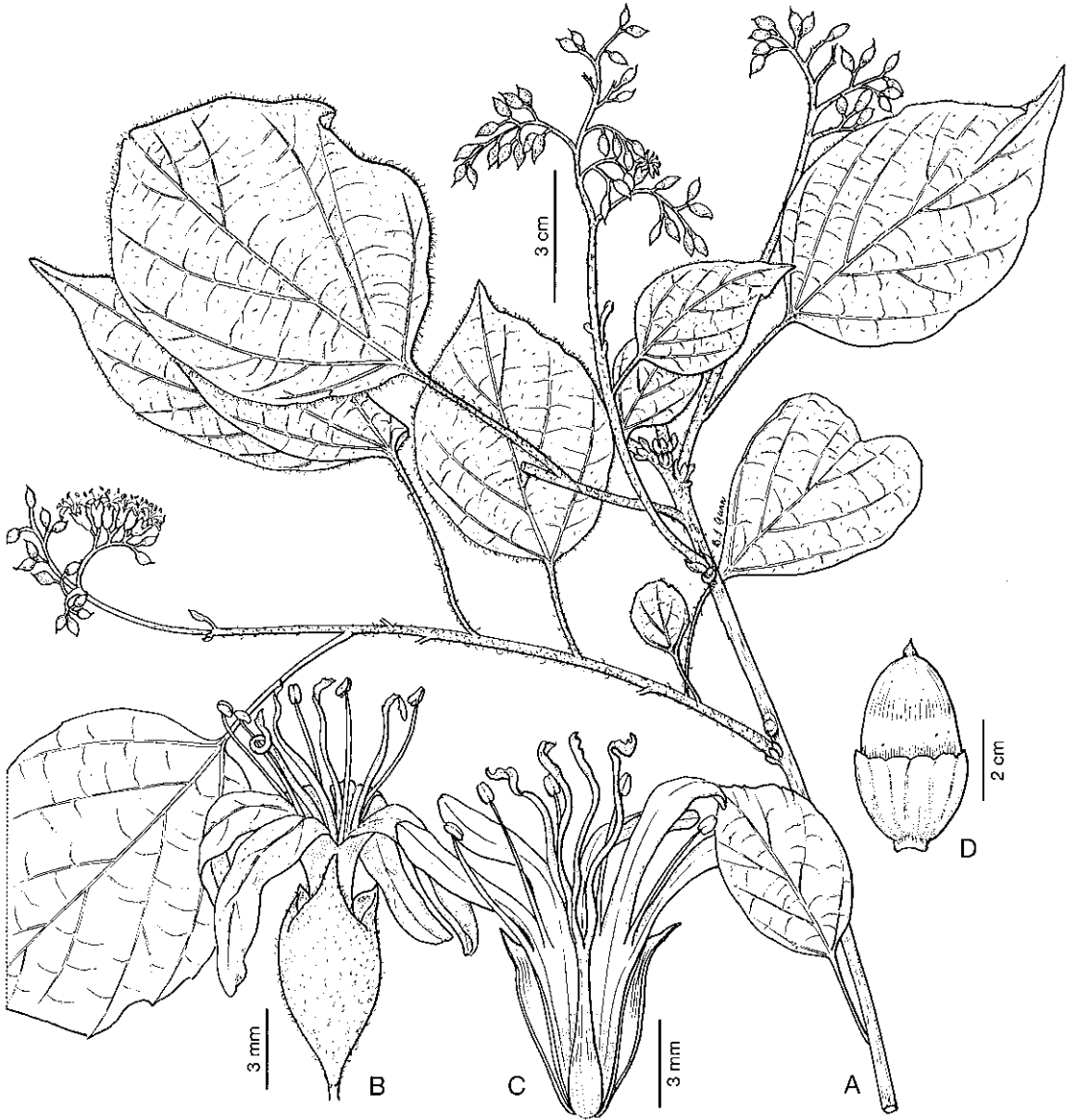


Fig. 2. — *Cordia lowryana* J.S. Mill.: A, flowering branch; B, flower; C, open flower; D, fruit. A-C, from Service Forestier: SF (Capuron) 24479; D, from Service Forestier: SF (Capuron) 22698.

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(-8) 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, peduncles and branches pilose to puberulent or glabrous. Flowers bisexual or male, the plants morphologically androdioecious; 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; gynoecium 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 18-30 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 lowryana 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. *Myxa* of which I am aware.

VERNACULAR NAMES. — Varo, varonala.

DISTRIBUTION AND HABITAT. — *Cordia lowryana* 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.

PARATYPES. — MADAGASCAR: *Bernier 219*, s.loc., fr., 1846 (P!); *Cours 2160*, forêt d'Ambohitresana, 1200 m, fl., 1 Jan. 1945 (P!); *Dequaire 27106*, ferme de Mahabo, fl., s. date (P!); *Greve 259*, s.loc., fl., 1889 (P!); *Humbert & Cours 32233*, Prov. Antsiranana, environs de Diego-Suarez, forêt d'Orangea, forêt trophile sur calcaire et sable, 1-100 m, 12°15'S, 49°24'E, fl., 23 Jan. 1960 (P!); *Perrier de la Bathie 8628*, Prov. Mahajanga, Marovoay, 16°58'S, 44°35'E, fl., Oct. 1908 (P!); *Service Forestier: SF 8363*, Prov. Toliara, Dabara-Mahabo, 20°24'S, 44°47'E, fl., 9 Jan. 1954 (P!); *Service Forestier: SF 12714*, Prov. Toliara, forêt d'Andranovorisosotra, Morondava, 20°29'S, 44°19'E, fr., 19 Dec. 1954 (P!); *Service Forestier: SF 15545*, Prov. Toliara, forêt d'Antanambao, Morondava, fr., 5 Feb. 1956 (P!); *Service Forestier: SF (Capuron) 22698*, Prov. Antsiranana, bassin de la Saharenana, forêt de Sahafary, sur sables, 12°34'S, 49°26'E, fr., 25 Apr. 1963 (P!); *Service Forestier: SF (Capuron) 23038*, Prov. Antsiranana, près d'Antsoha, piste d'Androfiabe à la baie de Rigny, 12°29'S, 49°28'E, FL., 17 Dec. 1963 (P!); *Service Forestier: SF (Capuron) 24431*, Prov. Antsiranana, forêt d'Antanambao, Morondava, fr., 5 Feb. 1956 (P!); *Service Forestier: SF (Capuron) 24480*, Prov. Antsiranana, sables, près d'Antsoha, à l'Ouest de la baie de Rigny, 12°29'S, 48°28'E, fl., 27 Jan. 1966 (P!, TEF!); *Service Forestier: SF (Capuron) 27430*, Prov. Antsiranana, forêt d'Andaingo, sur vieilles dunes, au Sud de la rivière d'Andripatra, au Nord de Vohémar, 13°16'S, 49°46'E, fl., 12 Mar. 1967 (P!, TEF!); *Service Forestier: SF (Capuron) 27497*, Prov. Antsiranana, forêt d'Analafiana, au Nord de la basse Manambey, au SW de Vohémar, fr., 11 Mar. 1967 (P!, TEF!); *Service Forestier: SF (Capuron) 28741*, Prov. Antsiranana, forêt d'Orangea, sur sables, à l'Est de Diego-Suarez, 12°15'S, 49°24'E, fl., 1 Feb. 1969 (P!, TEF!).

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REFERENCES

- CANDOLLE A.P. DE 1845. — Boraginaceae: 466-501. *Prodromus Systematis Naturalis Regni Vegetalis* 9.
- FRIESE C.V. 1933. — Les caractères essentiels de la famille des Sebestenaceae et révision du genre *Varronia*. *Bull. Soc. Bot. Genève*, sér. 2, 24: 117-199.
- GAVIRIA J. 1987. — Die gattung *Cordia* in Venezuela. *Mitt. Bot. Staatssamml. München* 23: 1-279.
- GIBSON D.N. 1970. — Boraginaceae: 111-167. *Flora de Guatemala. Fieldiana, Bot.* 24(9).
- GURKE M. 1893. — Boraginaceae: 71-131, in ENGLER A. & PRANTL K. (eds.) *Die Natürlichen Pflanzenfamilien*. IV, 3a. Leipzig.
- HUMBERT H. 1949. — Une espèce nouvelle ornementale de *Cordia* (*C. mairrei* Humb.) du sud-ouest de Madagascar. *Soc. Hist. Nat. Afr. Nord, hors-sér.* 2: 173-176.
- JOHNSTON I.M. 1930. — Studies in the Boraginaceae, 8. Observations on the species of *Cordia* and *Tournefortia* known from Brazil, Paraguay, Uruguay, and Argentina. *Contr. Gray Herb.* 92: 3-89.
- JOHNSTON I.M. 1935. — Studies in the Boraginaceae 10. The Boraginaceae of northeastern South America. *J. Arnold Arbor.* 16: 1-64.
- JOHNSTON I.M. 1940. — Studies in the Boraginaceae 15. Notes on some Mexican and Central American species of *Cordia*. *J. Arnold Arbor.* 21: 336-355.
- JOHNSTON I.M. 1949a. — Studies in the Boraginaceae 17. *Cordia* section *Varronia* in Mexico and Central America. *J. Arnold Arbor.* 30: 85-104.
- JOHNSTON I.M. 1949b. — Studies in the Boraginaceae 18. Boraginaceae of the southern West Indies. *J. Arnold Arbor.* 30: 111-138.
- JOHNSTON I.M. 1950. — Studies in the Boraginaceae 19. B) *Cordia* sect. *Gerascanthus* in Mexico and Central America. *J. Arnold Arbor.* 31: 179-187.
- JOHNSTON I.M. 1951. — Studies in the Boraginaceae, 20. Representatives of three subfamilies in eastern Asia. *J. Arnold Arbor.* 32: 1-26, 99-122.
- MARTINS E.S. 1990. — Boraginaceae: 59-110, in LAUNERT E. & POPE G.V. (eds.), *Flora Zambesiaca* 7(4).
- MEZ C. 1890. — Morphologische und anatomische studien über die gruppe der Cordieae. *Bot. Jahrb. Syst.* 12: 526-588.
- MILLER J.S. 1988. — A revised treatment of Boraginaceae for Panama. *Ann. Missouri Bot. Gard.* 75: 456-521.
- MILLER J.S. 2001a. — New Boraginaceae from tropical America 4: Three new species of *Cordia* from South America. *Novon* 11: 421-428.
- MILLER J.S. 2001b. — Boraginaceae: 435-455, in STEVENS W.D., ULLOA U. C., POOL A. & MONTIEL O.M. (eds.), *Flora de Nicaragua*. Monogr. Syst. Bot. Missouri Bot. Gard. 85. 1.
- NASH D.L. & MORENO P. 1981. — Boraginaceae, *Flora of Veracruz*, fasciculo 18.
- NOWICKE J.W. & MILLER J.S. 1991. — Boraginaceae: 3-33, in DASSANAYAKE M.D. (ed.), *Flora of Ceylon* 7.
- NOWICKE J.W. & RIDGWAY J.E. 1973. — Pollen studies in the genus *Cordia* (Boraginaceae). *Amer. J. Bot.* 60: 584-591.
- RANDRIANASOLO A. & MILLER J.S. 2000. — A revision of *Camposperma* (Anacardiaceae) in Madagascar. *Adansonia*, sér. 3, 20: 285-294.
- TARODA N. & GIBBS P.E. 1986. — A revision of the Brazilian species of *Cordia* subgenus *Varronia* (Boraginaceae). *Notes Roy. Bot. Gard. Edinburgh* 44: 105-140.
- TARODA N. & GIBBS P.E. 1987. — Studies on the Genus *Cordia* L. (Boraginaceae) in Brazil. 2. An outline taxonomic revision of subgenus, *Myxa Taroda*. *Hoehnea* 14: 31-52.
- VERDCOURT B. 1991. — Boraginaceae: 1-124, in POLHILL R.M. (ed.), *Flora of Tropical East Africa*.
- WARFA A.M. 1988. — *Cordia* (Boraginaceae), in NE tropical Africa and tropical Arabia. *Acta Univ. Upsaliensis* 174: 1-78.
- ZHU GE-LING, RIEDL H. & KAMELIN R. 1995. — Boraginaceae: 329-427, in WU ZHENG-YI & RAVEN P.H. (eds.), *Flora of China* 16, St. Louis.

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