

STUDIES IN THE BORAGINACEAE, XIX

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A. NOTEWORTHY SPECIES FROM TROPICAL AMERICA

Antrophora, gen. nov. Ehretioidearum

Calyx 5-partitus, segmentis ovato-orbicularibus valde imbricatis quincuncialibus nempe 2 exterioribus et 3 interioribus. Corolla parva; tubo cylindrico calyce paullo longiore, faucibus haud differentiatis apertis intus nudis, lobis tubi brevioribus ovato-oblongis imbricatis recurvis. Stamina 5 in faucibus affixa paullo exserta; filamentis brevibus basim versus plus minusve dilatis; antheris erectis medio-affixis sagittato-lanceolatis; lobis antherae a medio segregatis superne collateraliter adnatis rima lateraliter longitudinali utrinque dehiscentibus. Ovarium sub anthesi glabrum ellipsoideum vel obovoideo-ellipsoideum, discum tenuiter patelliformum parvum suffultum. Stylus elongatus simplex lateraliter compressus tandem deciduus; stigmatibus 2 oblongis, apice approximatis vel fortasse subconfluentibus deinde deorsum sub angulo ad 80° abeuntibus, dorse apice compresso styli longitudinaliter affixis. Ovula 4 erecta. Fructus ellipsoideus vel obovoideo-ellipsoideus; exocarpio chartaceo nitido in sicco luteolo; mesocarpio tenui ut videtur exsucco; endocarpio duro in pyrenas 2 biseminatas tarde diviso, extus opaco sublaevo faciebus duobus (dorsali et ventrali) fere a basi usque ad apicem fossula longa conspicua instructo faciebus ad dextram sinistramque supra medium fossula brevi donato, intus loculas fertilis 4 uniseminatas angustas elongatas et loculas sterilis 4–5 (2–3 majores) materia spongioso-cellulosa repletas gerente. Semina 4. — Arbor. Folia alterna exstipulata integerrima ovato-elliptica supra punctis albis minutis evidenter obsita. Inflorescentia terminali dichotoma multiramosa ebracteata multiflora foliis dimidio brevior. — Nomen derivatus a *άντρον*, *antrum*, et *γρόπος*, *fero*, propter loculos steriles fructus.

Antrophora Williamsii, sp. nov.

Arbor ad 10 m. alta; ramulis novellis ad 4 mm. crassis sparse strigosis; petiolo 1–2 cm. longo subtus convexo supra canaliculato; lamina folii subcoriacea ovato-elliptica 6–10 cm. longa 4–6 cm. lata, basi obtusa vel rotunda, apice obtusa vel breviter lateque acuminata, supra in sicco nigrescenti abundantissime minuteque albo-punctata pilis adpressis 0.2–0.8 mm. longis praesertim secus venas et costam inconspicue obsita, subtus in sicco brunnea pilis erectis 0.2–0.6 mm. longis donata tenuiter subvelutina; venis

primariis laminae folii utroque latere costae 8–10 rectis vel laeviter curvatis sub angulo ad 80° abeuntibus, in facie inferiori prominulis; venis secundariis transversis; inflorescentia cymoso-corymbosa 3–6 cm. lata dense multiramosa 1–2 cm. longe pedunculata in statu fructiferi rigida ramulis crassiusculis donata; floribus subsessilibus vel ad 1 mm. longe crasseque pedicellatis; calyce sub anthesi campanulato; lobis erectis valde imbricatis amplis saepe 1.5 mm. longis et 2 mm. latis marginem ciliatam versus plus minusve scariosis, apice obtusis vel rotundis, basi subauriculatis et 1 mm. late affixis, dorso convexis plus minusve strigosis; calyce fructifero explanato accrescenti indurato 5–6 mm. diametro persistenti; corolla glabra, tubo cylindrico 2 mm. longo 1.5 mm. diametro, lobis ca. 1 mm. longis et 0.6 mm. latis recurvis oblongis vel ovato-oblongis apice obtusis vel rotundis basi late affixis; filamentis ca. 0.3 mm. longis ascendentibus rigidulis 0.1–0.2 mm. infra sinus angustos acutos loborum corollae affixis; antheris 0.5 mm. longis in faucibus apertis corollae gestis, basi sagittatis 0.3 mm. latis, apice acutis; ovario subanthesi glabro ellipsoideo ad 1.5 mm. longo in tertiam partem superiorem minutissime abundantissimeque pallido-papillato; stylo 1 mm. longo, lobis oblongis ca. 0.3 mm. longis; fructu glaberrimo ellipsoideo vel ovoideo-ellipsoideo ad 9 mm. longo et 7 mm. crasso paullo supra medium crassiore symmetrico erecto apice cicatrice basis styli parva inconspicua donato.

NICARAGUA: near Matagalpa, dept. Matagalpa, tree to 10 m. along stream, 750 m. alt., Nov. 15, 1946, *L. O. Williams & A. Molina 10960* (TYPE).

The Central American tree here described as *Antrophora* has its closest relative in *Lepidocordia* Ducke, Archiv. Jard. Bot. Rio Janeiro 4: 170, t. 22 (1925), a monotypic genus of the Amazon Valley. Though closely related it is readily distinguished from the southern tree by having a single well-developed style and a four-seeded fruit with a more complicated endocarp.

Antrophora and *Lepidocordia* show similarities in the general form, texture, venation, and disposition of their foliage, and agree very closely in the character and abundance of the minute clusters of mineralized epidermal cells that dot their upper leaf-surfaces. Both genera have tiny glabrous un-appendaged corollas with a tube only barely surpassing the broad, erect, spirally arranged, strongly imbricate sepals. *Antrophora*, however, has distinctly recurving rather than spreading corolla-lobes, a cylindric rather than a slightly ampliate corolla-tube, and very broad and rounded rather than acute ovate sepals. Its very short filaments are also attached very high in the corolla-tube. The inflorescence of *Antrophora* is coarser and more spreading than in *Lepidocordia* and also more regularly dichotomous and persistent.

In *Antrophora* the ovary is terminated by an elongate laterally compressed style. The apex of the style is slightly enlarged and also compressed and is acute in lateral outline. The stigmatic surface is developed along the length of both of the narrow divergent slanting edges of the style-

apex. The stigmas, accordingly, are not free but rather depressed narrow-elongate bodies attached along the entire length of their backs to the edges of the style-apex. The two stigmas, one on each of the slanting edges of the style-apex, are in contact only over the very tip of the style. They usually remain distinct but at times appear to be somewhat confluent. The manner in which the stigmas are borne is utterly different from that in *Lepidocordia*. In the latter genus two tiny elongate stigmas arise directly and independently from the apex of the ovary. No style is developed, a condition unique in the Boraginaceae.

In both *Antrophora* and *Lepidocordia* the fruit has a lustrous, completely glabrous, chartaceous exocarp which at extreme maturity dries, breaks up and shells off to free a large bony endocarp. The mesocarp is thin, only very moderately if at all juicy, but in any case dry and inconspicuous at maturity. The endocarp has a relatively smooth dull surface. This is marred by deep longitudinal furrows on the axial and abaxial sides of the endocarp and usually also by a shorter furrow above the middle of the endocarp on its left and right sides. It is by the deepening and breaking along the axial-abaxial furrows that the endocarp eventually divides in half.

A transverse cross-section of the endocarp of *Antrophora* well below its middle is nearly circular in outline and is divided internally into nearly equal quarter-sectors by narrow bony partitions that meet and fuse at the center. The left and right sectors, slightly smaller than the axial and abaxial ones, each contain two elongate diverging seminiferous locules. Between these latter and near the outer endocarpial wall there is a small sterile cavity. The axial and abaxial sectors, on the other hand, are each occupied by a single large sterile cavity. The curved outer wall of each cavity is abruptly thinned at its midpoint, for here is located the large furrow on the outside of the endocarp.

A transverse cross-section well above the middle of the endocarp reveals a change in structural pattern. The tips of the fertile sectors, which were fused below the middle, are separated above the middle. Furthermore, the small sterile cavity between the seminiferous locules no longer has a bony outer wall but is now the furrow on the upper half of the left and right sides of the endocarp. There is also change in the large axial and abaxial sterile sectors. Above the middle of the fruit there has appeared a narrow arching plate of tissue connecting the sides of opposing fertile sectors. This divides each of the large sterile sectors transversely. Since the fertile sectors have their tips no longer in contact, a cross-section above the middle of the endocarp reveals three cavities along the axial-abaxial diameter. These consist of an hourglass-shaped central cavity and, exterior to it, two large transversely elongate cavities, one just inside of both the axial and abaxial sides of the endocarp. At maturity the endocarp breaks apart along its axial-abaxial diameter, dividing the three sterile cavities exactly in half. Each half of the endocarp is two-seeded.

The endocarp of *Lepidocordia* is morphologically similar to that of

Antrophora, but differs in being smaller and more elongate and in maturing a total of only two seeds. Unlike *Antrophora* it has no small sterile cavity in the fertile sectors or at most has them represented only by furrows on the upper half of the endocarp. The large cavities along the axial-abaxial diameter are smaller, asymmetric, and less clearly developed than in *Antrophora* but function similarly. *Lepidocordia* normally matures not four but only two seeds per fruit. Two of the fertile locules in *Lepidocordia* are imperfectly developed. As a result of this, the cross-sections of the endocarp do not have the bilateral symmetry exhibited by *Antrophora*.

I am unable to give any information regarding the inner structure of the seeds of *Antrophora*. In available material they were apparently unfertilized and shriveled and represented only by empty seed-coats. I feel confident that they will prove to be similar to those of *Lepidocordia*. In the latter genus the seeds have evident endosperm and non-plicate cotyledons.

Although the genera *Antrophora* and *Lepidocordia* have many structures very suggestive of the Heliotropioideae, they seem best assigned to the Ehretioideae. I am not sure that such classification is the most natural, but, whatever the case, it does appear to be practical, since it will allow the continued use of style and stigmas in the delimitation of subfamilies. I have compared *Antrophora* and *Lepidocordia* with members of all the genera assigned to the Ehretioideae. They are obviously different and do not seem to be closely related in that subfamily. On the other hand, in the Heliotropioideae, especially in *Heliotropium* (particularly among species with biseminate nutlets or indehiscent fruit), and in *Tournefortia* (the Andean *Eutournefortia* in particular) one finds much agreement, notably a similar calyx, similar corollas, and similar endocarps. My impression is that *Antrophora* and *Lepidocordia* have closer and more pervading agreement with the Heliotropioideae than with any genus in the Ehretioideae. Indeed, had our genera markedly scorpioid inflorescence-branches and single terete stigmas, I would assign them to the Heliotropioideae with confidence.

The Heliotropioideae consist of two very large, probably artificial genera, *Heliotropium* and *Tournefortia*, and also a remarkable Argentine monotype, *Ixorhoea*. All these plants have a single style that is terminated by a terete stigma. The stigma is variable in size, form, and appendages, and can be simple or highly specialized. It may be conic, truncate-conic, oblong, or rarely subglobular, and may be receptive all over or only in a more or less well-defined band near the base. When differentiated into receptive and non-receptive parts its sterile portion can be various-lobed. In all cases it is radially symmetric and terete at least near the base. Most of the genera of the Ehretioideae have styles that are distinctly lobed or even divided. The two stigmas, generally globose or peltate, terminate the lobes of the style. Among the long-established members of the subfamily only *Rhabdia* has a simple style. Its filiform style is terminated by a minute bilobed subpeltate stigma.

In *Antrophora* there is a single style which bears two downwardly divergent stigmas, one on each of the sloping edges of its flattened, slightly enlarged acute tip. Its stigmas, in arrangement, are unlike those in any genera of the two subfamilies mentioned. The two separate sessile stigmas of *Lepidocordia* are even more aberrant. In both genera, however, the stigmas developed are less discordant in the Ehretioideae than in the Heliotropioideae. There are many reasons for believing that the original Boraginaceae were ehretioid in character and that from them have evolved in divergent lines of specialization the three other subfamilies, the Cordioideae, Heliotropioideae, and Boraginoideae, and perhaps even the modern Hydrophyllaceae also. Perhaps we have in *Antrophora* and *Lepidocordia* conservative remnants of an old group which originated at a time when heliotropioid evolution had developed its characteristic fruit but had not yet greatly modified the simple primitive ehretioid stigmas.

Cordia hebeclada, sp. nov.

Arbor 3–15 m. alta abortu styli staminumve dioica; ramulis dichotomis pilis abundantibus minutissimis molliter vestitis minute velutinis; foliis dimorphis, facie superiore laminae virida subscabra pilis minutis rigidis laxe vel valde adpressis 0.1–0.2 mm. longis 0.1–0.3 mm. distantibus obsita, facie inferiore graciliter abundanterque reticulata molliter minuteque velutina secus costam et reticulum prominulum nervorum pilis 0.1–0.3 mm. longis gracilibus saepe curvatis abundantibus donata; foliis majoribus elliptico-lanceolatis vel ovatis 15–25 cm. longis 7–15 cm. latis 1–2 cm. longe petiolatis, apice plus minusve acuminatis, basi rotundis utroque latere costae nerviis 6–10 donatis; foliis minoribus 5-plo rarioribus suborbicularibus vel orbiculari-ovatis saepe 8–10 cm. longis, apice rotundis vel obtusis, basi saepe truncatis vel subcordatis; inflorescentia corymbosa dichotoma 1–3 dm. diametro multiflora. Flores masculi: calyce cupulato 3–4.5 mm. longo 1.8–2.5(–3.5) mm. crasso, extus minute denseque pubescentibus, intus strigosis, lobis inaequalibus acutis 0.5–1.2 mm. longis; corolla alba 6–8 mm. longa, lobis oblongis recurvatis 3–4 mm. longis 1.5–2 mm. latis, tubo 3–4 mm. longo basi ca. 2 mm. diametro apice ad 3 mm. crasso; filamentis ca. 4 mm. longis basi villosis; antheris ca. 1.2 mm. longis et 1 mm. latis; ovario abortivo glabro obovoideo 1.5 mm. longo infra medium tumescenti, stylo 1.5–2 mm. longo. Flores feminei: calyce subcylindraco 2.5–3 mm. longo 1.5–1.9 mm. crasso, lobis inaequalibus acutis 0.5–0.7 mm. longis; corolla alba 3.5–4 mm. longa, lobis oblongis recurvatis 1.5–2 mm. longis, tubo ad 2 mm. longo; filamentis staminum abortivorum 0.5–0.9 mm. longis glabris vel basim versus sparsissime villosis, antheris ca. 0.3 mm. longis; ovario glabro ovoideo; stylo exserto 3.5–4 mm. longo bifido; drupa glabra albescenti depresso globosa, endocarpio depresso-ovoideo valde rugoso ad 10 mm. longo et 8 mm. lato oblique ascendenti; calyce fructifero explanato 4–5 mm. diametro.

COLOMBIA: Villavicencio, tree 3 m., 1939, Killip 34349 (TYPE, Gray Herb.).

ECUADOR: hills near Guayaquil, large tree, 1933, Mille 838 A-B (G);

Cerro de Lantana Guayaquil, Dec. 1845, *Jameson 507* (Brit. Mus.); 1 km. west of Guayaquil, tree 20 ft., *E. L. Little 6435* (U. S. Forest Service); San Lorenzo, prov. Esmeraldas, tree 20–34 ft., *Little 6287* and *6345* (U. S. Forest Service); Rio Amarillo above Portovelo, prov. E. Oro, tree 25 ft., *Steyermark 54074* (Chicago).

PERU: Morales near Tarapoto, upper Rio Huallaga, 1929, *L. Williams 5676* (G).

BOLIVIA: forests of Buenavista, dept. Santa Cruz, tree 10–15 m., Oct. 26 and 31, 1924, *Steinbach 6633* (G); dept. Santa Cruz, prov. Sara, Oct. 5, 1916, *Steinbach 2933* (G); Campos region, Buenavista, 6–12 m. tall, Dec. 9, 1924, *Steinbach 6734* (G).

A *Cordia* having regular dichotomous branching, dimorphic leaves, and strongly heterostyled flowers unisexual by abortion. It is evidently a member of the group of *C. toqueve* Aubl. and probably most closely related to *C. panamensis* Riley. In size and form of leaves, structure and size of flowers, and form and structure of the glabrous drupe, it agrees with *C. panamensis*. It differs, however, in indument, in its regular dichotomous branching, and in its more southern distribution. The twigs, calyx, and lower leaf-surface in *C. panamensis* are clothed with stiffish hairs, their indument being stiffish velvety or even bristly. In *C. hebeclada*, on the other hand, the indument consists of a great abundance of minute short hairs that give a thin downy cover that is uniform and very soft to the touch. On old specimens it becomes *cafe au lait* or fawn-color and not brownish or fulvous as common in *C. panamensis*.

The branching of *C. panamensis*, cf. Johnston, *Sargentia* 8: 257 (1949), is not regularly dichotomous. In the present species the branching has the regularity of that in *C. bicolor* DC., cf. Johnston, l.c. 255. It would accordingly give the tree a flat top and so justify the vernacular *Quitazol*, which Little, *Caribbean Forester* 9: 269 (1948), sub "*C. panamensis*," reports is applied to it in Ecuador. *Cordia panamensis* ranges from southernmost Mexico to Panama, near the coast in northern Colombia, and on the islands of Trinidad and Tobago in the West Indies. In contrast, *C. hebeclada* is known from low altitudes along the east side of the Andes in eastern Colombia, Peru and Bolivia, and also near the coast in Ecuador.

***Cordia Brownei* (Friesen), comb. nov.**

Montjolya Brownei Friesen, Bull. Soc. Bot. Genève II, 24: 180 (1933). — based on *Varronia curassavica* sensu Swartz, Obs. Bot. 88 (1791), a plant of Jamaica.

GRAND CAYMAN: east end of the island, 1938, *W. King 126* (Brit. Mus.).

JAMAICA: Bath, 1928, *Orcutt 2005* (Brit. Mus.); without locality, *Wm. Wright* (Brit. Mus.), *J. Wolle* (G) and *Marsh* (G).

The specific name I have accepted was launched in a very casual manner. The binomial *Montjolya Brownei* n. sp. was merely listed, without description or discussion, as the correct name for the Jamaican plant long ago, in 1790, described by Swartz as "*Varronia curassavica*." The Latin description given by Swartz, however, is adequate for the recognition of the

species concerned and sufficient to give legal standing to the name that von Friesen proposed. The type of *M. Brownei* is a Jamaican specimen collected by Swartz. The species is almost certainly named for Patrick Browne, well known for his botanical work in Jamaica. The name *Cordia Brownii* DC., Prodr. 9: 499 (1845), has a different derivation and a different spelling and does not invalidate the name *C. Brownei*. The former is named for Robert Brown and is an Australian plant probably synonymous with *C. dichotoma* Forst.

The present Jamaican plant is a close relative and perhaps only a well-marked geographic variety of *C. portoricensis* Spreng (= *C. angustifolia* R. & S., 1819; not Roxb., 1814) of Porto Rico and the Virgin Islands. It differs in its broader and firmer leaf-blades, which are copiously hairy beneath. Though the most westerly ranging of the West Indian spicate Cordias, it seems readily separable from any relatives in Mexico and Central America. In Jamaica it can be confused only with *C. jamaicensis* but is readily distinguished by its narrower, more elongate leaves hairy on the lower surface. Its calyx is distinctly strigose rather than nearly glabrous, and is much less accrescent, in the fruiting state embracing only the lower half of the drupe and not nearly covering it. *Cordia Brownei* appears to be an erect bushy shrub. *Cordia jamaicensis*, on the other hand, is more or less clambering. Grisebach, Fl. Brit. W. I. 480 (1861), seems to have treated *C. Brownei* as one of the forms of "*C. cylindrostachya*," a mistake followed by many more recent botanists.

Cordia jamaicensis, sp. nov.

Frutex subscandens ad 6 m. alta; ramulis foliosis saepe 1–3 dm. longis 2–3 mm. crassis pilis 0.2–0.3 mm. longis rigidis adpressis incurvis e basi incrassatis orientibus sparse obsitis; foliis saepe lanceo-ovatis vel late lanceolatis 2.5–10 cm. longis 1.2–4.5 cm. latis, basi acutis vel obtusis, apice acutis, margine evidente sed minute sinuato-dentatis (dentibus ad 1 mm. altis), supra glabris sub lente minute albo-verruculosis, subtus granuliferis secus costam et nervos majoris pilis minutis incurvatis sparse donatis alibi glabris, nervis supra impressis, utroque latere costae 5–7(–9) sub angulo 45° abeuntibus; petiolo 3–13 mm. longo, parte infima 1–2 mm. longa foliis delapsis persistenti lignescenti; inflorescentia spicata multiflora sub anthesi clavata mox anguste cylindrica 8–10 mm. crassa 2–4 cm. longa; pedunculo terminali vel non rariter extra-axillari 3–9 cm. longo, calyce sessili in alabastro obovoideo apiculato, sub anthesi 3–4 mm. longo cupulato secus marginem loborum deltoideorum 1 mm. longorum sparse pubescenti alibi glabro granulis resiniferis obsito; corolla alba extus glabra, tubo 4 mm. longo gradatim ampliato basi 2 mm. diametro, supra 4 mm. crasso, intus medium versus dense villosa, limbo reflexo ca. 1 cm. lato, lobis ovatis crispis margine erosodentatis; filamentis medium versus tubi corollae affixis inaequalibus 0.5–1.5 mm. longis, antheris 0.8 mm. longis; ovario glabro globoso stylo 3.5 mm. longo gesto; ramulis styli clavatis; drupa rubra calyce persistenti accrescenti fere inclusa; endocarpio oblique globoso-ovoideo 3.5–4 mm. longo ad 3–3.5 mm. crasso irregulariter tuberculato.

JAMAICA: Glasgow near Troy, 1200 m. alt., climbing to 20 ft., 1917, *Harris 12634* (G); near Troy, 1400 m., shrub 8–10 ft., 1906, *Harris 9456* (Brit. Mus.); near Troy, 2000 ft. alt., rocky bank, shrub 6 ft., 1904, *Harris 8732* (Gray Herb., type; Brit. Mus., isotype); Knowsley Park, Devon, 2548 ft., tall shrub, fruit red, 1908, *H. A. Wood* (Brit. Mus.); Giddy Hall, St. Elizabeth, 1926, *Iris Maxwell* (Brit. Mus.); without locality, *J. Wolle* (G).

A member of the section *Varronia* having distinctly spicate terminal or extra-axillary inflorescences. It is distinguished at a glance from other West Indian, Mexican and Central American congeners. It has passed usually as a phase of *C. cylindrostachya*, a very different shrub with axillary spikes and a native of northwest South America. In having rather broad leaves and the calyces apiculate in the bud it bears some superficial resemblance to *C. martinicensis* Jacq. and is probably the basis of Grisebach's, Fl. Brit. W. I. 481 (1861), report of the latter species from Jamaica. In fact, however, *C. jamaicensis* seems only very generally related to that species of the Lesser Antilles.

The larger leaves are usually 2.5–3 times as long as broad, moderately thin in texture, minutely dotted and glabrous above, and only obscurely pubescent and in fact seemingly glabrous beneath. The calyx in the bud has rudimentary free lobe-tips, and though not very pronouncedly so, is evidently puckered up at the apex. At maturity the drupe is closely ensheathed by the accrescent bag-like calyx with connivent lobes, only the apical portion of the fruit being uncovered. The texture and scanty pubescence of the leaves and the short-tipped calyx-lobes quickly distinguish *C. jamaicensis* from *C. martinicensis*. The broad thinnish leaves and the calyx much ensheathing the fruit readily separate *C. jamaicensis* from other spicate *Cordias* of the West Indies and the adjacent continent.

B. CORDIA § GERASCANTHUS IN MEXICO AND CENTRAL AMERICA

The section *Gerascanthus* is one of the very well marked groups in its genus. Its species are exclusively American and about equally represented north and south of the Equator. Most of its members have rather limited geographic distribution, and only one, *C. alliodora*, is really wide-ranging.

The fruit, unlike that in most *Cordias*, is not a drupe. It is ellipsoidal or sausage-shaped and has fibrous chartaceous walls enclosing a single seed. At the apex it is usually crowned by the persistent disk-like cartilaginous base of the style. This thin-walled, dry, single-seeded fruit develops inside a cylindric calyx, where it is ensheathed by the tube of the persisting marcescent corolla. At maturity it commonly drops to the ground still associated with calyx and corolla.

The corolla is usually white at anthesis but afterwards turns brown, dries without shriveling, and, changed in color but unaltered in form, persists for several months while the fruit is maturing. In at least some species, e.g. *C. alliodora* and *C. Gerascanthus*, its spreading lobes may act as a parachute and so aid in dissemination. Although the flowers are

characteristically pentamerous it is not uncommon to encounter in the inflorescences of this group at least occasional flowers having corollas with six or even seven lobes. The sinus between the corolla-lobes are usually plicate. In *C. alliodora* they are acute and very narrow, but in most species they are truncate and commonly at least 1 mm. broad at the base. Heterostyly is well marked in most species of the section, the corollas on a given plant having either their stamens or their styles, but not both, conspicuously exerted from the funnellform throat. Among the species in our area only *C. alliodora* has a single type of corolla, one with a short style and long exerted stamens.

The calyx in the section is usually elongate and more or less cylindrical. It is traversed longitudinally by at least ten ribs and is usually tough and firm in texture. Among our species only *C. megalantha* is exceptional in these respects. Its calyx is firm-chartaceous and perhaps best described not as ribbed but rather as longitudinally lineate-striate. In most species the calyx-lobes are small and triangular and separated by V-shaped sinus. They may be all free, five in number and equal in size, or, failing to separate, be united in two to four unequal groups. The calyx-lobes of *C. alliodora* and *C. igualensis*, however, are somewhat different. The calyx appears to have a truncate upper edge upon which are borne minute, well-separated lobes that are scarcely more than apical prolongations of five of the calyx-ribs. These minute lobes, or teeth, are separated not by V-shaped but by broad flat sinus.

The species bloom during the dry season, and most of them are reported as producing flowers in great abundance. The individual trees can be a mass of bloom and very conspicuous and decorative. This is particularly true of the Mexican *C. Gerascanthus*, *C. Nelsonii*, *C. globulifera*, *C. morelosana*, and *C. sonora*, which are leafless or nearly so when in full flower. The timber produced by members of the section *Gerascanthus* appears to be of good quality. Most of the species are reported to be a source of wood esteemed locally for such purposes as carpentry, furniture, turned objects, handles, etc.

KEY TO THE SPECIES

Corolla-lobes with sides straight and parallel or nearly so, usually oblong and with a truncate or retuse tip.

Plant with abundant stellate hairs, usually myrmecophilous; flowers not heterostyled, sinus of corolla-lobes acute.....1. *C. alliodora*.

Plant with no stellate hairs, not myrmecophilous; flowers heterostyled; sinus of corolla-lobes usually truncate at base.

Indument of calyx thin, chiefly of minute short hairs not obscuring the 10 ribs of the calyx.....2. *C. Gerascanthus*.

Indument of calyx velvety tomentose, of abundant slender elongate hairs densely clothing and obscuring the ribs of the calyx.

Calyx 8-10 mm. long, short and stout; corolla-lobes 8 mm. long, almost as broad as long.....3. *C. Nelsonii*.

Calyx 9-13 mm. long, elongate; corolla-lobes 8-12 mm. long, evidently longer than broad.....4. *C. globulifera*.

Corolla-lobes ovate to suborbicular, not oblong nor with noticeably elongate straight and parallel lateral margins.

Lobes of corolla triangular-ovate, broadest near the base and gradually contracted towards the usually blunted apex.....5. *C. megalantha*.

Lobes of corolla rounded, semicircular to transversely elliptic, not at all pointed.

Calyx 7-8 mm. long, subtruncate, the lobes minute, inconspicuous and separated by sinus several times their width..6. *C. igualensis*.

Calyx 10 mm. long or more, with triangular lobes separated by V-shaped sinus.

Indument of calyx conspicuous, velvety or coarsely strigose, with hairs 0.5-1.2 mm. long.

Lower leaf-surface arachnoid-tomentose, the felty indument eventually more or less deciduous.....7. *C. Guerkeana*.

Lower leaf-surface not at all tomentose.

Leaves elliptic, less than twice as long as broad, dull and scabrous above, beneath bearing short stiff spreading usually curved hairs along the prominent veins and much branched veinlets.....8. *C. morelosana*.

Leaves elliptic to lanceolate, at least twice as long as broad, somewhat lustrous and nearly glabrous above, beneath glabrate or bearing only fine soft hairs, the veins and veinlets not forming a prominent reticulum.....9. *C. sonorae*.

Indument of calyx of abundant minute hairs, usually black tomentulose or puberulent, coarse hairs if also present less than 0.3 mm. long.

Leaf-blades 3-4 times as long as the petiole; calyx 4-5 mm. thick above the middle, its ribs narrow, high and acute, clothed only with minute black tomentulum, bearing no coarse hairs; filaments glabrous.....10. *C. gracilipes*.

Leaf-blades 6-25 times as long as the petiole; calyx 2-3.5 mm. thick, cylindric, the ribs broad and usually longitudinally sulcate; filaments hairy near base.

Calyx 13-14 mm. long, scantily puberulent or nearly glabrous; corolla 28-31 mm. long; leaf-blade smooth, thin, elongate; petiole 10-22 mm. long, its length only $\frac{1}{3}$ to $\frac{1}{2}$ the width of the leaf-blade; disk beneath the ovary glabrous.....11. *C. colimensis*.

Calyx 10-12 mm. long, minutely black tomentulose and scantily strigulose; corolla 24-27 mm. long; leaf-blade firm, prominently veined; petiole 7-10 mm. long, its length usually $\frac{1}{4}$ to $\frac{1}{8}$ the width of the blade; disk beneath the ovary usually bearing some hairs.....12. *C. tinifolia*.

1. *Cordia alliodora* (R. & P.) Oken, All. Naturgeschichte, Bot. 2²: 1098 (1841).

Cerdana alliodora R. & P. Fl. Peruv. 2: 47, t. 184 (1799). — type from Peru.

Cordia consanguinea Klotzsch ex Chodat, Bull. Soc. Bot. Genève sér. 2, 12: 211 (1921). — Herbarium name associated with material from Guatemala collected by Friedrichsthal.

A species widely distributed in Central America. In Mexico it extends northward at low altitudes along the Pacific coast to middle Sinaloa and along the Caribbean lowlands north into southern Vera Cruz and adjacent Chiapas. In the West Indies it is native on most of the islands from Trinidad north to eastern Cuba. Curiously, it is not native in western Cuba nor in Jamaica.

In the past the name of the species has been cited as "*Cordia alliodora* (R. & P.) Cham." That combination was made by DeCandolle, Prodr. 9: 472 (1845) who incorrectly attributed it to Chamisso. Oken, however, made the combination at an earlier date and he, rather than Chamisso, must be cited as authority for it.

The tree flowers early in the dry season while well clad with foliage. Its masses of white flowers begin to attract attention generally during December in Mexico and a month or so later in southern Central America. Unlike other species in our area *C. alliodora* does not have heterostylic flowers. Its flowers all have the stamens protruding well beyond the only shortly exerted style. A distinctive feature of the plant is its myrmecophily, cf. Wheeler, Bull. Mus. Compar. Zoology, Harvard 90: 9-41 (1942). The leafy twigs towards their apex, and frequently even the axis of the inflorescence, develop irregular swellings that serve as ant domatia.

2. *Cordia Gerascanthus* L. Syst. ed. 10, 936 (1759); Johnston, Contr. Gray Herb. 73: 77 (1924). — Based on Jamaican plants.

Gerascanthus foliis ovato-oblongis, utrinque productis racemis terminalibus. — Browne, Nat. Hist. Jamaica 1: 170, t. 29, f. 3 (1756).

Cerdana Gerasacanthus (L.) Moldenke, Phytologia 1: 16 (1933).

Cordia gerascanthoides HBK., Nov. Gen. et Sp. 3: 69 (1818); Ramon de la Sagra, Fl. Cubana 4: t. 59bis (1853). — type from Cuba.

Cordia bracteata DC., Prodr. 9: 472 (1845). — type from near Havana, la Sagra 3.

Gerascanthus lanceolatus J. S. Presl, Wseob. Rostl. 2: 1103 (1846), in part. — a mixture of *C. alliodora* and *C. Gerascanthus*.

Cordia Langlassei Loesener, in Fedde, Repert. 12: 240 (1913). — type from Rio Coyuguilla, Guerrero, Langlasse 834.

Cordia Rothschuhii Loesener, Bot. Jahrb. 60: 368 (1926). — type from between Esquipulos and San Dionysio, dept. Matagalpa, Nicaragua, Rothschuh 462.

GUATEMALA: near Gualán, Record & Kuylen 115 (G).

HONDURAS: near Tela, Standley 53119 (G).

YUCATAN: road to Tepakaam, Jan. 15, 1895, Millspaugh 89 (G); Isamal, Jan. 14, 1895, Millspaugh 89 (G); Calotmul, Gaumer 2160, 2161 & 2438 (G); Sitalpeck, Gaumer 23217 (G); San Anselmo, Gaumer 2439 (G); Buena Vista Xbac, Gaumer 1066 (G).

GUERRERO: banks of Rio Coyuguilla, tree 12-15 m., fl. white, Feb. 6, 1899, Langlasse 834 (G, ISOTYPE).

Known from Mexico (Guerrero and Yucatan), British Honduras, eastern

Guatemala and Honduras, and from west-central Nicaragua. In the West Indies it is a well-known tree on Jamaica, Isle of Pines and Cuba.

This readily defined species has developed minor races in various parts of its total geographic range. West Indian trees usually flower while the tree is in leaf, whereas the continental ones come into flower after the foliage is shed, early in the dry season. Continental plants also tend to differ from the West Indian in having slightly smaller leaves which average broadest above the middle rather than below the middle, and in usually having short stiff hairs on the calyx. Jamaican plants usually have perceptibly larger leaves and flowers than those from Cuba. Yucatan material differs from that of Guatemala and western Mexico in having glabrous filaments and smaller flowers. The plant of western Mexico (*C. Langlassei*) is distinguished by having the corolla-lobes not exactly oblong with parallel margins, but rather perceptibly narrowed from the base outwards.

The plant usually flowers from January into March and bears maturing fruit enclosed by calyx and brown marcescent corollas from February into May. The flowers are markedly heterostyled.

The tree is known as Spanish Elm in Jamaica and as *Baría*, *Baría negra*, or *Baría prieta* in Cuba. On the mainland the following names are applied to it: *Laurel negro*, *Bohonche*, *Bojon*, *Baría*, and *Barillo*.

3. *Cordia Nelsonii*, sp. nov.

Arbor; ramulis pilis minutis adpressis obsitis; foliis ellipticis 2.5–4 cm. longis 14–20 mm. latis scabris pilis numerosis brevibus rigidis adpressis vel adpresso-ascendentibus obsitis, utrinque acutis, 2–5 mm. longe petiolatis, supra viridis costa et nerviis laeviter impressis ornatis, subtus pallidioribus costa et nerviis prominulis donatis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita umbellato-corymbosa ca. 5 cm. diametro, rhache subnullo vel ad 15 mm. longo simplici pilis ad 0.5 mm. longis vestito; pedicellis gracilibus 2–6 mm. longis; calyce sub anthesi 8–10 mm. longo cylindrico ca. 4 mm. crasso (fructifero ad 5 mm. crasso), pilis griseis rectis 0.5–1 mm. longis ascendentibus subvelutinis, lobis triangularibus ca. 1.5 mm. longis, costis 10 propter indumentum inconspicuis; corolla 21 mm. longa glaberrima; limbo 21 mm. diametro; lobis oblongis 8 mm. longis ca. 7.5 mm. latis, marginibus lateralibus subparallelis rectis, apice obtusis vel emarginatis, basi ima abrupte angustatis et late affixis, sinibus basi ad 1 mm. latis; filamentis ca. 7 mm. supra basim tubi affixis 7–10 mm. longis glabris, antheris 2–2.5 mm. longis; stylo medium versus longitudini filamentum attingenti; fructu ellipsoideo 5–6 mm. longo 3.5–4 mm. crasso glabro apice disco cartilagineo basis styli coronato.

MEXICO: La Salada, 40 mi. south of Uruapan, Michoacan, March 15–22, 1903, *E. W. Nelson 6924* (TYPE, Gray Herb.).

Related to *C. morelosana*, from which it differs in its short stout calyx, rectangular corolla-lobes, and small acute leaves. The species is no doubt heterostyled like its relative. The type represents the short-styled form.

4. *Cordia globulifera*, sp. nov.

Arbor ad 10 m. alta; ramulis sparse inconspicueque strigosis; foliis ignotis; inflorescentia apice ramulis defoliatis ante foliorum novarum evolutionem prodita multiflora globosa 5–7 cm. diametro, rhache abortu crasso 0.1–0.5 mm. longo pilis mollibus nigrescentibus dense vestito bracteis ca. 1 mm. latis et 5 mm. longis donato; calyce sessili vel rare ad 3 mm. longe pedicellato 9–13 mm. longo 2.5–3.5(–4.5) mm. crasso velutino pilis gracilibus erectis vel ascendentibus 0.5–1.2 mm. longis dense vestito propter indumentum obscure costato, lobis saepe inaequalibus 3–5 triangularibus vel ovatis 1–2 mm. longis; corolla 20–30 mm. longa alba, limbo 25 mm. diametro; lobis oblongis 8–12 mm. longis 6–8 mm. latis, apice rotundis rare emarginatis, marginibus lateralibus rectis subparallelis, sinibus basi 0.8–1.5 mm. latis plicatis, tubo 5–8 mm. longo medium versus 1–1.5 mm. crasso, faucibus 13–18 mm. diametro; filamentis 6–8 mm. longis glabris vel basi sparsissime strigosis 7–11 mm. supra basim tubi corollae affixis; antheris 2 mm. longis; stylo glabro filamentos superanti; ovario glabro 1 mm. longo quam disco crasso glabro saepe latiore; fructu ignoto.

MEXICO: Acapulco, Guerrero, tree on hillside, 15 ft. tall, trunk 6–8 in. thick, 1895, *Palmer 573* (TYPE, Gray Herb.).

A relative of *C. morelosana*, from which it differs in having narrower, very elongate corolla-lobes and a more slender calyx with less well developed lobes. Also unlike *C. morelosana*, its twigs have appressed rather than spreading hairs. The type collection appears to be the long-styled form of corolla. Foliage and fruit of the species are unknown.

5. *Cordia megalantha* Blake, Proc. Biol. Soc. Washington 36: 200 (1923). — a renaming of *C. macrantha* Blake (1922), not Chodat (1921).

Cordia macrantha Blake, Contr. U. S. Nat. Herb. 24: 19 (1922). — type from Quebradas, dept. Izabal, Guatemala, *Blake 7498*.

GUATEMALA: Quebradas, dept. Izabal, tree 10 m., dry hillside, May 18, 1919, *Blake 7498* (G, ISOTYPE); lower Rio Motagua, large tree, March 6, 1927, *Kuylén 147* (G).

A very distinct species known only from low altitudes in eastern Guatemala. Its glabrous calyx is much less firm in texture than usual in *Gerascanthus* and its ribbing is very much less pronounced. The very broad low ribs may be deeply and broadly longitudinally sulcate. The calyx accordingly may appear to be 20-ribbed or at times merely striate rather than ribbed. In the bud it is tipped by a short apical prolongation. It opens to form two unequal triangular lobes 3–4 mm. long which becomes spreading or somewhat reflexed. The corolla-lobes are also unusual. They are 11–13 mm. long and 9–11 mm. broad at or near the base. Their lateral margins are straight and converge towards the acute or blunted tip of the lobe. The two collections studied have short styles.

6. *Cordia igualensis* Bartlett, Contr. Gray Herb. 36: 632 (1909). — type from Iguala, Guerrero, *Pringle 13912*.

MEXICO: Iguala Canon near Iguala, Guerrero, Dec. 26, 1906, *Pringle*

13912 (G, TYPE); Acatitlan, dist. Temascaltepec, Mexico, in churchyard, Jan. 20, 1933, *Hinton* 3176 (G).

Distinctive of this species is its short cylindric calyx, 7–8 mm. long and 3–4 mm. thick, which is truncate above and bears five subequal, minute, widely separate teeth 0.5 mm. long or less. The plant probably has general relations with *C. tinifolia* Willd. The two collections studied have long filaments and only very shortly exerted style. The species apparently comes into flower around the beginning of the New Year.

7. *Cordia Guerkeana* Loesener, Verhand. Bot. Ver. Brandenburg 55: 186 (1913). — type from near Totolapam, Oaxaca, *Seler* 1636.

MEXICO: cañada above Totolapam, Jan. 3, 1896, *Seler* 1636 (G, ISOTYPE); between San Carlos and Plantamisto, Oaxaca, Dec. 1842, *Liebmann* 12729 (G).

Known only from the watershed of the Rio Tehuantepec in southern Oaxaca. The two specimens seen are from plants apparently not long in full bloom. They bear some old leaves but give evidence of having shed most of their foliage. The species, like *C. sonorae* and *C. morelosana*, is probably leafless or nearly so when it comes into flower early in the dry season. The type has a style shortly exerted and much surpassed by the filaments. Very distinctive of the species is the thin felty arachnoid-tomentose indument which clothes the lower surface of its leaves.

8. *Cordia morelosana* Standley, Contr. U. S. Nat. Herb. 23: 1220 (1927). — type from Cuernavaca, Morelos, *Pringle* 8205.

MEXICO: Michoacan: Coalcoman, *Hinton* 12951 and 13611 (G); Huerto del Barillo, *Langlasse* 39 (G); Huetama to San Lucas, *Hinton* 5702 (G). Guerrero: Calavera, *Hinton* 10034 (G); Placeras, *Hinton* 9981 & 10046 (G); 15 mi. northeast of Taxco, *Frye* 3142 (G); near Huajintlan, *Abbott* 108 (G). Mexico: Nanchititlan, dist. Temascaltepec, *Hinton* 3122 (G). Morelos: Cuernavaca, *Pringle* 7670 (G) and 8205 (G, ISOTYPE).

This very fine species is practically confined to the Rio Balsa watershed, where it has been collected between altitudes of 300 to 1500 m. Flowering occurs from January to May but seems to be most abundant from mid-February to mid-April. Most trees are leafless when in bloom. The species is very markedly heterostylic. The type is the short-styled form. The following vernaculars have been applied to the tree: *Cherire*, *Cherare*, *Chiraire* and *Palo Prieto*.

9. *Cordia sonorae* Rose, Contr. U. S. Nat. Herb. 1: 106, t. 9 (1891). — type from Alamos, Sonora, *Palmer* 376.

Cordia Palmeri Rose, Contr. U. S. Nat. Herb. 1: tab. 9 (1891), not Wats. (1889). — a tentative name and homonym for the species eventually published as *C. sonorae*.

MEXICO: Sonora: Las Durasnillas, 1892, *Brandege* (G); Tesopaco, Rio Mayo, *Gentry* 3031 (G); Alamos, 1890, *Palmer* 376 (G, ISOTYPE); Navojoa, 1910, *Rose*, *Standley* & *Russell* 12963 (G). Chihuahua: south

wall of Batopilas barranca, 1946, *Hewitt 107* (G). Sinaloa: San Blas, *Rose, Standley & Russell 13235* (G). Nayarit: Maria Madre Island, *Nelson 4207* (G) and *Mason 1740* (G).

A very well marked species ranging from northern Sinaloa north to central Sonora and eastward, in the Rio Mayo watershed, into westernmost Chihuahua. It also occurs in the Tres Marias Islands. It is reported that the tree is extremely decorative when in bloom. White flowers in great profusion are produced on branches bare or nearly bare of leaves, usually sometime between late March and early May. Heterostyly is well marked in the species. The type collection represents the short-styled flowers. The tree appears to be well known under the name *Palo de Aste*.

10. *Cordia gracilipes*, sp. nov.

Arbor 10 m. alta; ramulis 2–2.5 mm. crassis glabris; foliis lanceolatis vel obovatis medium versus vel ultra medium latioribus 5–9 cm. longis 2.5–4.5 cm. latis 1.5–3 cm. longe petiolatis, basi acutis, apice acutis vel obtusis et breviter acuminatis, supra viridibus minute abundanterque verrucosis, subtus opacis pallidioribus costa et nerviis prominulis evidenter donatis secus costam pilis ca. 0.5–0.8 mm. longis inconspicuis donatis alibi glabris; inflorescentia terminali 1–6 cm. longe pedunculata multiflora, pilis abundantibus fuscis dense vestita demum subglabrescenti, ramulis pluribus apice congeste ramosis; calyce 10–11 mm. longo clavato-cylindrico (apicem versus 4–5 mm. crasso) prominenter 10-costato tomentulo nigro tenui vestito, costis angustis apice longitudinaliter leviterque sulcatis, lobis triangularibus 3–5; corolla alba, 24 mm. longa, extus supra medium pilis sparsis inconspicuis adpressis donata, intus glaberrima, limbo ad 30 mm. diametro; lobis 8 mm. longis 10–11 mm. latis medium versus vel paulo supra medium latioribus apice rotundis marginibus lateralibus rectis, sinibus plicatis basi truncatis et ad 1 mm. latis, tubo ad 6 mm. longo, faucibus ca. 10 mm. profundis infundibuliformibus; filamentis glabris apice tubi affixis 8–9 mm. longis, antheris oblongis 2 mm. longis; ovario glabro, disco cupulato margine ciliato; fructu ignoto.

MEXICO: Campo Morado to Pueblo Viejo, Guerrero, tree 10 m. tall on rocky hillside, fl. white, Nov. 9, 1939, *Hinton 14826* (TYPE, Gray Herb.).

A well-marked species perhaps most closely related to *C. tinifolia* Willd., but very different in its smaller long-petiolate subglabrous leaves and coarse, very acutely and prominently ribbed calyx. If the species is heterostyled the type is the short-styled form.

11. *Cordia colimensis*, sp. nov.

Arbor; ramulis gracilibus glabratis; foliis glabris, lamina lanceolata 6–13 cm. longa 2–4 cm. lata 1–2 cm. longe petiolata basi acuta, apice acuta vel subattenuata, supra viridi, subtus pallidior; inflorescentia apice ramulorum foliatorum gesta multiflora globosa vel umbellata ca. 7 cm. diametro, rhache valde reducta congesta breviterque ramosa 1–5 mm. diametro 0–5 mm. longe pedunculata pilis brunnescentibus brevibus curvatis dense vestita; calyce cylindrico glabrato vel inconspicue puberulenta 13–14

mm. longo 3–3.5 mm. crasso 10-costato (costis longitudinaliter sulcatis), lobis 3–5 parvis 1.5–2 mm. longis; corolla 28–31 mm. longa, limbo 27–30 mm. diametro, lobis 7–8 mm. longis 10–11 mm. latis medium versus latioribus apice rotundis extus secus costas pilis adpressis gracilibus sparsissime donatis, sinibus basi 1–1.5 mm. latis, tubo ca. 10 mm. longo, faucibus 13 mm. longis late infundibuliformibus; filamentis 10–11 mm. supra basim tubi corollae affixis 15–16 mm. longis basim versus minute villulosis alibi glabris, antheris ca. 3.5 mm. longis; ovario glabro; disco ca. 1 mm. diametro cupulato glabro; fructu ignoto.

MEXICO: Manzanillo, Colima, Dec. 1–31, 1890, *Palmer 898* (TYPE, Gray Herb.).

A relative of *C. tinifolia* Willd., differing in its much larger flowers, glabrate calyx, and glabrate elongate long-petiolate leaves. The type has a short style and elongate, well-exserted stamens. It is the short-styled form if the species proves to be heterostyled.

12. *Cordia tinifolia* Willd. ex R. & S., Syst. 4: 800 (1819); Cham., Linnaea 8: 122 (1833). — type given as from South America but actually from Acapulco.

Cordia Geraschanthus sensu HBK., Nov. Gen. et Sp. 3: 69 (1818). — a plant from Acapulco, Mexico, and part of the same collection as that described as *C. tinifolia* Willd.

Cordia linifolia Willd. ex Cham., Linnaea 4: 472 (1829). — lapsus calami.

MEXICO: Acapulco, Guerrero, tree 15–45 ft. tall, trunk ca. 1 ft. thick, found in bottomlands, native and much planted about dwellings, free bloomer, flowers rather dull white, Oct. 1894 to March 1895, *Palmer 236* (G); without locality [Acapulco], *ex herb. Willd.* (G, fragment of TYPE); Colochuca, Guerrero, bottomland, 50 ft. alt., tree 5–6 m., fl. white, Jan. 6, 1899, *Langlasse 732* (G).

The species is heterostylic and its type is representative of the long-styled form. Flowering specimens have been collected between January and April. From the few collections available it would appear that the species is confined to bottomlands along the coast of Guerrero.

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