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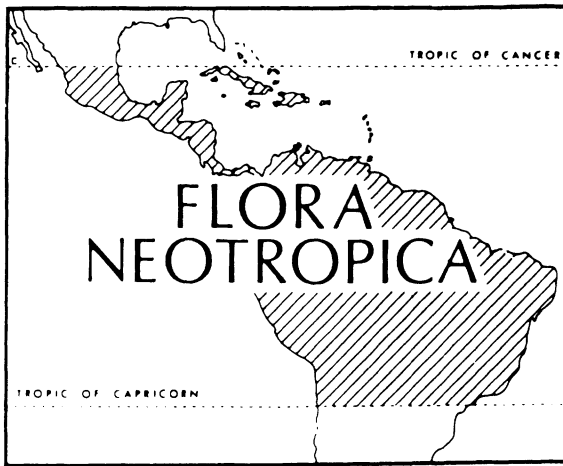
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(TRIBE TECOMEAE)

by

Alwyn H. Gentry



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BIGNONIACEAE—PART II (TRIBE TECOMEAE)

ALWYN H. GENTRY

with a Study of the
Wood Anatomy of Tecomeae

GRACIELZA DOS SANTOS AND REGIS B. MILLER

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ABSTRACT

Gentry, A. H. (Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166, U.S.A.). *Bignoniaceae*—Part II (Tribe Tecomeae). *Flora Neotropica* **25** (Pt. II): 1–371. 1992.—A monographic treatment of *Bignoniaceae*, tribe *Tecomeae*, for the Neotropics, treating 19 native genera and 203 native species plus 11 additional subspecies and 7 varieties. Also included are several paleotropical genera and species that are more or less regularly cultivated or naturalized in the Neotropics. The treatment of the 49 species of *Jacaranda*, partially based on the Ph.D. thesis of Wilfried Morawetz, is jointly authored with Dr. Morawetz. Included are keys to the genera and species, illustrations for each genus, descriptions and distribution maps for each species, and a complete list of exsiccatae. Thirteen species and a subspecies are described as new—*Jacaranda carajasensis* A. Gentry, *J. caucana* ssp. *calycina* A. Gentry, *J. intricata* A. Gentry & Morawetz, *J. microcalyx* A. Gentry, *J. rugosa* A. Gentry, *Sparattosperma catinae* A. Gentry, *Tabebuia arianae* A. Gentry, *T. botelhensis* A. Gentry, *T. caleticana* A. Gentry & Albert, *T. cristata* A. Gentry, *T. pumila* A. Gentry, *T. reticulata* A. Gentry, *T. riodocensis* A. Gentry, and *T. selachidentata* A. Gentry. In addition two new combinations are proposed in *Tabebuia*—*T. myrtifolia* var. *petrophila* (Greenman) A. Gentry and *T. pedicellata* (Bureau & K. Schumann) A. Gentry. An illustrated appendix on the wood anatomy of the *Tecomeae*, by Graciela Dos Santos and Regis B. Miller is also included.

RESUMEN

Se presenta un tratamiento monográfico de *Bignoniaceae*, Tribo *Tecomeae*, para los neotrópicos, incluyendo 19 géneros nativos con 203 especies nativas más 11 subespecies y 7 variedades. También se incluyen varios géneros y especies paleotrópicos a menudo cultivados o naturalizados. *Jacaranda* tiene como co-autor a W. Morawetz y está basada en parte en su tesis doctoral. Se ha incluido claves a géneros y especies, ilustraciones para cada género, descripciones y mapas de distribución para cada especie, y una lista completa de exsiccatae. Trece especies y una subespecie son descritas como nuevas—*Jacaranda carajasensis* A. Gentry, *J. caucana* ssp. *calycina* A. Gentry, *J. intricata* A. Gentry & Morawetz, *J. microcalyx* A. Gentry, *J. rugosa* A. Gentry, *Sparattosperma catinae* A. Gentry, *Tabebuia arianae* A. Gentry, *T. botelhensis* A. Gentry, *T. caleticana* A. Gentry & Albert, *T. cristata* A. Gentry, *T. pumila* A. Gentry, *T. reticulata* A. Gentry, *T. riodocensis* A. Gentry, and *T. selachidentata* A. Gentry. También hay dos combinaciones nuevas propuestas para *Tabebuia*—*T. myrtifolia* var. *petrophila* (Greenman) A. Gentry y *T. pedicellata* (Bureau & K. Schumann) A. Gentry. Se incluye también un apéndice ilustrado de la anatomía leñosa de la *Tecomeae* preparado por Graciela Dos Santos y Regis B. Miller.

INTRODUCTION

This is the second of a planned three-part monograph of the more than 600 species of neotropical *Bignoniaceae*. Introductory material for the entire family was included in Part I along with a key to the tribes (Gentry, 1980). Subsequent to that treatment, additional general material on *Bignoniaceae* was published on dispersal biology (Gentry, 1983b), conservation biology (Gentry, 1986, 1988) and speciation (Gentry, 1990: from a symposium at the Berlin

International Botanical Congress). Several additional papers on uses of *Bignoniaceae* have also been published subsequent to the completion of Part I of this monograph (Gentry, 1982b, 1984b; Gentry & Cook, 1984; Plowman, 1980), including several papers focussing on the chemistry of *Tabebuia* bark and its uses in treating cancer (Awang et al., 1991; Girard et al., 1988; Farnsworth & Gyllenhaal, 1991). *Bignoniaceous* lianas feature prominently in two recent summaries of climbing plants (Gentry, 1991a, 1991b). Floristic treatments of *Bignoniaceae* in *Flora de Veracruz*

(Gentry, 1982a), *Flora de Venezuela* (Gentry, 1983a), *Flore du Cameroon* (Gentry, 1984a), *Flore du Gabon* (Gentry, 1985), and *Flora de Nicaragua* (in press) have appeared subsequent to Part I of *Flora Neotropica* monograph 25.

Tecomeae is a pantropical tribe that includes the great bulk of the trees belonging to this family. They are differentiated from Crescentieae (and from paleotropical Coleeae) by the dehiscent fruit and from Bignoniaceae, which contains the bulk of the neotropical Bignoniaceae climbers, by the fruit dehiscing perpendicular (rather than parallel) to the septum. A key to the tribes can be found in Part I of this monograph, as well as introductory material pertinent to tribe Tecomeae.

All of the neotropical genera of Tecomeae are found exclusively in the New World except *Catalpa*, which is essentially Laurasian, and *Tecoma*, into which African *Tecomaria* should be (and has been) merged. Only the Antillean *Catalpa* species are included in this treatment, but the two African species of *Tecoma*, one of them frequently cultivated in the New World, are treated. Only a synopsis is provided for South Temperate *Argylia* (except the one species that reaches southern Peru).

In addition to the 19 native neotropical genera of Tecomeae, four genera represented only in cultivation are included in this treatment. At least one of these, *Spathodea*, has become rather widely naturalized in the Antilles, and *Podranea* sometimes persists from cultivation. Not included are two other paleotropical genera of Tecomeae—*Markhamia* and *Haplophragma*—which are occasionally cultivated as specimen trees in neotropical botanical gardens.

A total of 203 native species of Tecomeae occur in the Neotropics. An additional 11 subspecific and 7 varietal taxa are also recognized in this region. The five additional Tecomeae species that are more or less regularly cultivated in the Neotropics, at least one of them frequently naturalized, bring the total number of species considered here to 209 (including strictly African *Tecoma nyassae*). To these might also be added

the three species of temperate zone *Catalpa* that are cultivated in warm-temperate South America.

TAXONOMIC TREATMENT

II. Bignoniaceae tribe Tecomeae Endlicher, Gen. pl. 711. 1839.

Bignoniaceae subtr. Catalpinae A. P. de Candolle, Biblioth. Universelle Genève 17: 123. 1838.

Incarvilleoideae ("suborder Incarvilleae") Endlicher, Gen. pl. 710. 1839.

Argylieae Endlicher, Gen. pl. 711. 1839.

Jacarandae Fenzl, Denkschr. Bayer. Bot. Ges. Regensburg 3: 264. 1841.

Trees, shrubs or lianas. Leaves usually opposite or whorled, rarely alternate (*Argylia*), simple or palmately, pinnately, or bipinnately compound; etendrillate or rarely with the petiole twining (*Perianthomega*). *Inflorescence* a terminal, axillary, or cauliflorous panicle or raceme or reduced to 1–few flowers. *Flowers* variously pollinated by bees, bats, birds, butterflies, or hawkmoths, the calyx usually cupular, sometimes spathaceous, reduced and broadly campanulate, or split to near base and consisting of five nearly separate foliaceous lobes; stamens (2–)4 (rarely five in Old World), usually didynamous, a posterior staminode usually present, sometimes elongate and conspicuous (*Jacaranda*, *Digomphia*), the two anther thecae typically divaricate and held against root of corolla tube, sometimes exerted and with pendent parallel thecae, occasionally (*Jacaranda* sect. *Monolobos*) one of the thecae reduced and vestigial; pollen grains simple or in tetrads, typically 3-colporate and finely reticulate but rather variable; ovary bilocular with two axile vertical placental ridges in each locule, the stigma bilamellate; nectariferous disk at base of ovary usually large and conspicuous. *Fruit* a capsule with dehiscence perpendicular to the septum; *seeds* without endosperm, usually somewhat flattened and winged, sometimes thick, corky and wingless in water-dispersed species.

Type genus. *Tecoma* Juss.

Key to Genera

1. Leaves pinnately or bipinnately compound; plant erect or scandent.
 2. Vines; cultivated or the non-spathaceous calyx >2.5 cm long.
 3. Leaves triternate; petiole twining; calyx >2.5 cm long; southern Brazil to Bolivia. *Perianthomega*.
 3. Leaves simply pinnate; petiole non-twining; calyx <2 cm long; cultivated or native to Valdivian forests.
 4. Flowers white with purple throat or magenta; calyx either shallowly 2–3-lobed or membranaceous and 5-dentate; cultivated.
 5. Calyx deeply 5-dentate, >15 mm long; flowers light magenta. *Podranea*.
 5. Calyx shallowly 2–3-lobed, <10 mm long; flowers white with purple throat. *Pandorea*.
 4. Flowers red or red-orange; calyx coriaceous and 5-dentate; native or cultivated.
 6. Corolla slightly constricted at apex, <0.8 cm wide at mouth of tube; calyx <12 mm long; Valdivian region. *Campsidium*.
 6. Corolla not constricted at apex, >1.4 cm wide at mouth of tube; calyx >12 mm long; cultivated. *Campsis*.
 2. Trees or shrubs; native or the calyx either large and spathaceous or less than 15 mm long.
 7. Corolla broadly campanulate, >4.5 cm wide at mouth; calyx spathaceous and more than 4.5 cm long; fruit narrowly oblong-elliptic, more than 4 cm wide, dehiscent on only one side; exotic tree. *Spathodea*.
 7. Corolla tubular-campanulate to salverform-tubular, <3.5 cm wide at mouth; calyx <4.5 cm long; fruit linear to orbicular, dehiscent on 2 sides, <4 cm wide unless broadly elliptic to suborbicular; native trees and shrubs or exotic shrub.
 8. Staminode longer than stamens, the tip enlarged and usually glandular-pilose; flowers blue to purple; fruit flattened, orbicular to oblong.
 9. Apex of staminode strongly bifurcate, each branch 6–7 mm long; calyx >1.4 cm long, spathaceous or split to base into 3–5 lanceolate to ovate lobes. *Digomphia*.
 9. Apex of staminode capitate or barely bifid; calyx <1 cm long, cupular to deeply 5-lobed. *Jacaranda*.
 8. Staminode minute or absent; flowers yellow to orange-red; fruit linear. *Tecoma*.
1. Leaves palmately compound or simple or unifoliolate; plant erect.
 10. Leaves simple or unifoliolate, present at anthesis, sometimes alternate or in whorls.
 11. Leaves linear, <1.4 cm wide.
 12. Flowers yellow; leaves whorled; fruit fusiform, <8 cm long, with a cross-shaped septum; seeds minute with hyaline-membranaceous wings. *Astianthus*.
 12. Flowers magenta; leaves alternate; fruit linear, >13 cm long, with flat septum; seed wing consisting of tuft of trichomes at each end. *Chilopsis*.
 11. Leaves narrowly oblong-elliptic to variously ovate or elliptic, mostly >1.4 cm wide.
 13. Fertile stamens 2; seeds pilose, the wings of separate trichomes loosely fused basally; Antilles. *Catalpa*.
 13. Fertile stamens 4; seeds glabrous, the wings membranaceous or lacking.
 14. Staminode longer than stamens; flowers blue, lavender or bluish-purple; capsule oblong-elliptic to suborbicular, flattened perpendicular to septum.
 15. Calyx cupular, 3–4 mm long, coriaceous; staminode capitate; leaves rough to the touch; cerrado. *Jacaranda simplicifolia*.
 15. Calyx split to base, >14 mm long, membranaceous; staminode strongly bifid or 4-parted; leaves smooth to touch. *Digomphia* (p.p.).
 14. Staminode much shorter than stamens; flowers yellow, white, red or magenta; capsule linear to narrowly oblong, terete or flattened parallel to septum.
 16. Anthers strongly exerted (by up to 2 cm); corolla greenish purple to yellowish brown; flowers borne singly, mostly ramiflorous; capsule spirally twisted, the thickened septum interrupted by a series of pits and fragmenting transversely; Cuba. *Spirotecoma spiralis*.
 16. Anthers included to slightly exerted; corolla yellow, red, white, lavender, or magenta; flowers usually in terminal racemes or panicles, if reduced to single flowers these borne at branch apices or in the axils of uppermost leaves; capsule straight or very slightly curved, the septum flat, not fragmenting.
 17. Flowers yellow; calyx >14 mm wide or 2–4 mm wide and evenly and sharply 5-dentate with triangular teeth, never “double” with submarginal teeth; leaves in verticels of 4–5 or serrate.
 18. Capsule linear, <12 mm wide; leaves serrate, opposite; calyx cupular, <6 mm long; corolla tubular-campanulate. *Tecoma* (p.p.).
 18. Capsule oblong-ellipsoid, 3–5 cm wide; leaves entire, in verticels of 4–

- 5; calyx campanulate, >20 mm long; corolla broadly infundibuliform.
Romeroa.
17. Flowers red, white, lavender, or magenta; calyx 4–14 cm wide, not evenly and sharply 5-dentate with triangular teeth, sometimes “double” with conspicuously submarginal teeth; leaves opposite, usually entire (serrate only in *Delostoma*, usually with “double” calyx).
 19. Corolla tube glabrous outside; calyx never with conspicuous submarginal teeth; fruits linear, more or less terete; leaves entire; Antilles and lowland South America. *Tabebuia* (p.p.).
 19. Corolla tube puberulous outside; calyx often “double” with conspicuously submarginal teeth; fruits narrowly elliptic or elliptic-oblong, somewhat flattened perpendicular to septum; leaves conspicuously serrate or serrulate to subentire; Andes. *Delostoma*.
 10. Leaves palmately compound, sometimes deciduous at anthesis, always opposite unless herbs.
 20. Herbs; southern Andes of Chile and Argentina north to lomas of south Peru. *Argylia*.
 20. Trees or shrubs; northwest Argentina to Mexico and the Antilles.
 21. Fruit oblong or orbicular, >(3.5–)4 cm wide (<4 cm wide only when orbicular), the surface verrucose-warty or with strongly raised ribs; calyx bilabiate to near base or membranaceous and deeply 5-dentate.
 22. Fruit oblong, surface smooth except for prominent longitudinal ribs; leaflets cuneate, puberulous with simple trichomes usually restricted to secondary vein axils below; flower greenish; calyx 5-dentate. *Cybistax*.
 22. Fruit orbicular, verrucose-surfaced, without ribs; leaves densely dendroid-pubescent below; calyx deeply 2-lobed. *Zeyheria*.
 21. Fruit linear to oblong-ovoid, <4 cm wide; calyx cupular to tubular, mostly 5-denticulate to shallowly bilabiate or subspathaceous, rarely deeply 5-dentate but only when coriaceous.
 23. Fertile stamens 2; corolla white and salverform-tubular, <5 cm long; capsule woody, 3 mm thick, fusiform-linear. *Paratecoma*.
 23. Fertile stamens 4; corolla various, white and salverform-tubular only when >15 cm long; capsule subcoriaceous to subwoody, usually linear.
 24. Flowers mostly ramiflorous, borne singly or in reduced few-flowered racemes; corolla yellow to magenta or yellowish brown; stamens long-exserted; fruit curved or spiralled; septum more or less thickened, with pits or depressions into which seed bodies are impressed; Cuba and Hispaniola. *Spirotecoma*.
 24. Flowers terminal or axillary, often in multiflowered racemes or panicles; stamens usually included or subexserted, conspicuously exserted only when corolla white or red; fruit usually straight, spiralled only in continental *Godmania*; septum thin and flat; Mexico and Antilles to Argentina.
 25. Fruits spirally twisted; anthers pilose; leaves 5–9-foliolate, the leaflets often cuneate to base; corolla broadly campanulate from base, without narrow basal tube; calyx broadly campanulate, <2 mm long *Godmania*.
 25. Fruits more or less straight; anthers glabrous; leaves (1–)3–9-foliolate, the leaflets usually conspicuously petiolulate; corolla salverform to infundibuliform or campanulate, broadly campanulate only when the tube base narrowly cylindrical; calyx cupular to tubular, >3 mm long.
 26. Seeds with terminal trichomes instead of membranaceous wings; flowers white or pale pink with purplish stripes in throat; calyx membranaceous, >12 mm long, with a thinner irregularly rupturing apex; leaves (especially when young) and young shoots varnished in appearance. *Sparattosperma*.
 26. Seed wing an entire membrane or reduced and corky; corolla color various, when white the throat uniformly white or yellow; calyx 4–30 mm long, texture even throughout, usually coriaceous, the apex often evenly denticulate; leaves and young twigs not conspicuously varnished in appearance.
 27. Calyx circumscissilely caducous, falling with corolla; corolla white, the lobes irregularly laciniate-frilly; anthers subexserted; capsule longitudinally striate-costate, sometimes with conspicuous raised lenticels. *Ekmanianthe*.
 27. Calyx falling after anthesis or persistent in fruit; corolla purple, yellow, red, or white, the lobes rarely laciniate-frilly; anthers usually included; capsule without conspicuous raised costae or lenticels. *Tabebuia*.

ARGYLIA

1. *Argylia* D. Don, Edinb. Philos. Jour. 9: 260. 1823. Type. *Bignonia radiata* Linnaeus = *Argylia radiata* (Linnaeus) D. Don.

Oxymitus Presl, Abh. k. bohm. Ger., ser. 5, 3: 522. 1845 (Bot. Bemerk. 92. "1844"). Type. *Oxymitus argylioides* Presl = *Argylia radiata* (Linnaeus) D. Don.

Perennial *herbs*, often in rosette form, or chamaephytic *subshrubs*, usually glandular pubescent with multicelled trichomes, the root thick and woody, the stem usually more or less woody at base, rarely terminating in branch-spine. *Leaves* alternate or subopposite, long-petiolate, palmately compound, the leaflets often very deeply pinnatisect-lobed or palmatisect-lobed. *Inflorescence* a more or less contracted raceme with pedicellate flowers subtended by small bracts. *Flowers* with the calyx campanulate, deeply 5-toothed, the teeth sublinear to triangular; corolla usually yellow or yellow-orange, varying even within a population to red or brownish red or maroon in some species, infundibuliform-campanulate;

stamens didynamous, included, the thecae divergent, glabrous or occasionally with a few trichomes at base of thecal slit, the staminode often absent; ovary linear, with numerous ovules in each locule; disk reduced, subpentagonal, glandular. *Capsule* fusiform or linear, subtended by the persistent calyx, narrowed toward apex, coriaceous, the valves with three parallel longitudinal nerves; *seeds* thin, oblong, wingless or with a very reduced membranaceous margin.

Twelve species of the xeromorphic parts of north central Chile and adjacent Argentina; one species also disjunct in the southernmost lomas of Peru.

Argylia is unique among neotropical Bignoniaceae in its herbaceous habit and also highly unusual in the mostly alternate (to irregularly subopposite) leaves.

Since this genus, with the exception of *A. radiata*, is essentially extra-tropical and is, furthermore, covered by an excellent monograph (Gleisner & Ricardi, 1969), I have not treated it in detail here. This treatment, except for *A. radiata*, is largely a synopsis taken from that monograph.

Key to Species

1. Anthers with several conspicuous trichomes at base of longitudinal slit; mostly on eastern side of Andes in Argentina at elevations above 1200 m.
 2. Old branches terminating in long spines; fruit <4 cm long; south of 32°40'S, below 2000 m. *A. bustillosii*.
 2. Plants unarmed; fruit >4.5 cm long; north of 32°40', above 2000 m. *A. uspallatensis*.
1. Anthers glabrous, lacking trichomes at base of longitudinal slit; western side of the Andes N of 35°S in Chile and Peru, except *A. robusta* in the Argentinian Andean piedmont mostly below 1200 m.
 3. Capsule linear, 3.5–10 cm long; leaves in basal rosette or clustered near base; inflorescence a simple raceme with well developed leafless peduncle.
 4. Stems straight and erect; Argentina, Peru, and Chile, sea level to 3500 m.
 5. Leaflets variously incised but not pinnatifidly so; Chile above 900 m or Argentina.
 6. Leaflets 3–5, the margins with obtuse incisions, the central leaflet conspicuously wider than the laterals; Argentina south of 35°S. *A. robusta*.
 6. Leaflets 5–11, oblanceolate, the margins with acute incisions, the central more or less equal to the laterals; central Chile between 27°20'S and 30°S. *A. potentillifolia*.
 5. Leaflets bipinnatifid or tripinnatifid; Chile below 900 m or Peru. *A. radiata*.
 4. Stems procumbent and tortuously flexed; central Chile between 30°30'S and 34°S, above 900 m alt.
 7. Corolla 35–50 mm long, broadly infundibuliform-campanulate; racemes multi-flowered. *A. ascendens*.
 7. Corolla 20–35 mm long, narrowly infundibuliform-campanulate; racemes few-flowered. *A. ascendens* var. *viridis*.
 3. Capsule fusiform, 1–3.5 cm long; stems when well-developed leafy throughout; inflorescence a compound terminal raceme, usually lacking well-developed peduncle.
 8. Corolla glabrous inside.

9. Leaves 7–22-foliolate; leaflets mostly asymmetric; hemicryptophytic herb; indumentum densely gray-lanose. *A. geranioides*.
9. Leaves 7–11-foliolate; leaflets mostly symmetric; subshrub; indumentum glandular-hirsute. *A. farnesiana*.
8. Corolla pilose inside.
 10. Corolla throat papillose-puberulous; stems very short and with clustered leaves; leaflets deeply pinnatifid-incised; above 3000 m. *A. bifrons*.
 10. Corolla pilose; leaflets shallowly toothed to subentire; below 3000 m.
 11. Corolla more than 20 mm long; calyx teeth obtuse; leaflets oblanceolate. *A. glutinosa*.
 11. Corolla less than 20 mm long; calyx teeth acute; leaflets cuneate-oblong.
 12. Leaflets somewhat narrowed to more or less rounded apex, the margin entire or dentate; indumentum densely glandular-pubescent. *A. tomentosa*.
 12. Leaflets broadly and bluntly 3-lobed at apex, otherwise entire or slightly lobed; indumentum canescent-tomentose to lanose. *A. checoensis*.

1. *Argylia adscendens* A. de Candolle, Prodr. 9: 235. 1845. Type. Chile. Coquimbo: Coquimbo, La Chapa, *Gay s.n.* (holotype, G-DC; isotypes, F, M).

Argylia huidobriana Clos in Gay, Flora Chilena 4: 411. 1849. Type. Chile. Coquimbo: Coquimbo, *Gay 1184* (isotype, F).

Argylia lutea Philippi, Anal. Univ. Chile 43: 511. 1873. Type. Chile. Santiago: Mina Cristo, Villas Maipo, *B. Davila s.n. of 1869–1870* (holotype, SGO, not seen). *Argylia viridis* var. *lutea* (Philippi) Reiche, Anal. Univ. Chile 119: 147. 1906.

This polymorphic species is usually prostrate in habit unlike its close relative *A. radiata*, with which it shares a simple pedunculate raceme, linear capsule (6–12 cm long), and a pronounced tendency to have bicomound leaves with deeply pinnately incised primary leaflets. The other extreme of *A. adscendens*, variety *viridis*, approaches *A. potentillifolia* in its 5–7-foliolate leaves with less deeply incised oblanceolate leaflets.

Restricted to the Santiago area of central Chile, from 31°40'S in southern Coquimbo Province south to 34°S in O'Higgins Province, occurring in dry Andean and subAndean xerophytic formations between 900 and 3200 m.

Key to Varieties of *Argylia adscendens*

1. Corolla 35–50 mm long, broadly infundibuliform-campanulate; racemes multi-flowered. subsp. *adscendens*.
1. Corolla 20–35 mm long, narrowly infundibuliform-campanulate; racemes few-flowered. var. *viridis*.

1A. *Argylia adscendens* var. *viridis* (Philippi) Gleisner & Ricardi, Gayana 19: 40. 1969.

Argylia viridis Philippi, Linnaea 33: 181. 1864. Type. Chile. Coquimbo: Cuncumen, *Landbeck s.n. of Jan 1862* (holotype, SGO; isotypes, W, F negative 32849).

Vegetatively intermediate between *A. adscendens* and *A. potentillifolia*, differing from the latter in the more irregularly incised leaflets and prostrate growth form, and from typical *A. adscendens* in the shorter 2–3 cm long more narrowly infundibuliform-campanulate corolla and shorter capsule (4.5–6.5 cm long vs. 6–12 cm long).

Occurs at the northern margin of the range of *A. adscendens* in Coquimbo Province from 1800–2500 m altitude between 30°30' and 31°52'S.

2. *Argylia bifrons* Philippi, Anales Univ. Chile 90: 210. 1895. Type. Chile. Atacama: Dpto. Copiapo, Quebrada de Serna, *San Roman s.n. of 1885* (SGO, not seen).

Related to *A. geranioides* and *A. glutinosa* by the short (2–2.6 cm long) fusiform capsule, but unique in having the corolla interior papillose-puberulous whereas that of *A. geranioides* is glabrous and of *A. glutinosa* pilose. The extremely reduced multi-stemmed hemicryptophytic habit and dense leaves with small broadly obovate but deeply pinnatifid-incised leaflets are also characteristic.

Locally endemic in the high Andes of the Department of Copiapo, Atacama Province, Chile, between 27°18'S and 27°40'S and from 3000 to 3500 m altitude.

3. *Argylia bustillosii* Philippi, *Linnaea* **29**: 13. 1857. Type. Chile. Colchagua: Dpto. San Fernando, Cordillera de San Fernando, *Bustillos s.n. of Feb. 1843* (holotype, SGO; isotypes, G, F negative 32846).

Argylia australis Philippi, *Anales Univ. Chile* **43**: 512. 1873. Type. Chile. Bio-Bio: Dpto. Laja, Cupulhue, *Volkman s.n.* (holotype, SGO; isotypes, G, F negative 26178).

Argylia potentillifolia var. *australis* (Philippi) Macloskie, Rep. Princeton Univ. Exp Patagonia **8**: 242. 1914.

Consonant with its extreme southern distribution, *A. bustillosii* is one of the most reduced species of the genus, a chamaephytic *subshrub* unique in its nearly always solitary flowers and in having spine-tipped old branches. It shares with *A. uspallatensis* the otherwise unique character of several small trichomes at the base of the anther theca slit. Unlike *A. uspallatensis*, *A. bustillosii* shares the short (3–3.6 cm long) fusiform capsule type of *A. geranioides* and *A. glutinosa*. The only other *Argylia* to occur within most of its range is the completely different *A. robusta*, at the opposite extreme of the genus in its robust herbaceous growth form, large leaves, and multi-flowered racemose inflorescence.

This is the southernmost species of *Argylia*, ranging from 35° to nearly 40°S, rarely north as far as 32°40'S. It occurs in the Andes mostly between 1200–1800 m, mostly in the provinces of Mendoza and Neuquén in Argentina but also crossing the Chilean border into the Provinces of Colchagua and Bio-Bio.

4. *Argylia checoensis* (Meyen) Johnston, *J. Arnold Arbor.* **19**: 261. 1938.

Oxalis checoensis Meyen, *Reise um die Erde* **1**: 406. 1834. Type. Chile. Atacama: Dpto. Copiapo, Mina de Checo, 1000–1300 m, *Meyen s.n.* (B*, fide Johnston, *J. Arnold Arbor.* **19**: 261. 1938).

Argylia incana Philippi, *Reise durch Wueste Atacama* **36**. 1860. Type. Chile. Atacama: Dpto. Chanaral, Finca de Chanaral, 1430 m, *Philippi II-1854* (holotype, SGO, not seen).

Argylia sitiens Johnston, *Contr. Gray Herb.* **85**: 118. 1929. Type. Chile. Antofagasta: Dpto. Taltal, Aguada Panulcito, trail to Andacollo Mine, 5 Dec 1925 (fl), *Johnston 5467* (holotype, GH; isotype, CONC).

A more or less prostrate densely canescent *hemicyptophyte*, most closely related to similarly small-flowered *A. tomentosa* with which it

shares the pilose corolla interior and short (1–2.2 cm long) fusiform capsule of the *A. glutinosa* group. *Argylia checoensis* differs from *A. tomentosa* in the leaflets more broadly and bluntly apically 3-lobed and a less glandular more canescent indumentum.

Restricted to the dry western Andean slopes of northcentral Chile in Antofagasta and Atacama Provinces between 24°49'S and 28°2'S, from 1000 to 3000 m elevation. An extreme xerophyte found near the upper limit of vegetation on ridge crests (fide Johnston, 1929).

5. *Argylia farnesiana* Gleisner & Ricardi, *Gayana* **19**: 44. 1969. Type. Chile. Coquimbo: Dpto. Serena, Cuesta de Pajonales, 26 Oct 1964, *Ricardi et al. 1121* (CONC, not seen).

Argylia farnesiana is most closely related to *A. geranioides*, with which it shares an internally glabrous corolla as well as the small (2.2–2.8 cm long) fusiform capsule. It differs from *A. geranioides* in its suffruticose rather than hemicyptophytic habit, glandular-hirsute indumentum, and fewer leaflets (7–11 vs. 7–22).

Endemic to the Cuesta Pajonales, Coquimbo Province, Chile, at 29°7'S.

6. *Argylia geranioides* A. de Candolle, *Prodr.* **9**: 235. 1845. Type. Chile. Coquimbo: Coquimbo, *Gay s.n.* (holotype, G-DC; isotypes, CONC, F, GH, MO, US, F negative 7698).

Characterized by the short fusiform capsule and branched (but contracted and reduced) inflorescence of the *A. glutinosa* group, where it is distinguished by the glabrous corolla interior, dense glandular-canescenscent indumentum, and numerous (7–22) deeply pinnatifid leaflets. The corolla is 2–3 cm long and the capsule 20–30 cm long.

Endemic to a small region in the northern part of the Mediterranean climate area of central Chile between 27°10'S and 30°S, 900–1400 m altitude, in Atacama and northernmost Coquimbo Provinces.

7. *Argylia glutinosa* Philippi, *Reise durch Wueste Atac.* **36**. 1860. Type. Chile. Atacama: Dpto. Chanaral, Finca de Chanaral, 4700 ft, *Philippi s.n. of Feb. 1854* (holotype, SGO, not seen).

Related to *A. geranioides* by the short (2–2.6 cm long) fusiform capsule and branched more or less congested inflorescence, but differs in the pilose corolla interior, and differently shaped oblanceolate leaflets with only a few obtuse shallow teeth.

Locally endemic in “matorral desértico” of the Departments of Chanaral and Copiapo, Atacama Province, Chile, between 26° and 27°S and 1500 and 2900 m elevation.

- 8. *Argylia potentillifolia*** A. P. de Candolle, Prodr. **9**: 235. 1845. Type. Chile. Coquimbo, *Gay s.n. of 1839* (holotype, G-DC; isotypes, GH, US).

Argylia potentillifolia var. *beta* Clos in Gay, Flora Chilena **4**: 414. 1849. Type. Chile. Not seen.

Like the Argentinian *A. robusta*, an erect herb with an elongate simply racemose inflorescence with a well-developed peduncle, and relatively large and rather shallowly incised leaflets. It differs from *A. robusta* in the 5–11-foliolate leaves with narrower much more evenly incised oblanceolate leaflets. It has the long linear capsule (35–70 cm long) of the *A. radiata* group and is morphologically rather intermediate between *A. robusta* and *A. adscendens*.

Restricted to the Central Chilean Andes from 27°20'S to 30°S, between 900 and 3500 m elevation.

- 9. *Argylia radiata*** (Linnaeus) D. Don, Edinburgh Philos. J. **9**: 260. 1823. Fig. 1.

Bignonia radiata Linnaeus, Sp. pl., Ed. 1, **2**: 622. 1753. Type. Peru. Moquegua?: 17°40'S latitude, *Feuille s.n.* (not seen; type illustration: Feuillée, J. obs. **2**: 732, t. 22. 1714).

Argylia canescens D. Don, Edinburgh Philos. J. **7**: 88. 1829. Type. Chile. Coquimbo: Coquimbo, *Caldcleugh s.n.* (holotype, BM, not seen).

Argylia feuillei A. P. de Candolle, Prodr. **9**: 235. 1845. Nomen novum for *Argylia radiata* (Linnaeus) D. Don, not based on *Pavon s.n.* (BM, G, F negative 26181) which is incidentally mentioned by de Candolle.

Argylia puberula A. P. de Candolle, Prodr. **9**: 235. 1845. Type. Chile. Coquimbo: sin. loc., *Gay s.n. of 1839* (holotypes, G, F negative 7699).

Argylia tenuifolia Presl, Abh. konigl. Böhm. Ges. Wiss., ser. 5, **3**: 523. 1845 (Bot. Bemerk. 92. “1844”). Type. Chile. Based on *A. radiata* Endl., ic. t. 71, nec Don.

Oxymitus argylioides Presl, Abh. konigl. Böhm. Ges. Wiss., ser. 5, **3**: 522 (Bot. Bemerk. 92. “1844”). Type. Chile. Collector not indicated, probably *Haenke* (PR, not seen).

Argylia chrysantha Philippi, Linnaea **33**: 180. 1864. Type. Chile. Atacama: Dpto. Copiapo, Copiapo, *Dodt s.n. of 1862* (holotype, SGO, not seen).

Argylia eremophila Philippi, Linnaea **33**: 180. 1864. Type. Chile. Antofagasta: Cachinal, Hueso Parado, *Philippi s.n. of Dec 1853* (holotype, SGO, not seen).

Argylia glabriuscula Philippi, Linnaea **33**: 179. 1864. Type. Chile. Aconcagua: Dpto. San Felipe, Catemu, *Philippi s.n. of Sep. 1860* (holotype, SGO; isotypes, G, F negative 26179).

Argylia villosa Philippi, Anales Univ. Chile **43**: 512. 1873. Type. Chile. Atacama: Dpto. Freirina, Carrizal Bajo, *King 1871* (holotype, SGO, not seen).

Argylia digitalina Philippi, Anales Univ. Chile **90**: 208. 1895. Type. Chile. Not seen.

Argylia viridis var. *digitalina* (Philippi) Reiche, Anales Univ. Chile **119**: 147. 1906.

Hemicryptophytic perennial herb, 0.2–1 m tall, variably pubescent from almost completely glabrous to minutely glandular-puberulous to velutinous with flexuous multi-celled trichomes, the leaves clustered near base. *Leaves* mostly alternate, palmately 5–11-foliolate, the primary leaflets more or less ovate or obovate in general outline and ca. 1–1.1 cm long by 0.5–6 cm wide, deeply pinnatifid with the individual pinnae usually again pinnatifid, the ultimate segments linear or narrowly oblanceolate, obtuse to acutish, 0.5–5 mm wide, variably pubescent from more or less glabrous to glandular-puberulous to densely tomentose below, the petiole glabrous to pubescent, striate-ridged, 3–15 (–22 fide Gleisner & Ricardi) cm long. *Inflorescence* a simple long pedunculate terminal raceme, with flowers clustered toward apex or along upper third or half, the pedicels 0.4–1 cm long, subtended by a basal linear bracteole 2–8 (–12 fide Gleisner & Ricardi) mm long. *Flowers* with the calyx 4–12 mm long, deeply 5-parted to near base, the teeth sublinear to lanceolate, 3–1.1 mm long, sparsely to densely glandular-puberulous to glandular-pilose, the trichomes multicelled and flexuous, usually in part subdendroid with short lateral arms; corolla yellow to red or deep maroon, when yellow with dark red or purple spots in throat (occasionally white fide Gleisner & Ricardi), tubular-campanulate above a rather elongate basal tube, 3.5–5.5 cm long, 0.9–1.8 cm wide at mouth of tube, the tube 2–4.5 cm long, the lobes 0.5–1 cm long, glandular-puberulous outside, inside pilose with rather short stiff trichomes in floor of tube, with a very few gland-tipped trichomes at base of filaments; stamens didynamous, the thecae divaricate, 3–4 mm long, glabrous; pistil 2.5–5 cm



FIG. 1. *Argylia radiata*. A, flowering shoot; B, flower frontal view; C, flower side view; D, E, seeds; F, anthers; G, fruit; H, dehiscent fruit; I, leaf close up (Dillon et al. 3387).

long, the ovary narrowly oblong, lepidote-glandular and minutely glandular-puberulous, 2–3 mm long, ca. 1 mm wide; disk 0.5 mm long, 1–1.5 mm wide. *Fruit* a linear capsule, tapering apically, the calyx persistent, 5–10(–12 fide Gleisner & Ricardi) cm long, 3–5 mm wide, lon-

gitudinally striate-costate, sparsely glandular-puberulous; seeds thin, transversely oblong, 3–4 mm long, 4–7 mm wide, slightly and narrowly apically winged.

Distribution (Fig. 2). Dry xeromorphic vegetation, in Chile especially along the coast from

15°20'S in Aconcagua Province north to Antofagasta Province; disjunct in the southern lomas of Peru; 0–875 m elevation.

Representative collections examined. PERU. AREQUIPA: Prov. Caraveli, Loma de Arequipa, 13 Nov 1957 (fl), *Angulo 2562* (LP, TRUJ); Camana, 9 Nov 1947 (fl, fr), *Ferreyra 2548* (LP, MO, USM); Islay, S of Mollendo, Nov 1935 (fl), *Mexia 7772* (F, MO, NY). TACNA: 64 km N of Tacna, 20 Oct 1983 (fl), *Dillon & Dillon 3682* (F, MO).

CHILE. ANTOFAGASTA: Taltal, Oct 1925 (fl), *Werderman 845* (HBG, M, MO). ATACAMA: Desert of Atacama, Sep 1890 (fl), *Morong 1308* (MICH, MO). COQUIMBO: Ovalle, Fray Jorge, May 1939 (fl), *Werderman 921* (HBG, M, MO).

This is the only *Argyria* species that ranges north of Chile and Argentina, and the only species fully treated here.

10. *Argyria robusta* Sandwith, Kew Bull. 1927: 183. 1927. Type. Argentina. Neuquén: Entre Río Agrio and Chos Malal, 900–1200 m, *Comber 162* (holotype, K; isotypes, BM, E).

Morphologically well characterized among Argentinian species by its erect robust growth form 30–60 cm tall and with a well-developed, multi-flowered terminal raceme. The 3–5-foliolate leaves have leaflets that are broader (1–3 cm wide) and less deeply and regularly incised than in any other species of the genus. *Argyria robusta* is most closely related to *A. potentillifolia*, with which it shares habit and inflorescence features as well as a linear capsule (50–70 cm long in *A. robusta*), but that Chilean species has 5–11-foliolate leaves with narrower, more evenly incised leaflets.

Argyria robusta is endemic to Argentina, where it occurs in Neuquen and Mendoza Provinces east to the northern tip of Rio Negro. This is the only exclusively Argentinian species of *Argyria* (or of Bignoniaceae). It is geographically separated from the other Argentinian species, occurring farther south than *A. uspallatensis* and at lower altitudes (down to 250 m) and farther from the base of the Andes than either that species or *A. bustillosii*.

11. *Argyria tomentosa* Philippi, Reise durch Wueste Atacama 36. 1860. Type. Chile. Antofagasta: Dpto. Taltal, Atacama desert, Chaco, Agua de Profetas, 24°45'S, 8000 ft, *Philippi s.n. of Jan 1854* (holotype, SGO; isotypes, W, F negative 32848).

Argyria tenella Philippi, Anales Univ. Chile 90: 209. 1895. Type. Chile. Antofagasta: Dpto. Taltal, Aguada de Cachinal, *Borchers s.n. of Apr. 1888* (holotype, SGO, not seen).

Argyria tomentosa var. *tenella* (Philippi) Reiche, Anales Univ. Chile 119: 149. 1906.

A more or less prostrate, densely glandular-pubescent hemicryptophyte, related to *A. glutinosa* by the contracted compound raceme, pilose interior of the corolla tube, and fusiform capsule (1.5–2.2 cm long). This species differs most prominently from *A. glutinosa* in the smaller (1–1.5 cm vs. 2.3–3 cm long) corolla and acute (rather than blunt) calyx teeth.

The most widespread and northernmost of the Chilean species with fusiform capsules, ranging from 27°20'S in Atacama Province north across the Tropic of Capricorn to 22°S in Antofagasta Province. Altitudinally restricted to a narrow band between 2400 and 2900 m.

12. *Argyria uspallatensis* A. P. de Candolle, Prodr. 9: 235. 1845. Type. Argentina. Mendoza: Ad Corillos de Uspallata, *Cruishank & Gillies s.n.* (M, not seen).

Argyria trifoliata A. P. de Candolle, Prodr. 9: 236. 1845. Type. Argentina. Mendoza: Corillos de Uspallata, *Cruishank s.n.* (M, not seen).

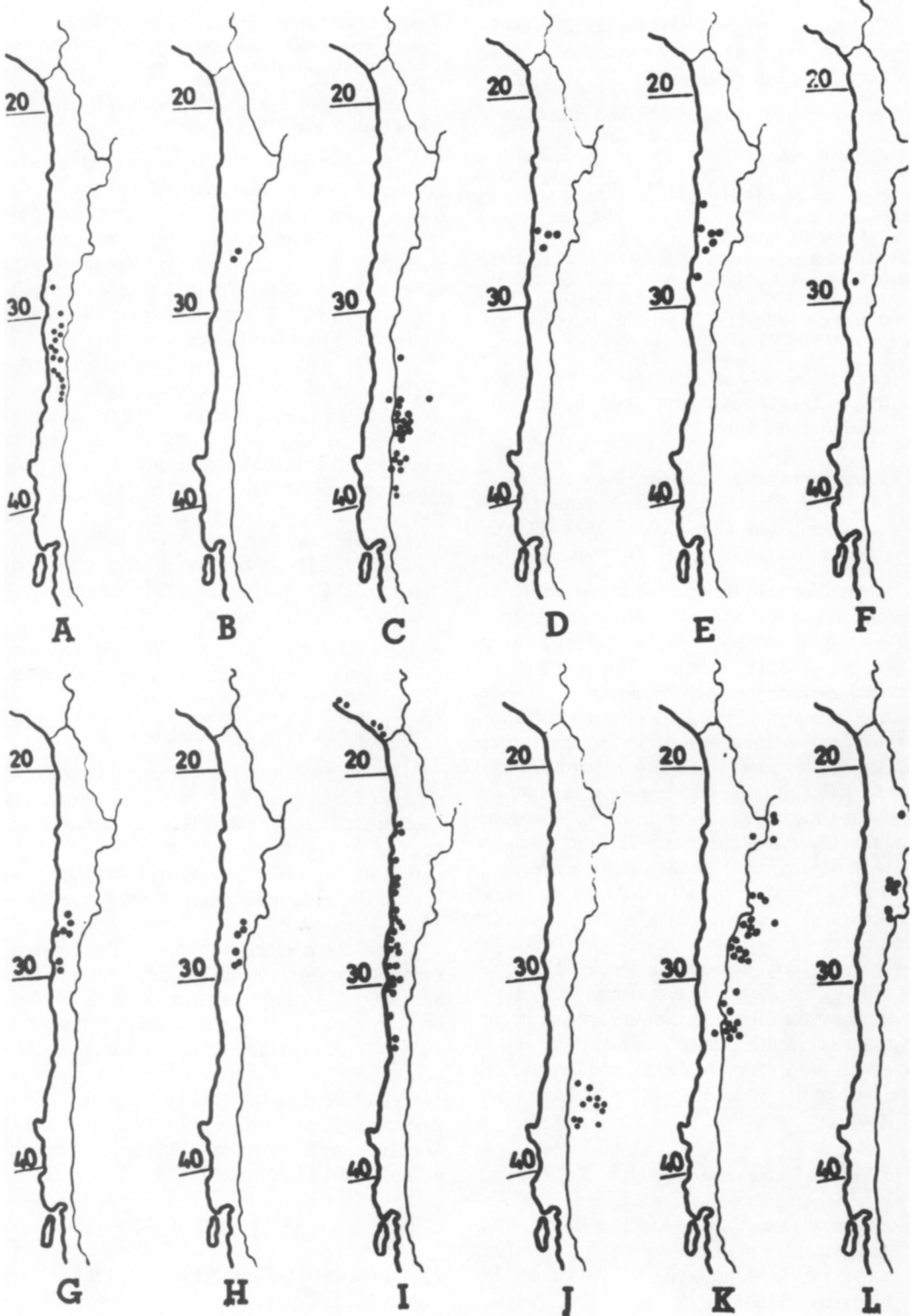
Tecoma uspallatensis Martius ex A. P. de Candolle, Prodr. 9: 235. 1845, nom. nud, pro syn.

Argyria uspallatensis is a clump-forming high Andean hemicryptophyte. It shares with more southern *A. bustillosii* the otherwise unique character of several small trichomes at base of the anther slit but differs in unarmed habit, mostly several-flowered inflorescence, and longer (4.5–10 cm long) capsule.

This is the northernmost of the three Argentinian species of *Argyria*, ranging between 2000 and 3400 m altitude and from 32°40'S in Mendoza Province north to the Bolivian border at 23°S in Jujuy Province. It barely crosses the Chilean border at the northern and southern extremes of its distribution into Antofagasta and Aconcagua Provinces. It is likely that *A. uspallatensis* will also be found to occur in the southernmost part of Potosí, Bolivia.

ASTIANTHUS

2. *Astianthus* D. Don, Edinburgh Philos. J. 9: 262. 1823. Type species. *Astianthus longifolius*



D. Don = *A. viminalis* (Humboldt, Bonpland & Kunth) Baillon.

Trees or shrubs. Leaves simple, verticillate, linear, entire. *Inflorescence* terminal, paniculate with a well-developed central axis. *Flowers* with the calyx campanulate, with 5 acute triangular teeth, the corolla yellow, tubular-infundibuliform above a narrowly tubular base, glabrous outside except the lobes, the ovary oblong, glabrous, the disk cupular. *Fruit* a terete capsule, narrowly fusiform, glabrous, the septum shaped like a cross in cross-section, the seeds borne perpendicularly on the septum and thus parallel to the false septum, tiny, flattened, the hyaline membranaceous wing completely surrounding the seed body.

A single rheophytic species of nuclear Central America from Mexico to Nicaragua.

A very isolated genus with no obvious affinities; the superficial resemblance to *Chilopsis* is apparently due to convergence for the same type of riparian site.

1. *Astianthus viminalis* (Humboldt, Bonpland & Kunth) Baillon, Hist. Pl. 10: 44. 1888. Fig. 3.

Bignonia viminalis Humboldt, Bonpland & Kunth, Nov. gen. sp. 3: 103. 1819. Type. Mexico. Mescala, Humboldt & Bonpland 3943 (holotype, B-WILLD; isotype, P-LAM).

Astianthus longifolius D. Don, Edinburgh Philos. J. 9: 262. 1823. Type. Mexico. Pavon s.n. (not seen).

Tecoma viminalis (Humboldt, Bonpland & Kunth) Hemsley, Biol. cent.-amer., Bot. 2: 497. 1882.

Bignonia salicifolia Sessé & Moçino, Pl. nov. Hisp. 99. 1889. Type. Mexico. Sessé & Moçino 2409 (F).

Trees or shrubs 2–20 m tall, the branchlets terete, without lenticels, finely longitudinally striate, minutely lepidote or glabrous. *Leaves* in whorls of three, simple, linear, attenuate to base and apex, 6–30 cm long (including the undifferentiated petiole), 0.3–1.4 cm wide, lepidote above and below, otherwise glabrous or with a few minute trichomes along the main vein below, the main vein prominent, the secondaries numerous, inconspicuous, strongly ascending. *Inflorescence* terminal, paniculate, with several well-developed central axes, the lateral branches in whorls

of three, with leaves subtending lower nodes, these intergrading to progressively smaller linear bracts at the apical nodes, glabrous. *Flowers* with the calyx campanulate, 5-dentate, 9–13 mm long, 5–8 mm wide, glabrous or very slightly lepidote near base, frequently with sparse glands, the teeth acutely triangular, 1–3 mm long; corolla yellow, tubular-infundibuliform above a narrowly tubular base, 4–5.6 cm long, 1.2–2.4 cm wide at mouth of tube, the tube 3–4 cm long, the lobes 1–1.5 cm long, the tube glabrous except for a few short glandular trichomes at base of filaments, in bud strongly bicolored with the lobes whitish-pubescent, the lobes puberulous; stamens didynamous, inserted 8–9 mm from base of corolla tube, the filaments 1.5–2 cm long, the anthers parallel, the thecae fused to each other and to filament apex, 4–5 mm long, shortly apiculate, basally sagittate; pistil 2.5–3 cm long, the ovary oblong, 6–7 mm long, ca. 2 mm wide, glabrous, acutely contracted below to a base surrounded by a cupular nectariferous disk 1 mm long and 2–2.5 mm wide. *Fruit* fusiform, terete, slightly curved, glabrous, the surface minutely asperous, 3–8 cm long, 0.5–0.9 mm wide, the midline not evident, the septum cross-shaped in transverse section; seeds borne perpendicular to the septum and parallel to the false septum, minute, 1–2 mm long, 2–5 mm wide, the tiny body acutely demarcated from and completely surrounded by the hyaline-membranaceous wing.

Distribution (Fig. 4). Mexico to Nicaragua, mostly along streams; from sea level to 1200 m.

Representative specimens examined. MEXICO. CHIAPAS: Mun. Venustiano Carranza, outskirts of Venustiano Carranza, 23 Mar 1973 (fl), *Breedlove 34347* (CHAPA, DS, F, MEXU, MO, NY). COLIMA: 16 mi WNW of Santiago, road to Cihuatlán, 22 Jun 1957 (fl), *McVaugh 14992* (MICH). GUERRERO: Placeres, 30 Mar 1937 (fl), *Hinton et al. 9972* (F, MICH, MO). JALISCO: Tecolotlán, 2 May 1951 (fl), *McVaugh 12236* (MEXU, MICH, NY). MÉXICO: Temascaltepec, Bejucos, 21 Aug 1933 (fr), *Hinton 4565* (MO, NY). MICHOACÁN: Tepalcatepec, 21 May 1963 (fl), *Rzedowski 16619* (MEXU, MICH, MSC). MORELOS: Amacuscac River, N of Amacuscac, 15 Aug 1949 (fr), *Rowell 2089* (MICH). NAYARIT: 7–10 mi W of Mazatlan on road to Las Varas, 30 Jun 1951 (fl), *H. Gentry & Gilby 10725* (LL, MEXU, MICH).

←

FIG. 2. Distribution of *Argylia* (Chile and adjacent countries). **A**, *A. adscendens*; **B**, *A. bifrons*; **C**, *A. bustillosii*; **D**, *A. glutinosa*; **E**, *A. checoensis*; **F**, *A. farnesiana*; **G**, *A. geranioides*; **H**, *A. potentillifolia*; **I**, *A. radiata*; **J**, *A. robusta*; **K**, *A. uspallatensis*; **L**, *A. tomentosa*. (From Gleisner & Ricardi, 1969.)

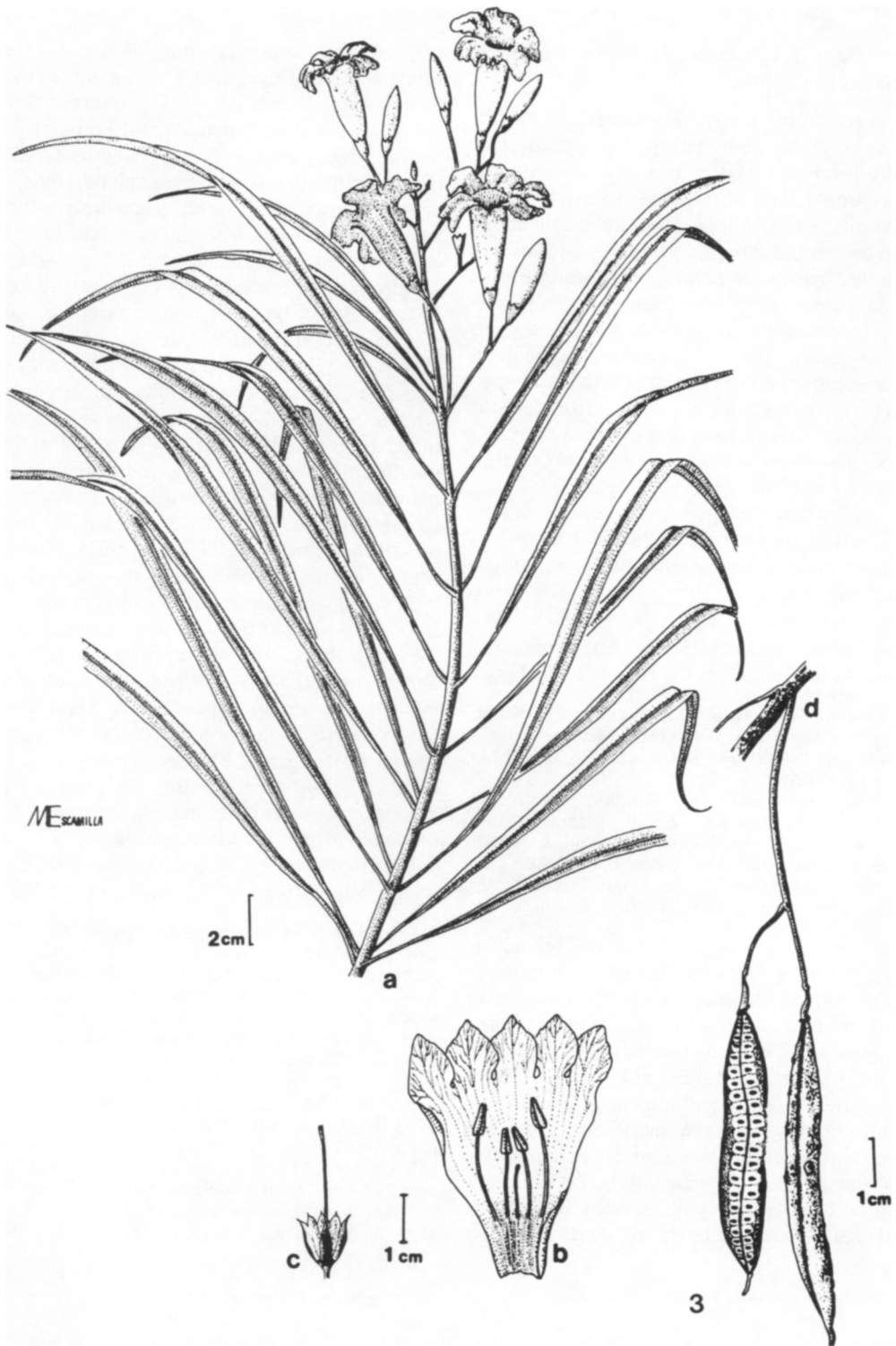


FIG. 3. *Astianthus viminalis*. A, flowering shoot; B, corolla cut open; C, calyx and pistil; D, fruit. (From *Flora de Veracruz*, Cox 486.)

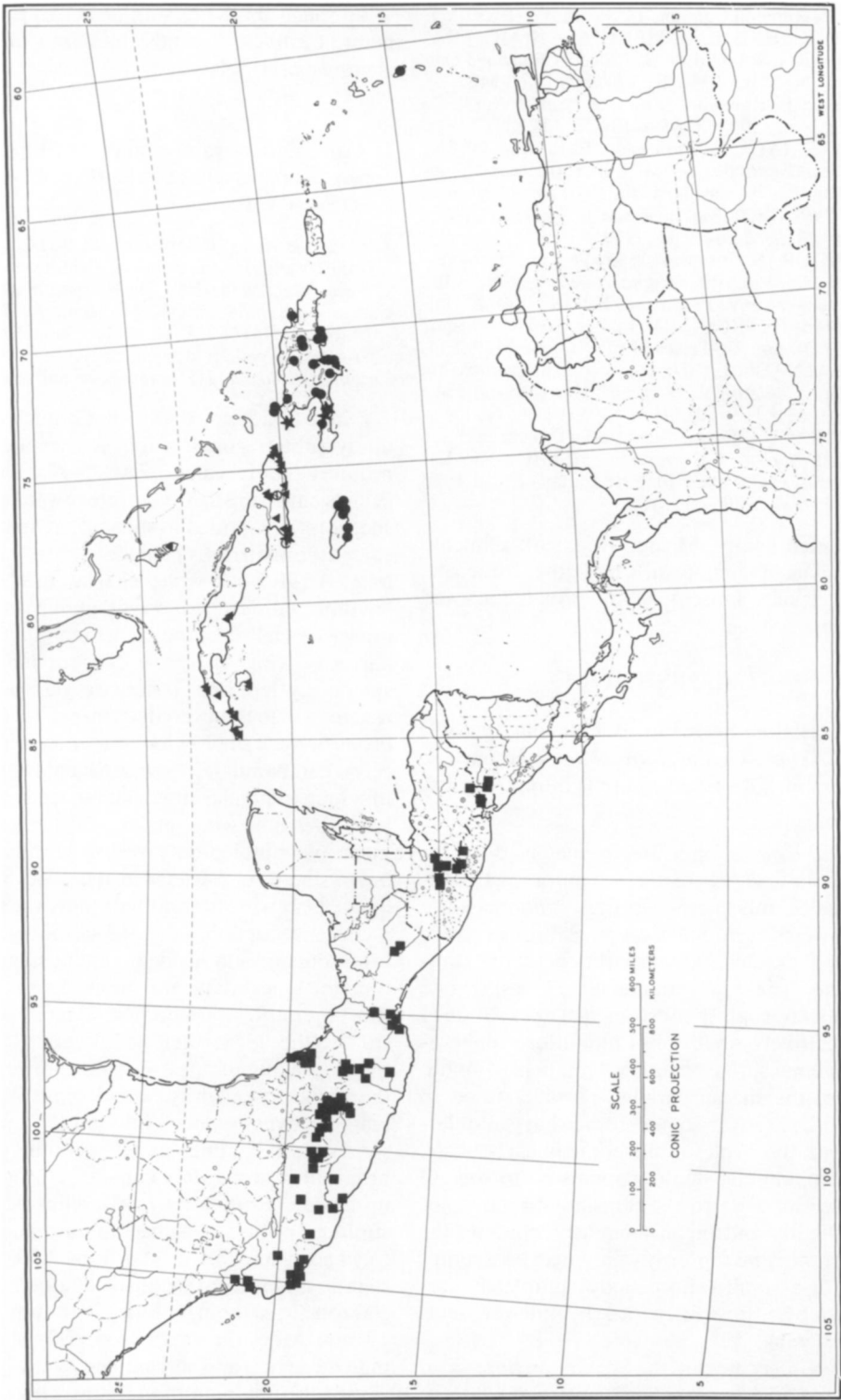


FIG. 4. Distribution of *Astianthus* and *Catalpa*. ■ = *A. viminalis*; ▲ = *C. macrocarpa*; ★ = *C. brevipes*; ○ = *C. purpurea*; ● = *C. longissima*.

OAXACA: Tomellia Canyon, 14 May 1906 (fl), *Pringle 10180* (F, G, HBG, L, M, MEXU, MICH, MO, MSC, NY). **PUEBLA:** Rancho de S. Rafael, Culucán, Distr. Matamoros, 27 Jan 1942 (fr), *Miranda 1981* (MEXU). **VERACRUZ:** El Ranchito, Mun. Actopán, 1 Apr 1976 (fl), *Ventura 12600* (CHAPA, ENCB, MEXU).

GUATEMALA. EL PROGRESO: El Rancho, 24 Mar 1939, *Standley 69007* (F, MO). **JUTIAPA:** near Asunción Mita, Río Tamasulapa, Jul 1970 (fr), *Harmon & Dwyer 3307* (MO). **SANTA ROSA:** El Rancho, 28 Dec 1908 (fr), *Kellerman s.n.* (F, NY).

HONDURAS. CHOLUTECA: Río Pespire, vic. of Pespire, 15 Mar 1967 (fl), *Molina 20619* (F, NY, WIS); Pespire River above Pespire, 15 Feb 1947 (fl), *L. Williams 11869* (F, MICH, MO). **EL PARAÍSO:** Río Grande cerca de Oropoli, 9 Mar 1958 (fl), *Molina 8629* (F).

EL SALVADOR. CHALATENANGO: El Paraíso, Jul 1928 (fr), *Calderón 2358* (B, F). **SANTA ANA:** Lake Guija, 19 Mar 1959 (fl), *Allen 7295* (F, LL, NY).

NICARAGUA. ESTELI: Venecia-La Esperanza, 1 Sep 1980 (fr), *Stevens & Moreno 17830* (MO); Río Los Encuentros, este de San Juan de Limay, 23 Jul 1975 (fr), *Atwood & Neill 263* (MO).

Common names. Mexico (México): achuchil, tirinchicua; (Michoacán): aguejote, ahuejote, aquila, sauce; (Jalisco): sabino. Guatemala and Honduras: chilca.

CAMPSIDIUM

3. *Campsidium* Seemann, Bonplandia 10: 147. 1862. Type. *Campsidium chilense* Reissek & Seemann = *C. valdivianum* (Philippi) Skottsberg.

Liana. Leaves opposite, pinnately 5–17-foliolate, the leaflets scattered-lepidote with reddish scales, otherwise glabrous. *Inflorescence* a few-flowered terminal raceme, glabrous or very slightly lepidote. *Flowers* with the calyx campanulate, 5-dentate with apiculate lobes; corolla red, tubular, slightly constricted at apex, 5-lobed with relatively small lobes moniliform puberulous on inner surface; stamens four, held in mouth of tube, the thecae parallel, partially fused to filament apex; ovary ovate, somewhat glandular-papillose, the ovules multiseriate in each locule; disk thin, cupular, closely appressed to base of ovary. *Fruit* a narrowly ellipsoid stipitate capsule, slightly and inconspicuously lepidote, the septum thin and uniformly flattened; *seeds* elliptic, with a small central body completely surrounded by a brownish-striate hyaline-membranaceous wing.

A single species of the Valdivian forests of Chile and adjacent southern Argentina.

Although there are similarities to north temperate *Campsis*, it is possible that *Campsidium* is more closely related to Australasian *Tecomante*.

1. *Campsidium valdivianum* (Philippi) Skottsberg, Kongl. Svenska Vetenskapskad. Handl. 56(5): 303. 1916.

Tecoma valdiviana Philippi, *Linnaea* 29: 14. 1857. Type. Chile. Valdivia, *Philippi s.n.* (lectotype, BM; isotypes, M, UPS (as 209), W, F negative 32880).

Campsidium chilense Reissek & Seemann, *Bonplandia* 10: 147, t. 11, 1862. Type. Chile. Chiloé Island, *Lobb 474* (lectotype here designated, K).

Tecomaria valdiviana (Philippi) Kränzlin, ined., in herb.

Liana to 2.5 cm diam., the branchlets irregularly subtetragonal, glabrous except for a few minute lepidote scales. *Leaves* 5–17-foliolate, the leaflets entire or slightly serrate toward apex, sessile, elliptic, rounded to subacute at apex, rounded or asymmetrically cuneate at base, 0.8–3.7 cm long, 0.5–1.5 cm wide, chartaceous, scattered lepidote with reddish scales above and below, otherwise glabrous, the rachis marginate to very narrowly winged; petiole 1–3 cm long, inconspicuously lepidote, otherwise glabrous. *Inflorescence* a few-flowered terminal raceme, glabrous or very slightly lepidote. *Flowers* with the calyx campanulate, evenly 5-dentate with 2–3 mm long triangular subapiculate teeth, 6–12 mm long, 7–9 mm wide, glabrous except for a few inconspicuous lepidote scales; corolla red, tubular, slightly constricted at apex, 3–3.5 cm long, 0.5–0.8 cm wide at mouth of tube, the tube 2.5–3 cm long, the lobes 0.3–0.5 cm long, tube glabrous outside and inside except at stamen insertion, the lobes ciliate and puberulous inside with short moniliform trichomes; stamens subexserted, the thecae parallel, not divergent, partially fused to filament apex, 4–5 mm long, glabrous, the connective slightly extended; pistil 3–3.5 cm long, the ovary ovate, 3 mm long, 1.5 mm wide, somewhat glandular-papillose, otherwise glabrous; disk very thinly cupular, 1 mm long, 1.5 mm wide. *Fruit* a narrowly ellipsoid capsule, stipitate, obtuse to subacuminate at apex, the calyx persistent, 5.5–8.5 cm long, 2.3–3 cm wide, slightly and inconspicuously lepidote, otherwise glabrous; *seeds* thin, elliptic, 7–10 mm long, 12–15 mm wide, the small seed body sharply demarcated from and surrounded by the brownish-veined hyaline-membranaceous wing.

Distribution. Valdivian region of Chile and southern Argentina; 0–800 m elevation.

Representative collections examined. ARGENTINA. RÍO NEGRO: Bariloche, *Edwards s.n. of 1926* (BM). CHUBUT: Dep. Futaleufu, Lago Menéndez, *Meyer 9513* (LIL, K).

CHILE. CHILOÉ: Alerzales de Piuchue, Jan 1902, *M. Espinosa 133* (MO). OSORNO: Osorno, 17 Sep 1930 (fl), *Berlin s.n.* (MO). VALDIVIA: Altos del Mirador, Parque Nacional Los Alerzales, 73°18'W, 40°14'S, 800 m, 18 Mar 1986 (fr), *Gentry et al. 53493* (MO).

Common names. Pilpil-voque, pilpilovqui blanco, voqui blanco, voqui-bejuco.

I have not attempted to examine all collections of this extratropical species, nor is its distribution mapped here.

CAMPSIS

4. *Campsis* Loureiro, Fl. cochinch. 377. 1790. Type. *Campsis grandiflora* (Thunberg) K. Schumann.

Lianas; branchlets terete, lacking interpetiolar glandular fields and pseudostipules, the opposite petiole bases connected by an interpetiolar line, this usually pilose. *Leaves* imparipinnately compound, without tendrils. *Inflorescence* a few-flowered terminal panicle. *Flowers* with the calyx campanulate, coriaceous, sharply and regularly 5-dentate; corolla orange or red-orange, tubular-campanulate, glabrous except minutely ciliate lobe margins and stipitate-lepidote glands at stamen insertion; stamens four, the anthers glabrous, included but held near mouth of corolla tube, the staminode rudimentary; ovary flattened ellipsoid or oblong-ellipsoid, lepidote, somewhat stipitate at base, the ovules multi-seriate in each locule; disk conical-pulvinate. *Capsule* narrowly oblong, stipitate, acuminate at apex, the valves rather woody, glabrous except for inconspicuous lepidote scales and scattered plate-shaped glands; *seeds* thin, bialate.

A north temperate genus of two species, one each in China and the eastern United States. The North American species is cultivated in the montane neotropics and in temperate South America.

1. *Campsis radicans* (Linnaeus) Seemann, J. Bot. 5: 372. 1867.

Bignonia radicans Linnaeus, Sp. pl., ed. 1, 2: 624. 1753. Type. Specimen without data (*Bignonia* 6) (LINN).

Tecoma radicans (Linnaeus) Jussieu, Gen. pl. 139. 1789. *Campsis curtisii* Seemann, J. Bot. 5: 371. 1867. Type. Illinois. Across Mississippi River from St. Louis, *Seemann s.n.* (not seen).

Vine, often climbing by adventitious rootlets, the branchlets inconspicuously lepidote to variably puberulous. *Leaves* 5–11-foliolate, the leaflets elliptic to ovate-elliptic, acuminate, truncate or obtuse to cuneate at base, sharply and rather coarsely serrate, 1.5–8 cm long, 0.8–3.5 cm wide, sparsely pubescent with long flexuous simple trichomes along main veins and sometimes over surface below, above puberulous at least at base of midvein; petiolules 0.5 mm long, longer on basal leaflets. *Inflorescence* a few-flowered terminal panicle, occasionally reduced to a short raceme. *Flowers* with the calyx campanulate, 12–25 mm long, 9–14 mm wide, sharply and evenly 5-dentate, the teeth acuminate or apiculate, glabrous or inconspicuously lepidote-glandular, with a few plate-shaped glands near base of teeth; corolla orange or red-orange (rarely yellow), tubular-campanulate above a narrowly cylindrical base, 5.5–8 cm long, 1.4–2.5 cm wide at mouth of tube, the lobes 1–1.5 cm long, glabrous outside and inside except the shortly ciliate lobes and short-stalked lepidote glands at stamen insertion, the lobes inside also with a minutely glandular surface; stamens didynamous, included, the thecae divaricate, 3–4 mm long, held not far below mouth of tube; pistil 4.5–7 cm long, the ovary flattened-ellipsoid, lepidote, 4–5 mm long, 2 mm wide, slightly narrowing at base into top of conical-pulvinate disk, this ca. 2 mm long and 4 mm wide. *Fruit* a narrowly oblong to linear-ellipsoid capsule, stipitate, acuminate at apex, the valves smooth and subwoody, 10–28 cm long, 1.5–2.5 cm wide, glabrous except for inconspicuous lepidote scales and scattered plate-shaped glands; *seeds* thin, bialate, ca. 0.5–0.6 mm long, 12–20 mm wide, the membranaceous wings brownish-hyaline.

Distribution. Native to eastern North America; infrequently cultivated in the montane Neotropics and in South Temperate South America.

CATALPA

5. *Catalpa* Scopoli, Intr. hist. nat. 170. 1777. Type. *Bignonia catalpa* Linnaeus (= *C. bignonioides* Walter).

Cumbalu Adanson, Fam. Pl. 2: 199. 1763.

Catalpium Rafinesque, Princ. fond. somiol. 27. 1814.

Type. Nom. nov. for *Catalpa* Scopoli.

Macrocatalpa Britton, J. New York Bot. Gard. 19: 8. 1918. Type. *Catalpa punctata* Grisebach = *Catalpa macrocarpa* (A. Richard) Ekman ex Urban.

Trees. Leaves simple, opposite or verticillate. *Inflorescence* paniculate. *Flowers* white to pink or light yellow, the calyx membranaceous, bilabiate split to near base; corolla broadly campanulate, strongly bilabiate with 3 lower lobes longer than upper two; fertile stamens two, with three minute staminodes also present; ovary oblong, bilocular, the ovules multiseriate in each locule; disk small, annular-pulvinate. *Fruit* a terete capsule, the seed wings formed by separate or basally partially fused hairs, the body sometimes also dorsally plumose.

A genus of 10 species, four in Asia, two in the southeastern United States, and four in the Antilles.

In addition to the native species, three extratropical species are sometimes cultivated in subtropical South America. All three are readily dis-

tinguishable from the native species by the much broader heart-shaped leaves and by the seeds plumose only at the ends. *Catalpa speciosa* (Warder et Barney) Engelm. and *C. bignonioides* Walt., both temperate North American, can be differentiated by the former's larger flowers (>4 cm long vs. <3.5 cm long) with a notched lower petal and wider fruit (>1 cm diam. vs. usually <1 cm diam.) having broader seeds with the apical hairs not coming together in a point. *Catalpa speciosa* is usually a large tree with ridged bark, *C. bignonioides* a small tree with scaly bark. Asian *C. ovata* G. Don differs from the two North American species in glabrous or glabrate lower leaf surfaces, the tendency to sharply lobed or angled margins, and the smaller yellowish flowers (<2 cm across) and narrower fruits (5–8 cm diam.). *Catalpa* × *erubescens*, a hybrid between *C. ovata* and *C. bignonioides* is cultivated in Argentina; it is intermediate between its two parents with glabrous or slightly puberulous leaves, corollas 2.5–3 cm long and ca. 2 cm across, and fruits 7–8 mm wide.

Key to Species

1. Leaf surface smoothish below, the tertiary venation not at all raised-reticulate.
 2. Leaves at least in part more or less acutish, mostly oblong-lanceolate; flowers white; Jamaica and Hispaniola. 2. *C. longissima*.
 2. Leaves elliptic with rounded apices; flowers light yellow; Cuba, the Bahamas, and southern Hispaniola. 3. *C. macrocarpa*.
1. Leaves with tertiary venation intricately raised-reticulate below.
 3. Corolla pink, >2 cm long; calyx 6–10 mm long; buds ca. 10 mm across; leaves to 12 cm long, sometimes with erose-denticulate margins. 4. *C. purpurea*.
 3. Corolla white, <2 cm long; calyx ca. 5 mm long; buds ca. 5 mm across; leaves <6 cm long, the margin always entire. 1. *C. brevipes*.

1. *Catalpa brevipes* Urban, Feddes Repert. 24: 12. 1928. Type. Cuba. Oriente: Península de Cabo Cruz, S of Niguero, *Ekman 16166* (holotype, B; isotype, S).

Catalpa oblongata Urban & Ekman, Ark. Bot. 22A(10): 61. 1929. Type. Haiti. Mole St.-Nicolas ad Cap Les Anglais, *Ekman H4495* (B*, lectotype, S).

Catalpa ekmaniana Urban, Ark. Bot. 22A(10): 61. 1929. Type. Haiti. Massif de la Hotte, prope Miragoane, *Ekman H6476* (B*, lectotype, S).

Catalpa brevipes var. *oblongata* (Urban & Ekman) Paclt, Candollea 13: 274. 1952.

Catalpa brevipes var. *ekmaniana* (Urban) Paclt, Candollea 13: 275. 1952.

Small tree, the slender branchlets terete with small round lenticels, lepidote and minutely pu-

berulous. *Leaves* simple, opposite or in whorls of three, elliptic or ovate to elliptic-oblong, the apex rounded or obtuse, the base rounded, 1.5–6 cm long, 1–3.5 cm wide, coriaceous, lepidote above and below, otherwise glabrous above, below pubescent on the strongly and intricately prominent tertiary venation, with plate-shaped glands at base of the midvein below, the margin essentially entire, sometimes very inconspicuously erose, the petioles 0.3–1.5 cm long, lepidote and puberulous. *Inflorescence* a lax, few-several-flowered panicle, the branches lepidote and puberulous, the linear bracts 1–2 mm long. Calyx 2-lobed, split to the base, the lobes broadly rounded, 5–7 mm long and wide, more or less lepidote; corolla white with yellow and purple

markings in throat, campanulate, ca. 1.5 cm long, generally glabrous, with tiny sessile glands on lobes; stamens two, the thecae divaricate, 2 mm long; pistil ca. 1 cm long, the ovary oblong, lepidote, the style shortly puberulous toward base. *Fruit* a linear capsule, 8–32 cm long, 2–5 mm wide, longitudinally striate-ridged, lepidote or slightly puberulous; seeds strongly plumose-pubescent, the body linear-fusiform, 0.5–0.8 mm long, 6–10 mm wide, pilose with trichomes to ca. 1 mm long.

Distribution (Fig. 4). Haiti, southwesternmost Dominican Republic, and the Cabo Cruz area of the Cuban Oriente, mostly on coastal limestone.

Collections examined. CUBA. GRANMA: Cabo Cruz prope Niguero, *Ekman 16166* (B, S); Farallón del Cabo Cruz, 31 Jul 1935 (fl, fr), *León 16326* (HAC, NY).

HAITI. Massif de la Hotte, Miragoane towards Anse-à-Veau, *Ekman H7290* (S); Mole St.-Nicolas ad Cap Les Anglais, *Ekman H4495* (S); Massif de la Hotte, Morne Rochelais prope Miragoane, *Ekman H6476* (S).

DOMINICAN REPUBLIC. AZUA: Azua, *Lavastre 2199* (NY).

Very close to *C. purpurea* but differs in the smaller white flowers and generally smaller leaves.

2. *Catalpa longissima* (Jacqin) Dumont-Courset, Bot. cult., ed. 1, 2: 190. 1802. Fig. 5.

Bignonia longissima Jacquin, Enum. syst. pl. 25. 1760; non *B. longissima* Loureiro, 1790. Type. Hispaniola. *Jacquin (?) s.n.* (LINN 776.1), fide Paclt, 1952; type illustration. Jacquin, Sel. stirp. amer. hist. t. 176, fig. 78 (seed only). 1763.

Bignonia longisiliqua Jacquin, Select. stirp. amer. hist. 234. 1780; non *B. longisiliqua* Bertoloni ex Sprengel Syst. veg. 2: 830. 1825, non Vellozo, Fl. flumin. 247. 1825. Nom. nov. for *B. longissima* Jacquin.

Bignonia tenuisiliqua Vahl, Ecl. amer. 2: 43. 1798. Type. Without locality, von Rohr s.n. (C).

Bignonia quercus Lamarck, Encycl. méth. Bot. 1: 417. 1785. Type. Santo Domingo. Not seen; based on *Bignonia longissima* Jacquin.

Bignonia pseudo-quercus Tussac, Fl. antill. 4: 118. 1827. Type illustration.

Catalpa longisiliqua (Jacquin) Chamisso, Linnaea 7: 720. 1832.

Macrocatalpa longissima (Jacquin) Britton, J. New York Bot. Gard. 19: 8. 1918.

Trees (3)–4–20 m tall, the slender branchlets terete with small round lenticels, lepidote, occasionally minutely puberulous. *Leaves* simple, usually opposite, sometimes in whorls of 3, elliptic to narrowly ovate, typically elliptic-lanceolate, the apex acute or gradually and sharply acuminate to rounded, sometimes somewhat

apiculate, base rounded, 1.5–14 cm long, 0.6–4.5 cm wide, chartaceous, somewhat lepidote, otherwise glabrous or occasionally minutely puberulous on midvein below, strongly glandular at the base of the midvein below, the slender petioles 0.5–4 cm long, lepidote. *Inflorescence* a lax, usually few-flowered, panicle, the branches lepidote, the bracts minute, linear, ca. 1 mm long. *Flowers* with calyx 2-lobed, split to the base, the lobes broadly rounded but often apiculate, 4–7 mm long, ca. 4–5 mm wide, lepidote; corolla white with yellow in throat, sometimes also with purple markings in throat, campanulate, 1.4–2.4 cm long, 0.5–1 cm across at mouth of tube, the tube 1–2 cm long, strongly bilabiate, the lower lobes longer than upper two, 0.8–1 cm long, generally glabrous, with tiny sessile glands on lobes, with very short subsessile glandular trichomes only on filament bases; stamens two, the thecae divaricate, 1.5 mm long, also with three minute staminodia; pistil ca. 1 cm long, the ovary oblong-conical, densely lepidote, ca. 2 mm long, 1 mm wide, the style shortly puberulous in lower half; disk short, plate-shaped, ca. 2.5 mm wide. *Fruit* a linear capsule, 26–67 cm long, 2–4 mm wide, longitudinally striate-ridged, lepidote; seeds strongly plumose-pubescent, the body linear-fusiform, 7–10 mm wide, 1 mm long, pilose on all sides with up to 1 mm long trichomes.

Distribution (Fig. 4). Jamaica and Hispaniola. Introduced and more or less spontaneous in the Lesser Antilles (at least Martinique) but not Puerto Rico nor Cuba; sometimes cultivated elsewhere. Sea level to 500 m elevation.

Representative specimens examined. JAMAICA. MANCHESTER: Round Hill, 4 Feb 1980 (fl, fr), *Gentry & Kapos 28378* (AAU, MO). PORTLAND: 1 mi E of Hope Bay, 18 Mar 1956 (fl), *Stearn, Harris 549* (A). Sr. ANDREW: Hope Grounds, 5 Sep 1906, *Harris 9229* (UCWI). ST. THOMAS: Negro Bridge, 1 mi WSW of Serge Island, 30 Sep 1959 (fl, fr), *Proctor 19780* (A, NY).

HAITI. Bayeux, between Cap Haitien and Le Borgne, 24 Jul 1941 (fl), *Bartlett 17450* (A, MICH); Miragoane, 20 Sep 1927 (fl), *Eyerdam 597* (GH). Torture Island, Basse Terre, 29 Mar 1929 (fl), *Leonard & Leonard 13954* (A).

DOMINICAN REPUBLIC. AZUA: Near Tabara, 18 Mar 1922, *Schrenk 17* (MO). BARAHONA: Paraíso, near sea level, 12 Apr 1985 (fl), *Gentry & Mejia 50729* (JBSD, MO). LA VEGA: Güaigüi, Río Camu, 3 km N of Güaigüi, 9 Apr 1985 (st), *Gentry & Zanoni 50648* (JBSD, MO). PERAVIA: Galcón de Bani, 6 Apr 1985 (fl), *Gentry & Zanoni 50506* (JBSD, MO). SAMANÁ: Samaná, Sta.

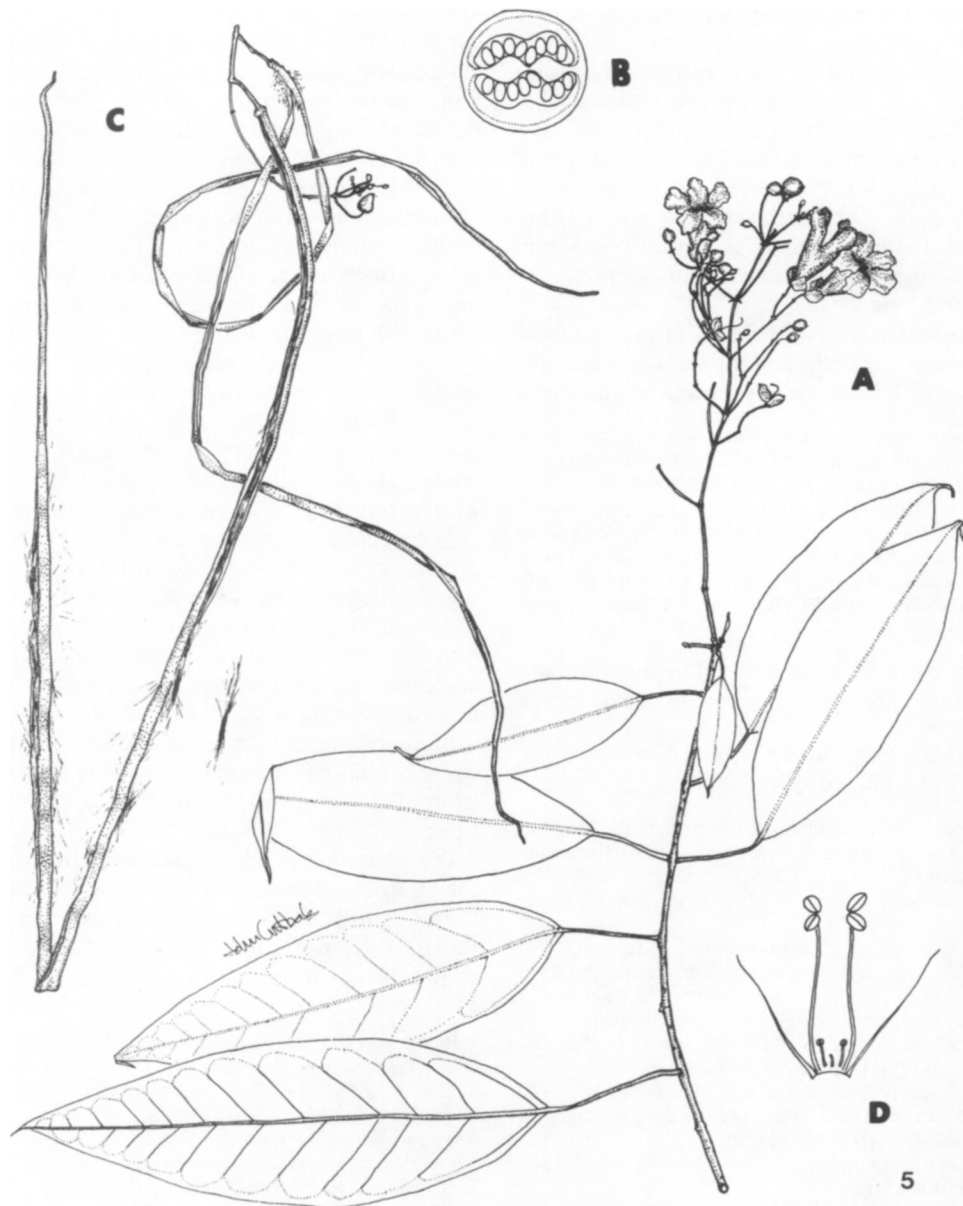


FIG. 5. *Catalpa longissima*. **A**, flowering shoot, $\times 0.5$; **B**, ovary x-section, $\times 25$; **C**, fruit, $\times 0.5$; **D**, stamens and staminodia, $\times 2$. (From *Flora de Venezuela*; Proctor 28592.)

Barbara de Samaná, Punta Corozos, 3 Aug 1930 (fl), Ekman H15827 (B). SAN CRISTÓBAL: El Rubio, 5 Oct 1938 (fl), Canela 731 (MO).

WINDWARD ISLANDS. MARTINIQUE: Compr. da Bourgeau, 1865 (fl, fr), Hahn 838 (B, FI).

Common names. Dominican Republic: roble, roble de olor, roble tubano; Haiti: chêne, chêne

noir, bois chêne; Jamaica: yokewood, mastwood, french-oak; Martinique: radegonde, chêne d'Amérique, chêne noir, poix doux marron.

The most widespread Antillean *Catalpa* and the only one cultivated outside its native range. Easily distinguished from the Asian and North American species by its much narrower leaves

and by the narrower fruits with the seeds plumose on all sides. Distinct from other Antillean species by its generally longer and/or more acute-tipped leaves.

One very atypical sterile collection (*Schrenk 17* from Tabara, Dominican Republic) with broadly ovate leaves to 9×6 cm and the twigs, petioles and midvein beneath densely puberulous, is not included in the above description.

3. *Catalpa macrocarpa* (A. Richard) Ekman ex Urban, Symb. antill. 9: 254. 1924.

Echites macrocarpa A. Richard, Fl. Cuba Fan. 2: 94. 1841. Type. Cuba. *Sagra s.n.* (P?, not seen), non Wallich, Cat. n. 1662, 1829, nom. nud.

Catalpa punctata Grisebach, Cat. pl. Cub. 192. 1866. Type. Cuba. Oriente, *Wright 3035* (holotype, GOET; isotypes, MO, P).

Catalpa punctata var. *pubescens* Grisebach, Cat. pl. Cub. 192. 1866. Type. Cuba. Oriente, pr. Bayamo, *Wright 3036* (holotype, GOET; isotypes, MO, P).

Robbia macrocarpa (A. Richard) Miers, Apocyn. S. Amer. 108. 1878.

Catalpa punctata var. *lepidota* Bureau, Nouv. Arch. Mus. Hist. Nat., ser. 3, 6: 206. 1894. Type. Cuba. Oriente, *Wright 3035* (holotype, P; isotypes, GOET, MO).

Macrocatalpa punctata (Grisebach) Britton, J. New York Bot. Gard. 19: 8. 1918.

Catalpa domingensis Urban & Ekman, Ark. Bot. 22A(10): 63. 1929. Type. Dominican Republic. Barahona: Cabo Falso, *Ekman H7011* (B*, lectotype, S).

Catalpa obovata Urban, Ark. Bot. 22A(10): 62. 1929. Type. Haiti. Massif de la Hotte, Miragoane, *Ekman H7897* (B*, lectotype, MO; isotype, S).

Catalpa punctata var. *domingensis* (Urban & Ekman) Paclt, Candollea 13: 273. 1952.

Catalpa punctata var. *domingensis* forma *urbanii* Paclt, Candollea 13: 274. 1952. Type. Haiti. Massif de la Selle, Anse-à-Pitre, *Ekman H6966* (holotype, S; isotype, MO).

Macrocatalpa tomentosa ("Grisebach") Bisse, Arboles de Cuba 73. 1981. Lapsis based on *C. punctata* var. *pubescens* Grisebach.

Tree 5–20 m tall, with thick trunk and ridged bark, the slender branchlets terete with usually inconspicuous small round lenticels, lepidote, also usually more or less puberulous. *Leaves* simple, mostly in whorls of three, also sometimes in part opposite, elliptic, the apex obtuse to rounded, base rounded, 1–7 cm long, 0.7–4 cm wide, chartaceous to coriaceous, lepidote above and below, usually also puberulous below, occasionally glabrous, conspicuously glandular at the base of the midvein below, the petioles 1–2.5(–3) cm long,

lepidote and puberulous (rarely glabrous, e.g., *Fuertes 218*). *Inflorescence* a sparsely branching usually few-flowered panicle, the branches lepidote, usually also puberulous in part with forked or few-branched trichomes, the bracts linear, to 2 mm long. *Flowers* with the calyx 2-lobed, split to the base, the lobes rounded, 4–7 mm long, 3–6 mm wide, lepidote, usually also puberulous; corolla light yellow with red and magenta or orange and brown markings in throat, campanulate, 1–2 cm long, 0.5–1 cm wide at mouth of tube, the tube 0.5–1 cm long, strongly bilabiate, the lower lobes longer than upper two, 0.5–1 cm long, generally glabrous, with tiny sessile glands on lobes; stamens two, the thecae divaricate, 1.5 mm long; also with three minute staminodia; pistil ca. 1 cm long, the ovary oblong, lepidote, 2–2.5 mm long, 1–1.2 mm wide, the style shortly puberulous toward base; disk reduced, annular-pulvinate, 0.2–0.3 mm long, 1–2 mm wide. *Fruit* a linear capsule, 11–40(–68) cm long, 2–4(–5) mm wide, longitudinally striate-ridged, lepidote, sometimes also rather strongly pilose; *seeds* pubescent, linear-fusiform, 8–10(–17) mm wide, 0.7–2 mm long.

Distribution (Fig. 4). Cuba, the Bahamas (Andros Island), and southern Hispaniola, mostly on limestone; sea level to 300 m elevation.

Representative specimens examined. BAHAMAS. ANDROS: South Andros, 1 May 1979 (fl, fr), *Correll & Correll 50608* (MO). **NEW PROVIDENCE:** Nassau (cultivated), 15 Nov 1973 (fl), *Gillis 11900* (MO). **SOUTH ANDROS:** N of Deep Creek, 26 May 1974 (fl, fr), *Gillis 12028* (B).

CUBA. CIENFUEGOS: Caonas River below Soledad, 5 Apr 1929 (fl), *Jack 3188* (HAC). **GRANMA:** Papayo, prope Sevilla, 25 Jul 1918 (fr), *Ekman 9436* (AAU). **GUANTÁNAMO:** Yaucu, Baracoa region, Jul 1924 (fr), *León 11688* (HAC); Sur de Baracoa, Valle del Río Tacre, O de Cajobabo, 17 Mar 1976 (fr), *Borhidi et al. 4373* (HAC). **HABANA:** Loma de Sumorrostre, 13 Jul 1923 (st), *León & Roig 12453* (HAC). **HOLGUÍN:** Mir prope cavernas ad Mijiul, 6 Mar 1915 (st), *Ekman 1912* (MO). **ISLA DE JUVENTUD:** Península del Jorobodo, cerca de Caleta Grande, 7 Mar 1916 (st), *Britton et al. 6087* (HAC). **LAS TUNAS:** Manigua Costera, Socucho, Puerto Padre, 19 May 1957, *Lopez-Figueiras 2922* (HAC). **PINAR DEL RÍO:** N of El Veral, Guanahacabibes, 21 Dec 1959 (st), *Acuña 24905* (HAC). **SANTIAGO DE CUBA:** Daiquiri, 16 Nov 1916 (fl), *Ekman 8367* (B, MO).

HAITI. Massif de la Selle, Morne des Commissaires, Anse-à-Pitre, *Ekman H6966* (MO); Massif de la Hotte, Miragone, 25 Mar 1927, *Ekman 7897* (S).

DOMINICAN REPUBLIC. PEDERNALES: 20 km NW of Oviedo, 12 Apr 1985 (fl), *Gentry & Mejia 50748*

(JBSD, MO). 7 km E de los caminos a Cabo Rojo y Pedernales, 25 May 1982 (fr), *Zanoni & Mejia 20805* (JBSD, MO).

Common names. Cuba: roble de olor, roblillo.

Most closely related to *C. longissima*, which it replaces on Cuba. That species differs in white rather than light yellow corollas and in a generally more acute leaf apex. The difference in fruit thickness suggested by Paclt (1952), correlates neither with other characters nor geography and is of no taxonomic importance.

Pubescence varies greatly in *C. macrocarpa* but the variation seems essentially continuous; Grisebach's *C. punctata* forma *pubescens* applies to pubescent extremes, but most collections are intermediate and there seems little point in formally recognizing the various pubescence morphs. Bisse's (1981) elevation of the pubescent form to specific rank as *Macrocatappa tomentosa* (Griseb.) Bisse is apparently based on a lapsus of "tomentosa" for "pubescens" and is at any rate invalid since no reference is given for the supposed basionym *Catalpa punctata* var. *tomentosa* Griseb.

I agree with Paclt's reduction of *C. domingensis* to *C. punctata* (i.e., *C. macrocarpa*) but question whether it warrants even varietal recognition. Most Hispaniolan collections can be recognized as having the leaves more coriaceous and with the midvein tending to be impressed above but there are some Hispaniolan collections (e.g., *Fuertes 218*) that are indistinguishable from glabrous Cuban forms and others (e.g., the type of *C. punctata* var. *dominguensis* f. *urbanii*) that are indistinguishable from pubescent Cuban forms. The differentiating characters suggested by Paclt for var. *domingensis* do not correlate with geography since petioles in Hispaniola can reach 1–2 cm in length and the seeds of most Hispaniolan collections are just as large as those from Cuba. Moreover, *C. obovata*, known only from the type and retained as provisionally distinct by Paclt, seems no more than a form of this same taxon with a very slight tendency for the secondary veins to be impressed above. I conclude that all *Catalpas* with obtuse leaf apices, yellowish flowers and non-intricate lower surface venation are conspecific.

This species was originally described as an Apocynaceae. Although *Echites macrocarpa* A. Richard is predated by *E. macrocarpa* Wallich

(Cat. 1662. 1829), the latter is a nomen nudum (see Sprague, 1925) and the basionym "macrocarpa" the appropriate one for the Antillean *Catalpa*.

4. *Catalpa purpurea* Grisebach, Cat. pl. Cub. 192. 1866. Type. Cuba. Oriente, *Wright 3037* (holotype, GOET; isotypes, BM, G, GOET, MO, P) (at MO & P mixed with material of *Tabebuia bibracteolata*).

Catalpa denticulata Urban, Feddes Repert. 24: 12. 1928. Type. Cuba. Oriente, *Ekman 19091* (B*, lectotype, S).

Macrocatappa purpurea (Grisebach) Britton, J. New York Bot. Gard. 19: 9. 1918.

Catalpa purpurea forma *denticulata* (Urban) Paclt, Candollea 13: 277. 1952.

Small tree, the slender branchlets terete with small round lenticels, lepidote and puberulous, becoming glabrate. Leaves simple, opposite or in whorls of three, elliptic to elliptic-oblong, the apex rounded or slightly retuse or occasionally obtusely acutish, the base rounded, 1.2–12 cm long, 1–5 cm wide, chartaceous to coriaceous, lepidote above and below, otherwise glabrous above, below conspicuously pubescent with erect trichomes, these concentrated on the strongly and intricately prominent tertiary venation, strongly glandular at the base of the midvein below, the margin entire, sometimes distinctly erose-denticulate, the petioles 0.4–3.5 cm long, lepidote and puberulous. Inflorescence a lax, few-flowered, panicle, the branches lepidote and puberulous, the linear bracts to 4 mm long. Flowers with calyx 2-lobed, split to the base, the lobes broadly rounded, 6–10 mm long, ca. 6–7 mm wide, densely lepidote, with a few inconspicuous trichomes near margin; corolla purple, campanulate, 2.5–3 cm long, 1–1.5 cm across at mouth of tube, the tube 1.5–2 cm long, strongly bilabiate, the lower lobes longer than upper two, 1–1.5 cm long, generally glabrous, with tiny sessile glands on lobes, stamens two, the thecae divaricate, 2 mm long; pistil ca. 1.5 cm long, the ovary oblong, densely lepidote, ca. 3 mm long, 2 mm wide, the style shortly puberulous in lower half; disk scarcely differentiated. Fruit unknown.

Distribution (Fig. 4). Cuban Oriente and Gonâve Island, Haiti; on limestone; 200–350 m elevation.

Specimens examined. CUBA. SANTIAGO DE CUBA: Mogote prope Palmarito de Cauto, 300 m, *Ekman 9171* (MO, S); Palmarito de Cauto, *Ekman 19091* (S). GRANMA: Cabo Cruz, S of Niquero, 16 Jan 1923 (st), *Ekman 16166* (B); La Catalina S of Sagua de Tanamo, *Wright 3037* (BM, G, GOET, MO, P).

HAITI. La Gonâve prope Les Abricots, 200 m, *Ekman H8763* (S).

Common names. Palo florido, roble de olor.

Although dentate leaf margins give *C. denticulata* a very distinct aspect, this character is highly inconstant and Paclt (1952) has already reduced *C. denticulata*, both collections of which are sterile, to *C. purpurea*. Since some leaves of the type collection are distinctly denticulate whereas the majority have perfectly entire margins, I do not think this merits recognition, even as a form.

This species differs from *C. brevipes* primarily in the larger purple flower. However, there are so few collections, especially with flowers, that it is difficult to evaluate these differences. In the absence of fertile material, the Gonâve Island collection is referred to *C. purpurea* rather than *C. brevipes*, which is vegetatively very similar (and otherwise known from Haiti, unlike *C. purpurea*), with some reservation.

CHILOPSIS

6. *Chilopsis* D. Don, Edinburgh Philos. J. 9: 261. 1823. Type. *Chilopsis saligna* D. Don = *C. linearis* (Cavanilles) Sweet.

Shrubs or small *trees*. *Leaves* simple, mostly alternate, sometimes partially opposite or

whorled, linear-lanceolate to linear. *Inflorescence* a terminal raceme or racemose panicle, sparsely to densely hirtellous-pilose or villous-tomentose. *Flowers* lavender to magenta outside and on lobes, the throat white with yellow ridges and purple nectar lines, the calyx bilabiate to near base (occasionally spathaceously split), pubescent; corolla broadly tubular-campanulate, glabrous outside, with short gland-tipped trichomes below stamen insertion, with flexuous multicellular simple trichomes 1–3 mm long in throat and on lower lobes; stamens four, didynamous, the thecae divaricate, 2–3 mm long, the pollen in tetrads, the coarsely reticulate sculpturing reduced to areoles, the staminode 4–10 mm long and sometimes tipped with aborted anther; ovary cylindrical conical, lepidote-glandular; disk patelliform-pulvinate, 0.3 mm long, 1 mm wide. *Fruit* a linear capsule, terete, the *seed* wings formed by separate or basally partially fused hairs.

A monotypic genus of the Chihuahuan and Sonoran Deserts of northern Mexico and the southwestern United States.

Chilopsis, sometimes divided into several varieties based on degree of leaf curving and pubescence, has been recently revised by Henrickson (1985) who concludes that it consists of two subspecies, one of which may be subdivided into two varieties. Since the distribution of the species is largely extratropical, I here merely reproduce relevant parts of Henrickson's treatment to which the reader may refer for exsiccatae and more details.

Key to the Intraspecific Taxa

1. Leaves straight or nearly so, erect-ascending, 5–9(–11) cm long; young stems usually hirtellous-pilose or glabrous and sparsely glandular, rarely densely villous with erect to crisped-curved trichomes 0.05–1.5 mm long; mature fruits (4.5–)5–7(–8.5) mm in diam.; plants usually erect with erect-ascending upper stems; Chihuahuan Desert. 1. *C. linearis* subsp. *linearis*.
2. Young stems moderately to sparsely hirtellous-pilose with trichomes (0.05–)0.1–0.4 mm long to glabrous, with sessile glands or variously glutinous; northern San Luis Potosí to Durango and north to northeastern New Mexico. *C. linearis* ssp. *linearis* var. *linearis*.
2. Young stems densely villous tomentose with crisped-curved, white trichomes (0.3–)0.5–0.8(–1.3) mm long; easternmost Chihuahua Desert in Tamaulipas and Nuevo León. *C. linearis* ssp. *linearis* var. *tomenticaulis*.
1. Leaves falcate-arcuate, curving away from stem, often distally pendent, (8–)10–18(–21) cm long; young stems glabrous or very sparsely pilose with widely scattered, erect hairs 0.05–0.2 mm long; mature fruits 3.5–5 mm in diameter; plants more rounded with spreading to drooping branches; Sonoran Desert. *C. linearis* subsp. *arcuata*.

1. *Chilopsis linearis* (Cavanilles) Sweet, Hort. brit., ed. 1: 283. 1827. Figs. 6, 7.

Bignonia linearis Cavanilles, Icon. pl. 3: 35, t. 269. 1794. Type. Mexico. Cultivated at Madrid, *Cavanilles s.n.* (MA, not seen, photo TEX, fide Henrickson).

Chilopsis saligna D. Don, Edinburgh Philos. J. 9: 262. 1823. Type. Mexico. *Pavon s.n.* (BM).

Chilopsis glutinosa Engelm., Bot. Wisliz. Exped. 94. 1848. Type. Mexico. Coahuila: Between Parras and Saltillo, 18 May 1847 (fl), *Wislizenus 289* (lectotype, MO, designated Henrickson, 1985).

Chilopsis linearis var. *originaria* Fosberg, Madroño 3: 365. 1936. Based on type of *C. linearis*.

Chilopsis linearis var. *glutinosa* (Engelmann) Fosberg, Madroño 3: 365. 1936.

Shrubs or small *trees* 2–9 m tall with more or less erect leaves and erect-ascending young stems and branches, the young stems hirtellous-pilose with erect, spreading trichomes (0.05–)0.1–0.3(–0.4) mm long or more or less glabrescent, with scattered lepidote glands, especially near nodes. *Leaves* linear to linear-lanceolate straight (4–)5.5–9(–12.5) cm long, (2.8–)4–7(–10) mm wide, lepidote-glandular, also usually with scattered trichomes 0.05–0.3(–0.4) mm long at base and along midvein and margins. *Inflorescence* paniculate, hirsute to densely villous-tomentose. *Flowers* with the calyx bilabiate split to near base, (8.5–)10–15 mm long, pubescent; corolla lavender-pink to strongly magenta outside and on lobes, tubular-campanulate, (3–)4–5.5(–6) cm long. *Fruit* a capsule, 13–32 cm long, (4.5–)5–7(–8.5) mm wide, glabrous, the septum flat, 2–4 mm wide; *seeds* thin, 6–12 mm long, ca. 4–5 cm wide, with a coma of unicellular trichomes at each end.

1a. *Chilopsis linearis* subsp. *linearis* var. *tomenticaulis* Henrickson, Aliso 11: 191. 1985. Type. Mexico. Tamaulipas: Sierra de San Carlos, vic. San Miguel, 25 Jul 1930 (fl), *Bartlett 10576* (holotype, US; isotype, MICH).

Differs from *C. linearis* subsp. *linearis* var. *linearis* primarily in the densely canescent whitish-gray woolly stems with appressed or crisped trichomes. In addition the leaves are thinner with less prominent venation, the inflorescence is more strongly villous-tomentose, the calyces more sparsely pilose and thicker, and the corollas larger and more strongly colored.

Distribution. Extreme eastern Coahuila, Nuevo Leon and Adjacent Tamaulipas, east of the

Sierra Madre Oriental, mostly in sandy to gravelly arroyos and streamsides in tropical scrub, chaparral-oak, and pine woodlands; 300–1800 m alt.

1b. *Chilopsis linearis* subsp. *arcuata* (Fosberg) Henrickson, Aliso 11: 194. 1985.

Chilopsis linearis var. *arcuata* Fosberg, Madroño 3: 336. 1936. Type. United States. California: San Bernardino County, Mission Creek E of San Bernardino Mts., 100 m, 12 Aug 1932 (fl), *Fosberg 8600* (holotype, US; isotype, MO).

Differs from subsp. *linearis* primarily by the longer more falcate-arcuate, drooping leaves. Mature leaves tend to be thinner than in subsp. *linearis*, the inflorescences tend to have shorter peduncles and pedicels, and the somewhat paler corollas are generally smaller as are other flower parts.

Distribution. Sonoran and Mojave deserts from southern California to southwestern Utah, south to northern Sonora and Baja California in Mexico, mostly occurring in sandy washes but also ranging into Joshua tree, juniper, and oak woodlands, 0–2100 m alt.

CYBISTAX

7. *Cybistax* Martius ex Meisner, Pl. vasc. gen. 2: 208, 1840; tab. Diagn. 300. 1840. Type. *C. antisiphilitica* (Mart.) Mart. *Yangua* Spruce, J. Proc. Linn. Soc. Bot. 3: 197. 1859. Type. *Y. tinctoria* Spruce (= *C. antisiphilitica* (Mart.) Mart.).

Shrubs to large *trees*, the bark rather thick and vertically fissured, lacking pseudostipules or interpetiolar glandular fields. *Leaves* palmately 5–7-foliolate. *Inflorescence* a short open, few-branched, terminal panicle with pedicels longer than the peduncle. *Flowers* light green, the calyx membranaceous, campanulate-infundibuliform, 5-dentate with usually long acuminate teeth extended as lateral ribs, minutely lepidote and sometimes also inconspicuously puberulous; corolla tubular-campanulate above the narrowed tube base, the tube minutely and inconspicuously lepidote and puberulous outside, almost completely glabrous inside, sometimes sparsely and inconspicuously short-puberulous in floor of tube; the lobes small and evenly rounded; stamens di-

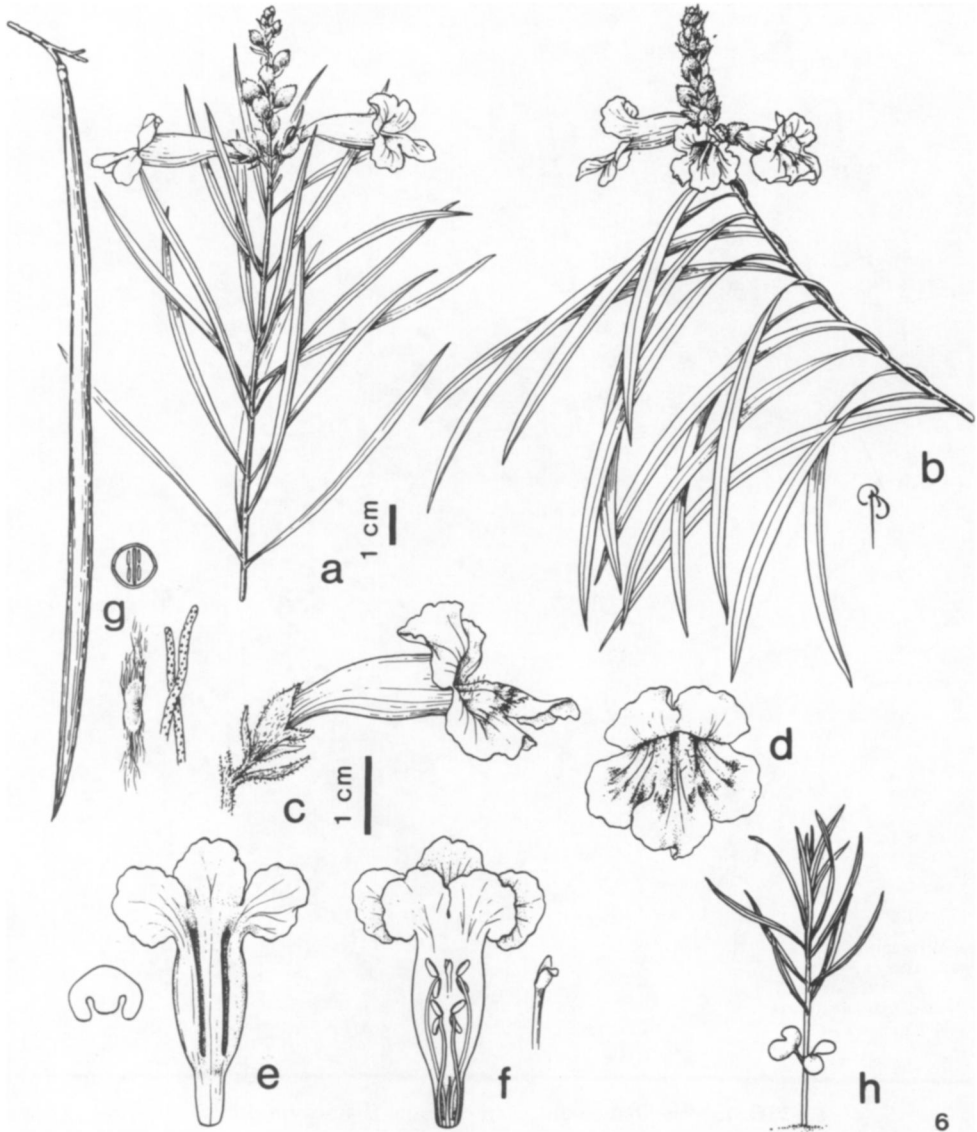


FIG. 6. *Chilopsis linearis*. **A**, *C. linearis* var. *linearis*, flowering shoot; **B**, *C. linearis* var. *arcuata*, flowering shoot; **C-F**, flowers. **C**, lateral view; **D**, frontal view; **E**, lower side; **F**, upper view with "transparent" tube showing anther and stigma arrangement. **G**, capsule and seeds; **H**, seedling with cotyledons. Top scale bar applies to **A**, **B**, **G**, **H**; lower scale bar applies to **C-F**. (From Henrickson, 1985.)

dynamous, the thecae divaricate, glabrous as the filaments; style glabrous, the ovary ovoid-oblong, minutely lepidote-glandular, the ovules multiseriate; disk annular pulvinate. *Fruit* a capsule, the calyx caducous, oblong, woody, longitudinally very strongly 12-ribbed, minutely lep-

idote, the thin septum elliptic; *seeds* with thin heart-shaped body completely surrounded by a broad hyaline-membranaceous wing.

A single species, ranging through much of sub-Amazonian tropical South America; disjunct in southernmost Surinam.

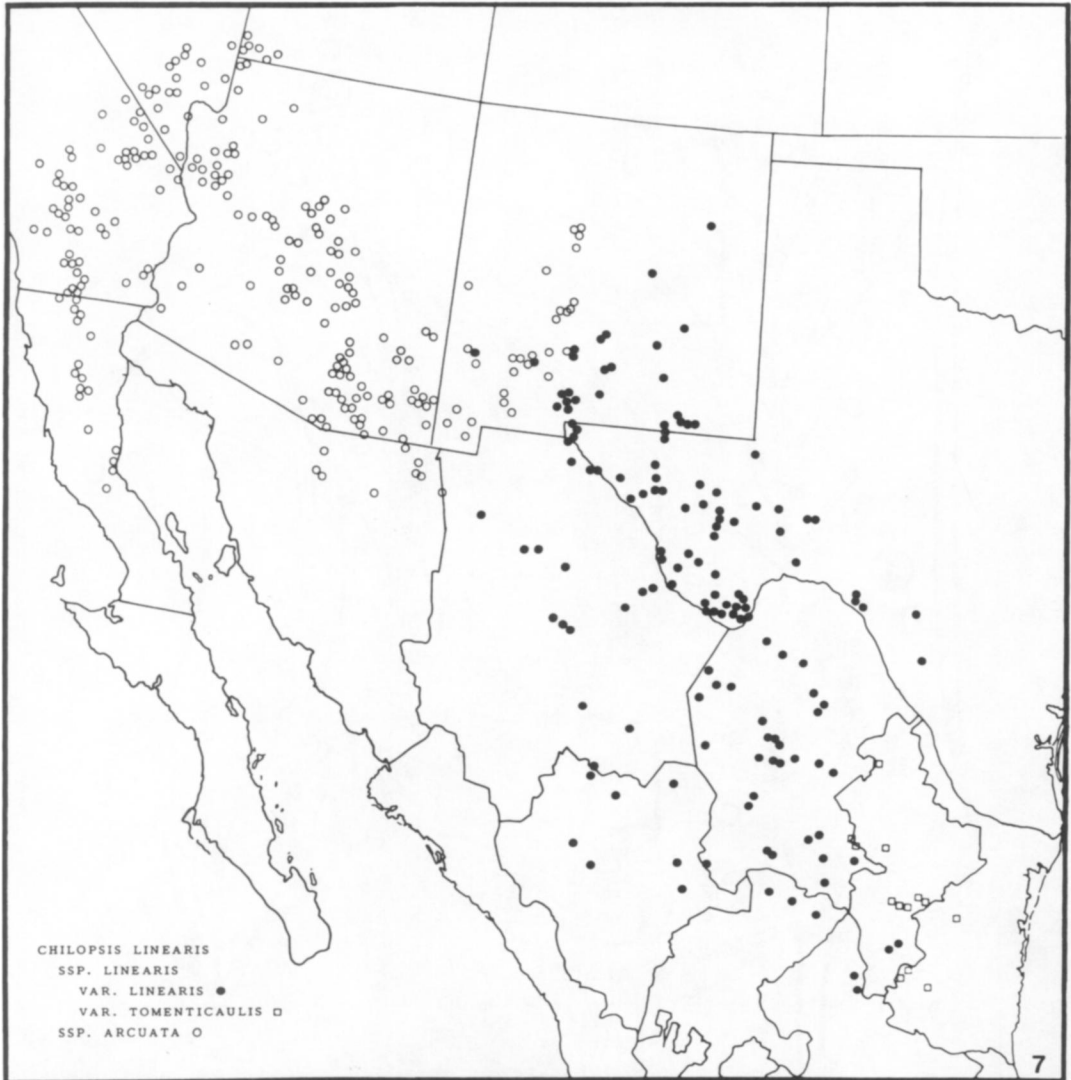


FIG. 7. Distribution of *Chilopsis*. (From Henrickson, 1985.)

1. *Cybistax antispyhilitica* (Martius) Martius, Syst. mat. med. bras. 66. 1843; De Candolle, Prodr. 9: 199. 1845. Fig. 8.

Bignonia antispyhilitica Martius in Spix & Martius, Reise Braz. 1: 283. 1823. Type. Brazil. Rio de Janeiro, prope Sebastianópolis, Martius 232 (M).

Bignonia viridiflora Loddiges, Bot. Cab. 11: pl. 1026. 1825, nom. nud.

Bignonia quinquefolia Vellozo, Fl. flumin. 252. 1829. Type illustration: Fl. flumin., Icones, 6: pl. 50. 1831.

Phryganocydia antispyhilitica Martius ex de Candolle, Prodr. 9: 199. 1845, nom. nud., pro syn.

Yangua tinctoria Spruce, J. Linn. Soc., Bot. 3: 198. 1859. Type. Peru. San Martín: Tarapoto. Spruce 4267 (holotype, K; isotype, NY).

Cybistax sprucei K. Schumann, Pflanzenfam. 4(3b): 240. 1894, nom. nud. Type. Peru. San Martín: Tarapoto. Spruce 4267.

Cybistax subtomentosa K. Schumann, Pflanzenfam. 4(3b): 240. 1894, nom. nud. Type. Brazil, collector not indicated.

Cybistax antispyhilitica var. *subtomentosa* Bureau & K. Schumann, Fl. bras. 8(2): 357. 1897. Type. Brazil. Minas Gerais: Prope Caldas, Regnell III-904 (not seen).

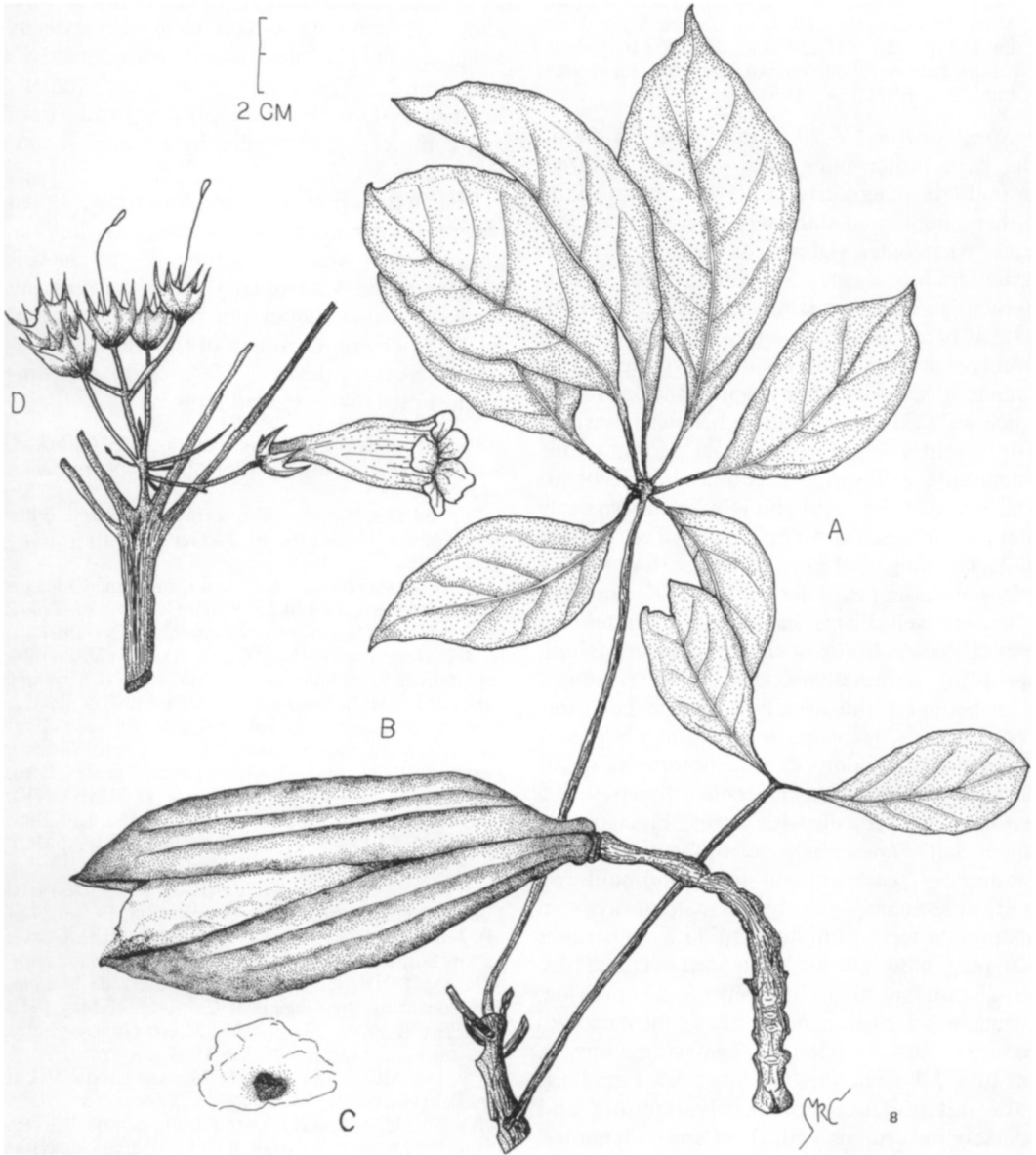


FIG. 8. *Cyblastax antisiphilitica*. A, twig with leaves; B, fruit; C, seed; D, flowering shoot. (A–C, Gentry 22842; D, Irwin et al. 30546.)

Cyblastax antisiphilitica var. *coriacea* Bureau & K. Schumann, Fl. bras. 8(2): 357. 1897. Type. Brazil. São Paulo: Prope Campinas, Mello 53 p.p. (not seen).

Cyblastax antisiphilitica var. *trochocalyx* Bureau & K. Schumann, Fl. bras. 8(2): 357. 1897. Syntype. Brazil. São Paulo, Mello 53 p.p.; Brazil. Santa Catarina: Prope Blumenau, W. Mueller s.n.; Brazil. Sin. loc., Sellow s.n.

Cyblastax coriacea Correa de Mello ex Stellfeld var. *barbatula* Correa de Mello, Arq. Mus. Paran. 9: 140. 1952. nom. illeg. (sine descr. Lat.). Type. Brazil. São Paulo, Mello 53 (not seen).

Cyblastax coriacea Correa de Mello ex Stellfeld var. *septenfoliata* Correa de Mello ex Stellfeld, Arq. Mus. Paran. 9: 143. 1952, nom. illeg. (sine descr. Lat.). Type. Brazil. São Paulo, Mello 53bis (not seen).

Cybastax intermedia Correa de Mello ex Stellfeld, Arq. Mus. Paran. 9: 186. 1952, nom. illeg. (sine descr. Lat.). Type. Brazil. São Paulo, Mello 61 (not seen). *Cybastax quinquefolia* (Vellozo) Macbride, Field Mus. Publ. Bot. 13(5C): 90. 1961.

Shrub or *tree* 1.5–20 m tall, to 20 cm diam., the bark rather thick and vertically fissured; branchlets irregularly subtetragonal, usually rather smooth and shiny when young, thick and corky when older, glabrous or very sparsely scattered-lepidote. *Leaves* 5–7-foliolate, the leaflets obovate to elliptic, acuminate, cuneate to attenuate at base, 3–21 cm long, 1–9 cm wide, entire (rarely coarsely serrate when very young), membranaceous, drying dark green or blackish, conspicuously glandular-lepidote below, above usually slightly lepidote at least along veins, puberulous with simple trichomes in axils of lateral nerves below and sometimes also sparsely along main veins and rarely on surface; petioles 4–26 cm long, glabrous or with a few minute trichomes, the petiolules ca. 0.5–2(–4) cm long, often not well differentiated from the attenuate leaflet base. *Inflorescence* a few-branched, spreading, terminal panicle with pedicels longer than peduncle and usually a straight but short central rachis, inconspicuously minutely puberulous and/or lepidote, each dichotomy subtended by membranaceous lanceolate bracts to 0.5 cm long, the pedicels with similar bracteoles in upper half. *Flowers* light green, the calyx membranaceous, campanulate to infundibuliform, more or less conspicuously 5-dentate, always with acuminate teeth, minutely lepidote, sometimes also puberulous, the teeth extended as lateral ribs, 11–29 mm long (including teeth), 8–25 mm wide; corolla tubular-campanulate above the narrowed base of tube, 4–7 cm long, 1–2 cm wide at mouth, the tube 3.5–6 cm long, the lobes 0.5–1 cm long, tube outside inconspicuously lepidote and sparsely puberulous with short erect trichomes, the lobes more densely puberulous and lepidote-glandular, the margins strongly ciliate, the tube inside almost completely glabrous except for a few short gland-tipped trichomes at stamen insertion, sometimes inconspicuously short-puberulous in flower; anther thecae divaricate, often slightly unequal, 2–3 mm long; ovary ovoid-oblong, somewhat compressed, often longitudinally costate, 3–4 mm long, 2 mm wide, minutely lepidote-glandular; disk annular-pulvinate, 1 mm long, 2.5–3 mm wide. *Fruit* an oblong capsule,

somewhat flattened, acute to acuminate at each end, 13–25 cm long, 4–6 cm wide, very strongly longitudinally 12-ribbed, minutely lepidote; *seeds* very thin, 2.3–3.5 cm long, 3.5–4.5 cm wide, the heart-shaped seed body sharply demarcated from and completely surrounded by a hyaline-membranaceous wing.

Distribution (Fig. 9). Extra-Amazonian Brazil (except the far northeast) to Paraguay, Bolivia, northernmost Argentina (probably) and the driest parts of the Amazonian slope of the Peruvian Andes; a disjunct population recently discovered in the Sipalwini Savannah of southernmost Surinam. Near sea level to 1800(–2400) m, commonest in scrubby second growth.

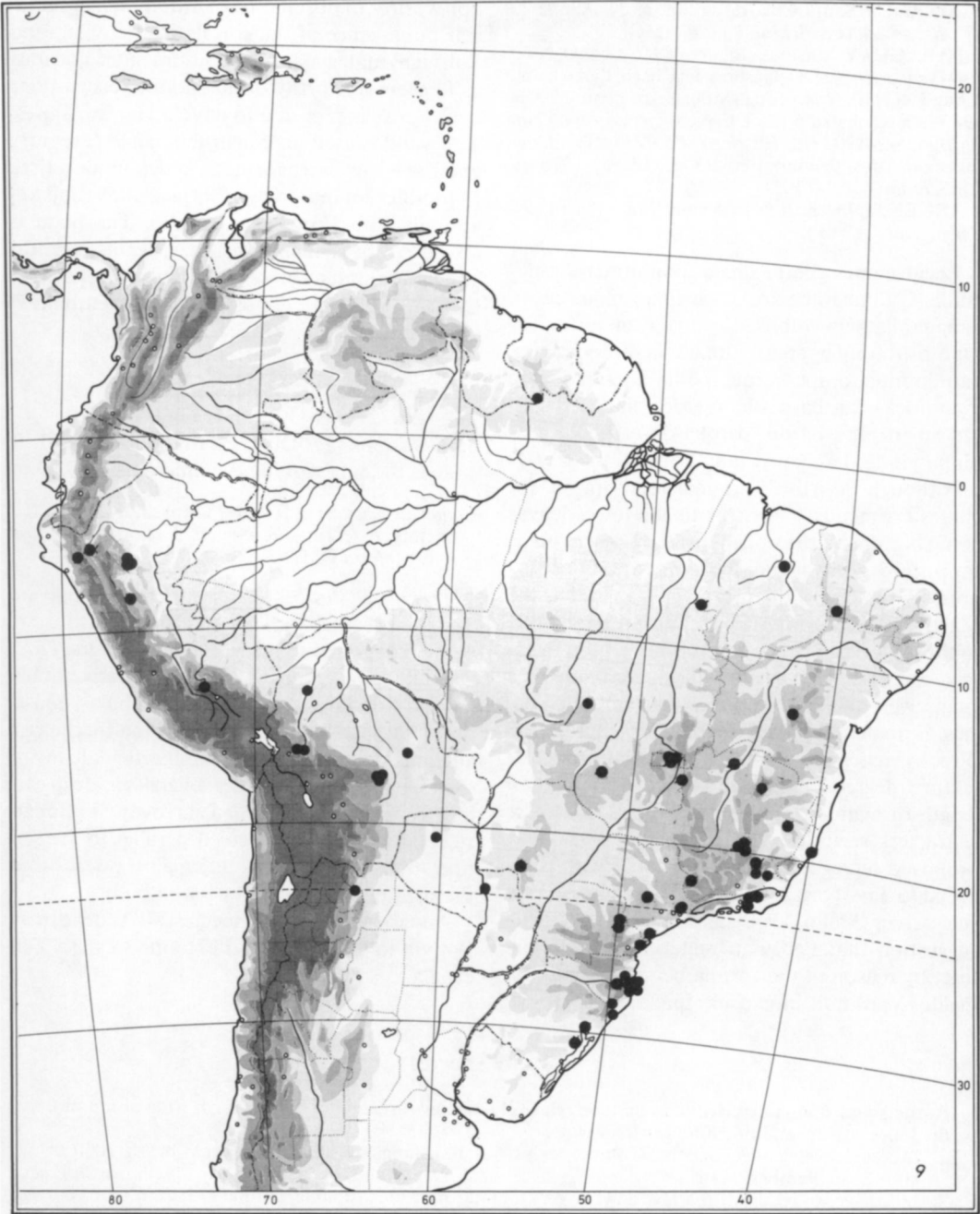
Representative specimens examined. SURINAM. Sipalwini Savana, 13 Nov 1968 (fl), *Oldenburger et al.* 544 (MO, NY).

ECUADOR. ZAMORA-CHINCHIPE: Isimanchi, 6 km N of Zumba, 1000–1100 m, 14 Oct 1988 (fl), *Harling & Madsen* 25217 (MO).

PERU. AMAZONAS: 14–15 km E of Bagua Chica on road to La Peca, 12 Jun 1978 (fr), *Gentry et al.* 22842 (MO, USM). CAJAMARCA: Colasay, 16 Oct 1961 (fl, fr), *Woytkowski* 6934 (K, MO). CUZCO: Rio Urubamba across from Quillabamba, 18 Apr 1977 (fr), *Gentry et al.* 19453 (MO). LORETO: Requena, Fundo Palencia, N of Fundo Canama, 19 Jul 1961 (st), *Mathias & Taylor* 5617 (MO). SAN MARTÍN: Lamas, 1 Sep 1974 (st), *Ferreira* 18441 (MO, USM); Mariscal Cáceres, Dpto. Tochache Nuevo, Sep 1970, *Schunke* 4450 (MO, NY).

BRAZIL. BAHIA: Santa Cruz de Cabralia, Res. Biol. Pau-brasil, 11 Dec 1971 (fl), *Eupunino* 88 (IPA, MO). CEARÁ: Chapada do Araripe, S of Flor. Nat., 13 Feb 1985 (fr), *Gentry et al.* 50048 (EAC, MO). DISTRITO FEDERAL: Cia Fercal, 30 km E of Brasília, 19 Sep 1964 (fl), *Prance & Silva* 59064 (M, MO, NY, UB). GOIÁS: 35 km E of Cristalina, 6 Apr 1973 (fr), *Anderson et al.* 8296 (MO, NY, UB). MARANHÃO: Serra da Malícia, Rio Tocantins, duas leguas de Carolina, 27 May 1950 (fr), *Pires & Black* 2344 (IAN). MATO GROSSO: Serra do Roncador, Garapu, 30 Sep 1964 (fl), *Prance et al.* 59196 (M, MO, NY, UB, UM). MINAS GERAIS: 40 km E of Belo Horizonte, 16 Jan 1971 (fl), *Irwin et al.* 30546 (MO, NY, UB). PARÁ: Monte Alegre, campo, 12 Dec 1908 (fr), *Ducke s.n.* (MG9902) (MG). PARANÁ: Sapi-tanduva, Mun. Morretes, 10 km NE of Morretes, 24 Jan 1985 (fr), *Gentry & Zardini* 49796A (MO). Serra Negra, Mun. Guaraquecaba, 17 Sep 1980 (fl), *Hatschbach* 43187 (MBM, SPF, UEC). RIO GRANDE DO SUL: Morro St. Ana, P. Alegre, 2 Nov 1949 (fl), *Rambo* 44172 (B). RIO DE JANEIRO: Teresópolis, Parque Nac. da Serra dos Órgãos, 31 Jan 1978 (st), *Peixoto & Gentry* 939 (MO, RB). SANTA CATARINA: Salto do Pilão, Lon-tras, 19 Oct 1958 (fl), *Reitz & Klein* 7354 (B, NY, WIS). SÃO PAULO: Mun. Botucatu, 18 km N of Botucatu, Mar 1973 (fr), *Gottsberger* 68-8 (MO).

BOLIVIA. LA PAZ: Prov. Nor Yungas, 5 km below Coroico, 16 May 1985 (fl), *Solomon* 13727 (MO).



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FIG. 9. Distribution of *Cybistax antisiphilitica*.

SANTA CRUZ: Santa Cruz de la Sierra, 21 Apr 1977 (fr), *Krapovickas & Schinini 31607* (MO).

PARAGUAY. Sin. loc., *Hassler 7385b* (C, MO, NY). CHACO: Parque Nac. Defensores del Chaco, Cerro León, 8 Aug 1983 (st), *Hahn 1561* (MO); Cerro León, 16 Aug 1983 (st), Kochalka 6 (PY). CONCEPCIÓN: Prope Concepción, Sep 1902 (fl), *Hassler 7385* (MO, NY). CORDILLERA: Altos, Colonia Bernal Cue, 18 Jun 1973 (fl, fr), *Schinini 6753* (LP).

ARGENTINA. JUJUY: Ledesma, Jan 1906 (fl, fr), *Spegazzini s.n.* (LP).

Local names. Peru: orcco-huoranhuay, espeguilla (Quillabamba area); yangua, yangua caspi, llangua, llangua colorado, yangua tinctoria (Tarapoto-Marañón area). Brazil: fava-de-aranha, pau de mulato, ipe-verde, ipe-de-flor-verde, ipe mandioca, caroba-de-flor-verde, cinco chagas, ipe-mirim, ipe pardo, caroba-do-campo, carobinha verde. Paraguay: taiiy hoby.

Although Martius' original description includes erroneous references to the lower leaves being bipinnate (the upper correctly described as quinately-digitate) and fruit linear and compressed, the rest of the protologue, as well as the Martius collection at Munich, is clearly referable to this species. Several attempts have been made to recognize segregates of what I treat here as a single well-defined but somewhat variable species. Bureau and K. Schumann (1897) proposed three varieties distinguished by variation in leaf texture, degree of leaf pubescence, and size and length of acumen of the calyx lobes, but these characters seem to vary independently. Other proposed segregations include *C. coriacea*, supposed to have coriaceous rather than woody capsule valves (Mello, 1952), and Macbride's (1961) suggestion that Peruvian material may be distinct by reason of the corolla being tomentulose inside. Variation in capsule thickness is clearly

not worthy of specific recognition and the interior pubescence of the corolla in Peruvian (and Bolivian) material is so sparse and inconspicuous as to seem unworthy of taxonomic recognition.

Cybastax is reported to have a variety of uses. The wood is used for construction and carpentry and the leaves were formerly much used in Peru to produce an indigo dye (Spruce, 1859) and kill animals (sub *Woytkowski 6934*). The plant is also used medicinally, in Brazil against syphilis and against retention of urine and hydropsy (Pio Correa, 1926), in Peru as a cure for "temblores" (sub *Gentry et al. 19453*).

DELOSTOMA

8. *Delostoma* D. Don, Edinburgh Philos. J. 9: 263. 1823. Lectotype. *D. integrifolium* D. Don.

Codazzia Karsten & Triana, Linnaea 28: 426. 1856. Lectotype. *C. rosea* Karsten & Triana = *Delostoma integrifolium* D. Don.

Trees or shrubs. Leaves simple, opposite, 3-veined from base. *Inflorescence* racemose or paniculate, often reduced to a few flowers. *Flowers* with the calyx thick, cupular, usually double; corolla tubular-campanulate or tubular, red or magenta; stamens didynamous, the thecae parallel, pendent, the pollen camporeticulate; ovary ovoid, bilocular, the ovules several-seriate in each locule; disk cupular. *Fruit* a narrowly elliptic capsule, somewhat compressed parallel to the septum, the valves usually unequal, the seeds thin, the hyaline wing encircling seed body.

Apparently only four species, all Andean, from Bolivia to Colombia and extreme western Venezuela.

Key to Species

1. Anthers and stigma exerted; corolla tube relatively narrow (usually less than 1.3 cm wide at mouth), the lobes narrow and much longer than wide.
 2. Inflorescence slender, openly racemose; calyx 6–7 mm long, simple; corolla pink; below 1000 m altitude in Tumbes, Peru. 2. *D. gracile*.
 2. Inflorescence reduced to a few flowers; calyx 11–20 mm long, double; corolla red; Andes of Peru and southernmost Ecuador above 1500 m altitude. 4. *D. lobbii*.
1. Anthers and stigma included; corolla tube wider (usually more than 1.3 cm wide at mouth), the lobes as wide as long.
 3. Calyx glabrate, the outer teeth conspicuous and often borne near middle of calyx cup; leaves finely and evenly serrate, less than 8(–10) cm long; western slope of the central Peruvian Andes. 1. *D. dentatum*.
 3. Calyx puberulous to glabrate, the outer teeth conspicuous or not, usually borne near apex of calyx cup; leaves usually entire (finely serrate only when leaves >8 cm long and/or calyx distinctly puberulous); Venezuela to Bolivia. 3. *D. integrifolium*.

1. *Delostoma dentatum* D. Don, Edinburgh Philos. J. 18: 263. 1823. Type. Peru. Pavon 766 (G, F neg. 26208 (excluding fruit)).

Bignonia rosea Pavon ex A. P. de Candolle, Prodr. 9: 174. 1845, nom. nud., pro syn.

Codazzia dentata (D. Don) Karsten, Fl. Columb. 2: 37, t. 119. 1862.

Shrub or small *tree*, mostly 1.5–2 m tall, branchlets terete to subangulate, glabrous. *Leaves* elliptic, obtuse at base and apex, more or less 3-veined at base, 2–8(–10) cm long, 1–4(–6) cm wide, chartaceous, the margin usually conspicuously serrate (occasionally barely serrulate, especially when immature), glabrous above, glabrous or with scattered lax trichomes below, with glands in axils of basal lateral nerves below, petiole 0.2–2 cm long, glabrous or somewhat puberulous. *Inflorescence* a few-flowered terminal raceme, usually reduced to one or two flowers, glabrous or glabrate, with linear bracts ca. 3 mm long. *Flowers* with the calyx campanulate, 10–15 mm long, 9–12 mm wide, in bud with a broadly and obtusely conical tip and five triangular lateral teeth, at anthesis irregularly 2–3-lobed with triangular submarginal teeth ca. $\frac{1}{3}$ of way from apex to base, glabrous; corolla magenta, narrowly tubular-campanulate, more or less straight, 5–7.5 cm long, 1.2–1.8 cm wide at mouth of tube, the tube 4–6 cm long, the lobes 1–2 cm long, puberulous outside, glandular-lepidote on lobes, glabrous inside except at level of stamen insertion; stamens didynamous, not exerted, the thecae subparallel, pendent, 4–5 mm long; pistil 3.5–4 cm long, the style pilose, the ovary ovoid, 3–4 mm long, 2–2.5 mm wide, minutely glandular-lepidote, the ovules several-seriate in each locule; disk cupular, 2 mm long, 3–4 mm wide. *Fruit* a capsule, 7.5–10 cm long, 2–2.5 cm wide, the two valves very unequal, somewhat lepidote, otherwise glabrous; *seeds* thin, winged, 1.3–1.7 cm long, 3.5–4 cm wide, the wing encircling three sides of seed body, hyaline-membranaceous, sharply demarcated from brown seed body.

Distribution (Fig. 11). Remnant forest patches of the upper parts of Pacific-slope Andean valleys of central Peru; 2200–3000 m elevation.

Representative specimens examined. PERU. ANCASH: Huaráz Prov., 5 km above Cochabamba, 8 Jun 1985 (fl, fr), *D. Smith & Buddensiek 10956* (MO). AYACUCHO: Coracora, Parinacochas, 19 May 1911 (fl), *Weberbauer 5792* (B, NY, US). LIMA: 39 km NE of Chosica, road to Huanzu, 6 May 1978 (fl, fr), *Gentry 21687* (MO,

USM); Huarochirí, Pariagancha, Río Chira, Santa Eulalia Valley, 7 Nov 1964 (fl, fr), *Hutchison & Saravia 7104* (F, K, M, MO, NY); Matucana, *Raymondi 12357* (USM).

Common names. Carahuayta, cara.

Not very well differentiated from *D. integrifolium*, perhaps not adequately so for specific recognition. The Ancash specimens have merely serrulate leaves and are intermediate with *D. integrifolium*. Nevertheless, the general correlation of small serrate leaves and more or less glabrate calyces with well-defined lateral teeth with a distinct geographic range supports taxonomic recognition. This is supported by the tendency of *D. dentatum* flowers to be somewhat more narrowly tubular and straighter than those of *D. integrifolium*; perhaps *D. dentatum* represents the first steps toward evolution of hummingbird-pollination from bee-pollinated *D. integrifolium*. While some collections of *D. integrifolium* do have serrate leaves, and others have leaves as uniformly small as *D. dentatum*, the combination of small leaves with strongly serrate margins seems restricted to the west-facing slopes of central Peru, except for one Ecuadorian collection (*Camp E-647* from Loja, 7500 ft), here assigned to *D. integrifolium* essentially on geographic grounds.

2. *Delostoma gracile* A. Gentry, Phytologia 35: 184. 1977. Type. Peru. Tumbes, *Weberbauer 7683* (holotype, F, fragm. MO). Fig. 10.

Shrub or small *tree* 6 m tall, branchlets subterete to somewhat angulate, puberulous. *Leaves* simple, obovate, apiculate, rounded at base, 3–9.5 cm long, 1.5–5.5 cm wide, the margin subentire or serrate towards apex, somewhat 3-veined from base, more or less glabrate above and below, membranaceous to chartaceous, sparsely puberulous along main veins below, with plate-shaped glands in axils of basal lateral nerves below, petiole 0.5–3 cm long, puberulous. *Inflorescence* an open few-flowered terminal raceme, slightly puberulous, pedicel pairs separated by about 2 cm, the pedicels ca. 1 cm long. *Flowers* with the calyx cupular, simple, evenly 5-dentate, 6–7 mm long, 6 mm wide, sparsely puberulous with scattered trichomes; corolla pink, very narrowly tubular-campanulate, 6 cm long, 0.9 cm wide at mouth of tube, the tube 4.5 cm long, the lobes long and narrow, 1–1.3 cm long, 5–6 mm wide, sparsely and minutely puberulous outside,

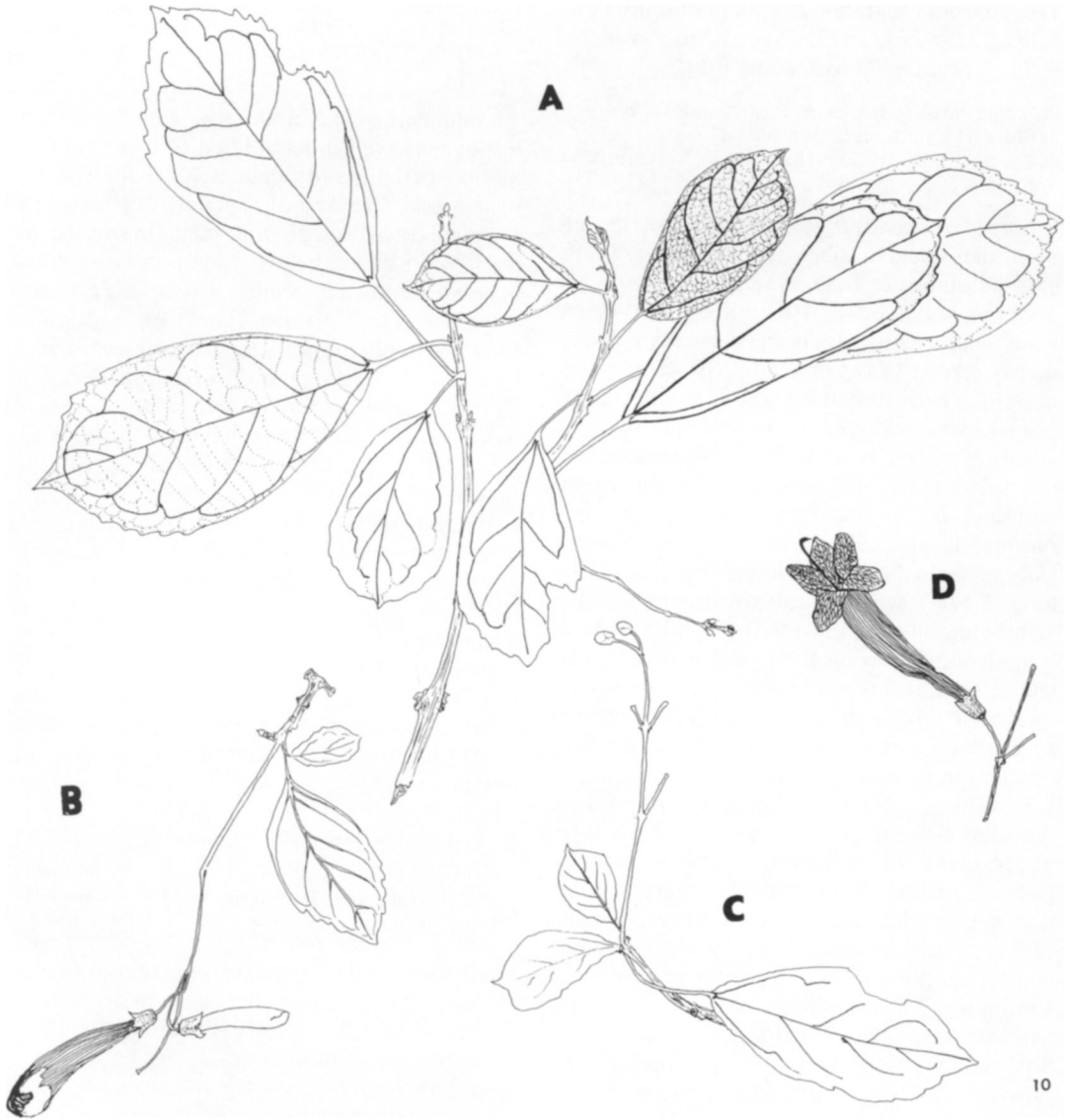


FIG. 10. *Delostoma gracile*. A, leafy twig; B, inflorescence with mature buds; C, inflorescence with young buds; D, flower with anthers broken off (all $\times 0.3$). (From *Phytologia* 35; *Weberbauer* 7683.)

the lobes inside glabrous but glandular-surfaced; stamens exserted, the anther thecae parallel, pendent, 3.5 mm long; pistil ca. 6 cm long, stigma long-exserted, style sparsely pilose, the ovary and disk not seen. *Fruit* unknown.

Distribution (Fig. 11). Known only from the type from scrubby deciduous forest in the Cerros del Amotape between 900 and 1000 m.

Specimen examined. PERU. TUMBES: Hacienda La Choza, 900–1000 m, *Weberbauer* 7683 (F).

A very distinctive species from an area of known high endemism; presumably also occurs across the border in Ecuador. This is the only *Delostoma* species to occur below 1500 m altitude.

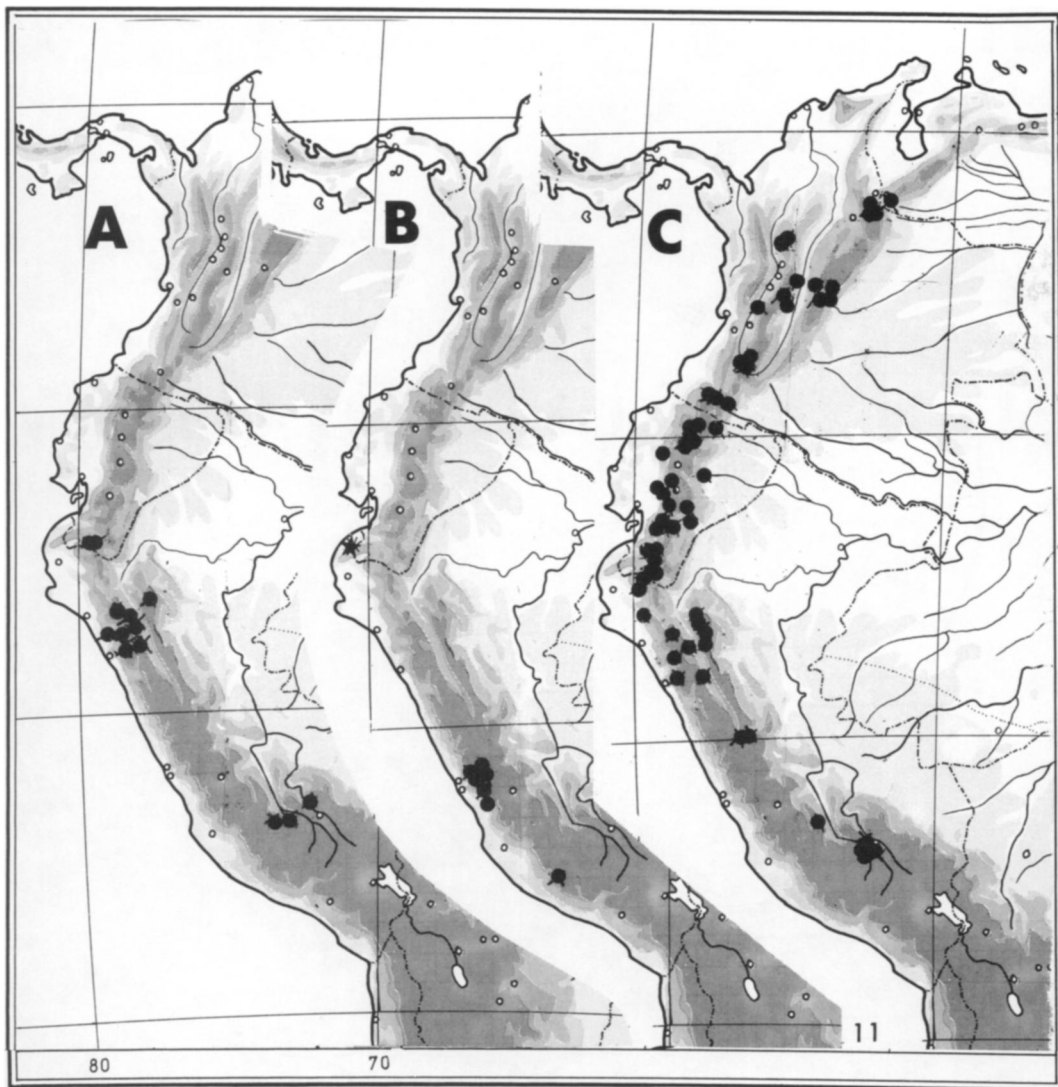


FIG. 11. Distribution of *Delostoma*. A, ● = *D. lobbii*; B, ● = *D. dentatum*; ★ = *D. gracile*; C, ● = *D. integrifolium*.

3. *Delostoma integrifolium* D. Don, Edinburgh Philos. J. 9: 264. 1823. Type. Peru. Huánuco, Pavon s.n. (not seen). Figs. 12, 13.

Tecoma loxensis Benthham, Pl. hartweg. 354. 1839. Type. Ecuador. Loja, Hartweg 826 (K).

Delostoma nervosum A. de Candolle, Prodr. 9: 198. 1845. Type. Peru. Huánuco, Dombey 390 (holotype, G-DC, F. neg. 7650).

Codazzia rosea Karsten & Triana, Linnaea 28: 427. 1856. Type. Colombia. Nariño, 2700 m, Triana s.n. (B*, not seen, F. neg. 18432).

Codazzia speciosa Karsten & Triana, Linnaea 28: 427. 1856. Type. Colombia. Tolima: Ibagué, Quindiu, 2600–3000 m, Triana s.n. (lectotype, NY; isotype, FI).

Delostoma roseum (Karsten & Triana) K. Schumann ex Jackson, Index kew., Suppl. 1: 576. 1893.

Delostoma speciosum (Karsten & Triana) K. Schumann ex Jackson, Index kew., Suppl. 1: 576. 1893.

Delostoma weberbauerianum Kränzlin, Bot. Jahrb. 54, Beibl. 119: 25. 1916. Type. Peru. Piura, Weberbauer 6386 (B*, lectotype, US).

Delostoma hookeri Kränzlin, Bot. Jahrb. 54; Beibl. 119: 25. 1916. Type illustration. Bot. Mag. t. 5754 (=Ec-



FIG. 12. *Delostoma integrifolium*. A, flowering shoot, $\times 0.5$; B, fruit, $\times 0.5$. (From *Flora de Venezuela*; A, Lopez-Palacios, 3732; B, Gentry 12138.)

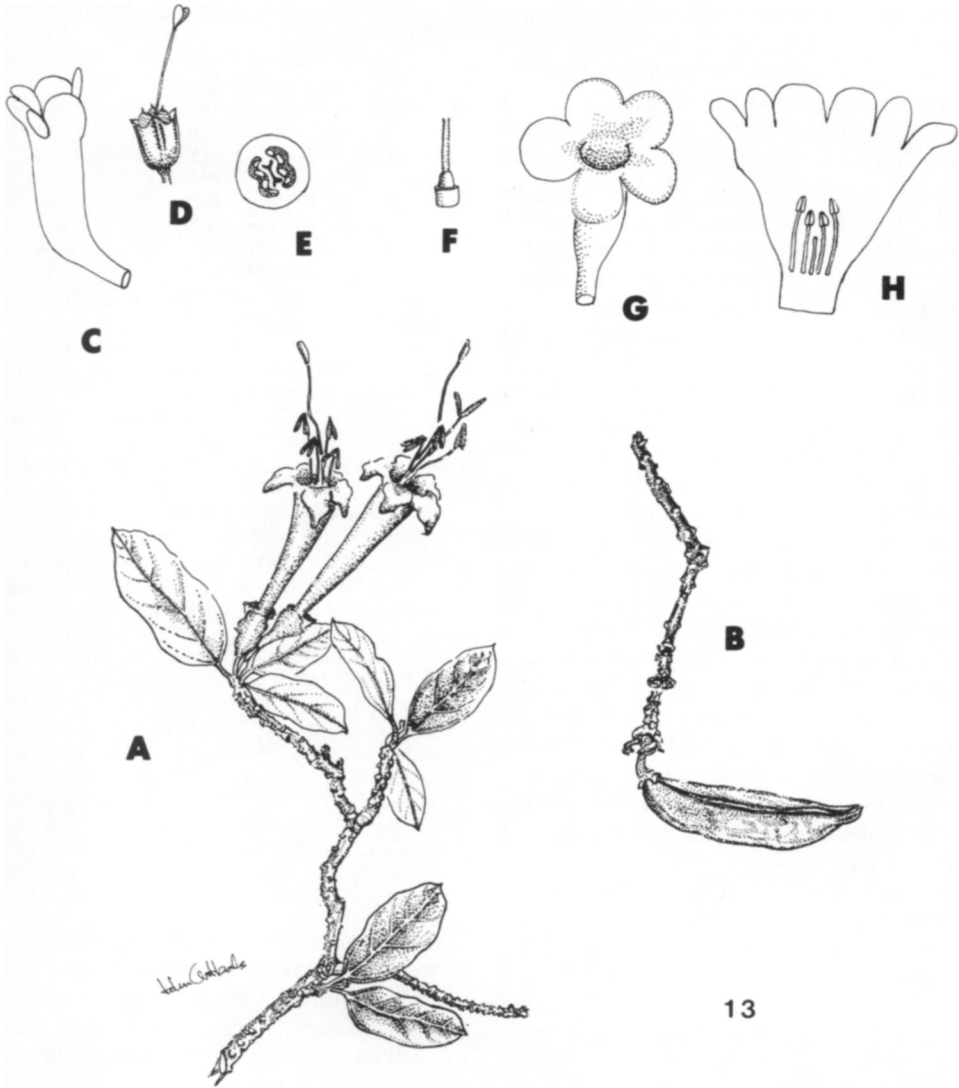


FIG. 13. *Delostoma*. A, B, *D. lobbii*. A, habit, $\times 0.5$ (Vargas 9608); B, fruit, $\times 0.5$ (Lopez & Sagastegui 8300). C-H, *D. integrifolium*. C, corolla from side, $\times 0.5$; D, calyx, $\times 0.5$; E, ovary cross section, $\times 5$; F, ovary, $\times 2.5$; G, corolla from below, $\times 0.5$; H, corolla split open, $\times 0.5$. (From *Flora of Ecuador*.)

cuador. Azuay, *Jameson s.n.* (K), specimen not seen by Kränzlin).
Delostoma loxense (Bentham) Sandwith, Lilloa 14: 136. 1948.

Shrub or *tree* to 25 m, branchlets terete to subangulate, glabrate to puberulose. *Leaves* elliptic or oblong-elliptic to obovate, obtuse to acute or very abruptly sub-acuminate, the base rounded to obtuse or truncate, 6–19 cm long, 3–12 cm

wide, chartaceous, the margin entire to serrate, 3-veined from base, sparsely pilose to glabrous above, densely to sparsely pilose with kinky trichomes below, with clusters of plate-shaped glands in axils of basal lateral nerves below, petiole 1.5–10 cm long, glabrate to pilose. *Inflorescence* a few-flowered terminal raceme or a narrow racemose panicle with the lower branches of the raceme 2–3-flowered, pilose with weak,

kinky trichomes or glabrescent, sometimes bracteate with linear bracts to 2 cm long. *Flowers* with the calyx campanulate, 9–16 mm long, 7–11 mm wide, in bud with a terminal apiculation and five triangular lateral teeth, at anthesis irregularly 2–3-lobed with triangular submarginal teeth a few mm below apex, these sometimes exceeding the terminal lobes and sometimes not evident, usually prolonged toward base of calyx as vertical ridges, lepidote and sparsely pubescent with long weak simple trichomes; corolla magenta to whitish, tubular-campanulate, curved slightly, 5–7 cm long, 1.4–2.4 cm wide at mouth of tube, the tube 3.5–5 cm long, the lobes 1–1.5 cm long, tube finely puberulous outside, becoming glandular-lepidote on lobes; glabrous inside except for longer simple trichomes at level of stamen insertion; stamens didynamous, the thecae subparallel, pendent, 3–4 mm long; pistil 4–5 cm long, the style sparsely minutely glandular-lepidote, the ovules several-seriate in each locule; disk cupular, 1.5–2 mm long, 3 mm wide. *Fruit* an elliptic to narrowly ovate-elliptic capsule, flattened parallel to the septum, one valve usually larger than other, 7–13 cm long, 2.5–3 cm wide, glabrous or slightly glandular-lepidote, drying blackish; *seeds* thin, winged, 1.3–2 cm long, 3.3–4 cm wide, the wing encircling seed body, hyaline-membranaceous, rather sharply demarcated from brown seed body.

Distribution (Fig. 11). Andean cloud forests and inter-Andean valleys from the Venezuela/Colombia border to southern Peru; 1500–3100 m elevation.

Representative specimens examined. **COLOMBIA.** ANTIOQUIA: Le Ceja, 14 Oct 1968 (fl), *Espinal T. et al.* 1493 (COL). CAUCA: Popayán, La Hermita, carretera al Puracé, *García-Barriga & Hawk* 12701 (COL); between Popayán and Puracé, 8 Aug 1951 (fl), *Pérez-Arbelaez & Cuatrecasas* 5882 (COL, NY). CUNDINAMARCA: Entre Chipaque y Caqueza, Puente Serviez, 14 Jun 1974 (fl), *García-Barriga & Jaramillo* 20532 (COL, F). HUILA: 25 km ESE of Bacaya, 1 Nov 1944 (fl), *Little* 8912 (NY). NARIÑO: Pasto-Buesaco, 16 Sep 1962 (fl), *Mora* 2360 (COL). PUTUMAYO: Valley de Sibundoy, alrededores de Sibundoy, 10 Dec 1942 (fl), *Schultes & Smith* 3085 (COL). QUINDÍO: Quindío Valley, 1918 (fl), *Dawe* 808 (NY); Finca Milán, Salento, Parque Nat. Los Nevados, 8 Nov 1984 (fr), *Barbosa et al.* 2673 (MO). SANTANDER: Vic. of Tona, 17 Feb 1927 (fr), *Killip & Smith* 19502 (NY). TOLIMA: La Colonia, E of Nevado del Huila, 5 Oct 1944 (fr), *Little* 8755 (NY). VALLE: Río Bugalagrande, Quebrada de la Palma, Apr 1946 (fl), *Cuatrecasas* 20936 (COL, MO).

VENEZUELA. TÁCHIRA: Between Tabor and Villa-

paez, Río Tachira, 12 Jul 1944 (fl), *Steyermark* 57154 (VEN).

ECUADOR. AZUAY: Valley of Río Paute, between Paute & Cuenca, Apr 1945 (fl), *Camp E-2340B* (F, MO, NY, US). BOLÍVAR: Carretera San Pablo de Ateñas-Chillanes, 31 Aug 1987 (fl), *Zak & Jaramillo* 2600 (MO, QCA). CAÑAR: El Tambo-Suscal, 30 Jul 1962 (fl), *Jativa & Epling* 270 (MO, NY, S, US). CARCHÍ: 5 km E of Santa Barbara, Tulcan-Alegría road, 5 Feb 1982 (fl), *Dodson & Gentry* 12110 (MO). CHIMBORAZO: Cañon of Río Chanchan, 5 km N of Huigra, May 1945 (fr), *Camp E-3255* (MICH, NY, S). EL ORO: N of Pascha, *Escobar* 763 (AAU). IMBABURA: Intag Valley, Apuela at Río Intag, 7 May 1980 (fl), *Holm-Nielsen & Jaramillo* 23430 (AAU, MO). LOJA: Vilcabamba-Yanhana, Apr 1974 (fl), *Harling & Andersson* 13604 (AAU, GB). NAPO: 3.3 km SE of Cuyujua, 28 Oct 1971, *MacBryde* 898 (MO, QCA). PICHINCHA: Tandayapa-Nono, W of Nono, 27 Jan 1977 (fl), *Harling et al.* 14873 (GB). TUNGURAHUA: Ambato, Dec 1944 (fl, fr), *Acosta-Solis* 9469 (F).

PERU. AMAZONAS: 41 km SW of Leimebamba, road to Balsas, 17 Jun 1978 (fl), *Gentry et al.* 23142 (MO, USM). AYACUCHO: 9 km below Jano on Tambo-Ayna road, 30 Jul 1978 (fr), *Berry* 3063 (MO). CAJAMARCA: Carretera entre Olmos y Jaén, paso de Porculla, 8 Oct 1986 (fl), *Díaz* 2076 (MO, USM); Cajamarca, 1 km NE of San Pablo, May 1964 (fl), *Hutchison & Wright* 5047 (F, NY, US). CUZCO: Km 90 on Cuzco-Machu Picchu railroad, 17 Apr 1977 (fl), *Gentry et al.* 19501 (MO, NY, USM). HUÁNUCO: Acomayo, near Pillao, Apr 1946 (fl), *Woytkowski* 34225 (MO). LA LIBERTAD: Huaranchal, Prov. Otuzco, 7 Jun 1958 (fl), *Sagástegui & Suarez* 2683 (TRUJ). Piura: Alrededores de Ayabaca, Prov. Ayabaca, 9 Sep 1976 (fl), *Sagástegui & Cabanillas* 8713 (MO, NY, TRUJ). SAN MARTÍN: Prov. Mariscal Cáceres, near Pajaten, Río Abiseo National Park, 22 Jul 1985 (fl), *Young* 1272 (MO).

Common names. Ecuador: campanillo, chicharron, yaloman; Peru: huarama, huaruma.

I have adopted a much broader circumscription of this species than previous authors. It is exceedingly variable, but I am unable to consistently separate the several additional taxa usually recognized. See the *Flora of Ecuador* (Gentry, 1977) for a more complete discussion.

4. *Delostoma lobbii* Seemann, Bonplandia 10: 72. 1862. Type. Peru. Amazonas, Chachata-pazas, *Lobb s.n.* (holotype, K; isotype, CGE). Fig. 13.

Delostoma vargasii Standley ex Vargas, Diez Anos Serv. Bot. Univ. Cuzco 47. 1946. Type: Peru. Apurímac, *Vargas* 1270 (not seen), nom. nud.

Shrub or small *tree* 2–6 m tall; branchlets terete to subangulate, puberulous. *Leaves* oblong-elliptic, obtuse to rounded at base and apex, 3-veined

at base, entire (rarely serrulate), 1.5–9.5 cm long, 0.6–5 cm wide, coriaceous, sparsely pilose above, conspicuously pilose below, the venation prominently reticulate below, petiole 0.3–1.5 cm long, pilose. *Inflorescence* usually reduced to one or two flowers, pilose to subglabrescent, ebracteate. *Flowers* with the calyx campanulate, 11–20 mm long, 10–17 mm wide, irregularly several-labiate, usually prominently 5-winged with the wings ending in lateral submarginal teeth a few mm below apex, sparsely pilose to glabrate; corolla red with light yellow throat, tubular, straight, 5.5–8(–9) cm long, 0.9–1.3(–1.8) cm wide at mouth of tube, the tube 4.5–7(–8) cm long, the lobes narrow, 1–1.5 cm long, very sparsely and inconspicuously puberulous outside, glabrous inside except at level of stamen insertion, the lobes minutely papillose and sparsely glandular-lepidote inside; stamens conspicuously exerted, the thecae divergent to subparallel, 5–6 mm long; pistil 7.5–9 cm long, the style sparsely pilose, the ovary narrowly conical, ca. 3 mm long and 1.5 mm wide at base, minutely papillose; disk cupular, 2 mm long, 3 mm wide. *Fruit* an elliptic capsule, flattened parallel to septum, the two valves very unequal, 4–6 cm long, 1.5–2.1 cm wide, lepidote and very slightly puberulous to glabrate; *seeds* thin, winged, 0.8–1.7 cm long, 1–3 cm wide, the wing encircling three sides of seed body, hyaline-membranaceous, sharply demarcated from brown seed body.

Distribution (Fig. 11). Dry inter-Andean valleys from southernmost Ecuador to southern Peru; 1550–3250 m.

Representative collections examined. ECUADOR. LOJA: Between El Tambo & La Toma, 3 Sep 1923 (fl), Hitchcock 21342 (NY); Manchi, 26 Nov 1910 (fl), Townsend A1 (US).

PERU. AMAZONAS: 25 km E of Balsas, 17 Jun 1978 (fl), Gentry et al. 23133 (MO, USM). **APURIMAC:** Abancay, Jesús y María, 3 km before Quebrada Honda, Nov 1938 (fl), Vargas C. 9608 (MO). **CAJAMARCA:** Contumaza, Nov 1974 (fl, fr), López & Sagástegui 8300 (MO, TRUJ, US). **Cuzco:** Anta, entre Río Blanco y Cunyac, Nov 1947 (fl), Vargas C. 6743 (MO). **LA LIBERTAD:** Huamachucho, Río Marañón, 17 km W of Aricapampa, 8 Aug 1964 (fl), Hutchison et al. 6201 (M, MICH, MO, NY). **LAMBAYEQUE:** Carretera entre Trujillo y Laredo-Otuzco, entre Simbal y Sinsicat, 26 Oct 1986 (fl), Díaz 2195 (MO, USM).

Common names. Montetunya, pichus.

Easily differentiated from the rest of the genus by the bright red, presumably hummingbird-pollinated flowers with exerted anthers.

DIGOMPHIA

9. *Digomphia* Benth, Hooker's London J. Bot. **5:** 364. 1846. Type. *D. laurifolia* Benth.

Jacaranda sect. *Nematopogon* A. P. de Candolle, Prodr. **9:** 232. 1845. Type. *J. densicoma* Martius ex A. P. de Candolle = *D. densicoma* (Martius ex A. de Candolle) Pilger.

Nematopogon (A. P. de Candolle) Bureau & K. Schumann, Fl. bras. **8(2):** 395. 1897.

Trees or shrubs. Leaves simple or imparipinnately compound. *Inflorescence* a few-flowered terminal panicle, frequently reduced to 1 or 2 flowers. *Flowers* with calyx large, membranaceous, spathaceous or split into 3–5 lanceolate or ovate lobes; corolla lavender or bluish purple, tubular-campanulate, mostly glabrous outside; anthers glabrous, bithecate, the pollen grains 3-colporate with a smooth exine, the staminode elongate, exceeding the stamens, bifurcate or 4–6-parted at apex, glandular pubescent in upper $\frac{2}{3}$; ovary compressed-elliptic, glabrous; disk pulvinate. *Fruit* a capsule, flattened perpendicular to the septum, dehiscing perpendicular to the septum and parallel to the plane of compression; *seeds* thin, winged.

A genus of three species of the Guayana shield region in southern Venezuela and adjacent parts of Brazil, Colombia and Guyana. It is paraphyletically derived from and very closely related to *Jacaranda*. The main differentiating characters are the much more deeply divided staminode apex and the large foliaceous calyx > 1.4 cm long and irregularly (sometimes spathaceously) split to base into 3–5 leaflike lobes. This is clearly a monophyletic assemblage with a number of other distinctive defining features including reduced leaflet number, large smooth, coriaceous leaflets (or leaves), reduced inflorescences, and very small thin-valved fruits, but all of these features also occur sporadically in *Jacaranda*.

Key to Species

1. Leaves simple.
 2. Staminode 4–6-parted at apex; leaves narrowly elliptic (more than 2.5 times as long as wide); below 200 m alt.; fruit apex truncate. 1. *D. ceratophora*.
 2. Staminode bifurcate at apex; leaves elliptic (almost always less than 2.5 times as long as wide); above 450 m alt.; fruit apex usually more or less acute. 3. *D. laurifolia*.
1. Leaves pinnately compound. 2. *D. densicoma*.



FIG. 14. *Digomphia*. A, B, *D. ceratophora*. A, habit, $\times 0.5$ (Maguire & Wurdack 34523); B, fruit, $\times 0.5$ (Maguire 36577). C, *D. laurifolia*, habit, $\times 0.5$ (Tillett & Tillett 43839). (From Mem. N.Y. Bot. Gard. 29.)

1. *Digomphia ceratophora* A. Gentry, Mem. N.Y. Bot. Gard. 29: 270. 1978. Type. Venezuela. Amazonas: Cerro Yapacana, 150 m, Maguire & Wurdack 34523 (holotype, NY; isotypes, P, VEN). Fig. 14.

Shrub 0.3–3 m tall, the branchlets puberulous or glabrescent, subterete, somewhat swollen be-

low the nodes, when young drying reddish-brown. *Leaves* simple, 3–12 cm long, 0.9–3.3 cm wide, narrowly elliptic to oblanceolate, rounded to acute at apex, cuneate at base, coriaceous, the margins occasionally involute, the secondary and tertiary veins inconspicuous, minutely scattered-lepidote, otherwise glabrous or with a few inconspicuous trichomes along the raised median

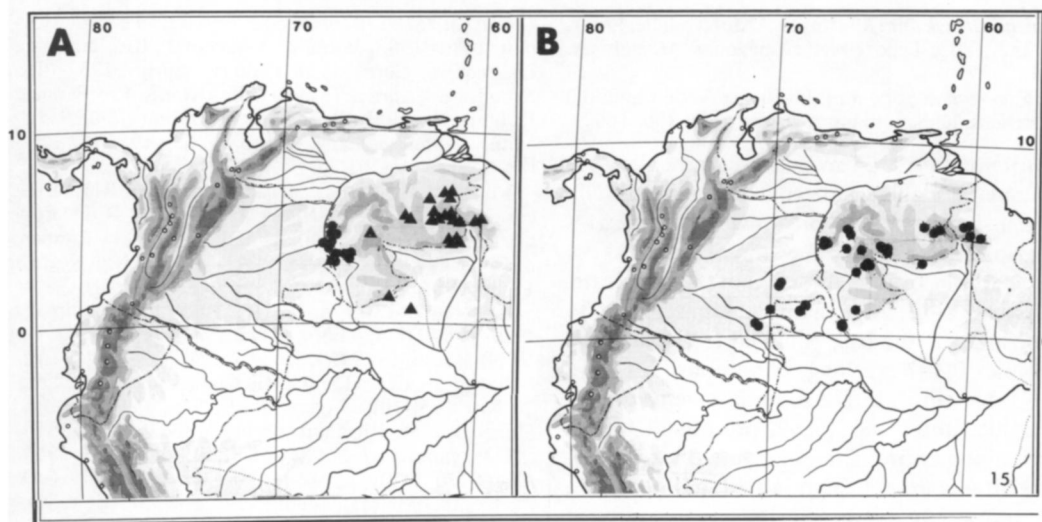


FIG. 15. Distribution of *Digomphia*. A, ● = *D. ceratophora*; ▲ = *D. laurifolia*; B, ● = *D. densicoma*.

nerve, drying olive above and below; petiole 0.3–1.5 cm long, subpuberulous or glabrate. *Inflorescence* a panicle or lateral raceme, short and few-flowered, frequently reduced to 1–2 flowers, ebracteate or with oblanceolate foliaceous bracts subtending the lower pedicels, inconspicuously puberulous. *Flowers* with the calyx membranaceous, spathaceously split almost to the base in 2–3 lanceolate or narrowly ovate segments, these acute to acuminate, glabrate or subpuberulous; corolla tubular-campanulate, 3.5–4.5 cm long, the tube 2.7–3.5 cm long, the lobes 0.5–1 cm long, glabrous outside and inside except at level of stamen insertion, the lobes sometimes ciliate; stamens didynamous, the thecae divaricate, 1–2 mm long, the staminode 4-furcate, bifurcate near apex with each of the primary bifurcations split to near base, the apical bifurcation occasionally also divided, 3–4 cm long to the first bifurcation, the ultimate bifurcations 2–7 mm long, glandular-pubescent with simple gland-tipped trichomes except at base; pistil 2.5–3 cm long, the ovary compressed-elliptic, 2 mm long, 2.5 mm wide, glabrous; disk pulvinate, 0.5 mm long, 2 mm wide. *Fruit* a flattened-oblong capsule, the apex more or less truncate, sometimes minutely apiculate, the base rounded to acute, the margins not undulate, 1.8–3.2 cm long, 1.3–2.3 cm wide, glabrous, drying gray; *seeds* small, flat, round, 5–6 mm in diameter, the brown seed body rela-

tively thick, completely surrounded by a narrow hyaline-membranaceous wing.

Distribution (Fig. 15). White sand savannas of Amazonas Territory, Venezuela and adjacent Colombia; 100–200 m alt.

Collections examined. COLOMBIA. Vaupés: Savanna at Cacagual, Río Atabapo, 125 m, 13 Sep 1957 (fl), *Maguire et al.* 41430 (K, NY).

VENEZUELA. AMAZONAS: Cucurital de Yaga, 8 May 1979 (fr), *Davidse et al.* 17355 (VEN); Cerro Yapacana, Atabapo, 3 Jun 1978 (fr), *Huber* 2019 (MO); Río Ventuari, frente Canaripo, 22 Aug 1978 (fl, fr), *Huber* 2435 (MO); Río Guayapo, Serranía de Sipapo, 23 Aug 1978 (st), *Huber* 2499 (MO); Casiquiare, 5 km W de Río Temi, 24 Feb 1979 (fr), *Huber* 3422 (MO); Atures, 10 km S del Río Autana, 15 km SW del Cerro Autana, 2 Jul 1979 (fr), *Huber* 4092 (MO); Atabapo, medio Caño Caname, 1 Mar 1980 (fl), *Huber* 4920 (MO); Casiquiare, 2–3 km SE del Guasacavi, 10 Mar 1980 (fl), *Huber* 5126 (MO); 20 km NW de Yavita, Caño Pimichin, 11 Feb 1981 (fl), *Huber & Medina* 5952 (VEN); Atabapo, Cerro Cucurito, 8 Dec 1978 (fl), *Huber & Tillett* 2951 (MO); Atures, 4 km W de Serranía del Cuao, 14 Jul 1980 (fr), *Huber & Tillett* 5301 (MO); Savanna No. 3, Cerro Yapacana, 125 m, 1 Jan 1951 (fl), *Maguire et al.* 30536 (NY), 17 Mar 1953 (fl), *Maguire & Wurdack* 34523 (NY, US, VEN), 125 m, 20 Nov 1953 (fl, fr), *Maguire et al.* 36577 (F, NY, US), 16 Sep 1957 (fl), *Maguire et al.* 41515 (NY), 3°45'N, 66°45'W, 7 May 1970, *Steyermark & Bunting* 103246 (NY, VEN).

2. *Digomphia densicoma* (Martius ex A. de Candolle) Pilger, Feddes Repert. 8: 151. 1910.

Jacaranda densicoma Martius ex A. de Candolle, Prodr. 9: 232. 1845. Type. Brazil. Amazonas, Martius s.n. (M).

Nematopogon densicoma (Martius ex A. de Candolle) Bureau & K. Schumann, Fl. bras. 8(2): 396. 1897.

Shrub or *tree* 2–25 m tall, the branchlets puberulous or glabrescent, subtetragonal, usually thickish, brown or gray-brown when dry. *Leaves* imparipinnately compound, the rachis 9–30 cm long, glabrous or puberulous, unwinged, sulcate, the leaflets 7–13, 2–7 cm apart, elliptic, acute to retuse at apex, the base rounded to cuneate, the petiolules 0.4–2 cm long, coriaceous, 2–14 cm long, 1.5–6 cm wide, the secondary veins 6–9 on each side, impressed above, prominent below, the margins entire, sometimes revolute, generally glabrous except for minute lepidote scales, sometimes puberulous near the base of midvein above and on the petiolules, drying olive-gray above, yellowish below. *Inflorescence* a few-flowered terminal panicle, frequently reduced to 1–2 flowers subtended by a pair of foliaceous oblanceolate bracts at each node, the branches puberulous or glabrous. *Flowers* with the calyx membranaceous, spathaceous or frequently split to near base into 3–5 lanceolate or ovate lobes 1.4–2.5 cm long, glabrescent or puberulous with glandular or simple trichomes; corolla tubular-campanulate, 3.6–3.8 cm long, the tube 2.9–3.1 cm long, 1.2–1.4 cm wide at mouth of tube, the lobes 0.6–0.8 cm long, generally glabrous, the lobes usually ciliate-margined, glandular pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 2 mm long, the staminode bifurcate at apex, sometimes each branch bifurcate near base, 3.2–4.6 cm long to the bifurcation, each branch 6–7 mm long, glandular pubescent with simple gland-tipped trichomes in upper $\frac{2}{3}$; pistil 2.3–2.5 cm long, the ovary flattened-elliptic, 2–3 mm long, 2 mm wide, glabrous; disk pulvinate, 1 mm long, 1.5 mm wide. *Fruit* an elliptic-oblong capsule, acute at base and apex, 3.6–6.5 cm long, 1.7–2.7 cm wide, brown when dry, frequently with paler flecks; *seeds* bialate, 5–7 mm long, 1.1–1.5 cm wide, the hyaline-membranaceous wing clearly differentiated from the seed body.

Distribution (Fig. 15). Guayana highland region of northern Amazonian Brazil and southern Venezuela and Colombia.

Representative collections examined. COLOMBIA. AMAZONAS: Cerro do Cupaty, 24 Nov 1912 (fl, fr),

Ducke s.n. (MG12276) (MG); Cerro de la Pedrera, Cupati, 1 Aug 1983, *Barbosa 1948* (FMB); Río Caqueta, La Pedrera, Cerro de la Pedrera, 2 May 1952 (fl), *Schultes & Cabrera 16298* (US). VAUPÈS: Río Parana Pichune, Jun 1953 (fl), *Schultes & Cabrera 19965* (US); Mitú, savanna of Cano Timbo, 23 Sep 1976 (fl), *Zarucchi 2118* (MO).

VENEZUELA. AMAZONAS: Cerro Yavi, Río Parucito, 29 Oct 1986 (fl), *Huber 11871* (MO); Río Corocoro, 8 km NNW of Yutaje, 26 Feb 1987 (fr), *Liesner & Holst 21434* (MO); Cerro Aracamuni, Río Negro, 19 Oct 1987 (fl), *Liesner & Delascio 22177* (MO); Cerro Sipapo, 1600–1800 m, 12 Dec 1948 (fl), *Maguire & Politi 27640* (US, VEN), 12 Jan 1949 (fl), *28311* (NY, VEN), 25 Jan 1949 (fr), *28596* (NY), 26 Jan 1949 (fr), *28664* (NY); Cerro Duida, Río Cunucunuma, 1400 m, 20 Nov 1950 (fl), *Maguire et al. 29562* (VEN); Cerro Huachamacari, Río Cunucunuma, 1800 m, 6 Dec 1950 (fl), *Maguire et al. 30003* (IAN, VEN), 14 Dec 1950 (fl), *30240* (NY); Cerro Moriche, Río Ventuari, 1000 m, 15 Jan 1951 (fl), *Maguire et al. 39052* (NY, VEN); Cerro Huachamacari, Río Cunucunuma, 1900 m, 11 Dec 1950 (fl), *Maguire et al. 30140* (NY); Serranía Paru, Río Ventuari, 2000 m, 4 Feb 1951 (fr), *Cowan & Wurdack 31254* (NY); Serranía Yatuje, Río Manapiare, 2100 m, 17 Feb 1953 (fl), *Maguire & Maguire 35330* (VEN), 23 Feb 1953 (st), *35378* (NY). **BOLÍVAR:** Auyan-tepui, Río Churun, 1690 m, *Steiermark 93260*; Cerro Arepuchi, Río Caroni, 650 m, 5 Nov 1946 (fl, fr), *Cardona 1945*, 25 Sep 1947 (fl, fr), 2153 (US, VEN); alto Caroni, Jan 1949 (fr), *Cardona 2690* (VEN); Toronto-tepui, Chimanta, 1925 m, 3 Mar 1955 (fr), *Steiermark & Wurdack 1239* (VEN); Ptari-tepui, 1800 m, 4 Nov 1944 (st), *Steiermark 59823* (VEN); 1585–1600 m, *Steiermark 60011* (F); Macizo de Chimanta, 2 Jun 1953 (st), *Steiermark 75615* (F, US); Meseta de Jaua, Cerro Sarisarinama, 1320 m, 13 Feb 1974 (st), *Steiermark et al. 109032* (MO), *109254* (MO); Meseta de Jaua, Cerro Jaua, 1750–1800 m, 28 Jan 1974 (st), *Steiermark et al. 109512* (MO), *109653* (MO); Sarventepui, 1750 m, 16 Jan 1953 (fl), *Wurdack 34152* (NY); Cerro Guaiquinima, 1560 m, 26 Jan 1977 (st), *Steiermark & Dunsterville 113538A* (MO).

GUYANA. Kaieteur Plateau, 19 Mar 1962 (fl), *Cowan & Soderstrom 2238* (MICH, NY); Pakaraima Mts., Mt. Aymatoi, 16 Oct 1981 (fl), *Maas et al. 5788* (U); Imbaimadai Savannas, Upper Mazaruni River, Oct 1951 (fl, fr), *Maguire & Fanshawe 32306* (MO, NY); Cuyuni-Mazaruni Region, vic. Chinoweing Village, 21 Feb 1987 (fl), *Pipoly 10413* (NY).

BRAZIL. AMAZONAS: Barcelos, Plata de Serra Araça, 20 Feb 1984 (fr), *Coleta 1644* (MO); Río Iguana, região de Tunui, 28 Mar 1952 (fl), *Fróes 28082* (IAN, INPA); Río Negro, Taracuaia, 28 Feb 1959 (fl, fr), *J. Rodriguez 152* (IAN, RB).

Common name. Kirpau.

3. *Digomphia laurifolia* Bentham, Hooker's London J. Bot. 5: 364. 1846. Type. Guyana. Roraima, *Schomburgk 1049* (K). Fig. 14.

Nematopogon laurifolius (Benth) Bureau & K. Schumann, Fl. bras. **8**(2): 396. 1897.

Shrub or small *tree* 0.2–5 m tall, the branchlets puberulous or glabrescent, subterete, enlarged below the nodes, striate, drying grayish or brownish. *Leaves* simple, 1.9–7.8 cm long, 1.2–4.8 cm wide, oblong-elliptic to obovate, rounded or retuse at apex, rounded to cuneate at base, thick-coriaceous, the margins involute, the secondary and tertiary veins inconspicuous but intricately reticulate below, minutely sparsely lepidote or lepidote-punctate, otherwise glabrous or with a few trichomes along the prominent midvein, drying dark olive to brownish above, lighter olive below, appearing shiny above and opaque below, the petiole 0.2–1.1 cm long, puberulous or glabrescent. *Inflorescence* a terminal panicle, few-flowered, frequently reduced to a single flower, ebracteate or bracteate with a pair of oblanceolate bracts at each node, the branches puberulous with pointed trichomes. *Flowers* with the calyx membranaceous, spathaceous or split almost to the base into 3–5 lanceolate or narrowly ovate lobes, these acute or acuminate, glabrescent or with scattered glandular-lepidote trichomes, these usually stipitate; corolla tubular-campanulate, 4–6 cm long, the tube 3–5 cm long, 1–1.5 cm wide at mouth of tube, the lobes 1–1.5 cm long, glabrous outside, inside glabrous except for some simple trichomes at level of stamen insertion, the lobes sometimes ciliate; stamens didynamous, the thecae divaricate, 2–3 mm long, the staminode bifurcate, 3.5–5 cm long to the bifurcation, each branch 6–7 mm long, glandular pubescent with long simple and gland-tipped trichomes except the lower 0.5–2 cm; pistil 2.8–3 cm long, the ovary flattened-elliptic, 2–3 mm long, 1.5 mm wide, glabrous; disk pulvinate, 0.5 mm long, 2 mm wide. *Fruit* a flattened-elliptic capsule, acute at base and apex, the margins not undulate, 2.9–5 cm long, 1.8–2.9 cm wide, glabrous, when dry brown or blackish; *seeds* small, flat, 4–6 mm long, 6–7 mm wide, the brownish seed body relatively thick, more or less surrounded by the narrow, hyaline-membranaceous clearly delimited wing.

Distribution (Fig. 15). Guayana Highlands of Bolívar, Venezuela, and adjacent Guyana; also from Cerro Araça, Brazil; 500–2500 m alt.

Collections examined. VENEZUELA. AMAZONAS: Serranía del Paru, 3 Oct 1979 (fr), *Huber 4294* (VEN),

7 Oct 1979 (fl, fr), *Huber 4441* (MO). BOLÍVAR: Altiplanicie del Aprada-tepui, Uriman, 1400–1500 m, Aug 1953 (fl), *Bernardi 937* (NY), Altiplanicie de Yauante-pui, 1500 m, 21 May 1937 (fl), *Cardona 68* (VEN), entre Uaiparu y el Cerro Perai, Ikabaru, 700 m, Oct 1946 (fr, fl), *Cardona 1891* (VEN); Cerro Uaipan, Rio Caroni, 1700 m, 26 Nov 1946 (fl), *Cardona 2082* (VEN), Cerro Acopan, Rio Caroni, 2200 m, Oct 1947 (fl), *Cardona 2349* (VEN); Cerro Curutu, Rio Carun, alto Paragua, 850 m, Feb 1948 (fl), *Cardona 2483* (VEN); Cerro Auyan, 2100 m, Jan 1949 (fl), *Cardona 2665* (US, VEN); Cerro Manacauray, Gran Sabana, 1130 m, 24 Mar 1967 (fl), *Cardona 3027* (VEN); Gran Sabana, 24 km S of La Ciudadella, 4 Dec 1973 (fl, fr), *Davidse et al. 4767* (MO); Kavanayen, 1300 m, 22 Apr 1972 (fl), *Ferrari 1069* (MV); Auyan-tepui, 1900 m, Apr 1956 (fl), *Foldats 2604* (VEN); Chimanta, 26 Jan 1983 (fl), *Huber & Steyermark 6867* (MO); Uaipan-tepui, 1200 m, 1 Mar 1967 (fl), *Koyama & Agostini 7337* (MO, NY, VEN); Kavanayen, May 1946 (fl), *Lasser 1729* (VEN); El Pauji, 8 Nov 1985 (fl), *Liesner 19696* (MO); Ilu-tepui, Gran Sabana, 1200 m, 5 Feb 1952 (fl, fr), *Maguire 33167* (NY), 900–1000 m, 6 Mar 1952 (fl), *Maguire 33300* (VEN); 1200 m, 4 Apr 1952 (fl), *Maguire 33738* (NY); Kavanayen, 1300 m, 13 Dec 1952 (fl), *Maguire & Wurdack 33786* (NY); Ptari-tepui, 1500 m, 17 Dec 1952 (fl), *Maguire & Wurdack 33913* (NY); Macizo de Chimanta, 1940 m, 3 Feb 1955 (fl, fr), *Steyermark & Wurdack 373-A* (VEN); Rio Uarama debajo de Uarama-tepui, 1220 m, 24 Apr 1960 (fl), *Steyermark & Nilsson 571* (VEN); Macizo de Chimanta, Torono-tepui, 21 Feb 1955 (fl), *Steyermark & Wurdack 1023* (VEN); Gran Sabana, entre Kavanayen y Rio Karuai, *Steyermark 59327* (F); Ptari-tepui, 1600 m, 1 Nov 1944, *Steyermark 59692* (F); Carrao-tepui, 2470–2500 m, 7 Dec 1944 (fl), *Steyermark 60895* (F); Macizo de Chimanta, 2100 m, 20 Jun 1953 (fl), *Steyermark 75851* (F); Auyan-tepui, 2200 m, 1 May 1964 (fl), *Steyermark 93187* (VEN); 1800 m, 7 May 1964 (fl), *Steyermark 93487* (NY, P, US); Rio Aponguao, 145 km al S de El Dorado, Gran Sabana, 1350–1400 m, 22 Dec 1970 (fl), *Steyermark & Dunsterville 104236* (VEN); km 101 S de El Dorado, 1200–1400 m, 19 Feb 1972 (fl), *Steyermark et al. 105487* (VEN); Uari, Gran Sabana, 13 Mar 1946 (fl), *Tamayo 3112* (VEN); Auyan-tepui, 2200 m, Dec 1937 (fl), *Tate 1279* (NY).

GUYANA. Upper Mazaruni River, Karowitipi Mt., 21 Apr 1987 (st), *Boom & Gopaul 7601* (MO); Pakaraima Mts., Kako R., 13 Nov 1979 (fl), *Maas & Westra 4374* (MO); Mt. Aylmatoi, 16 Oct 1981 (fl), *Maas et al. 5766* (MO); Imbaimadai, upper Mazaruni River, 21 Oct 1951 (fr), *Maguire & Fanshawe 32154* (NY); Cuyuni-Mazaruni region, vic. Chinoweing Village, 21 Feb 1987 (fl), *Pipoly 10426* (NY).

BRAZIL. AMAZONAS: Barcelos, Plato da Serra Araça, 18 Feb 1984 (fl), *Amaral et al. 1625* (MO); Serra Araça, Feb 1975 (fr), *Pires s.n. (IPEAN 14989)* (MO), 11 Feb 1984 (fl), *Prance et al. 28969* (MO).

Differs from *D. ceratophora* in the broader leaves, once-bifid staminodium, and higher altitudinal distribution.

EKMANIANTHE

10. *Ekmanianthe* Urban, Feddes Rept. 20: 308. 1924. Type. Cuba. *E. longiflora* (Grisebach) Urban.

Trees to ca. 20 m tall, with thick ridged bark. *Inflorescence* terminal, racemose or narrowly paniculate. *Flowers* white or greenish cream, the calyx cupular, lepidote, early caducous, the corolla tubular-salverform or infundibuliform, the lobes poorly defined and deeply laciniate-margined, lacking a differentiated basal portion of tube below stamen insertion; stamens four or five, the anthers exerted or subexserted, pendulous, slightly twisted; ovary linear, the ovules in 2 series; disk thick, fleshy. *Fruit* a linear capsule, slightly curved, subterete, tapering to base and apex, prominently longitudinally costate, lepidote, the septum thin and flat; *seeds* thin, bialate, the wings hyaline-membranaceous.

Two species of Cuba and Hispaniola.

Key to Species

1. Corolla salverform, more than 15 cm long, pure white; leaflets with tertiary venation conspicuously raised below, usually acute to abruptly acuminate; stamens 4; fruit subwoody with conspicuous raised lenticels, very faintly prominulous-ribbed. 2. *E. longiflora*.
1. Corolla infundibuliform, less than 4 cm long, greenish-cream; leaflets with tertiary venation inconspicuous; very finely prominulous below, gradually very long acuminate; stamens 5; fruit coriaceous, without lenticels, with conspicuous longitudinal costae. 1. *E. actinophylla*.

Ekmanianthe is closely related to *Tabebuia* and has sometimes been included therein. The corolla adaptations associated with hawkmoth (*E. longiflora*) and bat (*E. actinophylla*) pollination are the most obvious differentiating features of *Ekmanianthe*, although a few *Tabebuia* species also have (though somewhat less accentuated) hawkmoth or bat-pollinated flowers. *Ekmanianthe* was originally differentiated by the caducous calyx, laciniate corolla margin, and soft wood (Urban, 1924), but several *Tabebuia* species have soft wood and the hawkmoth and bat-pollinated species have the corolla lobes somewhat laciniate, although less so than in *Ekmanianthe*.

This is an enigmatic and phylogenetically interesting genus. Despite their very different co-

rolla sizes and different stamen numbers, the two *Ekmanianthe* species are clearly closely related. The presence of five fertile stamens and perfectly actinomorphic flowers in *E. actinophylla* (which also lacks the normal bignoniaceous differentiation of the lower corolla tube below the stamen insertion), could be an argument for the premise that this is a primitive element in tribe Tecomeae. Interestingly, the situation is exactly parallel to that in the Asian tribe Oroxyleae, where bat-pollinated *Oroxylum*, often interpreted as primitive in the family (Gentry, 1980; Goldblatt & Gentry, 1979), has perfectly actinomorphic bat-pollinated flowers with five fertile stamens, while *Nyctocalos* has elongate hawk-moth-pollinated flowers and most species have only four fertile stamens.

1. *Ekmanianthe actinophylla* (Grisebach) Urban, Feddes Rept. 20: 309. 1924. Fig. 16.

Tecoma actinophylla Grisebach, Cat. pl. Cub. 194. 1866. Type. Cuba: Pinar del Rio. *Wright 3045* (holotype, GOET; isotypes, BM, MO).

Tabebuia actinophylla (Grisebach) Britton, Bull. Torrey Bot. Club 42: 377. 1915.

Tree to 10 m tall, the trunk bark with thick corky ridges broken to form a peculiar geometric pattern resembling caiman skin, the branchlets subterete to subtetragonal, when older sometimes corky-winged, drying dark with a few conspicuous whitish lenticels when young, glabrous or with lepidote trichomes, lacking pseudostipules or interpetiolar glands. *Leaves* (3-)5(-7)-foliolate, the leaflets lanceolate to ovate, very long acuminate, obtuse to truncate or broadly subcordate at base, 1.5-15 cm long, 0.6-5 cm wide, membranaceous, entire, above usually rather smooth and shiny, mostly glabrous except for a few scattered lepidote glands, puberulous along midvein, below scattered-lepidote, otherwise glabrous except for tufts of trichomes in axils of lateral veins, the trichomes mostly multicelled and forked or with several short side-branches; petiolules 0.2-4 cm long, grooved and at least slightly puberulous above, the petiole 2-19 cm long, usually conspicuously whitish puberulous at apex above with simple and forked trichomes. *Inflorescence* a raceme or subpaniculate with the lowermost branches bifurcate, the pedicels long and strongly ascending, the lowermost longer so lower flowers usually held near level of upper

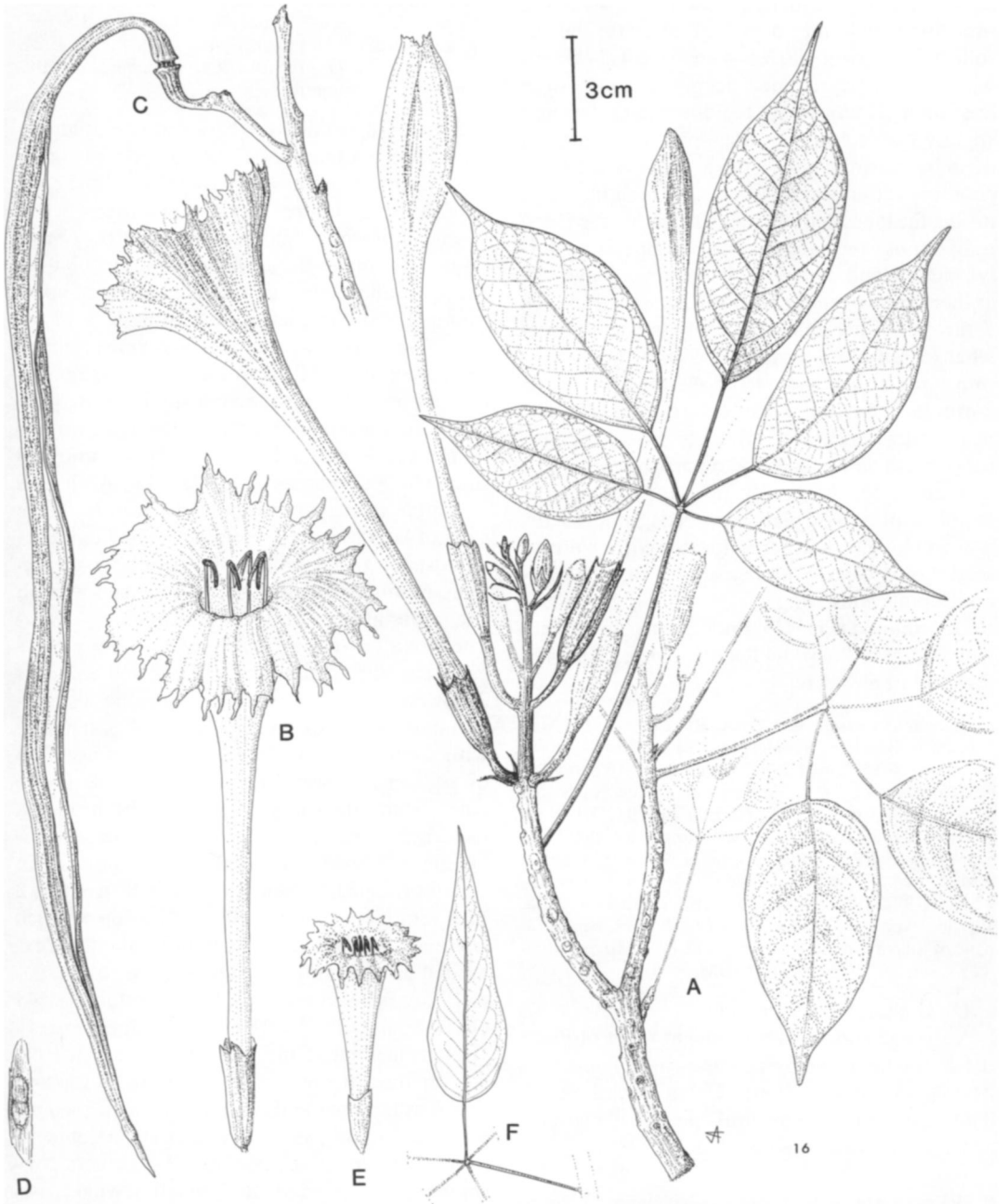


FIG. 16. *Ekmanianthe*. A-D, *E. longiflora* (Gentry & Mejia 50686). A, flowering shoot; B, flower; C, fruit; D, seed. E, F, *E. actinophylla* (Wright 3044). E, flower; F, portion of leaf.

buds, mostly glabrous, somewhat lepidote and sometimes subpuberulous at nodes, the pedicels usually with linear bracts 5–10 mm long near or below middle, sometimes subtended by cadu-

cous linear bracts to 3 cm long. *Flowers* pale greenish, the calyx cupular 0.9–17 mm long, 8–10 mm wide, minutely to conspicuously 5-denticulate, otherwise truncate to slightly bi-

labiate, lepidote, usually also with a few minute branching trichomes near base of teeth, the corolla infundibuliform, 3.5–4 cm long, 1.5–2.5 cm wide, the poorly defined deeply lacinate lobes less than 1 cm long, lepidote-glandular and slightly puberulous outside, sparsely below but densely toward apex, with a few long lax trichomes scattered near level of stamen insertion inside, the lobes densely stalked glandular, crisped puberulous especially around margins, irregularly lacinate and poorly defined; stamens five, the anthers subexserted or held just inside tube, 6–7 mm long, pendulous, slightly twisted, somewhat or not at all divergent; ovary linear, ca. 5 mm long, 1 mm wide, lepidote; disk pulvinate, 2 mm long, 6–7 mm wide. *Fruit* a linear capsule, usually slightly curved, subterete, 17–23 cm long, 0.6–0.9 cm wide, tapering to narrow sterile base and apex, longitudinally prominently costate, lepidote, otherwise glabrous; seeds thin, bialate, 4–5 mm long, 1.8–2.2 cm wide, the elliptic brown seed body clearly demarcated from hyaline-membranaceous wing.

Distribution (Fig. 17). Endemic to the the mogote region of Pinar del Río Province, Cuba. Below 100 m elevation.

Specimens examined. CUBA. PINAR DEL RÍO: Mogote de la Bandera, Viñales, 29 Mar 1953 (st), *Alain* 2875 (GH, NY); Baños de San Vicente, 12–16 Sep 1910 (st), *Britton et al.* 7492 (NY); region of Mogotes, Sierra de Viñales, 6 Jun 1923 (st), *Ekman* 16550 (NY); pine-lands at km 12 of hwy. to La Coloma, 27 Oct 1923 (st), *Ekman* 17779 (B); Loma de la Bandera, Viñales, 8 Mar 1924 (fl), *Ekman* 18656 (NY); Guane, El Salto, 12 Mar 1924 (fl), *Ekman* 18697 (B); Sierra Mercedita, Viñales, Apr 1930 (fl, fr), *Leon* 14358 (GH, NY, US); base of Sierra Guane, 26 Nov 1911 (st), *Shafer* 10536 (NY); sin. loc., *Wright* 3045 (BM, MO).

Local name. Roble caimán.

A strange and probably ancient relict of Pinar del Río where it grows in the same habitat as *Microcycas*, the endemic Cuban cycad genus. This is the only neotropical species of Bignoniaceae with five fertile stamens.

2. *Ekmanianthe longiflora* (Grisebach) Urban, Feddes Repert. **20**: 309. 1924. Figs. 16, 18.

Tecoma longiflora Grisebach, Cat. pl. Cub. 194. 1866, non *T. longiflora* Martius ex de Candolle, Prodr. **9**: 218. 1845, nom. nud., pro syn., nec. *T. longiflora* Bureau & K. Schumann in Martius, Fl. bras. **8**(2): 324. 1897 (15 Feb). Type. Cuba. *Wright* 3044 (holotype, GOET; isotypes, G, GOET, MO, NY, P, S).

Tabebuia longiflora (Grisebach) Greenman in Combs, Trans. Acad. Sci. St. Louis **7**: 451. 1897 (13 Sep). *Tabebuia grisebachii* Urban, Symb. antill. **8**: 640. 1921, nom. nov. for *Tecoma longiflora* Grisebach, non Bureau & K. Schumann.

Tree to 18 m tall, the bark rather ridged, the branchlets scattered lepidote, sometimes with a few minute trichomes when young, drying dark with conspicuous pale elongate lenticels when young, uniformly light tan when older. *Leaves* (3–)5–7-foliolate, the leaflets elliptic to oblong-ovate or lanceolate, acute to acuminate at apex, rounded to broadly subcordate at base, 3–17 cm long, 1–8 cm wide, chartaceous, entire, above macroscopically rather smooth except the impressed midvein, microscopically intricately insculpted, scattered lepidote and sometimes minutely scurfy puberulous, at least the midvein somewhat puberulous, below lepidote, with tufts of simple (sometimes forked) trichomes in the axils of lateral nerves; petiolules 0.5–7 cm long, inconspicuously lepidote, the petioles 3–21 cm long, minutely puberulous with crisped whitish trichomes at apex and sometimes above. *Inflorescence* a few-flowered raceme or a more elongate racemose panicle with the lower branches 3-flowered, lepidote, usually more or less puberulous with crisped whitish trichomes at nodes, with small caducous linear bracteoles near top of pedicels. *Flowers* white (tube yellow inside when fresh), the calyx tubular, 20–30 mm long, 8–12 mm wide, subtruncate or 5-dentate to bilabiate or shortly subspathaceous, the margin usually irregularly 5-denticulate with teeth to 2 mm long, lepidote, usually with a few whitish trichomes at base of denticulations, the teeth extended as incomplete costae in upper calyx; corolla tubular-salverform, 15–22 cm long, 1.5–3 cm wide, the tube 13–18 cm long, the lobes very strongly lacinate-frilly, not very well defined, ca. 2–3 cm long, the lower tube glabrous, at top and on lobes lepidote and with a few inconspicuous scurfy trichomes; stamens four, the filaments inserted high in tube, glabrous, the anthers conspicuously exserted, pendulous, somewhat twisted, 8–12 mm long; ovary linear, 6–8 mm long, 1 mm wide, costate, very minutely lepidote-glandular, disk annular-pulvinate, ca. 1 mm long, 5 mm wide. *Fruit* a linear capsule, subterete, curved near base (12–[fide Leon & Alain])18–36 cm long, 0.8–1 cm wide, subwoody, inconspicuously longitudinally striate, scattered lepidote, drying dark,

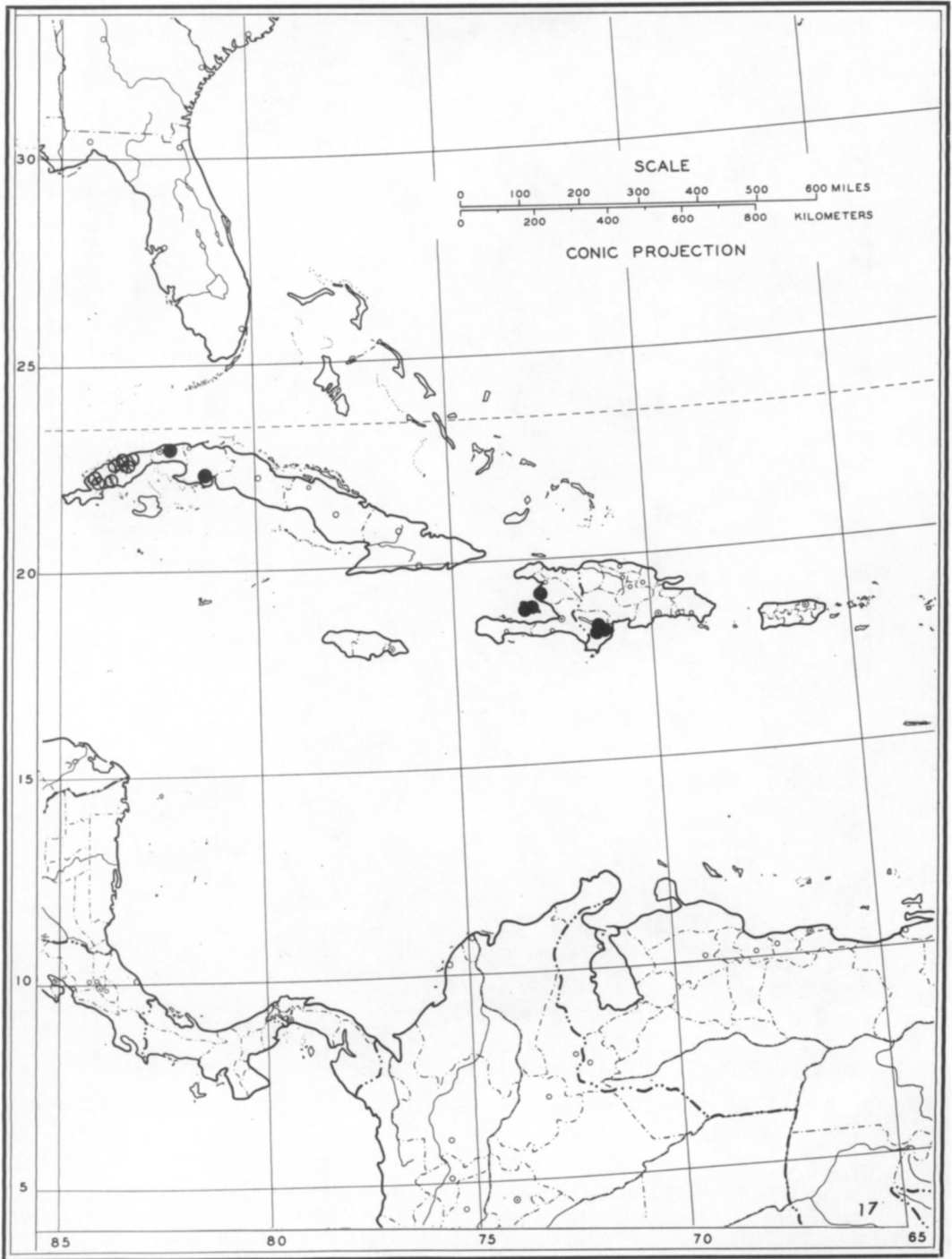


FIG. 17. Distribution of *Ekmanianthe*. ⊙ = *E. actinophylla*; ● = *E. longiflora*.



FIG. 18. Top, flowers of *Ekmanianthe longiflora* (Gentry & Mejia 50738). Bottom, fruits of *Godmania dardanoi* (Gentry et al. 50148).

with conspicuous large warty tannish lenticels; seeds 5–7 mm long, 3–3.5 cm wide, the wings hyaline membranaceous at apex, brownish at base.

Distribution (Fig. 17). Cuba and Hispaniola, mostly in dry types of forest on flat, well-developed soil. Sea level to 700 m elevation.

Specimens examined. CUBA. Sin. loc., *Wright 3044* (G, GOET, MO, NY, P, S). HABANA: Lomas de Camoa, 21 Nov 1921 (st), *Ekman 13509* (B, MO). SANTA CLARA: Jurugua, Colonia Columbia, 14 Sep 1895 (fl, fr), *Combs 581* (G, GH, MO, NY, P).

HAITI. Gonaives, 200 m, May 1900 (fl), *Buch 354* (GH); vic. Pikmi, Gonâve Island, 5–9 Jul 1920 (fl), *Leonard 5227* (GH, MO, NY, US).

DOMINICAN REPUBLIC. Sin. loc., *Schiffino 30* (MO). **BARAHONA:** Bei Barahona, Jun 1910 (fl), *Fuertes 125* (A); Barahona, *Fuertes 962B* (A, NY, US); Laguna de Juan Santiago 18°15'N, 71°8'W, 0 m, 11 Apr 1985 (fl, fr), *Gentry & Mejia 50686, 50687* (JBSD, MO); La Colonia, 12 km NE of Oviedo, 17°50'N, 71°18'W, 20 m, 12 Apr 1985 (fl), *Gentry & Mejia 50738* (JBSD, MO).

Local names. Cuba: Roble real. Dominican Republic: Roble de Puerto Rico.

Now rare and currently known from only two localities in Barahona Province of the Dominican Republic (T. Zanoni, pers. comm.); it has not been collected in over 50 years in Cuba or Haiti.

This unmistakable species, which has the longest flowers in tribe Tecomeae, has a complicated nomenclature despite its lack of any taxonomic problems. It was originally described as *Tecoma longiflora* by Grisebach but there was already a different *Tecoma longiflora* from Brazil. The Brazilian *Tecoma longiflora* was based on Vellozo's much earlier *Bignonia longiflora*, itself, however, a later homonym of *Bignonia longiflora* Cav. Much confusion surrounds the combination in *Tecoma* for Vellozo's plant, which de Candolle (1845) included under the synonymy of *Tecoma speciosa* DC. with this comment: "*Tecoma longiflora* Mart.! herb. *Bignonia longiflora* fl. flum. 65. 52? non Cav. Icon. fl. flum. differt a specim Martiano foliis acute et regulariter serratis." Since *Tecoma longiflora* Mart. ex DC. was published in synonymy, it should not effect nomenclatural priority despite potential validation of the name by the queried reference to Vellozo's *Bignonia longiflora*. The earliest valid publication for Vellozo's plant was by Bureau and K. Schumann in the *Flora Brasiliensis* as *Tecoma longiflora*. Thus Grisebach's 1866 *Tecoma longiflora* is the correct basionym for the Antillean species now referred to *Ekmanianthe*. Unfortunately, Urban (1921), realizing that *Tecoma longiflora* Bureau & K. Schum. was based on Vellozo's much older name, decided that that name had precedence over *Tecoma longiflora* Griseb. and proposed the now widely used, but superfluous, nomen novem *Tabebuia grisebachii* for the Antillean plant.

GODMANIA

11. *Godmania* Hemsley, *Diagn. pl. nov. mexic.* 35. 1879. Type species. *G. macrocarpa* (Benth.)

Hemsl. (= *G. aesculifolia* (Humboldt, Bonpland & Kunth) Standl.).

Xerotecoma J. C. Gomes, *Revista Brasil. Biol.* 24: 405. 1965. Type. *X. dardanoi* J. C. Gomes (= *G. dardanoi* (J. C. Gomes) A. Gentry).

Small to medium-sized trees. Leaves palmately 5–9-foliolate, the leaflets cuneate and with poorly developed petiolules. Inflorescence a corymbose terminal panicle. Flowers yellow and brown to yellowish outside and magenta inside, the calyx broadly campanulate, less than 2 mm long, 5-lobed; corolla broadly campanulate from base, the lobes triangular, valvate, the tube puberulous or glandular lepidote outside; stamens didynamous with pubescent anthers; ovary linear-oblong or linear-conical, lepidote and more or less puberulous, the ovules multiseriate in each locule; disk annular-pulvinate. Fruit a linear capsule, longitudinally striate-costate, twisted, more or less terete; seeds bialate, the hyaline-membranaceous wings long, irregular, conspicuously demarcated from the seed body.

Two species of Central and South America, from Mexico to Brazil and Bolivia.

Key to Species

1. Leaflets petiolulate; corolla 1–1.6 cm long, yellow and brown inside; fruit 45–100 cm long; Mexico to Bolivia and northern Brazil. 1. *G. aesculifolia*.
1. Leaflets sessile; corolla 2.5–3.5 cm long, magenta inside; fruit 15–38 cm long; Brazilian caatinga. 2. *G. dardanoi*.

Godmania can be distinguished from *Tabebuia*, its nearest relative, by the twisted capsule, the almost urceolate corolla with triangular valvate lobes, and vegetatively by the cuneate leaflet base not clearly demarcated from the petiolule apex.

1. *Godmania aesculifolia* (Humboldt, Bonpland & Kunth) Standley in Standley & Calderón, *Lista pl. Salvador* 200. 1925. Fig. 19.

Bignonia aesculifolia Humboldt, Bonpland & Kunth, *Nov. gen. sp. pl.* 3: 140. 1819. Type. Mexico: Guerrero, *Humboldt & Bonpland 3902* (holotype, B-WILLD; isotype, P) (F Neg. 39408).

Tecoma digitata Humboldt, Bonpland & Kunth, *Nov. gen. sp. pl.* 3: 142. 1819. Type. Colombia: Santa Cruz, *Humboldt & Bonpland 321* (P).

Tecoma fuscata Moçino ex de Candolle, *Prodr.* 9: 221.

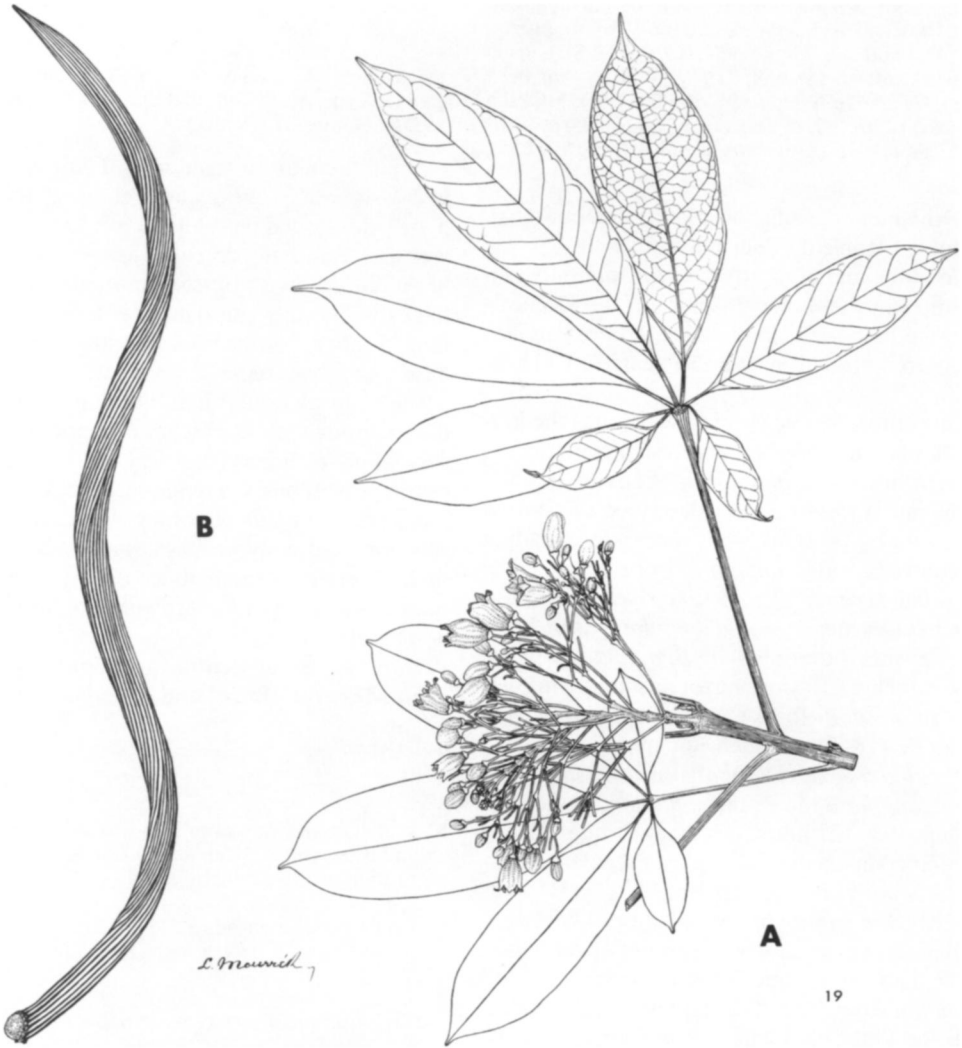


FIG. 19. *Godmania aesculifolia*. A, flowering shoot, $\times 0.5$ (Allen 4492); B, fruit, $\times 0.25$ (Gentry 359).

1845. Type. Mexico: Sessé & Moçino s.n. (copy of ined. illustration (G-DC)).

Tecoma? aesculifolia (Humboldt, Bonpland & Kunth) A. P. de Candolle, Prodr. 9: 221. 1845.

Cybistax macrocarpa Benth in Benth & Hooker f., Gen. pl. 2: 1043. 1876. Type. Panamá: Hayes 61 (holotype, K; isotypes, BM, P).

Godmania macrocarpa (Benth) Hemsley, Diagn. pl. nov. mexic. 2: 35. 1879.

Tabebuia aesculifolia (Humboldt, Bonpland & Kunth) Hemsley, Biol. centr.-amer., Bot. 2: 494. 1882.

Tabebuia fuscata (Moçino ex de Candolle) Hemsley, Biol. centr.-amer., Bot. 2: 494. 1882.

Tabebuia globiflora Ernst, Rev. Ci. Mens. Univ. Centr. Ven. 1(4): 133. 1887. Type. Venezuela: El Copey, Turmerito, Ernst s.n. (not seen).

Godmania uleana Kränzlin, Notizbl. Königl. Bot. Gart. Berlin 6: 379. 1915. Type. Brazil. Rio Branco: Ule 7969 (B*; lectotype, US; isotypes, K (as 7696), L).

Small or middle-sized tree to 20 m tall and 30 cm dbh., the bark smooth to longitudinally furrowed, the branches terete or subterete, puberulous, with a rank odor when broken. Leaves (5-)7-9-foliolate, the leaflets more or less obovate or oblanceolate, acute, attenuate-cuneate at base, membranaceous, with 7-13 secondary nerves on each side, puberulous with simple trichomes, especially along the nerves on both sides,

densely impressed-lepidote at least below, when dry greenish olive above and tannish below, the terminal 8.2–16.5 cm long by 3.1–7.2 cm wide, the laterals smaller; petioles 6.6–15.5 cm long, the petiolules 0.2–2.3 cm long, puberulous. *Inflouescence* a flat-topped terminal panicle, few-many-flowered, the branches puberulous. *Flowers* with the calyx broadly campanulate, shortly 5-lobed, 1–2 mm long, 2–4 mm wide, lepidote and simple-puberulous; corolla yellow ventrally and orangish-brown dorsally outside, mostly yellow inside, top of throat and margins of three lower lobes brown, urceolate-campanulate, 1–1.6 cm long, 7–8 mm wide, the tube 9–10 mm long, the upper lobes 0.2–0.3 cm long, the lower 0.4–0.3 cm long, simple puberulous outside, short-pubescent inside on the edges of the lobes with long simple trichomes on the lower lobe, in the throat and sparsely at level of stamen insertion; stamens didynamous, the filaments pubescent, 0.6–1 cm long, the thecae divaricate, pubescent, less than 1 mm long; pistil curved against the upper surface of corolla, ca. 1 cm long, the ovary linear-conical, 2 mm long, 1 mm wide, strongly lepidote and slightly simple-puberulous; disk pulviniform, inconspicuous, 0.5 mm long, 1.5 mm wide. *Fruit* a terete capsule, linear, twisted, 45–100 cm long, 0.9–1.5 cm wide, longitudinally finely costate, simple-puberulous; *seeds* narrow, bialate, with hyaline-membranaceous wings.

Distribution (Fig. 20). Mexico to Bolivia and northernmost Brazil, mostly in seasonally deciduous forest; 0–1300 m. The coastal Ecuador population occurs mostly as living fence posts and may be introduced, although this species seems an unlikely candidate for cultivation.

Representative specimens examined. **MEXICO.** CAMPECHE: Camino de China, *Flores s.n.* (F). Chiapas: El Chorreado, 5.6 mi E of Chiapa de Corzo, 2500 ft, 7 Apr 1965 (fl), *Breedlove 9563* (DS, F, MEXU, MICH, NY). GUERRERO: 10 mi S Tierra Colorado, 1200 ft, 20 Jun 1952 (st), *Cooper 2704* (MICH). JALISCO: Mun. Puerto Vallarta, 3 km S of Las Palmas, 60 m, 20 Dec 1970 (fr), *McVaugh 25588* (MICH). MÉXICO: Ixtapán, Temascaltepec, 5 Oct 1933 (fl), *Hinton 3912* (MO, NY). MICHOACÁN: Solargileux, 900 m, 5 Mar 1899 (fl), *Langlasse 1018* (MEXU). NAYARIT: 26 mi SW of Compostela, Mar 1973 (fr), *Johnson 304-73* (MO). OAXACA: Acahual, Mun. Chiltepec, 112 m, 24 Jun 1967 (fl), *G. Martínez C. 1429* (F, LL, MEXU, MICH, MO, NY). TABASCO: Entronque a Balancas, 23 Sep 1979 (fl), *Tellex & Martínez 947* (MEXU). VERACRUZ: Atoyote Tomate, 10 May 1973 (fl), *Chavelas P. & Zamora S. ES4999* (CHAPA, MEXU). YUCATÁN: Uxmal, 11 Mar 1955 (fr), *Enriquez 260* (MEXU).

GUATEMALA. ESCUINTLA: Río Guacalate, NW of Escuintla, 700 m, *Standley 89344* (F). **GUATEMALA:** Fiscal, 3700 ft, 1 Jun 1909 (fl), *Deam 6090* (F, MICH, MO, NY). HUEHUETENANGO: Río Trapichillo between Democracia and canyon of Chamushu, 1000–1100 m, *Steyermark 51243* (F). **IZABAL:** Puerto Mendez, 13 Oct 1969 (fr), *Contreras 9345* (F, LL). **SUCHITEPÉQUEZ:** Finca Variedades, 412 m, 1 Mar 1928 (fl), *Morales Ruano 1054* (F).

BELIZE. CAYO: Macal River 1 mi past Guacamallo Bridge, 29 Jan 1974 (fr), *Dwyer & Liesner 12357* (MEXU, MO).

EL SALVADOR. LA LIBERTAD: Between Opico & Tacachico, 1500 ft, 26 Nov 1958 (fr), *Allen & Armour 7108* (F, LL, NY). **SAN SALVADOR:** San Salvador, *Calderón 933* (NY). **SAN MIGUEL:** 15 mi E of Usulután, 400 ft, 5 Aug 1962 (fl), *Webster et al. 12768* (F, MO). **SANTA ANA:** Vic. of Metapán, 370 m, *Standley & Paddilla 3151* (F).

HONDURAS. CHOLUTECA: 3 km N de Choluteca, 24 Oct 1973 (fr), *Hazlett 1003* (MO). **COMAYAGUA:** Certo de Comayagua, 17 Oct 1970 (fr), *Hernández M. 5267* (MO). **LA PAZ:** Near La Paz, 700 m, 29 Jun 1974 (fl), *Hazlett 1724* (MO). **MORAZÁN:** Zamorano, 850 m, 19 Jun 1947 (fl), *Molina 124* (F, MO).

NICARAGUA. CHINANDEGA: SW de Puerto Potosí, 20 m, 19 Jun 1983 (fl), *Sandino 4399* (MO). **CHONTALES:** W of Juigalpa, 14 Jun 1984 (fl), *Stevens 22966* (MO). **LEÓN:** Km 37, carretera Nueva a León, 26 Apr 1982 (fl), *Sandino 2624* (MO). **MANAGUA:** Between Managua and Masachapa, 100 m, 18 Aug 1977 (st), *Croat 43736* (MO). **MATAGALPA:** Puertas Viejas a Esquipulas, 600–620 m, 10 May 1982 (fl), *Moreno 16285* (MO). **RIVAS:** Isla Ometepe, 18 Apr 1985 (fl), *Robledo 1927A* (MO).

COSTA RICA. ALAJUELA: Entre Santiago and San José de San Ramón, 25 Apr 1929 (fr), *Brenes 6843* (CR, NY). **GUANACASTE:** N of Bagaces, 30 Jan 1969 (fr), *Gentry 359* (MO, WIS). **HEREDIA:** Barba, 1 Sep 1940 (fr), *Leon 65* (CR). **PUNTARENAS:** Near Miramar turnoff, 21 Feb 1969 (st), *Gentry 521* (MO). **SAN JOSÉ:** Buenos Aires, Jan 1892 (fr), *Tonduz 6714* (BR, CR, US).

PANAMA. CANAL ZONE: Thatcher Ferry Bridge, 4 Aug 1971 (fl), *Gentry 1394* (MO). **CHIRIQUÍ:** Vic. Boquete, 24 Apr 1935 (fl), *Allen 1018* (MO). **DARIÉN:** Sin. loc., 6 Oct 1961 (fl), *Sexton 116* (MO). **PANAMÁ:** Pedregal, 7 Apr 1971 (fl), *Holdridge 6505* (PMA). **VERAGUAS:** NE of La Mesa, 19 Sep 1965 (fr), *Blum & Tyson 654* (MO, SCZ).

COLOMBIA. ANTIOQUIA: Pato, 20 May 1949 (fl), *Romero-Castañeda 1700* (AAU, COL, NY). **CESAR:** Valledupar, *Karsten s.n.* (W). **META:** Puerto Lopez, 240 m, 26 Jul 1944 (fr), *Little & Little 8235* (COL, NY, US). **VICHADA:** 35 km E of Las Gaviotas, 170 m, Dec 1973 (fr), *Davide & Llanos 5199* (COL, MO).

VENEZUELA. ANZOÁTEGUE: Cantaura, 26 Mar 1950 (fl), *F. Smith 109* (US). **ARAGUA:** Road from Cua to El Sombrero, 6 Mar 1974 (fr), *Gentry 10228* (MO, VEN). **BARINAS:** Parque Barinitas, 500 m, 26 Jun 1956 (st), *Bernardi 3360* (MER). **BOLÍVAR:** Ciudad Bolívar, 14 Mar 1974 (fr), *Gentry 10401* (MO, VEN). **DISTRITO FEDERAL:** Sábana Grande, *Williams 12418* (F). **FALCÓN:** desde Mene de Mauroa, Ditto. Mauroa, 23 May 1980

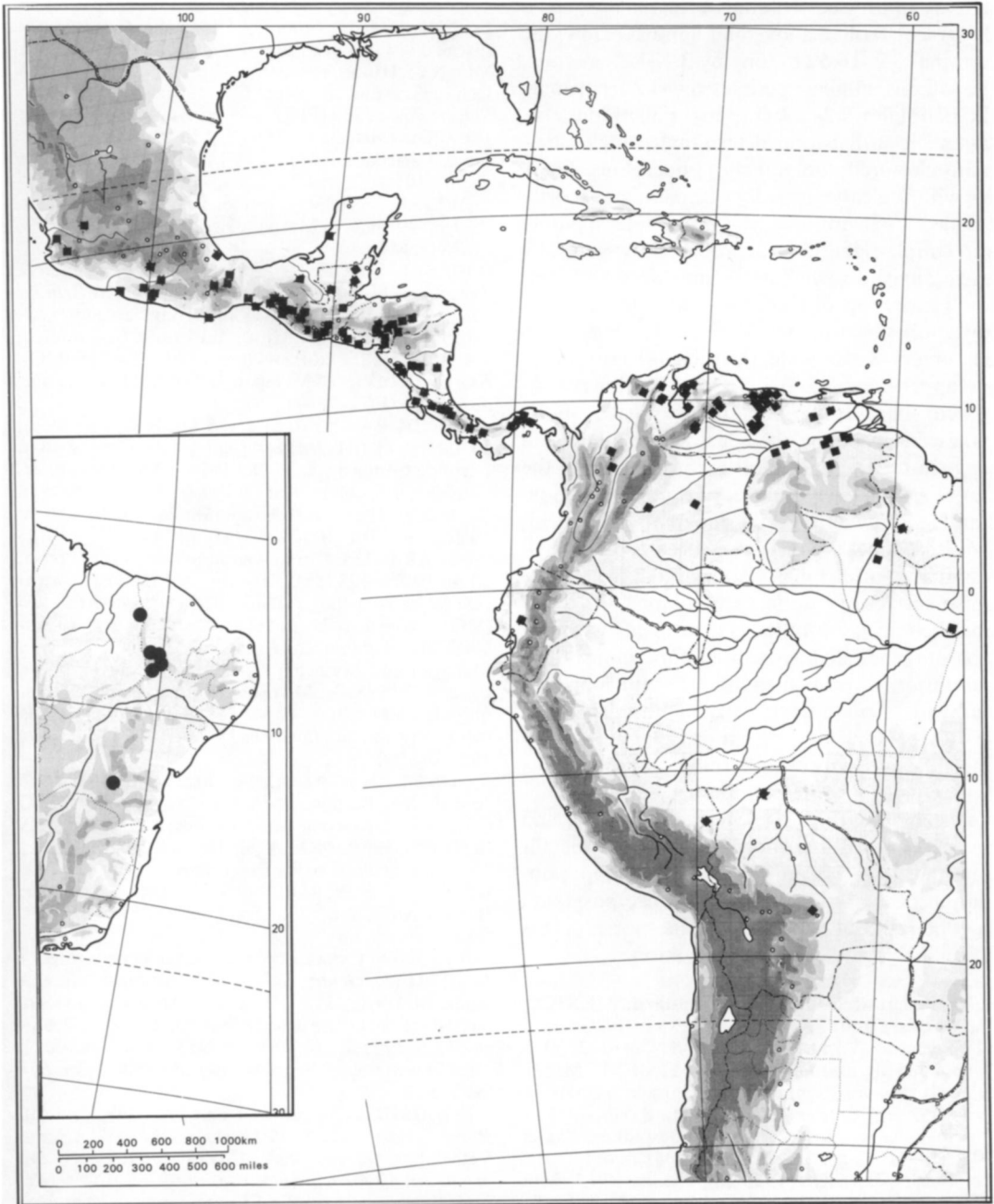


FIG. 20. Distribution of *Godmania*. ■ = *G. aesculifolia*; ● = *G. dardanoi*.

(fl), Bunting & Stoddart 9335 (MO). GUÁRICO: El Sombrero to Calabozo, 6 Mar 1974 (fr), Gentry 10238 (MO, VEN). LARA: El Altar, este de Sarare, 4 Jan 1967 (fr), R. F. Smith 1257 (VEN). MIRANDA: Carretera Caracas-Baruta, May 1952 (fl), Aristeguieta 1713 (VEN). MONAGAS: 23 km NW of Jusepín, 340–360 m, 5 Apr 1967 (fl), Pursell 8648 (NY). PORTUGUESA: Acarigua, 5 Jul 1946 (fl), Burkart 17052 (VEN). ZULIA: Dto.

Miranda, carretera El Mecocal, 125–150 m, 24 Sep 1977 (fr), *Bunting 5594* (MO).

GUYANA. Between Takutu River & Kanuku Mts., 12–22 Mar 1938 (fl), *A. C. Smith 3363* (B, IAN, MO, NY, U).

ECUADOR. LOS RÍOS: Jauneche, 70 m, 1 Oct 1979 (fr), *Gentry et al. 26700* (ECU, MO).

PERU. MADRE DE DIOS: 13–15 km from Puerto Maldonado to Labyrintho, ca. 250 m, 24 Aug 1983 (fr), *Gentry 43736* (AMAZ, MO, USM).

BRAZIL. RORAIMA: Boa Vista, Sep 1913, *Kuhlmann 3299* (U); Serra de Praçana, Feb 1909 (fl), *Ule 7696* (K, US). **PARÁ:** Faro, 1 Jan 1920 (fl, fr), *Ducke s.n. (RB 11424)* (B, RB, U).

BOLIVIA. SANTA CRUZ: Sara, Río Surutu, 400 m, Mar 1926 (fr), *Steinbach 7520* (MO).

Local names. Mexico: cacho de burrego, cacho de noville, cuerno chivo, roble; (Maya) xopel, hocop, yuy; (Zoque) jayhuay. Central America: cacho de chivo, cacho de cabra, cortés, cortés blanco, corté blanco, corteza de chivo, roble, roble macho. Colombia and Venezuela: araguaney sabanero, cacho de chivo, cacho de vaca, cacho de venado, cacho de venado sabanera, cornicabro, cuerno de cabro, cuerno de vaca.

A fairly common dry forest tree in parts of Central America and northern South America, less common in moist forest and very uncommon south of Venezuela. The tiny flowers are the smallest of the neotropical Tecomeae and are distinctive in shape and color pattern. Leafless in the dry season, when the rank odor of the broken twigs (said to resemble horse urine) is a useful field character.

2. *Godmania dardanoi* (J. C. Gomes) A. Gentry, *Ann. Missouri Bot. Gard.* **63**: 74. 1976.

Fig. 18.

Xerotecoma dardanoi J. C. Gomes, *Rev. Bras. Biol.* **24**: 405. 1965. Type. Brazil. Pernambuco: Entre Pernambuco e Ouricuri, *Lima 61-3598* (holotype, RB).

Shrub or small *tree* to 7 m tall, the branchlets terete, longitudinally striate, puberulous with erect trichomes, lenticels inconspicuous or lacking. *Leaves* (3–)5(–7)-foliolate, the leaflets narrowly elliptic, acute, cuneate and sessile at base, 1–7 cm long, 0.5–2.5 cm wide, usually entire at maturity, coarsely serrate when young, membranaceous, pilose above and below, much more densely below, drying dark olive above, light gray below from the trichomes, petiolules lacking, the petioles 2–8.5 cm long, puberulous. *Inflorescence* a corymbose-terminal panicle, pu-

berulous, the branches subtended by ca. 2 mm long linear bracts. *Flowers* yellow or greenish yellow outside, magenta or wine-colored inside, the calyx broadly campanulate, sharply 5-dentate or denticulate, 1.5–2 mm long, 3–5 mm wide, lepidote and sparsely pubescent; corolla broadly campanulate from base, 2.5–3.5 cm long, 1.5–2 cm wide at mouth of tube, the tube ca. 2 cm long, the lobes ca. 1 cm long, narrowly triangular, valvate in bud, reddish lepidote-glandular outside, puberulous inside mostly with short erect and glandular trichomes, upper two lobes only pubescent near margin; stamens didynamous, the anther thecae short and thick, divergent to divaricate, 2 mm long, pilose; ovary narrowly oblong, 4–5 mm long, densely lepidote and sparsely pilose, not well differentiated from the similarly lepidote and pubescent style base; disk annular-pulvinate, ca. 1 mm long, 2 mm wide. *Fruit* a linear capsule, spirally twisted, 15–38 cm long, 0.5–0.7 cm wide, longitudinally striate-costate, lepidote and puberulous; *seeds* 4–5 mm long, 3–4.5 cm wide, the long narrow hyaline-membranaceous wings distinctly demarcated from seed body.

Distribution (Fig. 20). The caatinga of northeastern Brazil; 550–700 m elevation.

Specimens examined. **BRAZIL. BAHIA:** Serra da Sapa, Rio São Francisco, *Luetzelburg 3046* (M); Santa Elena, 16 Oct 1912 (fl), *Zehntner 378 (RB 6383)* (RB); km 21 entre Piripa y Cordeiros, 680 m, 15 Oct 1970 (fl), *Andrade-Lima 70-6057* (IAN, MO). **CEARÁ:** Estrada para Araripe, 15 km alem Potengi, 4 Dec 1971 (fl), *Acad. Bras. Cienc. 1160* (MO); Viçosa do Ceará, Serra do Ibiapaba, 28 Jun 1970 (fl), *Andrade-Lima 70-5919* (IAN, MO); Serra do Salitre-Salitre, 11 Feb 1984 (fl), *Fernandes & Angelica s.n. (EAC12314)* (EAC, MO); between Araripe and Campos Salas, 620 m, 7°10'S, 40°25'W, 15 Feb 1985 (fr), *Gentry et al. 50133, 50138* (EAC, MO); 14 km W of Potengi, 650 m, 7°10'S, 40°5'W, 15 Feb 1985 (fr), *Gentry et al. 50148* (EAC, MO). **PERNAMBUCO:** 6 km Espírito na estr. para Araripina, 4 Jan 1961 (fl), *Andrade-Lima 61-3590* (IAN, MO, RB, SP). **PIAUI:** Picos, entrada da BR 020, 16 Nov 1981 (fl), *Fernandes & Nunes s.n. (EAC 10869)* (EAC, MO).

Local name. Chifre de bode.

JACARANDA

(Contributed jointly by A. Gentry and W. Morawetz and in part based on the latter's Ph.D. thesis.)

12. *Jacaranda* Jussieu, Gen. pl. 138. 1789. Type species. *Jacaranda caerulea* (Linnaeus) Jussieu.

Icaranda Persoon, Syn. pl. 2: 173. 1807. Sphalm.

Kordelestris Arruda in Koster., Trav. Brazil 1: 500, 1816, fide Index kewensis.

Rafinesquia Rafinesque, Sylva tellur. 79. 1838., non Nuttall. Type. *R. caerulea* (Linnaeus) Rafinesque = *J. caerulea* (L.) Juss.

Etorloba Rafinesque, loc. cit., nom. alt. for *Rafinesquia*.

Pteropodium A. P. de Candolle ex Meisner, Gen. 300; Comm. 209. 1840. Lectotype. *Pteropodium glabrum* (A. P. de Candolle) = *Jacaranda glabra* (A. P. de Candolle) Bureau & K. Schumann.

Mostly medium-sized to large trees, sometimes shrubs or xylopodial subshrubs. Leaves usually bipinnate, occasionally pinnate, rarely simple. Inflorescence a few- to many-flowered terminal or axillary panicle or rarely raceme, sometimes from the old wood. Flowers with the calyx short and broadly campanulate to cupular, usually 5-denticulate or acutely 5-lobed, sometimes more or less truncate or deeply 5-lobed to

base; corolla blue or blue-purple to magenta, rarely white, tubular-campanulate above a narrow basal tube, pubescent to essentially glabrous outside; anthers glabrous, often 1-thecate, the staminode elongate, exceeding the stamens, variously glandular-pubescent especially at the tip; pollen grains 3-colpate, the exine smooth; ovary flattened-cylindrical, glabrous or pubescent (even in the same species), the ovules ca. 8-seriate in each locule; disk pulvinate. Fruit an oblong capsule strongly flattened perpendicularly to the septum, dehiscing perpendicular to the septum and parallel to the plane of compression, the valves variously glabrous or lepidote, often with undulate margins; seeds thin, winged, the wings membranaceous, hyaline or brownish. A neotropical genus of 49 species, ranging from Guatemala and the Antilles to northern Argentina. The presumably primitive section *Dilobos* is concentrated in Brazil; section *Monolobos* is more evenly distributed but has more species in northwestern South America and the West Indies.

Key to Species

1. Anthers 1-thecate (section *Monolobos*); mostly Antilles, Central America and western South America (only 4 species in subAmazonian Brazil, these with calyces deeply 5-parted to near base and also with convex fruit valves except *J. decurrens* with incompletely divided pinnatifid pinnae); calyx not persistent in fruit; fruit valves <5.5 cm wide in upper Amazonia.
2. Continental America; leaflets either acuminate or >2 cm long or the corolla tube (except at base) glabrous outside; ovary usually puberulous; fruits >3 cm wide (unless ovary glabrous in *J. obtusifolia* ssp. *rhombifolia*).
3. Xylopodial subshrub <1 m tall; leaflet bases strongly decurrent, usually incompletely separated from the winged rachis. 15. *J. decurrens*
3. Small to large trees without xylopodium; individual leaflets completely separate.
4. Leaflets large (in part >3 cm long), asymmetrically elliptic or obovate; inflorescence candelabriform (pyramidal with a well-developed central rachis); calyx cupular, minutely 5-dentate; large trees of Amazonia, trans-Andean South America and Central America.
5. Leaflets elliptic or oblong-elliptic, obtuse, subcoriaceous, distinctly petiolulate; capsule valves woody, more than 7 cm wide; Guayana area. 11a. *J. copaia* ssp. *copaia*.
5. Leaflets rhomboid-elliptic, acute to acuminate, membranaceous, sessile or subsessile; capsule valves thin-woody, less than 6 cm wide; widespread. 11b. *J. copaia* ssp. *spectabilis*.
4. Leaflets mostly very small, always <3 cm long; inflorescence not large and candelabriform; calyx very short (<2 mm long) and broadly campanulate or deeply 5-lobed to below middle; trees of sub-Amazonian dry areas.
6. Leaflets acuminate, often glabrous, never both pubescent and bullate nor with pilose "beard" at base of midvein; inflorescence terminal; corolla tube conspicuously pubescent outside; calyx lobes narrowly triangular and acuminate or much reduced.
7. Leaflets lanceolate to ovate-oblong, mostly >15 mm long; calyx divided to near base, the conspicuously acuminate lobes mostly 3–7 mm long; fruit 4.5–8 cm long and wide. 14. *J. cuspidifolia*.
7. Leaflets elliptic, <12 mm long, mostly much smaller; calyx broadly campanulate, <3 mm long, 5-denticulate or with short triangular teeth.
8. Leaflets completely smooth above; pinnae mostly fewer than 12 and separated by 2–3 cm; capsule mostly <4.5 cm wide, usually slightly longer than wide, often slightly cuspidate; inter-Andean valleys of Peru. 1. *J. acutifolia*.
8. Leaflets usually with venation slightly impressed above; pinnae mostly more than

- 12 and separated by 1.3–2 cm; capsule mostly >4.5 cm wide, usually about as wide as long, rarely cuspidate; northwest Argentina to Bolivia; also much cultivated. 29. *J. mimosifolia*.
6. Leaflets not narrowly acuminate, the apex usually obtuse (although often apiculate); leaflets mostly pubescent, often both bullate and pubescent; inflorescence usually axillary or ramiflorous; corolla tube often glabrous; calyx lobes ovate and obtuse to acutish except when corolla tube glabrous or subglabrous.
9. Leaflets bullate and hairy, the margins involute; eastern and central Brazil.
10. Leaflets subcordate, strongly bullate; leaves with 4–8 pairs of pinnae; fruits <4 cm wide. 39. *J. praetermissa*.
10. Leaflet base asymmetrically cuneate; leaves with 8–14 pairs of pinnae; fruits >8 cm wide. 4. *J. brasiliana*.
9. Leaflets not bullate, usually not strongly hairy, the margins not or only slightly involute.
11. Western Andean slopes near Peru/Ecuador border; staminode exerted; corolla tube densely puberulous outside, the lobes reduced, <5 mm long. . . . 47. *J. sparrei*.
11. Cis-Andean northern South America to Costa Rica and trans-Andean Colombia; staminode included or subexserted; corolla tube mostly glabrous outside, sometimes glandular-pubescent or stalked-glandular at base, the corolla lobes >5 mm long.
12. Fruit <3.6 cm wide, with straight margins; leaflets mostly <1 cm long; inflorescence congested when the ovary is puberulous.
13. Ovary puberulous; fruit <3 cm wide; western half of Venezuela to Bolivia. 34a. *J. obtusifolia* ssp. *obtusifolia*.
13. Ovary glabrous; fruit usually >3 cm wide; Guianas and Guayanan Venezuela and Brazil 34b. *J. obtusifolia* ssp. *rhombofolia*.
12. Fruit >3.8 cm wide, with straight or undulate margins; leaflets mostly >1 cm long; inflorescence relatively lax.
14. Ovary glabrous; sandy beaches of middle Orinoco. 35. *J. orinocensis*.
14. Ovary puberulous; Costa Rica to northern Venezuela.
15. Fruit with straight margin, mostly >6 cm wide; leaves with less than 12 pinnae pairs; Choco and around north tip of Colombian Cordillera Central. 21. *J. hesperia*.
15. Fruit with more or less undulate margins, <6 cm wide; leaves usually in part with >12 pinnae pairs; Costa Rica to Venezuela.
16. Lobes of calyx short or absent; Venezuela or Costa Rica to northwest Colombia.
17. Base of corolla tube glandular-pilose outside; Costa Rica to northwest Colombia. 10c. *J. caucana* ssp. *sandwithiana*.
17. Base of corolla tube glabrous outside; Venezuela. 10b. *J. caucana* ssp. *glabrata*.
16. Calyx 5-lobed, split beyond middle; Colombia.
18. Fruit oblong, weakly undulate; calyx lobes 5–10 mm long. 10d. *J. caucana* ssp. *calycina*.
18. Fruit subrotund, strongly undulate; calyx lobes <3 mm long 10a. *J. caucana* ssp. *caucana*.
2. West Indies; leaflets obtuse, <2 cm long; corolla tube puberulous and/or lepidote-glandular outside; ovary glabrous; fruits <3(–3.5) cm wide.
19. Leaflets tiny (1–3 mm long), suborbicular, the margin strongly revolute.
20. Leaves mostly simply pinnate; leaflets with short distinct petiolule; Cuban serpentine barrens. 12. *J. cowellii*.
20. Leaves bipinnate; leaflets completely sessile; southern Hispaniola. 18. *J. ekmanii*.
19. Leaflets small to relatively large (at least some >5 cm long), oblong-elliptic or obovate.
21. Leaflets relatively large (mostly 1–1.5(–2) cm long), obovate to asymmetrically oblong-elliptic; inflorescence an open panicle; Cuba, Bahamas, and Hispaniola.
22. Fruit valves thick, woody; leaflets membranaceous to chartaceous, more or less reticulate below, the margin not involute; on limestone, Cuba, the Bahamas, and northernmost Hispaniola. 6. *J. caerulea*.
22. Fruit valves thin, subwoody; leaflets coriaceous, densely whitish-scaly and non-reticulate below, the margins involute; on serpentine, eastern Cuba. 2. *J. arborea*.
21. Leaflets smaller (mostly less than 1 (rarely to 1.3) cm long); mostly narrowly oblong-elliptic; inflorescence more or less congested; Hispaniola.
23. Flowers 4.5–5 cm long; leaves with 20–40 pinnae; southern Haiti and Barahona Peninsula of Dominican Republic. 45. *J. selleana*.
23. Flowers <4 cm long; leaves with 6–26 pinnae; most of Hispaniola. 38. *J. poitaei*.

1. Anthers 2-thecate (section *Dilobos*); mostly subAmazonian Brazil and adjacent Paraná Valley (plus two species in upper Amazonia, these with fruits >5.5 cm wide or with persistent calyx or both); calyces cupular, never divided even to middle; fruit valves more or less flat and thinly woody or subwoody, never strongly convex; pinnae never pinnatifid.
24. Leaves simple or simply pinnate.
25. Leaves simple. 46. *J. simplicifolia*.
25. Leaves simply pinnate.
26. Rachis prominently winged; plants of sandy Amazonian campinas.
27. Leaflets membranaceous, mostly serrate; inflorescence narrowly paniculate; fruit >3.7 cm long. 5. *J. bullata*.
27. Leaflets coriaceous, entire; inflorescence a raceme; fruit <3.5 cm long.
28. Inflorescence terminal; leaflets <3 cm long. 17. *J. egleri*.
28. Inflorescence axillary; leaflets mostly >3 cm long. 7. *J. campinae*.
26. Rachis unwinged or barely marginately subwinged; east central Brazil.
29. Leaves forming basal rosette; leaflets narrowly elliptic; inflorescence a raceme. 42. *J. racemosa*.
29. Leaves borne along stem or branches; leaflets more or less broadly elliptic; inflorescence a panicle.
30. Leaflets very strongly bullate above and raised reticulate below, pilose below with stiff hairs mostly oriented into interior of the areolae; inflorescence lateral and axillary. 44. *J. rugosa*.
30. Leaflets usually plane above or with the secondary veins raised or slightly impressed, if slightly bullate, then the inflorescence terminal.
31. Inflorescence mostly lateral, axillary or from axils of fallen leaves; leaflets glabrous or membranaceous and slightly puberulous along main veins, if coriaceous, the upper surface either glossy or intricately prominulous-reticulate.
32. Leaflets membranaceous (leaves usually in part bipinnate); coastal Ceará to Fr. Guiana. 16. *J. duckei*.
32. Leaflets coriaceous; Goiás or Bahia.
33. Upper surface intricately reticulate; leaf ca. 11-foliolate; Goiás, campo rupestre. 22. *J. intricata*.
33. Upper surface not prominulous-reticulate; leaf 3–5-foliolate; Bahia, coastal restinga. 20. *J. grandifoliolata*.
31. Inflorescence terminal; leaflets coriaceous, usually pubescent; if glabrous, lacking intricately reticulate upper surface and with curved not strongly ascending secondary veins.
34. Leaflets with intricately prominulous tertiary venation above; secondary veins straight, close and rather strongly ascending; calyx shallowly 5-dentate. 37. *J. paucifoliolata*.
34. Leaflets with intricately prominulous tertiary venation above; secondary veins curving, neither noticeably close together nor strongly ascending; calyx usually with conspicuously laterally expanded teeth. 23. *J. irwinii*.
24. Leaves bipinnate.
35. Leaf rachis distinctly winged at least towards apex; cerrado shrubs or pachycaul treelets of upper Amazonia; leaflets membranaceous.
36. Shrubs, inflorescence terminal; cerrado.
37. Leaflets membranaceous, serrate. 43. *J. rufa*.
37. Leaflets coriaceous, entire. 49. *J. cf. ulei* (Irwin et al. 25307).
36. Pachycaul tree or treelet; inflorescence cauliflorous; upper Amazonian forests. *J. glabra*.
35. Leaf rachis usually canaliculate but not distinctly winged (sometimes slightly marginate, occasionally more or less winged in *J. ulei* and *J. morii* with coriaceous leaflets); coastal and central Brazil (plus adjacent Paraná Valley) except *J. macrocarpa*, a large Amazonian tree with coriaceous leaflets.
38. Leaflets coriaceous or distinctly pubescent or both; if glabrous; the inflorescence puberulous.
39. Leaflet underside densely pubescent, usually with rather long whitish trichomes.
40. Small shrub <2 m; leaflets coriaceous and strongly bullate, mostly (very) narrowly oblong-elliptic or oblong-ovate; capsule round to broadly elliptic.
41. Leaflets mostly very narrowly oblong-elliptic, base rounded or minutely narrowly cordate; central cerrado, central Goiás and southwesternmost Bahia to Minas Gerais. 49. *J. ulei*.

41. Leaflets narrowly oblong-ovate with broadly subcordate bases; northern cerrado transition with Mato do cipo and Amazonia. 31. *J. morii*.
40. Trees to 4 m; leaflets membranaceous to subcoriaceous, not bullate or very slightly subbullate, elliptic to oblong or ovate; capsule narrowly elliptic to oblong.
42. Leaves with 2–4 pinnae pairs; leaflets ovate, the margin not revolute. 24. *J. jasminoides*.
42. Leaves with 6–10 pinnae pairs; leaflets narrowly elliptic to obovate, the margin revolute. 41. *J. pulcherrima*.
39. Leaflets glabrous or pubescent with short trichomes, usually only slightly puberulous along the main nerves below or in the secondary vein axils.
43. Leaflets strongly asymmetrical (half ovate/half obovate), entire or with a few irregular teeth on one side.
44. Leaflets coriaceous, slightly puberulous only on the midvein; inflorescence rather sparsely and interruptedly branched; corolla lobes frilly; middle elevations in Serra de Mantiqueira. 13. *J. crassifolia*.
44. Leaflets membranaceous, puberulous on secondary veins below; inflorescence a simple non-interrupted panicle; corolla lobes entire.
45. Capsule strongly undulate margined; corolla (where known) <5 cm long and 1.2 cm wide at mouth of tube; leaflets slightly bullate or not; Parana valley and S. coastal Brazil to southeast Para.
46. Leaves with 4–8 pinnae pairs; leaflets slightly bullate, <3.5 cm long; Serra do Carajas. 8. *J. carajasensis*.
46. Leaves usually with 7–9 pinnae pairs; leaflets smooth above, mostly >3.5 cm long; Paraná Valley to Rio de Janeiro. 27. *J. micrantha*.
45. Capsule not undulate-margined; corolla 5–6.5 cm long, >1.3 cm wide at mouth of tube; mature leaflets slightly bullate; middle elevations of Serra da Mantiqueira. 25. *J. macrantha*.
43. Leaflets symmetrically rhomboid to elliptic, if asymmetric then lanceolate; mostly regularly toothed.
47. Shrub; leaflets strongly coriaceous, lanceolate to narrowly elliptic; inflorescence rather contracted at end of peduncle; cerrado. 32. *J. mutabilis*.
47. Tree or treelet; leaflets broader, elliptic to rhomboid; inflorescence regularly paniculate, the flowers not clustered at branch apices; widespread in mata atlantica, in cerrado only in gallery forest.
48. Leaves with 5–11 pinnae pairs; leaflets narrowly elliptic, obtuse at apex; pseudostipules well-developed, to 8 mm long; capsule <3.5 cm wide; Serra da Mantiqueira above 1500 m alt. 48. *J. subalpina*.
48. Leaves with 4–6 pinnae pairs; leaflets broadly elliptic to rhombic; pseudostipules small and inconspicuous; capsule 3–5.6 cm wide; widespread in mata atlantica. 40. *J. puberula*.
38. Leaflets and inflorescence glabrous or essentially so.
49. Flowers <2.5 cm long; staminode strongly T-shaped; capsule 11–21 cm long; Amazonia. 26. *J. macrocarpa*.
49. Flowers >3 cm long; staminode entire or weakly bifid; capsule <8 cm long; eastern and central Brazil.
50. Shrubs or subshrubs; leaflets sessile or subsessile, elliptic to narrowly lanceolate or very narrowly rhomboid, coriaceous with entire margins; cerrado and campo limpo grasslands.
51. Leaflets more or less elliptic, 2 to 4 times as long as wide; cerrado. 9. *J. caroba*.
51. Leaflets narrowly lanceolate to very narrowly rhomboid, 5–8 times as long as wide; campo limpo grasslands and edges of adjacent forest. 36. *J. oxyphylla*.
50. Trees; leaflets mostly distinctly petiolulate or subsessile with a toothed margin.
52. Leaflets serrate; fruit with undulate margins; wet middle elevation forests of São Paulo and southern Rio de Janeiro. 30. *J. montana*.
52. Leaflets entire; fruit with or without undulate margin; lowland coastal forests from northern Rio de Janeiro to Pernambuco and easternmost Pará.
53. Leaflets coriaceous to subcoriaceous, obovate or rhombic-elliptic; fruit margins non-undulate (except 1 collection of *J. bracteata*); coastal restingas from northern Rio de Janeiro to Alagoas.
54. Leaflets coriaceous, obovate to elliptic, the apex rounded to obtuse,

- often minutely emarginate; Alagoas to northern Espírito Santo. 33. *J. obovata*.
54. Leaflets subcoriaceous, rhombic-elliptic to elliptic, the apex acutish to apiculate obtusely acuminate; southernmost Bahia to northern Rio de Janeiro. 3. *J. bracteata*.
53. Leaflets membranaceous to chartaceous, asymmetrically ovate to oblong; fruit margins undulate or not; Bahia to easternmost Pará, mostly on lateritic soils.
55. Fruit margins undulate; leaves with 6–10 pinnae; calyx 3 mm long; inflorescence a terminal panicle. 28. *J. microcalyx*.
55. Fruit margins not undulate; leaves with maximum of 2 or 4 pairs of pinnae, in part simply pinnate; calyx 7–10 mm long; inflorescence lateral, few-flowered. 16. *J. duckei*.

1. *Jacaranda acutifolia* Humboldt & Bonpland, Pl. aequinoct. 1: 59. t. 17. 1808. Type. Peru. Cajamarca: San Felipe, *Humboldt & Bonpland s.n.* (holotype, B; isotypes, P, FLOR).

Tree 5–15 m tall, to 37 cm dbh., the branchlets subterete, sparsely and glabrescently minutely lepidote and puberulous, with or without inconspicuous tannish lenticels. *Leaves* bipinnate, with 9 to 22 pinnae, these (1.5–)2–3 cm apart on the rachis, each pinna with subwinged essentially glabrous rachis and 11–33 sessile leaflets, these 5–16 mm long and (1–)2–4 mm wide, narrowly elliptic, sharply acuminate, the base cuneate, chartaceous, glabrous, entire, the surface smooth above. *Inflorescence* an open terminal panicle, slightly puberulous, bracts caducous or absent. *Flowers* with the calyx reduced, broadly campanulate, shallowly 5-dentate, 1.5–2.5 mm long and 2–4 mm wide, puberulous; corolla deep purplish blue, tubular-campanulate above a narrow neck which is conspicuously curved and enlarged toward the base, 3.5–5 cm long, 1–2 cm wide at the mouth, the lobes 0.7–1.3 cm long, the tube 3–4 cm long, puberulous outside, with several-celled flexuous trichomes especially toward base, pubescent inside at level of stamen insertion and sparsely so with long trichomes in tube; stamens didynamous, the anthers monothebate, the second theca reduced to a minute appendage, each theca ca. 2 mm long, the staminode 2–2.5 cm long, included, the middle third and apex glandular villous, the apex not expanded; ovary flattened-ovate, 2 mm long, 2 mm wide, glabrous; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* orbicular to slightly elliptic or ovate-elliptic, obtuse to acutish at apex, truncate to rounded at base, 3–6 cm long, 2–4.5(–5) cm wide, the margin not undulate at dehiscence, glabrous,

drying dark brownish with lighter flecks; *seeds* small-bodied with a surrounding suborbicular wing, 1–1.5 cm long, 1.4–2.4 cm wide, the wing hyaline-membranaceous, sometimes with radial brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 21). Dry Inter-Andean Valleys of central and northern Peru; 1000–2300 m.

Representative specimens examined. PERU. AMAZONAS: Balsas-Leimebamba, 17 Jun 1978 (fl), *Gentry et al. 23127* (MO). CAJAMARCA: 13 km NW of Pucara on road to Olmos, 10 Jun 1978 (fr), *Gentry et al. 22683* (MO, USM); Cajabamba, Condebamba valley, Cajabamba-Cajamarca road, 15 Feb 1983 (fr), *Smith & Vasquez 3411* (MO, USM). HUÁNUCO: Huánuco, Acomayo, 11 Nov 1964 (fl, fr), *Ferreyra 16116* (MO, USM); 10 km N of Huánuco, 13 Apr 1977 (fr), *Gentry 19237* (AAU, MO, USM).

Common names. Yaravisco, paravisco.

As here interpreted (following Sandwith, 1954) this is an endemic species of Peru, while the closely related and widely cultivated *J. mimosifolia* is native farther south in Bolivia and northwestern Argentina. Additional Peruvian collections weaken most of the supposed differentiating characters between these two species. *Jacaranda acutifolia* can have as many as 22 pinnae and *J. mimosifolia* as few as 13. The calyx of material of *J. acutifolia* examined by us is only 1.5–2.5 mm long, thus barely or not at all larger than in *J. mimosifolia*, while the fruits, though usually narrower, can be as wide as 5 cm while those of *J. mimosifolia* are occasionally as small as 4 cm. While the fruits of *J. acutifolia* are never wider than long and tend to be more cuspidate at apex, occasional *J. mimosifolia* fruits can also approach this form. Impressed leaflet venation above is always lacking in *J. acutifolia* but also

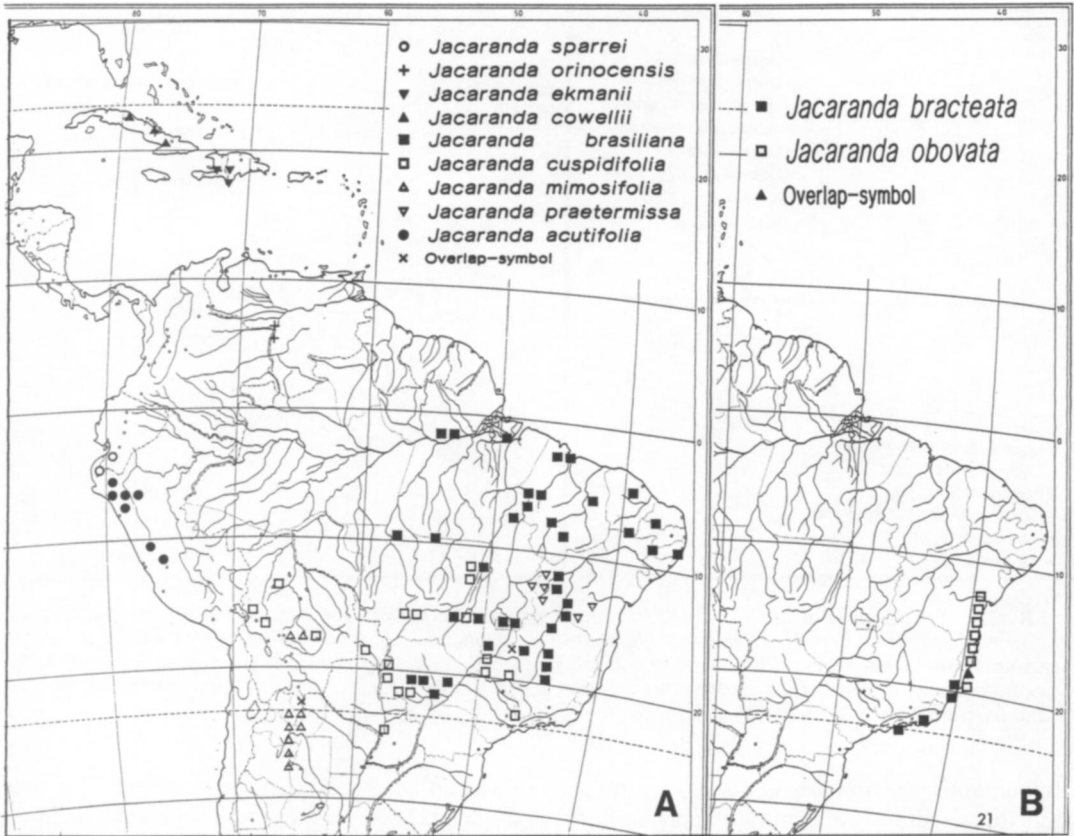


FIG. 21. Distribution of *Jacaranda*. A, *Jacaranda* section *Monolobos*. ● = *J. acutifolia*; ■ = *J. brasiliiana*; ▲ = *J. cowellii*; □ = *J. cuspidifolia*; ▼ = *J. ekmanii*; △ = *J. mimosifolia*; ○ = *J. sparrei*; + = *J. orinocensis*; ▽ = *J. praetermissa*. B, *Jacaranda* section *Dilobos*. ■ = *J. bracteata*; □ = *J. obovata*.

in some cultivated collections of *J. mimosifolia*. Nevertheless, the two plants have a decidedly different aspect where they grow together in the Marañón Valley (*J. mimosifolia* in cultivation), especially in the deeper blue flower color and tendency to smaller leaves with more widely separated (2–3 cm apart vs. 1.3–2 cm) of *J. acutifolia*. Therefore, we retain these two species as distinct, but with some reservation.

2. *Jacaranda arborea* Urban, Symb. antill. 7: 375. 1912. Type. Cuba. Oriente (Guantanamo): Monteverde, Wright 360 (lectotype, GOET; isotypes, G, K, NY, W).

Shrub or small *tree* 2.5–8 m tall, the branchlets subterete. *Leaves* bipinnate, with (2)–6–10 pinnae, each pinna with slightly winged glabrous

rachis and 7–19 sessile obovate to asymmetrically oblong-obovate leaflets, these 1–2 cm long and 0.5–1 cm wide, apex rounded or retuse, the base cuneate to poorly demarcated petiole (to 2–3 mm long in uppermost leaflets), coriaceous, completely glabrous except for dense whitish scaling below, the margin involute. *Inflorescence* a few-flowered terminal panicle, glabrous, the bracts subulate, ca. 1 mm long, caducous. *Flowers* with the calyx cupular, acutely 5-dentate to near middle, 1.5–2 mm long and 2–3 mm wide, completely glabrous; corolla bluish-purple, tubular-campanulate above a narrow neck which is curved and enlarged toward the base, ca. 2.5 cm long, ca. 1 cm wide at the mouth, the lobes ca. 0.5 cm long, the tube ca. 2 cm long, lepidote glandular outside, also with minute more or less appressed trichomes, mostly near base; stamens

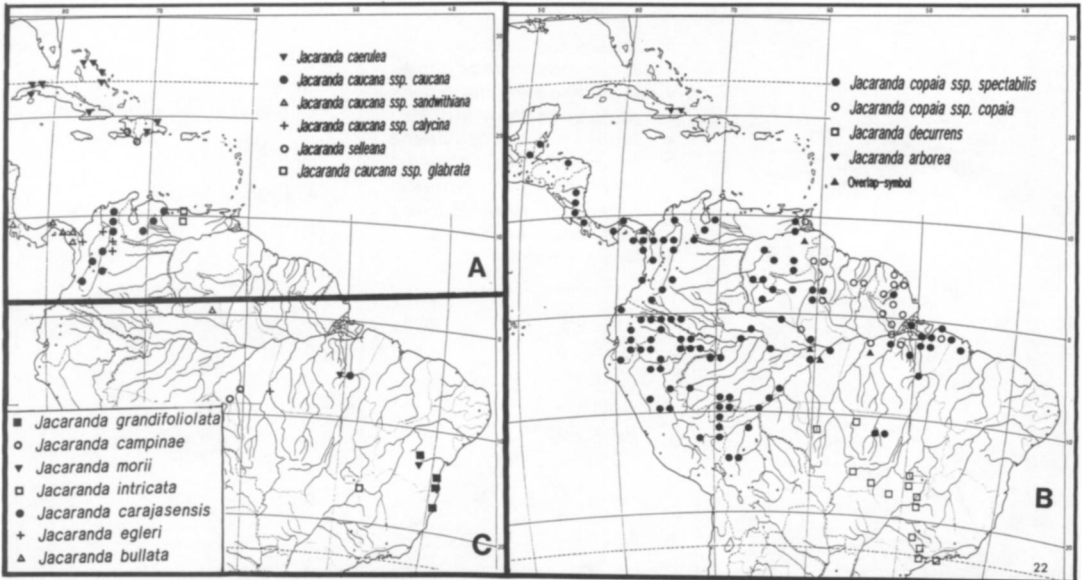


FIG. 22. Distribution of *Jacaranda*. **A**, *Jacaranda* section *Monolobos*. ● = *J. caucana* ssp. *caucana*; + = *J. caucana* ssp. *calcyina*; □ = *J. caucana* ssp. *glabrata*; △ = *J. caucana* ssp. *sandwithiana*; ▼ = *J. caerulea*; ○ = *J. selleana*. **B**, *Jacaranda* section *Monolobos*. ▼ = *J. arborea*; ○ = *J. copaia* ssp. *copaia*; ● = *J. copaia* ssp. *spectabilis*; □ = *J. decurrens*. **C**, *Jacaranda* section *Dilobos*. △ = *J. bullata*; ● = *J. carajasensis*; ○ = *J. campinae*; ■ = *J. grandifoliolata*; □ = *J. intricata*; ▼ = *J. morii*; ± = *J. egleri*.

didynamous, the anthers monothecate, the second theca reduced to a minute appendage, the long staminode subexserted, glandular-pubescent; ovary flattened-ovate. *Fruit* elliptic, thinly woody, rounded at base and apex, ca. 3 cm long, ca. 1.7 cm wide, the margin not undulate at dehiscence, glabrous except for a few lepidote scales, drying brown; *seeds* thin, bialate, 5–7 mm long, 13–17 mm wide, the wing hyaline-membranaceous at tip, brownish at base, indistinctly demarcated from the seed body.

Distribution (Fig. 22). Serpentine areas of Cuban Oriente; near sea level.

Representative specimens examined. CUBA. GUANTÁNAMO: Cerro de embocadura del Río Yamonigüey, Moa, 24 Mar 1970 (fl), *Borhidi et al. s.n.* (HAC27944) (HAC); Moa region, near Moa, 19 Jul 1951 (fl, fr) *Webster 3821* (MICH). HOLGUÍN: Los Mulos, Sierra Cristal, Mayari, *Budowski s.n.* (HAC24155); Sierra de Nipe, Loma de Estrella, 29 Jul 1914 (st), *Ekman 2264* (B, S); Sierra de Nipe, Río Piloto, 30 Jul 1914 (fl), *Ekman 2298* (B, MO, S).

Common name. Abey.

Closely related to *J. caerulea*, differing in the more coriaceous leaflets with densely whitish-lepidote smooth lower surface and involute mar-

gins and in the thinner fruit valves. The two species are also ecologically separated, with *J. arborea* restricted to serpentine.

3. *Jacaranda bracteata* Bureau & K. Schumann in Martius, Fl. bras. 8(2): 369. 1897. Type. Brazil. Rio de Janeiro (probably), *Sellow s.n.* (not seen).

Shrub or *tree* (1.5–)3–15 m, the branchlets subterete, glabrous, with scattered whitish lenticels when young. *Leaves* bipinnate, with 6–10 pinnae, each pinna with strongly canaliculate glabrous rachis and 3–13 distinctly petiolulate, somewhat asymmetric, elliptic to rhombic-elliptic leaflets, these 1–7(–7.5) cm long, 0.5–3(–3.4) cm wide, apex acutish to usually rather apiculately obtusely acuminate, the base cuneate, conspicuously lepidote-glandular, otherwise glabrous, rather glossy, subcoriaceous, the margin entire; lateral petiolules 1–8 mm long, the terminal to 3 cm. *Inflorescence* an open terminal panicle, very minutely and inconspicuously puberulous, usually with persistent oblanceolate leafy bracts to 1.5 × 0.7 cm. *Flowers* with the calyx cupular, subtruncate to irregularly shallowly 2–5-lobed,

4–7 mm long, 3–6 mm wide, subglabrous, usually with a few minute trichomes at apex or near base; corolla wine-colored to purplish-blue, tubular-campanulate above a narrow basal tube, 3.5–6 cm long, 1–2 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 3–5 cm long, sparsely puberulous outside, with minute subappressed trichomes and sessile lepidote glands, more densely puberulous on lobes, especially in bud, glabrous inside except on the stamen insertions; stamens didynamous, the anthers dithecate, each theca 2 mm long, the staminode 3–3.5 cm long, subexserted, the middle third and apex glandular villous, the upper part with shorter gland-tipped trichomes, the apex capitate or sub-T-shaped; ovary flattened-ovate, 1.5 mm long, 1.5 mm wide, glabrous, slightly contracted at base; disk pulvinate, 1 mm long, 2 mm wide. *Fruit* elliptic or oblong-elliptic, thinly woody, 3.5–7.5 cm long, 2.5–4 cm wide, the margin usually not undulate at dehiscence (distinctly undulate in *Gentry et al.* 49470), glabrous except for scattered lepidote scales, drying dark brown or blackish with paler flecks; *seeds* small-bodied with surrounding elliptic or suborbicular wing, 0.7–1.1 cm long, 1.5–2.5 cm wide, the wing hyaline-membranaceous at edge, with radial brownish striations at base, not very sharply demarcated from the seed body.

Distribution (Fig. 21). Restingas of central coastal Brazil from northern Rio de Janeiro to southernmost Bahia; near sea level.

Specimens examined. BRAZIL. BAHIA: Rod. BR 101, Rio Mucri, 19 Oct 1983 (fl), *Hatschbach & Guimarães* 47013 (MO). ESPÍRITO SANTO: Praia das Neves (Pr. de Moroba), 18 May 1983 (fr), *Araujo & Maciel* 5606 (MO); Linhares, 18 Jan 1975 (fl, fr), *Benson* 39 (MO); Linhares, Povoação, 17 Oct 1983 (fl), *Hatschbach & Guimarães* 46917 (MO); Mun. Serna, BR101, 10 km S de Nova Carapina, 5 Feb 1985 (fl, fr), *Peixoto et al.* 3520 (MO). RIO DE JANEIRO: Mun. de Macae, 3 km de Quicama, 13 Feb 1980 (fl), *Araujo* 3482 (MO); Mun. Macae, restinga de Carapebus, 10 Feb 1981 (fr), *Araujo & Maciel* 4285 (MO); Angua das Reis, Ilha Grande, 19 Dec 1984 (fl), *Araujo et al.* 6488 (MO); Restinga de Macae, 11 Jan 1985 (fl, fr), *Gentry et al.* 49452 (MO), 49467 (MO), 49470 (MO).

Very close to *J. obovata* and perhaps only a southern variant of that species, differentiated by the more acute, usually less coriaceous, often green-drying leaflets. The northern collections from southernmost Bahia are somewhat intermediate with more coriaceous, less acuminate

leaflets. Were it not that *J. bracteata* grows sympatrically with and seems quite distinct from *J. obovata* near Linhares, Espírito Santo, we would have been inclined to treat them as conspecific.

4. *Jacaranda brasiliana* (Lamarck) Persoon, Syn. pl. 2: 174. 1807.

Bignonia brasiliana Lamarck, *Encycl.* 1: 425. 1785. Type. Brazil. Not seen; based on Piso, Bras. 165.

Tree (3–)4–10 m tall, to 20 cm dbh., the branchlets subterete, glabrous or with a few widely scattered trichomes or lepidote scales, often with whitish lenticels. *Leaves* bipinnate, with 17–31 pinnae, each pinna with narrowly subwinged or deeply canaliculate, more or less sparsely pilose rachis, and 30–50 sessile, asymmetrically elliptic or oblong leaflets, these less than 1.4 cm long and 0.4 cm wide, apex obtuse to apiculate, the base asymmetrically cuneate, usually more or less pilose with long flexuous trichomes at least near midvein below, chartaceous, the margin entire, only the midvein evident below. *In-florescence* a large open panicle, sparsely puberulous, in part with gland-tipped trichomes, bracts not apparent. *Flowers* with the calyx 5-lobed to near base, the lobes ovate, acute to obtuse, 3–4 mm long, ca. 2 mm wide, puberulous, in part with long gland-tipped trichomes; corolla blue to bluish purple, tubular-campanulate above a somewhat narrowed neck which is slightly curved and enlarged toward the base, 4–5.5 cm long, 1–2 cm wide at the mouth, the lobes ca. 1 cm long, the tube 3–4.5 cm long, densely glandular pilose near base outside, otherwise very sparsely pubescent, also with some longer trichomes on lobes, mostly glabrous inside except for a few long flexuous trichomes along nerves and more or less densely glandular villous at stamen insertion; stamens didynamous, the anthers monothebate, the second theca reduced to a minute appendage, the theca 2 mm long, the staminode 3–3.5 cm long, subexserted, gland-tipped pilose from middle to apex; ovary flattened-ovate, 1.5–2 mm long, 1.5 mm wide, glabrous; disk patelliform-pulvinate, 1 mm long, 2.5 mm wide. *Fruit* more or less oblong-orbicular, extremely woody, ca. (7–)10–12 cm long, (5.5–)8–10 cm wide, the margin broadly undulate at dehiscence, more or less glandular-lepidote, otherwise glabrous, drying tan; *seeds* not seen.

Distribution (Fig. 21). A characteristic species

of the cerrado and campos cerrados, also in gallery forest. Mato Grosso and Minas Gerais to Pernambuco, Maranhão and southern Pará. From 200–1000 m elevation.

Representative specimens examined. BRAZIL. BAHIA: St. Thome, 1844 (fl), *Blanchet 3774* (B, G, P). CEARÁ: Banks of Rio Cauipe, Cauipe, Mun. Soure, 17 Oct 1935 (fl), *Drouet 2621* (MICH, MO). DISTRITO FEDERAL: 30 km E of Brasília, 19 Sep 1964 (fl), *Prance & Silva 59063* (B, MO, UB). GOIÁS: Caldas Novas, 1 km da ponte do Rio Corumba, 8 Sep 1976 (fl), *Gibbs et al. 2835* (M, MBM, UB). MARANHÃO: Maracassume river region, 26 Oct 1932 (fl), *Frões 1987* (MICH, MO). MATO GROSSO: Xavantina, 26 Sep 1964 (fr), *Irwin & Soderstrom 6343* (C, MO, NY). MINAS GERAIS: Corinto, Fazenda do Diamante, trail to Serra do Angico, 13 Apr 1931 (fr), *Mexia 5604* (G, MICH, MO, WIS). PARÁ: Igarape Gameleirinha, Araguaia, 16 Jun 1953 (fr), *Frões 30084* (IAN). PARAÍBA: Parahyba do Norte, Serra do Araripe, Aug 1921 (fl), *Luetzelburg 12539* (M). PERNAMBUCO: Tapera, Dec 1930 (fl), *Pickel s.n.* (MICH, MO, WIS). PIAUÍ: Castelo-do-Piauí, 14 Aug 1979 (fl), *Salgado 93* (MO).

Common names. Castelo do cavallo, caroba.

A well-marked species on account of its large woody undulate-margined fruit (the biggest in the genus), the numerous small rather obtuse leaflets and the deeply split calyx with obtuse to acutish lobes. Its closest relatives are *J. cuspidifolia*, allopatric in the western and southern part of the cerrado, which has acuminate leaflets, narrower long-acuminate calyx lobes and fruits only 4.5–8 cm long and 4.5–7 cm wide, and *J. praetermissa* of the caatinga/cerrado interface, which has a much smaller fruit and much thicker, strongly bullate leaflets with truncate or cordate bases. In the contact zone between *J. cuspidifolia* and *J. brasiliana* in Mato Grosso there are occasional apparent hybrids, e.g., *Santos & Souza 1649*, Xavantina-São Felix Road (RB) with the leaves of *J. cuspidifolia* and fruit of *J. brasiliana*. *Cordeiro & Mello-Silva s.n. (CFCR10129)* (SPF) from Rio Itacambirucu, Minas Gerais, has a fruit only 5.5 by 7 cm but the flowers and leaves of typical *J. brasiliana*.

5. *Jacaranda bullata* A. Gentry, Ann. Missouri Bot. Gard. 65: 729. 1978. Type. Brazil. Amazonas: Margem do Rio Araca (Rio Negro drainage north of Barcelos), 29 Oct 1952 (fl, fr), *Frões & Addison 29141* (holotype, IAN; isotypes, K—2 sheets, US, MO—fragm.).

Fig. 23.

Branchlets subtetragonal, without noticeable lenticels. *Leaves* simply pinnate with narrowly winged rachis from the decurrent leaflet bases and 11–17 leaflets; leaflets asymmetrically elliptic or rhombic-elliptic, acutish at the apex, obtuse at base, subsessile, membranaceous, 2–7 cm long, 0.6–2.3 cm wide, entire to remotely serrate, glabrous above, puberulous with short curved trichomes along the margin and the veins beneath, more or less bullate with all the veins impressed above and raised beneath. *Inflorescence* terminal, very narrowly paniculate, almost racemose, the lateral branches 2–3-flowered and mostly less than 1 cm long, puberulous. *Flowers* with the calyx campanulate, essentially truncate, minutely and evenly 5-denticulate, 5 mm long, 4 mm wide, sparsely lepidote, otherwise glabrous or with a few minute trichomes near the margin; corolla pink (“rosea”), narrowly tubular-campanulate, 4 cm long, 0.8 cm wide at the mouth of tube, the tube 3.5 cm long, the lobes 0.5 cm long, minutely stalked glandular-lepidote outside, conspicuously so in bud, very inconspicuously so at anthesis, the lobes puberulous outside and inside, especially toward tips; stamens didynamous, the anthers dithecate, each theca 2.5 mm long, the staminode ca. 2.8 cm long, capitate, glandular villous for the middle 5 cm and the apical 6 cm, otherwise glandular-lepidote; ovary flattened ovate, ca. 1.3 mm long and wide, glabrous; disk patelliform, ca. 0.5 mm long and 2.5 mm wide. *Capsule* elliptic, strongly compressed, subacute at the base and the apex, 3.7–5 cm long, 2.3–3 cm wide, glabrous except for a few scattered lepidote scales; *seeds* 0.7–1 cm long, 1.4–1.7 cm wide, the brown seed body almost surrounded by the thin brownish-hyaline wings.

Distribution (Fig. 22). Known only from the type collection from terra firme of the upper Rio Negro.

One of relatively few simply pinnate species of *Jacaranda*, it differs from *J. egleri* of the Rio Tapajos region in the larger, less coriaceous, bullate leaflets, pubescent inflorescence, truncate calyx, larger corolla and larger capsule; and differs from *J. campinae* especially in the terminal inflorescence, small elliptic fruit, and bullate leaflets.

6. *Jacaranda caerulea* (Linnaeus) Jussieu, Gen. pl. 138. 1789.



FIG. 23. *Jacaranda bullata*. **A**, fruiting shoot, $\times 0.6$; **B**, flower, $\times 0.6$. (From *Ann. Missouri Bot. Gard.* 65; *Froes & Addison 29141*.)

Bignonia caerulea Linnaeus, Sp. pl. 2: 625. 1753. Type.

Bahamas ("Carolina"): Providencia, Catesby t. 42.

Jacaranda caroliniana Persoon, Syn. pl. 2: 174. 1807. Nom. nov. for *B. caerulea* Linnaeus.

Jacaranda bahamensis R. Brown, Bot. Mag 49: t2327. 1822. Type. Bahamas. Specimen without data, Herb. Banks (BM).

Jacaranda sagraeana A. P. de Candolle, Prodr. 9: 229. 1845. Type. Cuba. Havana: Prope Havanam, *de la Sagra s.n.* (G-DC).

?*Jacaranda abbottii* Urban, Feddes Repert. 7: 370. 1922. Type. Dominican Republic. Samaná: Laguna, Pílon de Azúcar, 100–500 m, *Abbott 460* (*B, not seen); topotype here designated as neotype, *Ekman H14955* (B).

Tree to 12 m tall, the branchlets subtetragonal, very minutely and glabrescently puberulous, with whitish lenticels. *Leaves* bipinnate, to 40 cm long, with 8 to 26 pinnae, each pinna with glabrous or adaxially sparsely puberulous rachis and 9–29(–35 fide Correll & Correll, 1982) sessile, asymmetrically oblong-elliptic leaflets, these (0.5–)1–2 cm long and (0.3–)0.5–1 cm wide, apex rounded to subacute, the base cuneate, more or less lepidote below, otherwise glabrous except for minute trichomes along margin and sometimes midvein, often with a beard of longer trichomes along base of midvein below. *Inflorescence* an open panicle, minutely puberulous, with caducous bracts. *Flowers* with the calyx campanulate, shallowly acutely 5-dentate (2–3–)5–6 mm long, ca. 3 mm wide, puberulous with subappressed trichomes; corolla purplish blue, tubular-campanulate above a narrow neck which is curved and enlarged toward the base, 3.5–4 cm long, 1–1.4 cm wide at the mouth, the lobes ca. 0.8 cm long, the tube 2.5–3 cm long, puberulous outside, with sessile lepidote glands and minute simple trichomes, villous on lower lobe, glabrous inside, even at stamen insertion; stamens didynamous, the anthers monotheate, the second theca reduced to a minute appendage, each theca 2–2.5 mm long, the long staminode ca. 2 cm long, subexserted, the middle third and apex glandular pubescent; ovary flattened-ovate, 2 mm long, 1.5 mm wide, glabrous; disk cylindrical, 1 mm long, 1.5 mm wide. *Fruit* elliptic, woody-valved, rounded to truncate at base and apex, 3.5–5 cm long, 2.5–3.5 cm wide, the margin not undulate but rolling up at dehiscence, glabrous, drying tannish brown; *seeds* small-bodied with a surrounding suborbicular wing 0.9–1.4 cm long, 1.8–2 cm wide, the wing hyaline-membranaceous with ra-

dial brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 22). The Bahama Islands, Cuba, and northern Hispaniola, mostly on limestone; sea level to 300 m elevation.

Collections examined. BAHAMAS. NEW PROVIDENCE: *Eggers 4427* (C, M, NY, WU); Nov 1866 (fl), *Krebs s.n.* (C). LONG ISLAND: *Hill 2405* (NY); GREAT EXUMA: *Britton & Millspaugh 3003* (NY); CAT ISLAND: Orange Creek, *Britton & Millspaugh 5181* (NY); 1 mi NE of Bennets Harbor, 18 Aug 1967 (fl, fr), *Byrne 252* (WIS). ANDROS: Deep Creek, 27 Jun 1890 (fl), *John & Northrop 701* (G); Nichols Town and vic., *Brace 6850* (NY). ELEUTHERA: *Britton 6481* (NY); 1 mi S of Savannah Sound, 24 Jul 1969 (fl), *Proctor 30965* (LL).

CUBA. Sin. loc., *Wright 3034* (G, MO), *Rugel 862* (NY). CAMAGÜEY: Finca Sta. Irene, Sep 1944 (fr), *Gutierrez 741* (HAC); El Quemado, 15 May 1915 (fl), *Roig et al. 6141* (HAC); Finca Salvia, 24 Apr 1952 (st), *E. Smith 516* (HAC). GUANTÁNAMO: Papayo prope Sevilla, *Ekman 9310* (G, MO, NY). HOLGUÍN: Holguín airport, 13 Jul 1985 (fr), *Gentry 51028, 51035* (both MO). HAVANA: Río Cojimar, 9 Sep. 1921 (st), *Ekman 13170* (MO); near Cojimar, 26 Apr 1917 (fl), *Leon 7170* (HAC); 22 Jun 1916 (fl), *León & Roca 6279* (NY); Montes de Bartolina, Batabano, 1 Aug 1930 (st), *Leon 14637* (HAC); Quintana de los Molinos, Habana, 10 Nov 1914, *Roig 5832* (HAC). LAS TUNAS: Zona de Puerto Padre, 1932 (fr), *Curbelo 176* (HAC). PINAR DEL RÍO: Corrientes Bay, *Britton & Cowell 9934* (NY); Rangel, Jan 1956 (st), *Alain & Chrysogone 5273, 6088* (both HAC); El Brujo, El Rosario, May 1927 (fl), *Fors s.n.* (*Roig 4371*) (HAC); Tetras de María La Gorda, Pen. Guanahacabibes, Oct 1967 (fr), *Yero 26513* (HAC). SANTIAGO DE CUBA: Cercana de Cabanas, 3 Jan 1920 (fr), *Clemente 202* (HAC); camino viejo del Morro de Santiago de Cuba, Jul 1943 (fl, fr), *Clemente 2475* (HAC); Cupey inter Mir et Cacocum, 7 Mar 1915 (st), *Ekman 4921* (MO); Santiago de Cuba, 10 Dec. 1916 (st), *Ekman 8479* (B, MO); Puerta Gaviota, cerca Playa Siboney, *Lopez-Figueiras 519* (HAC); cerca Bahía de Nispero, 24 Aug 1952 (fl, fr), *López-Figueiras 607* (HAC).

HAITI(?). Sosua Settlement, *Holdridge 515* (NY).

DOMINICAN REPUBLIC. SAMANÁ: Pan de Azúcar, 300 m, 4 May 1930 (st), *Ekman H14888* (B); Laguna, 13 May 1930 (fl), *Ekman H14955* (B).

Common names. Bahamas: Boxwood, cancer tree, what-o'clock. Cuba: abey macho, framboyan azul, abey.

Along with *J. arborea*, this species has the largest leaflets of Antillean *Jacaranda*. Its woodier fruit and less coriaceous leaflets with more or less reticulate undersurface distinguish it from *J. arborea*. It is not at all certain that *J. abbottii*, endemic to the Samaná Peninsula of Hispaniola, which is intermediate between this species and *J. poiteai*, is correctly assigned here. It has a

smaller calyx as in *J. poiteai* and fruiting collections are needed.

7. *Jacaranda campinae* A. Gentry & Morawetz, *Phytologia* 57: 244. 1985. Type. Brazil. Amazonas: TransAmazon Hwy. 53 km W of Aripuana River, 29 Jun 1979 (fl), *Calderón et al. 2719* (holotype, MO; isotypes, US, INPA).

Shrub 1–2 m tall, the branchlets subterete to subtetragonal, glabrous, lenticellate, rather prominently longitudinally ridged. *Leaves* simply pinnate, 7–9-foliolate, the petiole and rachis strongly winged, the wing to 1 cm wide, the leaflets elliptic to narrowly ovate, 2–8 cm long, 1.5–3.8 cm wide, acute to obtuse at apex, rounded to broadly cuneate at base, coriaceous, completely glabrous except for conspicuous impressed lepidote glands below, drying dark brown above, brownish tan below, the ultimate venation intricately prominulous above and below. *Inflorescence* a contracted few-flowered axillary raceme, sometimes reduced to one or two flowers, glabrous to minutely and inconspicuously puberulous, slender and rather conspicuously jointed from the raised pedicel attachments. *Flowers* with the calyx campanulate, 4–5 mm long, ca. 3 mm wide, shallowly 5-dentate, glabrous except the ciliate margin and a few appressed hairs on inside of lobes; corolla lilac to pink-violet, tubular-campanulate above the narrowly tubular base, finely puberulous outside especially toward apex, with a few stalked glands near base, the lobes puberulous inside, ca. 3 cm long, ca. 7 mm wide at mouth of tube, the tube 2.5 cm long, the lobes ca. 3 mm long, the stamens didynamous, 2-thecate, each theca ca. 1 mm long, the staminode subexserted, capitate, the apex densely glandular-villous; ovary flattened-ovoid, glabrous, ca. 1 mm long and wide, the annular disk 0.5 mm long, ca. 1 mm wide. *Fruit* oblong-elliptic, rounded to truncate at base and apex, thin, flattened, 3–4 cm long, 2.5–3 cm wide; *seeds* thin, bialate, ca. 1 cm long by 2–2.5 cm wide, the brownish-veined subhyaline wings indistinctly demarcated from seed body.

Distribution (Fig. 22). Endemic to white sand campinas of the Rio Madeira drainage in the border area between Amazonas, Rondônia, and Mato Grosso States in southern Amazonian Brazil.

Collections examined. BRAZIL. AMAZONAS: TransAmazon Hwy. 53 km W of Aripuana River, 27 Jun 1979 (fl), *Calderón et al. 2683* (MO, US), (fl, fr), *Calderón et al. 2719* (MO); Mun. de Manicore, BR230, 243 km de Humaita, 24 Apr 1985 (fl), *Cid 5816* (MO); Mun. Novo Aripuana, BR230, 30 Apr 1985 (fr), *Cid 5900* (MO). RONDÔNIA (“Mato Grosso”): Tabajaza, upper Machado River, Nov–Dec 1931 (fr), *Krukoff 1482* (BM, G, K, MICH, NY, U).

Related to *J. eglei* by its simply pinnate leaves and shrubby habit. Differs from that species in its much larger leaves and leaflets, reduced axillary inflorescences, more puberulous corollas, and larger (2–3.5 × 1.5–2 cm in *J. eglei*), more oblong fruits.

8. *Jacaranda carajasensis* A. Gentry, sp. nov. Type. Brazil. Pará: Maraba, Serra dos Carajas, entrada da estrada para a serraria, mata, terra firme, 5 Apr 1977 (fr), *M. Silva & R. Bahia 3040* (holotype, MO).

Arbor 15 m alta. Folia bipinnata, pinnis 8–12, foliolis in quoque pinna 5–15, oblongis, acutis vel subacuminatis, petiolulatis, infra puberulis. Inflorescentia floribus in panícula terminali dispositis. Capsula elliptica, 6.5–7.5 cm longa, 5.5–6 cm lata, margine undulata.

Tree 15 m, 40 cm dbh, the branchlets subtetragonal, minutely puberulous, apparently without whitish lenticels. *Leaves* bipinnate, with 8–12 pinnae, each pinna with slightly canaliculate, strongly puberulous rachis and 5–15 short-petiolulate (petiolules 1–2 mm long) asymmetrically oblong (half ovate/half obovate) leaflets, these (1–)2–3.5 cm long and (0.5–)1–1.8 cm wide, the terminals rhombic-obovate and slightly larger, apex acute to subacuminate, the base broadly cuneate to rounded, sparsely and minutely puberulous on upper surface, below persistently puberulous along veins and very slightly over surface, slightly bullate, membranaceous, the margin entire to inconspicuously remotely serrate, drying black above and dark olive below. *Inflorescence* a terminal panicle, densely puberulous. *Flowers* not seen, with the calyx persisting in fruit, apparently irregularly 5-dentate and 5–7 mm long. *Fruit* elliptic, thinly woody, 6.5–7.5 cm long, 5.5–6 cm wide, the margin strongly undulate at dehiscence, glabrous, drying blackish with scattered brownish lenticels; *seeds* not seen.

Distribution (Fig. 22). Apparently endemic to

the Serra dos Carajas iron outcrop in Brazil's Pará State.

Although description of a new *Jacaranda* based only on fruits may seem inadvisable, there is little doubt that this represents a new species. Moreover, its morphology, especially the remnants of the large cupular calyx, make it possible to assign it to section *Dilobos* with a good deal of confidence. The largish, slightly bullate leaflets are reminiscent of *J. macrantha* but the strongly undulate fruits are like those of *J. micrantha*. The leaves have a peculiar open form resulting from the relatively wide separation (usually by 5–6 cm) of adjacent pairs of pinnae.

9. *Jacaranda caroba* (Vellozo) A. P. de Candolle, Prodr. 9: 232. 1845.

Bignonia caroba Vellozo, Fl. flumin. 250. 1829. Type illustration. Brazil. Rio de Janeiro. Atl. Fl. flumin. 6: t. 43. 1831. Neotype. Brazil. Barbacena, *Pohl 223* (F, W), designated Morawetz, 1982.

Jacaranda clauseniana Casaretto, Nov. stirp. bras. 6: 53. 1843. Type. Brazil. Minas Gerais, *Claussen 26190* (holotype, G; isotypes, BR (as 648), K).

Jacaranda mendoncae Bureau & K. Schumann in Martius, Fl. bras. 8(2): 383. 1897. Type. Brazil. São Paulo: Prope Jacarehy, *Mendonça 144* (not seen).

Tree or shrub 0.7–3 m, the branchlets subterete, usually glabrous, sometimes minutely puberulous, usually with whitish lenticels (even on petiole). *Leaves* bipinnate, (11–)20–30(–39) cm long, with 8 to 10(–12) pinnae, each pinna with grooved or sub-winged, glabrous to somewhat puberulous rachis and (3–)9–13(–17) sessile or subsessile elliptic or obovate leaflets, these (1.2–)2–5(–7) cm long and (0.5–)0.8–1.5(–3) cm wide, the apex obtuse to acute, the base cuneate, more or less glabrous except for lepidote glands, sometimes with a few minute trichomes near margin, coriaceous or subcoriaceous, the margins entire (very rarely a few leaflets with one or two irregular teeth). *Inflorescence* a usually rather open panicle, completely glabrous to minutely puberulous, with caducous subulate bracts, sometimes from the old wood. *Flowers* with the calyx cupular, subtruncate to shallowly 5-dentate, 4–11 mm long and 4–7 mm wide, usually glabrous or very sparsely and inconspicuously puberulous; corolla light to dark purple, tubular-campanulate above a narrow basal tube, 1–2 cm wide at the mouth, the lobes 1–1.5 cm long, the tube 3.5–5.5 cm long, more or less puberulous outside,

with simple and gland-tipped trichomes, the latter in part sessile, with longer simple trichomes on lobes, the lobes ciliate, somewhat glandular on inner surface, otherwise glabrous inside except at the stamen insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the long staminode 3–4 cm long, usually subexserted, the apex entire or slightly bifid, glandular villous, especially on apex and near middle; ovary flattened-ovate, 2 mm long, 1.2 mm wide, glabrous; disk short-cylindric, 1 mm long, 2 mm wide. *Fruit* elliptic or almost round, obtuse at base and apex, subwoody, 4–7 cm long, (2.5–)3–4 cm wide (l:w = 1.3–2.4), the margin not at all or very slightly undulate at dehiscence, glabrous with a somewhat papillate surface, drying brown to blackish; *seeds* small-bodied with a surrounding elliptic wing, 0.7–1 cm long, 1.2–1.5 cm wide, the wing hyaline-membranaceous with basal tannish striations, clearly demarcated from the seed body.

Distribution (Fig. 26). Brazilian Cerrado, São Paulo, Minas Gerais, Goiás, and the Distrito Federal; 600–1600 m elevation.

Representative specimens examined. BRAZIL. AMAZONAS: Maua, 14 Dec 1897 (fl), *Ule 4587* (HBG). **BAHIA:** Vitoria da Conquista, 16 Oct 1981 (fl), *Hatschbach 44281* (MO). **DISTRITO FEDERAL:** Chapada da Contagem, ca. 20 km E of Brasília, 15 Aug 1964 (fl), *Irwin & Soderstrom 5137* (C, MO, NY). **GOIÁS:** Fazenda Monjolinho, 20 km NE of Anapolis, 5 Jun 1943 (fl), *Cutler 8011* (F, MO, US). **MINAS GERAIS:** Serra do Cipo, S. Luzia, 26 Oct 1961 (fl), *Duarte 6431* (MO, RB). **SÃO PAULO:** Mogi Guaçu, Faz. Campininha, 29 Oct 1975 (fr), *Morawetz 11-291075* (MO, W).

Local names. Caroba, caroba muuda.

A common and characteristic shrub of the cerrado but not very strongly differentiated from several relatives. A southwestern relative (*J. mutabilis*) differs in narrower acuminate leaflets and a tendency to be more pubescent; an even narrower leafleted form from Paraná, São Paulo, and Minas Gerais is recognized as *J. oxyphylla*.

Arborescent forms that have been attributed to *J. caroba* (e.g., *Irwin & Soderstrom 5974, 5306, Irwin et al. 12157, Heringer et al. 1869, Maguire et al. 49252*) tend to have more pubescence on calyces, inflorescence, and leaf midveins below and are here assigned to *J. puberula*. It is possible that *J. caroba* itself is insufficiently distinct from *J. puberula* for specific recognition. As here interpreted, *J. caroba* is always a shrub or subshrub

0.7–3 m tall and has the leaflet midveins below completely glabrous or occasionally with two or three widely scattered minute trichomes. The cerrado form of *J. puberula* is a small to medium-sized tree 3–10 m tall (rarely fertile when only 2.5 m tall) and has the leaflet midveins below distinctly puberulous. Apparently these two forms are ecologically distinct, with *J. puberula* occurring mostly in gallery forest and *J. caroba* in open cerrado. According to George Eiten (pers. comm., 17 Feb 88), noted cerrado expert, there definitely seem to be two ecologically distinct taxa in the cerrado region although there is some intergradation. While he suggests that *J. caroba* might best be treated as a subspecies, we have tentatively opted to retain it as a distinct species.

Although we have seen no authentic material of *Jacaranda mendoncaei*, the only remotely similar suffruticose species that grows in the São Paulo cerrados is *J. caroba* and the description fits that species. The openly dichotomously-branching (rather than pyramidal), inflorescence emphasized as a distinguishing feature from *J. caroba* by Bureau and K. Schumann is not a significant difference and can occur throughout the range of *J. caroba*.

One specimen from the Distrito Federal (*Genety 21466* (MO, UB)) from Chapada do Contagem, 1100 m, appears to be a hybrid between *J. caroba* and *J. ulsei*. It has the aspect of *J. caroba* but with somewhat narrower, intermediately pubescent leaflets.

10. *Jacaranda caucana* Pittier, Contr. U.S. Natl. Herb. 18: 258. 1917. Type. Colombia. Cauca, Pittier 925 (US).

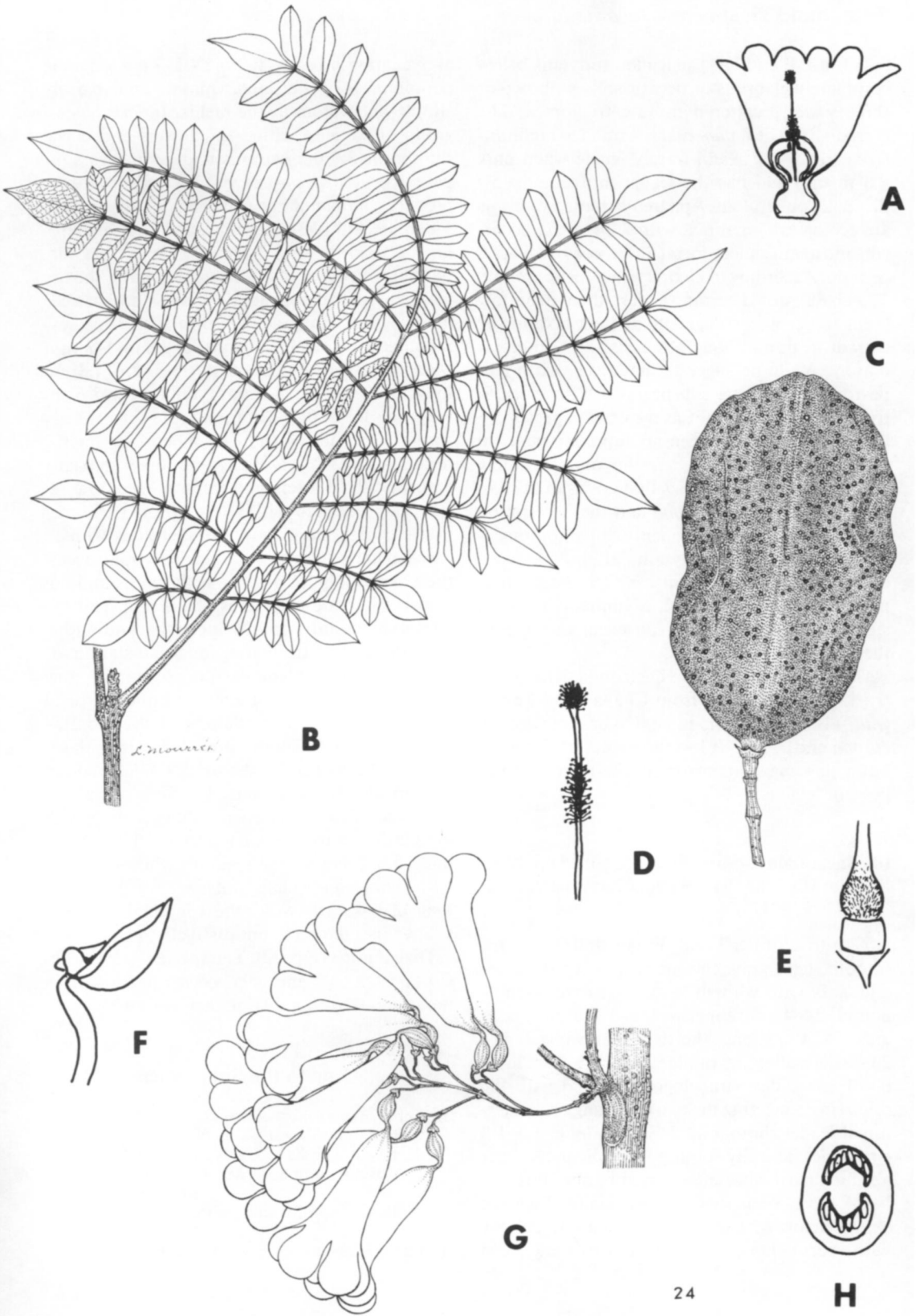
Tree to 25 m tall and 39 cm dbh., the bark smooth, light gray, the branchlets lepidote, terete, gray with whitish lenticels. *Leaves* bicom-pound, 24–43 cm long, with 8–18 pinnae, each one 10–14 cm long, the rachis subwinged, 11–23 sessile leaflets per pinnae, these 0.8–3 cm long, 0.4–1 cm wide, parallelogram-shaped with the midvein connecting the two acute angles, the terminal leaflet rhomboid, 3–3.5 cm long, 1.3–1.8 cm wide, apically obtuse or apiculate, base abruptly narrowly cuneate, membranaceous, puberulous on both surfaces, especially along the nerves below with long simple trichomes, above with sparse short trichomes, drying dark green

above, grayish below, petiole 4.5–7 cm long, the petiolules 4–10 mm long, lepidote and sparsely simple-puberulous as the rachis. *Inflorescence* a group of panicles with 3–27 flowers and borne ramiflorously, the pedicels and peduncles simple-puberulous. *Flowers* with the calyx reduced, broadly campanulate, subtruncate to obtusely 5-dentate, simple-puberulous and sparsely lepidote, 1.5–3 mm long, 3–4 mm wide; corolla purple-blue outside and on lobes, the throat mostly white, tubular-campanulate above a basal swelling 5–9 mm long and 5–7 mm wide, this surmounted by a neck 3–4 mm long and 1–2 mm wide, this bent almost 90 degrees, 3.6–4.8 cm long, 1–2 cm wide at mouth, the tube 3–3.6 cm long, the lobes 0.7–1 cm long, the tube mostly glabrous outside, glandular puberulous on the neck (except ssp. *glabrata*), the lobes adaxially and the tube densely and minutely lepidote inside, the tube also with a few simple trichomes in the throat and glandular-puberulous with 1–3-celled hairs at level of stamen insertion, at least the abaxial lobe pubescent with long simple or in part bifurcate trichomes, the rest at least ciliate; stamens didynamous, the anthers monothe-cate, the thecae 1.5–2 mm long, the staminode 2.2–2.5 cm long, glandular-pubescent with long 1–6-celled trichomes at apex and middle; pistil 2–2.6 cm long, the ovary flattened-cylindric, 1.5–2 mm long, 1.5–2 mm wide, 1–1.5 mm thick, appressed puberulous, the ovules 4–6-seriate in each locule; disk pulvinate, 1–1.5 mm long, 1–2 mm wide. *Fruit* a flattened-oblong capsule with undulating margins when mature, 4.6–8.5 cm long, 3.8–6 cm wide, lepidote, when dry dark with lighter lenticellate dots; *seeds* 0.8–1.6 cm long, 2.3–4.1 cm wide, the wings brownish to subhyaline, the body not distinctly demarcated.

Distribution (Fig. 22). The species ranges from Costa Rica to Venezuela, occurring mostly in moist forest with a distinct dry season.

Key to the Subspecies

1. Lobes of calyx short or absent; Venezuela or Costa Rica to northwest Colombia.
2. Base of corolla tube glandular-pilose outside; Costa Rica to northwest Colombia.
 subsp. *sandwithiana*.
2. Base of corolla tube glabrous outside; Venezuela. subsp. *glabrata*.
1. Calyx 5-lobed, split beyond middle; Colombia.



3. Fruit oblong, weakly undulate; calyx lobes 5–10 mm long. subsp. *calycina*.
 3. Fruit subrotund, strongly undulate; calyx lobes <3 mm long. subsp. *caucana*.

10a. *Jacaranda caucana* Pittier subsp. *caucana*.

Fig. 27.

Jacaranda filicifolia D. Don sec. Seemann, Bot. Voy. Herald 181. 1854, non Don.*Jacaranda gualanday* Cortes, Fl. Col. 99. 1897, nom. nud.*Jacaranda trianae* Kränzl., Feddes Repert. 17: 226. 1921. Type. Colombia. Cundinamarca: *Triana s.n.* (G).

This subspecies is distinct in its rounder more strongly undulate fruit, in its mostly 2–3 mm long calyx lobes, and its generally smaller leaflets.

Distribution. The Magdalena and Cauca Valleys of Colombia and in Barinas, Portuguesa, and Yaracuy States of Venezuela; 200–1800 m elevation.

Representative specimens examined. COLOMBIA. ANTIOQUIA: Mpio. de Ituango, road San Andres-Ituango, 10 May 1988 (fl), *Zarucchi & Betancur 6426* (MO). CALDAS: Quebrada Yeguas, 20 km N of Honda, 7 Mar 1977 (st), *Gentry et al. 18170* (MO). EL CÉSAR: Vía La Paz a Manaure, 26 Apr 1987 (fr), *Cuadros & Gentry 3436* (JBGp, MO). CUNDINAMARCA: Near Fusagasuga, 17 Oct 1959 (fl), *Barkley & Juajibioy 9482* (MO); km 61 from Bogotá to Neiva, W of Fusagasuga, Jan 1974 (fr), *Gentry et al. 8946* (COL, MO). GUAJIRA: Manaure, *Cuadros & Gentry 3579* (JBGp, MO). NORTE DE SANTANDER: Ocana (fl), *Schlim 288* (G). SANTANDER: Near airport, Barranca Bermeja to El Centro, 25 Jul 1975 (fl, fr), *Gentry & Forero 15397* (MO). TOLIMA: Entre Mariquita y Guayabal, May 1940 (fl), *Cuatrecasas 9413* (COL, US). VALLE: Around Cali, W side of Cauca Valley, Dec 1905 (fl, fr), *Pittier 925* (US).

VENEZUELA. BARINAS: Ticoporo Forest Reserve, Bumbun River, 4 May 1964 (fl), *Breteler 3905* (L, M, US, VEN). MÉRIDA: 2–4 km above dam, Rio Guaimaral, 16 Mar 1981 (fl, fr), *Liesner & González 10655* (MO). PORTUGUESA: 22 km NNW of Guanare, road to Biscucuy, Jun 1975 (fl, fr), *Gentry & Puig-Ross 14368* (MEXU, MO). TACHIRA: Rio Negro 0.5–2 km from hwy., 5 May 1981 (fr), *Liesner & Guariglia 11821* (MO). ZULIA: Dtto. Lagunillas, Cuenca del Embalse, Burro Negro, 3 Apr 1982 (fl, fr), *Bunting et al. 11410* (MO).

Local names. Gualanday, bayeto, jacaranda.

Uses. An infusion of leaves and bark has been used to treat venereal disease.

10b. *Jacaranda caucana* ssp. *glabrata* A. Gentry, Flora Venezuela 8(4): 201. 1982. Type. Venezuela. Distrito Federal: Osma, E de Los Caracac, *Gentry & Berry 14760* (holotype, MO; isotypes, MO, VEN).

This subspecies is almost identical to subsp. *caucana* except that the base of the corolla tube is completely glabrous outside; the lobes of the calyx are also more reduced than in subsp. *caucana*.

Distribution. Northern Venezuela in the Cordillera de la Costa; 200–600 m elevation.

Specimens examined. VENEZUELA. DISTRITO FEDERAL: E of Los Caracac, Vic. of Osma, 2 Jul 1975 (fl, fr), *Gentry & Berry 14760* (MO, VEN). GUARICO: 25 km N of Altigracia de Orituco, S of Parque Nacional de Guatopo, Jul 1975 (fl), *Gentry & Berry 15115* (MO, VEN). MIRANDA: Dto. Páez, Río Guapo, 44 km SE Caucagna, 1 Jun 1977 (fl, fr), *Davidse & González 13610* (MO); Dto. Páez, Fila El Guapo, 1 Jun 1977 (fl, fr), *González & Davidse 862* (MO); Cerros del Bachiller, S of Santa Cruz, 20 Mar 1978 (fr), *Steyermark & Davidse 116867* (MO).

10c. *Jacaranda caucana* subsp. *sandwithiana* A.

Gentry, Ann. Missouri Bot. Gard. 60: 858. 1973. Type. Panama. Canal Zone: Cultivated at Summit Gardens, *Gentry 744* (holotype, MO; isotypes, SCZ). Fig. 24.

Differs from subsp. *caucana* in having larger leaflets, more widely separated pinnae, and a calyx with reduced lobes, the calyx broadly campanulate, subtruncate to bluntly 5-toothed, simple-puberulous. The capsule also tends to be more elongate than in subsp. *caucana*.

Distribution. Costa Rica to extreme northwestern Colombia; mostly in areas transitional between moist and wet forest and having a short but distinct dry season; 0–500 m elevation.

Representative specimens examined. COSTA RICA. PUNTARENAS: El General Valley, vic. of San Isidro del General, 1 Mar 1966 (fr), *Molina et al. 18187* (BM, F, GH, NY, US); Environs de Santo Domingo de Golfo Dulce, Mar 1896 (fl), *Tonduz 7102* (BM, BR, CR, G, GH, H, K, R, US).

PANAMA. CANAL ZONE: Near Paraíso Station, Panama Railroad, *Hayes 12* (BM, BR, K); vic. of Miraflores Lake, 9 May 1940 (fl), *White & White 190* (GH,

FIG. 24. *Jacaranda caucana* subsp. *sandwithiana*. A, corolla slit open, $\times 0.6$; B, leaf, $\times 0.6$; C, fruit, $\times 0.6$; D, staminode, $\times 1.8$; E, ovary and disk, $\times 4.2$; F, anther, $\times 12$; G, inflorescence, $\times 0.6$; H, ovary cross section, $\times 7.8$. (From *Flora of Panama*; A–C, *Gentry 1939*; D–H, *Gentry 744*.)

MO, US). **CHIRIQUÍ:** David, San Lorenzo, Mar 1869 (fl), *Seemann 1127* (BM, K). **DARIÉN:** Isla Cartagena near La Palma, *Gentry 3934* (MO); below Boca de Cupe on Río Tuirá, 28 Feb 1972 (fr), *Gentry 4487* (MO); vic. El Real, S of El Real, 30 Jun 1959 (fr), *Stern et al. 743* (GH, K, MO, US). **PANAMÁ:** Vic. Arraiján, 4 May 1939 (fl), *Allen 1763* (F, GH, MO, NY, US).

COLOMBIA. Chocó: Trail from Unguía toward Panama border, 50 m, 19 Jan 1975 (fr), *Gentry & Mori 13748* (MO); Río Cacarica, Riosucio, 8 Jul 1957, *Romero C. 6371* (COL, MO).

10d. *Jacaranda caucana* Pittier subsp. *calycina*

A. Gentry, ssp. nov. Type. Colombia. Santander: 5 km N of Barranca Bermeja on road to Puerto Wilches, 150 m, 24 Jul 1975 (fl, fr), *Gentry & Forero 15363* (holotype, COL; isotypes, COL, MO, duplicates distributed as *J. cf. hesperia*).

Ab subspecie typica lobis calycis 5–10 mm longis, foliaceis, corollae tubo ad basim glabro, capsula plus oblonga, margine vix undulata difert.

Differs from *J. caucana* subsp. *caucana*, which occurs mostly in the Cauca Valley and farther up the Magdalena Valley, in having a calyx with expanded foliaceous lobes (5–10 mm long vs. 2–3 mm long in subsp. *caucana*), in having the corolla tube completely glabrous outside, even at base, and the more oblong capsule (7–8 × 3–4 cm) with the margins barely undulate. *Jacaranda caucana* subsp. *sandwithiana*, which occurs mostly in Panama and Costa Rica and barely reaches northwest Colombia, has a similarly oblong (but usually broader) fruit but differs in the glandular-pubescent neck of the corolla tube and even smaller broadly triangular lobes < 1 mm long.

Distribution. Moist forests of Nechi area of northern Colombia and adjacent sector of Magdalena Valley, mostly around the north tip of the Cordillera Central; 50–600 m elevation.

Additional specimens examined. COLOMBIA. BOLÍVAR: Mun. Achi, La Raya, 4 May 1987 (fl), *Cuadros & Gentry 3586* (JBGP, MO). **CÓRDOBA:** Río Manso, Paramillo National Park, 29 Jul 1988 (fl, fr), *Gentry & Cuadros 63950* (JBGP, MO). **SANTANDER:** Carretera a Barranca, 1 Oct 1978, *León & Ayana 881* (COL); Cerro La Paz, 600 m, 16 Oct 1977 (fl), *Rentería, Torres, Garrica & Sierra 755* (MO).

In the oblong fruit and completely glabrous corolla tube this plant approaches *J. hesperia* and the senior author has previously identified sev-

eral of these specimens as *J. cf. hesperia*. However, the large oblong-ovate foliaceous calyx lobes are completely anomalous in *J. hesperia* and the fruit is far smaller and less woody than in that species. Both the plant with large calyx lobes and a form of *J. caucana* with much smaller calyx lobes are found around Barranca Bermeja; *J. hesperia*, as defined by its larger woodier fruit also occurs in the same area. If the two putative forms of *J. caucana* prove to be strictly sympatric and consistently differentiated, specific recognition might be in order; alternatively they could be extremes in a single extremely heterogeneous population worthy of no more than varietal recognition. In view of the variability patterns shown by *J. caucana* elsewhere in its range, it is anticipated that these two forms will prove geographically allopatric and thus most appropriately treated as subspecies.

11. *Jacaranda copaia* (Aublet) D. Don, Edinburgh Philos. J. 9: 267. 1823.

Key to the Subspecies

1. Leaflets elliptic or oblong-elliptic, obtuse, subcoriaceous, distinctly petiolulate; capsule valves woody, more than 7 cm wide; Guayana area. subsp. *copaia*.
1. Leaflets rhomboid-elliptic, acute to acuminate, membranaceous, sessile or subsessile; capsule valves thin-woody, less than 6 cm wide; wide-spread. subsp. *spectabilis*.

11a. *Jacaranda copaia* subsp. *copaia*.

Bignonia copaia Aublet, Hist. pl. Guiane 2: 650, tab. 262, fig. 1, tab. 265, 1775. Type. French Guiana: *Aublet s.n.* (P-AD 12304).

Jacaranda procera (Willdenow) R. Brown, Bot. Mag. tab. 2327. 1822. Nom. nov. for *B. copaia* Aublet.

Large tree 25–35 m tall, to at least 40 cm dbh., the branchlets subtetragonal to subterete, glabrous. *Leaves* bipinnate, with 5–9 pinnae, the rachis not winged, with 5–9 leaflets, these 2–9 cm long, 1.3–4.5 cm wide, symmetrically elliptic or oblong-elliptic, obtuse, narrowly cuneate at base, subcoriaceous to chartaceous, sparsely lepidote, otherwise glabrous, drying dark, the petiole 5–10 cm long, the petiolules 2–4 mm long, minutely lepidote to glabrate as the rachis. *In-florescence* a large terminal panicle, the branchlets puberulous. *Flowers* with the calyx cupular, minutely and irregularly 5-dentate, puberulous,

5–6 mm long, 3–4 mm wide; corolla purplish-blue with white throat, tubular-campanulate above the basal constriction, 2.5–3 cm long, 0.7–1 cm wide at mouth of tube, the tube 2.2–2.4 cm long, the lobes 0.5–0.6 cm long, densely puberulous outside with dendroid trichomes, puberulous inside, the tube pubescent abaxially and at level of stamen insertion; stamens monothecate, the theca 1.5 mm long, the filaments ca. 8–10 mm long, the staminode 1.6–1.8 cm long, glandular pubescent at apex and center; pistil 1.5 cm long, the ovary flattened-cylindrical, ca. 1.5 mm long, 1.2 mm wide, glabrous, the ovules few-seriate in each locule; disk cylindrical, 0.6 mm long, 1.2 mm wide. *Fruit* a flattened-oblong capsule, woody, with straight margins, 9–13 cm long, 7–10 cm wide, glabrous, blackish when dry; *seeds* not seen.

Distribution (Fig. 22). The Guianas and adjacent extreme northeastern Venezuela south into the northeastern sector of Amazonian Brazil; sea level to 600 m elevation.

Representative specimens examined. VENEZUELA. DELTA AMACURO: Este de Río Grande, ENE de El Palmar, 26 Nov 1965 (fl), *Blanco 402* (MO, VEN); 28 Feb 1964 (fr), *Marcano-Berti 113* (BR, COL, VEN).

GUYANA. Upper Rupununi River near Dadanawa, Jan 1922 (fl), *de la Cruz 1551* (CM, MO); Upper Mazaruni River basin, Kamarang River, below mouth of Utschi, 28 Oct 1960 (fl), *Tillett & Tillett 45854* (MO).

SURINAM. 3 km S of Juliana Top, 12 km N of Lucie River, Aug 1963 (fl), *Irwin et al. 55138* (C, MO). Zanderij I., 1 Sep 1942 (fl), *Stahel 16* (WIS).

FRENCH GUIANA. Saül, Nov 1972 (fl), *de Granville 1529* (CAY, MO, P); Cayenne, 40 km NW of Riviere La Comte, Cayenne-Regina, 21 Feb 1985 (fl), *Gentry & Zardini 50261* (MO).

BRAZIL. AMAPÁ: Rio Oiapoque, Rio Ingarari, 18 Sep 1960 (fl), *Irwin et al. 48357* (IAN, MG, MICH, NY). AMAZONAS: 2 km below mouth of Rio Brancinho, 13 Sep 1973 (fl), *Prance et al. 17888* (AAU, CH, MO, NY). MARANHÃO: Turiacu, km 6 BR 106, Maracaçumé-Sta. Helena, 2 Dec 1978 (fr), *Rosa & Vilar 2833* (MO). PARÁ: Rio Jari, Monte Dourado, 17 Sep 1968 (fl), *Silva 1027* (IAN, MO, NY).

Local names. Surinam: koepaia, koepaja (Kar.), njamoere (Kar.), goebai, goebaja, foete-i (Araw), jaifi (Bush Negro). Fr. Guiana: jasi man boon (Ndjuka). Brazil: marupauba, parapara, parapara, para'y (Ka'apor).

This subspecies is not as clearly allopatric with subsp. *spectabilis* as previously suggested by Gentry (1978). Both subspecies have been collected at Jari, Brazil, and subsp. *spectabilis* is now known from the Guianas. Thus it is quite pos-

sible that two distinct species exist; we have maintained these as only subspecifically distinct in large part out of deference for the very widespread use of *J. copaia* for subsp. *spectabilis* in extra-Guayan South and Central America.

11b. *Jacaranda copaia* subsp. *spectabilis* (Martius ex A. P. de Candolle) A. Gentry, *Rhodora* **79**: 441. 1977. Figs. 25, 27.

Jacaranda spectabilis Martius ex A. P. de Candolle, Prodr. **9**: 229. 1845. Type. Brazil. Amazonas: Rio Japura, Martius s.n. of 1819 (M).

Jacaranda copaia var. *spectabilis* (Martius ex de Candolle) Bureau ex Bureau & K. Schumann in Martius, Fl. bras. **8(2)**: 287. 1897.

Jacaranda copaia var. *paraensis* Huber, Bull. Soc. Bot. Genève, Ser. 2, (7-8): 202. 1914. Type. Brazil. Pará: Faro, Castanhaes ad E. do Lago Salgado, 24 Nov 1907 (fl), *Ducke s.n.* (holotype, MG).

Jacaranda superba Pittier, Bol. Soc. Venez. Ci. Nat. **6**: 19. 1940. Type. Venezuela. Bolívar: Salta de Pará, Caura, *Ll. Williams 11537* (holotype, US; isotypes, F, S).

Jacaranda paraensis (Huber) Vattimo, *Rodriguesia* **29**: 285. 1977.

Jacaranda amazonensis Vattimo, *Rodriguesia* **44**: 231. 1978. Type. Brazil. Amazonas: Manaus-Porto Velho highway, BR 319, km 245, *Prance et al. 20472* (holotype, MG; isotypes, CH, MO, NY).

Tree to 45 m tall and 45 cm dbh, when young the trunk unbranched or branched at apex, the trunk frequently somewhat flattened, the bark rather smoothly fibrous-scaly, with small vertical fissures; branchlets lepidote, subtetragonal, drying dark, the pith rather large. *Leaves* bipinnate, 15–165 cm long, with 5–20 pinnae, each 5–25 cm long with the rachis essentially unwinged and with 5–25 sessile leaflets, these 1.5–8 cm long, 0.8–2.5 cm wide, asymmetrically rhomboid-elliptic, acute to acuminate, asymmetrically cuneate at base, membranaceous, lepidote, the midvein glabrescent to puberulous on both faces, drying dark above, olive below, the petiole and petiolules lepidote to subpuberulous as the principal and lateral rachis. *Inflorescence* a rather narrow terminal panicle, the branches lepidote and more or less puberulous. *Flowers* with the calyx cupular, more or less truncate with five unequal teeth, pubescent with simple or branched trichomes, 5–7 mm long, 3–5 mm wide, eglandular; corolla purplish-blue outside and on the lobes, the throat white inside, tubular-campanulate above a 7–10 mm long 3–4 mm wide basal constriction, 3.2–5 cm long, 1–2 cm wide at mouth, the tube 2.3–3.7 cm long, the lobes 0.5–

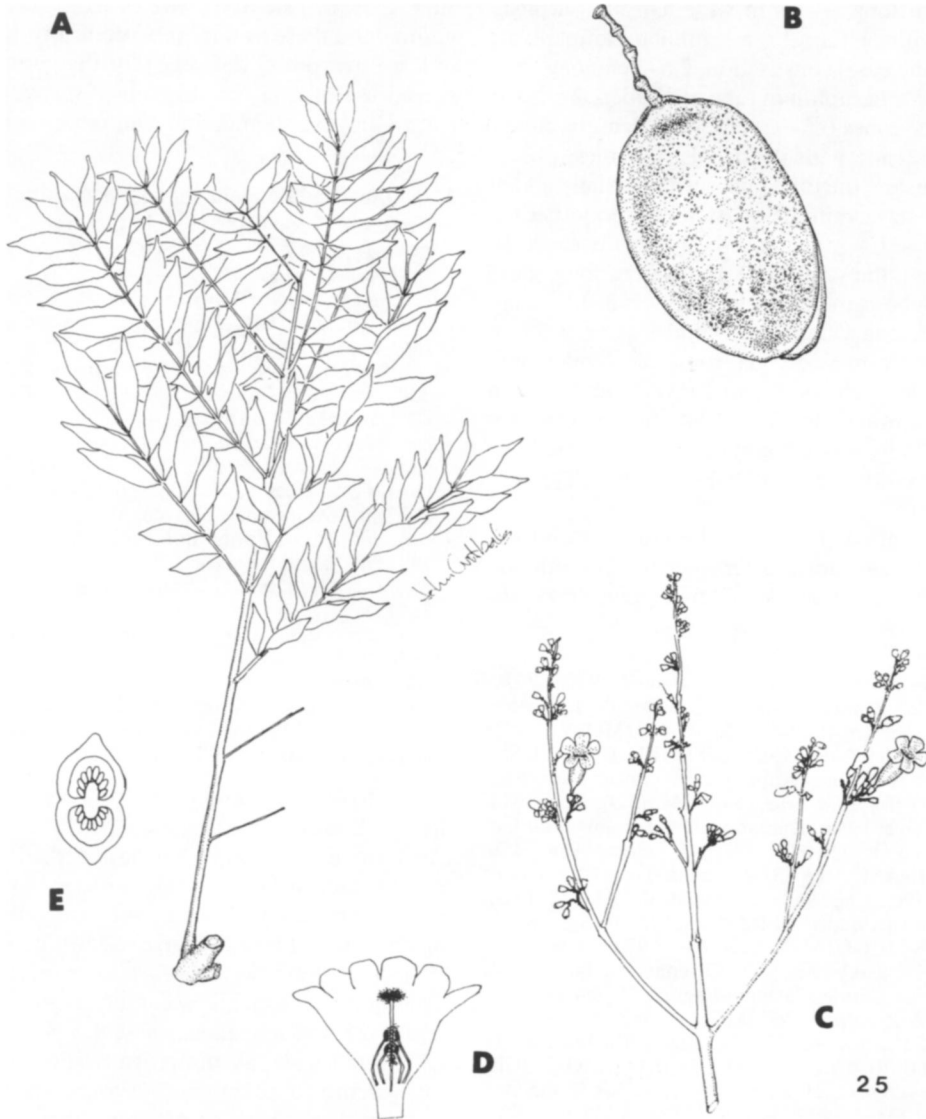


FIG. 25. *Jacaranda copaia* subsp. *spectabilis*. **A**, leaf, $\times 0.25$; **B**, fruit, $\times 0.5$; **C**, inflorescence, $\times 0.25$; **D**, corolla split open, $\times 0.5$; **E**, ovary cross section, $\times 8$. (From *Flora of Ecuador*; **A**, Richards 6770; **B**, Gentry 1957; **C-E**, Lawrence 434.)

1.4 cm long, densely puberulous outside with simple bifurcate and slightly dendroid trichomes, inside with dendroid pubescence, the tube glabrous adaxially, with pubescence of glandular trichomes at level of stamen insertion; stamens didynamous, monothebate, the theca 1.5–2 mm long, the staminode 2.4–2.7 cm long, bifurcate at apex, glandular-pubescent with long

simple trichomes at apex and at center; pistil 1.5–1.8 cm long, the ovary flattened-cylindric, 2–2.5 mm long, 2–2.5 mm wide, 1.5 mm thick, the ovules more or less 8-seriate in each locule; disk pulvinate, 1 mm long, 2.5 mm wide. *Fruit* a flattened-oblong capsule, the margins straight, 6.2–12.7 cm long, 3.3–6 cm wide, lepidote to glabrous, drying black or blackish with lighter

lenticels; seed body 3–5 mm long, 3–4 mm wide, the small body surrounded by suborbicular wing 1–2 cm long and 1.7–2.8 cm wide, the wing hyaline-membranaceous with darker radial striations, clearly demarcated from seed body.

Distribution (Fig. 22). Widespread in lowland moist and wet forest from Belize to Bolivia; 1–1200 m elevation.

Representative specimens examined. **BELIZE.** TOLEDO: Río Grande, 27 Feb 1933 (fr), *Schipp 1152* (MICH, MO, NY).

HONDURAS. GRACIAS A DIOS: 2 mi NW of Bulebar, 4 Apr 1981 (fl), *Saunders s.n.* (MO).

NICARAGUA. ZELAYA: S de Río Wawa, 60 km NW de Pto. Cabezas, 15 Mar 1971 (st), *Little 25145* (MO); Kurinwacito, 18 Mar 1984 (fl), *Moreno 23687* (MO).

COSTA RICA. CARTAGO: S de Turrialba, 6 Feb 1965 (st), *Little & Budowski 20245* (CR). **HEREDIA:** Finca La Selva, Río Puerto Viejo, 20 Jun 1982 (fr), *Hammel & Trainer 12930* (MO). **LIMÓN:** Cerro Coronel, E of Laguna Danto, 19 Jan 1986 (st), *Stevens 23822* (MO). **PUNTARENAS:** Talamanca Valley, 1927 (st), *Cooper 17* (US). **SAN JOSÉ:** 3 km de San Isidro del General, 16 Jul 1968 (st), *Fournier & Fournier 1482* (USJ).

PANAMA. BOCAS DEL TORO: Almirante, Jan 1928 (fr), *Cooper s.n.* (F). **CANAL ZONE:** Barro Colorado Island, 8 Oct 1968 (fr) *Croat 6782* (MO, NY, SCZ); 11 Feb 1969 (fl), *Gentry 425* (MO, WIS). **COLÓN:** Santa Rita Ridge 2–3 mi from Transisthmian Hwy., 19 Sep 1971 (st), *Gentry 1867* (MO). **DARIÉN:** Vic. Pinogana, 4 Mar 1947 (fl), *Allen 4431* (K, MO, US). **PANAMÁ:** Río Maestro, 2 mi from coast, 27 Oct 1971 (fr), *Gentry 2218* (MO). **SAN BLAS:** Perme, 3 Apr 1928 (fl), *Cooper 631* (BM, K, MO, NY, US).

COLOMBIA. AMAZONAS: 18–22 km N de Leticia, cerca de Los Alpes, Nov 1974 (st), *Gentry 12752* (MO). **ANTIOQUIA:** Betw. Providencia & Quebrada La Tirana, 28 km SW of Zaragoza, 9 Apr 1977 (fl), *Alverson et al. 395* (MO). **BOYACÁ:** 130 mi N of Bogotá, 28 Aug 1932 (fl), *Lawrance 434* (LL, MO). **CAQUETÁ:** Km 76 from Neiva to Florencia, Jan 1974 (fl), *Gentry et al. 9066* (COL, MO). **CHOCÓ:** Río Caquerica, Atrato, Riosucio, Jul 1957 (fr), *Romero-Castaneda 6400* (COL, MO). **CÓRDOBA:** Río Manso, Paramillo National Park, 29 Jul 1988 (st), *Gentry & Cuadros 63947* (MO). **META:** La Macarena, Río Guayabero, Jan 1959, *García Barriga & Jaramillo 17154* (AAU, COL). **NORTE DE SANTANDER:** Sarare region, Río Cubugon, El Carano, 18 Nov 1941 (fl), *Cuatrecasas 1323* (F). **PUTUMAYO:** *Cuatrecasas 10687* (CM). **SANTANDER:** 10 leguas SE de Barranca Bermeja, 8 km de Río Opón, Aug 1954 (fl), *Romero-Castaneda 4773* (COL, MO). **VALLE:** Río Dagua, Las Cascadas-Alto de Yundo, 7 Jul 1984 (fr), *Gentry & Monsalve 48246* (CUVC, MO). **Vaupés:** Río Kananair, Cerro Isibukuri, 29 Sep 1951 (fl), *Schultes & Cabrera 14680* (MO). **VICHADA:** Parque Nacional Natural El Tuparro, 9 km NE of El Tapón, 18 Mar 1985 (fl), *Zarucchi & Barbosa 3741* (MO).

VENEZUELA. AMAZONAS: Atabapo, Río Cunucunuma, 28 Jan 1982 (fl), *Steyermark et al. 126197* (MO, VEN). **APURE:** Reserva Forestal San Camillo,

Cerro La Cristalina, 5 Apr 1968 (st), *Steyermark et al. 101899* (VEN). **BARINAS:** Pedraza, Pintadera, 10 km NO de Ciudad Bolivia, 14 Apr 1953 (fl), *Little 15035* (VEN). **BOLÍVAR:** 14 km E de Turiba, Distr. Cedeno, 6 Dec 1970 (fr), *Marcano-Berti 2567* (MO, VEN). **DELTA AMACURO:** Dtto. Tucupita, 13 km ESE of Sierra Imataca, 4 Apr 1979 (fr), *Davidse & González 16555* (MO). **MÉRIDA:** El Vigía, 7 Oct 1953 (fl), *Little 15612* (VEN). **MONAGAS:** Caripito y Quiriquire, 9 Mar 1948 (fr), *Tamayo 3517* (VEN). **TÁCHIRA:** 5 km NE of San Mateo, 1 Apr 1974 (fl), *Gentry et al. 11047* (MO). **ZULIA:** Dtto. Lagunillas, Cuenca del Embalse, Burro Negro, 3 Apr 1982 (fl), *Bunting et al. 11249* (MO).

GUYANA. Berbice, E Berbice-Corentyne Region, Torani Canal, 29 Apr 1987 (st), *Pipoly et al. 11708* (MO); NW slopes of Kanuku Mountains, 31 Mar 1938 (fl), *A. Smith 3474* (B, MO, US).

SURINAM. Lely Mtns, 2 Oct 1975 (st), *Lindeman et al. 700* (MO).

FRENCH GUIANA. Maripasoula, 23 Oct 1965 (fl), *Oldeman 1646* (CAY, MO); Saül, trace Limonade, Oct 1971 (fl), *Oldeman B4145* (CAY, MO).

ECUADOR. ESMERALDAS: Panadero, 7 km E de San Lorenzo, 25 Sep 1965 (fl), *Little & Dixon 21143* (F, MO, NY). **NAPO:** Coca, 15 Sep 1986 (fl), *Neill et al. 7358* (MO). **PASTAZA:** 30 km SE of Puyo, road to Macas, 26 Dec 1987 (st), *Boom et al. 7818* (MO). **ZAMORA-CHINCHIPE:** 30 km NE of Zamora, 15 Nov 1982 (fl), *Pennington & Tenorio 10740* (MO).

PERU. AMAZONAS: Valle del Río Santiago, Caterpiza, 1 Jan 1980 (fr), *Tunqui 510* (MO). **HUÁNUCO:** Miel de Abejas, Dtto. Honoria, Pachitea, 7 Aug 1967 (fl), *Schunke 8* (F, MO). **LORETO:** Base Araguana, upper Río Mazan, 9 Jul 1976 (fr), *Gentry & Revilla 16607* (MO). **MADRE DE DIOS:** Tambopata, 28 Feb 1981 (fr), *Gentry & Young 31778* (MO). **PASCO:** Oxapampa, Gran Pajonal, Chequitavo, 26 Sep 1983 (st), *D. Smith 5278* (MO). **SAN MARTÍN:** Zepelacio, near Moyobamba, Jul 1934 (fl), *Klug 3732* (MO, WIS). **UCAYALI:** Bosque Nacional Alexander von Humboldt, Prov. Coronel Portillo, km 86 Pucallpa-Tingo María, Aug 1978 (fl), *Froehner 356* (MO).

BRAZIL. ACRE: Río Macauhan, Aug 1933 (fr, fl), *Krukoff 5313* (LP, M, MICH, MO). **AMAPÁ:** Camaipi, Embrapa reserve, 18 Sep 1983 (fl), *Mori et al. 16336* (MO). **AMAZONAS:** Boca do Acre, Río Purus, 19 Sep 1966 (fl), *Prance et al. 2407* (INPA, M, MG, MO, NY). **MARANHÃO:** Maracassume River, Region, Campo de Boa Esperança, 20 Oct 1932 (fl), *Krukoff 1960* (LP, MICH, MO, NY, WIS). **MATO GROSSO:** Tabajara, upper Machado River, Nov 1931 (fr), *Krukoff 1503* (LP, MICH, MO, NY, WIS). **PARÁ:** Acara, Thome Assu, Santa Maria, Aug 1931 (fl), *Mexia 6055* (MICH, MO, WIS). **RONDÔNIA:** Río Madeira, 13 Jul 1968 (fl), *Prance et al. 5939* (INPA, M, MG, MO, NY). **RORAIMA:** Canto Galo, Río Mucajai betw. Pratinha & Río Apiau, 21 Jan 1967 (fl), *Prance et al. 3971* (INPA, M, MG, NY).

BOLIVIA. BENI: Prov. Ballivía, Serranía Pilón, Lajas, 14 km N of Río Quiquibey, 10 Jun 1985, *Solomon 13943* (MO). **COCHABAMBA:** Carrasco, 62 km hacia Puerto Villarroel de Villa Tunari, 2 May 1979 (st), *Beck 1491* (MO). **LA PAZ:** Larecaja, Tuiroi, 12 Sep 1939 (fr), *Krukoff 10879* (LP, MICH, MO). **PANDO:** Prov. Manu-

ripi, Río Madre de Dios, 2 km W of Humaita, 31 Aug 1985 (fl), *Nee 31686* (MO).

Local names. Panama: cigarrillo, siete cueros, sule-grie (Guaymi). Colombia: mallirokai (Witoto). Venezuela: girasol, flor azul, wei-oima-yek, palo azul, uai-cuima-yek, puti, pata de garza. French Guiana: coupaya, copa la bois blanc, jaifi (Sar.), taki-taki (fenti), basa gobaja (Ndjuka), jasi man boon (Ndjuka). Ecuador: gualandano, gualanday, jacaranda, copa (Quichua), quepapajin (Cofan), kuiship (Shkuar), huilisha (Palomino). Peru: huamansamana, huamanzamana, ishtapi, cakaska (Jivaro). Brazil: caroba, curoba, caruba, marupauba, parapara, para-para, para'y (Maranhão: Ka'apor).

A very fast-growing, typical element of wet and moist forest second growth. Widely used for firewood and construction timber. In Amazonian Ecuador currently being promoted as *the* species with the most agroforestry potential (Peck, pers. comm.). In Maranhão the leaves are used against mosquitoes (*Moses 12*).

12. *Jacaranda cowellii* Britton & Wilson, Bull. Torrey Bot. Club 17: 392. 1915. Type. Cuba. Las Villas: Santa Clara, *Britton & Cowell 13316* (NY).

Jacaranda variifolia Urban, Feddes Repert. 7: 371. 1922. Type. Cuba. Oriente (Holguín): Prope Holguín in Cerro de Fraile, *Ekman 3249* (holotype, B; isotypes, AAU, G, MO).

Shrub 1–2 m tall, the branchlets terete, sparsely minutely puberulous, with or without whitish lenticels. *Leaves* mostly simply pinnate (occasionally in part bipinnate with 15–25 pinnae), each pinna 1–8 cm long, with glabrous rachis (occasionally with a few minute trichomes) and 15–50 minute sessile, suborbicular leaflets, these 1–3 mm long and 1–2 mm wide, glabrous or with a few longish trichomes along midvein below and sometimes a few minute trichomes above, the margin entire, very strongly involute, the tiny slender petiolules less than 0.5 mm long. *Inflorescence* a reduced narrow panicle or few-flowered raceme, sparsely puberulous in part with gland-tipped trichomes, the bracts early caducous. *Flowers* with the calyx cupular, acutely 5-dentate to near middle, 2 mm long, 2 mm wide, rather sparsely puberulous with simple and gland-tipped trichomes; corolla purplish blue, tubular-campanulate above a narrow neck which is

somewhat enlarged toward the base, 2–3(–3.5) cm long, 0.7–1 cm wide at the mouth, the lobes ca. 0.5 cm long, the tube 1.5–2.5 cm long, rather sparsely puberulous with simple and glandular trichomes outside, more densely glandular pubescent near base, mostly glabrous inside except at the stamen insertion; stamens didynamous, the anthers monothebate, the second theca reduced to a minute appendage; ovary flattened-ovate, glabrous. *Fruit* elliptic, obtuse at apex, ca. 3 cm long, ca. 1.7 cm wide, the margin not undulate at dehiscence, glabrous, *seeds* not seen.

Distribution (Fig. 21). Serpentine barrens of central and eastern Cuba in Las Villas, Camagüey, and Oriente Provinces.

Representative specimens examined. CUBA. CAMAGÜEY: Blanquizale, La Ciegu, Caobilla, 23 Jun 1927 (fr), *Acuna 13983* (HAC); Savana de Cromo, *Thierert 861* (F). HOLGUÍN(ORIENTE): Cerro de Fraile, 28 Oct 1914 (st), *Ekman 3249* (AAU, B, MO); Holguín, *Shafer 12434* (NY); Holguín y La Presa, Jul 1953 (fr), *Acuna et al. 18758* (HAC). VILLA CLARA: 5 km W of Santa Clara, 1–20 Jul 1950 (st), *Howard et al. 403* (B, MICH, NY); Santa Clara, 21–22 Mar 1911 (fl), *Britton & Cowell 10174* (MO, NY), *Britton et al. 6071* (NY), 19 Feb 1923 (fl), *Ekman 16328* (B).

Very distinctive in the simply pinnate leaves with minute suborbicular leaflets; occasionally partially bipinnate variants are differentiable from Hispaniolan *J. ekmannii* by the minute but clearly demarcated petiolules.

13. *Jacaranda crassifolia* Morawetz, Pl. Syst. Evol. 132: 337. 1979. Type. Brazil. Rio de Janeiro: Mun. Resende, 4 km NW of city of Itatiaia, 500 m, semideciduous forest, 15 Aug 1978, *Gottsberger & Morawetz 31-15878* (holotype, RB; isotypes, K, M, MO, WU).

Tree 8–12 m tall, the branchlets strongly tetragonal. *Leaves* bipinnate, 45–90 (–110) cm long, with 13–15 pinnae, the pinnae 9–32 cm long, with 7–19 leaflets, the leaflets with petiolule 1–5 mm long, irregularly ovate-elliptic or obovate, the apex briefly acuminate, the base cuneate, (1.5–)4–6(–10) cm long, (0.8–)1.5–2.5(–4.3) cm wide, coriaceous (membranaceous when young), drying dark olive above, lighter olive below, entire, subglabrous. *Inflorescence* a rather interrupted apical panicle, the branches puberulous. *Flowers* with calyx cupular or narrowly infundibuliform, 6–10 mm long, 4–6 mm wide, 5-dentate, puberulous; corolla violet with white

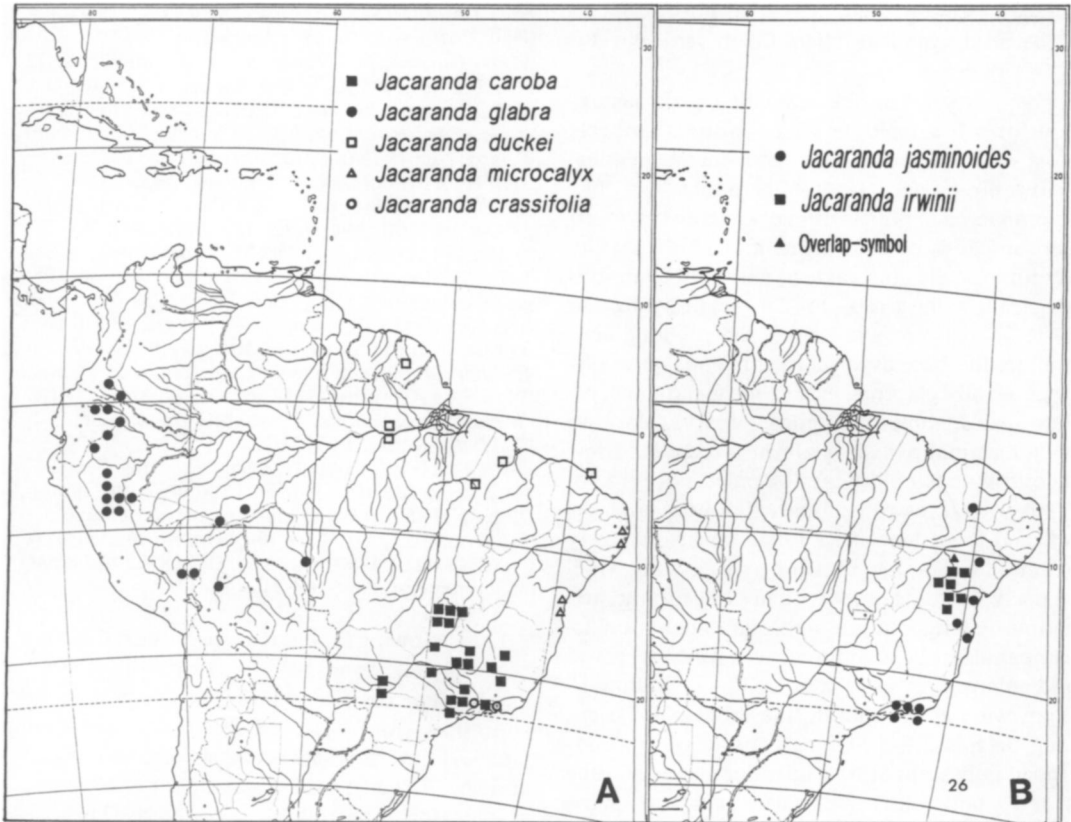


FIG. 26. Distribution of *Jacaranda* section *Dilobos*. A, ■ = *J. caroba*; ○ = *J. crassifolia*; □ = *J. duckei*; ● = *J. glabra*; △ = *J. microcalyx*. B, ■ = *J. irwinii*; ● = *J. jasminoides*.

throat, campanulate-infundibuliform, 3.5–5 cm long, 2–3.5 cm wide at mouth, outside glandular-puberulous; stamens dithecate, the thecae divaricate, the staminode apex bifurcate, densely glandular-pilose; ovary glabrous; disk pulvinate. Juvenile fruit elliptic-ovate to oblong, thick, woody, 5.7–9 cm long, 3.2–5 cm wide.

Distribution (Fig. 26). Endemic to the Itatiaia National Park area of the Serra da Mantiqueira of Brazil's Rio de Janeiro State, 500 to 1000 m.

Specimens examined. BRAZIL. RIO DE JANEIRO: Sin. loc., *Glaziou 17706* (C, K, P). São João de Rei, *Glaziou 12978* (B, C, G, P). Mun. de Rezende, Itatiaia to Itatiaia Camping, 1000 m, *Gottsberger & Morawetz 11-8175* (BOTU, K, MO, WU); *Gottsberger & Morawetz 11-12878* (BOTU, G, K, MO, RB, WU); Eng. Passos, along highway "Via Dutra," *Morawetz 92-20275* (RB, WU); Mountains of Itatiaia, Parque Nacional de Itatiaia, *Gottsberger & Morawetz 16-13878* (K, MO, WU).

Characterized by the rather large coriaceous olive green leaflets. Perhaps the most similar species is *J. obovata*, which occurs in restingas from northern Rio de Janeiro to Bahia but differs in darker-drying different-shaped leaflets with an obtuse or barely acute apex. Of the sympatric species, *J. crassifolia* is closest to *J. macrantha*, but that species has more bullate thinner leaflets with the secondary veins pubescent below; it is possible that there is hybrid introgression between these species.

14. *Jacaranda cuspidifolia* Martius ex A. P. de Candolle, *Prodr.* 9: 228. 1845. Type. Brazil. Mato Grosso: Cuiaba, *Martius 531* (lectotype, K; isotypes, BM, G, HAL, L, M, NY, W).

Jacaranda chapadensis Barbosa Rodrigues, *Contr. Jard. Bot. Rio Janeiro* 3: 63. 1902. Type. Brazil. Mato

Grosso: Serra de Chapada, *Barbosa Rodrigues s.n.* (not seen; type illustration, *Contr. Jard. Bot. Rio Janeiro* 3, t. 10).

Tree 5–15 m tall, the branchlets glabrous except for a few lepidote scales, whitish lenticels mostly lacking or small and inconspicuous. *Leaves* bipinnate, 10–40(–50) cm long, with 11–35 pinnae, each pinna with very narrowly winged glabrous or pubescent rachis and 19–45 sessile, asymmetrically lanceolate to narrowly ovate-oblong leaflets, these (10–)15–27(–45) mm long and (3–)4–7(–10) mm wide, apex sharply long acuminate, the base asymmetrically cuneate to obtuse, usually glabrous except for glandular lepidote scales, sometimes pilose. *Inflorescence* an open terminal panicle, glabrous except for a few inconspicuous lepidote scales, bracts not evident. *Flowers* with the calyx 5-parted to near base, the reflexed lobes lanceolate to sublinear, narrowly acuminate, (2–)3–7 mm long, ca. 1 mm wide, sparsely lepidote and with a few minute trichomes along margins; corolla blue, tubular-campanulate above a narrow neck which is curved and enlarged toward the base, 3.5–6 cm long, 1–2 cm wide at the mouth, the lobes 0.5–1.5 cm long, the tube 2.5–5 cm long, conspicuously gland-tipped pubescent at base outside, the rest of tube sparsely puberulous in part with gland-tipped trichomes, the lobes somewhat pilose with flat weak trichomes, their margins ciliate, also with lepidote glands, inside with long thin trichomes in floor of tube, also glandular villous at stamen insertion; stamens didynamous, the anthers monotheate, the second theca reduced to a minute appendage, the theca 2 mm long, the staminode ca. 3 cm long, exserted or subexserted, the middle and apical portions very densely glandular pilose, less so in between, the apex not at all expanded; ovary flattened-ovate, 1.5 mm long, 1.5 mm wide, glabrous; disk pulvinate-cylindric, 1 mm long, 2 mm wide. *Fruit* orbicular-oblong, thick-woody, 4.5–8(–9?) cm long, 4.5–7(–8.5?) cm wide, the margin somewhat undulate at dehiscence, glabrous except for small scattered lepidote scales, drying tan or brownish; *seeds* with a suborbicular wing surrounding the seed body, the wing hyaline-membranaceous.

Distribution (Fig. 21). Northern Argentina (Salta) and Paraguay to Bolivia, Mato Grosso and western Minas Gerais; cerrado and savanna; 150–1300 m elevation.

Representative specimens examined. BRAZIL. GOIÁS: Rio Corumba, Ipameri, 4 Oct 1976 (fl), *Hatsch-*

bach 38927 (MO); Rod. BR452, Bom Jesus de Goiás, Sep 1974 (fl), *Hatschbach & Kummrow* 34944 (C, MO). MATO GROSSO: Rio Verde, Serra da Pimenteira, 12 Nov 1973 (fl), *Hatschbach & Koczi* 33131 (C, GB, MO); Garapu, 1 km NE of Garapu, 1 Oct 1964 (fl, fr), *Irwin & Soderstrom* 6527 (C, MO, NY); 100 km N of Cuiaba, Aug 1963 (fl), *Maguire et al.* 56388 (MEXU, MO, NY). MINAS GERAIS: Triangulo region, 1967 (fl), *Goodland* 930 (MO, NY). SÃO PAULO: Mogi Guaçu, 29 Oct 1975 (fl), *Morawetz* 31-291075 (MO, W).

BOLIVIA. BENI: Trinidad-Misiones Guarayos, Sep 1926 (fl), *Werdermann* 2492 (MO). LA PAZ: Sud Yungas, Chulumani, 21 km hacia La Paz, 19 May 1980 (fr), *Beck* 2987 (MO); Prov. Nor Yungas, 13 km N of Yolosa, road to Caranavi, 6 Oct 1984 (fl), *Solomon & Escobar* 2475 (MO). SANTA CRUZ: Nuflo de Chavez, 3 km S de Ascensión de Guarayos, 27 Apr 1977 (fr), *Krapovickas & Schinini* 31840 (MO); Sara, 7 Oct 1924 (fl), *Steinbach* 6521 (G, MO).

PARAGUAY. CENTRAL: Lacus Ypacaray, Sep 1913 (fl), *Hassler* 12270 (C, L, MO). CHACO: Puerto Olimpo, 20 Nov 1946 (fl), *Rojas* 13807 (C). PARAGUARI: Cerro San José (fl), 20 Oct 1978 (fl), *Bernardi* 18155 (MO).

ARGENTINA. SALTA: Oran, Oct 1873 (fl), *Lorentz & Hieronymus* 398 (GOET).

Local name. Caroba, pará parai guazú.

Closely related to, but allopatric with, *J. brasiliiana* (where see discussion). The only São Paulo collection (*Morawetz* 31-291075 from Mogi Guaçu) is intermediate between these two species and here assigned to *J. cuspidifolia* more on geographical than morphological grounds. This collection has slightly subbullate leaflets more like *J. brasiliiana* but with the acuminate apex of *J. cuspidifolia*, rather short and broad but distinctly acuminate calyx lobes, the large fruits to 9 × 8.5 cm. In the leaf and calyx characters it shows a distinct resemblance to *J. decurrens* and it is possible that this plant represents introgression between *J. decurrens* and *J. cuspidifolia*.

Jacaranda chapadensis is here reduced to the synonymy of *J. cuspidifolia*. It was described from the fruit only but the illustration of the fruit is clearly this species; moreover *J. cuspidifolia* is the only remotely similar species in southern Mato Grosso.

15. *Jacaranda decurrens* Chamisso, *Linnaea* 7: 544. 1832. Type. Brazil *Sellow s.n.* (B*, F photo 18467). Neotype. Brazil. São Paulo: Mun. Botucatu, 550 m, *Morawetz* 12-9975 (WU, isotype, MO).

Jacaranda pteroides Manso, Enum. subst. braz. 40. 1836. Type. Brazil. São Paulo & Minas Gerais. *Manso s.n.* (not seen).

Jacaranda robertii Moore, J. Bot. **45**: 404. 1907. Type. Brazil. Mato Grosso: Santa Anna da Chapada, *Roberts 675* (holotype, BM; isotype, MO—flowers only). *Jacaranda decurrens* var. *glabrata* Hassler, Feddes Report. **9**: 63. 1910. Type. Paraguay. Sierra de Amambay, *Rojas 10635* (lectotype, K; isotype, G).

Xylopodial *subshrub* 20–50(–100) cm tall, the branchlets subterete, more or less glabrescently pilose, without whitish lenticels. *Leaves* bipinnate, (25–)30–40(–50) cm long, with 14 to 26 pinnae, each pinna with varyingly pilose more or less winged rachis and 5–39 sessile oblong, usually incompletely separated leaflets, these 0.7–1.5 cm long and 0.3–0.6 cm wide, apex obtuse to acutish, usually apiculate, with the base usually decurrent and more or less continuous with the winged rachis, usually sparsely to densely pilose at least along midvein below, sometimes completely glabrescent, coriaceous, more or less bullate, the margin involute. *Inflorescence* a small contracted terminal panicle much exceeded by the leaves, pilose, in part with gland-tipped trichomes, bracts thin, narrowly oblong, to 3–4 mm long. *Flowers* with the calyx deeply 5-parted to near base, the lobes oblong-ovate or oblong-lanceolate, acute to subacuminate, 4–6 mm long, ca. 2 mm wide, more or less sparsely pilose at least around margins, in part with gland-tipped trichomes; corolla blue or bluish purple, tubular-campanulate above a narrow neck which is curved and enlarged toward the base, 4–5 cm long, 1–2 cm wide at the mouth, the lobes 1 cm long, the tube 3–4 cm long, puberulous outside, in part with gland-tipped trichomes, rather densely near base, more sparsely on rest of tube, the lobes somewhat pilose with long weak trichomes, inside with scattered long trichomes in throat, also glandular villous on stamen insertions; stamens didynamous, the anthers monothebate, the second theca reduced to a minute 0.5 mm long appendage, each theca 2–2.5 mm long, the staminode 2.5–3 cm long, included to subexserted, densely glandular villous, the apex not or very slightly expanded; ovary flattened-ovate, 2 mm long, 1.2 mm wide, glabrous; disk patelliform-pulvinate, 1 mm long, 2 mm wide. *Fruit* elliptic to obovate-elliptic, strongly woody, with a more or less developed short basal stipe, 6.5–10 cm long, 4.5–6.5(–8) cm wide (l:w = 1.1–1.5), the margin not undulate at dehiscence, glabrous except for a few scales, the surface microscopically fissuring, drying yellowish tan to brownish; *seeds*

flat suborbicular, 2–2.5 cm long, 2.5–3 cm wide, the hyaline-membranaceous wing surrounding and not sharply demarcated from the seed body.

Distribution (Fig. 22). Cerrado and campos cerrados from São Paulo and the Sierra de Amambay of Paraguay to Mato Grosso, Goiás, and Minas Gerais; 500–800 m elevation.

Representative specimens examined. BRAZIL. GOIÁS: Serra do Caiapo, 60 km S of Caiapônia, road to Jataí, 27 Oct 1964 (fr), *Irwin & Soderstrom 7438* (MO, NY). MATO GROSSO: 15–120 km beyond Alto Araguaia, road to Cuiabá, 25 Aug 1963 (fl), *Maguire et al. 56295* (COL, NY); Cuiabá, atras do Colegio Buri-ti, 12 Oct 1973 (fl), *Prance et al. 18868* (CH, MO, NY). MINAS GERAIS: Rod. BR 153, Frutal, Sep 1974 (fl), *Hatschbach & Kummrow 34928* (C, MBM, MO). SÃO PAULO: Botucatu, 18 km N of Botucatu, 14 km E of São Manuel, 24 May 1975 (fr), *Morawetz 11-24575* (MO).

PARAGUAY. AMAMBAY: Cabecera Río Aquidaban, Sierra de Amambay, Oct 1933 (fl), *Rojas 6432* (MO).

Local name. Pará parai mi.

The only xylopodial subshrub of section *Monolobos*; also very distinctive in the small inflorescence much exceeded by the leaves and the leaflet bases usually strongly decurrent on the rachis and incompletely differentiated from it. The woody fruits, borne at ground level, are also unique. Western collections tend to have leaflets with much less decurrent bases but are otherwise so similar that no taxonomic distinction seems warranted. Morawetz (1982) has suggested that such forms may represent hybridization with *J. cuspidifolia*, at least in Paraguay.

16. *Jacaranda duckei* Vattimo, Rodriguesia 36: 79. “1984.” Type. Brazil. Pará: Monte Alegre, Camara, 6 Mar 1923 (fr), *Ducke s.n. RB18171* (RB).

Small *tree* 1.5–4(–12?) m tall, the branchlets sparsely lepidote, otherwise glabrous, without whitish lenticels. *Leaves* in part bipinnate, in part simply pinnate, when bipinnate often with only 2 or 4 pinnae plus some undivided basal leaflets, each pinna (or simply pinnate leaf) with canaliculate rachis slightly puberulous in groove and ca. 3–7(–9) subsessile, asymmetrically ovate to subelliptic leaflets, these 1.5–12 cm long and 1–7 cm wide, apex obtuse to acuminate, the base rounded, slightly puberulous on midvein above, below slightly puberulous to glabrate on main veins,

membranaceous, the margin entire, drying light olive below, darker above. *Inflorescence* a flexuous sparsely branched axillary or cauliflorous panicle, almost glabrous with a few lepidote scales and simple trichomes, the bracts and bracteoles sublinear, ca. 5 mm long. *Flowers* with the calyx cupular, shallowly and irregularly 2–5-dentate, 7–10 mm long, 4–6 mm wide, glabrous or nearly glabrous, usually with a few lepidote scales and some inconspicuous trichomes near margin; corolla dark purple, tubular-campanulate above a narrow basal tube, 3.5–5 cm long, ca. 1 cm wide at the mouth, the lobes ca. 0.5 cm long, puberulous with sessile scales and short gland-tipped trichomes outside, inside glandular-villous at the stamen insertion; stamens didynamous, the anthers dithecate, each theca ca. 2 mm long, the staminode 3.5–4 cm long, subexserted, the middle third and apex glandular villous; ovary flattened-ovate, 2 mm long, 1.5 mm wide, glabrous; disk cylindrical-pulvinate, 1 mm long, 2 mm wide. *Fruit* elliptic, acutish at apex, slightly stipitate with a persistent calyx; subwoody, 5–9 cm long, 2.5–4 cm wide, the margin not undulate at dehiscence, glabrous, drying blackish; *seeds* thin, the body surrounded by elliptic wings, 0.8–1.2 cm long, 2–2.8 cm wide, the wing brownish-hyaline.

Distribution (Fig. 26). Northern coast of eastern Brazil from eastern Pará to Ceará; also recently discovered at Saül, French Guiana; near sea level to 200 m elevation.

Specimens examined. FRENCH GUIANA. Saül, 3°38'N, 53°12'W, 220 m alt., 23 Jun 1988 (st), Gentry 63140 (MO).

BRAZIL. CEARÁ: Praia de Soure, Fortaleza, 22 Feb 1955 (fl), *Ducke* 2414 (EAC, K); Amanari, Pocihu, 8 May 1957 (fl, fr) *Guedes* s.n. (K). Serra do Porinho, 8 May 1957 (fl, fr), *T. Guedes* 396 (IAN, K). MARANHÃO: Mun. Monção, Ka'apor Indian Reserve, 6 May 1986 (st), *Balée* 2178 (NY). Anajatuba, *Ribeiro & Pinheiro* 1196 (MO); Araguana, Alto Turi, 28 Sep 1966 (fl, fr), *Rodrigues* 8259 (INPA, MO). PARÁ: Rio Jari, Monte Dourado, 4 Feb 1968 (st), *Oliveira* 4100 (IAN). Monte Alegre, Região do Camara, 6 Mar 1923 (fr), *Ducke* s.n. (RB18171) (RB); Monte Alegre, Colonia Itanajury, 26 Apr 1916 (fl, fr), *Ducke* s.n. (MG16095) (K, MG).

Common names. Paparauba de rato, caroba.

This species has been treated by Sandwith (in Herb.) and Gentry (in Herb.) as *J. heteroptila*, as characterized by the incompletely bipinnate leaves with relatively large membranaceous leaflets. However, the type of *J. heteroptila* is from

São Paulo and seems referable to *J. macrantha*. The northern plant (i.e., *J. duckei*) differs from *J. macrantha* in thinner narrower more elliptic fruits and a relatively few-flowered inflorescence with tenuous nearly glabrous branches. *Jacaranda duckei* is very closely related to upper Amazonian *J. glabra* from which it differs mainly in having smaller leaves with fewer leaflets; however the large range disjunction supports separation of these two taxa.

The Maranhão collection by Ribeiro & Pinheiro has uniformly simply pinnate leaves and is from a 12 m tall tree. The leaflets are young but appear to be narrower, thinner, and more sharply acuminate than in other collections. It is possible that this represents a different taxon; if so, *Carvalho & Lewis* 846 from Ilhéus, Bahia, here tentatively assigned to *J. puberula*, will probably prove conspecific with it, despite the latter's bipinnate leaf.

17. *Jacaranda egleri* Sandwith, Kew Bull. 15: 463. 1962. Type. Brazil. Pará: Missão Velha, Rio Cururu, Alto Tapajos, 19 Jul 1959 (fl, fr), *Egler & Raimondo* 950 (holotype, MG; isotypes, HB, IAN, K).

Xylopodial *subshrub* 0.25 m tall, the branchlets subterete to subtetragonal, very slightly minutely puberulous, with inconspicuous tannish lenticels. *Leaves* simply pinnate with narrowly winged lepidote but otherwise glabrous rachis and 5–11 sessile elliptic-ovate leaflets, these 0.7–2.8 cm long, 0.4–1.5 cm wide, apex obtuse to acutish, the base rounded, lepidote-glandular, otherwise glabrous except for a very few minute trichomes along margin and occasionally on main vein below, coriaceous, entire. *Inflorescence* a few-flowered terminal raceme, very minutely puberulous, with linear inconspicuous bracts. *Flowers* with the calyx cupular, shallowly 5-dentate, 4–6 mm long, 3–4 mm wide, minutely lepidote, otherwise glabrous except for small appressed trichomes around and inside the lobes; corolla pale purple, tubular-campanulate above a long narrow basal tube, 2.5–4 cm long, 0.8–1 cm wide at the mouth, the lobes ca. 0.5 cm long, the tube 1–3.5 cm long, nearly glabrous outside, with a few minute trichomes, the lobes minutely puberulous with ciliate margins, inside glabrous except at the stamen insertion; stamens didyna-

mous, the anthers dithecate, each theca 2 mm long, the staminode ca. 2.5 cm long, subexserted, glandular pubescent on middle and the capitate apex; ovary flattened-ovate, 1 mm long, 1 mm wide, glabrous; disk annular-pulvinate, 1 mm long. *Fruit* elliptic, subwoody, 3–3.5 cm long, 1.5–1.8 cm wide, the margin not undulate at dehiscence, scattered lepidote, otherwise glabrous, drying blackish; *seeds* small-bodied with a surrounding elliptic wing, ca. 0.7 cm long, ca. 1.5 cm wide, the wing hyaline-membranaceous with brownish base.

Distribution (Fig. 22). Known only from Pará, Brazil from the sandy poorly drained floodplain of the Rio Cururu on the Alto Tapajos; alt. 200 m.

Collections examined. BRAZIL. PARÁ: Missão Velha, 2 km N of Rio Cururu, 200 m, 7°45'S, 57°20'W, 13 Feb 1974 (fl, fr), *Anderson et al.* 10933 (C, MO, NY); Alto Tapajos, Rio Cururu, Missão Velha, 19 July 1959 (fl, fr), *Egler & Raimundo* 950 (HB, IAN, K, MG).

Most closely related to *J. campinae* but differing in much smaller leaves and leaflets, the inflorescence a terminal raceme, nearly glabrous corolla, and smaller fruits.

18. *Jacaranda ekmanii* Alain, *Brittonia* **20**: 150. 1968. Type. Haiti: Massif de la Selle, Gauthier, *Ekman H9872* (holotype, NY; isotypes, B, G, MO, NY). Fig. 27.

Shrub or small *tree* 3–8 m tall, the branchlets subterete, sparsely and minutely puberulous, with whitish lenticels. *Leaves* bipinnate, with 12 to 30 pinnae, each pinna with glabrous or sparsely puberulous rachis and 11–70 completely sessile suborbicular leaflets, these 1–3 mm long and 1–2 mm wide (sometimes lowermost pinnae reduced to single leaflets, these to 5 by 3 mm), glabrous, the margin very strongly involute or the whole leaflet folded over. *Inflorescence* a panicle, sparsely puberulous, in part with gland-tipped trichomes, the bracts linear, 2–3 mm long, caducous. *Flowers* with the calyx broadly campanulate, acutely and deeply 5-dentate, 2–3 mm long and 3–4 mm wide, puberulous in part with gland-tipped trichomes; corolla sky blue to purplish blue, tubular-campanulate above a narrow neck which is conspicuously curved and enlarged toward the base, 4–5 cm long, 1–2 cm wide at the mouth, the lobes 1 cm long, the tube 3–4 cm long, puberulous outside with short gland-tipped

and longer several-celled trichomes, the lower lobe densely pubescent, the tube glabrous inside even at the stamen insertion; stamens didynamous; the anthers monothecate, the second theca reduced to a minute appendage, each theca 3 mm long, the long staminode 2.5–3 cm long, subexserted, conspicuously glandular pubescent except at base; ovary flattened-ovate, 1.5–2 mm long, ca. 2 mm wide, densely pubescent; disk pulvinate-cylindrical, 1 cm long, 2 mm wide, fused to base of ovary. *Fruit* elliptic, obtuse at base and apex, 3.5–5 cm long, 2–3 cm wide, the margin not undulate at dehiscence, very minutely puberulous, drying grayish; *seeds* not seen.

Distribution (Fig. 21). Restricted to the peculiar area of dog-tooth limestone in southern Haiti and the Barahona Peninsula of the Dominican Republic; 50–200 m elevation.

Specimens examined. HAITI. Cerro Juan José, 300 m, 23 Sep 1926 (st), *Ekman H7047* (G, MO). Massif de la Selle, Gauthier, 17 Apr 1928 (fl, fr), *Ekman H9872* (B, G, MO, NY).

DOMINICAN REPUBLIC. PEDERNALES: Loma El Guano, 30 km SE of Pedernales, 200 m, 17°57'N, 71°35'W, 12 Apr 1985 (fl, fr), *Gentry & Mejia* 50762 (JBSD, MO); 10 km E del cruce de Cabo Rojo-Pedernales, Loma El Guano, 17°56'N, 70°34'W, 200 ft, 7 May 1982 (fl, fr), *Zanoni et al.* 20523 (JBSD, MO).

The only remotely similar species is *J. cowellii* of Cuba which has similarly minute suborbicular leaflets. That species generally is very different in having simply pinnate leaves. However there is a partially bipinnate form of *J. cowellii* and the Hispaniolan material was originally identified as that species. *Jacaranda ekmanii* differs from both forms of *J. cowellii* in having completely sessile leaflets; it also differs in acuminate calyx lobes and larger more puberulous corollas.

19. *Jacaranda glabra* (A. P. de Candolle) Bureau & K. Schumann in Martius, *Fl. bras.* **8(2)**: 394. 1897.

Pteropodium glabrum A. P. de Candolle, *Prodr.* **9**: 239. 1845. Type. Bolivia. Santa Cruz: Inter San Carlos et Buena Vista, *D'Orbigny s.n.* (P).

Jacaranda rachidoptera Bureau & K. Schumann in Martius, *Fl. bras.* **8(2)**: 374. 1897. Type. Peru. San Martín: Tarapoto, *Spruce* 4893 (B*, isotypes, BR, G, K, NY, W).

Jacaranda cauliflora Bureau & K. Schumann in Martius, *Fl. bras.* **8(2)**: 373. 1897. Type. Peru. Huánuco: Pozuzo, *Poeppig* 1987 (holotype, W; isotype, K).

Jacaranda longiflora Britton ex Rusby, *Bull. Torrey*



FIG. 27. *Jacaranda*. **A**, *J. morii* (type); **B**, *J. ulei* (Gentry 21381) [note the former's more open arrangement of larger leaflets]; **C**, *J. ekmanii* (Gentry & Mejia 50762) [note minute leaflets]; **D**, *J. caucana* ssp. *caucana* (Gentry & Forero 15397) [note conspicuous trichomes on lower corolla lobe]; **E**, *J. paucifoliolata* (Gentry et al. 49587), a xylopodial subshrub; **F**, *J. copaia* ssp. *spectabilis*, a 30 m canopy tree [scale provided by T. Croat at 25 m level].

Bot. Club 27: 73. 1900. Type: Bolivia. Beni: Junction of Ríos Beni and Madre de Dios, *Rusby 1151* (holotype, NY).

Jacaranda atropurpurea Rusby, Mem. N. Y. Bot. Gard. 7: 357. 1927. Type. Bolivia. Beni: Rurrenabaque, 1000 ft, *White 862* (holotype, NY; isotype, K).

Jacaranda intermedia Huber, Bol. Mus. Para 4: 608. 1906, non Sonder 1849. Type. Peru. San Martín: Río Chipurana, *Huber 1551* (RB).

Small tree or treelet 2.5–8 m tall, to 10 cm dbh, usually unbranched or few-branched, the branchlets thick, terete. Leaves bipinnate, with 9–11 pinnae, each pinna with narrowly winged (sometimes very obscurely winged) rachis and 3–13 sessile, asymmetrically elliptic to elliptic-oblong leaflets, these 2–17 cm long, 1–8 cm wide,

apex acuminate, the base cuneate, virtually glabrous to puberulous with short erect trichomes over whole surface above and below. *Inflorescence* a small, few-flowered ramiflorous or cauliflorous panicle, these sometimes densely aggregated along whole trunk, more or less lepidote, also densely to very sparsely puberulous, the bracts caducous. *Flowers* with the calyx cupular, shallowly 5-dentate, 5–12 mm long and 4–8 mm wide, usually very sparsely puberulous with a few simple and gland-tipped trichomes, occasionally completely glabrous; corolla purple, tubular-campanulate above a narrow basal tube, 4–5.6 cm long, 1–2.5 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 3.5–5.5 cm long, glandular-lepidote outside, inside glabrous or sparsely glandular lepidote even at level of stamen insertion; stamens didynamous, dithecate, the thecae divaricate, 2 mm long, the staminode ca. 4 cm long, glandular pubescent throughout; ovary flattened-ovate, 2 mm long, 1.5–2 mm wide, glabrous; disk pulvinate, 1.5–2 mm long, 3 mm wide. *Fruit* elliptic, rounded to subacute at apex, abruptly cuneate to more or less rounded at base, usually subtended by persistent calyx, 9–17 cm long, 4.5–6 cm wide, the margin not undulate at dehiscence, glabrous, drying blackish; *seeds* small-bodied with a surrounding transversely elliptic wing, 1.6–2.2 cm long, 2.5–3 cm wide, the wing subhyaline-membranaceous, not sharply demarcated from seed body.

Distribution (Fig. 26). Southern Colombia to Bolivia and westernmost Amazonian Brazil; 200–1100 m elevation.

Representative specimens examined. **COLOMBIA.** CAQUETA: 10 km S of San José de Fragua, Jan 1974 (st), Gentry et al. 9143 (MO). PUTUMAYO: Río Putumayo, Puerto Ospina, 25 Nov 1940 (fl), Cuatrecasas 10796 (COL, US).

ECUADOR. MORONA-SANTIAGO: 16 Oct 1975 (fl), Little 751 (US). NAPO: Nuevo Rocafuerte, Río Braga, 1 Mar 1981 (fl), Jaramillo & Coello 4491 (AAU, MO, QCA). PASTAZA: Puerto Sarayacu, Oct 1974 (fl), Lugo 3897 (AAU, GB, MO). ZAMORA-CHINCHIPE: N of Yantzaza, 16 Nov 1982 (fl), Pennington & Tenorio 10751 (MO).

PERU. AMAZONAS: Río Santiago, Caterpiza (fl), 18 Oct 1979 (fl), Huashikat 991 (MO). AYACUCHO: La Mar, Machete-Rosario, 16 Sep 1976 (fl, fr), Wasshausen & Encarnación 668 (MO, US). CUZCO: Paucartambo, Villa Carmen, Oct 1963 (fl), Vargas C. 14896 (MO). HUÁNUCO: Tingo María, Sep 1959 (fl, fr), Woytkowski 5396 (MO). JUNÍN: Sanibeni, Sep 1960 (fl, fr), Woytkowski 5951 (MO). LORETO: Andoas, campamento petrolero, Río Pastaza, 21 Nov 1980 (fl), Vasquez & Jara-

nillo 807 (AAU, AMAZ, MO). MADRE DE DIOS: confluence of Río Tambopata and Río La Torre, 39 km SW of Puerto Maldonado, 14 Oct 1985 (fl), S. Smith 729 (MO, US). SAN MARTÍN: Prov. Alto Amazonas, vic. Convento, NE of Pongo de Canarachi, 12 Oct 1985 (fl), Gentry et al. 52287 (MO, USM); Tarpoto, Oct 1902 (fl), Ule 6487 (G, HBG, L, MG). UCAYALI: Quebrada Shesha, 65 km NE of Pucallpa, 25 Jun 1987 (st), Gentry & Diaz 58547 (MO).

BRAZIL. ACRE: Rio Acre-Seringal S. Francisco, Sep 1911 (fl), Ule 9776 (G, MG). AMAZONAS: Mun. Humaita, Estrada Humaita-Jacarecanga, km. 64, 15 Jun 1982 (fl), Teixeira et al. 1152 (MO).

BOLIVIA. BENI: Junction of Rivers Beni and Madre de Dios, Aug 1886 (fl), Rusby 1151 (MO, NY, US). LA PAZ: S. Yungas, Río Bopi, Asunta, Jul 1939 (fr), Krukoff 10612 (MO). SANTA CRUZ: Sara, Buenavista, 2 Oct 1924 (fl), Steinbach 6551 (G, MO).

A common pachycaul second growth treelet in western Amazonia. In sterile condition it could easily be confused with juveniles of sympatric *J. copaia* ssp. *spectabilis*, from which it is most readily distinguished by the more strongly winged rachis and/or generally larger uniformly entire leaflets.

20. *Jacaranda grandifoliolata* A. Gentry, *Phytologia* 57: 246. 1985. Type. Brazil. Bahia: 24 km SW of Belmonte on road to Itapebi, 39°3'W, 16°0'S, Harley et al. 17362 (holotype, CEPEC; isotypes, K, MO).

Shrub or *treelet* 0.5–3 m tall. Branchlets subterete to subtetragonal, glabrous, finely ridged. *Leaves* simply pinnate (in part bipinnate in juveniles), 3–5-foliolate (to ca. 9-foliolate in bipinnate juveniles), the rachis subulate; leaflets (except terminal) subsessile or with 1–2 mm long petiolules, elliptic to obovate, obtuse at apex, cuneate to obtuse at base, 3–13 cm long, (1–)1.8–7 cm wide, entire, coriaceous, minutely glandular lepidote above and below, otherwise completely glabrous, the venation slightly raised above and below, drying dark above, olive brown with reddish brown midvein below. *Inflorescence* terminal and axillary, paniculate, with a well-developed main rachis and few-flowered lateral branches, rather small (less than 12 cm long), glabrous or very sparsely and minutely puberulous. *Flowers* with the calyx cupular, evenly 5-dentate, 3–4 mm long, 3–4 mm wide, ciliate, otherwise glabrous or with scattered minute trichomes, a few plate-shaped glands often present; corolla purple, tubular-campanulate, 3–4.5 cm long, 0.7–1.2 cm wide at mouth of tube, the tube

2.4–4 cm long, the lobes ca. 0.5 cm long, sparsely puberulous inside with longer trichomes on lobes and at level of stamen insertion; stamens didynamous, the anthers 2-thecate, each theca 2 mm long, the staminode ca. 3.5 cm long, glandular pubescent at middle and tip, the apex undivided; ovary flattened-oblong, 1.5 mm long, 1.5 mm wide, glabrous; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* (immature) elliptic, 4–5 cm long, ca. 3 cm wide, glabrous except for scattered lepidote scales, the margin apparently undulate, the calyx persistent; *seeds* not seen.

Distribution (Fig. 22). Endemic to the restingas of the south central coast of Bahia in the Ilhéus region; below 50 m elevation.

Collections examined. BRAZIL. BAHIA: Mun. Alcobaça, Rod. BA 001, 5 km sul de Alcobaça, 10–20 m alt., 17 Mar 1978 (fl), *Mori et al.* 9605 (MO); Mun. Palmeiras, Pai Inacio, BR242, W of Lencois, 12 Jun 1981 (fr), *Mori & Boom* 14342 (MO); Rod. Sta. Luzia-Canavieiras, 3 Nov 1971 (fl), *Pinheiro* 1697 (CEPEC, RB); Mun. Ilhéus, Faz. Guanabara, ramal com entrada no km 10 de Rod. Pontal-Oliveira, 30–40 m, 16 Oct 1980 (fl), *L. M. Silva et al.* 1198 (CEPEC, MO); Mun. Ilhéus, Faz. Barra do Manguinho, ramal com entrada no km. 12 da Rodovia Pontal-Oliveira, 50 m alt., 25 Sep 1980 (fl), *L. M. Silva et al.* 1069 (CEPEC, MO).

Common name. Caroba, carobinha.

This species has the largest leaflets of any *Jacaranda*. It is closely related to *J. obovata* which grows in the same coastal restingas, though usually in wetter places. That species differs in uniformly bipinnate leaves with smaller leaflets, truncate to irregularly labiate calyx, and larger, many-flowered inflorescence. Apparently *J. grandifoliolata* is always less than 3 m high while *J. obovata* is 3–10 m tall. It is possible that *J. grandifoliolata* is a juvenile or ecotypic form of *J. obovata* but the available collections are very uniform and strikingly different in their much larger leaflets and simply pinnate leaves at maturity.

21. *Jacaranda hesperia* Dugand, *Mutisia* 23: 1. 1954. Type. Colombia. Valle: Río Cajambre, 5–80 m, 5–15 May 1944, *Cuatrecasas* 17661 (holotype, COL; isotype, F).

Tree (3–)5–25 m tall, to 35 cm dbh., the branchlets glabrous, subterete, with whitish lenticels when young. *Leaves* bipinnate, with 14 to 22(–26) pinnae, each pinna with very narrowly winged rachis usually at least slightly but gla-

brescently puberulous in dorsal groove, and (15–)21–41 sessile, asymmetrically oblong leaflets, these 0.3–2.5(–3.2 fide Dugand) cm long and 0.2–1 cm wide, apex obtuse, usually apiculate, the base asymmetrically cuneate, minutely lepidote, usually somewhat pilose-bearded near base of midvein below, sometimes glabrescent, membranaceous to chartaceous, the margins entire, drying dark olive above, pale olive below. *Inflorescence* a ramiflorous panicle, somewhat lepidote, otherwise glabrous or with a very few minute trichomes, with linear bracts ca. 3–4 mm long. *Flowers* with the calyx broadly campanulate but deeply 5-lobed, the narrow acute lobes reflexed, 2–3 mm long, 1 mm wide, lepidote, usually slightly puberulous around lobe margins; corolla magenta, tubular-campanulate above a narrow neck which is curved and enlarged toward the base, 4–6 cm long, 1.5–2.5 cm wide at the mouth, the lobes 1–1.5 cm long, the tube 3–5 cm long, tube completely glabrous outside except usually for a few sessile or short-stalked glands at base, pilose with long flexuous trichomes on lobes, glandular villous inside at stamen insertion; stamens didynamous, the anthers monothecate, the second theca reduced to a minute appendage, each theca 1.5–2 mm long, the staminode 2.5–3 cm long, subexserted, glandular villous near middle, otherwise glabrous except for a tuft of long stiffish trichomes at the undivided apex; ovary oblong, 2–2.5 mm long, 1 mm wide, minutely appressed puberulous; disk cylindrical, 1.5 mm long, 1.5 mm wide. *Fruit* oblong-elliptic, woody, substipitate at base, (9–)11–17 cm long, (5–)7–9 cm wide, the margin not undulate at dehiscence but tending to roll up, glabrous, at maturity drying brownish with some lighter flecks; *seeds* elliptic or suborbicular, (1.8–)2.5–3 cm long, (3–)4–5 cm wide, the hyaline-membranaceous wing surrounding the brownish seed body, wing base with radial brownish striations, not sharply demarcated from the seed body.

Distribution (Fig. 28). Northern half of Chocó region of Pacific coastal Colombia from the Río Calima, Valle Department to northern Antioquia; probably also the lowermost Cauca Valley and middle Magdalena Valley. Mostly in wet and pluvial forest; 0–800 m elevation.

Representative specimens examined. COLOMBIA. ANTIOQUIA: Mun. San Luis, Cañón del Río Claro, 5

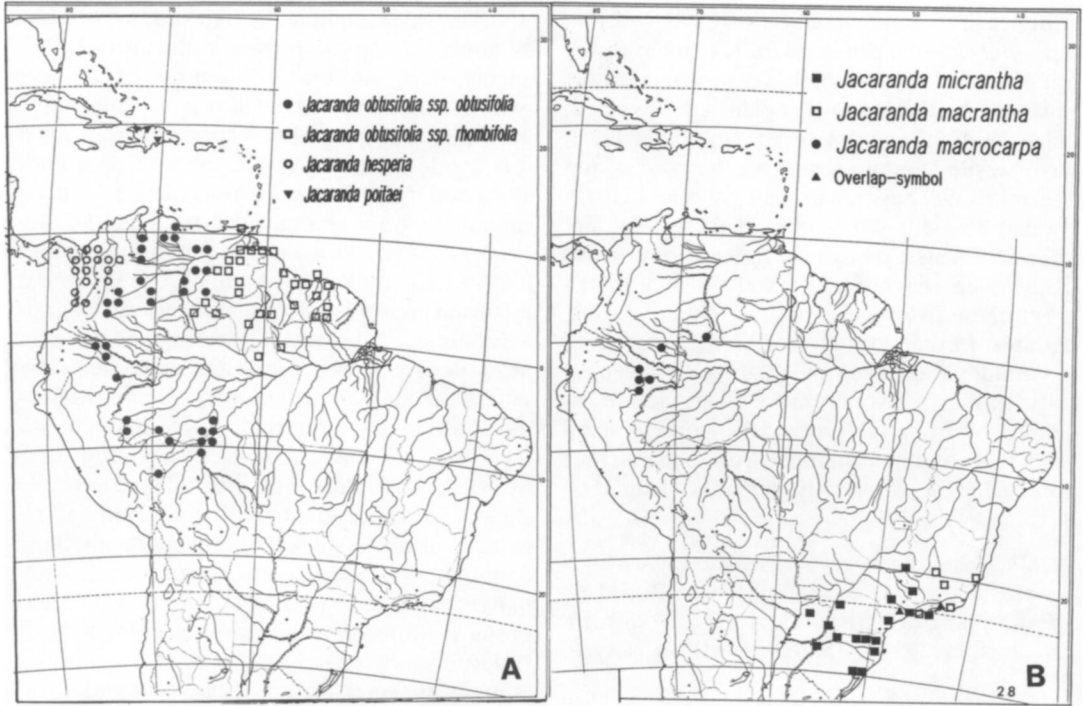


FIG. 28. Distribution of *Jacaranda*. **A**, *Jacaranda* section *Monolobos*. ● = *J. obtusifolia* ssp. *obtusifolia*; □ = *J. obtusifolia* ssp. *rhombifolia*; ○ = *J. hesperia*; ▼ = *J. poitaei*. **B**, *Jacaranda* section *Dilobos*. □ = *J. macrantha*; ● = *J. macrocarpa*; ■ = *J. micrantha*.

Mar 1984 (fl), *Cogollo 1363* (MO); hoyo del Río León, Villa Arteaga, Las Caucheras, 20 Oct 1961 (fr), *Cuatrecasas & Willard 26165* (COL, US); between Cauca & Taraza, Cauca Valley, 18 Nov 1981 (fr), *Gentry et al. 34845A* (COL, MO). **BOLÍVAR:** Quimari, May 1949 (fl), *Sneidern 5784* (COL, F). **CALDAS:** 14–21 km N of La Dorada, road to San Miguel, 7 Mar 1977 (fr), *Gentry et al. 18138* (COL, MO). **CHOCÓ:** San José del Palmar, Río Torito, Finca Los Guadales, 1 Mar 1982 (fl), *Forero 6264* (COL, MO); 6–10 km E of Quibdo, road to Tutunendo, 12 Jun 1982 (fl, fr), *Gentry & Brand 36721* (AAU, COL, MO). **SANTANDER:** 21 km W of San Vicente de Chucuri, 25 Jul 1975 (fr), *Gentry & Forero 15434* (MO). **VALLE:** San José, Dagua Valley, 10 Dec 1908 (fr), *Pittier 599* (US).

This species is most closely related to the highly variable *J. caucana*, from which it can be distinguished chiefly by the larger fruit with non-undulate margin. Dugand (1954) also listed a number of differentiating characters including number and separation of leaf pinnae (7–11(–13) pairs separated by 2.5–3.7(–4.5) cm in *J. hesperia* vs. (12–)16–20 pairs separated by <1.8(–2.4) cm), slightly larger leaflets with non-revolute margins,

less pubescence on leaflet undersides and corolla tube, and narrower more acute calyx lobes in *J. hesperia*. None of the non-fruiting characters is very definitive, especially with the discovery of *J. caucana* var. *glabrata* with the corolla tube completely glabrous outside. To these potential differentiating characters may be added that of staminodial pubescence, with the staminode of *J. hesperia* glandular villous only near the middle and on the extreme apex while that of *J. caucana* is glandular villous (though usually with shorter trichomes) throughout (except the extreme base).

Even the fruit distinction becomes somewhat nebulous in the Magdalena Valley. Included parenthetically in the above description are several large-fruited *Jacaranda* specimens from the Magdalena Valley and the lowermost Cauca Valley, whose affinities remain problematic. Their fruits are 9–13 × 5–8 cm and have non-undulate margins; the seeds are 1.8–2.5 cm long and 3–4.5 cm wide. These fruits (and seeds) are thus larger than any known for *J. caucana* in South

America (Panamanian collections of *J. caucana* ssp. *sandwithiana* can have fruits to 6 cm wide), but smaller than normal for *J. hesperia*. Unfortunately, the flowers of this plant are unknown; one collection includes very young buds which have sessile lepidote scales on the corolla and apparently will have small acute calyx lobes, both compatible with *J. hesperia*. If these represent an eastern range extension of *J. hesperia*, as seems likely, then the morphological distinction between these two species begins to blur. The situation is further complicated by the fact that in the middle Magdalena Valley there also seem to be at least two distinct forms of *J. caucana* (as defined by fruits <5 cm wide), one with small calyx lobes and non-undulate fruit margins, thus approaching *J. hesperia* in the latter character.

22. *Jacaranda intricata* A. Gentry & W. Morawetz, sp. nov. Type. Brazil. Goiás: Rod. BR-040, 5 km de Cristalina, 13 Aug 1980 (fl), *Hatschbach 43100* (holotype, MBM; isotype, MO).

Frutex 1 m altus. Folia pinnata, ca. 11-foliolata, foliolis oblongis, acuminatis, coriaceis, glabris, 2.5–7 cm longis, 1–2.5 cm latis. Inflorescentia floribus in panícula parva glabra dispositis. Calyx cupulatus, 5-dentatus; corolla purpurea, tubulo-campanulata, extus sparsim lepidotoglandulosa; stamina didynama thecis duabus. Capsula elliptica, 5 cm longa, 3 cm lata, margine non undulata.

Xylopodial *subshrub* 1 m, the branchlets subterete, somewhat flattened at nodes, glabrous, without whitish lenticels. *Leaves* simply pinnate with deeply canaliculate rachis, essentially glabrous or with a few lepidote scales and minute trichomes inside dorsal groove, and ca. 11 short petiolulate (petiolule 2–4 mm long) asymmetrically oblong (=half ovate/half obovate) leaflets, these 2.5–7 cm long and 1–2.5 cm wide, apex short-acuminate, the base cuneate, completely glabrous except for scattered lepidote scales, coriaceous, the margin usually entire, occasionally with a few coarse teeth, with brochidodromous secondary veins close together, straight, and strongly ascending, these prominent below and prominulous above, the tertiary venation finely and intricately prominulous above. *Inflorescence* a series of small congested panicles from the axils

of fallen leaves, completely glabrous, the branches noticeably striate-ridged, with narrowly triangular persistent bracts 2–3 mm long. *Flowers* with the calyx cupular, shallowly 5-dentate, 5–7 mm long, 4–6 mm wide, glabrous except for a few lepidote trichomes and minute trichomes along and inside margin; corolla purple, tubular-campanulate above a narrow basal tube, 3.5–4.5 cm long, 1–1.5 cm wide at the mouth, the lobes 0.5 cm long, the tube 3–4 cm long, sparsely and inconspicuously lepidote-glandular outside, puberulous on lobes, inside sparsely pilose with flexuous trichomes in throat and short glandular-villous at stamen insertion; stamens didynamous, the anthers dithecate, each theca ca. 2.5 mm long, the staminode ca. 3 cm long, subexserted, the middle third glandular villous, the slightly bifid apex villous with non-glandular trichomes, also with sessile lepidote glands, these continuous in upper half of staminode; ovary flattened-ovate, 2 mm long, 1 mm wide, glabrous, continuous with the more or less conical-truncate 1 mm long and 1.5 mm wide disk. *Fruit* elliptic, subwoody, 5 cm long, 3 cm wide, glabrous, drying dark; *seeds* thin, with surrounding elliptic wing 0.8–0.9 cm long, 1–1.4 cm wide, the wing brownish-membranaceous.

Distribution (Fig. 22). Known only from the Serra dos Cristais near the Goiás-Minas Gerais boundary; campo rupestre; 1100–1200 m.

Additional collection examined. BRAZIL. Luziania to Cristalina, km 127, near Cristalina, 15 Mar 1980 (fr), *Morawetz 22-151280* (MO, W).

Probably most closely related to *J. caroba* despite the simply pinnate leaves. Since the leaves are not only simply pinnate but have larger leaflets with more secondary veins and a more intricately prominulous venation above than in *J. caroba*, it seems preferable to recognize this plant as specifically distinct. The reddish-drying upper leaflet surface and olive lower surface with reddish veins are also different from any material of *J. caroba*, although approached by a few specimens of that species. The flowers and inflorescence appear to be exactly the same as many collections of *J. caroba*.

Jacaranda intricata is easily distinguished from most other simply pinnate species of the genus by having lateral inflorescences borne along the stem. Amazonian *J. campinae* and coastal Bahian *J. grandifoliolata* also have lateral inflores-

cences, the former differing most conspicuously in a strongly winged rachis, the latter in the fewer larger darker-drying leaflets. *Jacaranda rugosa* of interior Pernambuco apparently also has lateral inflorescences but very different strongly and intricately bullate leaflets. In addition *J. duckei* of the northeast coastal forest sometimes has simply pinnate leaves but these are very different in being membranaceous. A good differentiating character from more or less sympatric *J. paucifoliolata* is the longer more elliptic fruit.

23. *Jacaranda irwinii* A. Gentry, Ann. Missouri Bot. Gard. **61**: 880. 1974. Type. Brazil. Bahia: Serra do Tombador, 18 km E of Morro do Chapeu, 1110 m, 16 Feb 1971 (fl), *Irwin et al.* 32250 (holotype, UB; isotypes, MO, NY).

Spindly shrub or treelet 1.5–3(–5) m tall, the branchlets subtetragonal, puberulous to glabrate. Leaves simply pinnate with the rachis lepidote, usually minutely puberulous, unwinged, strongly grooved above, and 5–19 leaflets, these elliptic, obtuse, the base rounded, subsessile or usually with petiolule 1–4 mm long, coriaceous or subcoriaceous, 1–10 cm long, 0.5–5 cm wide, the secondary veins 3–8 on a side, curving, inconspicuous above, prominent below, sometimes more or less bullate, the margin entire, revolute, glandular punctate above and below, variably pubescent, usually pilose below, often short puberulous and rarely scabrous above, sometimes completely glabrous. Inflorescence a narrow panicle, puberulous and glandular punctate, with obovate or oblanceolate foliaceous bracts to 3.5 by 1.8 cm. Flowers with calyx cupular, usually with five laterally expanded suborbicular lobes to 2–3 mm in diam., the lateral lobe expansion reduced or lacking in some populations, 4–7 mm long (with lobes) and 4–7 mm wide, more or less puberulous and minutely lepidote, usually also with scattered plate-shaped glands; corolla purple to lavender-purple, tubular-campanulate above a narrow basal tube, 3–6 cm long, 1–2 cm wide at mouth of tube, the tube 4–5 cm long, the lobes 5–10 mm long, puberulous with simple trichomes outside, the lobes inside very sparsely glandular lepidote and puberulous to almost glabrous, tube glabrous inside except for glandular trichomes at level of stamen insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the staminode ca. 3 cm long, bifid at

tip, densely glandular villous near middle, the upper third glandular-lepidote, also with gland-tipped trichomes near apex; ovary flattened-ovoid, 1 mm long, 1 mm wide, glabrous; disk 1.5 mm long, 2 mm wide, cupular-pulvinate. Fruit round to elliptic or obovate, barely subwoody, 3–5(–7) cm long, 2–3(–4) cm wide, the margin not at all undulate at dehiscence, glabrous, drying blackish; seeds unknown.

Distribution (Fig. 26). Endemic to the Serra do Sincora and Serra do Tombador in west central Bahia, mostly in campo rupestre; 800–1300 m.

Representative specimens examined. BRAZIL. BAHIA: Morro do Chapeu, Cachoeira do Ferro-Doido, 31 May 1977, *Fernandez & Matos s.n.* (EAC3312) (EAC); Estrada Barra da Estiva-Capão da Volta, 7 km de Barra da Estiva, 19 Jul 1981 (fr), *Giulietti et al.* CFCR1348 (MO, UEC); Rio Cumbuca, 3 km S of Mucuge, 4 Feb 1974 (fl), *Harley et al.* 15899 (CEPEC, K, M, MO); Serra do Sincora, W of Barra da Estiva, road to Jus-siape, 22 Mar 1980 (fl), *Harley* 20745 (CEPEC, K, MO); Serra do Tombador, 18 km E of Morro do Chapeu, 16 Feb 1971 (fl), *Irwin et al.* 32250 (MO, NY, US); Rio de Contas, 9–11 km N de Rio de Contas, 20 Jul 1979 (fl), *Mori et al.* 12362 (MO, NY); Saude, Serra da Saude, 3 Sep 1981 (fr), *Orlandi* 503 (F).

Most closely related to *J. paucifoliolata* from which it differs in the usually more numerous leaflets with fewer more curved less ascending secondary veins, mostly longer petiolules, and especially the lack of a conspicuously intricately reticulate upper surface. *Jacaranda paucifoliolata* also occurs farther west than *J. irwinii*. The pubescence of *J. irwinii* is extremely variable but appears to be of no taxonomic significance whatsoever. Both collections with completely glabrous leaves and with leaves strongly velutinous below are known from all four populations represented by multiple collections. Most populations of *J. irwinii* have very characteristic laterally expanded round calyx teeth but all collections from the Mucuge area (in the middle of the species distributional area) and the two collections from south of Rio das Contas have unwinged calyces.

24. *Jacaranda jasminoides* (Thunberg) Sandwith, Meded. Bot. Mus. Herb. Univ. Utrecht **40**: 232. 1937.

Bignonia jasminoides Thunberg, Pl. bras., decas tertia, **28**: 36. 1821. Type. Brazil. *Thunberg s.n.* (holotype, UPS).

Jacaranda tomentosa R. Brown, Bot. Mag. **49**: t. 2327.

1822. Lectotype. Brazil. *Sellow 308* (lectotype, G; isotypes (s.n.), HBG, US).

Bignonia curialis Vellozo, Fl. flumin. 253. 1829. Type illustration. Brazil. Fl. flumin. 6: t. 55. 1831. (see Gentry, 1975: 339).

Jacaranda curialis (Vellozo) A. P. de Candolle, Prodr. 9: 232. 1845.

Jacaranda pubescens Guillemain ex A. P. de Candolle, Prodr. 9: 231. 1845, pro syn.

Jacaranda subvelutina Martius ex A. P. de Candolle, Prodr. 9: 231. 1845, pro syn.

Jacaranda alagoensis Vattimo, Rodriguesia 36: 82. 1984. Type. Brazil. Alagoas: Arapiraca, *Lyra et al.* 159 (RB).

Small tree (1–)2–4 m tall, the branchlets terete, puberulous. Leaves bipinnate, sometimes in part simple pinnate or with part of pinnae reduced to single leaflets, 12–25 cm long with 5–9 pinnae, the rachis terete, puberulous, the leaflets (1–)5–9(–11) per pinna, sessile, ovate or ovate-elliptic, somewhat asymmetric, apex acute to obtuse, the base cuneate to rounded, 1.8–4(–7) cm long, 0.9–2(–4) cm wide, the terminal leaflet usually conspicuously larger, the surface smooth, olive green and sparsely pilose above, below densely whitish-pilose, sometimes scabrous above, membranaceous to subcoriaceous, sometimes slightly subbullate. Inflorescence a panicle, puberulous, with small linear bracts. Flowers with the calyx cupular, shallowly 5-dentate, 4–7 mm long and 3–6 mm wide, usually rather sparsely pilose, sometimes in part with gland-tipped trichomes; corolla lilac to deep wine-colored, tubular-campanulate above a narrow basal tube, 3.5–5(–7) cm long, 0.8–2.5 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 3–5(–6) cm long, rather sparsely puberulous outside with short (in part sessile) gland-tipped trichomes, also glandular-pubescent on lobes and inside at stamen insertion; stamens didynamous, the anthers bithecate, each theca 2–3 mm long, the long staminode to 5 cm long, subexserted, the apex entire or slightly bifid, only the middle and apex strongly glandular pubescent; ovary flattened-ovate, 2 mm long, ca. 1 mm wide, glabrous, slightly contracted at base to top of broadly conical 1 × 2 mm disk. Fruit elliptic to oblong, thinly woody, glabrous with a somewhat raised lepidote surface, drying dark brown to blackish, subtended by persistent calyx; seeds small-bodied, with a surrounding suborbicular wing, ca. 1 cm long, ca. 2 cm wide, the wing hyaline-membranaceous with radial brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 26). Coastal Brazil from Rio de Janeiro to Pernambuco; also Ceará. Especially characteristic of vegetation patches on top of the morros around Rio de Janeiro; 0–600 m elevation.

Representative specimens examined. BRAZIL. BAHIA: Monte Santo, 20 Feb 1974 (fl, fr), *Harley 16906* (CEPEC, MO). CEARÁ: Serra do Araripe, 25 Feb 1958 (fr), *Guedes 520* (IAN, K, MG). ESPÍRITO SANTO: St. Theresa, May 1839 (fr), *Guillemain 801* (P). MINAS GERAIS: Sin. loc., *Martius s.n.* (M). PERNAMBUCO: Qui-papa, Uzina Agua Branca, Fazenda Pelada, 12 Jul 1950 (fr), *Lima 50-596* (K). PIAUÍ: Serra da Capivara, entre S. João do Piauí e São Raimundo Nonato, 5 Dec 1971 (fl), *Lima 1193* (ESA, MO). RIO DE JANEIRO: Niteroi, Itaipu, Morro des Andorinhas (fl, fr), *Araujo et al.* 3200 (MO); Piedra de Itauna, S edge of Rio de Janeiro, 13 Jan 1985 (fl, fr), *Gentry & Zardini 49497* (MO).

Local names. Carobo, carobo miuda.

Characterized by the strongly pilose leaflets, usually of noticeably different sizes on the same leaf, especially with the terminal conspicuously larger. The persistent calyx in fruit is also unusual in the genus.

Recently described *J. alagoensis* is clearly referable to *J. jasminoides*. The very fragmentary type was described as having bipinnate leaves but is a perfect match with material from Pernambuco that shows the typical combination of divided upper pinnae with lower pinnae reduced to single leaflets that is so characteristic of *J. jasminoides*. Rather bullate leaflets with a scabrous upper surface, similar to those of the *J. alagoensis* type, are found as variants throughout the range of *J. jasminoides*.

25. *Jacaranda macrantha* Chamisso, Linnaea 7: 552. 1832. Type. Brazil. *Sellow s.n.* (lectotype, HBG; isotype, K).

Bignonia elliptica Vellozo, Fl. flumin. 6, 1829. Type illustration. Brazil. Vellozo, Atl. Fl. flumin., t. 44, 1831. Non *B. elliptica* Thunberg, Pl. bras. decas 3(26): 34. 1821.

Jacaranda elliptica (Vellozo) Steudel, Nomencl., ed. 2, 2: 204. 1841, nom. nud.

Jacaranda elliptica (Vellozo) Martius ex A. P. de Candolle, Prodr. 9: 232. 1845.

Jacaranda heteroptila Bureau & K. Schumann in Martius, Fl. bras. 8(2): 378. 1897. Type. Brazil. São Paulo: Campos da Bocaina, *Glaziou 11239* (holotype, P; isotype, C).

Small tree 2–10 m tall, the branchlets subtrigonal, very minutely and glabrescently puberulous, usually with small whitish lenticels.

Leaves bipinnate (rarely some of the lower pinnae reduced to single large leaflets), 30–60 cm long on fertile branches, with (12–)14–20(–30) pinnae, each pinna with slightly margined puberulous rachis and (13–)15–21(–25) sessile or short petiolulate asymmetrically ovate or ovate/obovate leaflets, these (2.5–)5–8(–15) cm long and (0.9–)1.5–2.5(–4.5) cm wide, the apex acuminate, the base more or less cuneate, entire, somewhat bullate, glabrous or glabrescent above except the midvein, below puberulous at least along the veins and sometimes over surface (Espírito Santo) with short crisped trichomes. *Inflouescence* a large open panicle, minutely puberulous, the bracts caducous. *Flowers* with the calyx cupular, subtruncate, 6–8 mm long, 5–7 mm wide, glabrous or puberulous with a very few minute inconspicuous trichomes; corolla dark purple, tubular-campanulate above a narrower base, (4.5–)5–6(–6.5) cm long, (1–)1.3–1.7 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 4–5.5 cm long, puberulous outside, mostly with sessile glands, also with a few minute simple trichomes, lobes inside glandular papillose, otherwise glabrous, tube inside very sparsely glandular pubescent at stamen insertion; stamens didynamous, the anthers dithecate, each theca 3 mm long, the staminode ca. 3 cm long, not exerted, the apex slightly expanded, glandular villous near middle, villous with mostly non-glandular trichomes at apex, otherwise with sessile glands; ovary flattened-ovate, glabrous. *Fruit* broadly oblong to obovate, distinctly woody, rounded to slightly apiculate at apex, 6.5–13 cm long, 4.5–5.7 cm wide (1:w = 1.3–2.3), the margin usually not undulate at dehiscence, occasionally very slightly undulate, glabrous, drying dark brown to black; *seeds* small-bodied with a surrounding suborbicular wing, ca. 2 cm long, 2.5–3 cm wide, the wing hyaline-membranaceous with radial brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 28). Coastal Brazil, in middle elevations of the Serra da Mantiqueira from São Paulo to Espírito Santo, mostly along forest margins or in open and second growth forest, often associated with bamboo; near sea level to 1200 m elevation.

Representative specimens examined. BRAZIL. ESPÍRITO SANTO: Santa Leopoldina, Ponte do Balanco, 21 Feb 1980 (fl), *Bittencourt & Bittencourt s.n.* (RB20163) (MO, RB); Santa Barbara de Caparão, 4

Dec 1929 (fl), *Mexia 4092* (K, MO, P, WIS). MINAS GERAIS: Estação Biologica de Caratinga, 26 Apr 1984 (fl), *Lopes & Andrade 368* (BHCB); Viçosa, Ag. College lands, Barbado, 8 Apr 1930 (fl), *Mexia 4579* (G, MICH, MO, US, WIS). RIO DE JANEIRO: Resende, Itatiaia to Campina of Itatiaia, 12 Aug 1978 (fr), *Gottsberger et al. 21-12878* (MO); Rezende, Mantiqueira, 2 Feb 1975 (fl), *Morawetz 51-20275* (MO, W). SÃO PAULO: Portal de Igarata, N from km 13 of Dom Pedro Hwy., 5 Jan 1985 (st), *Gentry & Zardini 49206* (MO).

Common names. Carabobinho, caroba.

Well characterized by the largish somewhat bullate leaflets, dark-colored flower, and thinly woody fruit with a straight or very slightly undulate margin. Some collections from Espírito Santo (*Mexia 4092*, *Bittencourt & Bittencourt s.n.*) and adjacent Minas Gerais (*Paulinho Filho s.n.*) have more strongly pubescent and bullate leaflets and thicker capsules but appear to be conspecific.

Jacaranda heteroptila, which, following Sandwith (in herb.), we previously applied to the species from NE Brazil that is here treated as *J. duckei*, differs only in having the lower part of the leaf simply pinnate. Since the type of *J. heteroptila* is from São Paulo (fide Glaziou, 1911) the similar plant from northeastern Brazil with lower pinnae reduced to single leaflets seems unlikely to be conspecific, especially in the absence of geographically intermediate populations. Moreover, the replacement of lower pinnae by simple leaves is common in closely related *J. jasminoides* and occasionally occurs in otherwise typical *J. macrantha* (*Mexia 4579*, MO). Therefore, we are confident in reducing *J. heteroptila* to *J. macrantha*.

26. *Jacaranda macrocarpa* Bureau & K. Schumann, *Martius, Fl. bras.* 8(2): 372. 1897. Type. Colombia. Río Vaupes, Panure, *Spruce 2571* (B*, lectotype, G; isotypes, BR, GOET, K, NY, P, W).

Midcanopy tree 8–20 m tall, to at least 15 cm dbh., the branchlets subtetragonal, glabrous, with numerous small brownish pustulate lenticels. *Leaves* bipinnate, with 22 to 30 (or more?) pinnae, the rachis rather strongly tetragonal, each pinna with dorsally canaliculate, narrowly sub-winged rachis and usually sparsely minutely puberulous inside groove, and 15–31 sessile or subsessile (petiolule <2 mm long) asymmetrically oblong leaflets, these 1–7 cm long and 0.9–2.5 cm wide, apex rounded or obtuse, the base very

asymmetrically cuneate, essentially glabrous, usually very sparsely and minutely puberulous with scattered trichomes on midvein below, also lepidote; coriaceous, entire, the margin involute, drying blackish above. *Inflorescence* a terminal panicle with well-developed central axis and narrow lateral branches, minutely lepidote and puberulous, the bracts inconspicuous. *Flowers* with the calyx shortly cupular, subtruncate to very shallowly 5-denticulate, 2–3 mm long, 3–4 mm wide, puberulous; corolla bluish white to whitish pink, tubular-campanulate above a very short broad basal tube, 2–2.5 cm long, ca. 1.5 cm wide at the mouth, the lobes 0.5 cm long, the tube 1.5–2 cm long, densely short-puberulous outside, the lobes pilose, tube inside with scattered long weak trichomes in throat, also densely pilose at stamen insertion; stamens didynamous, the anthers dithecate, each theca 1.5–2 mm long, the staminode 1.5–2 cm long, subexserted, densely glandular villous in upper half, the apex strongly T-shaped, each branch of “T” 3–4 mm long and pubescent with short glandular hairs; ovary flattened-ovate, 2 mm long, 2 mm wide, glabrous; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* narrowly elliptic or obovate-elliptic, woody, with the midrib noticeably raised toward base, 11–21 cm long, 5.5–8 cm wide, the margin not undulate at dehiscence, slightly lepidote, otherwise glabrous, drying dark brown or blackish; *seeds* relatively large-bodied with a surrounding elliptic wing, 2.8–3 cm long, 5–6 cm wide, the wing hyaline-membranaceous with radial brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 28). Restricted to campinarana forests on white-sand soils in northwestern Amazonia; Peru and Colombia, below 400 m alt.

Representative specimens examined. COLOMBIA. AMAZONAS: Río Caqueta, Cano Solarte, 19 Aug 1986 (st), Palacios *et al.* 1742 (ARAR).

PERU. LORETO: Mishana, 25 Feb 1979 (fl, fr), Gentry & Aronson 25015 (AMAZ, MO, USM); Genaro Herrera, Río Ucayali, 7 Dec 1977 (st), Gentry *et al.* 21227 (MO); Mishana, 14 Jan 1983 (fr), Gentry *et al.* 39509 (AMAZ, MO); Prov. Maynas, Alpuhuayo, 14 Nov 1984 (fr), Vasquez *et al.* 5957 (AMAZ, MO). SAN MARTÍN: Río Cainarachi, 22 Jul 1982 (st), Gentry *et al.* 37925 (MO).

BRAZIL. AMAZONAS: Prope Panure ad Rio Vaupes, Oct 1852 (fl, fr), Spruce 2571 (BR, G, GOET, K, P, NY, W).

Local name. Huamansamana.

Looks rather like *J. copaia* ssp. *copaia* in the large leaves with relatively large obtuse leaflets and large flat fruit but presumably not at all closely related on account of the bithecate anthers. The strongly T-shaped staminodial apex, general vegetative *gestalt*, and white sand habitat suggest that this species may be close to the ancestral stock of *Digomphia* despite the very different calyx.

27. *Jacaranda micrantha* Chamisso, Linnaea 7: 554. 1832. Type. Brazil. *Sellow s.n.* (lectotype, HAL; isotypes, K, L, W).

Jacaranda intermedia Sonder, Linnaea 22: 563. 1849. Type. Brazil. Minas Gerais: Caldas, Regnell I 291 (P, S, US).

Tree mostly 8–20 m tall, to 50 cm dbh., with fluted trunk, the branchlets subtetragonal, minutely and glabrescently puberulous, usually with tiny whitish lenticels when young. *Leaves* bipinnate, (40–)50–70(–90) cm long, usually with 14 to 18 pinnae, each pinna with puberulous rachis flattened or canaliculate above and (5–)15–19(–23) short-petiollulate (petiollule 1–5 mm long) asymmetrically oblong (half ovate/half obovate) leaflets, these (1.3–)3.5–7.5(–10) cm long and (0.5–)1–2.5(–3.5) cm side, apex acuminate, the base cuneate, short puberulous along midvein above, puberulous along midvein and bases of secondary nerves below, membranaceous, not at all bullate, the margin entire (except in juveniles). *Inflorescence* an open panicle, minutely puberulous, with caducous linear bracts. *Flowers* with the calyx cupular, shallowly and irregularly 5-dentate, 4–6(–8) mm long, 4–5 mm wide, subglabrous, usually with a few minute scattered trichomes; corolla lilac or light purple, tubular-campanulate above a narrow base, 3–4(–5) cm long, 0.8–1.2 cm wide at the mouth, the lobes 0.4–0.5 cm long, the tube 2.5–3.5(–4) cm long, glabrous outside except for sessile and subsessile glandular trichomes, the lobes somewhat ciliate, glabrous inside except for gland-tipped trichomes on the filament bases; stamens didynamous, the anthers bithecate, each theca 2 mm long, the long staminode 2.5–3 cm long, subexserted, the middle third and apex glandular-villous, otherwise with sessile glandular trichomes; ovary flattened-ovate, 1.5 mm long, 1 mm wide, glabrous; disk annular pulvinate, 0.5

mm long, 1.5 mm wide. *Fruit* round to elliptic, woody, 6–9 cm long 4–7 cm wide, the margin strongly undulate at dehiscence, glabrous with a somewhat pustulate glandular surface, drying dark brown to blackish; *seeds* small-bodied with a surrounding elliptic wing, 1–1.5 cm long, 1.8–2.5 cm wide, the wing hyaline-membranaceous with brownish base.

Distribution (Fig. 28). Mostly in lowland subtropical evergreen and semideciduous forests of the Parana basin from Rio Grande do Sul and Corrientes, Argentina, to Alto Parana, Paraguay and São Paulo, north along the Serra do Mar to Rio de Janeiro, up to 850 m altitude.

Representative specimens examined. BRAZIL. MINAS GERAIS: Prata, May 1975 (fl), *Hatschbach 36665* (AAU, C, MBM, MO). PARANÁ: Jaguarihyva, 1 Jan 1915 (fl), *Dusen 16243* (C, L, MICH, MO). RIO GRANDE DO SUL: Vila Manresa, pr. P. Alegre, 12 Dec 1945 (fl), *Rambo 31667* (B). RIO DE JANEIRO: Mun. Angra dos Reis, Serra do Mar, Parati to Cunha, 1 Nov 1975 (fl), *Morawetz 31-11175* (MO, W). SANTA CATARINA: Mata do companhia Herig, Bom Retiro, 15 Dec 1959 (fl), *Klein 2355* (B, K, M); Ibirana, 25 Nov 1957 (fl), *Reitz & Klein 5690* (B, K, L, WIS). SÃO PAULO: Serra de Botucatu, Botucatu to Rubião Junior, 4 Oct 1975 (fr), *Gottsberger & Morawetz 11-41075* (MO).

PARAGUAY. ALTO PARANÁ: Puerto Puente Stroessner, *Stutz 842* (MO). ITAPUA: Est. Caapucu, Colonia Gral. Delgado, 10 Nov 1956 (fl), *Pedersen 4365* (C, CTES, K, LP). CANENDIYU: Kateuete, 4 Feb 1984 (st), *Little 40130* (PY). GUAIRA: Nebocaiati, pres Villarica, Mar 1876 (fr), *Balansa 511* (G, K).

ARGENTINA. MISIONES: Campo Grande, 6 Nov 1944 (fl), *Ragonese & Castiglioni 2123* (LP); Gral. San Martín, Salto Encantado, 9 km NE de Aristóbulo del Valle, 31 Jul 1987 (fr), *Vanni et al. 947* (MO).

Local names. Caroba, caroba do mato.

The rather large acuminate leaflets suggest *J. macrantha* but that species has more bullate leaflets, larger darker purple flowers, and a non-undulate capsule margin. *Jacaranda micrantha* is also related to *J. puberula*, but that species differs in fewer pinnae, smaller leaflets with usually serrate margins, and larger flowers. See also the northern segregate, *J. microcalyx*.

One additional collection not cited above may be referable here. This is *Peixoto, Gentry et al. 3412* from 700–750 m alt. at Nova Lombardia, Espírito Santo and is sterile. The leaflets dry the same dark color as *J. obovata* but are puberulous along the veins below. The rather thick leaflet texture suggests *J. crassifolia* but that species differs in glabrous green leaflets. Perhaps this col-

lection is no more than an extreme form of variable *J. puberula* but it may also represent a northward range extension of *J. micrantha* or an undescribed taxon.

28. *Jacaranda microcalyx* A. Gentry, sp. nov.
Type. Brazil. Bahia: Ubaituba-Itacare road, ca. 5 km from BR-101, 14°20'S, 39°20'W, *Gentry & Zardini 49962* (holotype, CEPEC; isotype, MO).

Arbor 8–20 m alta. Folia bipinnata, pinnis 6–10, foliolis in quoque pinna (3–)9–15, oblongis, obtusis vel subacuminatis, petiolulatis, glabris, membranaceis vel chartaceis. Inflorescentia floribus in panicula terminali dispositis. Calyx cupulatus, truncatus, 3 mm longus; corolla tubulocampanulata, extus puberula; stamina didynama thecis duabus. Capsula oblongo-elliptica, lignosa, margine valde undulata.

Tree 8–20 m tall, the branchlets slightly lepidote, otherwise glabrous, with whitish lenticels when young. *Leaves* bipinnate, with 6–10 pinnae, each pinna with canaliculate or subwinged rachis, more or less lepidote inside groove (sometimes also with a few minute enation-like trichomes), and (3–)9–15 petiolulate, asymmetrically oblong, half-ovate/half-obovate leaflets, these (1–)2–8 cm long and (0.5–)0.7–4 cm wide, noticeably smaller toward base, apex obtuse to acutish or obtusely acuminate, the base cuneate, minutely and glabrescently glandular-lepidote, otherwise completely glabrous, entire, membranaceous to chartaceous; lateral petiolules 2–5 mm long, the terminal sometimes longer. *Inflorescence* a large terminal panicle, in part compounded from individual panicles in the axils of upper most leaves, somewhat lepidote, otherwise glabrous (or with a few minute trichome-like enations), ebracteate except for the occasional presence of reduced but still compound leaves. *Flowers* with the calyx cupular, truncate, rather thin and brownish drying, 3 mm long, 3 mm wide, more or less lepidote, otherwise glabrous except for a few minute trichomes near margin; corolla magenta, tubular-campanulate above a narrow basal tube, 3–4 cm long, 1–1.5 cm wide at the mouth, the lobes 0.5 cm long, the tube 2.5–3.5 cm long, puberulous outside, especially toward base, mostly with subappressed simple trichomes, also with sessile lepidote glands, inside glabrous except glandular villous on the sta-

men insertions; stamens didynamous, the anthers dithecate, each theca 2–2.5 mm long, the long staminode ca. 3 cm long, subexserted, glandular villous except the glabrous basal third, the “neck” trichomes shorter, the apex conspicuously bifid; ovary flattened-ovate with a raised marginal rib, 1.5 mm long, 1.5 mm wide, glabrous; disk annular-pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* broadly oblong-elliptic, strongly woody, ca. 7 cm long, 5–5.5 cm wide, the margin undulate at dehiscence, minutely lepidote, drying grayish; *seeds* not seen.

Distribution (Fig. 26). Northeastern Brazil from Bahia to Pernambuco; lowland coastal forest on lateritic soil, below 50 m elevation.

Additional collections examined. BRAZIL. BAHIA: Road from Ubaituba to Itacare, ca. 20 km from BR 101, alt. ca. 20 m, 14°20'S, 39°10'W, 9 Feb 1985 (fr), *Gentry & Zardini 49997* (CEPEC, MO); Rod. Gandu/Itubera, 8 km de Gandu, 9 May 1969 (fl), *J. de Jesus & T. Santos 357* (CEPEC, MO). **PERNAMBUCO:** Ipojuca, Eng. Maranhão, 10 June 1967 (fl), *A. Lima 67-5032* (IPA, MO).

This species is very similar to *J. micrantha* and may be no more than a disjunct population of that species. *Jacaranda microcalyx* differs in leaves with more pinnae (14–18 vs. 6–10), a puberulous leaf rachis, more acuminate leaflets that have the midvein puberulous above and below, a puberulous inflorescence, slightly larger calyx (4–)6(–8) mm vs. 3 mm, corolla tube pubescence entirely or almost entirely of sessile and subsessile glandular trichomes, and a non-bifid staminode. In addition *J. micrantha* lacks the strong reduction in size of the basal as compared to terminal leaflets of each pinna and has leaflets that dry green to blackish green rather than olive. Although there are thus numerous differences between *J. microcalyx* and *J. micrantha*, none of them seems very definitive. However, taken together they give *J. microcalyx* a distinctly different aspect than *J. micrantha*. The geographical disjunction also argues against conspecificity, especially since *J. micrantha* is basically a plant of subtropical forests that ranges as far north as Rio de Janeiro State only in the mountains.

Jacaranda microcalyx is also similar to sympatric *J. puberula* but differs from that species in shorter calyces, glabrous or subglabrous leaflets, leaf rachises, inflorescences, and calyces, and especially in the much woodier undulate-margined fruit. *Jacaranda obovata*, which also occurs in

Bahia but is ecologically separated in the coastal restingas, can have a similarly small calyx but is very different in its coriaceous or subcoriaceous rounded to obtuse leaflets and thinly woody fruit with a non-undulate margin.

29. *Jacaranda mimosifolia* D. Don, Bot. Reg. 8: tab. 631. June 1, 1822. Type. Described from cultivation in England, Type illustration, Bot. Reg. 8, Tab. 631.

Jacaranda ovalifolia R. Brown, Bot. Mag. 49: tab. 2327. June 1, 1822. Type. Described from cultivation in England, Type illustration, Bot. Mag. 49, Tab. 2327. *Jacaranda chelonina* Grisebach, Pl. Lorentz. 175. 1874, non Symb. fl. argent. 258. 1879. Type. Argentina. Tucumán: Pr. La Cruz, *Lorentz s.n. of 1872* (holotype, GOET (as 195); isotypes, F, K, US).

Tree to at least 15 m tall and 45 cm dbh., the bark gray, the branchlets terete. *Leaves* bipinnate, 15–30 cm long, with 13–31 pinnae, these 1.3–2.1 cm apart on the rachis, each pinna 5–10 cm long with subwinged rachis and 13–41 sessile leaflets, these 3–12 mm long and 1–4 mm wide, narrowly elliptic, sharply acuminate, the base cuneate, chartaceous, glabrous or slightly puberulous along midrib and margin, the margin slightly revolute. *Inflorescence* an open terminal panicle, the branches shortly puberulous. *Flowers* with the calyx reduced, broadly campanulate, 5-denticulate, 1 mm long, 1.5–2 mm wide, subpuberulous at least along margin; corolla purplish-blue with the tube white inside, tubular-campanulate above a slightly narrowed neck which is conspicuously curved and slightly enlarged toward base, 3–4 cm long, 0.7–1.2 cm wide at mouth of tube, the tube 2.4–5.2 cm long, the lobes 0.3–0.8 cm long, pubescent outside, especially toward the base, pubescent inside at the level of stamen insertion and sparsely so with long trichomes in the tube; stamens didynamous, monothebate, the second theca reduced to a minute appendage, each theca 2 mm long, the filaments pubescent below middle, the staminode 2–2.5 cm long, glandular-pubescent at middle and apex; pistil 2.2–2.5 cm long, the ovary flattened-cylindrical, 2–3.5 mm long, 1.5–2 mm wide, glabrous, the ovules 6–8-seriate in each locule; disk short, pulvinate. *Fruit* a compressed-orbicular capsule, often shallowly emarginate at the tip and truncate to broadly but shallowly subcordate basally, 3.2–6 cm long, 3.7–6 cm wide, drying brownish or tannish, the margins not or very slightly undu-

late; *seeds* thin, 0.9–1.2 cm long, 1.1–1.7 cm wide, the wing more or less surrounding and clearly demarcated from seed body, hyaline-membranaceous with brownish streaks.

Distribution (Fig. 22). Native to northwestern Argentina and adjacent Bolivia; widely cultivated throughout the tropics and subtropics of the world; 500–2800 m elevation.

Representative specimens. BOLIVIA. COCHABAMBA: Carrasco, Cochabamba 185 km hacia Santa Cruz, 27 Sep 1981 (fl, fr), *Beck 7035* (MO); 10 km E of Epizana, 5 Dec 1975 (fl), *Davidson 3765* (MO); Cercado, 24 Oct 1985 (fl), *Solomon 14518* (MO). TARIJA: Arce, 5 km N of Mamora, 27 Apr 1983 (fr), *Solomon 101082* (MO).

ARGENTINA. JUJUY: San Pedro, Sierra Sta. Bárbara, Oct 1929 (fl), *Venturi 9738* (MO). SALTA: Santa Victoria, camino del Condado a Los Toldos, 4 km de Los Toldos, 10 Nov 1975 (fl), *Schiavono et al. 11955* (MO). TUCUMÁN: Dep. Famaillá, San Pablo, 23 Nov 1923 (fl), *Venturi 2207* (LP, MO).

Common names. Argentina: tarco, jacaranda.

This widely cultivated species is closely related to *J. acutifolia* and has sometimes been interpreted as no more than a form of that taxon, which is here treated as endemic to the Peruvian inter-Andean valleys. We have followed Sandwith (1954) in maintaining these two as distinct, with *J. mimosifolia* differentiated by its larger fruits, shorter calyx, and greater number of pinnae per leaf. This species is occasionally cultivated within the natural distribution of *J. acutifolia* and the cultivated trees look quite different from wild *J. acutifolia*, differing in larger size, more numerous leaflets and pinnae, and especially a much less intense flower color.

- 30. *Jacaranda montana*** Morawetz, Pl. Syst. Evol. 132: 333–341. 1979. Type. Brazil. Rio de Janeiro: Mun. de Angra dos Reis, Parati to Cunha, 970 m, 44°50'W, 23°10'S, 18 Feb 1975, *Morawetz 51-18275* (holotype, RB; isotypes, BOTU, K, M, MO, WU).

Tree 15–20 m tall, the branchlets terete, sparsely glandular, otherwise glabrous. *Leaves* bipinnate, 16–45 cm long, with 9–11 pinnae, the leaflets 3–15 per pinnae, irregularly serrate or crenulate, the laterals sessile, irregularly elliptic or rhombic, (1.9–)3–5(–6) cm long, (0.2–)1.2–1.8(–2.2) cm wide, terminals larger and petiolulate, the apex narrowly long acuminate, the base narrowly cuneate, glabrous. *Inflores-*

cence a terminal panicle, the branches glandular lepidote, the lower bracts bipinnate, the bractlets small, lanceolate. *Flowers* with the calyx tubular or suburceolate, 5–6 mm long, 3–4 mm wide, 5-dentate, sparsely glandular-lepidote, otherwise glabrous; corolla purplish blue, tubular-campanulate, 3.8–5.2 cm long, 1.5–2.2 cm wide at mouth, the upper lobes smaller than the lower, outside minutely puberulous, inside subpuberulous and glandular-pubescent at level of stamen insertion; stamens dithecate, the thecae divaricate, the staminode clavate with an emarginate apex, pilose at apex and in middle; ovary glabrous, the disk annular-pulvinate. *Fruit* a subwoody capsule, broadly elliptic to subrotund, 4.5–6 cm long, 2.5–4 cm wide, the margin undulate; *seeds* thin, bialate, 0.8–1.2 cm long, 1.5–2 cm wide, the wings brownish-hyaline.

Distribution (Fig. 29). Endemic to upland rain forest of the Serra do Mar in Brazil's São Paulo and Rio de Janeiro States; from 300 to 1000 m elevation.

Specimens examined. BRAZIL. RIO DE JANEIRO: Guanabara, Tijuca, 25 Oct 1967 (st), *Lanna Sobrinho 1601* (MO, RB); Corcovado, 4 Oct 1921, *Constantino & Occhioni 2378* (RB, WU). SÃO PAULO: Cunha, Reserva Florestal, 11 Feb 1981 (fl), *Custodio Filho 527* (GUA); Boraceia, betw. Moji das Cruces & Biritibi-Mirim, 5 Feb 1987 (fr), *Custodio Filho & Gentry 4521, 4721* (both MO); Alto da Serra, 14 Oct 1961 (fl), *Fromm et al. 215* (R), Oct 1917, *Schwebel 405* (SP); Parque Estadual de Caraguatatuba, 700–750 m, 23°28'S, 45°30'W, 9 Jan 1985 (fr), *Gentry & Zardini 49383* (MO, RB); Mun. de Eldorado, 270 m, 10 Feb 1975, *Morawetz 31-10275* (MO, RB, WU); Mun. de Ubatuba, Serra do Mar along road from Ubatuba to Taubate, 850–900 m, Aug 1975, *Morawetz 11-8875, 21-11875, 129875, 211-15875, 12-26875* (all MO, RB, WU); Carlos Botelho State Park, 46°56'W, 24°15'S, 23 km S of headquarters, 560 m, 2 Sep 1987 (fl), *Gentry et al. 58800* (MO), 30 km S of Headquarters, 46°55'W, 24°20'S, 300 m, 4 Sep 1987 (fl), *Gentry et al. 59034* (MO).

Common name. Caroba.

This species is closely related to *J. puberula* (sensu lato) from which it differs in its greater size (maximum 12 m in *J. puberula*), the glabrous condition of the leaves, inflorescence, and calyx, the smaller flowers (up to 5 cm vs. 5.5–8.5 cm), and smaller capsule (4.5–6 cm vs. 6–9 cm long).

- 31. *Jacaranda morii*** A. Gentry, Phytologia 57: 247. May 1985. Type. Brazil. Bahia: Mun. Andaraí, Novo Rodovia Andaraí-Mucuge, 15–20

km S de Andaraí, 800 m, 21 Dec 1979 (fl), *Mori & Benton 13114* (holotype, CEPEC; isotype, MO, RB). Fig. 27.

Jacaranda bahiensis Vattimo, *Rodriguesia* 36: 80. "1984" (distributed 16 Oct 1985 fide M. L. G. Lima). Type. Based on same type as *J. morii*.

Shrub or *treelet* 0.8–2 m tall and 4 cm in diameter, the branchlets subtetragonal, puberulous, with narrow paler lenticels. *Leaves* bipinnate with mostly 11–13 pinnae, each with narrowly subwinged pubescent rachis and 7 to 25 sessile narrowly oblong-ovate leaflets, more or less acute at apex, truncate or subcordate at base, (0.7–)1.2–3 cm long, (0.3–)0.5–1.2 cm wide, coriaceous, strongly and intricately bullate, the entire margin involute, densely puberulous above and below (only below in Pará population), drying dark olive above and light grayish below. *Inflorescence* terminal, paniculate, puberulous. *Flowers* with the calyx tubular-campanulate, irregularly shallowly 2–5-dentate, 6–12 mm long, 5–7 mm wide, puberulous; corolla purple or wine-colored, tubular-campanulate above a narrow basal tube, 3.5–5.5 cm long, 0.9–1.5 cm wide at mouth of tube, the tube 3–4 cm long, the lobes 0.5 cm long, stalked glandular-lepidote outside, the lobes ciliate and shortly puberulous near margins; stamens didynamous, the anthers dithecate, each theca 2 mm long, the staminode 4 cm long with a glandular pubescent capitate tip; ovary flattened-ovoid, 1.5 mm long and wide, glabrous; disk annular-pulvinate, 0.5 mm long, 2 mm wide. *Fruits* somewhat woody, orbicular to elliptic, 2.5–7 cm long, 2.5–4 cm wide, glabrous; *seeds* thin, elliptic with a rather large body more or less surrounded by elliptic wing, 0.7–1.2 cm long, 1.4–2 cm wide, the wing hyaline-membranaceous at tip, brownish with radial striations at base.

Distribution (Fig. 22). Known only from central Bahia, Brazil, and from the Serra dos Carajás; in Bahia in the mata de cipo and adjacent cerrado in the upper Rio das Contas-Rio Una drainage; in the Serra dos Carajás in scrubby vegetation on ferrous outcrops; 600–800 m elevation.

Specimens examined. BRAZIL. BAHIA: Rio das Contas, 10 km N, 21 Jan 1984 (fl), *Hatschbach 47434* (MO). PARÁ: Serra dos Carajás, Marabá, 20 Apr 1970 (fl), *Cavalcante & Silva 2680* (MG, NY); 25–30 km NW of Serra Norte mining camp, 5°55'S, 50°26'W, 5 Dec 1981 (fr), *Daly et al. 1725* (MO, NY); AMZA camp

N-1, 6°1'S, 50°18'W, 650 m, 16 May 1982 (fr), *Sperling et al. 5722* (MO, NY).

It is possible that this species represents an extreme form of *J. ulei*, but that more southern species generally has much narrower leaflets with a rounded or very narrowly subcordate base. Although the differently shaped leaflets give typical *J. ulei* a very different aspect from *J. morii*, there is an intermediate collection (*Duarte 9344*) from the Distrito Federal that has the leaflets as wide as in *J. morii* but without the subcordate base.

This species is also related to *J. jasminoides* and *J. pulcherrima* in its flowers and to *J. praetermissa* in its leaves. *Jacaranda jasminoides* has usually much larger leaflets which are similarly pubescent but not strongly bullate and cuneate or rounded at the base. *Jacaranda pulcherrima* has similarly pubescent somewhat less bullate leaflets which differ in being basally cuneate. *Jacaranda praetermissa*, vegetatively extremely similar, differs in monotheate anthers and the 5-lobed calyx split clear to base; the leaves differ in lacking the subwinged rachis, and the fruit is conspicuously thickened in the center.

Only flowering material is known from Bahia. The Serra dos Carajás collections are all in fruit. Pending discovery of flowering material, they are tentatively assigned to this species rather than geographically closer *J. praetermissa* because of their subwinged rachises. The flat-valved fruits described above would also be anomalous for *J. praetermissa*.

Jacaranda morii and *J. bahiensis* were published almost concurrently and based on the same type. Although *Rodriguesia* 36(59) was the April–June 1984 issue of that journal, it was not actually distributed until 16 Oct 1985 (fide M. L. G. Lima, pers. comm.) making *J. morii* the older name.

32. *Jacaranda mutabilis* Hassler, Feddes Repert. 9: 60. 1910. Type. Paraguay. Alto Paraguay: Esperanza, Esperanza, *Rojas s.n.* (*Hassler 10535*) (holotype, G; isotypes(?), C, MICH, MO (as *10539*, Sierra de Amambay)).

Jacaranda mutabilis var. *angustiflora* Hassler, Feddes Repert. 9: 62. 1910. Type. Paraguay. Amambay: Punta Pora, *Rojas s.n.* (*Hassler 10904*, *10904a*) (syn-types, G).

Jacaranda mutabilis var. *parvifolia* Hassler, Feddes Repert. 9: 62. 1910. Type. Paraguay. Alto Paraguay: Esperanza, *Hassler 10535a* (G).

Jacaranda mutabilis var. *parvifolia* forma *integra* Hassler, Feddes Repert. 9: 62. 1910. Type. Paraguay. Alto Paraguay: Esperanza, Hassler 10535b (G).

Jacaranda mutabilis var. *parvifolia* forma *subcoaetanea* Hassler, Feddes Repert. 9: 62. 1910. Type. Paraguay. Alto Paraguay: Esperanza, Rojas s.n. (Hassler 10878) (holotype, G; isotypes, K, NY, W).

Shrub to 2 m tall, the branchlets subtetragonal, glabrous except for a few small lepidote scales, usually with elongate whitish lenticels (even on petiole). Leaves bipinnate, with 12–18 pinnae, each pinna with deeply grooved or subwinged rachis minutely puberulous above and 9–25 sessile or subsessile broadly lanceolate to narrowly elliptic leaflets, these 1–6 cm long and 0.5–2 cm wide, apex acuminate, the base cuneate, virtually glabrous except for numerous lepidote glands, usually also with a few minute curved trichomes along margins and sometimes base of midvein below. Inflorescence a rather congested panicle, usually borne in the axils of fallen leaves, puberulous, the linear bracts caducous. Flowers with the calyx cupular, shallowly 5-dentate, 3–7 mm long, 3–4 mm wide, minutely puberulous; corolla purple, tubular-campanulate above a narrow base, 4–6.5 cm long, 1–2 cm wide at the mouth, the lobes ca. 1 cm long, the tube 3–5 cm long, sparsely puberulous outside, in part with gland-tipped trichomes, the lobes somewhat ciliate, glabrous inside except for at least some gland-tipped trichomes at the stamen insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the long staminode 3–4 cm long, subexserted, the apex slightly capitate, glandular villous, especially at apex and near middle; ovary flattened-ovate, 2 mm long, 1 mm wide, glabrous (minutely puberulous in one perhaps diseased collection); disk short-cylindric, 1 mm long, 1.5 mm wide. Fruit elliptic, subobtusate at base and apex, 4–5.5 cm long, 2.5–3 cm wide, the margin not undulate at dehiscence, glabrous or very minutely and inconspicuously puberulous, drying blackish; seeds not seen.

Distribution (Fig. 29). Southwestern cerrado, mostly in Mato Grosso, also adjacent parts of Goiás, Minas Gerais, and the Sierra de Amambay of Paraguay; near sea level to 600 m elevation.

Representative specimens examined. BRAZIL, MATO GROSSO: Cerrado ca. 30 km S of Xavantina, 11 Jun 1966 (fl), Irwin et al. 16936 (C, MO, NY); Mun. Nova Andradina, Tres Casas, 95 km de Pto. 15 Nov, 7 Jun 1968 (fl), Krapovickas 14408 (IPA, LP, WIS). MATO

GROSSO DO SUL: BR267 W of Bataguacu, 5 Sep 1979 (fl), Christenson 1125 (MO). MINAS GERAIS: Ituiutaba, Fruiden, Aug 1950 (fl), Macedo 2470 (MO).

PARAGUAY. AMAMBAY: Sierra de Amambay, Rojas s.n. (Hassler 10878), (G, K), Hassler 10539 (C, G, MICH, MO); Parque Nac. Cerro Cora, Fortuno 281 (PY).

Close to *J. caroba* and perhaps only a geographic race of that species; differing in the more acuminate, usually narrower, often conspicuously toothed leaflets, more congested, always puberulous inflorescence usually from leafless older branches, and consistently puberulous calyx. The differences from *J. caroba* are all in the direction of *J. puberula* from which *J. mutabilis* differs in its subshrub habit, cerrado habitat, and more coriaceous essentially glabrous leaflets. Duarte 777 from Uberaba, Minas Gerais is intermediate with a narrow leaflet with strongly acute apex, almost glabrous calyx but distinctly puberulous inflorescence, and open inflorescences from leafless branches.

33. *Jacaranda obovata* Chamisso, Linnaea 7: 549. 1832. Type. Brazil. Bahia: Bahia de Todos os Santos, Lhotzky 18470 (B*, F photo 18470, isotype, K).

Jacaranda nitida A. P. de Candolle, Prodr. 9: 230. 1845. Type. Brazil. Bahia: in collibus aridis, Salzmann 347 (G, HAL, K, MO).

Small to midcanopy tree or treelet (1.5–)3–20 m tall, the branchlets glabrous or glabrescent, sometimes with a few whitish lenticels. Leaves bipinnate (sometimes the uppermost simply pinnate), 25–46 cm long, usually with 6 to 8 pinnae, each pinna with deeply canaliculate rachis with a few small trichomes in dorsal groove and (3–)9–13(–19) distinctly petiolulate elliptic to obovate or somewhat rhombic leaflets, these 3.5–13 cm long and 1.5–6 cm wide, apex rounded to obtuse, often minutely emarginate, the base cuneate, glandular-lepidote below, otherwise glabrous or with a very few minute trichomes near base of midvein, coriaceous or subcoriaceous, entire, usually with slightly involute margin, usually drying dark, if drying olive with noticeably reddish rachis and midveins beneath; lateral petioles 1–5(–10) mm long, the terminal to 15 mm long. Inflorescence a terminal panicle with a tendency to have the flowers more or less clustered toward the apices of lateral branches, the lateral branches sometimes reduced and the flowers be-

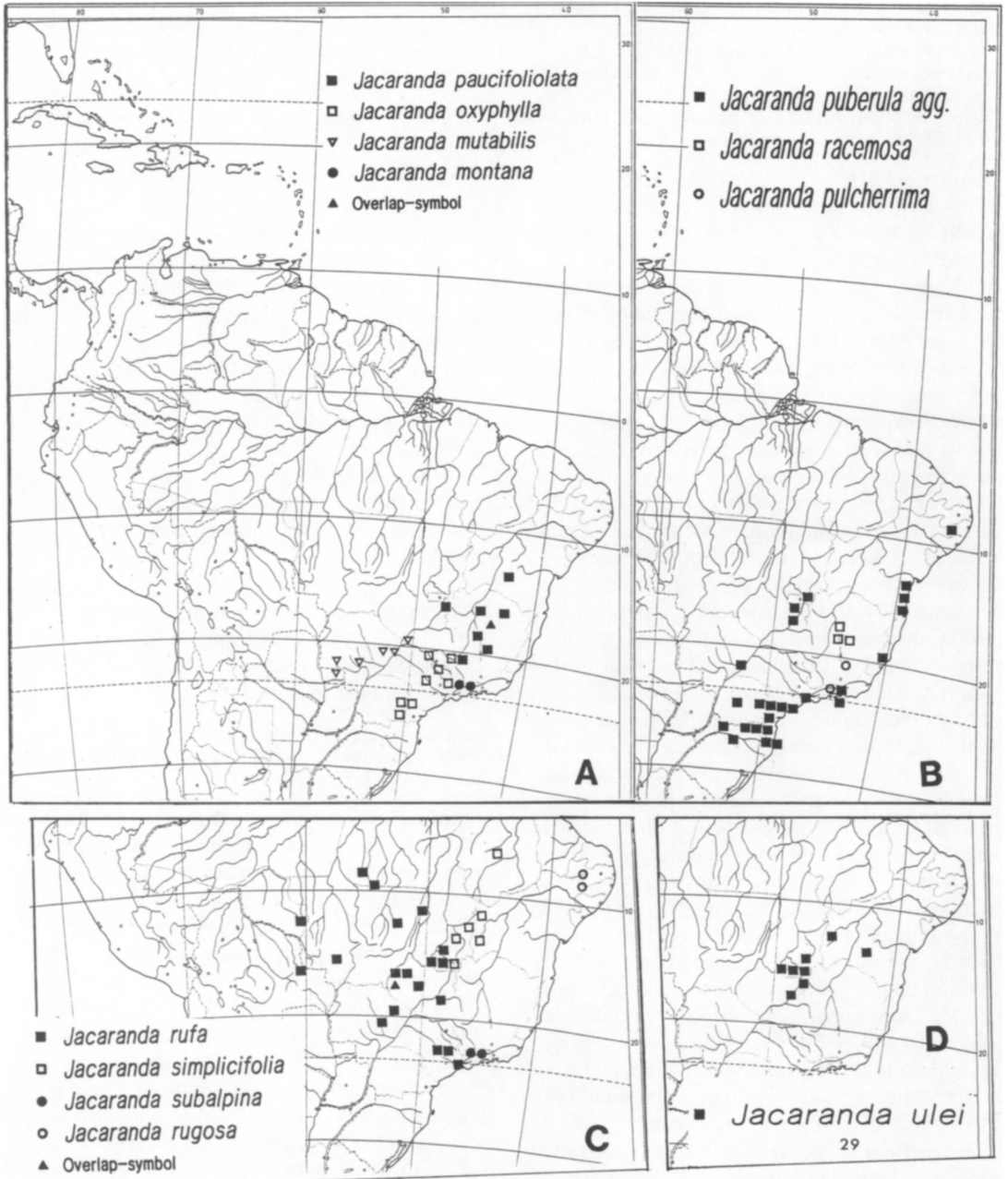


FIG. 29. Distribution of *Jacaranda*. **A**, *Jacaranda* section *Dilobos*. ● = *J. montana*; ▽ = *J. mutabilis*; □ = *J. oxyphylla*; ■ = *J. paucifoliolata*. **B**, *Jacaranda* section *Dilobos*. ■ = *J. puberula*; ○ = *J. pulcherrima*; □ = *J. racemosa*. **C**, *Jacaranda* section *Dilobos*. ○ = *J. rugosa*; ■ = *J. rufa*; □ = *J. simplicifolia*; ● = *J. subalpina*. **D**, ■ = *Jacaranda ulei*.

coming subfastigiate along a racemiform panicle, glabrous or with a few lepidote scales, sometimes with conspicuous oblanceolate leaf-like bracts. *Flowers* with the calyx cupular, truncate to shallowly 5-dentate, 3–6 mm long and 3–4 mm wide, with scattered lepidote scales, otherwise glabrous or with a very few minute simple trichomes; corolla magenta to purplish blue, tubular-campanulate above a narrow basal tube, 3–4.5 cm long, 0.9–1.4 cm wide at the mouth, the lobes ca. 0.5 cm long, the tube 2.5–4 cm long, inconspicuously puberulous outside, mostly with sessile lepidote glands, usually also with a few minute trichomes, the lobes more densely puberulous with longer trichomes (white in bud), inside glandular villous on stamen insertion; stamens didynamous, the anthers dithecate, each theca 1.5 mm long, the staminode 2.5–3 cm long, included, the apex usually T-shaped, densely glandular-villous at middle and apex, otherwise sparsely pubescent with short gland-tipped trichomes; ovary flattened-ovate, 1 mm long, 1 mm wide, glabrous; disk annular-pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* elliptic to elliptic-oblong, thinly woody, 3.5–5.5 cm long, 2.8–3.6 cm wide, the margin not undulate at dehiscence, somewhat lepidote-glandular, otherwise glabrous, drying dark brown or blackish; *seeds* small-bodied with a surrounding elliptic wing, ca. 1 cm long, ca. 2 cm wide, the wing hyaline-membranaceous with brownish base, clearly demarcated from the seed body.

Distribution (Fig. 21). Endemic to sandy coastal restingas of northeastern Brazil from Alagoas to northern Espírito Santo; near sea level.

Representative specimens examined. BRAZIL. ALAGOAS: Macagueira, 28 Jan 1981 (fr), *Paula 1418* (MO). BAHIA: Canavieiras, 21 Feb 1970 (fl, fr), *Almeida 555* (CEPEC); km 9 Pontal-Oliveira road, Mun. Ilhéus, 10 Feb 1985 (fl, fr), *Gentry & Zardini 50019* (CEPEC, MO); 11 km S of Santa Cruz Cabralia, 17 Mar 1974 (fl), *Harley 17089* (CEPEC, IPA, M, MO); km 1–4 da Rod. Nilo Pecanha/Cairu, 10 Feb 1975 (fl), *Santos 2878* (CEPC, MO). ESPÍRITO SANTO: Reserva Florestal da CVRD, Estr. Paraju, 18 Mar 1987 (fl), *Folli 633* (MO); Corrego do Rancho Alto, 1 Feb 1985 (fl), *Peixoto et al. 3062* (MO).

Common name. Carobinha.

As here interpreted, an ecologically limited strict endemic defined by the coriaceous, obtuse to rounded glabrous or nearly glabrous leaflets that dry either dark or olive with a reddish mid-

vein below. The small calyx and characteristically nearly glabrous inflorescence with flowers and branching clustered near the tips of the (sometimes reduced) lateral branches and often with characteristically oblanceolate bracts are also useful characters, as are the unusually small, thinly woody capsules with non-undulate margins. The three closest relatives are *J. grandifoliolata*, which grows sympatrically in the Bahia restingas but has simply pinnate leaves with subwinged rachis and reduced relatively few-flowered axillary inflorescences, *J. microcalyx*, a species of non-sandy soils, which is intermediate between *J. obovata* and *J. puberula* (see discussion under that species), and *J. bracteata*. The latter, which occurs mostly farther south and also on sand but in less extreme conditions (Rio de Janeiro: mata de restinga, Espírito Santo: mus-sanunga), has sometimes been included in *J. obovata* from which it differs in less coriaceous more acute, olive-drying leaflets.

34. *Jacaranda obtusifolia* Humboldt & Bonpland, Pl. aequin. 1: 62, t. 18. 1805. Type. Venezuela. Bolívar: Carichana, *Humboldt & Bonpland 824* (P).

Key to the Subspecies

1. Ovary puberulous; fruit <3 cm wide; western half of Venezuela to Bolivia. subsp. *obtusifolia*.
1. Ovary glabrous; fruit usually >3 cm wide; Guianas and Guayanian Venezuela and Brazil. subsp. *rhombifolia*.

34a. *Jacaranda obtusifolia* spp. *obtusifolia*.

Jacaranda lasiogyne Bureau & K. Schumann in Martius, Fl. bras. 8(2): 385. 1897. Type. Colombia. Meta: Llanos de Meta, *Karsten s.n.* (F—fragm.)

Small to medium-sized *tree* to 15 m tall, the branchlets terete, glabrous. *Leaves* bipinnate, with 15–25 pinnae, each one with a slightly winged rachis and 9–31 sessile leaflets, these 2–17 mm long, 1–7 mm wide (the terminal leaflets larger), rhombic-elliptic, obtuse, asymmetrically cuneate at base, chartaceous, the margins usually revolute, the underside lanate at base of midvein and sometimes over surface, the upper side and the margins with pubescence of more rigid hairs, the lateral rachises up to 1 mm wide, puberulous, the main rachis unwinged. *Inflorescence* a terminal or axillary panicle, sometimes ramiflo-

rous, the branches puberulous. *Flowers* with the calyx reduced, broadly campanulate, conspicuously 5-dentate, more or less puberulous, 2 mm long, 3 mm wide; corolla purple-blue with long trichomes inside and along lobe margins, varying glandular-lepidote, very lightly glandular-pubescent at base of the stamens; stamens didynamous, monothebate, the thecae 1.5 mm long, the staminode 2.3–2.5 cm long, the apex enlarged, villous with glandular trichomes in middle and near apex; pistil 2.4–2.5 cm long, the ovary ovoid, slightly flattened, 1.5 mm long, 1 mm wide, densely puberulous, the ovules ca. 6-seriate in each locule; disk cylindrical, 0.5–1 mm long, 1 mm wide. *Fruit* an oblong-elliptic capsule, strongly flattened, cuspidate at apex, abruptly short-stipitate at base, lepidote, 3.5–6(–7) cm long (average: 4.7), 2–3 cm wide (average: 2.5), the margins not undulate; *seeds* thin, flat, bialate, 6–7 mm long, 16–20 mm wide, the wings hyaline-brownish, not differentiated from seed body.

Distribution (Fig. 28). Venezuela and Colombia to Amazonian Peru and Bolivia; 50–700 m elevation.

Representative specimens examined. **COLOMBIA.** **ARAUCA:** Río Casanare, Esmeralda, 19 Oct 1983 (st), *Cuatrecasas 3849* (US). **BOYACA:** Caño Cancia, 23 km S de Hato Yarumito, 23 Feb 1971 (fl), *Sastre 833* (COL, P). **CASANARE:** Mochuelo y Tsamani, Río Casanare, 1984, *Ortiz 523* (COL). **CUNDINAMARCA:** Nocaima, Hacienda Tobia, 15 Jun 1942 (fr), *García-Barriga 10582* (COL). **GUAINÍA:** Río Inirida, Caranacoa, 3 Mar 1965 (fl), *Fernandez-Perez 7071* (COL). **META:** Río Metica, NE of Puerto Lopez, 24 Dec 1973 (fl, fr), *Davidse & Llanos 5104* (COL, MO). **VICHADA:** San José de Ocune, Río Vichada, 19 Jan 1944 (fl), *Hermann 10993* (COL, NY, US).

VENEZUELA. **AMAZONAS:** Carretera Puerto Ayacucho-Sanariapo, ca. km 35, 30 Dec 1969 (fl), *Bunting 4270A* (MV); 1 km E of Hotel Amazonas, Puerto Ayacucho, 18 Feb 1954 (fl, fr), *Maguire et al. 37710* (K, VEN). **APURE:** Romulo Gallegos, 18 km SSW of Elorza, 6 Mar 1979 (fl, fr), *Davidse & González 16095* (MO). **ARAGUA:** Guamitas, *L. Williams 10156* (F). **BARINAS:** Santa Barbara de Barinas, Dec 1965 (fl), *López-Palacios 388* (MO). **BOLÍVAR:** Periquera, Río Paragua, Mun. Barcelona, 30 Jan 1980 (fl), *Marciano-Berti & Barroeta 23-980* (MBM, MO, US). **CARABOBO:** San Diego, 30 Mar 1950 (fl), *Fernandez Y., 651* (MV). **DISTRITO FEDERAL:** Caracas, 25 May 1921 (fl), *Pittier 9541* (VEN). **GUÁRICO:** Estación Biológica de los Llanos, 12 km S of Calabozo, 7 Mar 1974 (fl, fr), *Gentry 10259* (MO, VEN). **PORTUGUESA:** 10 km NE of Guanare, 22 Apr 1953 (fl), *Little 15102* (VEN). **TACHIRA:** W of Joaquina de Navay, 6 Nov 1979 (fl), *Steyermark et al. 119451* (MO).

ECUADOR. PASTAZA: Río Curaray, Lagunas Paotamo, 2 Sep 1985 (fl), *Neill 6825* (MO).

PERU. LORETO: Negro Urco, Río Napo, 17 Sep 1972 (fl), *Croat 20334* (AAU, F, L, MEXU, MO); Florida, Río Putumayo, mouth of Río Zubineta, Oct 1931 (fl), *Klug 2288* (G, MO); **MADRE DE DIOS:** Tambopata, junction of Ríos La Torre and Tambopata, 28 Jul 1985 (fl), *Gentry et al. 51471* (MO, USM).

BRAZIL. ACRE: Near mouth of Río Macauhan, 9 Aug 1933 (fl), *Krukoff 5341* (M, MICH, MO, US). **AMAZONAS:** Río Purus, Río Ituxi, Boca do Curuquete, 10 Jul 1971 (fl), *Prance et al. 14040* (INPA, MG, MO, NY). **RONDÔNIA:** Río Madeira, km 220–223 Madeira-Mamore, near Abuna, 14 Jul 1968 (fl), *Prance et al. 6003* (F, INPA, M, MO, NY).

BOLIVIA. BENI: Vaca Diez, 22 km S of Riberalta, 2 Aug 1982 (fl), *Daly et al. 2087* (MO, NY); Riberalta-Guayamerin, Vaca Diez, 18 Sep 1981 (fl), *Solomon 6304* (MO). **PANDO:** Río Madeira, 2 km above Riberalta, 26 Jul 1968 (fl), *Prance et al. 6474* (F, INPA, M, NY).

Common names. Venezuela: clavellina montanesa, guarupa, rabo de iguana, uadam-kayu, clavellina, san jose, clavellino, casabe, uada camayu, patico.

34b. *Jacaranda obtusifolia* ssp. *rhombifolia* (G. F. W. Meyer) A. Gentry, Mem. N.Y. Bot. Gard. **29:** 257. 1978.

Bignonia filicifolia Anderson, Trans. Soc. Arts. **25:** 200. 1807. Type. Guyana: Essequibo, *Anderson s.n.* (G), nom. nud.

Jacaranda rhombifolia G. F. W. Meyer, Prim. fl. Esseq. **213.** 1818. Type. Guyana: Essequibo, *Anderson s.n.* (?) (GOET, not seen).

Jacaranda filicifolia D. Don, Edinburgh Philos. J. **9:** 266. 1823. Nom. nov. for *B. filicifolia* Anderson.

Jacaranda filicifolia var. *puberula* K. Schumann in Martius, Fl. bras. **8(2):** 390. 1897. Type. Surinam: Victoria, *Kappler 1359 p.p.* (B*, isotype, G).

Jacaranda obtusifolia var. *rhombifolia* (G. F. W. Meyer) Sandwith, Kew Bull. **1953:** 458. 1954.

Very similar to *J. obtusifolia* ssp. *obtusifolia* but has a glabrous ovary and slightly larger fruits (5.5–6.5 cm long (average: 5.9) by (2.7–)3–3.6 cm wide (average: 3.3)).

Distribution (Fig. 28). Eastern and southern Venezuela and the Guianas to Roraima, Brazil. Near sea level to 1200 m elevation.

Representative specimens examined. **VENEZUELA. AMAZONAS:** Prope Esmeraldas, Río Orinoco, Dec 1853 (fl), *Spruce 3233* (C, G, K, MG). **ANZOATEGUI:** Río Tigre, 5 km N de El Tigre, 27 Feb 1979 (fl), *Agostini & Agostini 2639* (MO, VEN). **APURE:** Hato Sta. Elena, Río Capanaparo, 15 Jan 1964 (fl), *Ramía & Ewel 853* (MV). **BOLÍVAR:** Salto Uraima, Río Paragua, boca Parupe, Apr 1943 (fl), *Cardona 507* (VEN); km 59 S of

El Dorado, 17 Mar 1974 (fl), *Gentry et al. 10612* (MO); Río Paragua, Salto de Auraima, 10 Apr 1943 (fl), *Killip 37336* (US, VEN); vic. of Tumeremo, 18 Dec 1944 (fl), *Steyermark 60965* (K). **DELTA AMACURO:** E de Río Grande, ENE de El Palmar, 11 Jan 1965 (fl), *Marcano-Berti 537* (IPA, MO, VEN); Eleanor Creek, lower Orinoco, 1896 (fr), *Rusby & Squires 132* (F, G, K, M, US). **GUÁRICO:** Ditto. Infante, Parque Nac. Aguaro-Guariquito, Dec 1981 (fl), *Delascio et al. s.n.* (MO). **MONAGAS:** entre Maturín y Barrancas, km 14, 26 Mar 1970 (fl, fr), *Rojas, 820* (MV). **SUCRE:** Cerro Imposible, between Cedeño and Boca del Tataricuál, 21 May 1945 (fr), *Steyermark 62828* (US, VEN).

GUAYANA. Upper Mazaruni River, Kamarang, 6 Jul 1987 (fr), *Boom et al. 8427* (MO, NY); Essequibo River, Sep 1937 (fl), *A. Smith 2119* (G, MO); W extremity of Kankuku Mts., Takutu River, Mar 1938 (fl, fr), *A. Smith 3125* (B, G, MO).

SURINAM. Zuid River, 19 Sep 1963 (fl), *Irwin et al. 55881* (MO, NY); Lely Mtns., 2 Oct 1975 (fl), *Lindeman et al. 662* (MO, U); Lucie River, 2 km below Oost River, Jul 1963 (fr), *Maguire et al. 53990* (MO, NY); Zanderij I, Nov 1942 (fl), *Stahel 144* (MO, U, WIS).

FRENCH GUIANA. Cayenne, Belingui et Langa Tabiki sur Maroni (fl), 22 Nov 1984 (fl), *Prevost 1718* (MO).

BRAZIL. AMAZONAS: Serra Araça, Rio Jauari, 10 Mar 1984 (fl), *Rodrigues et al. 10610* (MO). **RORAIMA:** Caracarahy, 21 Sep 1943 (fl), *Ducke 1319* (IAN, MG, NY, R, US).

Local names. Venezuela: clavellina, clavellino, clavellina montanesa, guarupa, rabo de iguana, casabe, patico, san jose, uadam-kayu, uada camayu. Surinam: alasoebabo, itoeli walabang, koballli (Arow.), alieskri, apakanipio, koepajarang, paloewe (Kar.), Diamalieki, diamoliki, achewood, gobo-gobo wiwirie, goebar, kandra hoedoe, malokopesie, malimali.

Uses. Sometimes cultivated outside its native range, as on Hawaii and in the Antilles.

35. *Jacaranda orinocensis* Sandwith, Mem. N.Y. Bot. Gard. **10:** 139. 1958. Type. Venezuela. Bolívar: Río Pargueni, *Wurdack & Monachino 39769* (holotype, NY; isotypes, K, S, US).

Small shrubby, thicket-forming *trees* mostly 3–4 m tall, the branchlets minutely lepidote, with glandular trichomes near apex, otherwise glabrous. *Leaves* bipinnate (rarely in part simple pinnate) with 5–19 pinnae, these without wings on the rachis and with 3–13 subsessile leaflets, the leaflets rhomboid-oblong to obovate, acute or obtuse and cuspidate, cuneate at base, inaequilateral, 0.5–3.7 cm long, 0.3–1.8 cm wide, the terminal leaflet larger, generally glabrous, pilosulous along the base of the midvein below and

minutely puberulous on the midvein above; leaves of sterile branches mostly larger than on fertile branches. *Inflorescence* paniculate, few-flowered but rather open, mostly terminal on young branches, the branches minutely and inconspicuously lepidote. *Flowers* with the calyx campanulate, 5-lobed, generally split to below the middle, lightly and irregularly lepidote, otherwise glabrous, the lobes spatulate-oblong or triangular-lanceolate, acute and obtuse, 3.5–5 mm long, 1.5–2 mm wide, the corolla purple-blue, curved, tubular-campanulate above the narrowly cylindrical neck, to 3.5 cm long and 1.5 cm wide at mouth of tube, the lobes ca. 1 mm long, ciliate, the tube glandular-pubescent and glandular-lepidote at base, otherwise glabrous, inside pubescent at level of stamen insertion; stamens didynamous, monothebate, the thecae 2–2.2 mm long, the staminode 2.7–3 cm long, the apex enlarged, glandular-pubescent at center and apex; pistil to 2.6 cm long, the ovary ovoid, glabrous, 1.5 mm in diam.; disk pulviniform, to 1.2 mm long, broader than the ovary. *Fruit* (immature) with rounded apex.

Distribution (Fig. 21). Endemic to the middle Orinoco in the area of Puerto Ayacucho. Apparently restricted to sandy river beaches where it is locally common and can form dense thickets; ca. 100 m elevation.

Collections examined. **VENEZUELA. AMAZONAS:** seasonally inundated forest at edge of Raudales del Orinoco behind Pto. Ayacucho airport, 100 m, 5°40'N, 67°40'W, 3 Apr 1984 (fl), *Gentry & Stein 46271* (MO, NY, US, VEN). **APURE:** Río Cinaruco entre la Boca y Las Galeras de Cinaruco, 25 Jan 1956 (fl), *Wurdack & Monachino 41365* (K, NY). **BOLÍVAR:** Márgenes del Orinoco, *Chaffanjon 263* (P); Río Parguaza entre la boca del Orinoco y El Carmen, Feb 1950 (fl), *Cruzent 25* (MV, VEN), márgenes del Orinoco, *Gaillard 236* (P); Río Pargueni, *Wurdack & Monachino 39769* (K, NY, S, US).

This species is characterized by the large thin leaflets and rather paucifoliolate leaves. One specimen (*Wurdack & Monachino 40873*) (NY) from Piedra Marimare, Río Orinoco, seems intermediate between this species and *J. obtusifolia*, with which it shares a pubescent ovary, and might be a hybrid.

36. *Jacaranda oxyphylla* Chamisso, Linnaea **7:** 546. 1832. Type. Brazil. *Sellow s.n.* (B*, lectotype, HAL; isotypes, HBG, K, US, W).

Jacaranda elegans Martius ex A. P. de Candolle, Prodr. 9: 230. 1845. *pro syn.* Type. Brazil. Martius 1527 (M).

Jacaranda caroba var. *oxyphylla* (Chamisso) Bureau, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 118. 1894.

Xylopodial *shrub* or *subshrub* 0.5–1.5(–2.5) m tall, the branchlets subterete to subtetragonal, glabrous, with conspicuous elongate whitish lenticels. *Leaves* bipinnate, with (8–)10–12(–14) pinnae, each pinna with narrowly subwinged glabrous rachis and (3–)9–15(–19) sessile or indistinctly petiolulate narrowly lanceolate to very narrowly rhomboid leaflets, these (0.4–)2–4(–5.5) cm long and (0.1–)0.4–0.7(–1.1) cm wide, apex acute to acuminate, the base narrowly cuneate or attenuate, glabrous, gland-dotted below, entire, subcoriaceous. *Inflorescence* a terminal panicle, essentially glabrous, with more or less persistent bracts, these similar to simply pinnate leaves or to a single sublinear leaflet. *Flowers* with the calyx cupular, subtruncate to shallowly and irregularly 2–5-lobed, 5–11 mm long, 4–6 mm wide, very minutely and inconspicuously puberulous; corolla magenta to purplish blue (rarely white), tubular-campanulate above a narrow basal tube, (3.5–)4.5–7 cm long, 1–2 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 3–6 cm long, puberulous with simple and gland-tipped trichomes outside and inside on the lobes and at the stamen insertion, also with a few long simple trichomes along nerves inside; stamens didynamous, the anthers dithecate, each theca 3 mm long, the long staminode ca. 4 cm long, included or subexserted, apically bifid, the middle third and apex densely glandular villous, otherwise sparsely pubescent with a mixture of short and long gland-tipped trichomes; ovary flattened-ovate, 2 mm long, 2 mm wide, glabrous, slightly contracted at base to 1 × 1.5 mm cylindrical-pulvinate disk. *Fruit* elliptic, thinly woody, 2.5–6(–7) cm long, 2.2–3.3(–4.5) cm wide (l:w = 1.2–2), the margin not undulate at dehiscence, glabrous, drying brownish or blackish with lighter flecks; *seeds* small-bodied with a surrounding suborbicular wing, 0.7–1 cm long, 0.9–1.2 cm wide, sometimes rather reddish, the wing hyaline-membranaceous with brownish striations, clearly demarcated from the seed body.

Distribution (Fig. 29). Southeastern Brazil; locally very common in open “campo limpo” grasslands; also in shrubby edges of gallery forest

and cerradão, Paraná, São Paulo, and Minas Gerais, 800–1500 m alt.

Representative specimens examined. BRAZIL. MINAS GERAIS: 12 km W of Diamantina, road to Curvelo, 9 Apr 1973 (fr), *Anderson 8406* (MO, NY). PARANÁ: Curitiba-Ponta Grossa hwy., BR376, Rio Tibagi, 26 Jan 1985 (fr), *Gentry & Zardini 49893, 49894* (both MO); Vila Velha, Ponta Grossa, 19 Nov 1969 (fl), *Hatschbach 22957* (L, MICH, MO). SÃO PAULO: Mun. Matão, 13 Apr 1981 (fr), *Leitao F. et al. 12475* (MO); Botucatu, 20 Mar 1979 (fl, fr), *Yanagizawa s.n.* (SP8967) (MO).

This is the only *Jacaranda* with very narrow elongate leaflets and bipinnate leaves. It is most closely related to *J. caroba* and has sometimes been treated as a narrow-leafleted variety of that species. In addition to the much narrower leaflets, which give it a very different aspect, *J. oxyphylla* is ecologically distinct from *J. caroba*, which is an exclusively cerrado species.

37. *Jacaranda paucifoliolata* Martius ex A. P. de Candolle, Prodr. 9: 230. 1845. Type. Brazil. Minas Gerais: Chapada do Paranã, Sep 1818 (fl), *Martius 1370* (holotype, M). Fig. 27.

Subshrub 0.4–1.5 m, the branchlets terete, puberulous, occasionally with whitish lenticels. *Leaves* simply pinnate, with puberulous canaliculate rachis and (3–)5–9 sessile or very short petiolulate obovate to oblong-elliptic leaflets, these 1.5–9 cm long and 0.7–5 cm wide, apex rounded or retuse, sometimes slightly apiculate, the base cuneate to rounded, usually scabrous above with small erect trichomes, with longer erect trichomes below, these concentrated along the intricately prominent tertiary and secondary venation, coriaceous, more or less bullate, the margin entire or occasionally with a few coarse teeth, the upper surface intricately prominulous-reticulate. *Inflorescence* usually a narrow racemiform terminal panicle, sometimes more freely branching, densely puberulous, sometimes with small oblanceolate leaf-like bracts. *Flowers* with the calyx cupular, 5-dentate, 3–6 mm long, 3–6 mm wide, puberulous, sometimes in part with gland-tipped trichomes; corolla magenta with bluish lobes, tubular-campanulate above a narrow basal tube, 3–5 cm long, 0.7–1.5 cm wide at mouth, the lobes 0.5–1 cm long, the tube 2.5–4 cm long, sparsely puberulous outside with short simple and gland-tipped trichomes, especially near base, inside glabrous except at the stamen

insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the long staminode 2.5–3.5 cm long, subexserted, the middle third glandular-villous, the apex mostly non-glandular villous, with short gland-tipped trichomes on apical bifurcation, otherwise glabrous; ovary flattened-ovate, 1.5 mm long, 1.5 mm wide, glabrous; disk annular-pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* orbicular or suborbicular, subwoody, 2.5–3 cm long, 2–3 cm wide, the margin not undulate at dehiscence, somewhat lepidote, otherwise glabrous, drying blackish; *seeds* not seen.

Distribution (Fig. 29). Known only from the Serra do Cipo-Serra do Espinhaço area of central Minas Gerais, Brazil and Serra dos Cristais and Serra Dourada of Goiás, 750–1450 m altitude; shrubby cerrado and campo cerrado.

Representative specimens examined. BRAZIL. GOIÁS: Cristalina, 29 Jan 1980 (fl), *Heringer & Rizzini 17591* (MO); 25 km W of Cristalina, Serra dos Cristais, 6 Nov 1965 (fl), *Irwin et al. 9986* (NY). MINAS GERAIS: Jaboticatubas, 16 Jan 1985 (fl, fr), *Gentry et al. 49787* (MO); Serra do Cipo, Serra do Espinhaço, 130 km N of Belo Horizonte, 17 Feb 1968 (fl), *Irwin et al. 22790* (NY, UB, US); Mun. Santana do Riacho, km 110, 24 Mar 1981 (fl), *Kamoyama & Zapp s.n. (CFSC9644)* (SPF); Estrada de Grão Mogol a Montes Claros, 16 Apr 1981 (fl), *Rossi et al. s.n. (CFCR1015)* (MO, SPF).

Unusual in the genus in its simply pinnate leaves. Most closely related to the *J. irwinii* complex (where see discussion).

38. *Jacaranda poitaei* Urban, Symb. antill. 7: 376. 1912. Type. Haiti. *Poiteau s.n.* (B*, not seen).

Small *tree* to 8 m tall, the branchlets terete, completely glabrous to minutely puberulous, with whitish lenticels. *Leaves* bipinnate, with 6 to 26 (–40) pinnae, each pinna 1–7(–9) cm long with usually more or less puberulous rachis and 5–33(–44) sessile oblong-elliptic leaflets, these 2–13 mm long and 1–5 mm wide, rounded at apex, the base rounded to truncate or minutely subcordate, membranaceous to coriaceous, glabrous to appressed puberulous below, sometimes with longer trichomes at base. Inflorescence a more or less congested terminal panicle, minutely puberulous, the bracts linear, 2–5 mm long, caducous. *Flowers* with the calyx reduced, broadly campanulate, 5-dentate, 1–2 mm long, 2–3 mm wide, minutely puberulous; corolla light blue, tu-

bular-campanulate above a narrow neck which is conspicuously curved and somewhat enlarged toward the base, 2.5–4 cm long, 1–1.4 cm wide at the mouth, the lobes ca. 0.5 cm long, the tube 2–3 cm long, puberulous with flexuous, in part several-celled, trichomes outside, more densely so at base, mostly glabrous inside, sparsely glandular pubescent at the stamen insertion; stamens didynamous, the anthers monothebate, the second theca reduced to a minute appendage, the theca 2–2.5 mm long, the long staminode 2.5–3 cm long, subexserted, the apex slightly capitate, conspicuously glandular-pilose except at base; ovary flattened-ovate, somewhat tetragonal, 2 mm long, 1 mm wide, glabrous; disk 1 mm long and wide, fused to base of ovary. *Fruit* elliptic, obtuse at base and apex, 3–5 cm long, 1.5–2.8 cm wide, the margin not undulate at dehiscence, glabrous, drying brownish; *seeds* thin, bialate, 0.6–0.7 cm long, 1–1.5 cm wide, the wing hyaline-membranaceous, clearly demarcated from the seed body.

Distribution (Fig. 28). Native to Hispaniola where it is widespread through much of the island, from sea level to 1400 m.

Representative specimens examined. HAITI. Nord-Ouest, Ile la Tortue, 20 May 1925 (fl), *Ekman H4060* (MO).

DOMINICAN REPUBLIC. LA VEGA: La Vega-Guaigui, W of La Vega, 9 Apr 1985 (fl), *Gentry & Zaroni 50643* (MO). MONTE CRISTI: Cordillera Central, Monción, La Majagua, 30 Jun 1919 (fr), *Ekman H13061* (B). PERAVIA: Galcón de Bani, 6 Apr 1985 (fl), *Gentry & Zaroni 50507* (MO). SANTIAGO: Cordillera Central, San José de las Matas, 11 Apr 1930 (fl), *Ekman 14603* (B, G).

Local name. Avay.

39. *Jacaranda praetermissa* Sandwith, Kew Bull. 1954: 599. 1955. Type. Brazil. Piauí: Serra Branca, Jan 1907 (fl), *Ule 7479* (holotype, K; isotypes, B, L).

Jacaranda gomesiana Rizzini, Rodriguesia 28: 168. 1976. Type. Brazil. Piauí: Picos, 25 Sep 1973 (fl, fr), *Ramalho 265* (RB, not seen).

Shrub or small *tree* 1–5 m, the branchlets subterete, pubescent with erect trichomes, with inconspicuous narrow whitish lenticels. *Leaves* bipinnate, with (8–)11 to 17 pinnae, each pinna with pubescent canaliculate rachis and 5–35 sessile oblong leaflets, these 0.5–2.2 cm long, 0.4–0.7(–1) cm wide, apex obtuse or rounded, some-

times minutely apiculate, the base subcordate, rather hispid with erect trichomes, especially below, coriaceous, strongly bullate with the entire margin strongly involute. *Inflorescence* a terminal panicle, about as broad as long, pilose, with conspicuous narrowly ovate to sublinear acuminate leaf-like bracts. *Flowers* (in part from Sandwith, 1955) with the calyx membranaceous, deeply split to near base, the five separate sepals each lanceolate, acuminate, 2.5–10 mm long and 1–3 mm wide, puberulous; corolla purple or purplish-blue, tubular-campanulate above a narrow neck which is curved and somewhat enlarged toward the base, 4–5 cm long, 1.5–2 cm wide at the mouth, the lobes 1 cm long, the tube 3–4 cm long, puberulous outside with mostly gland-tipped trichomes, also with long simple hairs inside mouth, glandular villous at the stamen insertion; stamens didynamous, the anthers monothecate, the second theca reduced to a minute appendage, the theca 2.5 mm long, the staminode ca. 2 cm long, glandular villous in upper half; ovary ovoid, 2 mm long, 2 mm wide, glabrous; disk cupular-pulvinate, 1 mm long, 2 mm wide. *Fruit* orbicular to slightly oblong-elliptic, sometimes apically retuse, usually subtended by some of the dried calyx lobes, woody with the valves somewhat convex, 2–5 cm long, 1.9–3.7 cm wide, the margin not undulate at dehiscence, glabrous except for scattered lepidote scales, drying tannish with paler flecks to blackish; *seeds* rather large-bodied with a surrounding elliptic wing, ca. 1 cm long and 1.5 cm wide, the wing hyaline-membranaceous only at tip, brownish at base, indistinctly demarcated from the seed body.

Distribution (Fig. 21). Known only from sandy shrubby cerrado in the Espigão Maestra area of southern Piauí and westernmost Bahia, 600–900 m.

Representative specimens examined. BRAZIL. BAHIA: Serra Geral de Caitite, 5 km N of Brejinhos das Ametistas, road to Caitite, 12 Apr 1980 (fr), *Harley 21284* (K, MO); Valley of Rio Das Ondas, 32 km W of Barreiras, Mar 1971 (fl, fr), *Irwin et al. 31539* (NY). **MARANHÃO:** Grajahu, Curraes, 29 Jul 1909 (fr), *Lisboa s.n. (MG2496)* (MG, RB). **PIAÚI:** Piracuruca, Parque Nacional de Sete Cidaes, 28 Oct 1976 (fl), *Fernandes & Matos s.n. (EAC2979)* (EAC); Serra Branca, Jan 1907 (fr), *Ule 7176* (B, G, HBG, L).

Although presumably related to *J. brasiliiana* and other species of section *Monolobos*, *J. praetermissa* does not look at all like these species

vegetatively and is remarkably convergent with *J. morii* of section *Dilobos* in the small narrowly oblong sessile cordate-based very strongly bullate leaflets.

40. *Jacaranda puberula* Chamisso, *Linnaea* 7: 550. 1832. Type. Brazil. *Sellow s.n.* (lectotype, K; isotype, HAL).

Bignonia obovata Vellozo, *Fl. flumin.* 251. 1829. Type illustration. Brazil. *Fl. flumin.* 6: 5. 45. 1831, non *B. obovata* (HBK) Spreng. (Jan–May 1825).

Jacaranda puberula var. *microphylla* Chamisso, *Linnaea* 7: 550. 1832. Type. Brazil. *Sellow s.n.* (lectotype, K; isotypes, HAL, HBG).

Jacaranda puberula var. *macrophylla* Chamisso, *Linnaea* 7: 551. 1832. Type. Brazil. *Sellow s.n.* (lectotype, HBG; isotype, K).

Jacaranda semiserrata Chamisso, *Linnaea* 7: 551. 1832. Type. Brazil. *Sellow s.n.* (K).

Jacaranda paulistana Manso, *Enum. subst. braz.* 40. 1836. Type. Brazil. São Paulo. *Manso s.n.* (not seen).

Jacaranda endotricha A. P. de Candolle, *Prodr.* 9: 231. 1845. Type. Brazil. São Paulo: *Gaudichaud 354* (P, photo K).

Jacaranda subrhombica A. P. de Candolle, *Prodr.* 9: 230. 1845. Type. Brazil. Rio de Janeiro: Sebastião-nópolis, *Martius s.n.* (M, photo K).

Jacaranda obovata Martius ex A. P. de Candolle, *Prodr.* 9: 230. 1845, non Chamisso, 1832.

Jacaranda hebeophora A. P. de Candolle, *Prodr.* 9: 231. 1845. Type. Brazil. Fazenda Rink, *Lhotsky s.n.* (G-DC).

Jacaranda gloxiniiflora Lemaire, *Illustr. hortic.* 3: Misc. 44. 1856. Type. Brazil. Santa Catarina: Isla Santa Catarina, *Devos s.n.* (not seen).

Jacaranda digitaliflora Lemaire, *Illustr. hortic.* 11: 393. 1864. Type. Brazil. Santa Catarina: *Devos s.n.*; single leaf without data, cult. Jard. de Plantes (P). Type illustration. *Illustr. hortic.* pl. 393; f. 1.

Jacaranda digitaliflora var. *albiflora* Lemaire, *Illustr. hortic.* 13: t. 489. 1866. Type. Brazil. Rio de Janeiro: Jardim Botânico, *Glaziou s.n.* (not seen). Type illustration: Lemaire, *Illustr. hortic.* pl. 489.

Jacaranda purpurea Vattimo, *Rodriguesia* 36: 81. "1984." Type. Brazil. Bahia: Vitoria da Conquista, *A. Lima 2921* (RB).

Small to medium-sized *tree* 3–20 m tall, the branchlets subterete to subtetragonal, very minutely puberulous to glabrous, with whitish lenticels. *Leaves* bipinnate, (20–)25–35(–45) cm long, with 8–10(–12) pinnae, each pinna with puberulous, subwinged or dorsally grooved rachis and (5–)9–17(–19) sessile or short petiolulate somewhat asymmetric rhombic-elliptic to obovate leaflets, these (1.1–)2.5–4(–8) cm long and (0.4–)1.1–1.6(–3.2) cm wide, apex obtuse to acuminate, the base cuneate or obtuse, always some-

what puberulous, almost always at least with tufts of trichomes in axils of secondary veins below, usually with simple trichomes along main veins below, membranaceous, usually irregularly few-toothed at least along one margin. *Inflorescence* a panicle, puberulous, with linear bracts 1–2 mm long. *Flowers* with the calyx cupular, shallowly 5-dentate, (6–)7–9(–13) mm long, 4–7(–10) mm wide (in Bahia as small as 4 × 3 mm), always more or less puberulous though sometimes very sparsely so; corolla light purple, tubular-campanulate above a narrow basal tube, (4–)5–7.5 (–8.5) cm long, 1–2.5 cm wide at the mouth, the lobes 0.5–1.5 cm long, the tube 3.5–7 cm long, varying puberulous usually with both simple and gland-tipped trichomes outside and on lobes, inside densely glandular villous at the stamen insertion, also usually with scattered long simple trichomes along nerves; stamens didynamous, the anthers dithecate, each theca 2 mm long, the long staminode ca. 4 cm long, subexserted, the apex slightly enlarged, densely glandular villous at apex and near middle, sparsely so with shorter hairs elsewhere; ovary flattened-ovate, 2 mm long, 1.5 mm wide, glabrous; disk short-cylindric, 1 mm long, 2 mm wide. *Fruit* elliptic to oblong-obovate, thinly woody, (5–)6–9.5 cm long, 3–5.6 cm wide (l:w = 1.5–2.2), the margin not at all or slightly undulate at dehiscence, glabrous, drying brownish gray to blackish; *seeds* small-bodied with a surrounding elliptic or suborbicular wing, 1–1.6 cm long, 2–2.5 cm wide, the wing hyaline-membranaceous with brownish striations at base, not sharply demarcated from the seed body.

Distribution (Fig. 29). Widespread through most of the “Mata Atlantica” formation from Misiones, Argentina and Rio Grande do Sul to Bahia, Pernambuco, and coastal Ceará, occurring in *Auracaria* forest, coastal evergreen forest, semideciduous forest, montane forest, and even in arborescent cerrado, 0–1300 m alt.

Representative specimens examined. **BRAZIL.** BAHIA: Ilhéus, estrada Ilhéus/Olivença, km 7, Cururupe, 29 Nov 1981 (fl), *Carvalho & Lewis 846* (CEPEC, MO). CEARÁ: Guaramiranga, 23 Jul 1908 (fr), *Ducke 1388* (MG). DISTRITO FEDERAL: Brasília, Horto de Sobradinho, 17 Jul 1979 (fl), *Heringer et al. 1869* (MO, NY); Chapada da Contagem, 25 km NE of Brasília, 31 Jan 1966 (fr), *Irwin et al. 12157* (C, MO, NY). ESPÍRITO SANTO: Reserva Florestal Linhares, Est. 143, 1 Oct 1979 (fl), *Folli 130* (MO). GOIÁS: Rio Corumba, 31

Aug 1965 (fl), *Heringer 10522* (UB). MATO GROSSO: Picada M-1, Roncador, 21 Sept 1977 (fl), *Heringer et al. 104* (HB, MO). MINAS GERAIS: Viçosa, Jul 1930 (fl), *Mexia 4874* (MICH, MO, WIS). PARANÁ: Tacarciz, 27 Sep 1915 (fl), *Dusen 17213* (L, MICH, MO); 8–10 km W of Morretes, 24 Jan 1985 (fr), *Gentry & Zardini 49771* (MO). PERNAMBUCO: Recife, Mata de Dois Irmãos, 6 Jan 1953 (fl), *Ducke & Lima 149* (ESA, IPA, MO). RIO GRANDE DO SUL: Alto Matador, 16 Oct 1958 (fl), *Reitz & Klein 7274* (G, M). RIO DE JANEIRO: Floresta de Tijuca, Nov 1886 (fl), *Glaziou 16268* (B, G, P). SANTA CATARINA: Pinhal da Companhia Lauro Muller, Urucanga, 20 Sep 1958 (fl), *Reitz & Klein 7200* (B, G, M, US). SÃO PAULO: Ubatuba, Rio Comprido, 8 Jan 1985 (fl, fr), *Gentry & Zardini 49352* (MO); Ubatuba, Serra do Mar, road from Ubatuba to Taubate, 26 Aug 1975 (fl, fr), *Morawetz 41-26875* (MO).

ARGENTINA. CORRIENTES: 3 km SW de Gdor. Virasoro, Dep. Santo Tomé, 2 Dec 1981 (st), *Tressens et al. 1931* (MO). MISIONES: 15 km N de Bernardo de Ysigoyen, 18 Sep 1961 (fl), *Fabris & Hunziker 7431* (LP).

Common names. Caroba, carobinha.

An extremely polymorphic species, characterized by usually 4–6 pinnae pairs per leaf, relatively large flowers, frequently serrate leaflet margins, and the usual presence of tufts of hairs in the secondary nerve axils below. The northern coastal populations from Pernambuco and Bahia tend to have smaller flowers and calyces, slightly undulate fruit margins, and lack the axillary hairs, but the single Ceará collection examined is completely typical with well-developed axillary trichomes and straight fruit margins. Plants from the Vitoria da Conquista area have slightly thicker leaflets with the main veins beneath distinctly more puberulous; this form has been recognized as *J. violacea*. Forms from the cerrado area of Goiás, D.F., and the Serra do Roncador (plus 1 collection from Minas Gerais (Serra Grão Mogul)) are only distinct from *J. caroba* by an act of faith. These plants have more coriaceous leaflets with generally blunter apices than other populations of *J. puberula* and have previously been included in *J. caroba* by Morawetz (1982) and Gentry (in herb.); however, they are morphologically differentiable in having distinctly puberulous leaf midveins below and ecologically differentiated by occurring in gallery forest (also in the caatinga-cerrado transition) rather than open cerrado. If these two forms are not specifically distinct, then *J. caroba* itself would have to be regarded as an extreme form of *J. puberula*. There is also one collection of this form from coastal Bahia (*Santos 2282*).

The lectotypification of *J. puberula* on *Sellow s.n.* (K No. H13281/74 (MO photo 4282) (Sandwith & Hunt, 1974) takes precedence over that of Morawetz based on the HAL duplicate.

We here reduce four species to the synonymy of *J. puberula* for the first time. Despite the lack of a type collection, *J. paulistana* can only be this species from the description of the leaves as large, glabrous, more or less 7-jugate, with leaflets attenuate at base and apex and with dentate margins. *Jacaranda gloxiniflora* has been identified with *J. caroba* but it came from Santa Catarina where this is the only species with serrate leaflets. *Jacaranda hebeophora* is the cerrado gallery forest form of *J. puberula* with blunt leaflet apices, and *J. violacea* is a slightly more puberulous variant of this same form from the mato de cipo/caatinga interface; one recent collection from coastal Bahia is also referable to this form.

41. *Jacaranda pulcherrima* Morawetz, Pl. Syst. Evol. **132**: 337. 1979. Type. Brazil. São Paulo: Mun. de Cunha, km 66 Cunha to Parati, 700 m, 1 Nov 1975 (fl), *Morawetz 1-1175* (holotype, RB; isotypes, BOTU, K, M, MO, WU).

Small tree to 4 m, the branchlets terete or flattened, tomentose-velutinous. Leaves bipinnate, 20–45 cm long, with 13–21 pinnae, the pinnae 5–11 cm long, the leaflets 7–27 per pinna, sessile, elliptic or oblong, obtuse, at base cuneate or rounded, (7–)10–20(–22) mm long, 5–8 mm wide, the margin entire or with a few teeth, revolute, drying dark above, tan below, the nerves conspicuously impressed above, somewhat raised below, puberulous above, tomentose below. Inflorescence a large dense panicle, the branches puberulous-pilose, the lower bracts bipinnate, the bracteoles lanceolate. Flowers with the calyx cupular or suburceolate, 8–10 mm long, 5–6 mm wide, irregularly 5-dentate, densely gray-puberulous; corolla violet with white throat, tubular campanulate, (4.5–)5–6.5(–7) cm long, 3–4 cm wide at mouth, the lobes 0.8–1 cm long, puberulous or glandular-pilose outside and on lobes; stamens dithecate, the staminode to 4.5 cm long, club-shaped, the apex bifurcate or emarginate, glandular-villose; ovary glabrous; disk annular-pulvinate. Fruit a subwoody capsule, elliptic to broadly oblong, 4.2–6.5 cm long, 2.8–3.5 cm wide; seeds not seen.

Distribution (Fig. 29). Endemic to uplands of

southern Minas Gerais and the adjacent edges of Rio de Janeiro and São Paulo, where locally common in moist areas in the transition between cerrado and campo de altura, 700–1500 m.

Specimens examined. BRAZIL. Sin. loc., *Sellow 220* (HBG, L, NY, US). MINAS GERAIS: Sin. loc., *Claussen 19* (NY), *Claussen s.n.* (F, P); *Glaziou 15262* (P); *St. Hilaire B435* (P); Serra da Caraça, *Jan Claussen s.n.* (G); Mun. de Santa Barbara, 13 Apr 1933, *Barreto 2025* (F, R); Caraça, trail to Cascatinha, 1300 m, 20°15'S, 43°30'W, 16 Jan 1985 (fr), *Gentry et al. 49616, 49618* (MO, RB). RIO DE JANEIRO: Sin. loc., 1816 (st), *St. Hilaire C61110* (P); Nova Friburgo, 9 Dec 1918 (fl), *Curran 628* (F, NY, US). SÃO PAULO: Campos de Bocaina, 8 Jan 1876 (fl, fr), *Glaziou 8212* (G, P, R).

Most closely related to *J. ulei* but differs in being a small tree to 4 m high rather than a xylopodial shrub only 1 m tall, in larger leaves with more pairs of pinnae, the divided staminode apex, and thinner fruit.

42. *Jacaranda racemosa* Chamisso, *Linnaea* **7**: 547. 1832. Type. Brazil. Minas Gerais. *Sellow s.n.* (lectotype, HBG; B*).

Xylopodial *subshrub* less than 0.5 m tall, monopodial, with a basal cluster of leaves (the axis sometimes slightly elongating between adjacent nodes) and a single relatively elongate terminal raceme, the stem subterete, glabrous, without whitish lenticels. Leaves simply pinnate (rarely [two leaves of *Duarte 10509*] bipinnate with lower leaflets replaced by several-foliolate pinnae) with glabrous rachis deeply grooved above and 7–25(38–foliolate in bipinnate leaf) sessile or indistinctly petiolulate oblanceolate to narrowly obovate leaflets, these 0.5–4 cm long and 0.2–0.9(–1.4) cm wide, apex acute to obtuse, the base narrowly cuneate, glabrous, entire, coriaceous, the few inconspicuous secondary veins strongly ascending. Inflorescence a terminal raceme with the few flowers clustered near tip, glabrous, with subulate caducous bracts. Flowers with the calyx cupular, shallowly sharply 5-dentate, 4–7 mm long, 4–7 mm wide, glabrous except for a few hairs along lobe margins; corolla wine-colored, tubular-campanulate above a narrow basal tube, 2.5–5.5 cm long, 0.8–1.5 cm wide at the mouth, the lobes 0.3–1 cm long, the tube 2–4 cm long, puberulous outside with gland-tipped and simple trichomes, inside glabrous except at the stamen insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the long

staminode ca. 2 cm long, included, glandular villos only near middle, otherwise with sessile glands and a fringe of non-gland-tipped trichomes around the non-expanded apex; ovary flattened-ovate, 1.5 mm long, 1 mm wide, glabrous, slightly contracted at base into indistinct disk 0.5 mm long and 1 mm wide. *Fruit* obovate, subwoody, 3.5–4 cm long, ca. 2 cm wide, the margin not or very slightly undulate at dehiscence, glabrous, drying blackish; *seeds* thin, bi-late, ca. 0.7 cm long, ca. 1.4 cm wide, the wing tips hyaline-membranaceous, the base brownish, indistinctly demarcated from the seed body.

Distribution (Fig. 29). Endemic to open campo rupestre on sandy soil, Serra do Cipo and Serra do Espinhaço, Minas Gerais, Brazil. 1100–1300 m elevation.

Representative specimens examined. BRAZIL. GOIÁS: Chapada dos Veadeiros, 28 km SW of Diamantina, 15 Jan 1969 (fl), *Irwin et al.* 22023 (UB, US). **MINAS GERAIS:** Diamantina, Para Couto Magalhães, 18 Oct 1967 (fl), *Duarte 10509* (M, MO); Santana do Riacho, Serra do Cipo, km 109, Estrada Lagoa Santa a Conceição do Mato Denro, 6 Sep 1980 (fl), *Forero et al.* 7698 (SPF); S. Ana do Riacho, 25 Oct 1974 (fl, fr), *Hatschbach 35355* (LP, M, MO); Estrada de Diamantina a Corinto, km 10, 1 Dec 1976 (fl), *Shepherd et al.* 3855 (MBM, UEC).

Very distinctive in the minute stature, basally clustered simply pinnate leaves with narrow leaflets, and racemose inflorescence. Its closest relative is *J. oxyphylla*, which differs in bipinnate leaves spaced along an erect stem and in a paniculate inflorescence; it is possible that the single partially bipinnate collection of *J. racemosa* represents hybridization between these two species.

43. *Jacaranda rufa* Manso, Enum. subst. braz.

40. 1836. Type. Brazil. Goiás and Mato Grosso. *Manso s.n.* (not seen); neotype, Brazil, *Pohl 169* (M).

Pteropodium hirsutum A. P. de Candolle, Prodr. 9: 239. 1845. Type. Bolivia. St. Rafou ad Chiquitos, *D'Oribigny 1086* (holotype, P; isotype, F—fragm.).

Small *shrub* with xylopodium, the branches 0.4–2 m tall, the young twigs purple, somewhat tetragonal, puberulous. *Leaves* bipinnate, 30–50 cm long with 7–11 pinnae, the rachises broadly winged, the leaflets 5–19 per pinna, sessile, broadly or narrowly elliptic ovate to obovate,

the base obtuse or slightly cordate, the apex acute to acuminate, 2–8 cm long, 1–3(–4) cm wide, larger toward apex, coarsely toothed, more or less puberulous above and below. *Inflorescence* paniculate, to 45 cm long, sparsely to densely puberulous, with linear bracts to 2.5 cm long. *Flowers* with the calyx campanulate, 8–14 mm long, 5–8 mm wide, irregularly 2–5-toothed, more or less puberulous with short erect trichomes; corolla dark purple with white throat, tubular campanulate above a narrower basal tube, 3–6.5 cm long, 0.9–1.7 cm wide at mouth of tube, the tube 2.8–6 cm long, the lobes 5–8 mm long, sparsely glandular puberulous with stalked-lepidote trichomes, puberulous with longer trichomes on lobes, especially around margins, glabrous inside except at level of stamen insertion; stamens with bithecate, the thecae divaricate, 2.5 mm long; the staminode club-shaped, glandular pilose along whole length; ovary flattened-conical, glabrous, 2 mm long, 1.5 mm wide; disk truncate-conical, 1 mm long, 2.5 mm wide. *Fruit* elliptic to obovate, woody, 5–10 cm long, 3–6 cm wide, glabrous, minutely lenticellate-roughened; *seeds* thin, the hyaline membraceous wing sharply demarcated and completely surrounding seed body, 1–2 cm long, 2–3 cm wide.

Distribution (Fig. 29). Mostly in “Campos cerrados,” also in cerrado and cerradão. Mostly in south central Brazil, also eastern Bolivia; 200–1000 m elevation.

Representative collections. BRAZIL. DF: Vargem Bonita, Brasília, 1 Feb 1962 (fl), *Heringer 8862* (MO, UB); Brasília, Bacia do Rio São Bartolomeu, 4 Dec 1979 (fl), *Heringer et al.* 2861 (MO, NY). **GOIÁS:** Luziania, 15 km S, 15 Dec 1980 (fl), *Heringer 18002* (MO); Serra do Caiapo, Caiaponia on road to Jatai, 17°12'S, 51°47'W, 27 Oct 1964 (fl), *Irwin & Soderstrom 7464* (F, MO, NY, U); 15 km S of Niquelandia, 1000 m, 21 Jan 1972 (fl), *Irwin et al.* 34670 (MO, NY). **MATO GROSSO:** Chapada dos Guimarães, 1 Mar 1983 (fr), *da Cunha et al.* 711 (CH), 22 Feb 1984 (fl), *Saddi 3523* (CH); Cuiaba, 720 m, 13 Oct 1973 (fl), *Prance et al.* 18896 (CH, MO, NY). **MINAS GERAIS:** Monte Alegre, 8 km N, 21 May 1963 (fr), *Magalhães 19242* (HB). **PARÁ:** Serra do Cachimbo, 29 Apr 1983 (fr), *Amaral et al.* 1040 (MO, NY); *Pires et al.* 6227 (NY, UB). **RONDÔNIA:** Vilhena, 2 Jan 1979 (fr), *M. Silva & A. Pinheiro 4072* (MO, NY). **SÃO PAULO:** Botucatu, 1 Jan 1975 (fr), *Morawetz 11-4175* (MO, WU); Mogi Guaçu, *Kuhlmann 4172* (SP).

BOLIVIA. BENI: Prov. Vaca Diez, 37 km E of Riberalta on road to Guayamerin, 21 May 1982 (fr), *Solomon 7732* (MO). **SANTA CRUZ:** San José-San Ignacio, km 152 pres San Miguel, 25 Oct 1977 (fl), *Evrard*

8314 (BR, MO); Prov. de Valasco, Serrania de Huan-chaca, 3 Dec 1987 (fl, fr), *Thomas 5600* (MO).

Local names. Caroba do campo, perobinha, carobao.

A very distinctive species characterized by the xylopodial habit, conspicuously winged rachises, relatively large leaflets and thick woody fruits.

44. *Jacaranda rugosa* A. Gentry, sp. nov. Type. Brazil. Pernambuco: Buique, 4.5 km de Ca-timbau, solo arenoso, 8 Oct 1971 (fl), *Andrade-Lima 71-6556* (holotype, IPA; isotype, MO).

Frutex vel arbor parva. Folia pinnata, 5–9-foliolata, foliolis oblongis, ad apicem obtusis vel rotundatis, coriaceis, valde bullatis. Inflorescentia floribus in panicula parva laterali dispositis. Calyx cupulatus, 5-dentatus; corolla tubulo-campanulata, extus puberulus; stamina didynama thecis duabus.

Shrub or small *tree* to 4 m tall, the branchlets subterete, persistently pilose with different length trichomes, without whitish lenticels. *Leaves* simply pinnate with round pilose rachis and 5–9 sessile asymmetrically oblong leaflets, these (1–)2.5–4.5 cm long and (0.8–)2–2.8 cm wide, apex obtuse to rounded, the base rounded or truncate, very strongly and intricately bullate, puberulous with short stiff trichomes above, pilose with longer trichomes oriented into areolae below, strongly coriaceous, the margin entire. *Inflorescence* a few-flowered raceme-like lateral panicle, axillary or from the axil of fallen leaf, viscid puberulous, the bracts caducous, linear, <2 mm long. *Flowers* with the calyx cupular, shallowly 5-dentate, 5–7 mm long, 4–5 mm wide, viscid puberulous, in part with gland-tipped trichomes, also with lepidote glands; corolla magenta, tubular-campanulate above a narrow basal tube, ca. 5 cm long, 1.5 cm wide at the mouth, the lobes 0.7–1 cm long, the tube ca. 4 cm long, rather sparsely puberulous with short gland-tipped trichomes outside, with lepidote scales and a few very short conical trichomes on lobes; stamens didynamous, the anthers dithecate, each theca ca. 3 mm long, subexserted; ovary (partially destroyed) flattened ovoid, ca. 1 mm long and wide, glabrous; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* unknown.

Distribution (Fig. 29). Known only from the type collection from sandy soil at Buique, Pernambuco.

Only a single open flower is available on the type material. That flower was not dissected and parts of the description are therefore somewhat incomplete.

Despite its simply pinnate leaves, this species is probably most closely related to *J. jasminoides*, which often has incompletely bipinnate leaves. The main difference from *J. jasminoides* is the very strongly bullate coriaceous leaflets of *J. rugosa*; even the most extreme forms of *J. jasminoides* (i.e., with relatively coriaceous leaflets having a rough upper surface and the secondary veins somewhat impressed above, e.g., the type of *J. alagoensis*) never have the intricately impressed upper surface venation nor the strongly raised reticulate undersurface of *J. rugosa*. *Jacaranda irwinii* is also similar and can have somewhat bullate leaflets with the secondary veins impressed above, but never strongly and intricately bullate as in *J. rugosa*; *J. irwinii* has a terminal inflorescence, usually subfoliaceous inflorescence bracts, and lacks gland-tipped trichomes on the calyx and corolla tube.

45. *Jacaranda selleana* Urban, Ark. Bot. Stockholm 22A (10): 59. 1929. Type. Haiti. Massif de la Selle, *Ekman H7606* (lectotype, S; isotype, MO).

Small *tree* 3–4 m tall, the branchlets subtetragonal, minutely puberulous to almost glabrous, with whitish lenticels. *Leaves* bipinnate, with 18–44 pinnae, each pinna 1–9 cm long with more or less puberulous rachis and 11–43 sessile elliptic to oblong-elliptic leaflets, these (3–)5–11 mm long and (2–)3–5 mm wide, rounded at apex (except the sometimes acutish apical leaflet), truncate to subcordate at base, chartaceous, minutely and sparsely puberulous with appressed trichomes below at least along midvein and sometimes secondary veins. *Inflorescence* an open terminal panicle, minutely puberulous, the bracts minute, 1–1.5 mm long. *Flowers* with the calyx reduced, broadly campanulate, 5-dentate, 1–2 mm long; corolla light blue, 4–5 cm long, ca. 1.5 cm wide at mouth of tube, the lobes 7–8 mm long, puberulous outside; stamens didynamous, the anthers monothebate, the second theca reduced to a minute appendage, the theca 2 mm long, the staminode 2.5–3 cm long, conspicuously glandular pilose at center and apex; ovary flattened-ovate; disk 1 mm long and wide. *Fruit* not seen.

Distribution (Fig. 22). Endemic to western Hispaniola where known only from around 500 m alt. in central Haiti and southwesternmost Dominican Republic.

Representative collections. HAITI. Massif de la Selle, prope Port-au-Prince inter Laval et Bouvier, 500 m, Feb (fl), *Ekman H7606* (MO, S).

DOMINICAN REPUBLIC. PEDERNALES: 29 km N of Cruce Carretera Cabo Rojo-Pedernales, road to Acetitillar, 18°4'N, 71°39'W, 500 m, 12 Apr 1985 (st), *Gentry & Mejía 50780* (JBSD, MO).

This is a very dubious segregate from *J. poitaei*, differing from that species in more oblong, broad-based leaflets and a larger corolla. We very tentatively retain it on the counsel of T. Zanoni (pers. comm., 18 Dec 1987) who is convinced that these two forms are distinct in the Dominican Republic on the basis of the generally larger more oblong leaflets of *J. selleana*, despite some overlap in absolute leaf dimensions. These two taxa may be allopatric, as I have seen no collections of *J. poitaei* from the southwestern extreme of Hispaniola, but whether this argues for or against specific recognition of such a tenuously differentiated plant as *J. selleana* is not clear.

46. *Jacaranda simplicifolia* K. Schumann in Martius, Fl. bras. 8(2): 414. 1897. Type. Brazil. Goiás: Fazenda do Palmital, *Glaziou 21848* (B*, F photo 18476; lectotype, G).

Xylopodial herb or unbranched subshrub to 2 m tall, the branchlets subtetragonal, puberulous, usually with small whitish lenticels. Leaves simple, sessile with thickish petioles 2–4 mm long, elliptic to oblong-elliptic, 2.5–17 cm long, 1.3–10 cm wide, apex rounded or obtuse, sometimes minutely apiculate or retuse, the base truncate or subcordate, usually scabrous above from the very short stiff trichomes (sometimes glabrous with intricately prominulous-reticulate venation), below puberulous with slightly longer erect trichomes, especially along the intricately prominent tertiary venation, coriaceous, usually more or less bullate, the margin entire. Inflorescence a narrow terminal panicle, densely puberulous, with small oblanceolate foliaceous bracts. Flowers with the calyx cupular, shallowly 5-dentate, 3–4 mm long, 4–6 mm wide, puberulous with simple erect trichomes and with scattered lepidote scales; corolla lavender to light magenta, tubular-campan-

ulate above a narrow basal tube, 4–5.5 cm long, 1–1.7 cm wide at the mouth, the lobes 0.5–1 cm long, the tube 3.4–4.5 cm long, sparsely puberulous outside with short simple and gland-tipped trichomes, especially near base, inside glabrous except at the stamen insertion; stamens didynamous, the anthers dithecate, each theca 2 mm long, the staminode ca. 3 cm long, subexserted, the middle third glandular villous, the upper portion and T-shaped apex with shorter gland-tipped trichomes, also with longer non-glandular trichomes near apex; ovary flattened-ovate, 1.5 mm long, 1.2 mm wide, glabrous; disk annular-pulvinate, 1 mm long, 2 mm wide. Fruit broadly elliptic, subwoody, the calyx persisting, 3.5–4.5 cm long, 2.5–3 cm wide, the margin not undulate at dehiscence, glabrous, drying blackish; seeds small-bodied with a surrounding suborbicular wing, 0.8–1.2 cm long, 1.3–2 cm wide, the wing hyaline-membranaceous with radial brownish striations, not sharply demarcated from the seed body.

Distribution (Fig. 29). Northwestern cerrado from Goiás and the Distrito Federal to western Bahia and southern Maranhão; 450–1100 m alt.

Specimens examined. BRAZIL. BAHIA: 22 km W of Barreiras, 2 Mar 1972 (fl), *Anderson et al. 36479* (MO, NY), 36480 (UB); Espigão Mestre, 100 km WSW of Barreiras, 6 Mar 1972 (fl), *Anderson et al. 36641* (MO, NY, UB); Roda Velha, Barreiras, 12 Jan 1977 (fl), *Hatschbach 39455* (MO); Valley of Rio das Ondas, 25 km W of Barreiras, 3 Mar 1971 (fl), *Irwin et al. 31393* (MO, NY, UB). DISTRITO FEDERAL: 12 km S of Planaltina, 21 Feb 1970, *Irwin et al. 26487* (UB); Barra Alta, este do Corrego São Gonçalo, 19 Feb 1981, *Kirkbride 3900* (UB); BR-20, Reserva Biol. Aguas Emendadas, 12 May 1982 (fl), *Proença 95* (MO). GOIÁS: 25 km N of Alto Paraíso, 8 Mar 1973 (fl, fr), *Anderson et al. 6694* (NY, UB); Chapada dos Veadeiros, 13 km S of Terezina, 16 Mar 1973 (fl), *Anderson et al. 7215* (MO); 18 km E of Pirenópolis, *Anderson et al. 34494* (UB); Faz. Palmital, 6 Jun 1895 (fl, fr), *Glaziou 21848* (G, K, R); Serra do Caiapo, 50 km S of Caiaponia, 27 Jun 1966 (fr), *Irwin et al. 17848* (NY); Chapada dos Veadeiros, 7 km S of Cavalcante, 8 Mar 1969, *Irwin et al. 24020* (UB). MARANHÃO: Mun. de Loreto, Ilha de Balsas, betw. Balsas & Parnaíba Rivers, 18 Feb 1970 (st), *Eiten & Eiten 10665* (MO); Carolina, BR010, Pedra Caida, 13 Apr 1983 (fr), *Silva et al. 1093* (MO). MINAS GERAIS: Serra do Rio Preto, 25 km E of Cabeceiras, 4 km Goiás-Minas border, 19 Nov 1965, *Irwin et al. 10509* (NY). PIAUÍ: Monte Alegre, estrada Bom Jesus-Monte Alegre, 15 Dec 1977, *Fernandes & Matos s.n. (EAC3587)* (EAC).

Absolutely distinctive; the only simple-leaved species of *Jacaranda*.

47. *Jacaranda sparrei* A. Gentry, Ann. Missouri Bot. Gard. **64**: 138. 1977. Type. Ecuador. Loja: Between Panamerican Hwy. and Zumbi on road to Machala, km 69, 2100 m, 23 Sep 1967 (fl), *Sparre 18862* (holotype, MO; isotype, S).

Tree to 10 m tall, the branchlets subtetragonal, very minutely puberulous, with whitish lenticels. *Leaves* bipinnate, usually with 13 pinnae, each pinna with slightly winged rachis and 13–21 sessile, asymmetrically oblong leaflets, these 1–2 cm long and 0.5–1 cm wide, apiculate, glabrescent above, barbate at least along the base of midvein below. *Inflorescence* an open terminal panicle, puberulous. *Flowers* with the calyx almost patelliform, shallowly 5-dentate, ca. 2 mm long and 5 mm wide, puberulous; corolla purplish blue, tubular-campanulate above a narrow neck which is conspicuously curved and enlarged toward the base, 2.5–3 cm long, 1.1–1.3 cm wide at the mouth, the lobes small, less than 5 mm long, the whole tube puberulous outside, glabrous inside except at the stamen insertion; stamens didynamous, the anthers 1–5 thecate, the second theca reduced to a minute appendage, each theca 3–4 mm long, the staminode 2.5–3 cm long, subexserted, the middle third and apex glandular pubescent; ovary flattened-ovate, 2 mm long, 2 mm wide, densely puberulous. *Fruit* 5–8 cm long, 4.5–5.5 cm wide, the margin strongly undulate at dehiscence; *seeds* not seen.

Distribution (Fig. 21). Endemic to the dry upland forest of the Pacific slope of southernmost Ecuador and adjacent Peru, 2000–2400 m elevation.

Collections examined. ECUADOR. LOJA: Road from Río Pindo to Loja, 1982 (fr), *Descimon s.n.* (MO); Cariamanga, 21–23 Jul 1959 (fr), *Harling 6022* (GB); below Curiamangas, 25 Nov 1910, *Townsend 957* (US).

PERU. PIURA: Ayabaca, Oct 1868 (fl), *Raymond 1252* (USM).

This rare and locally endemic species is intermediate between *J. acutifolia* and *J. mimosifolia* on the one hand and the *J. caucana* complex on the other. It has the relatively large leaflets and pubescent ovary of *J. caucana* but the pubescent corolla tube of *J. mimosifolia*. Both the curvature and enlarged base of the corolla are more pronounced than in *J. acutifolia* but less so than in *J. caucana*. The corolla lobes are more reduced than in any of the related species.

48. *Jacaranda subalpina* Morawetz, Pl. Syst. Evol. **132**: 336. 1979. Type. Brazil. Rio de Janeiro: Serra da Mantiqueira, Eng. Passos to Pouso Alto, turnoff to Agulhas Negras mountains, 1800 m, 44°41'W, 22°26'S, 10 Jan 1975, *Gottsberger & Morawetz 18-10175* (holotype, RB; isotypes, K, MO, WU).

Tree 5–12 m tall, the branchlets somewhat flattened, densely puberulous. *Leaves* bipinnate, 25–45 cm long, with 11–23 pinnae, the leaflets (9–)17–23(–27) per pinna, sessile, narrowly elliptic or oblong, obtuse to acute at apex, cuneate at base, 0.8–4 cm long, 0.4–1.8 cm wide, the terminal larger, entire to few-dentate or crenate, above dark green, the nerves obviously impressed, sparsely puberulous, below greenish gray, the main veins puberulous. *Inflorescence* a narrow terminal panicle, few-flowered, the branches puberulous, the lower bracts bipinnate, the bracteoles minute, caducous. *Flowers* with the calyx broadly cupular or infundibuliform, 6–11 mm long, 6–11 mm wide, irregularly 5-dentate, gray-puberulous; corolla purple with white throat, broadly campanulate-infundibuliform, 4.5–6.5 cm long, 3–5 cm wide at mouth, the lobes ca. 1.5 cm long, glandular-puberulous outside, the lobes puberulous, inside glabrous except at level of stamen insertion; stamens dithecate, the thecae divaricate, the staminode clavate, the apex entire, glandular-villous; ovary glabrous; disk annular-patelliform. *Fruit* a subwoody capsule, elliptic or narrowly elliptic or oblong, 5–6.5 cm long, 2.6–3.5 cm wide, the margin not undulate, the surface somewhat minutely verrucose.

Distribution (Fig. 29). Endemic to montane rain forests at higher altitudes in the Serra da Mantiqueira of southern Rio de Janeiro State and adjacent São Paulo; 1600–1800 m.

Specimens examined. BRAZIL. RIO DE JANEIRO: Serra da Mantiqueira, Eng. Passos to Pouso Alto, 1800 m, 44°41'W, 22°26'S, 19 Feb 1975, *Morawetz 22-, 31-, 32-, 33-19275* (K, MO, WU); 14 Aug 1978, *Gottsberger & Morawetz 19-14878* (K, MO, WU), *115-14878* (BOTU, G, K, M, MO, RB, WU). SÃO PAULO: Campos do Jordão, 20 Jun 1940, *Hashimoto 283* (SP), 3 May 1950, *Kuhlmann 2259* (SP); Serra da Bocaina 1600 m, 6 Jul 1952, *Markgraf & App. 10268* (RB, WU).

This species is close to widespread and heterogeneous *J. puberula* but occurs at higher altitudes than *J. puberula* and has a much more densely pubescent corolla and broader more co-

riaceous calyx than any material of *J. puberula*. The fruit of *J. subalpina* is smaller ($5-6.5 \times 2.6-3.5$ cm vs. $6-9$ cm \times $3-6$ cm in *J. puberula*). Its leaflets are also more elliptic to oblong (rather than elliptic-rhombic as typical for *J. puberula*) and are puberulous along the nerves, not just in the axils.

49. *Jacaranda ulei* Bureau & K. Schumann in Martius, Fl. bras. **8(2)**: 383. 1897. Lectotype: Brazil. Goiás: Corumba, *Ule 3020* (HBG).

Fig. 27.

Jacaranda crystallana Bureau & K. Schumann in Martius, Fl. bras. **8(2)**: 384. 1897. Type. Brazil. Minas Gerais: Serra dos Cristais, *Pohl 820* (W).

Xylopodial *shrub* or tiny *tree* 0.6–1.5 m tall, the branchlets subterete, usually densely pubescent, without apparent lenticels. *Leaves* bipinnate, 6–20(–30) cm long, with 8–12(–16) pinnae, each pinna with villous rachis (sometimes slightly winged) and 6–16(–20) sessile, very narrowly oblong-elliptic to narrowly oblong ovate leaflets, these 15–20(–25) cm long and 3–5(–8) cm wide, apex acutish, the base rounded or minutely cordate, entire, pubescent with rather long erect trichomes, usually more or less densely so below (the surface thus macroscopically somewhat grayish), coriaceous, strongly bullate. *Inflorescence* a panicle, puberulous, with bracts sublinear, leaflet-like, to 20 mm long. *Flowers* with the calyx cupular, shallowly 5-dentate, 5–10 mm long, 4–7 mm wide, more or less hirsute; corolla deep purple, tubular-campanulate above a narrow basal tube, 3.5–4(–4.5) cm long, to 2 cm wide at the mouth, the lobes 0.5–0.7 cm long, the tube 3–3.5 cm long, rather sparsely puberulous outside with both simple and sessile gland-tipped trichomes, glabrous inside except for a few gland-tipped trichomes at the stamen insertion; stamens didynamous, the anthers bithecate, each theca 2 mm long, the long staminode ca. 3–3.5 cm long, subexserted, slightly capitate, glandular villous only near apex, otherwise rather sparsely pubescent with short gland-tipped trichomes; ovary flattened-ovate, slightly contracted at base, 1.5 mm long, 1 mm wide, glabrous; disk subconical-pulvinate, 1 mm long, 1.5 mm wide. *Fruit* round to elliptic, apically rounded with a thickened ring-like basal stipe, rather woody, 3.5–5.5 cm long, 3–4 cm wide (l:w = 1–1.6), the margin

not undulate at dehiscence, glabrous and very sparsely lepidote, drying brown to blackish; *seeds* small-bodied with a surrounding suborbicular wing, 8–14 mm long, 14–24 mm wide, the wing hyaline-membranaceous with a narrow brownish base, clearly demarcated from the seed body.

Distribution (Fig. 29). The Brazilian cerrado; 700–1500 m elevation.

Representative specimens examined. BRAZIL. BAHIA: 12–14 km N of Rio de Contas, road to Mato Grosso, 17 Jan 1974 (fl), *Harley 15200* (CEPEC, K, MO). DISTRITO FEDERAL: Brasília, 20 Jan 1978 (fl), *Gentry 21381* (MO); 30 km N of Brasília, Corrego Sobradinho, Oct 1963 (fl), *Maguire 57027* (COL, MO, NY). GOIÁS: Serra dos Cristais, Cristalina, 7 Oct 1981 (fl), *Hatschbach 44066* (MO, US); Contraforte Central, 40 km NE of Catalão, 24 Jan 1970 (fr), *Irwin et al. 25307* (AAU, MO, NY, US). MATO GROSSO: Picado R-3, Res. Ecol. Roncador, 26 Sep 1977 (fl), *Heringer et al. 130* (MO, HB). MINAS GERAIS: Sin. loc., Jun 1840 (fl), *Claussen 11A* (G, MICH, P).

Very distinctive in its narrow bullate pubescent leaflets; its only close relative is *J. pulcherrima* (see discussion under that species).

The *Ule* specimen at Hamburg is a more appropriate lectotype than *Claussen 119* (G), proposed by Morawetz, since it matches the protologue equally well and the species was named for *Ule*.

Specimens of Uncertain Position

There are at least two additional *Jacaranda* collections that are not assignable to any known species but are inadequate for description. One of these, *Emperaire 2478* from São Raimundo Nonato, Piauí, is sterile but probably related to *J. brasiliiana*, from which it differs in larger thinner leaflets, widely separated along the rachises. The other is *Irwin et al. 25307* from Serra do Fação, Goiás, which is related to *J. ulei*, but differs in much larger broader more coriaceous leaflets. Although occasional collections of *J. ulei* approach this collection, it seems probable that it represents a new species rather than an extreme of that species.

PANDOREA

13. *Pandorea* Spach, Hist. veg. **9**: 136. 1840. Type. *Bignonia pandorana* Andrews = *Pandorea pandorana* (Andrews) van Steenis.

Tecoma sect. *Pandorea* Endlicher, Gen. pl. 711. 1839.
Bignonia pandorana Andrews = *Pandorea pandorana*
(Andrews) van Steenis.

Tecomathe sect. *montanae* van Steenis, Bull. Jard.
Bot. Buitenzorg **3(10)**: 204. 1928.

Lianas (rarely suberect in arid areas); branchlets terete, lacking interpetiolar glandular fields and pseudostipules. *Leaves* imparipinnately compound, without tendrils. *Inflorescence* a terminal panicle, sometimes reduced and appearing racemose. *Flowers* with the calyx cupular or campanulate, coriaceous, truncate to shallowly and irregularly lobed; corolla tubular to tubular-infundibuliform, slightly zygomorphic, usually pilose in ventral side of throat and below stamen insertion; stamens four, the anthers glabrous, included, the thecae divaricate, the staminode rudimentary; ovary linear to narrowly ovate, the ovules multi-seriate in each locule. *Fruit* a narrowly oblong capsule, stipitate at base, terete or somewhat flattened, the valves coriaceous, the septum flat with marginal seed-scars; *seeds* thin, bialate, the seed body surrounded by hyaline-membranaceous wing.

An Australasian genus of at least six species (fide van Steenis, 1977), probably a few more, occurring only south of Wallace's line; one species is widely cultivated pantropically.

1. *Pandorea jasminoides* (Lindley) K. Schumann, Nat. Pflanzenfam. **4(3b)**: 230. 1894.

Tecoma jasminoides Lindley, Bot. Reg. **23**(new ser., **10**): t. 2002. 1837. Type illustration. Cultivated in England, from New Holland, Bot. Reg. t. 2002.

Vine. *Leaves* imparipinnately compound, usually 5–7-foliolate, the leaflets more or less elliptic, obtuse to acute, rounded to broadly cuneate at base, entire, 2–5 cm long, 1–3 cm wide, coriaceous, petiolules 1–3 mm long. *Inflorescence* a few-flowered terminal panicle. *Flowers* with the calyx cupular, 7–10 mm long, 5–6 mm wide, truncate to shallowly and irregularly 2–3-lobed, glabrous or very sparsely and minutely puberulous; corolla white with red to deep purple throat, tubular-campanulate above a short cylindrical base, 5–7.5 cm long, 1.3–2 cm wide at mouth of tube, the lobes 2–2.5 cm long, minutely puberulous with thickish trichomes outside, the lobes inside similarly papillose-puberulous to lepidote-glandular; inside villous with long flexuous trichomes at and below stamen insertion and on throat ridge

es: stamens didynamous, the thecae divaricate, 2–3 mm long; pistil 2.5–2.8 cm long, the ovary linear-oblong to narrowly ovate, glabrous, 3–4 mm long, 1.5 mm wide; disk pulvinate. *Fruit* a narrowly oblong, stipitate capsule, acuminate at apex, the valves smooth and coriaceous; fruit never set in Neotropics.

Distribution. Native to northeastern Australia; widely cultivated, especially in the montane tropics.

PARATECOMA

14. *Paratecoma* Kuhlmann, Bol. Serv. Florest. Bras. **4**: 3. 1931. Type. *P. diandra* Kuhlmann (= *P. peroba* (Record & Mell) Kuhlmann).

Large trees. *Leaves* palmately 5–7-foliolate, the leaflets serrate, lepidote, otherwise mostly glabrous except in axils of lateral nerves below. *Inflorescence* a terminal panicle. *Flowers* white, the calyx broadly campanulate, minutely 5-denticulate; corolla salverform-tubular, bilabiate, puberulous outside; fertile stamens two; anthers subexserted; ovary oblong-tetragonal, lepidote, the ovules alternately 4-seriate (attached at different levels) in each locule. *Fruit* fusiform-linear, subterete, very gradually tapering to base and apex, the valves thick and woody; *seeds* bialate.

A monotypic genus of coastal Brazil.

1. *Paratecoma peroba* (Record & Mell) Kuhlmann, Bol. Serv. Flor. Bras. **4**: 3. 1931.

Fig. 30.

Tecoma peroba Record & Mell, Timbers trop. Amer. **537**. 1924. Type. Brazil. Espírito Santo: Colatina, Rio Doce, 30 m, 3 Jul 1918 (fr), *Whitford & Silveira* 59 (holotype, Y (now MAD?), n. v.; isotypes, K, MO, NY, P, US).

Paratecoma diandra Kuhlmann, Bol. Serv. Flor. Bras. **4**: 3. 1931. Type. Brazil. Minas Gerais: Figueira, Rio Doce, 25 Sep 1929 (fl, fr) *Kuhlmann* 252 (holotype, RB; isotypes, MAD, MO).

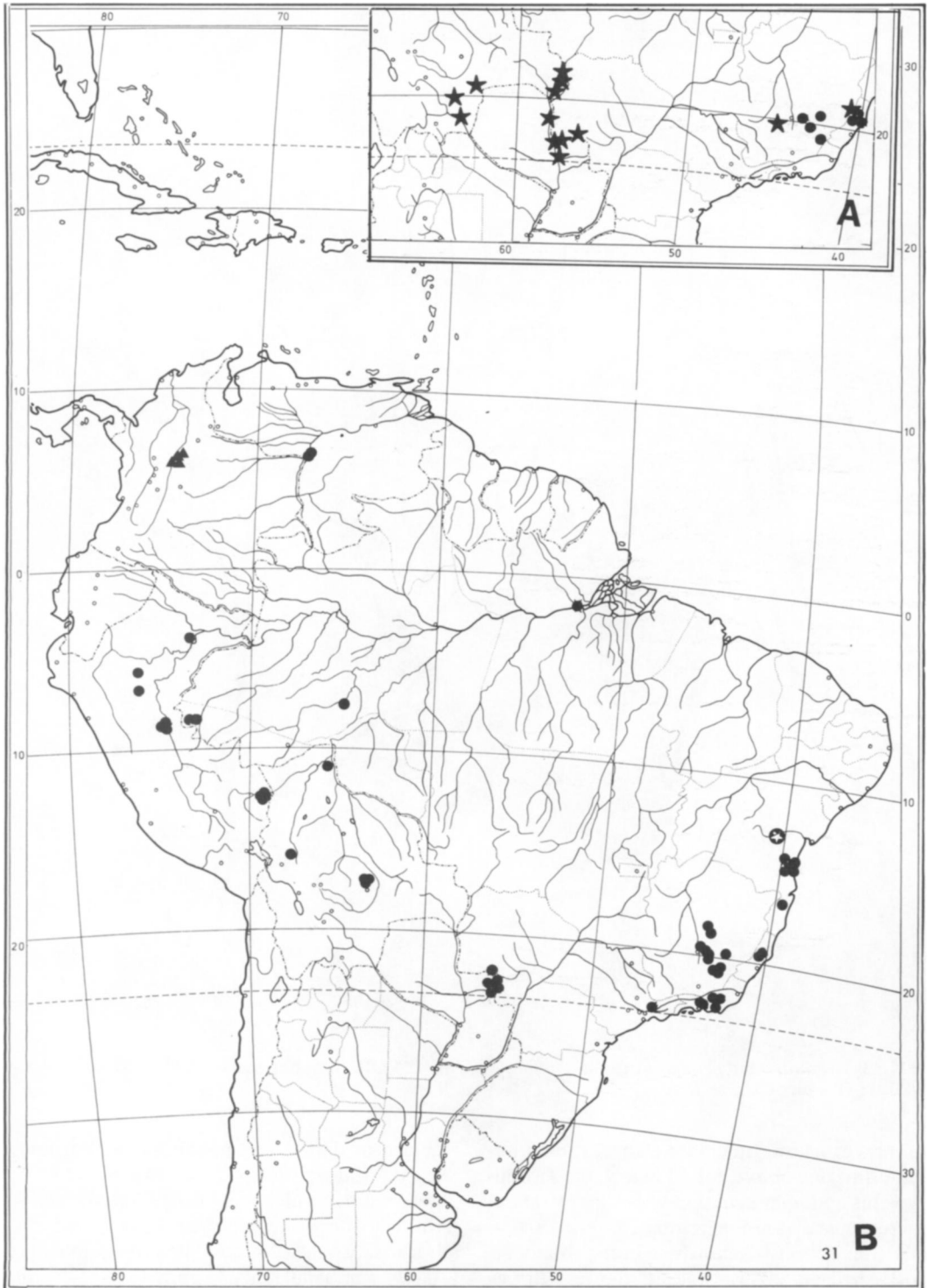
Emergent *tree* to 40 m or more tall and 150 cm dbh., the branchlets terete, finely striate, glabrate. *Leaves* 5–7-foliolate, the leaflets 2.5–14 cm long, 1–5 cm wide, oblanceolate-oblong to narrowly elliptic, acute to long-acuminate, the base rounded, margins serrate, lepidote, slightly subpuberulous near base of midvein above, usually pubescent with simple trichomes in axils of lat-



FIG. 30. *Paratecoma peroba*. A, fruit (Whitford & Silveira 59); B, flowering shoot (Folli 137/79); C, ovary and disk; D, ovary cross section.

eral nerves below, otherwise glabrous, the mid-vein immersed above, raised below, the secondary veins and finer venation very slightly raised, macroscopically not accentuated, microscopically conspicuously tannish or orangish and almost cartilaginous-translucent, the leaf drying

blackish or dark olive; petiolules 1–5 cm long, deeply sulcate, petiole 4.5–12 cm long, grooved above, subpuberulous in groove. *Inflorescence* a terminal panicle, the branches minutely and usually sparsely puberulous. *Flowers* white, the calyx broadly campanulate, 2–4 mm long, 4–5 mm



wide, more or less truncate, minutely 5-denticulate, the teeth extended as ribs along side of calyx, puberulous; corolla salverform-tubular, 2–4.5 cm long, 0.4–1 cm wide at mouth of tube, the lobes ca. 5 mm long, puberulous outside, more or less glabrous inside; stamens two, inserted 1–2 cm above base of corolla tube, subexserted, the anther thecae 2.5 mm long, the filaments 1–2 cm long, the posterior staminode 1.5–2 mm long, the more anterior pair ca. 2 mm long, the staminodes inserted below stamens: pistil 2.5–4 cm long, the style puberulous except at top, the ovary oblong-tetragonal, 4-ridged, ca. 2 mm long, 1 mm wide, lepidote; disk pulvinate-cupular, 1 mm long, 1 mm wide. *Fruit* fusiform-linear, subterete, the valves very thick (ca. 3 mm), 14–32 cm long, 1.2–2.5 cm wide, tapering gradually to apex and very gradually to narrow base, inconspicuously lepidote, otherwise glabrous, drying black with extremely conspicuous large whitish lenticels; *seeds* bialate, ca. 1 cm long, 3–4 cm wide, the wings membranaceous.

Distribution (Fig. 31). Rio Doce area of coastal Brazil; below 50 m elevation.

Specimens examined. BRAZIL. ESPÍRITO SANTO: Reserva Florestal Linhares, km 0.455, Estrada Santa Terezinha, 10 Oct 1979 (fl), *Folli 137* (MO); Reserva Florestal da CVRD, Linhares, Estrada Aceiro Antonio Spelta, km 0.383, 8 Nov 1984 (fl), *Folli 537* (MO); loc. cit., Estrada Pelada, km 0.247, 9 Nov 1982 (fl), *Folli 404* (MO); 64 km de Colatina, Estrada da Colonia, May 1934 (fr), *Kuhlmann 337* (MO, RB); Colatina, Rio Doce, 30 m, 3 Jul 1918, *Whitford & Silveira 59* (K, MO, NY, P, US). MINAS GERAIS: Faz. das Antilhas, Mun. Tombos, 9 May 1941 (fr), *Evangelista de Oliveira 351* (K, US); Mun. Coronel Fabriciano, Rio Piracubaba, 28 Aug 1957 (fr), *Froes 33370* (IAN), *33377* (IAN); Vargem Alegre, Faz. do Rochedo, Jul 1928 (st) (MO, RB). Faz. Ibituruna, Rio Doce, 5 Sep 1930 (fr), *Kuhlmann 1819* (MAD).

Common names. Ipe peroba, peroba, peroba amarela, peroba tremida, peroba manchada.

Now almost extinct, this species was once the most important timber tree of the Rio de Janeiro area, where it was used for fine furniture and interior trim (Kuhlmann, 1931; Record & Hess, 1940). *Paratecoma* is the only South American Bignoniaceae with only two fertile stamens. It

also differs from *Tabebuia* in the different flower shape and woodier fruit and from most *Tabebuia* species in the serrate mature leaflets.

PERIANTHOMEGA

15. *Perianthomega* Bureau ex Baillon, Hist. pl. 9: 33. 1888. Type. *Bignonia perianthomega* Vellozo = *Perianthomega vellozoi* Bureau.

Lianas, lacking pseudostipules or interpetiolar glandular fields. *Leaves* usually triternate, occasionally in part pinnately 5-foliolate, the petiole becoming twining and woody with age. *Flowers* white or cream, the calyx membranaceous, broadly campanulate, truncate except for 5 narrow denticulations to very shallowly 5-dentate, glabrous except for a few lepidote scales and a few trichomes on teeth and sometimes ribs descending from teeth; corolla tubular-campanulate, flared out over disk at extreme base, the tube glabrous outside, the lobes glandular-lepidote inside and outside; stamens didynamous, the thecae divaricate, glabrous; ovary linear-oblong, densely puberulous; disk broadly patelliform. *Fruit* a linear capsule, dehiscent perpendicular to the septum but sometimes the valves splitting in half, glabrous except for a few lepidote scales, with conspicuous raised whitish lenticels; *seeds* bialate, with a strongly bilobed body often not very clearly demarcated from the brownish base of the hyaline-tipped wings.

A single rare and extremely isolated species, of the drier areas of southern Brazil, northern Paraguay and the Andean foothills of southern Bolivia.

1. *Perianthomega vellozoi* Bureau, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 105. 1894. Nom. nov. for *Bignonia perianthomega* Vellozo. Fig. 32.

Bignonia perianthomega Vellozo, Fl. flumin. 248. 1829 (1825). Type illustration. Brazil. Icon. Fl. flumin. 6: t 34. 1831. Neotype. Brazil. Rio de Janeiro, *Glaziou 11246* (P), indirectly designated by Bureau, 1894. *Stizophyllum triternatum* J. C. Gomes, Arq. Jard. Bot. Rio de Janeiro. 12: 149. 1953 (as *Stizophyllum*).

←

FIG. 31. Distribution of *Paratecoma*, *Perianthomega*, *Romeroa*, and *Sparattosperma*. A, ● = *Paratecoma peroba*; ★ = *Perianthomega vellozoi*; B, ▲ = *Romeroa verticillata*; ● = *Sparattosperma leucanthum*; ● = *S. catingae*.

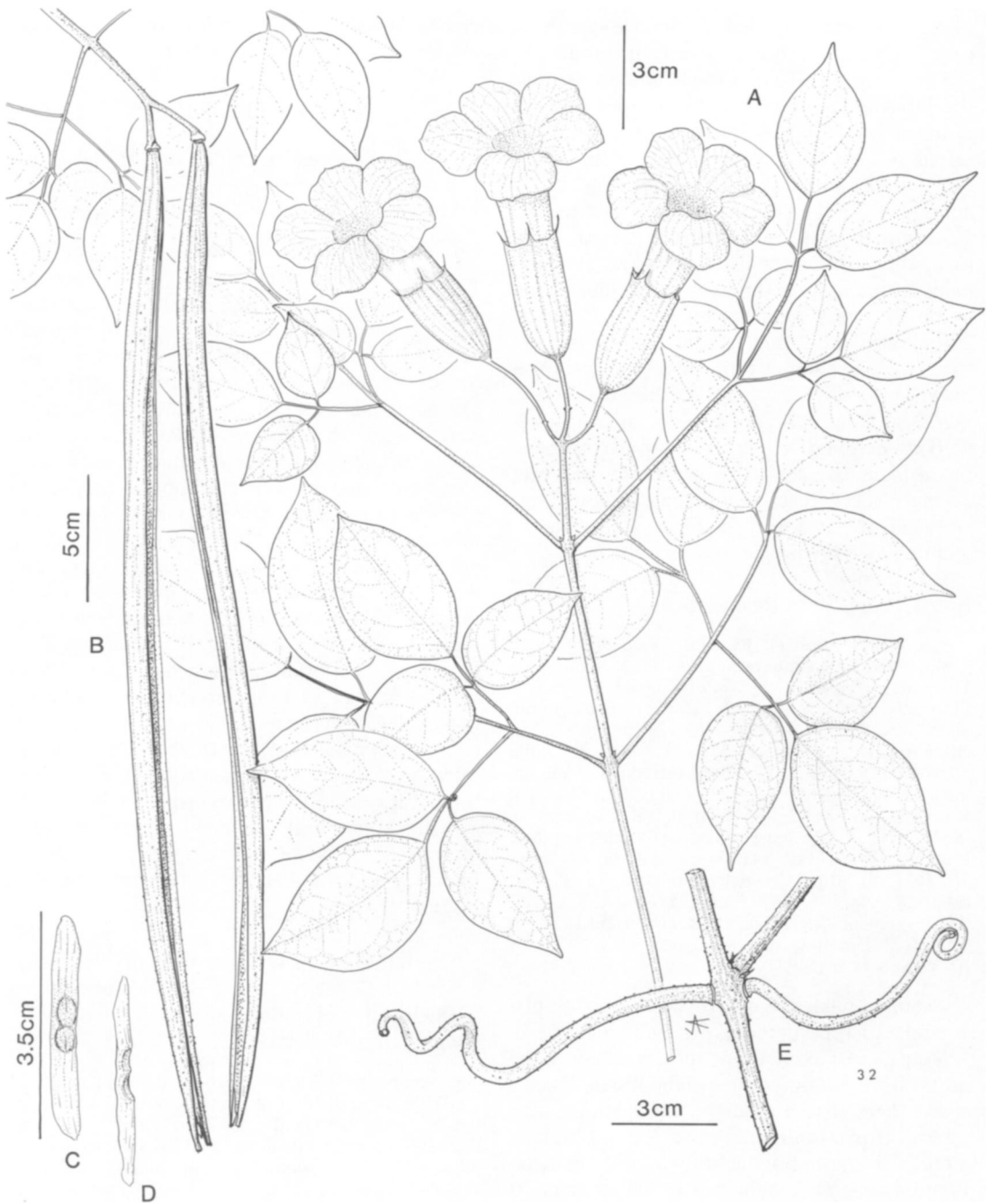


FIG. 32. *Perianthomega vellozoi*. **A**, flowering shoot; **B**, fruit; **C**, **D**, seed; **E**, twig and tendril. (**A**, Hassler 7356; **B-D**, Hassler 7356A; **E**, Beck & Liberman 9782.)

Type. Brazil. Minas Gerais, Coronel Pacheco, 14 Jun 1943 (fr), *Heringer 1211* (RB).

Liana, the branchlets terete, inconspicuously lepidote, minutely puberulous when young, glabrate, when older with conspicuous raised whitish lenticels. *Leaves* trternately 9-foliolate (rarely in part simply pinnate and 5-foliolate), the leaflets entire, ovate to elliptic, acuminate, rounded at base, 2–7 cm long, 1–5 cm wide, membranaceous to chartaceous, conspicuously glandular-lepidote below, above inconspicuously lepidote and sometimes very inconspicuously and sparsely minutely puberulous, soon glabrescent except the more or less persistently puberulous margin; lateral petiolules of each group of three leaflets 0.2–1 cm long, the terminals 0.6–3 cm long, the petiole 2–12 cm long, canaliculate, puberulous with simple trichomes in dorsal groove, sometimes also with a few short gland-tipped trichomes, with age becoming woody and developing into a twining tendril. *Inflorescence* a few-flowered terminal raceme, very sparsely puberulous with erect trichomes, in part gland-tipped, with early caducous linear bracteoles to 1 cm long. *Flowers* with the calyx campanulate, very large, shallowly and inconspicuously 5-lobed or subtruncate with five remote denticulations, these extended as inconspicuous calyx ribs, 2.5–4 cm long, 1.7–3 cm wide, inconspicuously lepidote, otherwise glabrous except for a few minute simple trichomes on apicules and sometimes on the ribs, also with a few scattered plate-shaped glands; corolla white or cream, tubular-campanulate, the extreme base flared out over large disk, 6–9 cm long, 1.5–3 cm wide at mouth of tube, the tube 4–7 cm long, the lobes 1.5–2 cm long, tube glabrous outside, glandular pubescent at base of filaments inside, the lobes lepidote-glandular, also with a few short thick trichomes around margins; stamens didynamous, the anther thecae divaricate, 3 mm long, glabrous, the connective not evident; pistil ca. 2.5 cm long, the ovary oblong, 4–5 mm long, ca. 1.3 mm wide, densely puberulous; disk broadly patelliform, 1 mm long, ca. 4 mm wide. *Fruit* a linear capsule, subterete, tapering to base and apex, the calyx caducous, 42–72(–100 fide Gomes) cm long, 8–9 mm wide, glabrous except for few minute lepidote scales, more or less longitudinally striate, drying light brown with conspicuously raised round whitish lenticels, the septum 6–7 mm wide, somewhat

thickened between adjacent seed bodies, dehiscent perpendicular to septum but the valves sometimes tending to split medially; seeds bialate, 4–8 mm long, 1.5–3.5 cm wide, the 2-lobed brown seed body sharply or indistinctly differentiated from brown-based, hyaline-tipped wings.

Distribution (Fig. 31). Deciduous forest of southern Brazil (Espírito Santo, Rio de Janeiro, Minas Gerais, Mato Grosso do Sur), northern Paraguay, and Andean foothills of southern Bolivia, 500–1150 m elevation.

Specimens examined. BRAZIL. ESPÍRITO SANTO: Entre São Roque e Colatina, 21 Nov 1953 (fl), *Duarte 4014* (MO, RB). MATO GROSSO: Mun. Corumba, Fazenda Marilandia, 5 Oct 1953 (fl), *Pereira et al. 192* (MO, RB). MINAS GERAIS: Coronel Pacheco, *Heringer 1211* (RB). RIO DE JANEIRO: *Glaziou 11246* (P).

BOLIVIA. SANTA CRUZ: Prov. Cordillera, Camiri 67 km hacia Monteagudo, 1150 m, 27 Oct 1983 (fl), *Beck & Liberman 9782* (MO); Prov. Cordillera, Alto Parapeti, 800 m, 30 Sep 1985 (fl, fr), *Michel et al. 424* (MO). TARIJA: Prov. Gran Chaco, Villamontes, 29 km hacia Camiri, Piriti, 550 m, 27 Sep 1985 (fl), *Beck et al. 11657* (MO).

PARAGUAY. ALTO PARAGUAY: Puerto Casado & vic., Cerro Galván, 23 Oct 1956 (fl), *Pedersen 4148* (C, CTES, LP). CONCEPCIÓN: Sin. loc., Sep 1902 (fl), *Hassler 7356* (C, MICH, MO, NY, P, RB, US); Upper Río Apa, Jan 1902 (fr), *Hassler 7356a* (NY); Cerro Paguani prope Vallemi, 20 Oct 1956 (fl), *Pedersen s.n.* (CTES).

Perianthomega vellozoi is well characterized by the trternate leaves, large tubular-campanulate white flowers with most of the corolla tube enclosed in the large expanded campanulate calyx, and by the unique development of the petiole into a tendril.

This taxonomically isolated species has traditionally been placed in the Bignoniaceae but the fruit dehiscent perpendicular to the septum suggests Tecomeae. While this would be the only member of Tecomeae with tendrils, the fact that the tendril of *Perianthomega* is a twining petiole rather than a modified terminal leaflet as in Bignoniaceae makes it just as anomalous in that tendrilate tribe. Perhaps *Perianthomega* represents a survivor from the ancestral plexus through which the Tecomeae gave rise to Bignoniaceae (cf. Gentry, 1974).

PODRANEA

16. *Podranea* Sprague in Thiselton-Dyer, Fl. cap. 4(2): 449. 1904. Type. *P. ricasoliana* (Tanfani) Sprague.

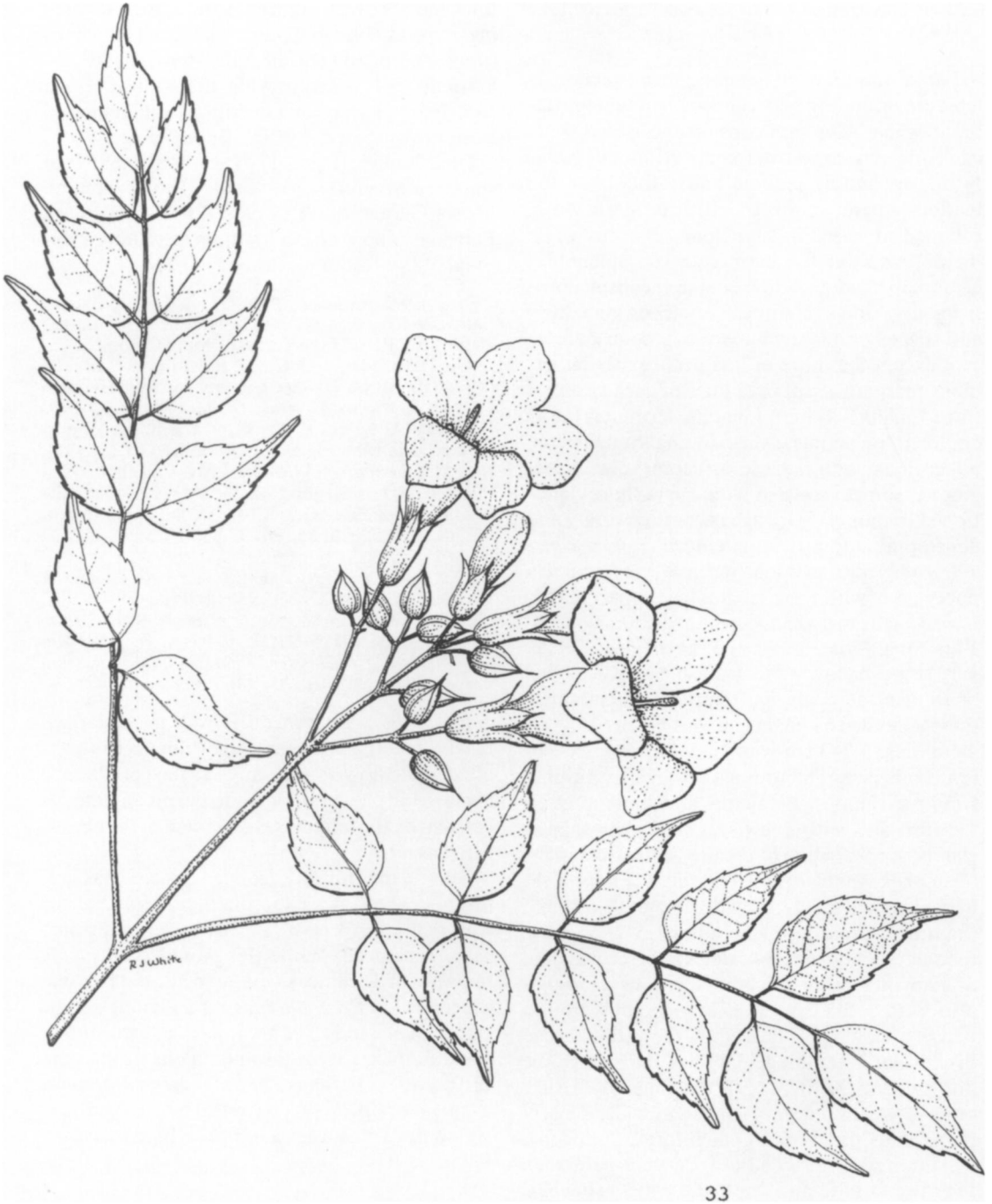


FIG. 33. *Podranea ricasoliana*, flowering shoot, $\times 0.7$. (From *Flora of Panama*, Gentry 473.)

Vines or climbing *shrubs*; branchlets terete without interpetiolar glandular fields; pseudostipules lacking. *Leaves* imparipinnately compound, without tendrils. *Inflorescence* a terminal panicle. *Flowers* with the calyx large, campanulate, membranaceous, strongly 5-toothed, pale lavender when fresh; corolla lavender with magenta markings, tubular-campanulate, glabrous outside; anthers glabrous, the thecae straight, divaricate; ovary linear, tetragonal, glabrous, the ovules ca. 6-seriate in each locule. *Fruit* a linear, leathery capsule dehiscing perpendicular to the septum.

A single species of east tropical and southern Africa. Widely cultivated but apparently never truly spontaneous in the Neotropics.

1. *Podranea ricasoliana* (Tanfani) Sprague in Thiselton-Dyer, *Fl. cap.* **4(2)**: 450. 1904.

Fig. 33.

Tecoma ricasoliana Tanfani, *Bull. Soc. Tosc. Ort.* **1887**: 17. 1887. Type. Not seen.

Pandorea ricasoliana (Tanfani) Baillon, *Hist. pl.* **10**: 40. 1888.

Vine or subscandent *shrub*. *Leaves* imparipinnately compound, usually 7–9-foliolate, the leaflets more or less ovate, obtuse to short-acuminate, serrate, truncate to cuneate or somewhat attenuate, 2.5–3.8 cm long, 1.5–2.0 cm wide, petiolulate. *Inflorescence* a terminal panicle. *Flowers* with the calyx large, cupular-campanulate, 1.5–2 cm long, strongly 5-dentate with apiculate lobes, pale lavender when fresh; corolla pale lavender or pinkish with a magenta patch at base of the two adaxial lobes, the tube white with deep magenta lines inside and some pinkish splotches near the base, campanulate above a short cylindrical base, 6–8 cm long, with scattered lepidote scales on the lobes, glandular-pubescent at the level of stamen insertion inside and pubescent with kinky trichomes in the sinuses between lobes, otherwise glabrous; stamens didynamous, the thecae divaricate, 3 mm long; pistil 3.2–3.4 cm long, the ovary linear, glabrous, 5 mm long, 1.5 mm wide, the ovules 6-seriate in each locule; disk pulvinate, 0.5 mm long, 1.5–2 mm wide. *Fruit* a linear capsule, coriaceous, *seed* never set in Neotropics.

Distribution. Widely cultivated in gardens; native to eastern and southern Africa.

ROMEROA

17. *Romeroa* Dugand, *Mutisia* **8**: 1. 1952. Type. *R. verticillata* Dugand.

Small to medium-sized *trees* with few tortuous branches. *Leaves* simple, clustered near branch apices, whorled, in verticels of 4–5, glabrous except for lepidote glands. *Inflorescence* a terminal, few-flowered, subcorymbose raceme. *Flowers* yellow, the calyx campanulate, deeply 3–4-lobed; corolla broadly infundibuliform, glabrous except for large plate-shaped glands at base of lobes, lepidote glandular on lobes and long simple trichomes at level of stamen insertion; anthers divergent, glabrous; ovary oblong to ellipsoid-oblong, lepidote, the ovules several-seriate in each locule. *Fruit* an oblong-ellipsoid capsule, long-stipitate, acute at apex, lepidote; *seeds* unwinged.

A monotypic genus of seasonally inundated swampy areas along the middle Magdalena river of Colombia.

1. *Romeroa verticillata* Dugand, *Mutisia* **8**: 2. 1952. Type. Colombia. Boyacá: 7 km E de Puerto Boyacá, 200 m, 26 Aug 1952 (fl, fr), *Romero-Castañeda & Jaramillo 3390* (holotype, COL; isotype, MO). Fig. 34.

Tree to 8 m, to 25 cm diameter, usually with few tortuous branches; branchlets terete, glabrous or with a few lepidote trichomes, pseudostipules small, subulate, paired in each leaf axil, lacking interpetiolar glands. *Leaves* simple with a flexed petiole apex, clustered near branch apices, elliptic to oblanceolate, obtuse to acuminate, cuneate to rounded at base, 5–61 cm long, 2–18.5 cm wide, entire, chartaceous, scattered lepidote, otherwise glabrous, usually with conspicuous plate-shaped glands near base of midvein below; petiole 3–29 cm long, grooved above, slightly lepidote, otherwise glabrous. *Inflorescence* terminal, a few-flowered subcorymbose raceme, the peduncle well-developed, inconspicuously minutely puberulous with erect trichomes. *Flowers* yellow, the calyx campanulate, deeply 3(–4)-lobed to near middle, 20–26 mm long, 14–25 mm wide, inconspicuously scattered lepidote, otherwise glabrous or very minutely and sparsely puberulous; corolla broadly infundibuliform, 4–6 cm long, to 3.5 cm wide at mouth of tube, the tube 3–4 cm long, the lobes

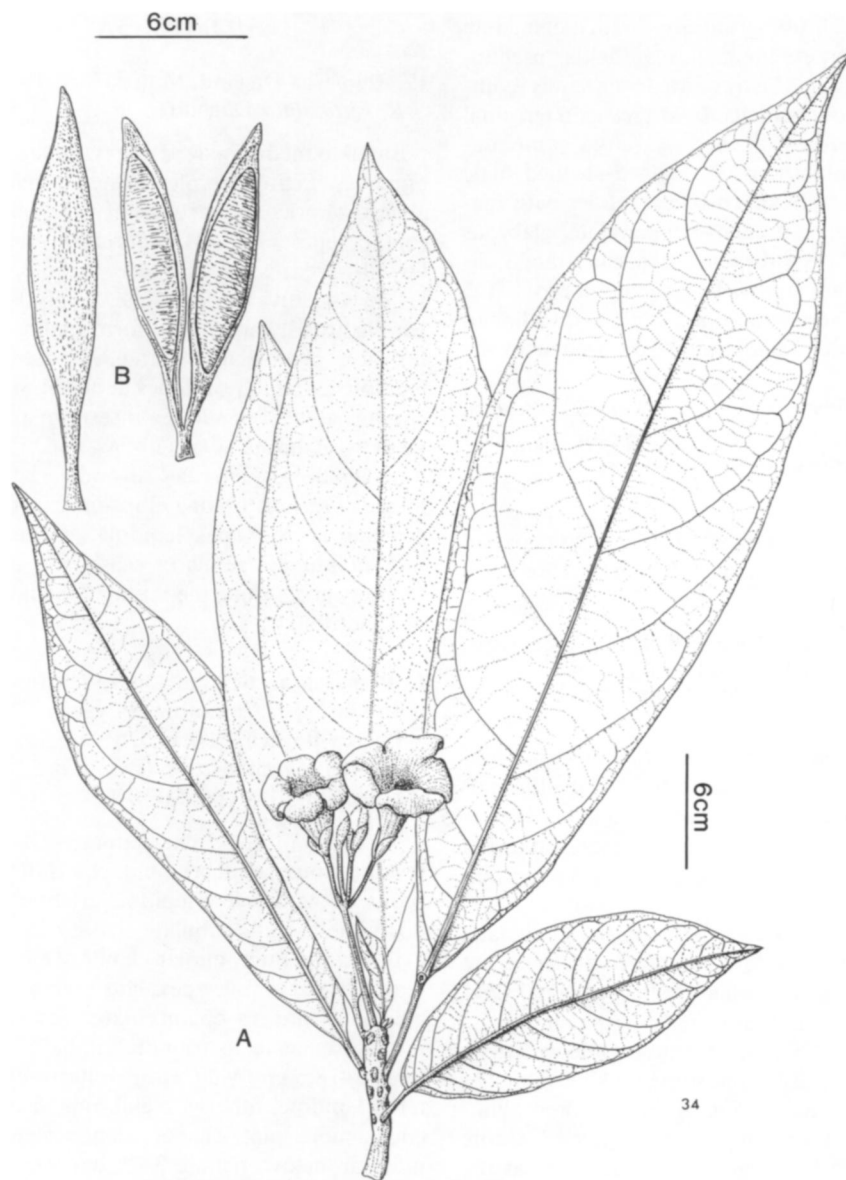


FIG. 34. *Romeroa verticillata*. A, flowering shoot; B, fruit. (A, Romero-Castañeda 4347; B, Romero-Castañeda 3390.)

1.5–2 cm long, tube glabrous, inconspicuously lepidote-glandular on lobes, with large plate-shaped glands outside at base of lobes, villous inside at level of stamen insertion; stamens with the anthers divergent, 3–4 mm long; ovary oblong to ellipsoid-oblong, 4–5 mm long, 2–3 mm wide, minutely lepidote, the style glabrous; disk annular-pulvinate 2–3 mm long, 4–6 mm wide.

Fruit an oblong-ellipsoid capsule, long (2–5 cm) stipitate, acute at apex, 12–20 cm long, 3–5 cm wide, lepidote, smooth, coriaceous, the septum broad, flat, with several series of seed scars along the margin; *seeds* (after Dugand) slightly and irregularly flattened, suborbicular, angular, 16–22 mm in diameter, lacking membranaceous wings.

Distribution (Fig. 31). Middle Magdalena re-

gion of Boyacá, and (presumably) Antioquia States at altitudes of about 200 m.

Specimens examined. COLOMBIA. Guaduas a Co-nejo, *Goudot s.n.* (P); Río Magdalena, Isla Brava, Dec 1875 (fl), *Andre 384* (P), *Andre 1532* (NY). BOYACÁ: Territorio Vásquez, 7 km E de Puerto Boyacá, 200 m, 6 Jun 1952 (fl), *Romero Castañeda 3066* (COL, MO); 7 km E de Puerto Boyacá, 6°0'N, 74°25'W, 200 m, 26 Aug 1952 (fl, fr), *Romero Castañeda & Jaramillo 3390* (COL, F, K, MO). SANTANDER: Río Opón, 15 leguas al SE de Barranca, 6°20'N, 73°55'W, *Romero-Castañeda s.n.* (COL); entre Guayabito y Oponcito, 200 m, 6°20'N, 73°55'W, 30 Aug 1953 (fl), *Romero-Castañeda 4347* (AAU, MO, NY).

One of many remarkable endemics found in the middle Magdalena Valley. The nearest relative is *Tabebuia*, from which it differs in its whorled leaves, a strictly cymose-racemose inflorescence, the large deeply-lobed calyx, and broader long-stipitate fruits. Also unusual in *Tabebuia* would be the simple leaves and wingless, presumably water-dispersed, seeds.

SPARATTOSPERMA

18. *Sparattosperma* Martius ex Meisner, Pl. vasc. gen. 2: 208. 1840. Type. *S. lithontripticum* Mart. ex DC. (= *S. leucanthum* (Vellozo) K. Schumann).

Medium-sized to large trees; branchlets terete to subtetragonal, lacking pseudostipules or interpetiolar glandular fields, usually sticky-verniceous as the leaves and inflorescence. *Leaves* palmately 3–5-foliolate. *Inflorescence* a terminal panicle with rather well-developed central rachis. *Flowers* white or pale pink, the calyx apiculate in bud, irregularly splitting, usually 2–3-labiate or subspathaceous at anthesis, glabrous or somewhat pubescent near base; corolla very broadly tubular-campanulate above a narrow basal tube, the tube glabrous outside, inside laxly pubescent in throat, the lobes puberulous outside and at base inside, their margins irregularly lacinate and more or less ciliate; stamens didynamous, the thecae straight, glabrous, divaricate; ovary narrowly oblong, the ovules multiseriate, the disk cylindrical. *Fruit* linear-cylindric, more or less terete, longitudinally costate, glandular-lepidote or apparently glabrous, the calyx caducous; septum not strongly compressed, irregularly subtetragonal; *seeds* very long and narrow,

the hyaline-membranaceous wings fragmented into hair-like capillary segments.

Two species of tropical South America.

Key to Species

1. Leaves all 3-foliolate, the leaflets acute, the longest less than 6 cm long; capsule less than 11 cm long, the valves coriaceous, smooth; caatinga. *S. catingae*.
1. Leaves mostly 5-foliolate, the leaflets acuminate to long-acuminate, the longest more than 6 cm long; capsule more than 20 cm long, the valves subwoody, finely costate; Peru to Brazil but not in caatinga. *S. leucanthum*.

The genus is probably most closely related to *Tabebuia*, with the *Catalpa*-like seed wings representing convergence rather than common ancestry. *Sparattosperma* is easily distinguished from *Tabebuia* and other genera by the vernicose secretions, especially of young vegetative shoots.

1. *Sparattosperma catingae* A. Gentry, sp. nov.
Type. Brazil. Bahia: Mun. Maracas, 26 km na estrada Maracas/Tamburi, caatinga, 20 Apr 1983 (fl, fr), *Carvalho, Mattos Silva & Leuenberger 1867* (holotype, CEPEC; isotypes, B, MO).

A *S. leucantho* foliis 3-foliolatis, foliolis acutis, minus quam 6 cm longis, capsula laeve minus quam 11 cm longa, et distributione geographica differt.

Tree 10 m tall, the bark ridged, the branchlets terete, longitudinally finely striate, drying black when young, more or less glandular lepidote, the surface obscured by a sticky vernicose secretion. *Leaves* uniformly 3-foliolate, elliptic to oblong-elliptic, acute to acutish at apex, obtuse at base, 1.5–6 cm long, 0.7–3 cm wide, entire, membranaceous, drying blackish with a slight shiny vernicose sheen above, dull and dark olive below, pubescent in axils of lateral nerves below and very inconspicuously along midvein above, densely lepidote-glandular above and below; petiole 1.5–3.5 cm long, the petiolules 0.3–1.5 cm long, puberulous on grooved adaxial surface. *Inflorescence* terminal, very sparsely and inconspicuously puberulous, conspicuously vernicose, few-flowered. *Flowers* white with red striations in throat; calyx tubular-campanulate, bilabiate, 12–14 mm long, 6–7 mm wide, vernicose-glandular, otherwise glabrous, lepidote inside; corolla

campanulate above the ca. 1 cm long narrow basal tube, ca. 4 cm long, 1.8 cm wide at mouth of tube, the tube ca. 3 cm long, the lobes ca. 1 cm long, glabrous outside except near base of lobes, inside with long lax trichomes in floor of tube and glandular pubescent at level of stamen insertion; anther thecae divaricate, 2 mm long, the filaments ca. 2 cm long; ovary oblong-conical, slightly flattened, 2 mm long, 1 mm wide, longitudinally ridged, the surface glandular; disk cylindrical, 1.5 mm long, 2 mm wide. *Fruit* a linear capsule, attenuate at apex, 11–18 cm long, 0.6–0.8 cm wide, the valves coriaceous, not costate, glabrous, the surface lepidote-glandular and vernicose; *seeds* 2–3 mm long, ca. 4 cm wide, the wing fragmented into individual elongate capillary trichomes, the narrow seed body ca. 1 cm long and 2 mm wide, apparently similar to *S. leucanthum*.

Distribution (Fig. 31). Known only from the type collection from the caatinga of Bahia, Brazil.

Although I originally identified the type specimen as an extreme variant of polytypic *S. leucanthum*, its consistently 3-foliolate leaves with small mostly oblong-elliptic non-acuminate leaflets give it a very different aspect from other collections of *S. leucanthum*. Since it also differs in a smaller fruit with thinner and non-costate valves, it seems best regarded as specifically distinct. The two *Sparattosperma* species thus recognized are also geographically distinct, with the otherwise widespread *S. leucanthum* absent from the caatinga.

2. *Sparattosperma leucanthum* (Vellozo) K. Schumann, Pflanzenfam. 4(3b): 235. 1894.

Fig. 35.

Bignonia leucantha Vellozo, Fl. flumin. 251. 1829. Type. Brazil. Rio de Janeiro: Silvis maritimis, n.v. Type illustration, Vellozo, Atlas Fl. flumin. 6: t. 49. 1831.

Spathodea vernicosa Chamisso, Linnaea 7: 661. 1832. Type. Brazil. Sin. loc., *Sellow 508* (holotype, B*, FM Neg. 18411; isotype, BM).

Bignonia subvernica A. P. de Candolle, Biblioth. Universelle Genève 22. 1838, nom. nud.

Tecoma salzmännii A. P. de Candolle, Prodr. 9: 219. 1845. Type. Brazil. Bahia: Sin. loc., *Salzmann 344* (G-DC).

Tecoma subvernica A. P. de Candolle, Prodr. 9: 219. 1845. Type. Brazil: Without data (G-DC).

Sparattosperma lithontripticum Martius, Syst. mat. med. bras. 66. 1843, nom. nud.

Sparattosperma lithontripticum Martius ex A. P. de

Candolle, Prodr. 9: 203. 1845. Type. Brazil: Rio de Janeiro, *Martius 455* (M).

Sparattosperma vernicosa (Chamisso) Bureau & K. Schumann, Fl. Bras. 8(2): 359. 1897.

Sparattosperma stenocarpum Bureau & K. Schumann, Fl. bras. 8(2): 360. 1897. Type. Brazil. Rio de Janeiro: Sin. loc., *Sellow n.3.b.1* (B*, not seen).

Tree 10–25 m, to 70 cm dbh., with fibrous bark varying from smooth to thick and fissured; branchlets terete to subtetragonal, drying blackish and finely longitudinally striate when young, brownish when older, often with inconspicuous narrow lenticels, usually glabrous or sparsely minutely puberulous, occasionally conspicuously puberulous or almost pilose. *Leaves* mostly 5-foliolate, occasionally in part 3-foliolate, the leaflets elliptic to lanceolate or oblong-ovate, acuminate to long-acuminate, broadly cuneate to truncate at base, 3–17 cm long, 1.5–7 cm wide, entire, sometimes appearing serrulate from the finely undulate-crisped margin, membranaceous, usually rather sticky and varnished from the densely glandular epidermis, especially above, drying dark green to blackish, variably pubescent, usually essentially glabrous except simple trichomes in the axils of lateral veins below and on midvein above, occasionally more or less densely pilose below over whole surface; petiole 2.5–14 cm long, usually varnished-glabrous, occasionally pubescent, the slender petiolules (0.5–)1–5 cm long, varnished-glabrous to puberulous. *Inflorescence* a rather few-flowered terminal panicle, usually shorter than the subtending leaves, usually with a well-developed central rachis, more or less dichotomously branched, glabrous to puberulous, drying blackish, the bracts and bracteoles early caducous. *Flowers* white or pale pink with dark pink striations in throat, the calyx irregularly tubular-campanulate, distinctly apiculate in bud, irregularly bilabiate or subspathaceous at anthesis, more or less vernicose, usually essentially glabrous, sometimes more or less pilose or puberulous at base, occasionally longitudinally striate, 12–22 mm long, 6–9 mm wide; corolla very broadly tubular-campanulate above the ca. 1 cm long narrow basal tube, dorsoventrally flattened when fresh, 3.5–5 cm long, 1.2–2.5 cm wide at mouth, the tube 2.5–4 cm long, the lobes 1–1.5 cm long, tube glabrous outside, sparsely pubescent with very long lax trichomes in throat, rather sparsely glandular-pubescent at stamen insertion, the lobes irregularly

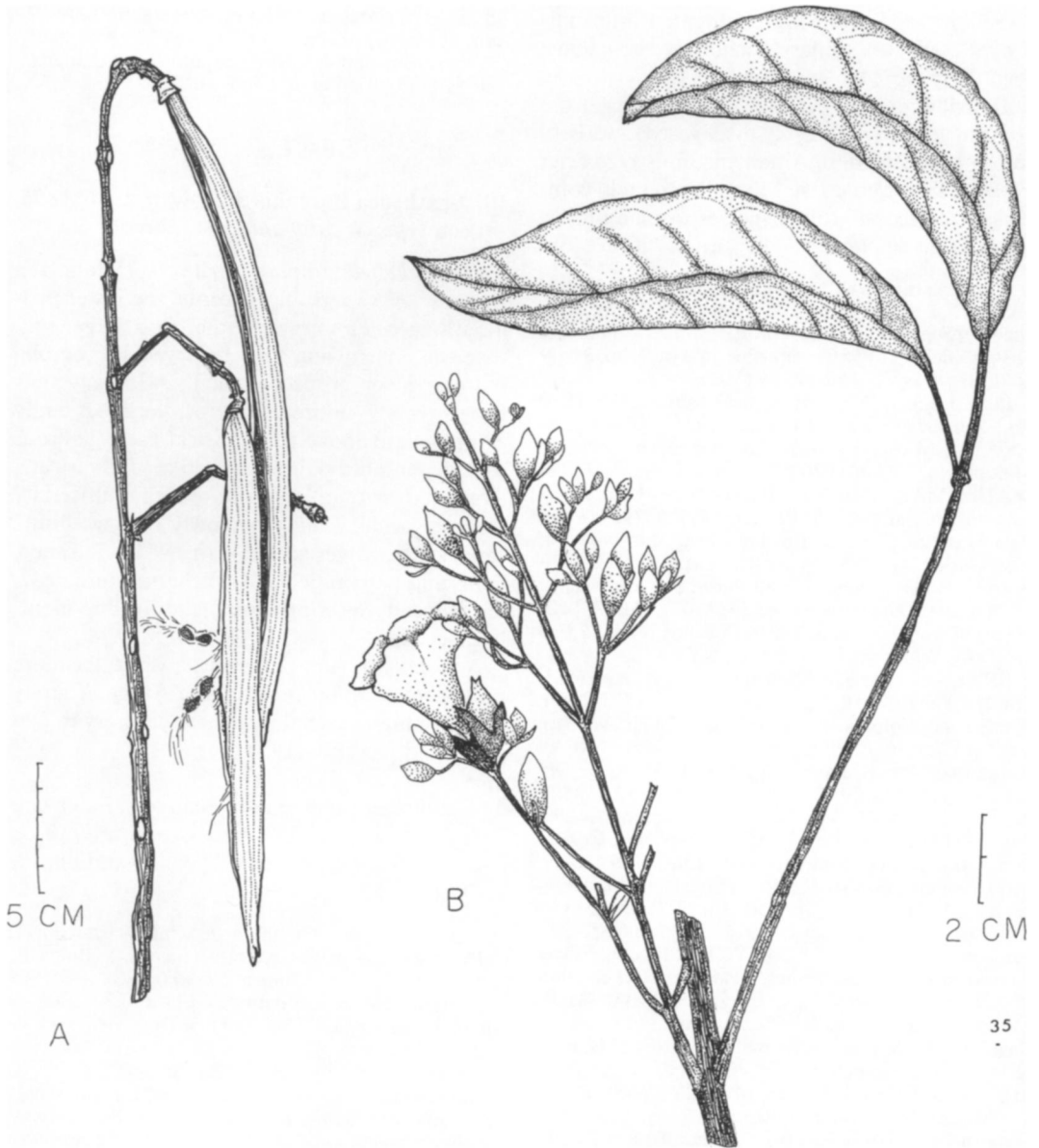


FIG. 35. *Sparattosperma leucanthum*. A, fruit; B, flowering shoot. (A, Steinbach 7480; B, Gentry & Revilla, 16323.)

lacinate, puberulous outside at bases and around margins; stamens didynamous, the anther thecae divaricate, 3–4 mm long, the filaments ca. 2 cm long; ovary flattened-oblong, 3–4 mm long, 1–2 mm wide, strongly longitudinally costate, the surface glandular, obscure from the glandular se-

cretions; disk evenly cylindric, 1.5 mm long, 2 mm wide. *Fruit* linear-cylindric, attenuate at apex, obtuse at base, 21–54 cm long, 0.5–1.2 cm wide, varnished-glabrous or lepidote-glandular, longitudinally more or less costate, the calyx caducous, the valves subwoody; seeds 2–4 mm long,

3–5.5 cm wide, the wing fragmented into individual elongate capillary trichomes, the narrow seed body ca. 2 by 7–10 mm.

Distribution (Fig. 31). Wide-ranging from Venezuela (where recently discovered) and Peru to southern Brazil. In Amazonia, mostly in drier types of forest, in coastal Brazil extremely common as a second growth species in many forest types. Near sea level to 1800 m elevation.

Representative collections. VENEZUELA. BOLÍVAR: E of Río Parguaza, 125 km N of Puerto Ayacucho, 9 Sep 1985 (fl), *Steyermark et al. 131733* (MO); Distr. Cedeño, km 35 Caicara-Puerto Ayacucho, 3 Nov 1985 (fr), *Werff & Holst 7729* (MO).

PERU. LORETO: Mishuyacu, near Iquitos, Feb 1930 (fl), *Klug 1019* (NY); Yurimaguas, 1924 (fl), *Tessmann 5505* (G). MADRE DE DIOS: Tambopata, near Puerto Maldonado, 25 Jan 1976 (fl), *Gentry & Revilla 16323* (AAU, AMAZ, MO, NY). PASCO: Selva Central, Iscozacín, 26 Mar 1986 (fl), *Hartshorn et al. 2914* (MO). SAN MARTÍN: Chazuta, Río Huallaga, Mar 1935 (fl), *Klug 3964* (MO, NY, WIS). UCAYALI: 3–8 km S of Bosque von Humboldt, km 88 Pucallpa-Tingo María, 14 Mar 1982, *Gentry et al. 36359* (AAU, AMAZ, MO, USM); Coronel Portillo, km 56 Pucallpa road, 12 Feb 1977 (fl), *Schunke 5254* (G, MO, NY).

BRAZIL. ACRE: Rio Branco, Colonia Amapá road, km 2, 3 Feb 1979 (fl), *Albuquerque et al. 1325* (MO); Rio Branco, Colonia Penal Agrícola, 17 Feb 1962 (fl), *Vasconcellos & Coelho s.n. (INPA11065)* (INPA). AMAZONAS: Purus, Labrea, 16 Mar 1904 (fl), *Huber s.n. (MG4192)* (MG). BAHIA: Marau, 7 Feb 1979 (fl), *Mori et al. 11450* (MO, NY); Itabuna, Rio Jequitinhonha, Apr 1971 (fl), *Santos 1577* (CEPEC, WAG). CEARÁ: Serra do Bezouro, 26 Jan 1958 (fl), *Guedes 497* (IAN, MG). ESPÍRITO SANTO: Reserva Florestal de Linhares-CVRD, 8 Jan 1973 (fl), *Spada 137* (MO). MATO GROSSO: 5 km E de Antonio João, 26 Jun 1977 (fr), *Krapovickas & Schinini 32726* (C, CTES, F, MO). MATO GROSSO DO SUL: Casa Branca, Bataguasu, 10 Feb 1983 (fl), *Hatschbach 46105* (AAU, CTES, MBM, MO). MINAS GERAIS: 20 km N of Serro on road to Diamantina, 25 Feb 1968 (fl), *Irwin et al. 20831* (C, IAN, NY, UB); Viçosa, Agricultural College Lands, 1 Jul 1930 (fr), *Mexia 4823* (G, MICH, MO, NY, WIS). PARÁ: São Miguel, Ig. do Inferno, Rio Jari, 21 Apr 1963 (fl), *Oliveira 2485* (IAN). RIO DE JANEIRO: Tijuca, Rio de Janeiro, 13 Jan 1985 (st), *Gentry & Zardini 49506* (MO, RB). RONDÔNIA: Mun. Costa Marques, 23 km NW of Costa Marques, 1 Apr 1987 (fl), *Nee 34672* (MO). SÃO PAULO: Represa Atabainha Lake, 5 Jan 1985 (fl, fr), *Gentry & Zardini 49222* (MO).

BOLIVIA. BENI: 5–8 km SW of Guayaramerín, road to Riberalta, 8 Feb 1978 (fl), *Anderson 12022* (MO, NY). LA PAZ: Nor Yungas, Corocoro, 12 km NE of Caranavi, 16 Jan 1984 (fr), *Gentry et al. 44332* (MO). SANTA CRUZ: Buenavista, Sara, Apr 1925 (fr), *Steinbach 7104* (G, MO).

PARAGUAY. AMAMBAY: Sierra de Amambay, Sep 1907 (fl), *Hassler 10162* (G, MO, NY, P). CANINDEYU:

85 km E of Curuguaty, 250 m, 24°18'S, 54°58'W, 26 Sep 1987 (fr), *Gentry et al. 59427* (MO, PY). CONCEPCIÓN: Between Río Apa and Río Aquidaban, Feb 1909 (fl), *Fiebrig 4933* (G, HBG, M).

SPATHODEA

19. *Spathodea* Beauvois, Fl. Oware 1: 46. 1805.
Lectotype. *S. campanulata* Beauvois.

Trees. Leaves imparipinnate, 9–15-foliolate. *Inflorescence* a terminal raceme, the lower pedicels longer. *Flowers* with the calyx large, spathaceous, narrowing to a recurved tip; corolla red-orange or crimson, usually with a yellow fringe (rarely entirely yellow), large, broadly campanulate above a cylindrical base, glabrous outside; anthers glabrous, the thecae divaricate; ovary narrowly oblong, the ovules multiseriate in each locule. *Fruit* a narrowly oblong-elliptic capsule, the valves keeled, narrowed at the ends, dehiscing perpendicularly to the septum; *seeds* flat, winged, the wings broad and hyaline-membranaceous.

A monotypic genus of tropical Africa; the more pubescent *S. nilotica* of eastern Africa is surely no more than varietally distinct, contrary to Degener and Degener (1974).

1. *Spathodea campanulata* Beauvois, Fl. Oware 1: 47, t. 27. 1805. Type. Nigeria. *Palisot de Beauvois s.n.* (not seen); Type illustration, Fl. Oware t. 27. Fig. 36.

Bignonia tulipifera Thonning in Schumach., Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. 4: 47. 1829. Type. Guinea, *Thonning s.n.* (P-JUSS) (?), specimen without data "e Guinea").

Spathodea tulipifera (Thonning) G. Don, Gen. syst. 4: 223. 1838.

Spathodea nilotica Seemann, J. Bot. 3: 333. 1865. Type. Ungoro Glav., *Speke & Grant Exped. s.n.* (not seen).

Spathodea danckelmaniana Butt., Verh. Bot. Vereins Prov. Brandenburg 31: 87. 1890. Type. Zaire. *Buttner 376* (not seen).

Tree to at least 25 m tall and 40 cm dbh. *Leaves* imparipinnate, usually 9–15-foliolate, the leaflets more or less elliptic, acute to acuminate, asymmetrically subtruncate or widely cuneate basally, 3–16 cm long, 1.5–9 cm wide, subsessile, slightly puberulous along main veins to densely puberulous below. *Inflorescence* a terminal raceme, the lower pedicels longer and curving upward to give a flat-topped effect. *Flowers* with



FIG. 36. *Spathodea campanulata*. A, flowering shoot, $\times 0.5$; B, fruit and seed, $\times 0.5$. (From *Flora of Panama*; A, Croat 8890 & Gentry 700B; B, Croat s.n.)

the calyx spathaceous, tapering to a recurved point which bends away from the corolla, 4–5.5 cm long, puberulous to villous, sometimes with raised longitudinal ribs; corolla red-orange with a yellow border (rarely entirely yellow), broadly campanulate above a cylindrical base, large, 8–15 cm long, 4.5–7 cm wide at mouth of tube, the tube 6–8 cm long, the lobes 0.8–1 cm long; stamens subexserted, held against the floor of the corolla tube, the anther thecae divaricate, slender, 8 mm long; ovary narrowly oblong, 4–5 mm long, 2–2.5 mm wide, finely papillose, the ovules multi-seriate in each locule; disk cupular, 2–3 mm long, 4–5 mm wide. *Fruit* a capsule, narrowly oblong-elliptic, dehiscent on one side, the valves boat-shaped, narrowing to the ends, 17–27 cm long, 3.5–7 cm wide; *seeds* thin, ca. 1.5 cm long and 2 cm wide, winged, the wings broad and hyaline-membranaceous, sharply demarcated from the small seed body.

Distribution. Native to tropical Africa but extensively cultivated throughout the tropics as an ornamental and shade tree. In the Neotropics it often sets fruit and at times is spontaneous, especially in the Antilles where it is becoming established as a weedy second growth tree species.

SPIROTECOMA

20. *Spirotecoma* Baillon ex Dalla Torre & Harms, Gen. Siphon. 467. 1904. Type. *Tecoma spiralis* Wright ex Grisebach = *S. spiralis* (Wright ex Grisebach) Pichon.

Spirotecoma Baillon, Hist. pl. **10**: 49. 1888, nom. nud. *Neuroteca* K. Schumann in Engler & Prantl, Pflanzenfam. **4(3b)**: 238. 1894. Type. *Tecoma spiralis* Wright ex Grisebach = *Spirotecoma spiralis* (Wright ex Grisebach) Pichon, nom. rej.

Neuroteca K. Schumann ex Kuntze, Rev. gen. pl. **3(2)**: 244. 1898, pro syn.

Neuroteca K. Schumann ex Dalla Torre & Harms, Gen. Siphon. 467. 1904, pro syn.

Cotema Britton & Wilson, Mem. Torrey Bot. Club **16**: 107. 1920. Type. *Tecoma spiralis* Wright ex Grisebach = *Spirotecoma spiralis* (Wright ex Grisebach) Pichon.

Shrubs to large trees. *Leaves* opposite, 1-foliolate or digitately 3–7-foliolate, lepidote, otherwise glabrous except for trichomes in the axils of secondary veins below. *Inflorescence* reduced to a few-flowered raceme or 1–2 individual flowers, borne in the leaf axils or ramiflorously from the axils of fallen leaves, the pedicels elongate,

the flower oriented to parallel the branch. *Flowers* with the calyx tubular-campanulate, irregularly dentate; corolla yellow to brick red, dark reddish purple, or yellowish brown, tubular-infundibuliform above a tubular base, 5-lobed, strongly bilabiate, curved and rather strongly oblique; stamens four, exserted, the thecae pendulous; ovary oblong, densely blackish-lepidote. *Fruit* a subterete linear capsule, usually curved or weakly to strongly coiling, the septum of most species thickened with depressions or pits in which the seed bodies fit; *seeds* bialate.

Four species of Cuba and Hispaniola.

Tecoma spiralis was independently proposed as constituting a different new genus no less than three different times by as many authors. The first two of these proposals, as *Spirotecoma* and *Neuroteca*, did not specifically attribute generic rank to this concept, although they strongly implied it. Although both names have subsequently been used at generic rank, neither is listed by *Index Nomina Genericorum*. *Spirotecoma*, the first of these, is here accepted as the correct name.

The original subnudum publication of *Spirotecoma* was as a footnote to Baillon's (1888) discussion of *Radermachera*: "Generis forte novi Radermacheram inter et Tecoma medii, v. sectionis (*Spirotecoma*) typus est *Tecoma spiralis* Wright in Griseb. Pl. cub. Wright., 194, cujus flores hucusque ignoti." The name was definitively taken up as a generic name by Dalla Torre and Harms in 1904, is accepted in Willis' *Dictionary* (where attributed as a generic-level combination both to Dalla Torre & Harms (p. 1090) and to "Baill. ex Dalla Torre and Harms" (p. 794)), and was used in the *Flora of Cuba* (Alain, 1957).

Although Schumann (1894) adequately characterized *Neuroteca*, he discussed that name under *Tecoma* and noted that more material was needed before reaching a definitive conclusion as to its generic status. Therefore *Neuroteca* must be rejected under Art. 34.1(a) as not accepted by its author (Nicholson, pers. comm.). Although Kuntze (1893) inserted *Neuroteca* in his reproduction of part of Schumann's generic key, he himself did not accept *Neuroteca* as a valid genus either since he considered the whole group of genera related to *Tecoma* and *Tabebuia* to constitute a single genus which he called *Gelseminum*. Even though *Spirotecoma* had not been

formally characterized by Baillon, the acceptance of that name, with adequately described *Neurotecma* in synonymy under it, by Dalla Torre

& Harms (1904), in the first valid publication for either name, establishes *Spirotecoma* as the correct name for this genus.

Key to Species

1. Inflorescence racemose, several-flowered; pedicels <1.5 cm long; stamens subexserted, exceeded by upper corolla lobes; fruit barely bent or linearly twisted, not spiralled; septum not transversely fragmenting at dehiscence. 3. *S. rubriflora*.
1. Flowers borne singly or in pairs directly from the branchlets or leaf axils, the pedicels >2.5 cm long; stamens strongly exserted, exceeding the corolla lobes; fruit spirally twisting; septum transversely fragmenting at dehiscence.
 2. Leaves 1–3-foliolate; flower greenish-purple to yellowish brown; limestone cliffs of Cuban south coast. 4. *S. spiralis*.
 2. Leaves mostly 5-foliolate; flower dark red or bright yellow; serpentine areas of northern and eastern Oriente region.
 3. Calyx with raised longitudinal costae; bud long-apiculate; flowers usually brick red; pedicels <4 cm long; leaves always strongly prominulous-reticulate above. 1. *S. apiculata*.
 3. Calyx ecostate; bud rounded; flowers yellow; pedicels >(3.5–)5 cm long; leaflets weakly to strongly prominulous-reticulate above. 2. *S. holguinensis*.

1. *Spirotecoma apiculata* (Britton) Alain, Contr. Inst. Bot. Univ. Montréal **68**: 94. 1956.

Cotema apiculata Britton, Mem. Torrey Bot. Club **16**: 108. 1920. Type. Cuba. Oriente (Guantánamo): Camp Toa, 400 m, *Shafer 4179* (holotype, NY).

Shrub or small *tree* 3–7 m tall, the branchlets terete, usually rather thick and with the leaves apically clustered, more or less lepidote, otherwise glabrous, dark and resinous when young, lacking lenticels, the cortex of older branchlets tending to split and exfoliate. *Leaves* 3–5-foliolate (rarely in part unifoliolate on short shoots: *León 11764*), the leaflets oblong-elliptic to slightly obovate, the apex obtuse or rounded, occasionally slightly blunt-apiculate, rounded or truncate at base, the terminal 2–10.5 cm long, 1.5–6.5 cm wide, the basals 1–7 cm long, 0.6–5 cm wide, coriaceous, rather sparsely and minutely lepidote above and below, with tufts of simple trichomes forming domatia in the secondary nerve axils below, the secondary veins raised below, prominulous above, the tertiary venation strongly prominulous-reticulate above, plane or slightly prominulous below, drying black above, black or blackish olive below, usually with contrastingly paler main veins, the margin entire to slightly serrulate or distinctly serrate in apical half; terminal petiolule 0.3–4 cm long, basal petiolules 0.2–2 cm long, petiole 0.7–8 cm long, lepidote. *Inflorescence* a single flower or usually pair of flowers borne in the leaf axils or ramiflo-

rously in the axils of fallen leaves, the pedicel 2.5–4 cm long (–6 cm in fruit), rather shiny and varnished-looking, drying black, slightly and inconspicuously lepidote, otherwise glabrous, ebracteolate. *Flowers* with the calyx thick-coriaceous, tubular-campanulate, irregularly 2–3-labiate, the lobes usually more or less obtuse, sometimes minutely apiculate, 11–15 mm long, 7–10 mm wide, ecostate, outside secretory, inconspicuously lepidote, inside conspicuously lepidote, drying black; corolla yellow, tubular-infundibuliform, gradually tapering to the narrower base of tube, slightly curved with a slight bulge in throat, strongly bilabiate, apparently with two upper lobes held horizontally and three lower ones strongly reflexed, held inverted below branch, 4.5–6 cm long, 1.3–1.7 cm wide at mouth of tube, the tube 3–3.5 cm long, the rather broad lobes 0.5–1 cm long, outside glabrous except for a few inconspicuous lepidote scales, completely glabrous inside even at stamen insertion, the lobes slightly ciliate and sometimes with a few scattered trichomes on inner surface; stamens didynamous, exserted, the thecae subpendulous, 5–6 mm long; pistil 4.5–6 cm long, the ovary and disk not examined. *Fruit* a linear capsule, strongly curved or spirally twisted, 20–40 cm long, 4–7 mm wide, only rarely subtended by the usually caducous calyx, minutely and inconspicuously lepidote, otherwise glabrous, the valves coriaceous, longitudinally finely striate, drying black when young, brown after dehiscence, the septum

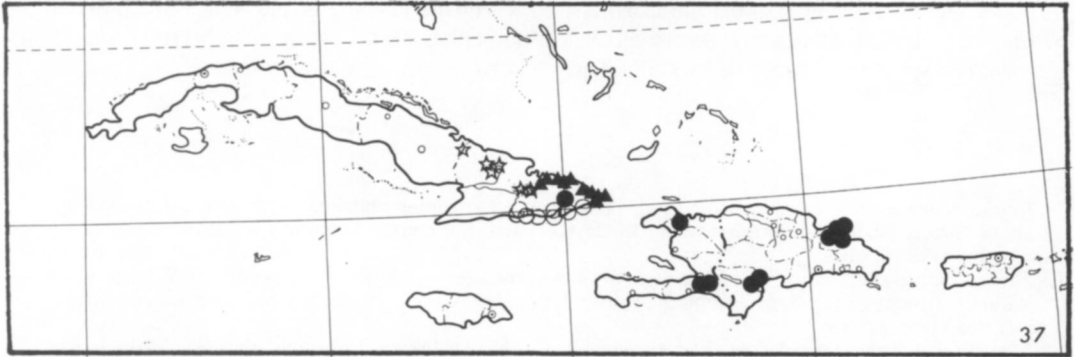


FIG. 37. Distribution of *Spirotecoma*. ▲ = *S. apiculata*; ★ = *S. holguinensis*; ● = *S. rubriflora*; ○ = *S. spiralis*.

thickened, longitudinally bisected by a medial furrow, each side interrupted by a series of shallow pits into which the seed bodies are appressed, fragmenting transversely at dehiscence; seeds thin, bialate, 2–3 mm long, 8–14 mm wide, the hyaline-membranaceous wings sharply demarcated from the tiny seed body.

Distribution (Fig. 37). Cuban Oriente; endemic to the serpentine barrens and pinelands of easternmost Cuba in the Moa and Baracoa areas of Holguín and Guantánamo Provinces, 0–900 m alt.

Representative specimens examined. CUBA. GUANTÁNAMO: Charrascos de Peña Prieta, Magdalena, Toa, (fr) *Alain* 3470 (GH, HAC, NY); Moa airfield, Jun 1941 (st), *Howard* 5998 (BM, GH, NY); Moa, 22 Jul 1947 (fr), *León & Clemente* 23281 (HAC, NY); camino desde Moa hacia La Melba, (fr), *Lippold s.n.* (HAJB12584) (HAJB). HOLGUÍN: Sierra Saca la Lengua, Cristal, May 1955 (fr), *Acuña & Zayas* 19781 (HAC); Sabana de la Yaba, 4 Jul 1932 (fr), *León* 15700 (HAC, NY). SANTIAGO DE CUBA: Pinar del Purico, Carbonico, 15 Sep 1917 (st), *Roig* 6638 (HAC).

Common name. Azufre.

Clearly distinct from *S. spiralis* by the yellow flowers, mostly 5-foliolate leaves, and different ecology but only doubtfully different from *S. holguinensis* from which it differs in the ecostate calyx, generally shorter pedicels, and perhaps in the yellow flower. The characters of more coriaceous leaflets with the venation more intricately reticulate above, and more lepidote calyx with obtuse lobes that were used to separate this species from *S. holguinensis* in the *Flora of Cuba* do not hold up.

2. *Spirotecoma holguinensis* (Britton) Alain, Contr. Ocas. Mus. Hist. Nat. Colegio “De La Salle” 15: 14. 1956. Fig. 38.

Cotema holguinensis Britton, Mem. Torrey Bot. Club 16: 108. 1920. Type. Cuba. Oriente (Holguín): Between Holguín and Cacocum, *Shafer* 1550 (holotype, NY).

Cotema woodfredensis Britton, Mem. Torrey Bot. Club 16: 108. 1920. Type. Cuba. Oriente (Holguín): Sierra Nipe between Piedra Gorda and Woodfred, *Shafer* 3320 (holotype, NY).

Spirotecoma woodfredensis (Britton) Alain, Contr. Ocas. Mus. Hist. Nat. Colegio “De La Salle” 15: 14. 1956.

Small few-branched tree 3–7 m tall, the branchlets terete, usually rather thick and with the leaves apically clustered, more or less lepidote, otherwise glabrous, dark and resinous when young, with or without lenticels, the cortex of older branchlets tending to split and exfoliate. Leaves 3–5-foliolate, the leaflets narrowly to broadly oblong-elliptic to slightly obovate, the apex obtuse or rounded, occasionally slightly emarginate, rounded or truncate at base, the terminal 2.3–11 cm long, 1–5 cm wide, the basals 1–6.5 cm long, 0.7–4 cm wide, subcoriaceous to coriaceous, rather sparsely and minutely lepidote above and below, with tufts of simple trichomes forming domatia in the secondary nerve axils below, the secondary veins raised below, prominent above, the tertiary venation strongly or weakly prominent-reticulate above, plane or slightly prominent below, drying black or dark gray above, black to blackish olive below, usually with contrastingly paler main veins, the

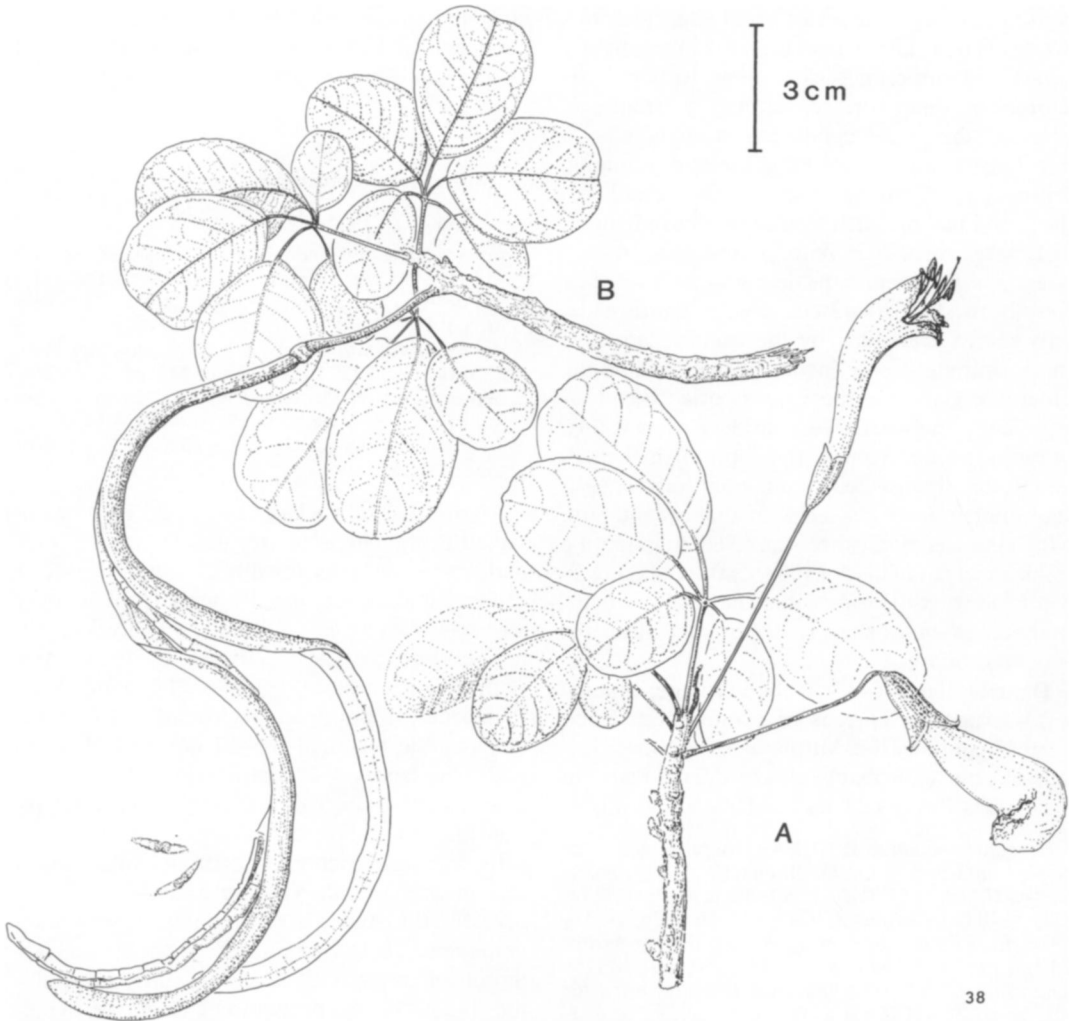


FIG. 38. *Spirotecoma holguinensis*. A, flowering shoot; B, fruiting shoot (Gentry 51055).

margin entire to slightly serrulate or obtusely serrate toward apex; terminal petiolule 1–3.5 cm long, basal petiolules 0.3–2 cm long, petiole 1–7 cm long, lepidote. *Inflorescence* a single flower or usually pair of flowers (rarely three together) borne in the leaf axils or ramiflorously in the axils of fallen leaves, the pedicel (3.5–)5–8.5 cm long (–10 cm in fruit), rather shiny and varnished-looking, drying black, slightly and inconspicuously lepidote, otherwise glabrous, ebracteolate or with a minute bracteole at base of calyx. *Flowers* with the calyx coriaceous, tubular-campanulate, irregularly 2–3-labiate, the lobes acute

and conspicuously apiculate 11–20 mm long, 8–10 mm wide, costate, outside secretory and inconspicuously lepidote, also lepidote inside, drying black; corolla dark red or brick red (rarely yellow? Shafer 1550), tubular-infundibuliform, gradually tapering to the narrower base of tube, curved with a distinct bulge in throat, strongly bilabiate, apparently with two upper lobes held more or less horizontally and three lower ones strongly reflexed, held inverted below branch, 5.5–6 cm long, 1.5–2 cm wide at mouth of tube, the tube ca. 4 cm long, the rather broad lobes ca. 1 cm long, outside glabrous except for a few in-

conspicuous lepidote scales, completely glabrous inside even at stamen insertion, the lobes slightly ciliate and sometimes with a few scattered trichomes on inner surface; stamens didynamous, exserted, the thecae pendulous, subparallel, 5–6 mm long; pistil 5–6 cm long, the ovary oblong, 3 mm long, 1 mm wide, the surface glandular, the individual blackish lepidote scales indistinct; disk patelliform-pulvinate, 1 mm long, 4 mm wide. *Fruit* a linear capsule, strongly curved or spirally twisted, 20–42 cm long, 5–7 mm wide, only rarely subtended by the usually caducous calyx, minutely and inconspicuously lepidote, otherwise glabrous, the valves coriaceous, longitudinally finely striate, drying black when young, brown after dehiscence, the septum thickened, longitudinally bisected by a medial furrow, each side interrupted by a series of shallow pits into which the seed bodies are appressed, fragmenting transversely at dehiscence; *seeds* thin, bialate, 2–3 mm long, 8–10 mm wide, the hyaline-membranaceous wings sharply demarcated from the tiny seed body.

Distribution (Fig. 37). Cuban Oriente; endemic to serpentine barrens of southeastern Cuba from Holguín to the Altiplanicie de Nipe, Holguín Province, probably also at Puerto Padre in Las Tunas Province (sterile); 100–500 m alt.

Specimens examined. CUBA. HOLGUÍN: Sierra de Nipe, Loma de la Estrella, 28 Oct 1979 (fr), *Bisse et al. s.n.* (HAJB35669) (HAC); Woodfred, Sierra de Nipe, May 1940 (st), *Carabia 3592* (HAC); Holguín, 28 Aug 1916 (fr), *Ekman 7654* (MO); entrada de Sao Arriba, 24 Jun 1937 (fr), *León 16878* (HAC, NY); SE of Holguín, *Shafer 2949* (NY); Cuabales, Holguín, Apr 1966 (fl), *Yero 585* (HAC). LAS TUNAS: Puerto Padre, El Cupeyo, *Curbelo 5219* (NY).

Common names. Roble yanilla, roble de sabana, roble cera, roble de costa.

Very close to *S. spiralis* and none of the characters used to separate these two species in the *Flora of Cuba* correlates with geography or with the morphological differences suggested here. Perhaps the best differentiating feature is the conspicuously costate calyx with longer apiculations, these especially obvious in the strongly apiculate bud. Other characters that seem to distinguish this species from *S. apiculata* are the dark red or brick-red flower color (although one collection is indicated as yellow) and the generally longer pedicels. *Spirotecoma woodfredensis* is certainly not distinct; neither the tendency to have flowers

clustered toward the branch apex nor the sub-cuneate leaflet bases are constant in the Serrania de Nipe collections formerly referred to that species.

3. *Spirotecoma rubriflora* (Leonard) Alain, Mem. N.Y. Bot. Gard. **21**: 148. 1971.

Tabebuia rubriflora Leonard, J. Wash. Acad. Sci. **14**: 416. 1924. Type. Dominican Republic. Samaná: Pí-lón de Azúcar, 12 May 1922 (fl), *Abbott 2346* (holotype, US).

Neuroteca domatiata Urban & Ekman, Ark. Bot. **22A(10)**: 70. 1929. Type. Haiti. Massif de la Selle, between Port-au-Prince and Rivière Momance, *Ekman H5490* (B*, lectotype, S; isotypes, MO, NY). *Spirotecoma domatiata* (Urban & Ekman) Alain, Brittonia **20**: 151. 1968.

Medium-sized to large tree 7–20 or more m tall, the branchlets terete, usually rather thick and with the leaves apically clustered, lepidote, otherwise glabrous, usually with tannish corky lenticels. *Leaves* 5–7-foliolate, the leaflets oblong-elliptic to ovate or narrowly ovate, the apex obtuse to acuminate, occasionally rounded but then usually blunt-apiculate, rounded or truncate at base, the terminal 3.5–17 cm long, 1–7 cm wide, the basals 3–11 cm long, 0.8–5 cm wide, chartaceous to coriaceous, rather sparsely lepidote above and below, with usually conspicuous tufts of simple trichomes forming axillary domatia in the secondary nerve axils below (these occasionally lacking in some axils), the secondary veins raised below, plane above, the tertiary venation plane above, plane or slightly prominulous below, drying brown to black above, lighter brown to blackish below, usually with contrastingly whitish axillary domatia, the margin entire; terminal petiolule 0.7–4 cm long, basal petiolules 0.4–2.5 cm long, petiole (2.5–)5–15 cm long, lepidote. *Inflorescence* a reduced several-flowered ramiflorous raceme, rather shiny and varnished-looking, drying black, lepidote, otherwise glabrous, the pedicels 1–1.5 cm long. *Flowers* with the calyx thick-coriaceous, tubular-campanulate, irregularly 2–4-labiate, usually part of the teeth more or less apiculate and some obtuse, 7–16(–17) mm long, 5–11 mm wide, scattered-lepidote, drying black; corolla dark purplish red or brownish purple, the tube sometimes pale orangish or greenish, tubular-infundibuliform, gradually tapering to the narrower base of tube, slightly curved, strongly bilabiate, apparently with two

upper lobes held horizontally and three lower ones strongly reflexed, 3–6 cm long, 0.8–1.2 cm wide at mouth of tube, the tube 2–4 cm long, the rather narrow lobes 0.7–2 cm long, glabrous except for a few inconspicuous lepidote scales, completely glabrous inside even at stamen insertion; stamens didynamous, somewhat exerted, the thecae pendulous, parallel, 3–6 mm long, the filaments inserted 1–1.5 cm above base; pistil 2.5–4.5 cm long, the ovary oblong, 2.5–5 mm long, 1–1.5 mm wide, the surface strongly glandular but the individual lepidote scales not clearly differentiated, drying black; disk annular-pulvinate, 1–2 mm long, 2–4 mm wide. *Fruit* a linear capsule, 9–23 cm long, 7–9 mm wide, subtended by persistent calyx, slightly and inconspicuously lepidote, otherwise glabrous, the valves coriaceous, slightly twisting at dehiscence and sometimes bent toward apex but not spiralled, drying black or blackish, the septum thickened with an irregularly undulate surface into which the seed bodies are only slightly appressed; *seeds* thin, bialate, 5–6 mm long, 11–20 mm wide, the hyaline-membranaceous wings sharply demarcated from seed body.

Distribution (Fig. 37). Hispaniola, mostly in tall moist forest on limestone; also one old collection from Oriente, Cuba. 0–1300 m elevation.

Specimens examined. CUBA. ORIENTE: La Perla Farallones, prope Monte Verde, Jan–Jul 1859 (fr), *Wright 1338* (GH, MO).

HAITI. Masif du Nord, Gros-Morne, Morne La Rue, 675 m, 13 Oct 1925 (st), *Ekman H5083* (NY); Massif de la Selle, Port-au-Prince-Rivière Momenche, 250 m, 2 Feb 1926 (fl, fr), *Ekman H5490* (MO, NY, S); Massif de la Selle, Croix-des-Bouquets, near Chapelle Mare-Congo, 1000 m, 17 Mar 1927 (fl), *Ekman H7885* (S).

DOMINICAN REPUBLIC. BARAHONA: Maniel Viejo, 600–850 m, 7–10 Mar 1922 (fl), *Abbott 1942a* (US); Sierra Martín García, limites de Barahona y Azua, 1290 m, 18°23'N, 71°2'W, 13 Sep 1984 (fr), *Mejia et al. 1309* (JBSD, MO). SAMANÁ: Vic. Laguna, Pilon de Azucar, 100–500 m, 12 May 1922 (fl, fr), *Abbott 2346* (US); Samana, Laguna, Los Banaderos Prietos, 500 m, 28 May 1930 (fl, fr), *Ekman H15147* (B, K, NY, US); Los Haitises, Boca del Infierno, 24 Jun 1930 (st), *Ekman H15416* (B). EL SEIBO: Pilancón Bayaguana, 200 m, Los Haitises, 31 Mar 1973 (fl), *Liogier & Liogier 18878* (NY); Naranjo Arriba, Los Haitises, 0–10 m, 19°5'N, 69°34.5'W, 28 Oct 1982 (st), *Mejia & Pimentel 23965A* (JBSD).

Common name. Capa.

This species is clearly intermediate between *Tabebuia* and the rest of the *Spirotecoma* species. No doubt it is close to the ancestral stock wherein

a species of *Tabebuia* switched to pollination by perching birds, ultimately giving rise to *Spirotecoma*.

The collections from the Samaná Península all have smaller flowers (corolla < 3 cm long, calyces < 6 mm long) and more coriaceous leaves than the Haitian material formerly referred to *Neurotecoma domatiata*. However the Cuban collection and one Barahona Península collection, both in fruit, have small calyces (and presumably small flowers) as in the Samaná collections. Moreover the second Barahona Península collection, consisting only of fallen flowers, has the large flowers and calyces typical of *N. domatiata* suggesting that flower size is probably variable within a single population. More collections from this critical region are urgently needed, but may not be forthcoming, since the habitat of this distinctive species has now been largely destroyed.

4. *Spirotecoma spiralis* (Wright ex Grisebach) Pichon, Bull. Soc. Bot. France **92**: 228. 1945.

Tecoma spiralis Wright ex Grisebach, Cat. pl. Cub. 194. 1866. Type. Cuba. Oriente: Río Toro, *Wright 3038* (holotype, GOET; isotypes, G, K, MO, NY). *Cotema spiralis* (Wright ex Grisebach) Britton & Wilson, Mem. Torrey Bot. Club **16**: 108. 1920. *Neurotecoma calcicola* Urban, Symb. antill. **9**: 267. 1924. Type. Cuba. Oriente: Santiago de Cuba, El Morro, *Ekman 9194* (B*, lectotype S; isotype, NY). *Spirotecoma guantanamensis* Bisse, Arboles de Cuba **82**. 1981. Type. Cuba. Guantánamo: Guantánamo, *Bisse et al. s.n.* (HAJB), nom. nud. (published without indication of type or Latin diagnosis).

Shrub or small *tree* mostly 2–3(–4) m tall, the branchlets terete, more or less lepidote, otherwise glabrous, when young sometimes with tannish corky lenticels, the cortex of older branchlets tending to split and peel. *Leaves* 1–3(–5)-foliolate, the leaflets ovate to oblong ovate, the apex rounded to acute, occasionally shallowly emarginate, rounded to broadly cordate at base, the terminal (or only) leaflet 2–10 cm long, 1.5–8 cm wide, the basals (when present) to 6.5 by 3.5 cm, coriaceous, lepidote above and below, otherwise glabrous except for usually conspicuous tufts of simple trichomes forming axillary domatia in the secondary nerve axils below, the secondary veins prominent below, prominulous above, the tertiary venation intricately prominulous above and sometimes below, drying shiny dark olive to black above, lighter olive to blackish below, often with contrastingly whitish axillary domatia, and light-

er main veins, the margin entire to erose or conspicuously serrate; terminal petiolule to 2 cm long, lateral petiolules, when present, <1 cm long, petiole 0.4–5 cm long, lepidote. *Inflorescence* a single flower or usually a pair of flowers borne in the leaf axils or ramiflorously in the axils of fallen leaves, the pedicel (4–)5–8 cm long, drying black, inconspicuously lepidote, otherwise glabrous. *Flowers* with the calyx coriaceous, tubular-campanulate, irregularly 2–4-labiate, the lobes more or less obtuse, 10–15 mm long, 7–9 mm wide, lepidote, drying black; corolla greenish-purple to yellowish-brown, tubular-infundibuliform, gradually tapering to the narrower base of tube, slightly curved, with a small bulge in throat, strongly bilabiate, apparently with the two upper lobes held more or less straight and the lower ones more or less reflexed (but perhaps held inverted below branch?), 5–7 cm long, 1.5–2 cm wide at mouth of tube, the tube 3–5 cm long, the rather broad and irregularly fringed lobes 0.5–1 cm long, glabrous outside except for a very few inconspicuous lepidote scales, completely glabrous inside even at stamen insertion, the lobes usually more or less ciliate and sometimes with flexuous trichomes on inner surface; stamens subequal to distinctly didynamous, strongly exerted (by as much as 2 cm), the thecae pendulous, parallel, 5–7 mm long; ovary oblong, 4–5 mm long, ca. 1 mm wide, the surface strongly blackish-lepidote, glandular; disk annular-pulvinate, 1–2 mm long, 2–3 mm wide. *Fruit* a linear capsule, strongly curved or spirally twisted, 10–30 cm long, 4–6 mm wide, only rarely subtended by the usually caducous calyx, slightly and inconspicuously lepidote, otherwise glabrous, the valves coriaceous, longitudinally finely striate, drying black when young, tan after dehiscence, the septum thickened, longitudinally bisected by a medial furrow, each side interrupted by a series of shallow pits into which the seed bodies are appressed, fragmenting transversely at dehiscence; *seeds* thin, bialate, 1–2 mm long, 5–10 mm wide, the hyaline-membranaceous wings sharply demarcated from the tiny seed body.

Distribution (Fig. 37). South coast of Cuba in xeric vegetation on limestone cliffs and hills near the coast.

Representative specimens examined. CUBA. GUANTÁNAMO: Río Jauco, Baracoa, Feb 1929 (st), *Acuna 24902* (HAC); US Naval Station, Guantánamo Bay, 17 Mar 1909 (fr), *Britton 2089* (NY); Baracoa region,

Mesa de Prado, Jauco, Jul 1924 (fl, fr), *León 11764* (GH, HAC, NY, US). SANTIAGO DE CUBA: El Morro, Santiago Bay, 10 Mar 1912 (fl, fr), *Britton & Cowell 12550* (GH, NY, US); Pichón road to El Morro, Santiago, May 1940 (fl, fr), *Clemente 2432* (GH, HAC); Santiago de Cuba, 19 Nov 1917 (st), *Ekman 8942* (AAU, NY), *Ekman 19192* (B, MO).

Common name. Roble yanilla.

To judge from the corolla shape and reported yellowish-brown to greenish-purple color, this species may be bat-pollinated; if so it would be the only non-bird-pollinated species of the genus. This species is also distinctive in the mostly simple leaves.

TABEBUIA

21. *Tabebuia* Gomes ex A. P. de Candolle, *Biblioth. Universelle Genève*, ser. 2, **17**: 130. Sep, 1838. Type species. *T. uliginosa* (Gomes) A. P. de Candolle = *T. cassinoides* (Lamarck) A. P. de Candolle.

Leucoxydon Rafinesque, *Sylva tellur.* 77. Oct, 1838. Type. *L. riparia* Rafinesque = *T. heterophylla* (A. P. de Candolle) Britton.

Potamoxydon Rafinesque, *Sylva tellur.* 78. Oct, 1838. Type. *P. alba* Rafinesque = *T. fluviatilis* (Aublet) A. P. de Candolle.

Proterpia Rafinesque, *Sylva tellur.* 80, Oct, 1838. Type. *P. obtusifolia* (Lamarck) Rafinesque (*Bignonia obtusifolia* Lamarck) = *T. cassinoides* (Lamarck) A. P. de Candolle.

Couralia Splitgerber, *Tijdschr. Natuurl. Gesch. Physiol.* **9**: 14. 1842. Type. *Couralia fluviatilis* (Aublet) Splitgerber = *T. fluviatilis* (Aublet) A. P. de Candolle.

Roseodendron Miranda, *Bol. Soc. Bot. Mex.* **29**: 42. 1965. Type. *R. donnell-smithii* (Rose) Miranda = *T. donnell-smithii* Rose.

Handroanthus Mattos, *Loefgrenia* **50**: 1. 1970. Type. *H. albus* (Chamisso) Mattos = *T. alba* (Chamisso) Sandwith.

Shrubs to large *trees*. *Leaves* simple, 1-foliolate, or palmately 3–7(–9)-foliolate, the leaflets entire or serrate. *Inflorescence* a terminal panicle, sometimes reduced to a few-flowered raceme or single flower. *Flowers* with calyx cupular, campanulate, or tubular, truncate or bilabiate to slightly 5-lobed; corolla white, yellow, lavender, magenta, or red, tubular-infundibuliform to tubular-campanulate, glabrous or puberulous on outside of tube; stamens included or exerted, the anthers glabrous, the thecae straight, divaricate, glabrous; pollen grains single, globose, 3-colporate, the exine finely microreticulate; ovary linear-oblong, usually more or less lepi-

dote, the ovules 2–multi-seriate in each locule; disk annular-pulvinate. *Fruit* a subterete capsule, elongate-linear to short and oblong, dehiscent perpendicular to the septum, smooth to irregularly verrucose-muricate, glabrous to lepidote or variously pubescent; *seeds* thin, bialate with hyaline-membranaceous wings or thick corky and essentially wingless.

A neotropical genus of 100 species, ranging from northern Mexico and the Antilles to northern Argentina. The bulk of the species are on Hispaniola and Cuba.

In the West Indies *Tabebuia* is a taxonomically difficult group, but on the mainland most of the species are fairly clear-cut. Despite the large number of (mostly poorly defined) species on Hispaniola and Cuba, all Antillean species belong to the same, otherwise small, section of the genus and are almost entirely vegetatively differentiated. Part of the taxonomic problem in Antillean *Tabebuia* stems from the apparent frequency of hybridization on Cuba (Gentry, 1989a). Many of the intermediate forms have been given specific epithets. *Tabebuia* has been called perhaps the most taxonomically difficult genus in the Cuban flora (Alain, 1957) and a thorough taxonomic treatment of the Cuban species will be possible only after extensive field work. The treatment of Cuban species proposed in this monograph should be regarded as no more than a first approximation. It is to be hoped that the treatment of Bignoniaceae for the new *Flora of Cuba* project, which I will co-author with Delby Albert of the Academia de Ciencias, will provide a more definitive treatment based on much additional field work.

Tabebuia is an important genus horticulturally because of its very showy flowers (see Gentry, 1982b, 1984b) and in the timber trade (Amazonex Lumber Company, pers. comm.; Gentry, 1980). Some species have woods which are among the heaviest and most durable in the Neotropics (see discussion and references in Gentry, 1980). The bark of *Tabebuia* has recently become rather widely used as a cancer cure (Awang et al., 1991; Bencke, pers. comm.; Farnsworth & Gyllenhaal, 1989) and more recently in the treatment of candida infections (Duke, pers. comm.; Troth Ovrebø, pers. comm.).

The pharmacologically active property in *Tabebuia* bark appears to be the naphthoquinone lapachol and related compounds (Awang et al.,

1986; Farnsworth & Gyllenhaal, 1989; Girard et al., 1988).

While *Tabebuia* bark clearly includes chemicals with antitumor properties, these are often wildly exaggerated in the herbal medicine literature. Excerpts from a recent article (Orbis 73 (1989)) capture the essence of this literature: “Lapacho bark contains . . . lapachol. It is this substance that is able to enhance the immune system, help combat infections, improve vitality, build up immunity, strengthen cells, and help reduce and eliminate pain and inflammation. (Lapacho) grows where there is a high ozone content in the air where vital negative ions are also concentrated. It is therefore not contaminated by pollutants such as pesticides or exhaust fumes. The unusual thing about the flowers is that they are carnivorous and eat insects keeping the tree free from parasites and viral growths.”

While I have not formally proposed sectional subdivisions of *Tabebuia*, several of the species groups indicated in the key clearly represent natural units as indicated below. Other subdivisions of the key—notably the separation of Group 3 from Group 4 and of Groups 7, 9, and 10—are entirely for practical rather than taxonomic reasons.

The yellow-flowered species with mostly stellate pubescence and extremely hard heavy wood clearly constitute a natural unit (Group 3 + 4). Subdividing this group into less pubescent (Group 3) and more pubescent (Group 4) halves is merely an attempt to make the key less unwieldy. These two groups are the two halves of a continuum from less strongly pubescent to more strongly pubescent calyces and leaves and such species as *T. billbergii*, *T. subtilis*, and *T. lapacho* are intermediate. The two yellow-flowered species with lepidote leaves and calyces (Group 2) are probably not close to the other yellow-flowered species, to judge from their very different wood, and may not be close to each other, either. The yellow-flowered species formerly segregated as *Roseodendron* (Group 1) are characterized by thin calyces, a pyramidal inflorescence, dendroid and gland-tipped trichomes, and prominently costate fruit and are clearly closely related; however their distinctive medium-weight wood suggests that they may not be close to the heavy-wooded species.

The four species with purple flowers and corolla tubes puberulous outside (Group 5) con-

stitute a natural group for which the pubescence on the outside of the corolla tube provides a unique synapomorphy. These species have the heavy dark wood of the main yellow-flowered groups to which they may be more closely related than to other pink-flowered taxa.

The numerous species with lepidote scales and glabrous white to purple or red corollas constitute a large natural group which is concentrated in the Antilles and has speciated profusely on Cuba and Hispaniola. These taxa are further held together by possessing light to medium weight wood. The subdivision of this assemblage indicated in the key to "groups" is completely artificial, however.

Most of the "continental" species with exclusively lepidote indumentum (Group 7) are perhaps more closely related to each other than to the Antillean taxa. Moreover, all white-flowered species are clearly more related to the pink or lavender-flowered taxa than to the yellow-flowered ones. The two putatively hawkmoth-pollinated species (*T. striata*, *T. stenocalyx*) are extremely close to each other but otherwise rather isolated within the genus. *Tabebuia obtusifolia* and *T. cassinoides* are probably each other's closest relatives despite the former's very distinctive, putatively bat-pollinated, flowers. *Tabebuia elliptica*, *T. roseo-alba*, and *T. reticulata* are also a natural unit held together by their unique possession of calyces with pilose inner margins. They are also close to the variable *T. insignis* as are *T. pilosa* and *T. orinocensis*, at least the latter probably directly derived from the *T. insignis* complex, as may be the two water-dispersed spe-

cies *T. palustris* and *T. fluviatilis* (= *Couralia*). That leaves only *T. rosea* among the continental species of Group 6 as being apparently more closely related to the Antillean species, and especially to widespread *T. heterophylla*, than to the other mainland taxa with exclusively lepidote trichomes.

The two Hispaniolan species with unusually large and coriaceous bullate leaflets, simple trichomes (representing the stalks of "decapitated" stalked-peltate scales), and very short thick petioles and petiolules (Group 8) are closely related to each other but also to Groups 9 and 10, and their formal taxonomic recognition would make the remainder of the white- and pink-flowered lepidote taxa paraphyletic.

Recognition of the simple-leaved Antillean taxa as Group 7 is entirely artificial, as most of these species seem closer to various members of Group 9 or 10 than to each other. For example, *T. delriscoi* seems to be a doubtfully stabilized hybrid between members of Group 7 and Group 10. The bulk of the Antillean taxa are extremely closely related and many species are difficult to differentiate, especially on Cuba. Separation of Groups 9 and 10 on the basis of the strength and color of the lepidote indumentum of the leaf undersurface is far from satisfactory and necessitates keying out such species as *T. heterophylla* in both keys. Perhaps that is unavoidable, since *T. heterophylla* as here interpreted is so polymorphic that it spans much of the range of morphological variation found in the entire Antillean portion of the genus.

Key to Species Groups¹

1. Inflorescence with the central rachis straight and well-developed; calyx thin, membranaceous, of the same texture as the yellow corolla, sparsely puberulous in part with glandular trichomes and usually more or less viscid; capsule conspicuously irregularly longitudinally ribbed or striate-costate and sparsely puberulous in part with branched trichomes. Group 1.
1. Inflorescence dichotomously branching or reduced to a few flowers, without a well-developed central rachis; calyx coriaceous, thicker than the variously colored corolla, lepidote or variously pubescent but never viscid with gland-tipped trichomes; capsule not conspicuously ribbed, lepidote if slightly costate.
 2. Flowers yellow; calyx more or less stellate-rufescent (except *T. aurea* and *T. nodosa*, with sessile peltate scales), sometimes also with longer dendroid or barbate trichomes; corolla tube glabrous outside except sometimes a few inconspicuous scales or some stellate trichomes immediately below the sinuses; leaflets (except uniformly lepidote *T. nodosa* and *T. aurea*) puberulous below at least in nerve axils with stellate trichomes or simple trichomes around the margins of axillary domatia (simple puberulous over surface only when margin serrate or serrulate).

¹ This key should work for leafless flowering material of precociously-flowering species but will not always work for fruiting material unless leaves or flowers are also present.

3. Calyx and leaves lepidote, otherwise glabrous. Group 2.
3. Calyx more or less stellate pubescent, sometimes also with longer dendroid or barbate trichomes; leaflets puberulous below with simple or stellate trichomes at least in nerve axils.
 4. Calyx sparsely thick-stellate pubescent to macroscopically subglabrous; leaflets below with simple or stellate trichomes restricted to the nerve axils or with simple trichomes over the surface; fruit glabrous or with scattered lepidote scales. Group 3.
 4. Calyx densely pubescent with stellate or dendroid trichomes, sometimes villous; leaflets always with at least a few stellate trichomes along the main veins below and often more or less densely over surface; fruit puberulous to villous with stellate or dendroid trichomes. Group 4.
2. Flowers red, pink, purple, or white; calyx mealy puberulous or lepidote with sessile scales or with a mixture of simple trichomes and peltate scales; corolla tube sometimes densely puberulous outside; leaflets below lepidote with sessile scales or puberulous with simple (rarely in part forked) trichomes, these either formed from partially decapitated stalked-peltate scales or forming tufts in nerve axils (simple puberulous over surface only when margin entire).
 5. Corolla tube puberulous outside; flowers magenta; calyx mealy pubescent with thick-stellate whitish trichomes at least at base; leaflets serrate or entire, either pubescent below with simple or in part forked trichomes at least in axils or the margin jagged-serrate. Group 5.
 5. Corolla tube glabrous outside; flower white to pink or red; calyx lepidote (sometimes also with simple trichomes); leaflets entire to somewhat erose, usually only lepidote, if simple-puberulous the trichomes often in part stalked-lepidote.
 6. Continental South and Central America; leaves often (3–)5-foliolate, simple only when the flowers white, when the flowers pink or lavender the inflorescence either a many-flowered panicle or with conspicuously white-margined subtending bracts; leaflets large (the largest usually >3 cm wide), usually more or less elliptic and acuminate. Group 6.
 6. Antilles; inflorescence often few-flowered, never with conspicuously white-margined bracts; leaves simple or 1–9-foliolate, the leaflets variously shaped, often small, rarely elliptic, the apex usually obtuse to retuse, rarely subacuminate; flowers usually pink to lavender, occasionally white or red.
 7. Leaves uniformly simple. Group 7.
 7. Leaves in part 3–7-foliolate.
 8. Leaflets thick-coriaceous and somewhat bullate, strongly and intricately raised-reticulate below; petiole short (<1.5 cm long) and very thick (3–10 mm across); leaflets large, mostly >10 cm long; leaves puberulous with simple trichomes below; inflorescence pubescence in part of long-stalked erose-margined peltate scales. Group 8.
 8. Leaflets membranaceous to thick-coriaceous, if thick-coriaceous smooth below; petiole mostly 1–3 mm thick; leaflets puberulous with simple trichomes over surface below only when <10 cm long; inflorescence pubescence mostly of sessile lepidote scales or simple trichomes, if in part stalked-lepidote the trichome apices non-fimbriate.
 9. Leaflets discolorous and strongly whitish lepidote below; leaflet margins not erose (except sometimes very slightly in 3-foliolate *T. arimaensis* and Bahamas populations of *T. bahamensis*) nor strongly revolute. Group 9.
 9. Leaflets concolorous or discolorous but not strongly whitish below (often tannish or light brown, especially when margins erose); leaflet margins often erose or revolute (or both). Group 10.

Group 1

Inflorescence rachis well-developed; calyx thin, membranaceous, of same texture as corolla; corolla yellow, glabrous; vegetative parts with dendroid and gland-tipped trichomes, viscid.

1. Panicle open, the pedicels and lateral branches elongate, 1–4 cm long, at times bifurcating; pedicels ca. 1 cm long; capsule >2 cm wide. *T. donnell-smithii*.
1. Panicle racemose, the pedicels and lateral branches short, the lateral branches up to 2 mm long, not bifurcate; pedicels up to 7 mm long; capsule <1.3 cm wide. *T. chrysea*.

Group 2

Flowers yellow; calyx and leaf pubescence entirely of sessile peltate scales.

1. Leaves simple; flowers mostly borne individually at ends of short shoots. *T. nodosa*.
1. Leaves 3–7-foliolate; flowers not on short shoots, usually in branching inflorescences. *T. aurea*.

Group 3

Flowers yellow; calyx stellate or thick-stellate pubescent with yellow, tan, or reddish trichomes, sometimes also with elongate simple or barbate trichomes; leaf pubescence mostly of stellate trichomes, if uniformly simple the trichomes mostly restricted to margins of axillary domatia below (uniformly simple trichomes over lower leaflet surface only when margin serrate or serrulate).

1. Corolla throat essentially glabrous; leaves often 1–3-foliolate, the leaflets sometimes pilose below with simple trichomes.
 2. Leaves 5-foliolate; large trees of Guayana region or Rio Doce drainage of coastal Brazil.
 3. Leaflets pilose over surface below; Guayana region, mostly on laja outcrops. *T. uleana*.
 3. Leaflets glabrous below or with simple trichomes in lateral nerve axils; coastal Brazil.
 *T. riodicensis*.
 2. Leaves in part 3-foliolate; subshrubs to small trees of Central Brazilian uplands.
 4. Subshrubs <1 m tall; leaves 1–3-foliolate; calyx 4–5 mm long. *T. pumila*.
 4. Small to medium trees; leaves 3–5-foliolate; calyx (5–)8–11(–16) mm long. *T. serratifolia* (p.p.).
1. Corolla throat pilose; leaves (3–)5–7-foliolate, the leaflets with simple or stellate trichomes in axils of lateral nerves.
 5. Fruits <1 cm wide, valves thin, subcoriaceous; calyx pubescence concentrated below teeth, the upper part of calyx between the teeth almost glabrous and drying contrastingly dark; leaves 3–5-foliolate, the leaflets mostly small (the terminal <7(–10) cm long), usually drying blackish.
 6. Calyx <7 mm long; capsule 6–7 mm wide; coastal Colombia and Venezuela and sparsely in Antilles. *T. billbergii* ssp. *billbergii*.
 6. Calyx >8 mm long; capsule 8–10 mm wide; coastal Ecuador and adjacent Peru.
 *T. billbergii* ssp. *ampla*.
 5. Fruits >1 cm wide, valves thick-coriaceous to subwoody; calyx pubescence scattered; leaves 5–7-foliolate, the leaflets mostly larger (most terminals >7 cm long), usually drying olive.
 7. Corolla throat densely pilose with trichomes sometimes to 1.5 mm long; ovary without raised glands, smooth or verrucose toward apex; leaflets with stellate trichomes in nerve axils below; capsule irregularly mucronulate-ridged. *T. guayacan*.
 7. Corolla throat weakly pilose, the trichomes less than 0.8 mm long; ovary glandular-verrucose at least at apex; mature leaflets with simple trichomes in nerve axils below; capsule surface smooth or with a few small widely scattered projections. *T. serratifolia*.

Group 4

Flowers yellow; calyx densely pubescent with stellate or dendroid trichomes, sometimes villous; leaflets always with at least a few stellate trichomes along the main veins below and often more or less densely over surface; fruit puberulous to villous with stellate or dendroid trichomes.

1. Throat trichomes short, thick, almost papillose.
 2. Leaflets entire; Amazonia. *T. obscura*.
 2. Leaflets toothed; coastal Brazil. *T. bureavii*.
1. Throat trichomes mostly long, lax, multicelled.
 3. Trichomes of the calyx short and stellate and concentrated along the ribs descending from teeth, the surface of upper third of calyx thus more or less glabrous and exposed and drying darker (rarely lighter) than pubescent part of calyx; leaves with stellate trichomes mostly along main veins below (densely but minutely over whole undersurface in one form of *T. subtilis*).
 4. Leaflets strongly serrate, becoming nearly glabrescent; northwestern Argentina and adjacent Bolivia above 1400 m. *T. lapacho*.
 4. Leaflets entire; more or less persistently stellate-puberulous along main veins below; Amazonia and Guianas to coastal Brazil.
 5. Ovary slightly glandular-lepidote; calyx (8–)10–18 mm long; upland Guayana and coastal Brazil.
 6. Upland Guayana; leaflets sometimes densely puberulous over whole undersurface; calyx persistent in fruit. *T. subtilis*.
 6. Eastern Brazil; leaflets puberulous mostly on main veins; calyx irregularly caducous in fruit.
 7. Calyx with conspicuously raised ridges below teeth; exposed part of surface drying light; well-drained forest. *T. cristata*.
 7. Calyx without ribs or with barely prominulous ribs; exposed part of surface drying dark; swamp forest. *T. umbellata*.
 5. Ovary densely lepidote; calyx 8–10 mm long; Amazonia. *T. capitata* (p.p.).

3. Trichomes of the calyx short-stellate to long and barbate or apparently simple, relatively uniformly distributed over calyx (pubescence sometimes interrupted between teeth [esp. *T. pulcherrima*] but only when more or less woolly with the trichomes larger and usually in part barbate); leaflets usually stellate pubescent over most of undersurface, sometimes densely so.
8. Leaves 3-foliolate, the leaflets viscid; calyx strongly 5-angled, 3–4 mm wide; caatinga. *T. spongiosa*.
8. Leaves 5–7(–9)-foliolate; leaflets not viscid; calyx not 5-angled, >4 mm wide; widespread.
 9. Leaflets densely and finely whitish or tannish tomentose over whole undersurface, the surface macroscopically whitish or tannish; uppersurface of leaves usually rather smooth to touch; capsule densely tomentose or villous or completely glabrous.
 10. Calyx tomentose to short-woolly pubescent, the pubescence of short to medium stellate or barbate trichomes; fruits glabrous or tomentose with trichomes <1 mm long.
 11. Leaves mostly 7–9-foliolate, the leaflets serrate; inflorescence usually openly paniculate.
 12. Leaflets sharply and closely serrate, finely and densely white-tomentose below; calyx and inflorescence trichomes light tan; fruit finely tomentose, the yellowish-tan trichomes <1 mm long. *T. alba*.
 12. Leaflets inconspicuously and remotely serrate only toward tip, coarsely and rather sparsely tannish puberulous below; calyx and inflorescence trichomes rufescent; fruit short-villous, the reddish trichomes ca. 1 mm long. *T. botelhensis*.
 11. Leaves nearly always 5-foliolate, the leaflets entire; inflorescence contracted.
 13. Calyx >10 mm long, longer than wide, the pubescence stellate-rufescent to golden woolly; leaflets usually with conspicuous black glands scattered on lower surface; subtropical Brazil and adjacent Paraná Valley area or uplands of Andes or Guayana.
 14. Calyx campanulate, the pubescence rufescent; upland Guayana or the Andes.
 15. Leaflets finely whitish tomentose below; calyx <1.5 times as long as wide; Guayana. *T. subtilis* (p.p.).
 15. Leaflets relatively coarsely tannish tomentose below; calyx >1.5 times as long as wide; Andes. *T. chrysantha* ssp. *meridionalis*.
 14. Calyx tubular-campanulate, ca. 2 times as long as wide, the pubescence golden-woolly; subtropical south Brazil and adjacent Paraná Valley area. *T. pulcherrima*.
 13. Calyx 5–10 mm long, about as long as wide, the pubescence stellate-rufescent to barbate; leaflets lacking black glands below or these inconspicuous; Amazonia and Rio Doce area of coastal Brazil.
 16. Capsule glabrescently tomentose; leaflet surface plane above; calyx trichomes stellate; Amazonia. *T. incana*.
 16. Capsule completely glabrous; leaflet venation finely impressed above; calyx trichomes barbate; Rio Doce area of coastal Brazil. *T. arianae*.
 10. Calyx villous, the pubescence of long simple trichomes (in part >1 mm long) as well as short stellate ones; fruits villous with trichomes in part >2 mm long.
 17. Calyx trichomes mostly ca. 1 mm long, the calyx indumentum somewhat caducous; Brazilian cerrado and adjacent subAmazonian dry forest areas. *T. ochracea* ssp. *ochracea*.
 17. Calyx trichomes to 7 mm long, not caducous; El Salvador to northwestern Venezuela. *T. ochracea* ssp. *neochrysantha*.
9. Leaves sparsely tomentose below with reddish trichomes, the surface clearly visible between the trichomes, not strongly whitish or tannish; upper surface of leaflets smooth or rough (always rough when corolla lobes dry distinctly lighter than tube); capsule densely villous to sparsely tomentose.
 18. Leaflets strongly serrate; southeastern Brazil.
 19. Leaflets chartaceous, sparsely stellate along main veins when young, almost completely glabrescent; shrub; calyx and fruit trichomes short and stellate; upland campos of Paraná and Santa Catarina. *T. catarinensis*.
 19. Leaflets membranaceous, stellate puberulous over whole undersurface when young and persistently along veins when older; usually large tree; calyx and fruit trichomes in part long and simple; montane forest from Paraná to Rio de Janeiro and Minas Gerais. *T. vellosi*.
 18. Leaflets entire or almost entire; Mexico to Brazil.
 20. Calyx and fruit villous with long trichomes; inflorescence usually densely congested, essentially lacking visible pedicels and peduncles; corolla lobes drying with inconspicuous venation and conspicuously lighter than tube.

21. Calyx tubular-campanulate, about twice as long as wide, covered with reddish, mostly barbate trichomes; fruit reddish villous. *T. chrysotricha*.
21. Calyx campanulate, almost as broad as long, covered with tannish or yellowish mostly simple trichomes, fruit golden villous. *T. ochracea* ssp. *heterotricha*.
20. Calyx and fruit tomentose with shorter stellate trichomes; inflorescence more or less contracted but with obvious pedicels and usually peduncle; corolla lobes usually drying with conspicuously darker venation and more or less concolorous with the tube.
22. Corolla lobes when dry with visible but not accentuated venation; leaves 5–7-foliolate; calyx and leaflets with tannish pubescence; eastern Brazil. *T. pedicellata*.
22. Corolla lobes usually drying dark from the conspicuously dark-drying venation; leaves mostly 5-foliolate; calyx and leaflets with reddish to tannish pubescence; Mexico to northwestern Argentina.
23. Calyx trichomes short, thick-stellate; mature leaflets conspicuously lepidote or lepidote-punctate below, usually with stellate trichomes only on the main veins; plants of Amazonia and the Guianas or northern Colombia.
24. Amazonia and the Guianas; larger leaflets elliptic to narrowly ovate-elliptic, 2–3 times as long as wide, with >7 secondary veins on a side. *T. capitata* (p.p.).
24. Dry forest of northern Colombia; larger leaflets ovate or obovate, 1.5–2.1 times as long as wide, with <7 secondary veins on a side. *T. coralibe*.
23. Calyx trichomes longer, stellate to more or less dendroid; leaflets not lepidote-punctate below, usually with scattered stellate trichomes over surface or lightly lepidote; Mexico to Venezuela and south along both sides of Andes to Peru.
25. Calyx >10 mm long and 8 mm wide, rufescent with short-stellate trichomes; fruit nearly glabrescent, smooth, 30–80 × 1.5–2.4 cm; wet or upland forest. *T. chrysantha* ssp. *pluvicola*.
25. Calyx <10 mm long and 8 mm wide, densely rufescent with stellate to barbate trichomes; fruit persistently stellate-tomentose, often striate or rough-surfaced, 15–50 × 0.8–2 cm; dry or moist forest below 800 m. *T. chrysantha* ssp. *chrysantha*.

Group 5

Flowers magenta; corolla tube puberulous outside; calyx mealy pubescent with thick-stellate whitish trichomes at least at base; leaflets serrate or entire, either pubescent below with simple or in part forked trichomes at least in axils or the margin jagged-serrate.

1. Corolla tube sparsely puberulous outside; leaves 1–3-foliolate, the leaflets with jagged-serrate margins; Bahia. *T. selachidentata*.
1. Corolla tube more or less densely puberulous outside; leaves 5–7-foliolate, the leaflets entire to evenly finely serrate; widespread.
2. Calyx glandular, more or less bilabiate, 13–19 mm long; capsule finely stellate-tomentose; seasonally inundated forest. *T. barbata*.
2. Calyx eglandular, more or less truncate, <11 mm long; capsule glabrous or slightly lepidote; non-inundated forest.
3. Leaflets of mature leaves regularly serrate; petiolules relatively long and slender, the terminal petiolule about as long as leaflet width, the basal petiolules more than half as long as adjacent subbasal petiolules; fruit valves thin, often longitudinally striate, the fruit mostly <1.5 cm wide; mata atlantica forests of coastal Brazil and Paraná Valley sparsely west to easternmost Bolivia. *T. heptaphylla*.
3. Leaflets of mature leaves entire or slightly and irregularly serrate toward apex; terminal petiolule shorter than width of leaflet; basal petiolules < half as long as adjacent subbasal petiolules; fruit woody, usually smooth, mostly >1.5 cm wide; Mexico to northwest Argentina; mostly outside Mata Atlantica. *T. impetiginosa*.

Group 6

Flower white to pink or magenta; continental South and Central America; corolla glabrous outside; calyx lepidote, otherwise glabrous except sometimes a marginal fringe of cobwebby trichomes; leaves simple to

5-foliolate, the leaflets large (the largest usually > 3 cm wide), usually more or less elliptic and acuminate; capsule lepidote.

1. Stamens exerted or subexserted; corolla salverform-tubular or with the tube curved, elongate (6–9.5 cm long) and white; calyx (18–)25–40 mm long; leaves simple, not deciduous.
 2. Calyx broadly campanulate, > 10 mm wide; corolla tubular-infundibuliform, greenish-white, the tube curved forward, 1.7–2.5 cm wide at mouth (appears to be bat-pollinated). *T. obtusifolia*.
 2. Calyx narrowly tubular, < 10 mm wide, corolla narrowly salverform, pure white, the tube straight, < 1.5 cm wide at mouth (appears to be hawkmoth pollinated).
 3. Corolla tube glabrous inside, > 7 mm wide at mouth; fruit > 2 cm wide; northwest Colombia and easternmost Panama. *T. striata*.
 3. Corolla tube papillose-puberulous inside, < 7 mm wide at mouth; fruit < 2 cm wide; Guayana area and coastal Brazil. *T. stenocalyx*.
1. Stamens included; corolla tubular-infundibuliform, variously colored, purple, red, pink, or white; calyx cupular to campanulate, less than 2 cm long unless very broadly campanulate; leaves (when present) compound or simple.
 4. Corolla lobes not ciliate-margined; corolla throat glabrous inside except at stamen insertion; flowers white; coastal swamps of Guayana area and lower Amazon. *T. fluviatilis*.
 4. Corolla lobes ciliate; floor of corolla throat pubescent inside; flowers white to lavender; Mexico to Bolivia.
 5. Calyx teeth with pilose inner margins; bracts white-edged from the pilose margins; eastern Brazil to Peru and Paraguay.
 6. Leaves 5-foliolate; flowers white; calyx > 15 mm long; restingas of coastal Brazil. *T. elliptica*.
 6. Leaves 1–3-foliolate; flowers usually pink to purple; calyx < 15(–17) mm long; deciduous and semideciduous forest or scrubby forest on morros.
 7. Leaves mostly 3-foliolate, the leaflets glabrescent to densely puberulous, intricately reticulate; flowers usually pale lavender or almost white; occasionally deeper purple; widespread in subAmazonian South America. *T. roseo-alba*.
 7. Leaves simple, the leaflets pilose with intricately reticulate venation below; flowers deep purple; transitional caatinga of Minas Gerais-Bahia border area. *T. reticulata*.
 5. Calyx lepidote, otherwise completely glabrous; inflorescence without white-margined bracts; Costa Rica to coastal Brazil.
 8. Leaves 5-foliolate, pilose and intricately reticulate below; calyx with clusters of plate-shaped glands; laja outcrops in Guayana shield area. *T. pilosa*.
 8. Leaves simple to 7-foliolate, lepidote or (rarely) lepidote and pilose (but not intricately reticulate) below; calyx eglandular or with dispersed glands; widespread.
 9. Leaves 3–7-foliolate; Costa Rica to non-coastal Brazil.
 10. Leaves (1–)3-foliolate (always present); seeds thick, corky and wingless; Pacific coast mangrove swamps. *T. palustris*.
 10. Leaves mostly 5–7-foliolate (sometimes flowering while leafless); seeds with hyaline-membranaceous wings; not in mangroves.
 11. Flowers lavender to pink; inflorescence commonly a large panicle; leaves uniformly 5-foliolate; Mexico to northern Venezuela and coastal Ecuador. *T. rosea*.
 11. Flowers white; inflorescence usually few-flowered; leaves (3–)5–7-foliolate; Guayana, Amazonia, and the cerrado. *T. insignis* var. *insignis*.
 9. Leaves simple or 1-foliolate (rarely 3-foliolate in part); Guayana and Amazonia to coastal Brazil.
 12. Leaves often puberulous below when young, small (less than 10 cm by 3.5 cm); flowering inflorescence without small buds; laja outcrops of upper and middle Orinoco. *T. orinocensis*.
 12. Leaves lepidote, otherwise completely glabrous, larger (mostly more than 8 × 3 cm); flowering inflorescence also with small buds; Guayana to Amazonia and coastal Brazil, not on laja.
 13. Leaves simple with the blade attenuate onto the poorly differentiated petiole; narrowly obovate, apically obtuse to rounded, never apiculate; coastal Brazil. *T. cassinoides*.
 13. Leaves unifoliolate (at least with a flexed petiole apex), elliptic to oblong-elliptic or broadly oblanceolate; apex acute or apiculate; lowland Guayana and Amazonia.
 14. Leaves more than 14 cm long and 6 cm wide, mostly elliptic or elliptic-oblong, the base obtuse or broadly cuneate; secondary veins prominent below; Guayana to Amazonia. *T. insignis* var. *monophylla*.
 14. Leaves less than 13 cm long and 4.2 cm wide, obovate to oblanceolate, cuneate-attenuate at base; secondary veins not raised below; Amazonas Territory, Venezuela. *T. insignis* var. *pacimonensis*.

Group 7

Antillean species with simple leaves. Corolla white to magenta or red, glabrous; branchlets, inflorescences, calyces and leaves lepidote with sessile peltate scales, sometimes also with stalked-peltate scales and/or simple trichomes formed from the "decapitated" stalked-peltate trichomes; capsule lepidote.

1. Leaves microphyllous, <0.9 cm wide, mostly <2 cm long (the largest exceptionally to 3(–5) cm long); branching always dichotomous.
 2. All leaves nearly as broad as long, less than twice as long as wide, the largest 1.4 mm long, apex rounded. *T. microphylla*.
 2. Most leaves more than twice as long as broad, apex rounded or acute.
 3. Leaves oblong, the apex obtuse (sometimes with a spinose apicule).
 4. Leaves very densely whitish lepidote beneath, the surface invisible between the scales. *T. myrtifolia* var. *myrtifolia*.
 4. Leaves concolorous, sparsely to densely lepidote beneath, the surface visible between the scales. *T. myrtifolia* var. *petrophila*.
 3. Leaves narrowly elliptic, the apex acute. *T. densifolia*.
1. Leaves small to large, mostly >2 cm long and 0.8 cm wide; branching sometimes trichotomous.
 5. Leaves medium-small, mostly <6 cm long and 3 cm wide; flowers light pink to almost white; branching dichotomous or trichotomous.
 6. Branching trichotomous; congested short-shoots sometimes present; leaves in whorls of 3; fruit ribbed or not.
 7. Leaves large (to 8.5 cm long), apiculate, serrulate near apex; western Cuba (Pinar del Rio and Isla de Juventud). *T. lepidophylla*.
 7. Leaves smaller (mostly <5 cm long), emarginate or rounded at apex, not apiculate, entire; eastern and central Cuba (Villa Clara to Oriente).
 8. Leaves linear-oblong, 2.5 cm long, the apex rounded. *T. linearis*.
 8. Leaves oblong-oblancoolate to almost orbicular, emarginate. *T. trachycarpa*.
 6. Branching dichotomous, congested short-shoots not present; leaves opposite.
 9. Leaf upper surface rough to the touch, apex usually apiculate; leaves usually more or less discolorous, often distinctly whitish beneath.
 10. Leaves narrowly oblong, not strongly discolorous, the lepidote scales below of two kinds, small and dense and large and scattered; western Cuba. *T. jackiana*.
 10. Leaves narrowly elliptic or obovate, very densely lepidote below, often discolorous; Hispaniola and easternmost Cuba. *T. obovata*.
 9. Leaf upper surface smooth to the touch; apex emarginate, more or less concolorous, olive beneath. *T. simplicifolia*.
 5. Leaves large, mostly >6–8 cm long; flowers light pink to red; always dichotomously branched.
 11. Corolla red, salverform-tubular; anthers exerted or subexserted; Puerto Rico.
 12. Leaves elliptic; Luquillo mountains. *T. rigida*.
 12. Leaves obovate to oblanceolate; western and central Puerto Rico. *T. schumanniana*.
 11. Corolla pink or lavender to whitish, tubular-infundibuliform; anthers deeply included; Cuba or lesser Antilles.
 13. Leaf undersurface drying white with darker venation. *T. hypoleuca*.
 13. Leaf undersurface drying tan, olive, or brownish olive.
 14. Leaves broadly ovate with cordate bases; petiole 0.1–0.5 cm long. *T. caleticana*.
 14. Leaves elliptic-oblong to narrowly obovate, not cordate; petiole >1 cm long.
 15. Cuba; petiole mostly 1–3 cm long; leaves thick-coriaceous.
 16. Leaves percoriaceous with revolute margin; leaf undersurface densely lepidote with sessile overlapping scales, drying grayish or grayish olive; fruit <5 cm long, short, fusiform, with thick woody valves; corolla throat scurfy puberulous. *T. dubia*.
 16. Leaves coriaceous without revolute margins; leaf undersurface densely lepidote, in part with short-stalked peltate scales, more or less rough to the touch; drying brown to blackish; fruit >5 cm long, linear-oblong, the valves coriaceous; corolla throat very sparsely puberulous. *T. clementis*.
 15. Lesser Antilles; petiole of largest leaves usually 3–7 cm long; leaves coriaceous. *T. pallida*.

Group 8

Hispaniolan species with large (mostly >10 cm long), thick-coriaceous bullate leaflets strongly and intricately raised-reticulate and puberulous with simple trichomes below; petiole short (<1.5 cm long) and very thick (3–10 mm across).

1. Flowers white; corolla tubular-infundibuliform; calyces strongly ridged, brown-drying; leaf undersurface trichomes sparser and irregularly oriented. *T. bullata*.
1. Flowers red or purple-red; corolla narrowly tubular-campanulate; calyces usually not ridged, black-drying; leaf undersurface trichomes short and dense, evenly oriented inside the areoles. *T. acrophylla*.

Group 9

Antillean species with mostly compound leaves, the leaflets discolored and strongly whitish below. Corolla white to magenta, glabrous; branchlets, inflorescences, calyces and leaves lepidote with sessile peltate scales, sometimes also with stalked-peltate scales and/or simple trichomes formed from the “decapitated” stalked-peltate trichomes; capsule lepidote.

1. Puberulous with simple trichomes at least on leaflet midveins below and sometimes on calyx and branchlets; leaves 1–5(–9)-foliolate, if 5(–6)-foliolate, the base ± cuneate; calyx and inflorescence (where known) ± rufescent; eastern Cuba.
 2. Leaves 1–3(–5)-foliolate; calyx and inflorescence unknown; coastal lowlands near Baracoas. *T. polymorpha*.
 2. Leaves 3–5(–9)-foliolate; calyx and inflorescence ± rufescent; uplands in Sierra de Nipe. *T. bibracteolata*.
1. All trichomes of leaves, calyx, and branches lepidote, sometimes with a few short-stalked peltate trichomes but these never “decapitated”; leaves (1–)3–9-foliate; leaflet base cuneate (only on Hispaniola) or not; Cuba, Hispaniola, Jamaica, and the Bahamas.
 3. Calyx >13 mm wide; corolla broadly infundibuliform above a narrow basal tube, white; anthers subsessile (bat-pollinated); Jamaica. *T. platyantha*.
 3. Calyx 5–8 mm wide; corolla narrowly tubular-infundibuliform above basal tube, usually pink or pinkish; anthers deeply included (bee-pollinated); Jamaica, Cuba, Bahamas, Hispaniola.
 4. Secondary and tertiary venation of leaflet undersurface very obscure; flowers usually white (Jamaica) or the margin more or less erose.
 5. Leaves mostly 3-foliate; margins somewhat erose; Cuba. *T. arimaoensis* (p.p.).
 5. Leaves mostly 5-foliate; margin not at all erose; Jamaica and the Cayman Islands. *T. heterophylla* (p.p.).
 4. Secondary and tertiary venation of leaflet undersurface ± prominulous; flowers pink to pinkish white; leaflet margin sometimes inconspicuously erose only in the Bahamas; Cuba, Bahamas, Hispaniola.
 6. Leaflet bases ± cuneate; leaves (1–)3–5-foliate; petiole and petiolules not noticeably slender; mostly Hispaniola, also vicinity of Santiago de Cuba. *T. berteroi*.
 6. Leaflet bases usually obtuse to rounded; leaves 5–7(–9)-foliate; petiole and petiolules often conspicuously slender; Cuba and the Bahamas. *T. bahamensis*.

Group 10

Antillean species with mostly compound leaves, the leaflets concolorous or discolored but not strongly whitish below (often tannish or light brown, especially when margins erose); leaflet margins often erose or revolute (or both). Corolla white to magenta, glabrous; branchlets, inflorescences, calyces and leaves lepidote with sessile peltate scales, sometimes also with stalked-peltate scales and/or simple trichomes formed from the “decapitated” stalked-peltate trichomes; capsule lepidote.

1. Leaves percoriaceous, smooth and rather shiny, the margins completely entire; glabrous except for lepidote trichomes, no stalked-lepidote trichomes on calyces, bracts, or inflorescence; mostly on serpentine.
 2. Petioles short and thick, <1.5(–2) cm long (or if occasionally longer shorter than longest petiolules); Dominican Republic (one old Cuban collection).
 3. Flowers magenta; stamens deeply included; glabrous at level of stamen insertion; on serpentine. *T. ophiolitica*.
 3. Flowers red; anthers subsessile or held in upper third of tube; trichomes present at stamen insertion; mostly on limestone. *T. crispiflora*.
2. Petioles in part >2 cm long, longer than longest petiolules; Cuba or Puerto Rico.
 4. Flowers red; stamens exserted; Puerto Rico. *T. haemantha*.
 4. Flowers white to pink; stamens included; Cuba.
 5. Leaflets strongly bullate, mostly subcordate at base and at least the laterals subsessile; Baracoa region of easternmost Cuba. *T. pinetorum*.
 5. Leaflets not bullate, the secondary nerves prominulous or subprominulous below, the leaflet bases mostly obtuse to rounded, occasionally subcordate.

6. Flowers white; fruit valves woody, 2 mm thick; leaves mostly 3-foliolate with asymmetric \pm sessile basal leaflet pair, usually in part simple; mostly above 500 m elevation. *T. inaequipes*.
6. Flowers pink; fruit valves thin-coriaceous; leaves mostly 3–7-foliolate, occasionally in part simple; mostly below 500 m elevation; Sierra de Nipe and Moa areas.
 7. Terminal leaflet $>(1.5-)$ 2 cm wide; basal leaflets often subsessile; basal petiolule <1 cm long; petiole thick; leaves mostly 3–5-foliolate. *T. moaensis*.
 7. Terminal leaflet <2 cm wide; basal leaflets with slender petiolule 0.7–2 cm long; petiole relatively slender; leaves mostly 5–7-foliolate. *T. elegans*.
1. Leaflets thin-coriaceous to coriaceous; leaflets frequently dull and/or with roughish surface, the margins sometimes erose; sometimes with minute simple trichomes or stalked-lepidote trichomes; not on serpentine.
 8. Puberulous in part with simple (=decapitated?) trichomes (as well as peltate-stalked and sessile lepidote scales) at least at base of midvein and adaxial surface of petiole; usually also on inflorescence and calyx; flowers deep pink to wine-red with a densely papillose-puberulous or pilose corolla throat or the corolla lavender to light magenta with the tube glabrous or barely scurfy papillose inside; Hispaniola.
 9. Flowers white to light magenta; anthers deeply included; corolla tube glabrous or very slightly scurfy-papillose in throat; vegetatively puberulous with simple trichomes at least on petiole and near base of midvein.
 10. Tertiary venation strongly raised-reticulate beneath; leaflet margin erose; leaves, pedicels and calyces with long-stalked peltate scales and multicelled simple hairs; northern Haiti. *T. buchii*.
 10. Tertiary venation barely prominulous beneath; leaflet margin not erose; leaflets (at least near base of midvein above) and pedicels lepidote and with short single-celled simple trichomes; Samaná Peninsula, Dominican Republic. *T. paniculata*.
 9. Flowers dark magenta to wine-colored; corolla tube densely papillose-puberulous or pilose in throat; anthers subexserted or barely included; vegetative pubescence with or without simple trichomes.
 11. Throat of corolla tube papillose-puberulous; pubescence of inflorescence and calyx a mixture of sessile and very short-stalked black scales; minutely puberulous with single-celled trichomes on petioles and along leaflet midveins below, the leaflet margins \pm erose; karst limestone area S of Bahia de Samaná, near sea level. *T. zanonii*.
 11. Throat of corolla tube pilose; pubescence of inflorescence rufescent with mixture of sessile and peltate-stalked scales; vegetative trichomes all stalked-peltate or sessile; leaflet margins entire; Cordillera Central above 1200 m. *T. vinosa*.
 8. Leaves and inflorescence only with sessile or subsessile peltate scales; flowers usually white to pale pink, when crimson or deep wine-red the throat glabrous (*T. dominguensis*, *T. revoluta*) or rather sparsely pilose (*T. conferta*, *T. sauvallei*); various islands.
 12. Leaflets drying light tannish with contrasting darker or lighter main veins, the midvein and usually the secondary veins sharply raised below and more or less impressed above; margin more or less erose, not conspicuously revolute; surface dull and usually rough to the touch above; mostly on karst limestone; Cuba and Haiti.
 13. Leaflets linear-lanceolate, the terminal leaflet 7–10 times as long as wide, with 13–25 secondary veins on each side, the margin strongly erose; southern Haiti. *T. multinervis*.
 13. Leaflets elliptic to narrowly obovate, <3 times as long as wide, with fewer than 12 secondary veins per side; margins slightly to strongly erose; Cuba and Hispaniola.
 14. Calyx 18–23 mm long; terminal leaflets 8–21 by 4–11 cm; ultimate branchlets thick and corky, 5–10 mm wide; anthers subexserted; southern Haiti. *T. conferta*.
 14. Calyx 9–13 mm long; terminal leaflets <10 by 4.5 cm; branchlets <5 mm thick; anthers included to subexserted; Cuba and Haiti.
 15. Anthers subexserted; corolla deep wine-red to purple, narrowly tubular-campanulate, <1 cm wide at mouth of tube, the lobes <1 cm long; Trinidad mountains of central Cuba. *T. sauvallei*.
 15. Anthers included; corolla white to light magenta, tubular-infundibuliform above narrow base, 1 cm wide at mouth, the lobes >1 cm long; Haiti and Cuba. *T. calcicola*.
 12. Leaflets drying olive to grayish below, the secondary veins usually plane above and merely prominulous or subprominulous below, the margin often both entire and not at all or very slightly revolute; various substrates and islands.
 16. Leaflets mostly narrowly oblong-elliptic (sometimes in part oblanceolate, rarely narrowly obovate), usually small (terminal leaflets mostly <3 by 1 cm); at least the lateral leaflets and sometimes the terminal ones sessile or subsessile, the margin either conspicuously revolute or minutely erose (or both).

17. Flowers crimson or wine-red, the corolla narrowly tubular-infundibuliform to almost salverform, the throat glabrous; central Hispaniola above 500 m. *T. revoluta*.
17. Flowers light pink or lavender; corolla tubular-infundibuliform, the throat glabrous to conspicuously puberulous; various islands, near sea level.
18. Corolla glabrous in throat; all leaflets very narrowly elliptic-oblong, the margins entire and revolute, even the terminal sessile or subsessile; Samaná Bay, Hispaniola. *T. maxonii*.
18. Corolla scurfy puberulous to conspicuously puberulous in throat; leaflets narrowly elliptic-oblong to oblanceolate or narrowly obovate, the margins sometimes erose and sometimes not revolute, when narrowly elliptic-oblong with a revolute entire margin then the terminal leaflet distinctly petiolulate; various islands.
19. Leaflets thin-coriaceous with erose margins, the secondary veins distinctly raised below, the lower surface rather distinctly whitish-lepidote; inflorescence several-flowered; corolla throat scurfy puberulous; Trinidad area of central Cuba. *T. glaucescens*.
19. Leaflets various but without the above combination of characters, often strongly coriaceous, the margin often revolute, the terminal leaflet often subsessile, and the lower surface usually less strongly whitish lepidote; flowers usually solitary or borne 2 or 3 together; corolla throat sparsely to conspicuously puberulous on the throat ridges; Cuba, Hispaniola, and the Bahamas. *T. lepidota*.
16. Leaflets not elliptic-oblong (except very rarely when either chartaceous to very thin-coriaceous or large and >2.5 cm wide), the terminal leaflets usually more or less obovate to obovate-elliptic, with a petiolule 0.2–5.5 cm long; leaflets small to large, the largest usually >2 cm wide, the margins usually entire and usually not strongly revolute.
20. Leaves 5–9-foliolate, almost always in part 7-foliolate; leaflets narrowly oblong-elliptic to oblong-lanceolate or oblong-oblanceolate, chartaceous to coriaceous, sometimes with minute simple trichomes along midvein below; larger leaves usually with slender terminal petiolule 2–5 cm long.
21. Leaflets chartaceous to thin-coriaceous, the midvein below and petiolules often with minute simple trichomes; calyx caducous in fruit (where known); terminal leaflet >(2.1)–2.4 times as long as wide; Jamaica and lowland Cuba (<600 m).
22. Leaflets more or less acuminate, the margin entire to slightly erose; Cuba and Jamaica. *T. angustata*.
22. Leaflets rounded at apex, the margin conspicuously erose; eastern Cuba. *T. brooksiana*.
21. Leaflets coriaceous, with sessile lepidote scales, never with any simple trichomes; calyx persistent in fruit; Hispaniola and upland Cuba (>650 m).
23. Flowers magenta to wine-colored; corolla tube glabrous inside, lacking well-defined basal cylinder, the base ca. 5 mm across; Barahona Peninsula of Hispaniola. *T. dominguensis*.
23. Flowers white to pale pink; corolla tube pubescent in floor of throat, with a well-defined basal cylinder <4 mm across; Cuba and Hispaniola.
24. Corolla pure white, the tube densely pilose in throat; precociously flowering; fruit densely lepidote, coriaceous; Hispaniola. *T. polyantha*.
24. Corolla pale pink to whitish, the tube scurfy puberulous in throat; flowering with leaves; fruit sparsely lepidote, subwoody; Cuban Sierra Maestra. *T. shaferi*.
20. Leaves (1)–3–5-foliolate, almost never 7-foliolate; leaflets variable in size and shape, usually less oblong and obovate to elliptic, the terminal leaflet usually <2.4 times as long as wide, narrower only when terminal petiolule very thick or <2 cm long; leaflets thin-coriaceous to coriaceous, the midvein and petiolules only with sessile peltate scales.
25. Leaves mostly 5-foliolate (sometimes in part 3-foliolate); larger leaves with petiolules of basal leaflet pair 1–3 cm long; western Cuba. *T. leptoneura*.
25. Leaves 1–5-foliolate; basal leaflet pair usually asymmetrically subsessile, the basal petiolules always <1 cm long; throughout Antilles.
26. Leaflets narrowly oblong with erose margins, the undersurface paler from the dense lepidote scales; Cuba.
27. Leaves mostly 3-foliolate; terminal leaflet <6 cm long; Villa Clara. *T. arimaensis* (p.p.).
27. Leaves mostly 5-foliolate; terminal leaflet 9–19 cm long; Oriente. *T. elongata*.
26. Leaflets variously shaped but very rarely narrowly oblong, the terminal leaflet usually more or less obovate or oblong-elliptic; margins usually entire, erose

only when thin-coriaceous and with grayish-olive undersurface; widespread in Antilles.

28. Leaflets apiculate; leaves in large part 1-foliolate, clustered toward branch apices; branching mostly trichotomous; Pinar del Rio, Cuba. *T. ×del-riscoi*.
28. Leaflets not apiculate; leaves mostly 3–5-foliolate, usually not conspicuously clustered toward branch apices; branching uniformly dichotomous; throughout Antilles. *T. heterophylla*.

1. *Tabebuia acrophylla* (Urban) Britton, Bull. Torrey Bot. Club 42: 378. 1915.

Tecoma acrophylla Urban, Symb. antill. 3: 374. 1903. Type. Haiti. Prope Bilboro, *Buch* 349 (B*, NY–fragm.).

Tabebuia rugosa Leonard, J. Washington Acad. Sci. 14: 415. 1924. Type. Dominican Republic. Samaná: Samaná Península, *Abbott* 2272 (holotype, US).

Small tree or slender shrub, 2–8 m tall, unbranched or sparsely branched, the branchlets longitudinally wrinkle-ridged, minutely lepidote when young. *Leaves* 3-foliolate, the leaflets elliptic to oblong-ovate, obovate or oblanceolate, more or less rounded at apex, sometimes retuse or inconspicuously apiculate, gradually narrowed to the cuneate to narrowly subcordate base, the lateral leaflets usually more or less sessile with asymmetric bases, 7–30 cm long, 2.2–17 cm wide, thick coriaceous (thinner when young), the venation plane or somewhat impressed above, intricately raised below, above stalked-lepidote with peculiar stellate-tipped trichomes when young, soon glabrescent, below more or less lepidote along the veins and conspicuously and persistently puberulous with the more or less appressed trichomes filling the network between the ultimate veinlets; petioles thick and short, 0.5–1.5 cm long, more or less minutely puberulous, usually with conspicuous tan-drying lenticels. *Inflorescence* terminal, often in the dichotomy between two branches, paniculate, often contracted, puberulous with more or less stalked-lepidote stellate-tipped trichomes. *Flowers* with the calyx tubular-campanulate, irregularly bilabiate, more or less puberulous with the same irregularly fimbriate-tipped stalked stellate-lepidote trichomes as the inflorescence (these sometimes mostly sessile and the calyx then glandular-lepidote), the trichome tips sometimes mostly broken and the calyx apparently puberulous with simple trichomes, 9–16 mm long, 7–11 mm wide; corolla red or wine-red, narrowly

tubular-campanulate, abruptly flaring to the broad lobes, 2.5–5 cm long, the tube 2–3.5 cm long, 0.5–1.2 cm wide at mouth of tube, the lobes 0.5–0.9 cm across, glabrous outside, pilose in floor of throat inside; stamens didynamous, the anther thecae divaricate, 3 mm long; ovary linear, 4 mm long; disk annular-patelliform, 1.5 mm long, 3–4 mm wide. *Fruit* (juvenile) linear, 7–10 cm long, 5–10 mm wide, densely lepidote in part with more or less stalked trichomes.

Distribution (Fig. 39). Northern Hispaniola, from Haiti to the Samaná Península of the Dominican Republic, mostly in pine barrens on lateritic or serpentine soils or on limestone from near sea level to 800 m; one doubtfully identified collection from 1700 m.

Specimens examined. HAITI. Prope Bilboro, 600 m, May 1900 (fl), *Buch* 349 (NY); prope Monbin, 9 Sep 1909, *Christ* 2186 (NY); Port Margot, Morne Mauleuvre, 800–1000 m, 8 Dec 1924 (st), *Ekman* H2782 (S); St. Louis du Nord, Morne Baron, 800 m, 22 Apr 1925 (fl), *Ekman* H3861 (S, US); Mt. Organise near Rivière Terre-Neuve, 660 m, 31 May 1926 (st), *Ekman* H6214 (S, US); Valliere, Gde. Pavane, 700 m, 2 May 1928 (fl), *Ekman* H9945 (B, NY, S).

DOMINICAN REPUBLIC. La Manaclita, Los Algarrobos, 300 m, 28 May 1968 (fl), *Liogier* 11475 (NY); **DAJABÓN:** Cerro de Chacuey, Partido, 200–700 m, 4 Oct 1969 (fl), *Liogier* 16253 (NY, US). **EL CEIBO:** Los Haitises, Samaná Bay, 19 May 1969 (fl), *Liogier* 14525 (NY, US); Boca del Infierno, Los Haitises, 25 Jun 1930 (fl), *Ekman* H15443 (B, S, US); **LA VEGA:** Vic. Piedra Blanca, 200–500 m, 14 Oct 1947 (fl), *Allard* 16069 (GH, NY, S, US); Río Camu near Guaigui, 9 km W of La Vega, 340 m, 19°1'N, 7°32'W, 9 Apr 1985 (st), *Gentry & Zanon* 50652 (JBSD, MO); Barrancón, Bonao to Hato Viejo, 200–300 m, 17 Apr 1969 (fl), *Liogier* 14827 (NY, US), Bonao to Hato Viejo, 10 May 1969 (fl), *Jiménez* 5667 (NY); Barrancón-Bonao, 250 m, 17 Oct 1974 (fl), *Liogier* 17594 (NY); Cienaga de Manabao, Jarabacoa, La Cotorra, 1700 m, 10 Dec 1969 (fl), *Liogier* 17190 (NY); **LIBERTADOR:** Betw. Restauración and Banica, 20–23 Aug 1950 (fl), 20 Aug 1950 (fl), *Howard* 12567 (A, BM, US). **SAMANÁ:** Lajana, Samaná Península, 100 m, 30 Apr 1922 (fl), *Abbott* 2272 (US) (st), 2293 (US). **SAN CRISTÓBAL:** 23 km N of Yamasa, road to Maimón, 310 m, 18°50'N, 70°2'W,

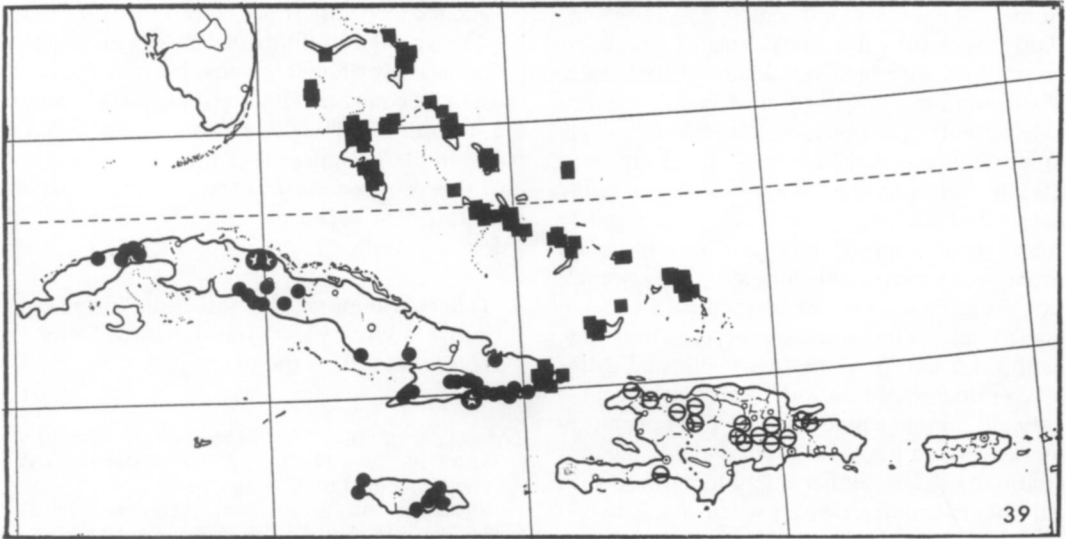


FIG. 39. Distribution of Antillean *Tabebuia*. \circ = *T. acrophylla*; \bullet = *T. angustata*; \odot = *T. arimaensis*; \blacksquare = *T. bahamensis*.

7 Apr 1985 (fl), Gentry & Zanon 50583, 50585 (both JBSD, MO). SANTIAGO: La Leonor, 6 Apr 1955 (fl), Jiménez 2872 (US); entre La Leonor y Monción, 500 m, 16 Mar 1975 (fl), Liogier & Liogier 22608 (JBSD).

Local name. Pata de cotorra.

This species and closely related *T. bullata* are very distinctive in their large thick coriaceous leaves with very short thick petioles and strongly intricately raised-reticulate venation beneath. They also have an unusual inflorescence indumentum with long-stalked erose-margined pelate scales. The closest relative to this species pair is *T. buchii*, which differs in smaller, less coriaceous, erose-margined leaflets and thinner petiole.

The Haitian material tends to have larger flowers and more noticeably pubescent inflorescences than Dominican material. Leonard differentiated *T. rugosa* on account of its smaller flowers and larger leaves and leaflets which are glabrous above. Leaf and flower size are variable and the indumentum of the leaf upper surface is early glabrescent, even when present. It seems inadvisable to differentiate the lowland Dominican Republic collections, which include the type of *T. rugosa*, from the Haitian populations, including typical *T. acrophylla*, on the basis of flower size and inflorescence pubescence, since geographically intermediate collections (e.g., Liogier 16253) are intermediate in these characters.

2. *Tabebuia alba* (Chamisso) Sandwith, Lilloa **14**: 136. 1948.

Tecoma alba Chamisso, Linnaea 7: 655. 1832. Type. Brazil. Paraná and Rio Grande do Sul, Sellow s.n. (B*; lectotype, HBG).

Handroanthus albus (Chamisso) Mattos, Loefgrenia **50**: 2. 1970.

Tree to 25 m, usually small and flowering when (3–)6–8 m tall, the twigs terete, longitudinally striate, when young densely covered with a fine yellowish-tan tomentum, this glabrescent on old branches. *Leaves* palmately 5–7(–9) foliolate, the leaflets narrowly elliptic to ovate or obovate, acute to short-acuminate at apex, rounded to broadly cuneate at base, conspicuously and evenly serrate, 5–25 cm long, 2–12 cm wide, chartaceous to subcoriaceous, strongly discolorous, dark above and silvery tan below, densely and persistently finely tomentose with pale dendroid trichomes below, sometimes with scattered black gland dots near the midvein, above more sparsely dendroid pubescent when young, but becoming more or less glabrate at maturity except for scattered lepidote scales; petiolules 0.5–9 cm long (usually even the basal petiolules at least 1.5 cm long), the petiole 3.5–36 cm long, finely dendroid puberulous to glabrescent. *Inflorescence* an open terminal panicle, often to 30 cm across, densely whitish lanose-puberulous with dendroid tri-

chomes, the bracts and bracteoles caducous. *Flowers* with the calyx campanulate, densely lanose-villous with light tan dendroid trichomes, 17–30 mm long, 9–15(–18 in *Mosén 3981*) mm wide, irregularly 5-lobed; corolla yellow, tubular-infundibuliform, 6–18 cm long, 1.5–3 cm wide at mouth of tube, the tube 4–6.5 cm long, the lobes 1.5–2 cm long, glabrous outside except in sinuses of the corolla lobes, inside villous on throat ridges with mostly long simple trichomes; stamens didynamous, the filaments 1.5–2.5 cm long, the anther thecae divaricate, ca. 2 mm long; pistil 3–4.5 cm long, the ovary ellipsoid-cylindrical, 5 mm long, 2 mm wide, glabrous except for scattered minute lepidote scales. *Fruit* linear, terete, 25–50 cm long, 1–1.7 cm wide, finely longitudinally striate, rather finely tomentose with dendroid trichomes, densely when young, sometimes sparsely at maturity, varying from light tan when young to more or less rufescent; seeds thin, bialate, 0.6–0.9 cm long, 2.3–3 cm wide, the hyaline wings clearly demarcated from brownish seed body.

Distribution (Fig. 40). Minas Gerais and Rio de Janeiro to Rio Grande do Sul and Misiones, Argentina; mostly in subtropical forest, especially in the *Araucaria* zone; 300–1100 m.

Representative specimens examined. BRAZIL. MINAS GERAIS: Caldas, 21 Oct 1868 (fl, fr), *Regnell III-53* (RB, US). PARANÁ: Curitiba, 14 Oct 1914 (fr), *Dusen 15611* (MICH, NY, P); Pedreira do Rio Pinhal, Mun. Campiã Grande do Sul, 25 Jan 1985 (st), *Gentry & Zardini 49862* (MO). RIO GRANDE DO SUL: Fartoupilha, 5 Nov 1957 (fl), *Camargo 2438* (B). RIO DE JANEIRO: Nova Friburgo, 11 Aug 1881 (fl), *Glaziou 12964* (BR, F, G, R). SANTA CATARINA: Riosinho, Bon Retiro, 18 Nov 1956 (fl), *Reitz & Klein 3974* (BR, G, L, NY, WIS); Lauro Muller, 23 Aug 1958 (fl), *Reitz & Klein 7037* (BR, G, L, M, MBM, MO, NY, US). SÃO PAULO: Piedade, 11 Aug 1954 (fl), *Kuhlmann 2988* (IAN, UB); Alto da Serra, Estac. Biolog., 17 Oct 1931 (fl), *Lemos s.n.* (SP).

PARAGUAY. ALTO PARANÁ: 30 km NW of Hernandarias, road to Salto del Guaira, 270 m, 25°15'S, 54°50'W, 26 Sep 1987 (fr), *Gentry et al. 59436* (MO, PY); Centro Forest, Alto Paraná, 12 km W of Pto. Pte. Stroessner, 2 Feb 1984 (st), *Little 40126* (MO, PY).

ARGENTINA. MISIONES: Campo Grande, 8 Nov 1944 (fr); *Ragonese & Castiglioni D2541* (K).

Common names. Brazil: ipe-da-serra, ipe-mandioca, ipe-branco, ipe-vacariano, ipe-amarelo, ipe-mamono, ipe-pardo, ipe, aipe, pau-d'arco-amarelo; Argentina and Paraguay: lapacho, lapacho amarillo.

A collection from Minas Gerais (*Mosén 3981*) has the typical multifoliolate leaves with sharply serrate densely white tomentose leaflets of *T. alba* but a more contracted inflorescence with broader (15–18 mm wide) woolly lanose calyces with, in part, simple trichomes 2–3 mm long. Presumably this is only a local variant. It might also be a mixture of flowering material of *T. vellosi* with a detached leaf of *T. alba*.

3. ***Tabebuia angustata*** Britton, Bull. Torrey Bot. Club 42: 376. 1915. Type. Jamaica. Dolphin Head, *Harris 9253* (holotype, NY; isotypes, A, BM). Fig. 61.

Tecoma heptaphylla "Martius ex DC." A. Richard in Sagra Hist. Cuba 11: 106. 1850, non Martius ex A. P. de Candolle, Prodr. 9: 218. 1845.

Tabebuia trinitensis Britton, Bull. Torrey Bot. Club 42: 373. 1915. Type. Cuba. Las Villas: Trinidad Mountains, Britton, Earle, & Wilson 4866 (holotype, NY). *Tabebuia richardiana* Urban, Feddes Repert. 22: 48. 1925. Nom. nov. for *Tecoma heptaphylla* A. Richard, non Martius ex DC. Type. Cuba. Pinar del Rio: Sierra de los Organos inter Echevarria et Mameyar (st), *Ekman 17503* (S).

Tree to 15 or more m tall, dichotomously branched, the branchlets terete, rather sparsely lepidote with small sessile scales. *Leaves* 5–7(–9)-foliolate, the leaflets narrowly oblong-elliptic to oblong-lanceolate or oblong-oblancheolate, the apex nearly always at least in part more or less acuminate (sometimes merely acutish), the base cuneate to rounded, the terminal 5–17 cm long, 1.5–6.8 cm wide (2.4–4.9 times as long as wide), the basals 3.5–11 cm long, 1.2–4 cm wide, chartaceous to thin-coriaceous, varyingly lepidote above and below, when mature usually rather densely lepidote with different-sized peltate scales, these mostly whitish, often intermixed with scattered reddish scales below, sometimes inconspicuously minutely puberulous along midvein below, the secondary veins prominulous below, plane above, the tertiary venation rather intricately prominulous below, especially in juveniles, in some populations drying dark brown to olive above, light brown to light olive below, the margin entire to somewhat erose, with large plate-shaped glands near base of midvein below, the terminal petiolule 1.5–5 cm long, the basal petiolules well-developed, (0.6–)1–4 cm long (sometimes shorter in 7-foliolate leaves), the petiole 3.5–15 cm long, petiole and petiolules rather



FIG. 40. Distribution of South American *Tabebuia*. ● = *T. alba*; ⊕ = *T. arianae*; ■ = *T. aurea*; ★ = *T. barbata*; ▲ = *T. billbergii* ssp. *billbergii*; ◆ = *T. billbergii* ssp. *ampla*.

slender, more or less lepidote, sometimes inconspicuously and sparsely minutely puberulous, usually with lax trichomes at apex of petiole. *Inflorescence* a dichotomously branched few- to many-flowered terminal panicle, lepidote with dark-drying scales. *Flowers* with the calyx cupular, irregularly 2–3-lobate, 8–17 mm long, 5–11 mm wide, densely lepidote with dark-drying sessile peltate scales; corolla white to pale pink or lavender, tubular-infundibuliform, 4–8 cm

long, 1–2 cm wide at mouth of tube, the tube 3–5 cm long, the lobes 1–3 cm long, glabrous outside, scurfy puberulous in throat inside, villous at level of stamen insertion, the lobes more or less ciliate; anthers included in lower part of tube, the thecae divaricate, 2–3 mm long; ovary linear, longitudinally ridged, lepidote, 5–6 mm long, 1 mm wide, the ovules 2-seriate in each locule; disk annular-pulvinate, 1–1.5 mm long, 2–2.5 mm wide. *Fruit* a linear-cylindric capsule, attenuate

toward base and apex, 13–24 cm long, 8–11 cm wide, the valves thin-coriaceous, more or less striate-costate, minutely lepidote, the calyx caducous; seeds thin, bialate, 5–8 mm long, 19–27 mm wide, the hyaline-membranaceous wings sharply demarcated from seed body.

Distribution (Fig. 39). Cuba and Jamaica, 0–700(–1000) m. Most habitat notes indicate streamsides, swamps, coastal lowlands, or the edge of mangroves.

Representative collections. CUBA. CAMAGÜEY: Altagracia, Apr 1975 (st), *Areces & Alvarez s.n.* (HAJB29495) (HAJB). CIENFUEGOS: Belmonte, Soledad, 2 Aug 1927 (fl), *Jack 5214* (A, NY, US). GRANMA: Las Mercedes, Comayayabo El Carey, Aug 1947 (fl), *Casas s.n.* (HAC14772) (HAC). GUANTÁNAMO: 15 km SW of Compañía de Moa mill, Moa, Jul 1941 (fl), *Howard 5880 p.p.* (GH, US). HABANA: Escaleras de Jaruco, 60 km SE of Habana, 5 Jul 1985 (fr), *Gentry 50830* (MO). HOLGUÍN: Valley of Río Matamoros, S of Holguín, 13 Apr 1909 (fl), *Shafer 1333* (NY, US). PINAR DEL RÍO: Taco-Taco River, Rangel, Sierra del Rosario, Jan 1957 (st), *Alain 6129* (GH, US). SANTIAGO DE CUBA: Siboney, Jun 1951 (fl), *Clemente 7602* (GH, NY, US). VILLA CLARA: Vic. of Soledad, E of Guaos, Jun 1941 (fl), *Howard 6614* (GH, NY, US).

JAMAICA. CLARENDON: Four Paths, 9 May 1956 (st), *Stearn 840* (A, BM). HANOVER: Negril Beach, 3 Apr 1964, *Robertson 24793* (UCWI). PORTLAND: Betw. Millbank and Bowden Pen, 6 Jun 1968 (fl), *Proctor 28761* (BM, NY). ST. ANDREW: Money Corner, 4 mi from Castleton, 18 Apr 1956 (fl), *Stearn 785* (A, BM). ST. CATHERINE: Castletown Distr., 15 Jun 1904 (fl), *Harris 8637* (BM, NY, UCWI). ST. ELIZABETH: Frenchman, 21 May 1966 (fr), *Proctor 26863* (BM). ST. MARY: Ballard's Valley, S of Port Maria, 18 Apr 1956 (fl), *Stearn 781* (A, BM, S, UCWI). ST. THOMAS: Bacleber's Hall, 15 Sep 1908 (fl), *Britton 3611* (NY). WESTMORELAND: Negril, 29 Mar 1962 (fl), *Adams 10974* (BM, M).

Local names. Jamaica: white wood. Cuba: roble, roble blanco.

Used for construction timber.

This is the most common Cuban species of *Tabebuia* with 7-foliolate leaves and the only 7-foliolate Jamaican species. When he published them simultaneously, Britton (1915) differentiated *T. brooksiana* by its 7-foliolate leaves, and *T. trinitensis* by its 4–5-foliolate leaves and unspecified differences in ultimate venation and leaf texture. *Tabebuia angustata* was presumably differentiated by being Jamaican, although Cuban collections have subsequently been referred to that species. The differences in leaflet form and texture differences between *T. trinitensis* and *T. angustata* seem minor, and inadequate to justify

specific recognition, especially as Jamaican material closely approaching typical *T. trinitensis* has recently been collected.

4. *Tabebuia arianae* A. Gentry, sp. nov. Type. Brazil. Espírito Santo: Reserva Florestal CVRD, near Linhares, estrada Santa Terezinha, km 0.600, 22 Oct 1987 (fr), *D. Folli 658* (CVRD 1678) (holotype, CVRD; isotype, MO).

Arbor ad 40 m altam. Folia palmatim 5-foliolata, foliolis ellipticis vel anguste oblongo-ellipticis, integris, infra dense stellato-tomentosis trichomatibus adpressis argenteis. Inflorescentia corymboso-paniculata, ramis dense stellato-rufescentibus. Flores calyce campanulato, stellato-tomentoso; corolla lutea, extus glabra, intus fauce vilosa. Capsula linearis, glabra.

Large emergent tree 25–40 m tall, 50–150 cm dbh, branchlets subtetragonal to subterete, the epidermis rather loose, golden stellate-tomentose when young. Leaves palmately 5-foliolate, the leaflets elliptic to narrowly oblong-elliptic, acute to acuminate, obtuse to cuneate at the base, the terminal 4–11 cm long, 1.3–4.5 cm wide, the laterals progressively smaller, entire, membranaceous to chartaceous, above stellate pubescent along the midvein, otherwise scattered lepidote, below densely tomentose with minute sessile or subsessile stellate trichomes, drying dark olive or blackish above, contrastingly tan or silvery below from the trichomes, the secondary and tertiary venation distinctly impressed above and raised below; petiolules 0.5–2 cm long, petiole 2–8 cm long, finely stellate-tomentose. Inflorescence a relatively open corymbose panicle, the pedicels mostly ca. 1 cm long, densely golden stellate. Flowers with the calyx campanulate, slightly 5-dentate, 6–10 mm long, 5–9 mm wide, densely golden stellate with mostly dendroid trichomes, more sparsely so or glabrescent between teeth; corolla yellow, tubular-infundibuliform, 5–6 cm long, 2–2.5 cm wide at the mouth of tube, the tube 4–4.5 cm long, the lobes 1.5–2 cm long, the tube glabrous outside, the lobes glabrous, not ciliate, the tube inside glabrous dorsally, ventrally villous with simple flexuous trichomes mostly short but some to 1.5 mm long, very sparsely short puberulous at the level of stamen insertion; stamens didynamous, the thecae divaricate, 2.5–3 mm long; pistil ca. 2 cm long, the

ovary linear-oblong, 4 mm long, 1 mm wide, glabrous, finely longitudinally ridged; disk annular, 5-lobed, 1 mm long, 3 mm wide. *Fruit* a linear capsule, ca. 75 cm long, 1 cm wide, with a few inconspicuous minute scales, otherwise completely glabrous; *seeds* thin, bialate, 0.7 cm long, 3 cm wide, the hyaline-membranaceous wings sharply demarcated.

Distribution (Fig. 40). Endemic to the Rio Doce Valley of coastal Brazil where it occurs in tall semi-evergreen forest, below 50 m elevation.

Specimens examined. BRAZIL. ESPÍRITO SANTO: Reserva Florestal CVRD, Linhares, Estrada Manteguiera, ant. 154, 29 Sep 1987 (fl), *Farias 140* (MO); Aceiro proximo ao posto meteorológico, 29 Sep 1987 (fl), *Farias 139* (MO); Corrego do Rancho Alto, Estrada 351, 1 Feb 1985 (buds), *Peixoto, Gentry et al. 3066* (AAU, COL, F, G, K, MBM, MEXU, MG, MO, NY, P, RB, TEX, US); Estrada Louro, km 4.880, 21 Jul 1983 (buds), *Folli 455* (MO, NY, RB).

Local name. Ipe preto.

This species is very closely related to *T. incana* of central and upper Amazonia and I have previously treated it as a disjunct population of that species. However, the fruiting collection here designated as type has an apparently completely glabrous fruit while the only fruiting collection of *T. incana* that I have seen is glabrescently stellate tomentose with obvious indumentum vestiges even after losing most of the original tomentum. Other differences include the tertiary venation which is plane rather than impressed above and plane or barely prominulous rather than prominent below in *T. incana*, as well as the latter's broader leaflets, more contracted inflorescence, denser corolla throat pubescence, and shorter less dendroid calyx indumentum. Although the differences, except for the completely glabrous fruit, are minor, the large range disjunction also argues in favor of taxonomic recognition of the Rio Doce plant as specifically distinct.

5. *Tabebuia arimaensis* Britton, Bull. Torrey Bot. Club **42**: 374. 1915. Type. Cuba. Villa Clara (Las Villas): Río Arimao, 22 Mar 1910 (st), *Britton & Wilson 5797* (holotype, NY).

Shrub or small *tree* 2–5 m tall, dichotomously branched, the branchlets minutely lepidote with sessile scales. *Leaves* 1–3-foliolate, the leaflets narrowly oblong-elliptic to very narrowly oblanceolate-oblong, the apex obtuse to acutish, some-

times mucronate, the base rounded to rather obtusely cuneate, the terminal 2–5.8 cm long, 0.6–1.6 cm wide (to 6.5 × 2.5 cm when unifoliolate) the basals 1.2–4.6 cm long, 0.4–1.4 cm wide, densely lepidote above and below with uniformly whitish trichomes, drying light olive above, grayish below, the secondary veins below not strongly raised nor conspicuously brochidodromous nor obviously different in color, only the midvein strongly raised and paler, the margin more or less erose; terminal petiolule 2–5 mm long, the lateral leaflets mostly asymmetrically subsessile, the petiole 0.5–2.4 cm long, lepidote. *Inflorescence* of one or two terminal flowers, lepidote with darkish sessile trichomes, with a few kinky multicelled trichomes on the bracteoles. *Flowers* with the calyx irregularly shallowly 3–5-labiate, 9–10 mm long, ca. 5 mm wide, densely lepidote with sessile (and a few subsessile) scales, drying dark brownish, sometimes with small darker areas around sunken-lepidote glands; corolla presumably light pink or lavender, tubular-infundibuliform above the narrow base of tube, 4–5 cm long, 0.9–1.3 cm wide at mouth of tube, the tube 3–4 cm long, the lobes ca. 0.5–0.8 cm long, glabrous outside, scurfy puberulous in floor of tube, conspicuously villous at level of stamen insertion, the lobes ciliate or not; anthers held near middle of tube, the thecae divaricate, 3 mm long; ovary linear, 4 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* (only 1 seen), linear-cylindric, the surface slightly wrinkle-ridged but not striate-costate, 12–13 cm long, 0.6–0.8 cm wide, densely lepidote with blackish scales, the calyx apparently not persistent; *seeds* thin, bialate, 4–5 mm long, 15–19 mm wide, the hyaline membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 39). Mostly in the mogote region of Villa Clara Province in Central Cuba; one collection from a coastal cliff in Oriente Province. Probably restricted to limestone. Below 200 m elevation.

Specimens examined. CUBA. VILLA CLARA: Río Arimao, 22 Mar 1910 (st), *Britton & Wilson 5797* (NY); Sagua La Grande at Chinchila, 20 Feb 1924 (fl), *Ekman 18538* (B, HAC, MO, NY—fragm., S); 10 km W of Sagua la Grande, on top of highest mogote, 12 Aug 1920 (fl, fr), *Leon 9472* (NY). SANTIAGO DE CUBA: Cabanas Bay, coastal cliff, 17–20 Mar 1912 (st), *Britton & Cowell 12714* (NY).

A close relative of *T. heterophylla* and *T. berteroi* distinguished by the narrowly oblong leaflet shape, erose leaflet margins, indistinct secondary veins, and lack of reddish peltate scales on the leaflet undersurface. It is approached by less extreme collections here retained in *T. heterophylla* (e.g., *T. dictyophylla*, *T. arenicola*) and is perhaps only a narrowly oblong-leafleted ecotype of that polymorphic species.

6. *Tabebuia aurea* (Manso) Bentham & Hooker
f. ex S. Moore, Trans. Linn. Soc. 2, Bot. 4: 423. 1895.

Bignonia aurea Manso, Enum. subst. braz. 40. 1836.

Type. Brazil. São Paulo, *Manso s.n.* (not seen). Neotype here designated: Brazil. Maranhão: Caxias, *Cutler 8249* (holotype, MO; isotypes, F, IJ).

Tecoma caraiba Martius, Flora 24, Beibl. 14. 1841.

Type. Brazil. Minas Gerais, *Martius 1564* (holotype, M).

Tecoma squamellulosa A. P. de Candolle, Prodr. 9: 220. 1845. Type. Brazil. Bahia, *Blanchet 2758* (holotype, G-DC; isotypes, G, K, NY).

Tecoma leucophloeos Martius ex A. P. de Candolle, Prodr. 9: 217. 1845. Type. Brazil. Bahia, Joazeiro, *Martius 2302* (holotype, M).

Tecoma trichocalycina A. P. de Candolle, Prodr. 9: 2212. 1845. Type. Bolivia. Pampas de Santa Ana, *d'Orbigny 3965* (P (not seen), photo K).

Tecoma aurea (Manso) A. P. de Candolle, Prodr. 9: 222. 1845.

Tabebuia caraiba (Martius) Bureau, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 113. 1893.

Tecoma argentea Bureau & K. Schumann in Martius, Fl. bras. 8(2): 332. 1897. Type. Paraguay. *Balansa 513* (K).

Tecoma caraiba var. *squamellulosa* (A. P. de Candolle) Bureau & K. Schumann in Martius, Fl. bras. 8(2): 331. 1897.

Gelsemium caraiba (Martius) O. Kuntze, Rev. gen. 3: 245. 1898.

Tecoma caraiba var. *grandiflora* Hassler, Feddes Rept. 9: 60. 1910. Type. Paraguay. Amambay, *Rojas s.n.* (*Hassler 10325*) (G).

Tabebuia argentea (Bureau & K. Schumann) Britton, Bot. Porto Rico 6: 197. 1925.

Tabebuia suberosa Rusby, Mem. N.Y. Bot. Gard. 7: 358. 1927. Type. Bolivia. *Rusby 1423* (holotype, NY; isotypes, K, US).

Handroanthus caraiba (Martius) Mattos, Loefgrenia 50: 2. 1970.

Handroanthus leucophloeus (Martius ex A. de Candolle) Mattos, Loefgrenia 50: 2. 1970.

Tree to at least 16 m, the branchlets frequently thick and corky, subterete to subtetragonal, lepidote. Leaves palmately 5–7-foliolate, the leaflets oblong-elliptic to narrowly oblong-lanceolate,

rounded or retuse at apex, rounded to subcordate at base, to 13 cm long, 9.5 cm wide, the lateral leaflets smaller, entire, coriaceous, lepidote above and below, otherwise glabrous, drying light olive; petiolules to 5 cm long, the petiole to 14 cm long, lepidote. Inflorescence a showy terminal panicle, the branches densely lepidote. Calyx campanulate, irregularly bilabiate, 8–16 mm long, 17–10 mm wide, densely lepidote, sometimes also with scattered plate-shaped glands; corolla yellow, tubular-infundibuliform, 5.5–9 cm long, 1.2–2.5 cm wide at mouth of tube, the tube 4.2–6.6 cm long, the lobes 1.2–2.2 cm long, glabrous outside, the lobes ciliate, the floor of tube appressed papillose-puberulous with hairs ca. 0.1 mm long, pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 4 mm long; pistil 2.9–3.2 cm long, the ovary linear-oblong, 4 mm long, 1 mm wide, densely lepidote, the ovules 2-seriate in each locule; disk pulvinate, 1 mm long, 3 mm wide. Fruit an oblong capsule, narrowed at each extreme, grayish, densely lepidote, 8.5–15 cm long, 1.7–3 cm wide; seeds thin, bialate, large, ca. 2 cm long, 4.5–5.5 cm wide, the wings hyaline-membranaceous at the tips, irregularly brownish at the base, not sharply differentiated from the seed body.

Distribution (Fig. 40). A characteristic element of the Brazilian cerrado, also found in seasonally dry forests and savannas south to northern Argentina, west to Bolivia, and disjunct in the savannas of southern Surinam. Near sea level to 1500 m. Also widely cultivated.

Representative specimens examined. SURINAM. Sipaliwini Savanna, 29 Aug 1966 (st), *van Donselaar 3654* (LL); Sipaliwini savanna W of 4-Gebroeders Mts., Oct 1968 (fl), *Oldenburger et al. 271* (MO).

PERU. SAN MARTÍN: Entre San Miguel y Lamas, Moyobamba, Jan 1869 (st), *Raymondi 17* (as 2811) (USM).

BRAZIL. AMAPÁ: Macapa, 28 Oct 1957 (fl), *Austin et al. 7258* (MO). AMAZONAS: Campo Cocodinho, Parintins, 18 Nov 1950 (fr), *Black & Ledoux 50-10840* (IAN). BAHIA: Rio Cariaca, SW of Monte Santo, 21 Feb 1974 (fl), *Harley et al. 16448* (CEPEC, MO). CEARÁ: Fortaleza, 23 Oct 1954 (fl), *Ducke 2360* (IPA, R). DISTRITO FEDERAL: W3 N of Brasília, 20 Jun 1973 (fl), *Heringer 12807* (MO, UB). GOIÁS: Jatai-Caiaponia, km 10, 24 Jul 1977 (fl), *Hatschbach 40058* (MBM, MO); Estrela do Norte, Belém-Brasília, 26 Jul 1964 (fl), *Prance & Silva 58442* (M, MO, S, UB). MARANHÃO: Rosario, Chapada, Sep 1940 (fl), *Frôes 11907* (MICH, NY). MATO GROSSO: 6 km SW of Xavantina, 9 Aug 1967 (fl), *Ratter & Ramos 296* (UB, UEC). MATO GROSSO DO SUL: Mun. Corumba, Faz. Marilandia, 7 Oct 1953 (fl), *Pereira et al. 265* (CH, INPA, RB). MI-

NAS GERAIS: Horto Florestal do Paraopeba, 25 Jul 1954 (fl, fr), *Heringer 3487* (MO, UB). **PARÁ:** Marajó, Rio Paracuaray, Menino Dues, 20 Feb 1950 (st), *Black & Engelhard 50-8929* (IAN); Monte Alegre, campo arenoso, 14 Dec 1908 (fr), *Ducke s.n. (MG9919)* (MG). **PARAÍBA:** Parahybo do Norte, Barra S. Rosa, Serra Canastra, *Luetzelburg 9020* (M). **PARANÁ:** Mun. Tibagii, Faz, Mte. Alegre, 15 Sep 1953 (fl), *Hatschbach 3384* (MBM). **PERNAMBUCO:** Tapera, 20 Dec 1930 (fl), *Peckel 1391* (B, F, MICH). **PIAUI:** 9 km Picos a Jaicos, 5 Aug 1964 (st), *Castellanos & Duarte 626* (MO). **RIO GRANDE DO NORTE:** Cabogi, 16 Sep 1977, *Fernandez & Matos s.n. (EAC3480)* (EAC). **SÃO PAULO:** Moji-Guaçu, *Eiten & Eiten 2216* (G, MSC); 18 km N of Botucatu, Oct 1974 (fr), *Gottsberger 17-101074* (MO). **BOLIVIA. BENI:** Ballivian, Espíritu, Rio Yacuma, 1 Oct 1979 (fl, fr), *Beck 2598* (MO); Rio Chapare-Mamore, Aug 1926 (fl), *Werdermann 2226* (MO, S). **LA PAZ:** S. Yungas, Tajma, 26 Aug 1939 (fl), *Krukoff 10718* (F, G, LP, MICH, MO, S). **SANTA CRUZ:** Sara, Buenavista, 21 Aug 1924 (fl), *Steinbach 6351* (F, G, MO, S).

PARAGUAY. ALTO PARAGUAY: Chovoreca, 12 Aug 1983 (fl), *Hahn 1589* (MO). **AMAMBAY:** Parque Nacional Cerro Cora, 18 Feb 1982 (st), *Solomon et al. 7050* (MO). **BOQUERÓN:** 25 km N de Filadelfia, camino a Fortin Tte. Montania, 22 Aug 1981 (fl, fr), *Schinini et al. 21094* (MO). **CANENDIYU:** Ype-Jhu, 12 Jan 1979 (fl), *Bernardi 19567* (MO). **CHACO:** Parque Nac. Defensores del Chaco, Cerro León, 8 Aug 1983 (st), *Hahn 1558* (MO). **CONCEPCIÓN:** Prope Concepción, Aug 1901 (fl, fr), *Hassler 7152* (G, MICH, MO, NY). **CORDILLERA:** Villarica, 1930 (fl), *Jorgensen 4592* (LP). **PRESIDENTE HAYES:** km 152–156, Trans-Chaco Hwy., Rio Verde, 2 Oct 1985 (fl), *Gentry et al. 51996* (MO, PY).

ARGENTINA. CORRIENTES: San Cosme, Paso de la Patria, *Meyer 8874* (S). **FORMOSA:** Dep. Capital, Timbo Pora, 23 Sep 1967 (fl), *Krapovickas & Cristobal 13243* (CTES); Dep. Laiishi, Crio. Yatai, Dec 1972 (fr), *Schulz 17165* (CTES).

Common names. Brazil: cinco folhas do campo, caraiba, pao d'arco, paratudo, ipe, ipe amarelo. Paraguay: paratodo. Bolivia: alchornoque.

Although Manso's name has been overlooked for almost a century, there seems little doubt that it must be applied to this common and well known species. Salient points of Manso's description are yellow flowers, quinate leaves with ovate-oblong glabrous leaflets, subcordate at the base. There is no other yellow-flowered glabrous-leaved *Tabebuia* species in the area (São Paulo and Mato Grosso) from which *Bignonia aurea* was reported. Moreover the common name paratudo (paratodo in Paraguay) is rather specifically applied to this species. The only discordant element in the description is the short petiole but this is a relative and highly variable character and some collections of this species have petioles shorter than the leaflets that would perhaps qualify as

"breviuscula" when compared with many other species. Although Moore (1895) questioned the subcordate leaflet base mentioned by Manso, this is one of the few *Tabebuia* species to frequently have such bases and the character is most pronounced precisely in São Paulo state where Manso would have encountered it. It is unfortunate that Moore's combination in *Tabebuia* predates *Tabebuia aurea* Spegazzini (1911).

I have proposed as neotype a specimen that matches the protologue especially well in the uniformly 5-foliolate leaves with subcordate leaflets 8–14 cm long and petioles ca. 5 cm long.

7. *Tabebuia bahamensis* (Northrop) Britton, Bull. Torrey Bot. Club **42**: 379. 1915.

Tecoma bahamensis Northrop, Mem. Torrey Bot. Club **12**: 65. 1902. Type. Bahama Islands. New Providence, *Northrop 218* (K, not seen).

Tabebuia turquinensis Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De La Salle" **15**: 19. 1956. Type. Cuba. Oriente: Pico Turquino, *Acuna 10216* (holotype, HAC).

Tabebuia affinis Britton & Wilson ex Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De La Salle" **15**: 14. 1956. Type. Cuba. Oriente (Guantánamo): Barbacoa, Jauco River, *León 11986* (holotype, HAC; isotype, NY). *Tabebuia leonis* Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De La Salle" **15**: 16. 1956. Type. Cuba. Oriente (Guantánamo): Mesa del Chivo, Maisi, Jul 1938 (st), *León 18346* (holotype, HAC; isotype, NY).

Shrub or small *tree* to 5 m tall, dichotomously branched, the branchlets terete, lepidote, drying brownish with white lenticels when young. *Leaves* 3–5(–7)-foliolate, the leaflets obovate to narrowly elliptic, obtuse to rounded at apex, rounded or obtuse at base and well differentiated from petiole apex, the terminal 2–6 cm long, 0.7–2.8 cm wide, the basals 1–3 cm long, 0.6–2 cm wide, subcoriaceous, densely lepidote above and below, drying olive above, conspicuously whitish below, the secondary veins usually plane above and prominulous below, the margin entire to very slightly erose; petiolules 0.2–2 cm long, rather slender, the petiole 1–6 cm long. *Inflorescence* a few-flowered terminal panicle or reduced to one-few terminal flowers, lepidote, usually with more or less persistent linear bracts and bracteoles 2–4(–7) mm long, these with at least a few long flexuous multicelled trichomes. *Flowers* with calyx irregularly 2(–3)-lobate, 11–18 mm long, 5–8 mm wide, usually rather thin and brownish, densely lepidote, some of the scales usually dis-

tinctly peltate-stalked; corolla pale magenta to whitish, tubular-infundibuliform above the narrow base of tube, 3–6 cm long, 1–2 cm wide at mouth of tube, the tube 2.5–4.5 cm long, the lobes 0.5–2 cm long, glabrous outside, inside rather scurfy puberulous in floor of tube, villous at level of stamen insertion, the lobes more or less ciliate; anthers deeply included, the thecae divaricate, 2 mm long; pistil ca. 2 cm long, the ovary linear, 5–6 mm long, 1–2 mm wide, densely whitish lepidote; disk cylindrical-pulvinate, 2 mm long, 2.5 mm wide. *Fruit* linear-cylindrical, longitudinally striate-costate, 6–11 cm long, 6–8 mm wide, drying dark or brownish, the calyx usually more or less caducous; *seeds* thin, bialate, 5–6 mm long, 15–20 mm wide, the hyaline-membranaceous wings distinctly demarcated from seed body.

Distribution (Fig. 39). Mostly the Bahama Islands, where it is the common, widespread representative of the genus; also northern Oriente, Cuba, mostly near the coast.

Representative specimens examined. BAHAMAS. ABACO: Opposite Cherokee Settlement, 31 Dec 1904 (st), *Brace 1998* (NY). ACKLINS ISLAND: Spring Point, 21 Dec 1905 (st), *Brace 4357* (NY). ANDROS: North of Love Hill, 29 Jan 1974 (fl), *Correll & Godfrey 41265* (MO, NY). BIMINI: Duck Pond, May 1948 (fl), *Howard & Howard 10127* (GH, NY). CAICOS ISLANDS: Pine Cay, 28 Aug 1974 (fl), *Correll 43243* (MO). CAT ISLAND: Wilsons Bay, 16 May 1968 (fl, fr), *Byrne 485* (NY, WIS). CROOKED ISLAND: Cabbage Hill, 17 Feb 1975 (fl), *Correll 44321* (MO). ELEUTHERA: Tarpum Bay, 18 May 1975 (fl), *Correll & Hill 45260* (MO). GRAND BAHAMA: Freeport Airport, 18 Aug 1974 (fl), *Correll & Kral 43018* (MO). GREAT ABACO: Marsh Harbour, 7 Aug 1952 (fl), *Robertson 331* (GH). GREAT EXUMA: NW of Goat Cay, 12 Jan 1975 (fl), *Correll 44127* (IJ, MO, NY). GREAT INAGUA: Airport road, 16 Mar 1963 (fl), *Dunbar 287* (A). HOG ISLAND: 18 Feb 1888 (st), *Eggers 4125* (C). LONG ISLAND: 2 mi N of Grays, 28 Apr 1975 (fl), *Correll 145004* (FTG, MO, NY). MAYAGUANA: Pirates Well to Betsy Bay, 9 Feb 1973 (fl), *Gillis & Proctor 11608* (A, IJ). MIDDLE CAICOS: S of Conch Bar, 23 Apr 1971 (fl), *Burch 4276* (MO, NY). NEW PROVIDENCE: Near Waterloo, 17 Mar 1946 (fl), *Degener 18850* (A, MO, NY). NORTH CAICOS: 5 mi S of Bottle Creek School, 11 Jun 1974 (fr), *Proctor & Gillis 34022* (IJ). PINE CAY: 23 Feb 1973 (fl, fr), *Gillis 11799* (A, IJ). SAN SALVADOR: Riding Rock airfield, 12 Feb 1976 (fl), *Correll & Wasshausen 46710* (MO). SOUTH ANDROS: S of Little Creek, 26 Sep 1974 (fl), *Correll 43573* (MO). SOUTH BIMINI: 16 Apr 1974 (fl), *Correll 42074* (FTG, NY).

CUBA. GUANTÁNAMO: Southern Baracoa Region, Yauco River, 17 Jul 1924 (st), *León 11986* (MO, NY); Jojo River, S of Baracoa, Jul 1924 (fl), *León 12424*

(NY); Jojo Valley, Cajobano, 17 Jul 1924 (fl), *León 72109* (MO, NY).

Common names. Bahamas: beef bush, 5-finger, old man, gunwood. Cuba: azulejo.

Close to *T. berteroi* from which it can be distinguished by the obtuse to rounded leaflet bases and generally more slender petioles and petiolules. I can see no consistent differences between Cuban *T. affinis* and Bahaman *T. bahamensis*. Moreover, *T. turquinensis* seems no more than a higher altitude morph.

8. *Tabebuia barbata* (E. Meyer) Sandwith, *Lilloa* 3: 462. 1938.

Bignonia fluviatilis Aublet sensu Humboldt, Bonpland & Kunth, Nov. gen. sp. Pl 3: 139. 1819, non Aublet. *Bignonia barbata* E. Meyer, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 12: 782. 1825. Type. Venezuela. Carichana, *Humboldt & Bonpland 1200* (holotype, B-WILLD; isotype, P).

Zeyheria barbata (E. Meyer) Miquel, *Flora* 25: 430. 1842.

Tecoma barbata (E. Meyer) A. P. de Candolle, *Prodr.* 9: 221. 1845.

Tecoma toxophora Martius emend A. P. de Candolle, *Prodr.* 9: 217. 1845 (excl. sin. Marcgr.) non Martius, *Flora* 24, Beibl. 15. 1841. Type. Brazil. Amazonas, *Martius s.n. (1819)* (holotype, G-DC; isotype, M).

Couralialia toxophora (Martius) emend A. P. de Candolle) Bentham & Hooker f. ex K. Schumann, *Nat. Pflanzenfam.* 4(3b): 239. 1894.

Handroanthus barbatus (E. Meyer) Mattos, *Loefgrenia* 50: 4. 1970.

Small to medium-sized *trees* to 15 m tall, the branchlets subterete, glabrous. *Leaves* palmately 5–7-foliolate, the leaflets ovate to narrowly ovate or almost lanceolate, obtuse to acute or acuminate, the base rounded, the terminal leaflets to 19 cm long and 9 cm wide, the laterals progressively smaller, entire, chartaceous to subcoriaceous, glabrous above, minutely lepidote below, also with tufts of simple whitish trichomes in the axils of the lateral nerves, drying dark gray to brown above, olive brown below, usually with the midvein contrastingly darker and the secondary nerves lighter; terminal petiolule 1–4.5 cm long, the laterals shorter, petiole 2–12 cm long, petiole and petiolules blackish when dry, glabrous. *Inflorescence* a contracted terminal or axillary panicle, the branches tannish tomentose with simple and branched trichomes, the bracts and bracteoles minute, linear, inconspicuous. Calyx irregularly 2–3-labiate, campanulate, 13–

18 mm long, 8–12 mm wide, densely tannish-tomentose, with conspicuously raised scattered plate-shaped glands; corolla magenta with a yellow throat, the throat fading to whitish, tubular-infundibuliform, 4.5–8 cm long, ca. 1 cm wide at mouth of tube, the tube 3.5–6 cm long, the lobes 1–2.7 cm long, the tube outside densely tomentose with branched hairs and usually with scattered dark-drying plate shaped glands, the lobes lightly stellate-pubescent, the tube inside glabrous dorsally and at extreme base, villous with long multicelled hairs in the floor and at level of stamen insertion; stamens didynamous, the thecae divaricate; pistil 3.4–3.6 cm long, the ovary ovoid, 2 mm long, 1.5–2 mm wide, papillose-lepidote, the ovules 4-seriate in each locule; disk pulvinate, 0.6 mm long, 3 mm wide. *Fruit* a linear-oblong capsule, subterete, contracted toward apex, to 27 cm long and 1.5 cm wide, densely yellow-stellate-tomentose with scattered dark-drying glandular areas; seeds somewhat flattened, essentially wingless, dark brown, 0.8–1 cm long, 1.7–2.3 cm wide.

Distribution (Fig. 40). Mostly in black-water inundated forests along the Rio Negro and upper Río Orinoco and their tributaries; also along the Rio Amazonas and its main tributaries but not reaching the Peru border; 10–150 m elevation.

Representative specimens examined. **COLOMBIA.** VAUPÉS: Río Naquteni, near Cerro Morachi, Jun 1948 (fl), *Schultes & Lopez 10040* (COL, IAN). VICHADA: Parque Nacional Natural El Tuparro, 40 km SSE of La Línea Roja, Caño Guinvaza, 13 Mar 1985 (fl), *Zaruchi & Barbosa 3700* (MO).

VENEZUELA. AMAZONAS: Raudales del Orinoco, behind Puerto Ayacucho airport, 3 Apr 1984 (fl), *Gentry & Stein 46270* (MO, VEN); San Fernando de Atabapo, Lago Titi, 2 Mar 1974 (st), *Gentry 10828* (MO, VEN); Río Orinoco, 30 May 1959, *Wurdack & Aderley 42694* (C, G, S, US). APURE: Pedro Camejo, Río Capanaparo, 14 km SW of Uranón, 6 Jul 1977 (fl), *Davidse & Gonzalez 12749* (MO).

BRAZIL. AMAZONAS: Rio Negro between Manaus and São Gabriel, 26 Jun 1979 (fl), *Alencar 60* (MO, NY); Rio Taruma, Manaus, 10 Mar 1943 (fl), *Ducke 185* (F, IAN, MG, MO, R); Margin of Igapo Acu, Manaus-Porto Velho road, Mar 1974 (fl, fr), *Prance et al. 20577* (MO, NY). MATO GROSSO: Tabajara, upper Machado River, Nov 1931 (fl), *Krukoff 1469* (F, G, MICH, MO, NY, WIS). PARÁ: Rio Cumina, Cumina-miri, Repartimento, 23 Jan 1968 (fl), *M. Silva 1243* (MG, MO). RONDÔNIA: Rio Madeira, Rio Mutumparana, 10 km above Mutumparana, 23 Nov 1968 (fl), *Prance et al. 8766* (INPA, M, MG, NY, R, S). RORAIMA: Roraima, Rio Univini, 25 Apr 1975 (fl), *Pires et al. 14266* (INPA, MG, MO).

Local names. Venezuela: apamate, palo mosquito, jaico, palo de mosquito. Brazil: pau d'arco, pau d'arco roxo, pau d'arco de flor roxa, ipe roxo, capitari, capitary.

Often very common and locally dominant in its restricted igapó habitat.

This species is related to *T. impetiginosa* by the pubescent purple corolla but differs in the larger 2–3-labiate calyx with conspicuous plate-shaped glands, the dark-drying glands on the outside of the corolla and the densely stellate-tomentose capsule. Vegetatively it can be distinguished from sympatric, largely glabrous-leaved species (*T. impetiginosa*, *T. serratifolia*, *T. insignis*, and *T. fluviatilis*), by the characteristic olive-brown drying leaf undersurface with darker mid-vein and lighter secondary veins. Similar axillary tufts of simple trichomes are also found in *T. serratifolia* and *T. impetiginosa*, these usually in part forked in the latter, but in *T. capitata* and other almost glabrescent-leaved yellow-flowered species these trichomes are stellate.

9. *Tabebuia berteroi* (A. P. de Candolle) Britton, Bull. Torrey Bot. Club **42**: 377. 1915.

Tecoma berterii A. P. de Candolle, Prodr. **9**: 220. 1845. Type. Dominican Republic. *Bertero s.n.* (G-DC; F neg. 33896).

Tabebuia anisophylla Urban, Symb. antill. **9**: 264. 1924. Type. Cuba. Oriente (Santiago de Cuba): Santiago de Cuba, Aguadores, solo calcareo, 7 Dec 1916 (fl), *Ekman 8456* (lectotype, S; isotype, NY).

Small tree to 10 m tall, dichotomously branched, the branchlets terete, lepidote, drying darkish with lighter lenticels when young. *Leaves* (1–)3–5-foliolate, the leaflets oblanceolate to elliptic or obovate, obtuse to rounded at apex, more or less cuneate at base, the terminal 1.5–6(–13) cm long, 0.6–3(–6.5) cm wide, the basals (0.5–)1–4(–9) cm long, 0.3–2(–4.5) cm wide, coriaceous, densely lepidote above and below, especially the higher altitude forms with scattered brownish scales below as well as the dense whitish ones, drying olive above, conspicuously whitish below with contrastingly darker main veins, venation brochidodromous, the main veins usually slightly impressed above and raised below, the margin entire; petiolules 0.3–2 cm long, the petiole mostly 1–6 cm long. *Inflorescence* of one-few terminal flowers, lepidote, with persistent linear bracts and bracteoles or these caducous. *Flowers* with calyx irregularly bilabiate, 11–14

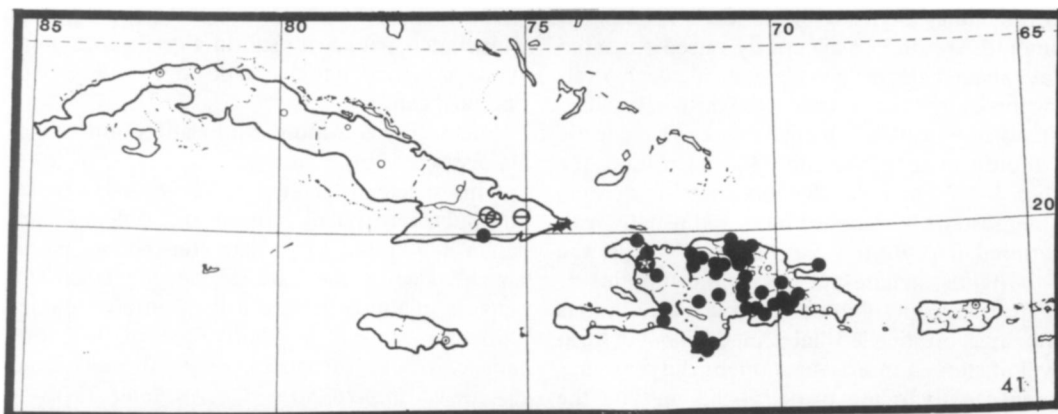


FIG. 41. Distribution of Antillean *Tabebuia*. ● = *T. berteroi*; ⊙ = *T. bibracteolata*; ◐ = *T. buchii*; ★ = *T. caleticana*.

mm long, 6–8 mm wide, densely lepidote, drying dark; corolla pale magenta to white, tubular-infundibuliform above the well-defined narrow base of tube, (3–)3.5–7 cm long, 1–2 cm wide at mouth of tube, the tube (2.5–)3–4 cm long, the lobes 1–2 cm long, glabrous outside, inside rather scurfy puberulous in floor of tube, villous at level of stamen insertion, the lobes irregularly ciliate; filaments ca. 1.5 cm long, the anthers deeply included, the thecae divaricate, 2 mm long, the connective slightly thickened and extended; pistil with the ovary linear, 5–6 mm long, 1 mm wide, very densely whitish lepidote; disk cylindrical-pulvinate, 2 mm long, 3 mm wide. *Fruit* linear-cylindric, longitudinally striate-costate, drying blackish, with a roughish-looking surface, 7–16(–20) cm long, 6–8 mm wide, lepidote with blackish scales, the calyx persistent; *seeds* thin, bialate, 4–7 mm long, 15–20 mm wide, the hyaline membranaceous wings distinctly demarcated from seed body.

Distribution (Fig. 41). Common throughout Hispaniola; one collection from Oriente, Cuba. Sea level to 1200(–1600) m elevation.

Representative specimens examined. CUBA. SANTIAGO DE CUBA: Aguadores, 7 Dec 1916 (fl), *Ekman 8456* (NY, S).

HAITI. Massif de la Selle, Petionville, St. Armand, 12 May 1927 (fl), *Ekman H8112* (K, LL, S, US); Montagnes du Tron d'Eau, Morne a Cabrits, 16 Jul 1924 (fl), *Ekman H913* (A, S, US); Massif de la Hotte, St. Louis du Sud, 2 Nov 1927 (fr), *Ekman H9240* (fr), LL, NY, S, US; vic. Furcy, 26 May 1920 (fl, fr), *Leonard 4482* (NY, US).

DOMINICAN REPUBLIC. AZUA: Sierra Martín García, Charco Frio, 13 Sep 1984 (fl), *Mejia et al. 1300* (JBSD, MO). BAORUCO: Sierra de Neiba, 8 km N de Villa Jaragua, 28 Sep 1982 (fl), *Mejia & Pimentel 23542* (JBSD). BARAHONA: Prope Paradis, Jul 1910 (fl), *Fuertes 460* (A, BM, GH, HBG, K, L, MO, US); 2 km NE of Paraiso, 11 Apr 1985 (st), *Gentry & Mejia 50725* (JBSD, MO); Dajabon, 9 km desde Santiago de la Cruz a Santiago Rodriguez, Río Chacuey, 12 Nov 1981 (fl), *Zanoni & Mejia 17998* (JBSD). DISTRITO NACIONAL: 4 km de Cruce Cuenca, El Cabreto-San Luis, 14 May 1981 (fl, fr), *Zanoni et al. 13383* (JBSD, MO). INDEPENDENCIA: 7 km S of Pto. Escondido, Aceitillar, 12 Apr 1985 (fl), *Gentry & Mejia 50799* (MO). LA ROMANA: La Caleta, 24 Nov 1974 (fl), *Liogier 21923* (JBSD). LA VEGA: 9 km S of Jarabacoa, Valle Río Juneroa, 10 Apr 1985 (fl), *Gentry & Zanoni 50656* (JBSD, MO); prope Constanza, Mar 1910 (fl), *von Tuerckheim 3083* (BM, FI, GH, HBG, K, L, MO, US). MONTE CRISTI: Monción, Cordillera Central, 28 Jun 1929 (fl), *Ekman H13028* (B, GH, LL, US). PEDERNALES: 29 km N of Cabo Rojo-Pedernales road on road to Aceitillar, 12 Apr 1985 (fl), *Gentry & Mejia 50779* (JBSD, MO). PERAVIA: 25 km N of San José de Ocoa, road to Carmona, 6 Apr 1985 (fl), *Gentry & Zanoni 50528* (JBSD, MO). PUERTO PLATA: 11 km W de Carretera de Santiago-Pto. Plata, 31 Aug 1982 (fr), *Zanoni et al. 22976* (JBSD, MO). SAMANÁ: Cape Samaná, Samaná Peninsula, 26 Mar 1921 (fl), *Abbott 1192* (US). SAN CRISTÓBAL: Carretera Duarte, 3 km S of Cruce de Madrigal, 10 Apr 1985 (fr), *Gentry & Zanoni 50680* (JBSD, MO). SAN JUAN: Río Arriba del Norte, N of San Juan, 9 Sep 1946 (fl, fr), *Howard & Howard 8960* (BM, GH, NY, S). SANTIAGO: El Limón, 25 mi W of Santiago, 24 May 1969 (fl, fr), *Liogier 15360* (JBSD, NY). TRUJILLO: Villa Alta Gracia, vic. of Piedra Blanca, 14 Oct 1947 (fl), *Allard 16096* (NY, S).

Common names. Aceituno, munieco, roble.

This species is very close to mostly Bahaman *T. bahamensis* and to Cuban *T. arimaensis*. It

can be told from *T. bahamensis* by the petiolules either shorter or thicker and especially by the leaflet bases more cuneate and not as evenly rounded or obtuse as in that species.

On Hispaniola *T. berteroi* intergrades with *T. obovata* both in northern Haiti (*Ekman H8478, H4956, Leonard & Leonard 9718, 14771, 15233*) and near Santiago, Dominican Republic (see under *T. obovata*), where a form with mostly unifoliate leaves (but including some 3-foliolate leaves) occurs. A form from Samaná Peninsula (*Ekman 15124*) that has long petiolate leaflets usually not very whitish below and with a 20 cm, long fruit with a smooth surface, except for longitudinal striations, approaches *T. polyantha*. On the Barahona Peninsula it has smaller denser leaves that are less conspicuously whitish below, approaching small coriaceous-leaved forms of *T. heterophylla*. In general, plants from moister areas and higher altitudes tend to have conspicuously larger leaflets and the extremes look very different from dry-area collections, but the continuous variation precludes taxonomic recognition.

The only Cuban collection which is definitely referable to *T. berteroi* is the type of *T. anisophylla*, which is virtually identical with the Barahona peninsula population. The Stockholm lectotype is 3–5-foliolate with leaflets clearly basally cuneate and whitish below and with larger reddish scales scattered among the otherwise white-lepidote surface, just as in *T. berteroi*. The scrappy New York isotype is not as good a match with *T. berteroi*. The Cuban collection has some leaflets that are more acutish than is usually the case on Hispaniola, but were it from Hispaniola it would be identified as *T. berteroi* without hesitation. *Tabebuia anisophylla* was noted by its author to be very close to *T. arimaoensis* and most of the material that I refer to *T. arimaoensis* was identified previously as *T. anisophylla*. As I define it, *T. arimaoensis* has a more erose and narrowly oblong-elliptic leaflet than does any material of *T. berteroi* and especially differs in lacking the scattered reddish scales intermixed with the dense whitish ones on the leaflet undersurface.

Tabebuia berteroi may be regarded as similar to the common ancestor that has probably radiated to give rise to the various Cuban species with white leaf undersides and a tendency to greater development of long-stalked peltate scales

(and their presumed simple stalk-derivatives)—*T. bibracteolata*, *T. pulverulenta*, *T. polymorpha*, and *T. bahamensis* (also in the Bahamas). Whereas speciation has more or less proceeded to completion on Cuba, *T. berteroi* remains a polymorphic assemblage interconnected by intermediates on Hispaniola.

10. *Tabebuia bibracteolata* (Grisebach) Britton, Bull. Torrey Bot. Club 42: 378. 1915.

- Tecoma bibracteolata* Grisebach, Cat. pl. Cub. 193. 1866. Type. Cuba. Oriente (Holguín): Sierra de Nipe ad Río Piloto, *Wright s.n.* (holotype, GOET; isotypes, GH, HAC (as 3037), K (as 3037), NY—fragm.).
Tabebuia nervosa Urban, Symb. antill. 9: 256. 1924. Type. Cuba. Oriente (Holguín): Sierra de Nipe, Loma de Estrella, 700 m, *Ekman 2266* (S, NY—fragm.).
Tabebuia nipensis Urban, Symb. antill. 9: 261. 1924. Type. Cuba. Oriente (Holguín): Sierra de Nipe in coll. calcar. ad Río Piloto, *Ekman 9044* (holotype, S; isotypes, NY, S).
Tabebuia furfuracea Urban, Symb. antill. 9: 262. 1924. Type. Cuba. Oriente (Holguín): Sierra de Nipe ad Río Piloto, *Ekman 5024* (lectotype, S).
Tabebuia subcordata Urban, Symb. antill. 9: 158. 1924. Type. Cuba. Oriente (Holguín): Sierra de Nipe in coll. calcar. ad Río Piloto, *Ekman 9538* (S, photo NY).
Tabebuia candicans Borhidi & Muñiz, Act. Bot. Acad. Sc. Hungar. 17: 25. 1970. Type. Cuba. Oriente: Finca Demajagua, pr. pag. Matias, 450 m, *Borhidi & Muñiz s.n.* (HAC 27129) (HAC).

Shrub or small *tree*, dichotomously branched, the branchlets terete, lepidote, also with long-stalked lepidote trichomes, the peltate apical scale with incised margin, these often caducous leaving the stalk as a straight simple trichome, the branch apices with flexuous multicelled simple trichomes. *Leaves* 3–5(–6)-foliolate, the leaflets elliptic or elliptic-oblong to obovate, obtuse to acute (rarely subacuminate) at apex (sometimes mucronate), the base generally obtuse, rounded to very broadly cuneate, the terminal 3.5–11 cm long, 1.5–5 cm wide, the basals 2–7 cm long, 1–3.5 cm wide, often asymmetrically sessile, coriaceous, lepidote with sessile scales above, below densely lepidote with stellate scales, also sparsely puberulous with a mixture of long-stalked peltate trichomes and the stalks of decapitated stalked scales, olive above, whitish to grayish below, slightly rough to the touch at least below, midvein impressed above, the secondary veins brochidodromous and prominent below, slightly impressed above, the petiolules 0.1–2.4

cm long, petiole 3–6.5 mm long, lepidote abaxially, lepidote and with stalked-lepidote trichomes (or their bases) adaxially. *Inflorescence* once or twice dichotomously branched, often with a flower in the axis of the first dichotomy, sometimes reduced to two or three single flowers, strongly rufescent with a mixture of lepidote scales and stalked lepidote trichomes, usually with one or two linear or subulate bracteoles, these typically 5–7 mm long and immediately subtending calyx. *Flowers* with calyx irregularly bilabiate, 10–15 mm long, 5–8 mm wide, strongly rufescent from the peculiar stalked-lepidote trichomes, the corolla magenta to dark purple, tubular-infundibuliform, 3–5 cm long, 0.8–1.5 cm wide at mouth of tube, the tube 2–3.5 cm long, the lobes ca. 1 cm long, glabrous outside, the lobes usually sparsely ciliate, the tube pubescent in two bands inside with short trichomes, the ovary (only one examined) tetragonal, linear-oblong, angled, 3–4 mm long, densely lepidote; disk cylindrical pulvinate, 1.5 mm long, 2 mm wide. *Fruit* linear-cylindric, 8–15 cm long, 6–8 mm wide, densely rufescent, not ribbed, subtended by persistent calyx, the *seeds* thin, bialate, 4–5 mm long, ca. 20 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 41). Known only from the Cuban Oriente, from Monte Verde and the Sierra de Nipe.

Specimens examined. CUBA. ORIENTE: Mogotes de Bairs, Finca Demajagua, Matias, 22 Oct 1969 (fl), *Borhidi & Muñiz s.n.* (HAC). HOLGUÍN: Sierra de Nipe, Loma de Mensura, 21 Apr 1940 (fl), *Carabia 3754* (NY); Loma de Estrella, 29 Jul 1914 (st), *Ekman 2266* (S, NY—fragm.); Río Piloto, 14 Mar 1915 (fl), *Ekman 5024* (S), 17 Feb 1918 (fl), *Ekman 9044* (NY, S), 20 Apr 1919 (fl, fr), *Ekman 9538* (S); Sierra de Nipe, Río Jimbambay, 23 Feb 1915 (st), *Ekman 4750* (MO, S), 27 Apr 1919 (fl), *Ekman 9565* (S). GUANTÁNAMO: Paredones, Monte Verde, *Wright s.n.* (GH, GOET, NY), 3037 (K); Monteverde, *Wright 1339* (GH, MO, NY—fragm.).

A species easy to recognize by the unusual indumentum of calyx, inflorescence, leaf undersides and twigs. The trichomes rather resemble antheridiophores of a *Marchantia* liverwort with a peltate cap at the apex of the stalk. The cap, however, often breaks off, leaving an apparently simple trichome. The calyx and inflorescence have a rufescent aspect reminiscent of mainland *T. chrysantha* and allies, except that they differ

in having the rufescence of stellate or dendroid trichomes.

Although Urban suggested the affinity of *T. nipensis* to be with *T. brooksiana* and of *T. subcordata* to be with *T. sauvallei*, both of which differ in lacking the distinctive trichomes of this species, he apparently overlooked the fact that *T. bibracteolata* has exactly the same trichome type. Alain (1957) differentiated *T. nipensis* from *T. bibracteolata* on account of 5-foliolate vs. 3-foliolate leaves and from *T. furfuracea* and *T. subcordata* by acuminate vs. acute to rounded leaflets but these characters are clearly not worthy of specific distinction: one of the type sheets of *T. nipensis* at S has mostly 5-foliolate leaflets with both acuminate and broadly rounded (even retuse) leaflet tips while the other type sheet has only 3-foliolate leaves. Urban's only comment on the affinities of *T. furfuracea* was "valde affinis *T. nipensis* Urb." to which I can only add "amen." Together, the two so-called "species" are known from a total of three collections, all from the same locality. *T. subcordata*, also collected at exactly the same locality and known only from the type is identical—the leaflets of the single leaf of the Stockholm sheet, at least, have rounded rather than subcordate bases. *Tabebuia nervosa*, also known only from the type, is also from the Sierra de Nipe, but differs from the other "species" here referred to *T. bibracteolata* only in having a few 6-foliolate leaflets and being sterile; its leaves are only sparsely stalked-lepidote but the midvein is distinctly though slightly puberulous (as well as lepidote) from the persistent trichome stalks. The type locality of *T. bibracteolata* was not specified other than "Oriente" but may well be the same as for the rest of the collections.

Tabebuia pulverulenta is very similar to this species and may be no more than a form of it, with less development of the peculiar indumentum and mostly 5–7-foliolate leaves often with narrower leaflet bases. Its calyx and inflorescence dry black, lacking the conspicuously rufescent aspect, though having the same trichome type. Finally, the calyces tend to have noticeable longitudinal ridges, a feature not found in any of the flowering material referred to *T. bibracteolata*.

Another relative is *T. polymorpha*, known only in sterile condition so that the calyx character cannot be evaluated. Its 1–3-foliolate leaves sug-

gest assignment to *T. bibracteolata* but the lowland habitat suggests *T. pulverulenta*. Although the type is only very faintly stalked-lepidote and puberulous, other material from the same locality is more strongly puberulous. All of these have at least a few long flexuous trichomes on the terminal buds.

11. *Tabebuia billbergii* (Bureau & K. Schumann) Standley, *Trop. Woods* **36**: 20. 1933.

Distribution (Fig. 40). Dry forests of northern Colombia and Venezuela, also Curaçao and adjacent islands and Oriente Cuba (ssp. *billbergii*); disjunct in the dry forest of coastal Ecuador and Peru (ssp. *ampla*). Sea level to 600 m elevation.

Key to the Subspecies

1. Calyx <7 mm long; capsule 6–7 mm wide; coastal Colombia and Venezuela and sparsely in Antilles. subsp. *billbergii*.
1. Calyx >8 mm long; capsule 8–10 mm wide; coastal Ecuador and adjacent Peru. subsp. *ampla*.

11a. *Tabebuia billbergii* ssp. *billbergii*. Fig. 42.

Tecoma billbergii Bureau & K. Schumann in Martius, *Fl. bras.* **8(2)**: 319. 1897. Type. Colombia. Bolívar: Cartagena, *Billberg 114* (B*, not seen).

Shrub or *tree* 1–15 m tall, the branchlets terete, glabrescent. *Leaves* palmately 3–5-foliolate, the leaflets narrowly ovate, acute to long-acuminate, the base rounded, the leaflets to 9 cm long and 4 cm wide, usually much smaller, the terminal leaflet larger, the laterals smaller, entire or somewhat serrate, membranaceous to chartaceous, inconspicuously scattered-lepidote above and below, glabrescent above or simple-puberulous along the midvein, below generally glabrescent, usually with some simple trichomes around the margins of the domatia in the secondary nerve axils, drying olive-gray to black; petiolules to 2 cm long, the laterals shorter, the petiole to 5 cm long, slender, inconspicuously lepidote and puberulous to glabrescent. *Inflorescence* with few flowers (to 5) clustered at the end of a branchlet, the pedicels to 5 mm long, densely tannish-tomentose, the resting buds sessile, tannish mealy pubescent, bracts and bracteoles inconspicuous. *Flowers* with the calyx campanulate, 5-dentate, 6–7 mm long, 4–6 mm wide, pubescent with stel-

late trichomes, light tan, these dense at base and along the five ribs descending from the teeth, calyx surface brown or blackish, visible toward the margin between the ribs; corolla lemon-yellow with reddish lines in throat, tubular-infundibuliform, 3–5.5 cm long, 1–1.4 cm wide at mouth of tube, the tube 2.5–3.8 cm long, the lobes 0.7–1.5 cm long, glabrous outside, inside somewhat sparsely pubescent with long multicelled trichomes in throat, at least along the ridges; stamens didynamous, the thecae divaricate, 2 mm long; pistil 1.7–1.8 cm long, the ovary linear, 3 mm long, 0.7 mm wide, lepidote, the ovules 2-seriate in each locule; disk pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* a linear-oblong capsule, subterete, 14–19 cm long, 6–7 mm wide, scattered lepidote, usually also with very few scattered minute simple trichomes, drying dark; *seeds* thin, bialate, 0.4–0.5 cm long, 1.3–1.5 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from seed body.

Distribution (Fig. 40). Dry forests of northern Colombia and Venezuela, the Dutch Antilles, and the southwestern tip of Cuba.

Representative specimens examined. CUBA. GRANMA: Cape Cruz, Sep 1935 (bd), *León 16339* (GH, NY).

SOUTHERN DUTCH ANTILLES. ARUBA: Hooiberg, *Stoffers 2094* (U). BONAIRE: Goto meer, Aug 1969, *Arnoldo-Broeders 3760B* (NY), 1913 (bd), *Boldingh 7204* (C, K, L, NY). CURAÇAO: Groot St. Martha, Jul 1969, *Arnoldo-Broeders 3760* (BM, NY).

COLOMBIA. ATLÁNTICO: Between Galapa & Baranoa, Arroyo Jubilado, 24 Dec 1933 (fl), *Dugand 505* (C, F, US); Casacoima, 6 Sep 1936 *Dugand 1035* (COL, F). BOLÍVAR: Isla de Baru, entre Santa Ana y Playa Mojana, 25 Aug 1986 (st), *Cuadros & Gentry 3049* (JBGP, MO); Galerazamba, N tip of Bolívar, 1 Jul 1984 (fr), *Gentry & Cuadros 47451* (JBGP, MO). CÉSAR: Valle del Río Cesar, SW of Los Venados, 15 Apr 1961, *Dugand 5669* (COL). GUAJIRA: Maicao, 19 May 1981 (fr), *Arboleda et al. 629* (MO). MAGDALENA: Santa Marta, Mar 1848 (fl), *H. Smith 747* (COL, F, L, MO).

VENEZUELA. ANZOÁTEGUI: 19 km N of San Mateo, 14 Mar 1974 (fl), *Gentry et al. 10397* (MO, VEN). ARAGUA: Carretera de Turiamo, 9 Feb 1950 (bd), *Delgado 622* (VEN). DISTRITO FEDERAL: W of Naiguata, Jul 1975 (fl), *Gentry & Berry 14731* (MBM, MO, VEN). FALCÓN: Between Puerto Judibana and Granja Taparo, NE of Punto Fijo, 23 Jan 1966 (bd), *Steyermark & Braun 94543* (B, US, VEN). GUÁRICO: 19 km W of Valle de la Pascua, 8 Jul 1975 (fr), *Gentry & Berry 15108* (MBM, MO); entre El Sombrero & Río Guariquén, 18 Apr 1927 (fl), *Pittier 12376* (G, M, MO, US, VEN). LARA: 9 km E of Puente Torres, 30 Mar 1974 (fl), *Gentry et al. 11008* (CTES, MO, VEN). MIRANDA:

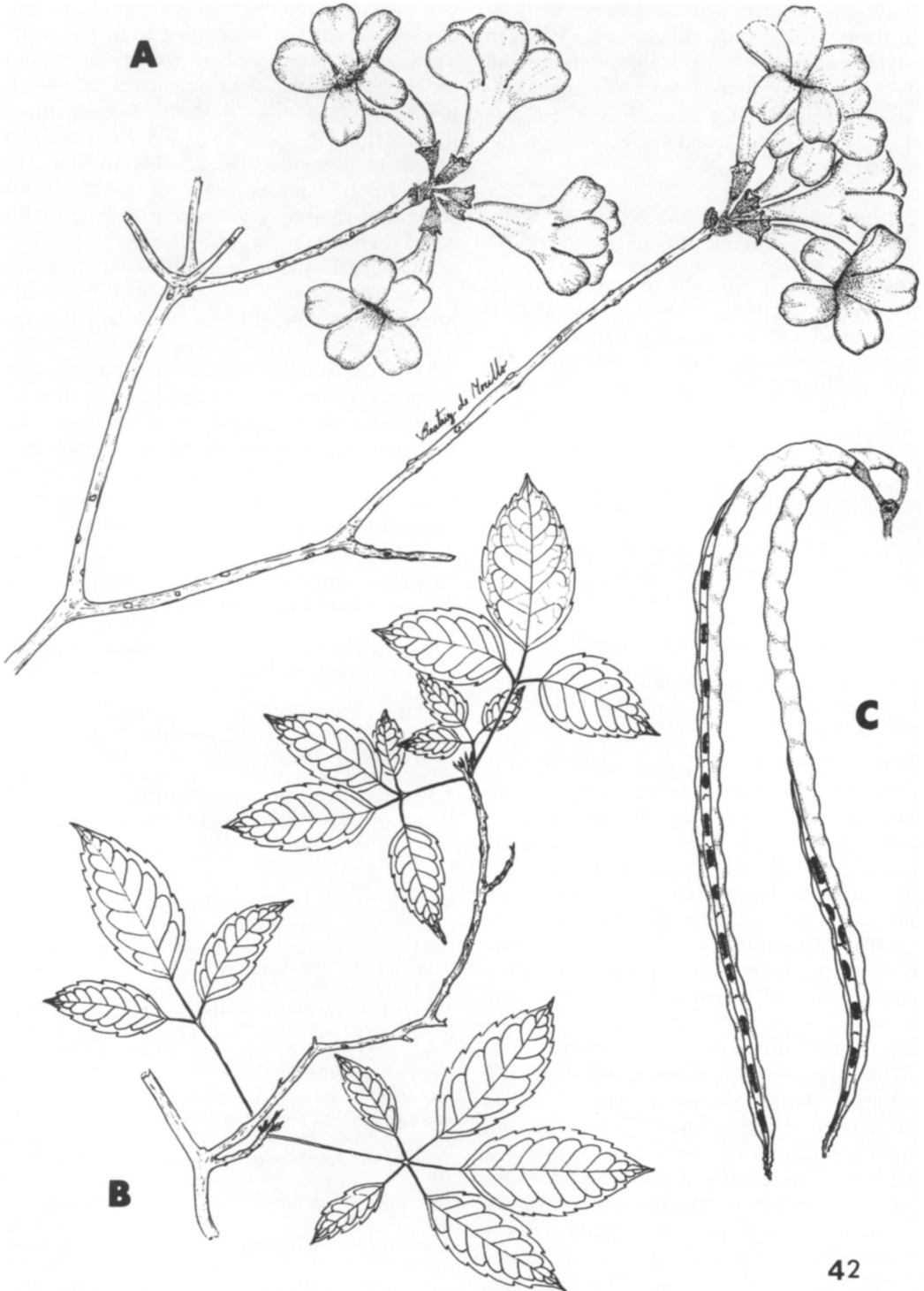


FIG. 42. *Tabebuia billbergii* ssp. *billbergii*. **A**, flowering shoot, $\times 0.5$; **B**, leafy twig, $\times 0.5$; **C**, fruit, $\times 0.5$. (From *Flora de Venezuela*; **A**, Davidse 4269; **B**, Steyermark 107882; **C**, Gentry et al. 10796.)

Dtto. Brión, Laguna Grande, 27 May 1981 (st), *Berry et al.* 3777 (MO, WIS). **MONAGAS:** Road betw. Barcelona & Maturín, Dec 1959 (fl), *Aristeguieta* 4045 (K, VEN). **SUCRE:** 18–20 km E of Cumana, 23 May 1945 (fl), *Steyermark* 62887 (C, K, VEN). **ZULIA:** Alrededores de Maracaibo, 24 May 1977 (fl, fr), *Bunting* 5098 (MO).

Common names. Venezuela: puy, pui, curari, curarira, araguaney, acapro, flor amarilla, caña-guato blanco.

The extremely hard heavy wood is much used in construction and in local handicrafts.

A very characteristic element of the Caribbean coastal forests of northern Colombia and Venezuela, where it grows in drier forests than does any other species of the genus. This is the only yellow-flowered *Tabebuia* species to reach the West Indies (other than Trinidad and Tobago), although the single record from Cuba may represent a chance introduction, perhaps via hurricane.

This is the national tree of Venezuela according to Steyermark (1973).

11b. *Tabebuia billbergii* ssp. *ampla* A. Gentry, *Phytologia* **35**: 187. 1977. Type. Ecuador. Guayas, *Gentry* 12243 (holotype, MO: isotypes, QCA, S).

Tabebuia ecuadorensis Standley, *Trop. Woods* **46**: 17. 1936. Type. Ecuador. Guayas, *Mille* 861 (F).

Shrub or *tree* 3–12 m tall, twigs terete, glabrate. *Leaves* palmately 5-foliolate, the leaflets narrowly ovate, acute to acuminate, the base rounded, the leaflets to 10 cm long and 5 cm wide, usually smaller, the terminal largest, chartaceous, inconspicuously scattered lepidote above, rather densely minutely lepidote below, above glabrate or simple puberulous along midvein, below mostly glabrate, usually with a few simple trichomes around margins of domatiate nerve axils, drying olive gray to black; petiolules to 2.5 cm long, laterals shorter, petiole to 6 cm long, thin, inconspicuously lepidote and puberulous to glabrate. *Inflorescence* a several (2–8)-flowered cluster at the end of a branchlet, the pedicels to 1 cm long, densely tannish tomentose, the resting buds sessile, tannish mealy pubescent, bracts and bracteoles not apparent. *Flowers* with the calyx campanulate, 5-dentate, (8–)9–15 mm long, 17–12 mm wide, pubescent with pale tannish thick-stellate trichomes, these dense at base and along the five ribs, descending from the marginal teeth,

the often contrasting brownish or blackish calyx surface visible toward margin between the ribs; corolla lemon yellow with reddish or brownish striations in throat, tubular-infundibuliform, 6–8 cm long, 1.4–2 cm wide at mouth of tube, the tube 3.5–4.5 cm long, the lobes 1.3–2.5 cm long, glabrous outside, inside pubescent with rather scattered long multicelled trichomes mostly along throat ridges; stamens didynamous, the thecae divaricate, 2–3 mm long; pistil 2.5–3 cm long, the ovary linear, 5–6 mm long, 1–1.5 mm wide, densely lepidote, the ovules 2-seriate in each locule; disk pulvinate, 0.5 mm long, 3 mm wide. *Fruit* a linear-oblong capsule, subterete, 17–29 cm long, 8–10 mm wide, scattered lepidote, sometimes also minutely and very inconspicuously puberulous, drying dark; the *seeds* thin, bialate, 0.5–0.6 cm long, 1.2–1.7 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 40). Endemic to the dry forest of coastal Ecuador and adjacent Peru; sea level to 150 m elevation.

Representative specimens examined. **ECUADOR. EL ORO:** Huaquillas, 7 Apr 1980 (fl, fr), *Holm-Nielsen* 22852 (AAU). **GUAYAS:** Isidro Ayora, 12 Sep 1955 (fl), *Asplund* 17607 (B, G, K, LL, NY, S); 1 km E of turnofo to Julio Moreno, Oct 1974 (fl, fr), *Gentry* 12243 (MO); between Guayaquil and Salinas, 10 Dec 1934 (fl), *Mexia* 6758 (C, F, K, US).

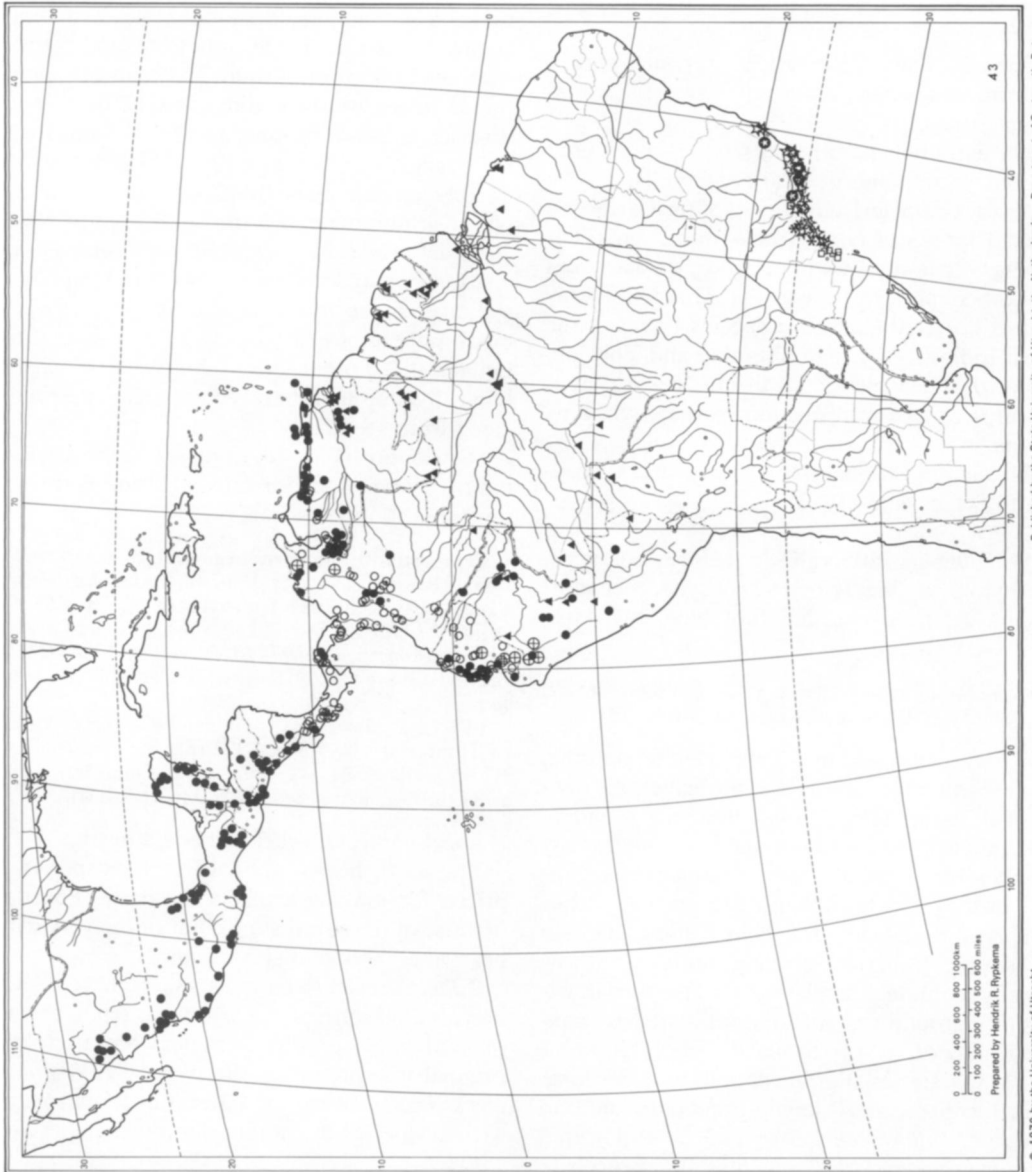
PERU. TUMBES: Prov. Tumbes, Ricaplaya, Valley of Tumbes River, 5 Mar 1927 (fl), *Weberbauer* 7734 (F, MO, US, USM, WIS); Casitas to Cañaverl, 8 Jun 1987 (bd), *Gentry & Díaz* 58180 (MO, USM).

Local name. Guayacán, madera negra.

The hard, heavy wood of this subspecies is prized for making artifacts in coastal Ecuador because of the contrasting color of the very dark heartwood and whitish sapwood.

Tabebuia ecuadorensis, as interpreted by Standley, is a mixture of *T. chrysantha* ssp. *chrysantha* and *T. billbergii* ssp. *ampla*. Contrary to my original interpretation, the type of *T. ecuadorensis* is referable to the latter, but when treated as a subspecies the nomenclature is unaffected.

12. *Tabebuia botelhensis* A. Gentry, sp. nov. Type. Brazil. São Paulo: Carlos Botelho State Park, 12 km S of Park Headquarters, edges of open swampy area. 760 m, 47°W, 24°12'S, 2 Sep 1987 (fl), *Gentry, A. Díaz & G. Franco* 58849 (holotype, SPSF; isotypes, F, MO, UEC).



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Arbor ad 20 m altam. Folia palmatim (5–)7-foliolata, foliolis ellipticis vel oblongo-ellipticis, integris vel inconspicue leviter serratis, infra stellato-tomentosis trichomatibus dendroideis. Inflorescentia paniculata, laxa, ramis dense rufescentibus. Flores calyce campanulato, dendroideo- vel stellato-tomentoso; corolla lutea, extus glabra, intus fauce pilosa. Capsula linearis, viloso-rufescens.

Tree to 20 m tall, 50 cm dbh, usually rather rachitic and thick-branched; the twigs irregularly subterete to subtetragonal, longitudinally fissured, when young finely tannish stellate-tomentose, glabrescent. *Leaves* palmately (5–)7–9-foliolate, the leaflets elliptic to oblong-elliptic, acute to short-acuminate at apex, rounded to truncate at base, entire or with a few small or inconspicuous teeth near apex, 3.5–32 cm long, 1.5–14 cm wide, membranaceous to chartaceous, weakly or not at all discoloured, softly but rather coarsely pubescent below with mostly few-branched dendroid trichomes, less densely pubescent and mostly glabrescent above except along main veins; petiolules 1.5–13 cm long, petiole 9–35 cm long, tannish stellate puberulous. Inflorescence an open panicle, to ca. 20 cm across, rufescent with barbate and dendroid trichomes, the bracts linear, to 1 cm long. *Flowers* with the calyx campanulate, densely villous with reddish dendroid trichomes, 19–23 mm long, petiole 9–35 cm long, tannish stellate puberulous. *Inflorescence* a panicle, open and to ca. 20 cm across or somewhat contracted, rufescent to tannish with barbate and dendroid trichomes, the bracts linear, to 1 cm long. *Flowers* with the calyx campanulate, densely villous with reddish to tannish dendroid to barbate and stellate trichomes, 19–28 mm long, 9–18 mm wide, irregularly 2–5-lobed; corolla yellow, tubular-infundibuliform, 6–8 cm long, 2–2.5 cm wide at mouth of tube, the tube 4.5–6.5 cm long, the lobes ca. 1.5 cm long, glabrous outside, inside pilose on throat ridges with mostly long simple trichomes, essentially glabrous at stamen insertion; ovary linear-oblong, 5–6 mm long, 1.5–2 mm wide, inconspicuously lepidote-

glandular or very minutely and sparsely puberulous toward base; disk thinly annular, 1 mm long, 3–4 mm wide. *Fruit* a linear capsule, terete, 21–23 cm long, 1.3–1.4 cm wide, villous-rufescent with mostly slightly barbate trichomes ca. 1 mm long; *seeds* thin, bialate, 0.5–0.8 cm long, 1.5–2.5 cm wide.

Distribution (Fig. 43). Coastal mountains of São Paulo and Rio de Janeiro States, 400–760 m alt., where it is apparently an edaphic specialist in poorly drained swampy areas.

Collections examined. BRAZIL. RIO DE JANEIRO: Novo Friburgo, 11 Aug 1881 (fl, fr), *Glaziou 12964 p.p.* (P). SÃO PAULO: Carlos Botelho State Park, ca. 12 km S of Park Headquarters, 47°W, 24°12'S, 760 m, 2 Sep 1987 (st), *Gentry et al. 58850* (MO, SPSF); Reserva Carlos Botelho, entre São Miguel Arcaño e Sete Barras, 400 m, 1 Feb 1978 (fl), *Prance et al. 6918* (MO, UEC).

This species is close to *T. alba* and somewhat intermediate between that species and *T. vellosi*. It differs from both *T. alba* and *T. vellosi* in its nearly entire leaflets (usually inconspicuously remotely serrate at apex). In addition it differs from *T. vellosi* in the generally more open inflorescence. It differs additionally from *T. alba* in the leaflets less densely tomentose below and with coarser tan rather than whitish trichomes, in the more rufescent slightly longer indumentum of calyx and inflorescence, and in the short-villous fruit with reddish trichomes ca. 1 mm long. At Carlos Botelho Park it appears to be ecologically isolated from *T. alba*, occurring only in open swampy areas below 760 m alt. while *T. alba* occurs at higher altitudes around forest edges (and also inside the forest, A. Diaz, pers. comm.) on well-drained sites. *Tabebuia botelhensis* is locally common in its restricted habitat at the type locality.

The Glaziou collection from Rio de Janeiro State may not be correctly referred here. One of the several sheets at P with the same number is a typical leaf of *T. alba* and the other vegetative material is in juvenile condition. How the *T. alba* leaf relates to the rest of the collection remains a mystery; unfortunately this is the only fruiting collection of *T. botelhensis*.

←
FIG. 43. Distribution of continental *Tabebuia*. ★ = *T. botelhensis*; ● = *T. bureavii*; ▲ = *T. capitata*; ☆ = *T. cassinoides*; □ = *T. catarinensis*; ● = *T. chrysantha* ssp. *chrysantha*; ○ = *T. chrysantha* ssp. *pluvicola*; ⊕ = *T. chrysantha* ssp. *meridionalis*.

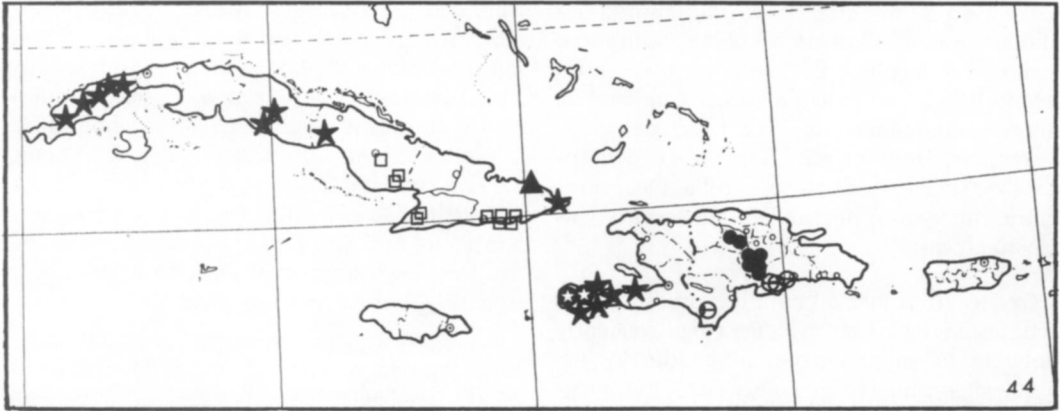


FIG. 44. Distribution of Antillean *Tabebuia*. □ = *T. brooksiana*; ● = *T. bullata*; ★ = *T. calcicola*; ▲ = *T. clementis*; ● = *T. conferta*; ⊙ = *T. crispiflora*.

Another problematic collection is Reitz & Smith 3541 from Santa Catarina which has been referred to *T. chrysostricha* but has the large leaflets of this species and intermediate calyces ca. 2×1 cm.

13. *Tabebuia brooksiana* Britton, Bull. Torrey Bot. Club 42: 372. 1915. Type. Cuba. Oriente (Granma): Ensenada de Mora, Britton, Cowell & Shafer 12985 (holotype, NY; isotype, MO).

Tabebuia nigripes Urban, Symb. antill. 9: 255. 1924. Type. Cuba. Oriente: Prope Bayate, Ekman 6252 (holotype, S).

Tree ca. 10 m tall, dichotomously branched, the branchlets terete, lepidote with small sessile whitish scales, sometimes also with scattered larger reddish scales or sparsely puberulous with inconspicuous minute simple trichomes. *Leaves* 5–7-foliolate, the leaflets narrowly oblong-elliptic, the apex rounded or minutely retuse (obtuse to acutish with a minute apiculation in Morton 9674), the base cuneate to rounded, the terminal 5.5–16 cm long, 1.5–5 cm wide (2.1–3.7 times as long as wide), the basals 2.5–8.7 cm long, 1.2–4 cm wide, chartaceous to thin-coriaceous, lepidote above and below, sometimes also minutely inconspicuously puberulous along midvein below, the secondary veins prominent below, plane or slightly impressed above, more or less brochidodromous, drying dark olive above, olive to brownish-olive below, the margin slightly erose, occasionally with a few large plate-shaped glands near base of midvein below, the terminal

petiolule 1–3.8 cm long, the basal petiolules well-developed, (0.2–)0.5–1 cm long, the petiole 5–13 cm long, petiole and petiolule lepidote, usually also with a few minute inconspicuous simple trichomes, often with longer trichomes at apex of petiole. *Inflorescence* a dichotomously branched terminal panicle, densely lepidote with dark-drying or reddish scales. *Flowers* with the calyx cupular, irregularly 2–3-labiate, 10–15 mm long, 5–7 mm wide, densely lepidote with dark-drying sessile peltate scales; corolla pink or light pink, tubular-infundibuliform 4–5 cm long, 1–1.5 cm wide at mouth of tube, the tube 2.5–3.5 cm long, the lobes ca. 1.5 cm long, tube glabrous outside, scurfy puberulous in throat inside, villous at level of stamen insertion, the lobes more or less ciliate, sparsely scurfy puberulous inside and outside along veins, anthers included in lower half of tube, the thecae divaricate, 2–3 mm long; ovary linear, the surface unridged, densely glandular-lepidote with darkish scales, 6 mm long, 1.5–2 mm wide; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* a capsule, not seen.

Distribution (Fig. 44). Eastern Cuba in Camagüey, Granma, Guantánamo, and Santiago de Cuba Provinces, 0–400 m alt. Savannas and woodlands.

Collections examined. CUBA. CAMAGÜEY: Savannas near Camagüey, 2–7 Apr 1912 (st), Britton et al. 13200 (NY); vic. of La Gloria, 30 Jan 1909 (st), Shafer 164 (NY, US); vic. of Daiquiri, 350 m, 14–16 Mar 1912 (fl), Britton & Cowell 12644 (NY); vic. of El Cuero, 330 m, 18–19 Mar 1912 (st), Britton & Cowell 12741 (NY); Ensenada de Mora, 350 m, 26–29 Mar 1912 (fl),

Britton et al. 12985 (MO, NY). GUANTÁNAMO: San Carlos, vic. of Guantánamo, 19–31 Mar 1909 (fl), *Britton 2287* (NY); Nagua, Rio Yara, 5 Jul 1922 (st), *Ekman 14162* (S); near Nagua, Jul 1922 (st), *Leon 11045* (GH). SANTIAGO DE CUBA: Bayate, 220 Jul 1915 (st), *Ekman 6252* (S); Monte Picote, Sierra de Nipe near Palmarito del Cauto, 400 m, 29 Jan 1956, *Morton 9674* (US); Sevilla Estate, Guama River basin near Santiago, 31 Aug 1906 (st), *N. Taylor 138* (NY).

Common name. Roble, roble de yugo.

Very close to and somewhat intermediate between *T. angustata* and *T. leptoneura*. From the former, of which it may be no more than a local variant, it is distinguished mostly by the rounded or retuse leaflet tips, from the latter by the mostly 7-foliolate leaves, erose leaflet margins, lack of prominent gland fields at base of midvein below, and generally thinner texture. The sterile type of *T. nigripes* has slightly larger leaflets more densely lepidote below and with the midvein below more obviously puberulous but is surely not specifically distinct; this specimen approaches *T. pulverulenta* and it is possible that that species and *T. brooksiana* hybridize. In general, density of leaf scales is too variable to be of much taxonomic significance. Thus the density of scales proposed in the Flora de Cuba as the key criterion for distinguishing *T. brooksiana* (as well as *T. trinitatis*) from *T. angustata* does not vary in parallel with the leaf shape and texture differences emphasized herein as specific distinguishing characters.

14. *Tabebuia buchii* (Urban) Britton, Bull. Torrey Bot. Club **52**: 377. 1915.

Tecoma buchii Urban, Symb. antill. **3**: 375. 1903. Type. Haiti: Môme La Pierre non procul a mar, 200 m, *Buch 612* (B*, not seen).

Shrub 1–3 m tall, dichotomously branched, with terminally clustered leaves, the branchlets subterete, when young grayish and puberulous with lepidote scales and stalked-lepidote trichomes, when older glabrescent and brownish with inconspicuous small pale lenticels. *Leaves* 3–5-foliolate, the leaflets elliptic, obtuse at base and apex, sometimes apiculate, the terminal 2–10 cm long, 1–4 cm wide, the basals (when 5-foliolate) 1–3 cm long, 0.4–2 cm wide, coriaceous, the margins usually distinctly erose and more or less crisped, slightly discoloured, gray to olive above, slightly paler below, densely lepidote above and below, also with long-stalked pel-

tate lepidote scales both above and below, both surfaces rough to the touch, conspicuously brochidodromous, the secondary veins plane or impressed above, strongly raised below, tertiary venation below also strongly prominulous and forming a conspicuous raised reticulum; petioles mostly virtually lacking to a maximum of 2 mm on terminal leaflet; petioles 0.1–1.5 cm long, densely lepidote, also pubescent with long-stalked peltate scales and crisped pilose from the persistent stalks of these trichomes. *Inflorescence* of one or two terminal flowers, densely minutely lepidote, also with short-stalked and long-stalked lepidote scales, the latter mostly decapitated and resembling simple hairs. *Flowers* with the calyx campanulate, bilabiate, 11–13 mm long, 5 mm wide, densely lepidote and also puberulous with longer articulated trichomes, a few of these retaining peltate apices, drying dark rufescent; corolla light purple, tubular infundibuliform, 4.5 cm long, ca. 1 cm wide at mouth, glabrous except for filament insertions and a few trichomes at apex, the stamens didynamous, the anthers divaricate, 2.5 mm long; ovary linear, lepidote; disc annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* a linear capsule, 6–7 cm long, 5–6 mm wide, acuminate, brownish, longitudinally costate, lepidote with sessile and very short-stalked trichomes; *seeds* (not seen) thin, bialate, 3–4 mm long, 11–13 mm wide.

Distribution (Fig. 41). Endemic to northern Haiti.

Specimens examined. HAITI. Presquile du Nord-Oest, Les Gonaives, towards La Pierre, 19 Jun 1927 (fl, fr), *Ekman H8486* (MO, S, TEX-LL, S, US).

Clearly allied to Cuban *T. bibracteolata* on account of the peculiar indument but very different from that species in having all leaflets sessile or subsessile and with crisped-erose margins.

15. *Tabebuia bullata* A. Gentry, Moscosoa **5**: 134. 1989. Type. Dominican Republic. La Vega: Alto de Casabito, 1140 m, 10 Apr 1983 (fl), *Gentry & Zanoni 50678* (holotype, MO; isotypes, JBSD, MO).

Shrub or small spindly *tree* 2–6 m tall, branchlets thick, subtetragonal to subterete, flattened at nodes, densely lepidote when young. *Leaves* 3-foliolate, the leaflets obovate to oblong-obovate, broadly rounded at apex, sometimes inconspic-

uously emarginate or subcuspidate, the base cuneate to obtuse, the lateral leaflets asymmetrically oblique, (5–)10–36 cm long, (2–)4–23 cm wide, thick-coriaceous, more or less bullate, the venation slightly impressed above, conspicuously and intricately raised below, glabrescently lepidote above, below pilose with stiff trichomes along the veinlets, the trichomes rather sparse and not impressed into areoles; petiolules 0.2–1.5 cm long, thick, lenticellate, the petioles thick and short, 0.1 to 1 cm long, with conspicuous lighter lenticels, lepidote and minutely puberulous. *Inflorescence* terminal, openly paniculate, the stalked-lepidote trichomes as in *T. acrophylla*. *Flowers* with the calyx campanulate, irregularly ca. 5-lobed, densely lepidote and stalked-lepidote, 15–21 mm long, 8–12 mm wide, conspicuously longitudinally ridged, especially in bud; corolla white or palest pink, tubular-infundibuliform, 5–8 cm long, the tube 4–6 cm long, 1.3–3.5 cm wide at mouth of tube, the lobes 1.5–2 cm long, glabrous outside, pilose in floor of throat inside; stamens didynamous, the thecae divaricate, 3 mm long; pistil ca. 2.5 cm long, the ovary linear, 5 mm long, 1 mm wide, densely minutely lepidote; disk annular-patelliform, 1.5 mm long, 4–5 mm wide. Immature *fruit* linear-cylindric, 6 cm long, 7 mm wide, longitudinally striate-costate, conspicuously rufescent with sessile and stalked peltate scales.

Distribution (Fig. 44). Endemic to upland forest in central Dominican Republic in Peravia, La Vega, and Santiago Provinces; 800–1400 m.

Specimens examined: REPUBLICA DOMINICANA. LA VEGA: 17 km S of Jarabacoa, road to Constanza, 1200 m, 10 Apr 1985 (st), *Gentry & Zanoni 50657* (JBSD, MO); Río La Palma, Constanza, 1000 m, 6–7 Jul 1973 (fl), *Liogier 19442* (JBSD); entre Loma La Sal y Loma La Golondrina, 19°4'N, 70°34'W, 3100 ft, 13 Apr 1982 (fl), *Zanoni et al. 19957* (JBSD, MO). PERAVIA: Arroyo Parra, La Vareda, 18°32'N, 70°28'W, 950–1000 m, 6 Apr 1985 (fl), *Gentry & Zanoni 50540* (JBSD, MO); Carmona road, 33 km N of San José de Ocoa, 18°38'N, 70°30'W, 1300 m, 6 Apr 1985 (fl), *Gentry & Zanoni 50533* (JBSD, MO); 12 km E of San José de Ocoa, 18°32'N, 70°28'W, 1150 m, 6 Apr 1985 (fl, fr), *Gentry & Zanoni 50551* (JBSD, MO); San José de Ocoa, Loma del Rancho, 1100 m, 18°31'N, 70°30'W, 8 Jul 1978 (fl), *Mejía 67* (JBSD); 9.8 km SW from Juan Aldian, 10 Jun 1980 (fl, fr), *Mejía & Zanoni 6818* (JBSD); 14.1 km N de San José de Ocoa, 1400 m, 18°38'N, 70°30'W, 7 Apr 1982 (fl), *Zanoni et al. 19862* (JBSD). SANTIAGO: Loma Bajita, Distr. San José de las Matas, Yaguasa, open pines, 700–800 m, 10 Jun 1933 (fl), *Valeur 911* (MO, NY, US); camino desde Aguacate

al sur, 570 m, 19°18'N, 71°19'W, 3 Mar 1982 (fl), *Zanoni et al. 19478* (JBSD).

Similar to *T. acrophylla* but differs conspicuously in white rather than red or purple-red flowers, larger and more infundibuliform corollas, larger browner-drying strikingly ridged calyces and many-flowered openly paniculate inflorescences. The two species are also ecologically separated, *T. bullata* occurring at generally higher altitudes from 550–1200 m and *T. acrophylla* generally below 500 m. A single high altitude collection of *T. acrophylla* (*Liogier 17190* from 1700 m) has prominently ribbed calyces, approaching *T. bullata* (although black drying) suggesting that there may be introgression between the two species. Vegetatively, *T. bullata* can be distinguished from *T. acrophylla* macroscopically by the different pubescence texture of the leaf undersides, gritty rather than soft; microscopically the sparser stiffer irregularly oriented trichomes of the leaf underside are quite distinct from the shorter denser trichomes appressed into the areoli of the leaf undersurface of *T. acrophylla*. The flowers and inflorescences of the two species are so different as to make specific recognition of the white-flowered, openly paniculate, taxon unavoidable.

16. *Tabebuia bureavii* Sandwith, *Kew Bull.* 1958: 442. 1959. Nom. nov. for *Tecoma dentata* Bureau & K. Schumann.

Tecoma dentata Bureau & K. Schumann in Martius, *Fl. bras.* 8(2): 323. 1897. Syntypes. Brazil. Rio de Janeiro, *Glaziou 12081* (lectotype, P; isotype, C) and *Glaziou 8806 p.p.* (BR).

Handroanthus dentatus (Bureau & K. Schumann) Matos, *Loefgrenia* 50: 2. 1970.

Tree to 12 m, twigs terete, striate, minutely stellate tomentose. *Leaves* palmately (6–)7-foliolate, the leaflets narrowly elliptic to lanceolate, acute to acuminate at apex, cuneate at base, conspicuously and evenly serrate, the terminal leaflet to 11 cm long and 3 cm wide, lateral leaflets progressively smaller, chartaceous, minutely stellate-rufescent when young, glabrate at maturity, drying olive; petiolules to 4 cm long, petiole to 8 cm long, glabrescently stellate-tomentose. *Inflorescence* a several–10-flowered corymbose terminal panicle, its branches stellate rufescent, the bracts and bracteoles minute, subulate. *Flowers* with the calyx campanulate, ir-

regularly 3–5-lobed, 15–17 mm long, 8–9 mm wide, finely stellate tomentose with black-drying plate-shaped glands in upper half; corolla yellow, tubular-infundibuliform, 5–6.5 cm long, 1–1.5 cm wide at mouth of tube, the tube 4.5–5 cm long, the lobes ca. 1 cm long, drying brown (as the tube) or yellowish, glabrous, the tube glabrous outside, inside sparsely puberulous with minute (ca. 0.1 mm long) papillose trichomes in throat and longer trichomes at level of stamen insertion; stamens didynamous, the filaments 2.3–3 cm long, the anther thecae divaricate, 5 mm long, the staminode 7 mm long; pistil 3.6–3.8 cm long, the ovary oblong, 4 mm long, 1.5 mm wide, densely lepidote; disk shortly cylindrical, 1–1.5 mm long, 3 mm wide. *Fruit* (only 1 seen) linear, terete, 27 cm long, 1.3 cm wide, glabrous with a few scattered lepidote scales, the valves smooth, not striate. *Seeds* thin, bialate, 0.5–0.7 cm long, 2–2.5 cm wide, the wing tips hyaline-membranaceous and clearly demarcated from the brownish wing base.

Distribution (Fig. 43). Upland forest of Rio de Janeiro and adjacent area of Serra do Mar, south to São Paulo; mostly collected on Pico de Tijuco; 300–1000 m elevation.

Representative specimens examined. BRAZIL. ESPÍRITO SANTO: Venda Nova, Mun. Conceição do Castelo, 20 Nov 1985 (fl), *Hatschbach & Zelma 49983* (MO). **RIO DE JANEIRO:** Rio de Janeiro, Torres da TV Tupi, 9 Jan 1963 (st), *Duarte 6210* (RB); Pico da Tijuca, Sep 1964 (fl), *Duarte 8464* (MO, RB); Lago de Freitas (fl, fr), *Glaziou 8806* (BR, C, G); Vista Chinesa, 25 Nov 1932 (fl, fr), *Kuhlmann s.n. (R129435)* (MO, RB); Vista Chinesa, 10 Nov 1971 (fl), *Laroche et al. 6* (MO, NY, US); Jardim Botânico, 17 Nov 1933 (st), *Occhioni s.n.* (UFMT); Teresópolis, Boa Fe, *Velloso 447* (R). **SÃO PAULO:** Alto da Serra, 14 Oct 1921 (fl), *Gehrt 5784* (SP).

Local names. Ipe amarelo, ipeuva.

Closely related to *T. serratifolia* and perhaps no more than a distinctive form of that species, characterized especially by the more sharply and closely serrate leaflets.

17. *Tabebuia calcicola* Britton, Bull. Torrey Bot. Club **42**: 373. 1915. Type. Cuba. Pinar del Rio: vic. Guane, *Britton & Cowell 9772* (holotype, NY; isotypes, HAC, NY).

Tecoma leucoxylo var. *reticulata* Grisebach, Cat. pl. Cub. **193**. 1866. Lectotype. Cuba: *Wright 1338* (=1042) (GOET) p.p.; syntype *Wright 3041* (GH)

p.p. (but *Wright 1338* at MO is *Spirotecoma domatata* and the other sheets of both *1338* and *3041* include material of *T. leptoneura*).

Tabebuia ekmanii Urban, Arkiv. Bot. Stockholm **17**(7): 54. 1922. Type. Haiti: Dept. Sud: inter Coteau et Damassins, *Ekman 311* (S).

Tabebuia erosa Urban, Arkiv. Bot. Stockholm **22A**(10): 66. 1929. Type. Haiti: Massif des Matheux, *Ekman H7103* (holotype, S; isotypes, IJ, K).

Tabebuia hotteana Urban & Ekman, Arkiv. Bot. Stockholm **22A**(10): 65. 1929. Type. Haiti: Massif de la Hotte, *Ekman H5184* (S).

Tabebuia jojoana Britton & Wilson ex Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De La Salle" **15**: 15. 1956. Type. Cuba. Oriente (Guantánamo): Baracoa region, Jojo Valley, *Leon 12113* (holotype, HAC; isotype, NY).

Tabebuia triorbicularis Borhidi, Act. Bot. Acad. Sci. Hung. **26**: 17. 1980. Type. Cuba. Las Villas (Sancti Spiritus): Trinidad, Loma del Burro, 400–600 m, *Bisse et al. s.n. (HAJB 34762)* (holotype, HAC; isotypes, HAJB (also JE, BP, not seen).

Tabebuia triorbicularis var. *obovata* Borhidi, Act. Bot. Acad. Sci. Hung. **26**: 18. 1980. Type. Cuba. Las Villas (Sancti Spiritus): Trinidad, Loma del Mirador, 550 m, *Bisse et al. s.n. (HAJB 34683)* (holotype, HAJB; isotypes, HAC (also JE, BP, not seen)).

Tree to 10 m tall, dichotomously branched, the branchlets terete, usually drying grayish with a few paler lenticels, lepidote when young. *Leaves* 3–5-foliolate, the leaflets elliptic, obtuse or rounded to retuse at apex, usually more or less rounded at base, sometimes cuneate (Haiti only: *T. erosa*), the terminal 2–10.5 cm long, 1–4.5 cm wide, the basals 1–6 cm long, 0.5–4 cm wide, coriaceous, densely lepidote above and below, usually with scattered reddish brown scales as well as the whitish ones, drying grayish above and tannish below, venation brochidodromous, the midvein and sometimes the secondaries impressed above and raised below, the tertiary venation usually somewhat prominulous below (sometimes strongly prominulous in Haiti), the margin entire to distinctly erose; petiolule 0.2–2 cm long, the petiole 1–6 cm long. *Inflorescence* a few-flowered dichotomously branching panicle or reduced to 2–3-flowers, densely lepidote, usually drying brownish. *Flowers* with calyx irregularly 2–3-lobed, 9–12 mm long, 5–8 mm wide, densely lepidote, the corolla whitish to pale magenta, tubular-infundibuliform above the narrow base of tube, the tube 3–4 cm long, the lobes 1–1.5 cm long, glabrous outside, inside puberulous in throat and on lobes, the filaments ca. 1.5 cm long, densely villous at base, the anthers deeply included, the thecae divaricate, 2–3 mm long;

ovary linear-oblong, 4 mm long, 1 mm wide, densely lepidote. *Fruit* linear-cylindric, 9–18 cm long, 7–9 mm wide, lepidote with blackish scales, somewhat striate ribbed, subtended by persistent calyx, drying blackish; *seeds* thin, bialate, 4–5 mm long, 15–18 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 44). Cuba (Pinar del Rio, and the old provinces of Las Villas and Oriente) and Haiti in karst limestone areas; perhaps also Jamaica; near sea level to 1000 m.

Specimens examined. CUBA. CIENFUEGOS: Lomas de Sigüanea, 700 m, 4 Jun 1922 (st), *Ekman 18901* (S); vic. of Soledad, Quesada, 12 Dec 1941 (fl), *González 393* (A, BM, NY, S); Las Lagunas, Buenos Aires, 2500 ft, 4 Mar 1929 (fl), *Jack 6974* (A, US); Buenos Aires, 2500–3500 ft, 22 Jul 1930 (fl), *Jack 7892* (A, US). GUANTÁNAMO: Jojo Valley, Cajobabo, Baracoa region, 17 Jul 1924 (fl, fr), *León 12113* (HAC, NY). PINAR DEL RÍO: Mogote José María, Viñales, 31 Mar 1953 (fl), *Alain 2926* (NY); Mogote El Queque, Viñales, 19 Sep 1953 (st), *Alain 3518* (NY); Rangel, Sierra del Rosario, Jan 1957 (st), *Alain 6111* (US); Paredón del Moro, Santa Cruz de los Pinos, 250 m, Apr 1957 (fr), *Alain 6252* (NY); vic. Guane, 4–5 Mar 1911 (fl, fr), *Britton et al. 9772* (HAC, NY); Pan de Guajaibón, 750–800 m, 9 Jan 1921 (st), *Ekman 12774* (S); Sierra de los Organos, Peña Blanca, 750 m, 30 Mar 1923 (fl), *Ekman 16378* (MO, S); Sierra de Viñales, 8 Jun 1923 (st), *Ekman 16594* (S); Loma de la Bandera, Sierra de Viñales, 9 Mar 1924 (fl), *Ekman 18661* (B, S); Viñales, 11 Dec 1930 (st), *Killip 13597* (US); Mogote de la Bandera, Viñales, 14 Apr 1930 (fl), *León 14362* (GH, HAC, NY); Sabicu, Rangel, 27 Apr 1933 (fr), *León 15974* (GH, NY, US); Guane, Mar 1940 (fl), *León et al. 17619* (fl); Mogote de la Bandera, 250 ft, 17 Mar 1957 (fl), *Proctor 16350* (A); Loma del Sabicu, 27 Apr 1953 (fl), *Roig & Alain 6430* (NY); vic. Sumidero, 24 Aug 1912, (fl), *Shafer 13823* (NY, US). VILLA CLARA: La Vigía Hill, Trinidad, Santa Clara, 14 Mar 1910 (fl), *Britton & Wilson 5526* (US).

JAMAICA (?). Lydford P.O., Reynolds mine area, 30 Jan 1955 (fr), *Howard & Proctor 14209* (IJ).

HAITI. Massif de la Hotte, Plaine des Cayes, Oct 1928 (fl), *Buch s.n.* (*Ekman H9964*) (B, S); Dept. du Sud, Milien prope Aux Cayes, 4 Jun 1917 (st), *Ekman H56* (S); inter Coteau et Damassins, 24 Jun 1917 (st), *Ekman H311* (S); Massif de la Hotte, Plaine des Cayes, 28 Nov 1925 (fl), *Ekman H5184* (IJ, S); Massif de la Hotte, Anse-a-Veau Massif, 11 Jan 1926 (fl), *Ekman H5390* (S); Massif de la Hotte, Morne Rochelois, Miragoane, 30 Jul 1926 (st), *Ekman H6547* (A, S); Massif des Matheux, Tron-Forban, 300 m, 10 Oct 1926 (st), *Ekman H7103* (IJ, K, S); Massif de la Hotte, group Morne Rochelois, Miragoane, 25 Mar 1927 (fl), *Ekman H7892b* (S); M. Rochelois, Miragoane, Massif de la Hotte, 25 Mar 1927 (fl, fr), *Ekman H7894* (TEXT, US); Massif de la Hotte, Petit-Riviere des Nippes,

16 Jul 1927 (st), *Ekman H8583* (G, GH, S); Grande Caimite, Les Abricots, 150 m, 21 Aug 1927 (st), *Ekman H8939* (K, S); Massif de la Hotte, Plain des Cayes, Apr 1928 (fl), *Ekman H9964* (B, S); Massif de la Hotte, 11.2 km de Port Salut, 18°8'N 73°58'W, 5–10 m, 25 Jan 1985 (fl), *Zanoni et al. 33181* (JBSD, MO); 5 km NE de Bombardopolis, 3 Feb 1985 (fl), *Zanoni et al. 33555* (JBSD).

Local name. Bois savanne (Haiti).

Tabebuia calcicola may be visualized as that part of the *heterophylla* complex which has retained the typical tubular-infundibuliform whitish to pale magenta West Indian *Tabebuia* flower while developing the leaf form with erose margins and pale and reticulate below that is so typical of many Greater Antillean karst limestone species. Although several names based on minor vegetative differences have been proposed for this taxon (especially on Haiti where sterile, presumably juvenile, forms have been described as *T. erosa* and *T. ekmanii*) it seems best to regard all but one of these as conspecific in what thus becomes a morphologically and ecologically coherent species. The most extreme member of this complex, *T. multinervis*, which differs primarily in its narrower leaflets is provisionally accepted as a different species.

No matter how finely the taxonomy is split, *T. calcicola* occurs on both Hispaniola and Cuba, since *T. hotteana* is virtually identical to typical *T. calcicola*.

Differentiation of *T. sauvallei*, with deeper red, narrower tubed, presumably hummingbird-pollinated flowers, from *T. calcicola* is much more problematic. On Cuba the two grow sympatrically in the Trinidad Mountains and cannot be consistently distinguished vegetatively, although *T. sauvallei* tends to have more erose leaflet margins and cuneate leaflet bases. On this basis Haitian extremes like the sterile *T. erosa* type should be referable to *T. sauvallei*, but since no collections of a plant with karst-type leaves and red flowers have been made on Hispaniola, I assume that only *T. calcicola* grows there, albeit becoming more variable.

The single Jamaican collection assigned here is in fruit and only tentatively identified. It may be no more than an unusual form of *T. angustata*.

18. *Tabebuia caleticana* A. Gentry & D. Albert, sp. nov. Type. Cuba. Guantánamo: Caletica,

Jauco, Baracoa region, *Leon 11832* (holotype, HAC; isotypes, NY, photocopy, MO).

Frutex ad 2 m altum. Folia unifoliolata, foliolo late ovato vel fere orbiculato, cordato, dense lepidoto. Inflorescentia floribus solitariis vel paucis. Flores calyce anguste campanulato, confertim lepidoto; corolla subrosea, extus glabra. Capsula linearis, interdum longitudinaliter costata, lepidota.

Shrub 2 m tall, dichotomously branched; branchlets subterete, flattened at nodes, longitudinally ridged, lepidote, sometimes with a few conspicuous lenticels. *Leaves* unifoliolate, opposite, clusters at ends of branchlets, broadly ovate to broadly elliptic or almost suborbicular, subacute to emarginate at apex, strongly cordate at base, 2.5–9.5 cm long, 2–8 cm wide, coriaceous, the margin not revolute, the surface dull and densely minutely lepidote above and below, subscabrous above, drying brownish to olive above, brownish olive below, the secondary venation slightly impressed above, raised below, tertiary venation plane above, prominulous below; subsessile, the petioles 0.1–0.5 cm long, lepidote. *Inflorescence* of one to several flowers, lepidote. *Flowers* with the calyx narrowly campanulate, irregularly bilabiate, smooth to inconspicuously ridged, 9–11 mm long, 5–6 mm wide, densely lepidote outside and inside, drying blackish brown; corolla (only 1 seen) light pink, tubular-infundibuliform, ca. 4 cm long, ca. 1.2 cm wide at mouth of tube, the tube 3–3.5 cm long, the lobes ca. 1 cm long, with scattered lepidote glands on outside of tube; ovary (mostly destroyed) densely lepidote. *Fruit* linear, terete, sometimes longitudinally prominulously ribbed, 9–12 cm long, 5–6 mm wide, lepidote, the calyx persistent; *seeds* thin, bialate, 3–4 mm long, 0.7–1.2 cm wide, the hyaline-membranaceous wings sharply demarcated from brown seed body.

Distribution (Fig. 41). Coastal thickets on limestone rocks in the Baracoa region of eastern Cuba; below 100 m elevation.

Collections examined. CUBA. GUANTÁNAMO: Caletica, Jauco, 16 Jan 1956 (st), *Alain & Morton 5236* (GH, HAC) (p.p.), 1935 (fl), *G. Bucher 10543* (HAC), 1938 (st), *G. Bucher s.n.* (HAC), Jul–Aug 1924 (fl, fr), *León 11832* (HAC, NY); Mesa del Chivo, Maísi, Jul 1938 (fr), *Alain & Seifriz 1844* (HAC), 30 Dec 1959 (st), *Alain & López-Figueiras 7059* (HAC), Jul 1938 (fl, fr), *León 18244* (NY).

Although these collections were included in *T. polymorpha* by Alain (1957), we do not think they are conspecific with the type of that species nor even close to it. *Tabebuia polymorpha*, which is known from only three collections from the same region, has mostly compound leaves. Only the New York isotype has uniformly simple leaves but these differ markedly in the much longer (2.5–4 cm) petioles, smooth upper surfaces, and conspicuously white undersides. One of the other collections of *T. polymorpha* has some leaves 3-foliolate, others unevenly 2-foliolate and others with basal lobes. We interpret all these as belonging to a normally compound-leaved species, especially in view of the strongly 3-veined leaf bases of the unifoliolate leaves.

One of the collections of the proposed species (*Alain & Morton 5236*) is a mixture of typical *T. caleticana* and a uniformly small-leaved plant with round-based mostly apiculate leaves, the latter referable to *T. obovata*. The genetic basis for many of the morphs here accepted as species on Cuba is undoubtedly very weak. Since *T. caleticana* seems as distinctive as most of the other forms recognized as species on Cuba, it seems best to propose it as a new species, albeit with reservations as to what truly constitutes a *Tabebuia* species on Cuba.

19. *Tabebuia capitata* (Bureau & K. Schumann) Sandwith, Rec. Trav. Bot. Neerl. **34**: 226. 1937.

Tecoma leucoxydon (Linnaeus) Martius ex A. P. de Candolle var. *miquelii* A. P. de Candolle. Prodr. **9**: 219. 1845.

Tecoma capitata Bureau & K. Schumann, Fl. bras. **8(2)**: 337. 1897. Type. Brazil. Amazonas: Tefe, *Poepig 138* (B*, lectotype, K; isotypes, F, W).

Tabebuia glomerata Urban, Feddes Repert. **14**: 305. 1916. Type. Tobago. *Broadway 2989* (B*, lectotype, MO; isotypes, G, NY).

Tabebuia hypolepra Sprague & Sandwith, Kew Bull. **1932**: 25. 1932. Type. Guyana. Rio Essequibo, *Sandwith 594* (holotype, K; isotypes, RB, U, US).

Handroanthus capitatus (Bureau & K. Schumann) Mattos, Loefgrenia **50**: 4. 1970.

Tree to 40 m tall, the branchlets subterete to subtetragonal, stellate-pubescent when young. *Leaves* palmately 5-foliolate, the leaflets elliptic to narrowly ovate-elliptic, acuminate, rounded at base, the terminal leaflet to 14.5 cm long and 6 cm wide, the lateral leaflets smaller, entire, chartaceous, stellate-puberulous along midvein

above and in the axils of the lateral veins and sometimes sparsely along the secondary veins and/or over the surface below, lepidote punctate above and especially below, drying greenish to blackish; petiolules to 2.5 cm long, the petiole to 7 cm long, somewhat stellate-pubescent in the adaxial groove. *Inflorescence* a multiflowered panicle, usually reduced and almost fasciculate, the branches yellowish-brown stellate-tomentose. Calyx campanulate, irregularly lobate, 8–12 mm long, 6–11 mm wide, conspicuously pubescent with thick-stellate yellowish-brown trichomes; corolla yellow, tubular-infundibuliform, 4.5–7 cm long, 1–1.8 cm wide at mouth of tube, the tube 3–5 cm long, the lobes 1–2 cm long, glabrous outside, the lobes not at all or inconspicuously ciliate, minutely glandular-lepidote, the throat pilose inside with long (to 1 mm) twisted trichomes, mostly near mouth, villous at stamen insertion; stamens didynamous, the thecae divaricate, 2–2.5 mm long; pistil 2–2.1 cm long, the ovary linear-oblong, 2–2.5 mm long, 1 mm wide, densely lepidote, sometimes also somewhat minutely stellate-puberulous, the surface smooth, not verrucose, the ovules multi-seriate in each locule; disk cupular, 5-lobed, 0.5 mm long, 1.5 mm wide. *Fruit* a linear capsule, to 31(–50) cm long, 1.5–1.7 cm wide, acuminate, the valves narrow, more or less scattered-lepidote, usually with scattered stellate trichomes, sometimes subglabrescent, longitudinally finely striate; *seeds* thin, bialate, 0.7–0.8 cm long, 1.7–2.4 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 43). Mostly in the Guianas and Guayanan Amazonia, southwest through much of the Amazon basin to Peru and northern Bolivia; in well-drained upland forests usually on rather poor soils; near sea level to 500 m.

Representative specimens examined. VENEZUELA. AMAZONAS: Ríos Pacimoni-Yatua, Casiquiare, 1 Feb 1954 (fl), *Maguire et al.* 37404 (NY). BOLÍVAR: 1–10 km W from Río Grande, E of El Palmar, Jul 1975 (st), *Gentry & Berry* 15012 (MO, VEN); Chimanta Massif, Río Abacapa, NW part of Abapapa-tepui, 29 Mar 1953 (fl, fr), *Steyermark* 74710 (G, K, VEN). DELTA AMACURO: E de Río Grande, ENE de El Palmar, Nov 1965 (fl), *Blanco* 496 (MO, MV, NY, US), 15 May 1964 (fl, fr), *Marcano-Berti* 135 (BR, COL, MO, P, US, VEN).

GUYANA. Lakeweah hill, Jun 1893 (fl), *Jenman* 6613 (NY); Essequibo River, Moraballi Creek, near Bartica, 11 Nov 1929 (fl), *Sandwith* 594 (K, RB, U, US).

SURINAM. Watramiri, 13 Oct 1921 (fl), *Herb. Acad. Rhenotraject* 5472 (IAN, MO); Zanderij I, 1 Nov 1942 (st), *Stahel* 114 (WIS).

FRENCH GUIANA. Tumuc Humac, versant sud du Mitaraka Sud, Aug 1972 (fl), *de Granville* 1273 (CAY, MO, P); route de Charvein-Acarouany, Nov 1954 (fl), *F. S.* 240M (CAY).

PERU. AMAZONAS: Comunidad de Caterpiza, Río Santiago, 8 Sep 1979 (fl), *Huashikat* 475 (MO). LORETO: Allpahuayo, 35 km SW of Iquitos, 3°50'S, 73°25'W, 130 m, 16 Feb 1987 (st), *Gentry et al.* 56005 (AMAZ, MO). MADRE DE DIOS: Puerto Maldonado, 220 m, 25 Jan 1976 (bd), *Gentry & Revilla* 16333 (MO, USM). PASCO: Central Selva, Iscozacín, 14 May 1985 (st), *Hartshorn et al.* 2744 (MO). UCAYALI: Boquerón Padre Abad, 22 Aug 1946 (st), *Woytkowski* 417 (MO, USM).

BRAZIL. ACRE: Rio Macauhan, *Krukoff* 5793 (G, NY). AMAPÁ: Maruanum, Macapa, 30 Oct 1980 (fl), *Rabelo* 901 (MO). AMAZONAS: Rio Jurua-Rio Embira, 28 Jun 1933 (fl), *Krukoff* 5049 (F, G, LP, M, MICH, S); Manaos, Estrada Aleixo, 12 Aug 1936 (fr), *Krukoff* 8029 (BR, F, G, MO); Manaus, km 3 da BR 17, 19 Sep 1955 (fl), *Rodrigues s.n.* (INPA1981) (INPA, MG). MARANHÃO: Maraçassu River, Campo de Boa Esperança, 22 Oct 1932 (st), *Frões* 1975 (F, G, MICH, MO, NY, S, US, WIS), 24 Oct 1932 (fl), *Frões* 1981 (MG, MO). PARÁ: 18 km from Tucuruí, 16 km S of BR 422, 1 Nov 1981 (fl), *Daly et al.* 1144 (MO); Montealegre, 16 Dec 1908 (fl, fr), *Ducke s.n.* (RB18184) (RB). RONDÔNIA: Ouro Preto, BR 364, Cuiaba-Porto Velho, km 353, 30 Jun 1984 (st), *Cid et al.* 4932 (MO). RORAIMA: Rio Apiau, km 5–15, 30 Jan 1967 (fl), *Prance et al.* 4179 (F, INPA, MG, MO, S).

Local names. French Guiana: lisière de la forêt. Venezuela: arauí-ye, araguaney, araguaney puy, canaguato blanco. Brazil: pau d'arco, pau d'arco amarelo, pau d'arco preto, pau d'arco tatajipoca. Peru: tahuari, comesebo negro.

Closely related to mostly allopatric *T. chrysantha*, a highly variable species of Central America and western South America, and perhaps not adequately differentiated for specific recognition. This species is essentially the Amazonian-Guayanan replacement of *T. chrysantha* from which it is usually separable by the impressed-lepidote scales on the leaflet undersurface and also by the generally less dense indumentum. In *T. chrysantha* there are always stellate trichomes along the main veins below and usually at least sparsely over the leaf undersurface, while in *T. capitata* the trichomes are mostly restricted to the nerve axils below and, when also occurring along the main nerves, are shorter and macroscopically less evident.

The ranges of *T. capitata* and *T. chrysantha* overlap in western Amazonia. Where the ranges of the two species overlap in Peru, *T. capitata*

appears to occur mostly on highly leached lateritic soils and *T. chrysantha* mostly on relatively rich alluvial soils. In this same region, *T. obscura*, vegetatively intermediate between *T. chrysantha* and *T. capitata*, also occurs but is usually restricted to the poorest sandy soils. In the Guayana area *T. capitata* can be confused with glabrescent forms of *T. subtilis* (where see discussion), but that species occurs only at elevations of over 500 m.

At the other, glabrescent, extreme, *Tabebuia capitata* is also close to *T. guayacan* and *T. serratifolia*, differing from both in having at least a few stellate trichomes along the leaflet midvein rather than having the pubescence entirely restricted to axils of lateral nerves below.

20. *Tabebuia cassinoides* (Lamarck) A. P. de Candolle, Prodr. 9: 213. 1845.

Bignonia cassinoides Lamarck, Encyc. Méth. 1: 418. 1785. Type. Brazil. Rio de Janeiro, Commerson s.n. (P-JUSS).

Bignonia uliginosa Gomes, Obs. Bot. Med. Bras. 2: 7, pl. 2. 1803; Mem. Acad. Lisboa 3: 57. 1812. Type. Brazil. Rio de Janeiro. Not indicated; lectotype: *Lhotsky 141* (G-DC; isotype, MO), designated by de Candolle.

Catalpa cassinoides (Lamarck) Sprengel, Syst. 1: 70. 1825.

Bignonia tabebuia Vellozo, Fl. flumin. 251. 1829(1825). Type illustration. Brazil. Rio de Janeiro. Icones Fl. flumin. 6: t. 53. 1831.

Spathodea magnolioides Chamisso, Linnaea 7: 661. 1832. Type. Brazil. *Sellow s.n.* (not seen).

Tabebuia leucantha Gomez ex Saldanha da Gama ex Bureau & K. Schumann in Martius, Fl. bras. 8(2): 309. 1897, nom. nud., pro syn.

Tabebuia uliginosa (Gomes) A. P. de Candolle, Prodr. 9: 212. 1845.

Tecoma uliginosa Martius ex A. P. de Candolle, Prodr. 9: 212. 1845, nom. nud., pro syn.

Tabebuia magnolioides (Chamisso) Miers, Proc. Roy. Hort. Soc. 3: 199. 1863.

Small to medium-sized tree 4–18 m, twigs subterete often rather flattened when young, lepidote. Leaves simple, the blade obovate to obovate-elliptic, the apex rounded, the base cuneate, 5–23 cm long, 2.5–7 cm wide, entire, coriaceous, lepidote above and below, otherwise glabrous, with a conspicuous glandular field at base on either side of petiole apex, the petiole 0.5–2 cm long, densely lepidote. Inflorescence a rather few-flowered corymbose terminal panicle, densely lepidote, the flowers mostly in 2's, bracts linear, 5–8 mm long, bracteoles minute or lacking.

Flowers with the calyx campanulate, bilabiate, 15–20 mm long, 8–12 mm wide, densely lepidote, usually with plate-shaped glands in more or less well-defined linear fields near middle; corolla white with yellow in throat, tubular-infundibuliform, 5.5–9 cm long, 1.5–1.8 cm wide at mouth of tube, the tube 4.5–6 cm long, the lobes 1.5–1.8 cm long, glabrous outside, the lobes subciliate with a few minute marginal trichomes; stamens didynamous, included, the anther thecae divaricate, 4–5 mm long, insertion ca. 15 mm from base of corolla tube; pistil ca. 4 cm long, the ovary linear, 5–6 mm long, 1.5 mm wide, densely lepidote; disk patelliform, ca. 1 mm long, 3–4 mm wide. Fruits linear-oblong, ca. 13–15 cm long, terete, 1–1.2 cm diam., the surface slightly striate-ridged, densely lepidote, drying gray, calyx persistent; seeds bialate, 0.6–0.7 cm long, 2.5–3 cm wide, the wings hyaline membranaceous with brownish veining, sharply demarcated from gray-brown seed body.

Distribution (Fig. 43). Coastal Brazil from Espírito Santo to Paraná; restricted to fresh-water swamps where it typically forms pure stands; near sea level.

Representative specimens examined. BRAZIL. ESPÍRITO SANTO: Linhares, Reserva Florestal da CVRD, Estrada 243, 31 Jan 1985 (fl), Peixoto, Gentry et al. 3014 (MO). PARANÁ: Saquarema, Mun. Morretes, 40 km W of Paranaguá, 25 Jan 1985 (fl), Gentry & Zardini 49844 (MO); Ilha do Malha, Morretes, Nov 1975 (fl), Kummrow 990 (MBM, MO). RIO DE JANEIRO: Itaboraí, Rio Guapimirim, 19 Nov 1975 (fl), Araujo 1355 (GUA); Gavea, Glaziou 4732 (K, S); Restinga de Jacarepagua, 10 Sep 1958 (fl), Pereira et al. 4162 (B, F). SÃO PAULO: Ubatuba, 19 Nov 1975 (fl), Gibbs et al. 3459 (MBM, NY, UEC); Mongaguá, Praia Grande, 29 Nov 1953 (fl), Grotta & Bartholomeu s.n. (SPF15134) (SPF); Iguape, Restinga de Grajau, 11 Dec 1981 (fl), Stubblebine et al. 13228 (MO, UEC).

Common names. Caixeta, pau de tamanco, tagibubua, tabebuia.

One of the very few simple-leaved continental *Tabebuia* species. At Linhares, Espírito Santo, this species grows sympatrically with *T. stenocalyx* in exactly the same swampy microhabitat, differing from that species only in floral characters (bee-pollinated vs. hawkmoth pollinated). *Tabebuia obtusifolia* is also very similar vegetatively, but is distinguished by very different flowers, apparently adapted for bat pollination; it grows sympatrically with *T. cassinoides* at Lin-

hares but is ecologically separated, occurring in terra firme forest.

The generic name *Tabebuia* is derived from one of the common names of this species, which means "ant wood" in Tupi-Guarani, referring to the frequent presence of ants in the hollowed out twigs of *T. cassinoides* (Pio Correa, 1926).

21. *Tabebuia catarinensis* A. Gentry, Ann. Missouri Bot. Gard. **64**: 318. 1977. Type. Brazil. Santa Catarina: Monte Crista, Garuva, 750 m, 21 Oct 1966 (fl), *Klein & Ravenna 6834* (holotype, K).

Shrub 0.5–3 m tall, the branchlets terete, striate, minutely and glabrescently stellate-tomentose. *Leaves* palmately (6–)7-foliolate, the leaflets oblong-elliptic to obovate, acute or very briefly acuminate, the base rounded, conspicuously and evenly serrate, the terminal leaflet to 11 cm long and 5 cm wide, lateral leaflets progressively smaller, chartaceous, when young sparsely stellate pubescent along main veins above and below, almost completely glabrescent at maturity, drying blackish or dark olive above and below; petiolules to 4 cm long, petioles to 13 cm long, glabrescently stellate-tomentose. *Inflorescence* a several-many-flowered short terminal panicle, its branches densely rufescent with stellate barbate and simple trichomes to 1 mm long, bracts minute, subulate, to 3 mm long. *Flowers* with the calyx tubular-campanulate, irregularly 3–5-lobed, 12–20 mm long, 8–12 mm wide, pilose with reddish mostly barbate trichomes to 1 mm long; corolla yellow, tubular-infundibuliform, 5–7 cm long, 1.4–2.2 cm wide at mouth of tube, the tube 3.5–5 cm long, the lobes 1–2 cm long, drying dark brown with blackish venation, glabrous outside, within pubescent with rather short (0.4–0.8 mm long) stiff erect trichomes descending from sinuses of the corolla lobes to above level of stamen insertion, \pm glabrous at and below stamen insertion; stamens didynamous, inserted ca. 10 mm above base of corolla tube, the filaments 1.7–2.2 cm long, the thecae widely divergent, 3 mm long; pistil 3.2–3.4 cm long, the ovary ovoid, ca. 2 mm long, 1.3–1.5 mm wide, densely lepidote, drying blackish; disk shortly

cylindric, 1 mm long, 2 mm wide. *Fruit* a linear-oblong capsule, 5–9 cm long, 1.5–1.8 cm wide, densely reddish brown pubescent with mostly barbate trichomes ca. 0.5 mm long, the surface finely and irregularly rugulose, not regularly striate; *seeds* (immature) bialate, the wings hyaline membranaceous.

Distribution (Fig. 43). Upland campos of southern coastal Brazil in Paraná and Santa Catarina States; 750–1350 m alt.

Specimens examined. BRAZIL. PARANÁ: PICO Caratuba, Campina Grande do Sul, 5 Oct 1967 (fl), *Hatschbach 17325* (MBM, MO); Alto da Serra, Mun. Guaratuba, 21 Nov 1959 (fr), *Hatschbach 21093* (B); Serra do Aracatuba, Guaratuba, 15 Sep 1982 (fl), *Kummrow 2017* (MBM, MO). **SANTA CATARINA:** Monte Crista, Garuva, 750 m, 21 Oct 1966 (fr), *Klein & Ravenna 6828* (K), 21 Oct 1966 (fl), *Klein & Ravenna 6843* (K), 1200 m, 3 Sep 1960 (fl), *Reitz & Klein 9766* (K), 900 m, 2 Sep 1960 (fl), *Reitz & Klein 9790* (K), 24 Mar 1961 (st), *Reitz & Klein s.n.* (K).

Common name. Pau santo.

This species is intermediate between lowland *T. chrysotricha* and *T. alba*. Its flowers and inflorescence are identical to those of *T. alba* but it differs in the usually shrubby habit, shorter rough-surfaced non-striate fruit, and the strikingly different, glabrate rather than densely canescent, leaves. Superficially *T. catarinensis* looks most like *T. bureavii* of the Rio de Janeiro area on account of the serrate glabrescent leaflets. That species differs in larger stature, a very shortly stellate-rufescent calyx with black-drying plate-shaped glands, a fewer-flowered, more finely tomentose inflorescence, sparsely papillose-puberulous corolla throat, narrower leaflets and longer smooth-surfaced glabrous fruit.

One additional collection may be referable to *T. catarinensis*. That specimen, *Mattos 15036* (SP) from São Jose dos Alpes, Campos do Jordão, would extend the distribution northward into São Paulo state, but needs to be reexamined.

22. *Tabebuia chrysantha* (Jacquin) Nicholson, Ill. dict. gard. **4**: 1. 1887.

Distribution (Fig. 43). Mexico to northern Venezuela, Trinidad, and Amazonian Peru; sea level to 2600 m. Also rather widely cultivated.

Key to the Subspecies

1. Leaflets densely tannish tomentose over whole undersurface, the surface macroscopically tannish; capsule densely tomentose; Andes. subspecies *meridionalis*.

1. Leaflets rather sparsely tomentose below with reddish trichomes, the surface clearly visible between the trichomes, not macroscopically tannish; capsule sparsely to densely tomentose; widespread.
2. Calyx > 10 mm long and 8 mm wide, rufescent with short-stellate trichomes; fruit nearly glabrescent, smooth, 30–80 × 1.5–2.4 cm; wet or upland forest. subsp. *pluvicola*.
2. Calyx < 10 mm long and 8 mm wide, densely rufescent with stellate to barbate trichomes; fruit persistently stellate-tomentose, often striate or rough-surfaced, 15–50 × 0.8–2 cm; dry or moist forest below 1200 m. subsp. *chrysantha*.

22a. *Tabebuia chrysantha* ssp. *chrysantha*.

Bignonia chrysantha Jacquin, Pl. hort. schoenbr. 2: 45, tab. 211. 1797. Type. Venezuela. Caracas (not seen).

Type illustration. Jacquin Pl. hort. schoenbr. t. 211.

Tecoma chrysantha (Jacquin) A. P. de Candolle, Prodr. 9: 221. 1845.

Tecoma spectabilis Planchon sensu Grisebach, Fl. Brit. W. I. 447. 1861, non Planchon.

Tabebuia rufescens J. R. Johnston, Proc. Amer. Acad. Arts 40: 696. 1905. Type. Venezuela. Isla Margarita, Johnston 79 (holotype, GH).

Tecoma evenia Donnell Smith, Bot. Gaz. (Crawfordsville) 20: 8. 1895, pro parte. Type. Guatemala. Santa Rosa, Heyde & Lux 3110 (MO, US—flowers only).

Tecoma palmeri Kränzlin, Feddes Repert. 17: 220. 1921. Type. Mexico. Guerrero, Palmer 419 (B*, lectotype, MO; isotypes, K, GH—4, NY, US).

Tree usually 10–20 m tall, the bark pale to dark gray, scaly, wood hard and heavy, dark olive brown with yellow (lapachol) deposits in the vessels, the sapwood contrastingly lighter; twigs subtetragonal, varyingly stellate-pubescent when young, glabrescent. *Leaves* palmately 5-foliolate, the leaflets oblong-obovate, obtuse to abruptly acuminate, obtuse to truncate at base, the terminal leaflet to 17 cm long and 9 cm wide, lateral leaflets progressively smaller, entire or serrate, membranaceous to rigid-chartaceous, lepidote above and beneath, sometimes stellate-pubescent above, always to some extent beneath, especially along main veins, the trichomes scattered to fairly dense over the lamina; terminal petiolule 1–3 cm long, the laterals shorter, the petiole 3–9 cm long, stellate pubescent to glabrate. *Inflorescence* a contracted more or less fasciculate terminal panicle, the branches stellate-rufescent, the bracts extremely reduced. *Flowers* with the calyx campanulate, 5-lobed, 5–9 mm long, 4–7 mm wide, stellate and short-dendroid pubescent, the reddish brown trichomes less than 1 mm long; corolla yellow with reddish pencilling in throat, when dried with the venation reticulate to the margins of the lobes, the dried tube and lobes indistinguishable in color, tubular-infundibuliform, 4–6.5 cm long, the tube 3–4.5 cm long and 1–2 cm wide at mouth, the lobes 0.8–

1.5 cm long, glabrous outside, inside rather densely pubescent in floor and throat and glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divergent to divaricate, 2–3 mm long; pistil 1.8–3.2 cm long, the ovary linear-oblong, 3.5–5 mm long and 1.5–2 mm wide, glabrous to lepidote or sparsely stellate-puberulous (densely stellate puberulous and rather warty-surfaced in Ecuador), the ovules 8–10 seriate in each locule; disk pulvinate, 0.5–1 mm long, 2–3 mm wide. *Fruit* a linear-cylindric capsule, tapering to the base and apex, 15–50 cm long, 0.8–2 cm wide, rather sparsely short-stellate puberulous, finely and irregularly striate to rather rough-surfaced (in western Ecuador and Mexico); seeds 0.4–0.9 cm long, 1.4–3.3 cm wide, the wings hyaline-membranaceous, well demarcated from the seed body.

Distribution (Fig. 43). Widespread from Mexico to northern Venezuela, Trinidad, and Amazonian Peru, mostly in seasonally dry lowland forest; sea level to 800(–1200) m. Also rather widely cultivated, especially in the West Indies.

Representative specimens examined. MEXICO. CAMPECHE: Near Xpujil, 18 Mar 1973 (st), *Shepherd 144* (MICH, WIS). CHIAPAS: E of Ocozocautla, Hwy. 190, Mun. Ocozocautla de Espinosa, 18 May 1965 (fl), *Breedlove 9983* (DS, F, LL, MICH); Cañon del Sumidero Nat. P., 7 Mar 1983 (fl), *Neill 5488* (MO). CHIHUAHUA: Almadén, 22 Jun 1937 (fr), *LeSueur 1259* (F, TEX). COLIMA: Cerro Sur, SSE of Manzanilla, 27 Jan 1958 (fl), *Miranda 8801* (MEXU). GUERRERO: Acapulco and vic., Oct 1894 (fl, fr), *Palmer 419* (BM, F, K, MO, NY, US). JALISCO: Chamela, Estac. Biol., 18 Jan 1974 (fl), *Pérez 812* (MEXU). MÉXICO: La Junta, Dist. Valle de Bravo, 11 Sep 1954 (st), *Matuda 31664* (MEXU). MICHOACÁN: 45–48 km S of Arteaga, 12–15 km N of Playa Azul, 26 Feb 1965 (fl), *McVaugh 22585* (MICH). NAYARIT: Acaponeta, Feb 1895 (fl), *Lamb 542* (DS, MO, MSC, NY, US). OAXACA: Camino a Zipolite, Mun. Pto. Angel, 7 Feb 1976 (fl), *Shapiro 318* (MEXU). QUINTANA ROO: 8 km S de Playa del Carmen, 6 May 1980 (fl), *Tellez 2041* (MEXU, MO). SINALOA: Near Alicama, Dto. de Badiraguato, 23 Mar 1940 (fl), *H. Gentry 5934* (MEXU, MICH, MO, NA, NY). SONORA: San Bernardo, Río Mayo, 4 Feb 1935 (fl), *H. Gentry 1267* (F, MEXU, MICH, MO, NY). VERACRUZ: Plan del Río, Mun. Emiliano Zapata, 24

Jan 1972 (fl), *Dorantes 477* (F, MEXU, MO); Conejos, Mun. Puente Nacional, 9 Nov 1972 (fl), *Ventura 4885* (AAU, MICH). **YUCATÁN:** Buena Vista Xbac, 1895 (fl), *Gaumer 1048* (F, MO); S. Kancabdzonot, Mar 1917 (fl), *Gaumer & Sons 23607* (F, G, US). **ZACATECAS:** Valley of Río Atenco (Chapalagan), 8–15 km NE of San Juan Capistrano, 14 Jan 1975 (fl), *McVaugh 25804* (MICH).

GUATEMALA. ALTA VERAPAZ: Cerro Chinaja between Finca Yalpemech and Chinaja, 1 Apr 1942 (fl), *Steyermark 45654* (F, US). **JUTIAPA:** Between Jutiapa and Plan de Urtutia, N of Jutiapa, 28 Oct 1940 (st), *Standley 75606* (F). **PETÉN:** La Libertad, 26 May 1933 (fl), *Lundell 3407* (F, MICH, NY, S, US). **SANTA ROSA:** Santa Rosa, Mar 1892 (fl), *Heyde & Lux 3110 p.p.* (MO, NY, US).

BELIZE. ORANGE WALK: Hillbank, Jul 1928 (st), Brown 15 (F).

EL SALVADOR. AHUACHAPÁN: Ahuachapán, 9 Jan 1922 (st), *Standley 20330* (MO, NY, US). **LA LIBERTAD:** La Libertad, 21 Mar 1959 (fl), *Allen 7297* (F, LL, NY); Deininger Park, 11 Apr 1979 (fr), *Witsberger 582* (MO). **SAN SALVADOR:** Hacienda Buena Vista, vic. Apopa, 17 Apr 1958 (fl), *Allen & Armour 6852* (F, US). **SONSONATE:** San Julien, 1924 (fl), *Calderón 2219* (US).

HONDURAS. CHOLUTECA: Vic. Choluteca, 31 Oct 1949 (st), *Standley 24333* (F). **EL PARAÍSO:** Quebrada de El Bosque, E of Danli, 18 Feb 1949 (st), *Standley 16777* (F); Isla Tigre, vic. Amapala, 14 Feb 1922 (st), *Standley 20710* (US). **MORAZÁN:** Río Yeguaré, 23 Mar 1950 (fl), *Molina 2708* (F, MO, US). **YORO:** Entre Yoro y Morazán, 11 May 1956 (fl), *Molina 6920* (F).

NICARAGUA. CHINANDEGA: Vic. of Chinandega, 12 Jul 1947 (st), *Standley 11465* (C, F). **CHONTALES:** Between Río Bizcocho and Río El Jordán, 18 Feb 1984 (st), *Stevens 22867* (MO). **MANAGUA:** 24 Mar 1926 (fl), *Chávez 210* (US). **RIVAS:** Río de Las Lajas, Apr 1893 (fl), *Shannon 5050* (US).

PANAMA. 4.8 mi N of hwy., W of El Llano, 14 Apr 1972 (st), *Gentry 5074* (MO).

COLOMBIA. ATLÁNTICO: Juan Mina, *Dugand 914* (F). **BOYACA:** Los Llanos, Río Guanapalo, 3 Mar 1939 (fl), *Haught 2653* (COL, MO). **CALDAS:** 12–21 km N of La Dorada, 6 Mar 1977 (fr), *Gentry et al. 18136* (MO). **CÉSAR:** La Paz a Manaure, 26 Apr 1987 (st), *Cuadros & Gentry 3430* (JBG, MO). **MAGDALENA:** Santa Marta, 3 May 1959 (fl), *Romero-Castañeda 8033* (COL). **META:** Mun. Puerto Gaitan, L. Forero & Vanezas 1178 (COL).

VENEZUELA. APURE: Muñoz, 5 km W of Bruzual-San Fernando Hwy., 4 Mar 1978 (fl), *Davidse & Gonzalez 14818* (MO). **ARAGUA:** Henri Pittier National Park, 2 Apr 1974 (fl, fr), *Gentry et al. 11186* (MO, VEN). **BARINAS:** 26 km SW of Santa Bárbara, 31 Mar 1974 (fl, fr), *Gentry et al. 11112* (MO, VEN). **BOLÍVAR:** E of Miami, W of Hato de Nuria, 21 Jan 1961 (fr), *Steyermark 88634* (K, NY, UB, VEN). **CARABOBO:** Valencia, 17 Jan 1920 (fl), *Pittier 8733* (US, VEN). **DISTRITO FEDERAL:** Between Caracas and Maiquetia, Jul 1975 (fr), *Gentry & Berry 14750* (MO, VEN). **FALCÓN:** Cerro Chichiriviche between Lizardo and Malloquines, 4 Sep 1974 (st), *Steyermark & Manara 110759* (MO). **GUARICO:** Los Dos Caminos y Calabozo (fl), Feb 1961

(fl), *Ferraz 14* (VEN). **LARA:** Jiménez, Yacambu, Quebrada Honda & Río Yacambu, 33 km SE de Sanare, 28 Jul 1973 (st), *Steyermark & Carreno 107623* (MO). **MIRANDA:** Lower Cotiza, near Caracas, 17 May 1919 (fr), *Pittier 7170* (US, VEN). **NUEVA ESPARTA:** Margarita, Copey, S of Santa Ana, 24 Mar 1985 (fl), *Steyermark et al. 131022* (MO). **SUCRE:** The Balcón, vic. Cristóbal Colón, 5 Jan 1923 (st), *Broadway 680* (NY, US). **TACHIRA:** 10 km E of La Fundación, 10 Mar 1981 (fr), *Liesner & González 10379* (MO, VEN). **YARACUY:** E of Chivacoa, to Nirgua, 29 Mar 1975 (fl), *Steyermark & Carreno 111759* (MO). **ZULIA:** Dto. Colón, entre Casigua El Cubo y km 8, rumbo a Palmira, 28 Apr 1979 (fl), *Bunting et al. 7314* (MO).

TRINIDAD & TOBAGO. Victoria Square, Port of Spain, *Broadway 5558* (K); Bockley Vale, 3 Feb 1910 (fl), *Broadway s.n.* (L, US).

GUYANA. Georgetown (fl), *Dahlgren & Persaud s.n.* (F).

ECUADOR. EL ORO: Piedras, 19 Jun 1943 (fl), *Little 6631* (F, NY, US). **ESMERALDAS:** Taone, 13 Feb 1949 (st), *Acosta-Solis 12095* (F). **GUAYAS:** Capeira, km 21 N of Guayaquil, 17 Feb 1982 (fr), *Dodson & Gentry 12609* (MO); 1 km S of Recinto Olón, 3 km N of Montanito, Feb 1974 (fl), *Gentry 10029* (MO). **MANABI:** 6 km N of Bahía de Caracas, 15 Oct 1980 (fl), *Croat 50698* (MO); Chone to Santo Domingo de las Colorados, km 13, Dec 1961 (fl), *Dodson & Thien 1751* (MO).

PERU. CAJAMARCA: 29 km E of Pucara, road to Bagua, Río Huancabamba, 10 Jun 1978 (fr), *Gentry et al. 22751* (MO). **HUÁNUCO:** Tingo María, 28 Mar 1977 (st), *Gentry & Daly 18759* (MO). **JUNÍN:** San Ramón to La Merced, Nov 1945 (st), *Seibert 2197* (MO).

LORETO: Quebrada Yanomono, 5 Nov 1979 (st), *Gentry et al. 27534* (AMAZ, MO); Carretera Iquitos-Nauta, km 32, 20 Aug 1986 (fr), *Vásquez & Jaramillo 7869* (AMAZ, MO). **MADRE DE DIOS:** Cocha Cashu Camp, Manu National Park, 21 Oct 1979 (fl), *Gentry et al. 27066* (MO). **SAN MARTÍN:** 31 km S of Tarapoto, 20 Jul 1982 (st), *Gentry et al. 37831* (MO). **TUMBES:** Cienago, SE de Zorritos, 28 May 1957 (fr), *Ferreira 12267* (MO, USM); Cerros de Amotape, Quebrada Los Conejos, 25 km SE of Cherralque, 10 Jun 1987 (st), *Gentry & Diaz 58278* (MO, USM). **UCAYALI:** Bosque Nacional Alexander von Humboldt, km 86 Pucallpa-Tingo María road, 14 Dec 1979 (st), *Begazo 71* (MO); Peru-Brazil border, Quebrada Sapallal, tributary of Quebrada Shesha, Cerro Las Cachoeiras, 19 Jun 1987 (st), *Gentry & Diaz 58465* (MO).

Local names. Mexico: verdecillo (Michoacán, Guerrero), amapa, amapa prieta (Sinaloa), roble (Guerrero), ahuu-che, ha-hauche (Yucatán: Maya). Guatemala: matilisguate. El Salvador: cortez, cortez amarillo, cortez, coyote, cortez negro. Ecuador: guayacán, guayacán de la costa. Venezuela: araguaney puy, araguaney, flor amarilla, guayacan. Puerto Rico: roble amarillo. Virgin Islands: yellow poui.

This species is part of a highly variable com-

plex in which species limits are difficult to draw. In general, it is defined by having leaves with fairly sparse stellate pubescence mostly along the main veins below, and by having fruit and calyx with a relatively short reddish indumentum. This circumscription also includes *T. capitata* (where see discussion), which replaces *T. chrysantha* more or less allopatrically in most of Amazonia and may not be adequately differentiated for specific recognition. Other taxa closely related to *T. chrysantha* by fruit and calyx pubescence mostly have the leaflets much more densely stellate below (thus usually strongly bicolored), but *T. chrysantha* ssp. *meridionalis* also has distinctly bicolored leaflets, densely stellate below, although with longer trichomes than in *T. incana* or typical *T. subtilis*.

What is here considered a southern population of *T. ochracea* in Bolivia, northwest Argentina, Paraguay, and southern Brazil, is intermediate between that species and *T. chrysantha*. This form, previously usually assigned to *T. lapacho* or *T. ochracea*, has the short reddish calyx pubescence of *T. chrysantha* and variable but generally intermediate leaf undersurface indumentum. The single fruit that I have seen (from Paraguay) is villous as in *T. ochracea* and *T. chrysotricha*, but the more glabrescent-leaved western populations might turn out to also have less pubescent fruits and be better placed in *T. chrysantha*. I here treat *T. lapacho* as a high altitude local endemic (see discussion under that species) and suspect that the southern collections related to *T. chrysantha* may be closer to *T. chrysotricha*, which (like *T. ochracea*) is most definitively differentiated by longer fruit trichomes. Unfortunately, fruits from this region are not available.

22b. *Tabebuia chrysantha* ssp. *meridionalis* A.

Gentry, *Phytologia* **35**: 193. 1977. Type. Ecuador. Chimborazo, *Camp E-3458* (holotype, MO; isotypes, F, G, K, LP, MICH, NY, RB, U, US).

Tecoma spectabilis Planchon & Linden, *Fl. Serres Jard. L'Europe* **9**: 233. 1854. Type. Colombia. Norte de Santander (Ocana): San Pedro, 8000 ft, *Schlim 867* (holotype, P; isotypes, K, P).

Tabebuia spectabilis (Planchon & Linden) Nicholson, *Ill. dict. gard.* **4**: 1. 1887.

Tree to 20 m tall and 50 cm dbh, the bark very pale, smooth with longitudinal cracks; branchlets

subtetragonal, densely tannish-stellate pubescent when young, glabrescent. *Leaves* palmately 5-foliolate, the leaflets elliptic, acute, obtuse at base, entire, densely stellate and dendroid pubescent beneath, with tufts of similar but longer trichomes in nerve axils beneath, partially glabrescent above, drying tannish below from the pubescence (cf. *T. ochracea*), petioles and petiolules lepidote and stellate and dendroid pubescent. *Inflorescence* a contracted to rather open terminal panicle, the branches stellate pubescent, the bracts conspicuous, linear, 5–20 mm long. *Flowers* with the calyx campanulate, irregularly 5-lobed, 15–22 mm long, 9–14 mm wide, pubescent with reddish-tan stellate and dendroid trichomes; corolla tubular-infundibuliform, ca. 6 cm long, 2 cm wide at mouth of tube, glabrous outside except for pilose sinuses, densely pilose in floor of throat and at stamen insertion; stamens didynamous, the thecae 3–4 mm long; ovary linear-oblong, glabrous, 5 mm long, 1.5 mm wide; disk annular-pulvinate, 1 mm long, 2.5 mm wide. *Fruit* unknown.

Distribution (Fig. 43). Restricted to isolated patches of Holdridge system premontane humid forest at 1200–2600 m in the Andes. Collected in northern Colombia, the western slopes of the Andes in southern Ecuador, and around the moister fringes of the Huancabamba depression in Peru.

Specimens examined. COLOMBIA. MAGDALENA: Mun. Santa Marta, Sierra Nevada de Santa Marta, 2150 m, 23 Apr 1959 (fl), *Romero-Castañeda 781* (AAU, COL); San Sebastian de Rabago, Sierra Nevada de Santa Marta, 7 Mar 1948 (fl), *Romero-Castañeda 890* (COL). NORTE DE SANTANDER: Prov. Ocana, near San Pedro, May 1951 (fl), *Linden 667* (K, P).

ECUADOR. CHIMBORAZO: Canyon of Río Chanchan, 5 km N of Huigra, 19 May 1945 (fl), *Camp E3458* (F, G, K, LP, MICH, MO, NY, RB, U, US). EL ORO: Camino de Zaruma a Malvas, 13 Sep 1947 (st), *Es-pinosa 2241* (K); between Portovelo and El Tambo, 2 Sep 1923 (fl), *Hitchcock 21290* (NY); Portovelo, 15 Jun 1918 (st), *Rose & Rose 25443* (NY). LOJA: Tambo Cachiayacu, Río Cachiayacu, SE of Yangana, 19 Oct 1943 (fl), *Steyermark 54820* (K).

PERU. AMAZONAS: Cordillera Colán, SE of La Peca, 10 Oct 1978 (fl), *Barbour 3975* (MO). CAJAMARCA: Carretera entre Jaen y San Ignacio, 6 Oct 1987 (fl), *Diaz 2066* (MO, USM); Santa Cruz, 1 km ENE Montesecco, 7 Jun 1987 (fl), *Santisteban & Guevara 148* (MO).

Local name. Cañagueta.

The much more densely pubescent leaflet un-

dersurface and larger calyx are the main distinguishing features from *T. chrysantha* ssp. *chrysantha*. The large calyces are shared by ssp. *pluvicola* but in that taxon they are much more finely puberulous and the leaflets are only slightly puberulous.

In Colombia the name *T. spectabilis* has been used (in herb.) for a plant with much less densely pubescent leaflet undersurfaces from the Sierra Nevada of Santa Marta. Thus, when I described this taxon as ssp. *meridionalis* I was unaware that it also grows in Colombia and is, in fact, conspecific with the type of *T. spectabilis*. That name would have precedence at specific rank, but I do not think the denser pubescence of the leaf undersurface is adequate for specific recognition in the extremely variable *T. chrysantha* complex, especially since there are forms from the Venezuelan Andes with an intermediate degree of pubescence on the leaflet undersurface.

22c. *Tabebuia chrysantha* ssp. *pluvicola* A. Gentry. Phytologia **35**: 190. 1977. Type. Ecuador. Pichincha, *Gentry 9505* (holotype, MO; isotypes, GB, QCA, S).

Tecoma grandis Appun. Behand. Samereien und Pflanzen 39. 1858, nom. nud.

Tree to 30 m tall, small buttresses to 0.7 m tall, the bark rather smooth, the branchlets subtetragonal, stellate rufescent when young, more or less glabrescent. *Leaves* palmately 5(–7)-foliolate, the leaflets elliptic to oblong obovate, acute to short-acuminate, obtuse to truncate at base, the terminal leaflet to 25 cm long and 14 cm wide, the laterals progressively smaller, entire at maturity, membranaceous, more or less glabrescent above, usually more or less stellate puberulous along main veins and often sparsely lepidote, below more or less persistently stellate pubescent at least along main veins and usually sparsely over surface; terminal petiolule 3–8 cm long, the laterals shorter, petiole 6–30 cm long, stellate-rufescent to glabrescent. *Inflorescence* a contracted terminal panicle, often almost fasciculate, stellate-rufescent, bracts and bracteoles usually 3–4 mm long. *Flowers* with the calyx campanulate, 5-lobed, the lobes usually more or less reflexed, (12–)14–19 mm long, 9–19 mm wide, shortly reddish brown stellate pubescent, the tomentum denser toward base; corolla tubular-infundibuliform, 6–11.5 cm long, yellow

with reddish penciling in throat, when dried with the venation reticulate to margins of lobes, the dried tube and lobes indistinguishable in color, the tube 4–8 cm long, 1.8–3 cm wide at mouth of tube, the lobes 1.5–3 cm long, glabrous outside except for a few stellate trichomes along main veins of lobes and upper part of tube, the sinuses and floor of throat rather densely pilose with long simple trichomes inside; stamens didynamous, the thecae divaricate, 2–3 mm long; pistil 3–3.9 cm long, the ovary linear-oblong, 4–8 mm long, 1.5–2 mm wide, densely minutely lepidote to apparently glabrous; disk annular-pulvinate, 1 mm long, 3–5 mm wide. *Fruit* a linear-cylindric capsule, 30–90 cm long, 1.5–2.4 cm wide, usually almost completely glabrescent; *seeds* thin, bilate, 0.6–0.9 cm long, 2.5–3.4 cm wide, the hyaline-membranaceous wings well-demarcated from seed body.

Distribution (Fig. 43). Costa Rica to northern Venezuela and Ecuador, mostly in wet forests from low to middle elevations; near sea level to 1500 m elevation.

Representative specimens examined. COSTA RICA. ALAJUELA: Near Villa Quesada, 16 Feb 1969 (st), *Gentry 470* (MO, WIS); 2 mi N of Villa Quesada, 10 Oct 1940 (fr), *Seibert 1602* (MO, NA, US). HEREDIA: Río Sarapiquí near La Virgen, 23 Feb 1969 (fl), *Gentry 525* (MO, WIS); La Selva, near Puerto Viejo, 28 Jun 1971 (st), *Gentry 1031* (MO). PUNTARENAS: Near Palmar norte, 31 Dec 1951 (st), *Allen 6339* (C, F); Osa Peninsula near Rincón, 17 Jul 1971 (st), *Gentry 1215* (MO). PANAMA. CANAL ZONE: Pipeline road, 6 mi from Gamboa, 11 Nov 1971 (st), *Gentry 2461* (MO). CHIRIQUÍ: Burica Peninsula, Quebrada Guanábano, 3 Mar 1973 (fr), *Croat 22514* (MO). COCLÉ: Cerro Pilón, 9 Jan 1972 (st), *Gentry & Dwyer 3661* (MO). COLÓN: 20 mi E of Canal, 10 mi from coast, 14 Feb 1969 (fl), *Gentry 456* (MO, WIS). DARIÉN: Summit of Cerro Pirre, 8 Mar 1972 (fl), *Gentry 4611* (MO). VERAGUAS: 3.5–4.5 mi above Santa Fe, 13 Dec 1971 (st), *Gentry 3082* (MO).

COLOMBIA. ANTIOQUIA: Planta Providencia, 28 km SW of Zaragoza, 19 Mar 1977 (fl), *Alverson et al. 219* (MO); Mun. San Luis, Cañon del Río Claro, 30 Mar 1984 (fl), *Cogollo 1468* (JAUM, MO). BOYACA: Mt. Chapón, NW of Bogota, 20 Jun 1932 (fl), *Lawrance 124* (F, G, MICH, MO, US). CAQUETA: 8 km S of San José de Fragua, Jan 1974 (fl), *Gentry et al. 9125* (AAU, COL, CTES, MO). CHOCÓ: Cerro Tacarcuna, Serranía del Darién, S of Cerro Mali, Jan 1975 (fl), *Gentry & Mori 13751* (MO); Baudo, near Aurora, 11 Feb 1967 (fl), *Fuchs & Zanella 22383* (COL, MO). CUNDINAMARCA: Cercanías de San Bernardo, 23 Jun 1940 (fl), *Cuatrecasas 9620* (COL, F); 29 km NW of Facatativa, 5 Mar 1977 (fl); *Gentry et al. 18055* (COL, MO). SANTANDER: 18 km W of San Vicente de Chucuri, 25

Jul 1975, *Gentry & Forero 15436* (COL, MO). VALLE: Yotoco, entre Buga y Buenaventura (fl), *García-Barriga 18818 p.p.* (COL).

VENEZUELA. ARAGUA: Rancho Grande, Párcue Nacional, Sep 1946 (fl), *Pittier 15284* (G, US, VEN). LARA: San Isidro, 24 Sep 1947 (fl), *Tamayo 3358* (VEN). MÉRIDA: 20 km W of Mérida, 31 Oct 1963 (fl), *Breteler 3239* (NY, S, U, VEN). MIRANDA: Cerros del Bachiller, 11 km SSE of El Guapo, 21 Mar 1978 (st), *Steyermark & Davidse 116619* (MO). PORTUGUESA: 15 km E de Chabasquen, 29 Oct 1982 (fl), *Steyermark 126590* (MO). TACHIRA: Delicias, 26 Jul 1979 (fl), *Steyermark & Liesner 118757* (MO). ZULIA: Dto. Mara, Cuenca del Río Guasare, La Yolanda, 3 Feb 1983, *Bunting & León 12859* (MO).

ECUADOR. BOLÍVAR: Cord. Occ., Valle de Limón, *Solis 6451* (F). ESMERALDAS: Río Verde, 2 Oct 1965 (fl), *Little & Dixon 21215* (F, MO, NY). GUAYAS: Balao, 9 Oct 1979 (fl), *Dodson 9200* (MO). LOJA: El Dulce, 3 km NW de Celica, *Samaniego & Vivar 80* (MO). MANABI: 21 km S of Jipijapa, 23 km N of Cascol, Oct 1974 (fl), *Gentry 12214* (COL, MO). MORONA-SANTIAGO: Carretera Bomboiza-Chuchumbletza, 4 Nov 1986 (fl, fr), *Zaruma 365* (MO). NAPO: 44 km E of el Chaco, Nov 1974 (fl), *Gentry 12408* (MO). PASTAZA: Curaray, 20 Mar 1980 (fl), *Holm-Nielsen et al. 22253* (AAU). PICHINCHA: 17 km E of Santo Domingo de los Colorados, Feb 1974 (fr), *Gentry 10222* (MO).

PERU. LORETO: Cumbre de La Divisora, 6 Feb 1979 (fl), *Schunke 9840* (MO).

23. *Tabebuia chrysea* Blake, Contr. Gray herb.

53: 50. 1918. Type. Venezuela. Zulia, *Curran & Haman 737* (holotype, GH; isotypes, A, K, NY, US).

Tecoma chrysea (Blake) Pittier, Supl. Pl. Usual. Venez. 63. 1939.

Cybistax chrysea (Blake) Seibert, Trop. Woods 63: 7. 1940.

Roseodendron chryseum (Blake) Miranda, Bol. Soc. Bot. Mexico 29: 43. 1965.

Tree to 20 m, branchlets subterete, finely striate-ridged, puberulous. Leaves palmately 5-foliolate, the leaflets oblong-elliptic, acute, the bases truncate, to 24 cm long and 9 cm wide, usually much smaller (to 13 cm long and 5 cm wide), serrate to serrulate, membranaceous, the surface somewhat rough, especially above, puberulous above and below with dendroid trichomes, drying olive; petiolules to 7 cm long, the petiole to 24 cm long, tomentose with dendroid and barbate trichomes. Inflorescence a large terminal panicle with the central rachis well developed and lateral branches very short, dendroid-pubescent. Calyx campanulate, 12–20 mm long, 6–15 mm wide, finely membranaceous, more or

less bilabiate to irregularly several-dentate, somewhat lepidote and puberulous; corolla dark yellow with a slight orangish tint, with reddish striations in throat, tubular-infundibuliform, 4–7.5 cm long, 0.8–2 cm wide at mouth of tube, the tube 3–4.5 cm long, the lobes 1–2.5 cm long, the tube lightly puberulous to almost glabrous outside, generally glabrous inside, pubescent at level of stamen insertion, the lobes also lightly pubescent; stamens didynamous, the thecae divaricate, 2–2.5 mm long; pistil 2–3 cm long, the ovary linear, 5–6 mm long, 0.6 mm wide, minutely tomentulose, the ovules 4-seriate in each locule; disk annular, 0.5 mm long, 2 mm wide. Fruit an elongate-linear capsule, somewhat flattened, 32–45 cm long, 0.9–1.3 cm wide, longitudinally striate-costate, puberulous with simple and branched trichomes; seeds thin, bialate, 0.4–0.9 cm long, 1.5–2 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 45). Endemic to the dry forest of northern Colombia and northwestern Venezuela; 30–600 m elevation.

Representative specimens examined. COLOMBIA.

ATLÁNTICO: Arroyo de Cipacua, carretera de Puerto Colombia, Jan 1935 (fl, fr), *Dugand 711* (F, US), BOLÍVAR: Coroza, alrededores de Palmitos, 25 Apr 1963 (fr), *Romero-Castañeda 9717* (AAU, COL, MBM, MO, NY). CÉSAR: San Juan de las Aguas, 20 km W of Valledupar, 13 Jan 1988 (fl), *Gentry et al. 60741* (JBG, MO). GUAJIRA: Arroyo Uatkaru, Serranía de Macuira, 18 Jul 1977 (fl), *Bernal & Sugden 32* (MO).

VENEZUELA. FALCÓN: Entrada a Bariro, 90 km de Dabajuro, 6 Mar 1979 (fl), *Wingfield et al. 462* (MO). LARA: Entre el Río Tocuyo y Carora, 15 Jan 1928 (fl, fr), *Pittier 12613* (G, M, NY, US, VEN). TRUJILLO: Fundo el Caney, 20 km N of Agua Viva, 4 Apr 1986 (fr), *Tanner & Kapos 318* (MO). ZULIA: Caserío El Llano 10–15 km de Machiques, 21 Nov 1968 (fl), *Aristeguieta et al. 6801* (US, VEN); Arriaga cerca de Maracaibo, 25 Dec 1922 (fl, fr), *Pittier 10996* (NY, US, VEN).

Common names. Araguán, araguaney, penda, cañada, pendra, roble amarillo.

24. *Tabebuia chrysotricha* (Martius ex A. de Candolle) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 176. 1936.

Tecoma ochracea var. *denudata* Chamisso, Linnaea 7: 653. 1832. Type. Brazil. *Sellow s.n.* (BR).

Tecoma flavescens Martius ex A. P. de Candolle, Prodr. 9: 216. 1845. Type. Brazil. Sebastianopolitana, *Martius s.n.* (M), non *Bignonia flavescens* Vellozo.



FIG. 45. Distribution of continental *Tabebuia*. ● = *T. chrysea*; ▲ = *T. chrysotricha*; ☆ = *T. coralibe*; ★ = *T. donnell-smithii*.

Tecoma chrysotricha Martius ex A. P. de Candolle, Prodr. 9: 216. 1845. Lectotype. Brazil. Rio de Janeiro: Santa Theresa, *Guillemin 783* (G-DC).

Tecoma obtusata A. P. de Candolle, Prodr. 9: 217. 1845. Type. Brazil. *Prince Neuwied s.n.* (BR).

Tecoma chrysotricha var. *obtusata* (A. P. de Candolle) Bureau & K. Schumann in Martius, Fl. bras. 8(2): 338. 1897.

Tecoma pedicellata Bureau & K. Schumann in Martius, Fl. bras. 8(2): 336. 1897. Type. Brazil. Rio de Janeiro, *Glaziou 1476* (P; isotype, BR—leaves only; flowering material is *Tabebuia pedicellata*).

Gelsemium chrysotrichum (Martius ex A. P. de Candolle) O. Kuntze, Rev. gen. pl. 3(2): 245. 1898.

?*Tecoma grandis* Kränzlin, Feddes Repert. 17: 217. 1921. Type. Brazil. Rio Grande do Sul: Tristeza pr. Porto Alegre, *Malme s.n.* (*Regnell II-776*) (B*, not seen).

Tabebuia chrysotricha var. *obtusata* (A. P. de Candolle) Toledo, Arq. Bot. Estado São Paulo 3(1): 35. 1952.

Handroanthus chrysotrichus (Martius ex A. P. de Candolle) Mattos, Loefgrenia 50: 2. 1970.

Handroanthus chrysotrichus var. *obtusata* (A. P. de Candolle) Mattos, Loefgrenia 50: 2. 1970.

Handroanthus pedicellatus (Bureau & K. Schumann) Mattos, Loefgrenia 50: 4. 1970 (leaves only).

Usually rather small tree 2–10 m tall, the branchlets subtetragonal to subterete, stellate-rufescent when young, more or less glabrescent. Leaves palmately (3–)5-foliolate, the leaflets oblong-obovate to oblong-elliptic, obtuse or rounded to abruptly cuspidate-subacuminate, basally obtuse to truncate, the terminal leaflet (1.5–)2–

11 cm long, (1–)1.7–5.5 cm wide (to 15 × 9 cm in juveniles and in “intermediate” population discussed below), the laterals progressively smaller, entire or rarely slightly obtusely dentate near apex, membranaceous to chartaceous, lepidote above and below, above also glabrescently stellate-puberulous, below persistently stellate-puberulous with trichomes scattered over the clearly visible greenish to dark olive surface and denser on the thus tannish-drying main veins, always scabrous above and usually below; terminal petiolule 0.2–7(–8 in juveniles) cm long, the petiole 1–2.5 cm long, tannish or reddish stellate puberulous. *Inflorescence* a contracted rather few-flowered terminal cluster, peduncle essentially absent, flowers subsessile or with the pedicels to 5 mm long, reddish dendroid-pubescent. *Flowers* with the calyx more or less tubular, irregularly shallowly 5-lobed, (9–)10–20 mm long, 5–10 mm wide, villous, reddish brown or reddish tan from the barbate to weakly dendroid trichomes, these to 2 mm long, also with shorter stellate trichomes; corolla yellow with reddish pencilling in throat, the venation of the lobes when dry inconspicuous and the lobes thus contrastingly lighter than the darker drying tube, tubular-infundibuliform, 4–7.5 cm long, 1.5–3 cm wide at mouth of tube, the tube 3.5–5.5 cm long, the lobes 0.5–1.5 cm long, almost always with some stellate trichomes along veins on outside of tube at least in upper half of lower side and sometimes on lobes, the sinuses and floor of throat pilose with rather long flat trichomes, also glandular-pubescent at stamen insertion; stamens didynamous, the thecae divergent, 2 mm long; pistil 2–2.7 cm long, the ovary conical-oblong, 3–4 mm long, ca. 1 mm wide, more or less lepidote near top; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* a linear-cylindric capsule, narrowing to base and apex, 11–38 cm long, 0.8–1.2 cm wide, usually reddish (occasionally golden-tannish) villous with barbate and sparsely dendroid 1–1.5 mm long trichomes, also with shorter stellate hairs and the bases of longer hairs usually more or less stellate; *seeds* 0.6–0.9 cm long, 1.7–2.9 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from seed body.

Distribution (Fig. 45). Mata atlantica of coastal Brazil, mostly in coastal restingas; also in other kinds of open or shrubby forest, as on tops of morros and in disturbed forest, especially on

sandy soils. Also widely planted as a small street tree; near sea level to 1000 m.

Representative collections examined. **BRAZIL. BAHIA:** Sta. Cruz de Cabralia, Res. Biol. Pau-brasil, 5 Jan 1972 (fl), *Eupunino 140* (MO, NY). **ESPIRITO SANTO:** Linhares, Reserva Florestal da CVRD, Estrada 243, 3 Jan 1985 (fl), *Peixoto et al. 3059* (MO). **MINAS GERAIS:** 14 km S of Ypanema, road to Manhuacu, 17 Jan 1985 (fr), *Gentry et al. 49637* (MO); Viçosa, road to San Miguel, 21 Oct 1930 (fl), *Mexia 5196* (C, F, G, MICH, MO, NY, US, WIS). **PARAIBA:** Alagoa Nova, lagoa da Roca, 16 Jan 1956 (fr), *Lima 56-2490* (IPA). **PARANÁ:** Vossoroca, Tijucas do Sul, 19 Oct 1974 (fr), *Kummrow 108* (MBM, MO). **PERNAMBUCO:** Tapera, 26 Jan 1926 (fl, fr), *Pickel 1218* (IPA, MICH, WIS). **RIO GRANDE DO SUL:** Porto Alegre, 15 Nov 1978 (fl), *Volkmer s.n.* (MO). **RIO DE JANEIRO:** Cabo Frio, Armação do Buzios, 11 Jan 1979 (fl), *Martinelli & Jouvin 5606* (CH, MO, RB); Guanabara, Restinga Recreio dos Bandeirantes, 29 Aug 1964 (fl), *Pabst et al. 33063* (MO); Corcovado, 12 Jul 1915 (fl, fr), *Rose & Russell 20215* (NY, US). **SANTA CATARINA:** Morro Spitzkopf, Blumenau, Sep 1960 (fr), *Reitz & Klein 4134* (G, K, L, NY); Rio do Sul, Alto Matador, Pinhal, 12 Sep 1958 (fl), *Reitz & Klein 7105* (B, BR, C, F, G, K, L, M, MBM, NY, US). **SÃO PAULO:** Border with Minas Gerais on Itatiba-Pauco Alegre road, 29 Jan 1978 (st), *Gentry 21500* (MO, UEC); Represa Atabaíha Lake, 5 Jan 1985 (st), *Gentry & Zardini 49227* (MO, UEC).

ARGENTINA. CORRIENTES: Dep. Mburucuyá, Est. Santa Teresa, *Krapovickas & Mroginski 22157* (LP). **MISIONES:** Dep. Monte Carlo, Monte Carlo, 26 Sep 1972, *Schinini 5495* (LP, MO).

Common names. Ipe, ipe tabaco, pau mulato, ipe do morro, ipe amarelo, aipe, pau d’arco amarelo.

This species is very close to *T. ochracea* and might well be treated as a distinctive subspecies of that taxon. It differs in the less dense indument of the undersurface of the usually smaller leaflets, the scabrous leaflet upper surface, the usually sessile or subsessile more narrowly tubular calyx with a redder, non-caducous indumentum of more barbate trichomes, the narrower capsule with more rufescent not at all caducous indumentum, and typically smaller stature.

Some plants seem to be intermediate between *T. chrysotricha* and *T. ochracea*, especially in São Paulo and Santa Catarina, where typical *T. ochracea* occurs mostly in cerrado and cerrado remnants, typical *T. chrysotricha* on tops of rocky hills or morros and in coastal restingas, and the intermediate, assigned to *T. chrysotricha* by Sandwith and Hunt (1974) in disturbed forest edges and second growth. This intermediate, vegetatively characterized by the leaflets larger

than in *T. chrysotricha* but usually similarly scabrous above, is also similar to plants found in southeastern and central Paraguay and in northwestern Argentina and adjacent Bolivia, and here tentatively referred to *T. ochracea*. This intermediate form is more like *T. chrysantha* ssp. *chrysantha* in its short reddish calyx indumentum and the corolla lobes usually with dark-drying venation. It is also similar vegetatively to that species which is most definitively differentiated by a much shorter fruit indumentum. Unfortunately, the fruits are unknown.

Another problematic intermediate between *T. ochracea* and *T. chrysotricha* occurs at Linhares, Espírito Santo (Folli 660, Farias 145). It has leaves typical of *T. chrysotricha*, and calyx hairs red as in that species but longer than in other collections. The fruit is pubescent as in *T. chrysotricha* but longer and wider than in most other collections. This form also has the corolla lobes dark-veined when dry and is a larger tree (14–20 m) than normal for *T. chrysotricha*.

Tecoma pedicellata was based on a mixed collection of *T. chrysotricha* (a few *T. chrysotricha* flowers are attached to the leafy branches at BR) with leafless flowering material of an otherwise undescribed species that proves to be locally common in the lowland forest remnants north of Rio de Janeiro.

Tecoma grandis is only provisionally placed in the synonymy of this species, since I have not seen the type. Five *Tabebuia* species are known from Rio Grande do Sul, but three of these clearly do not fit the *T. grandis* protologue. *Tabebuia chrysotricha*, which is rare in Rio Grande do Sul, fits the protologue in such key features as a capitate multiflowered inflorescence with sessile flowers and a densely “vulpino-villosus” calyx 18 by 6–7 mm. While the reputed large tree stature of the *Tecoma grandis* type was emphasized by Kränzlin and is anomalous for *T. chrysotricha*, no actual dimensions were given and large individuals of *T. chrysotricha* might well be considered fairly large trees. On phytogeographic grounds *T. pulcherrima*, which is relatively common in the Porto Seguro area and can be a large tree, might be a more likely candidate, but that species does not have sessile flowers. The densely pilose gray green leaflet undersurface described for *T. grandis* would seem to accord better with *T. chrysotricha* than with the silvery tomentose leaf undersurface of *T. pulcherrima*. If *Tecoma*

grandis applies to *T. pulcherrima*, its basionym would take precedence and a new combination would be needed in *Tabebuia*. Given the degree of uncertainty, I opt for assignment to *T. chrysotricha*, where no nomenclatural changes are needed.

25. *Tabebuia clementis* Alain, Contr. Oc. Mus. Hist. Nat. Colegio “De LaSalle” 15: 14. 1956. Type. Cuba. Oriente (Guantánamo): Cayaguán, Clemente, Alain & Crisogono 4073 (holotype, HAC; isotypes, NY, US).

Shrub, dichotomously branched, the branchlets subterete to tetragonal, the round to half-round leaf scar not conspicuously raised, lepidote, not noticeably lenticellate. *Leaves* simple, opposite, mostly clustered at ends of branchlets, elliptic-oblong, rounded and slightly emarginate at apex, rounded at base, 5–12 cm long, 2–6 cm wide, coriaceous, the margin not revolute, the surface dull and densely lepidote above and below, some of the scales peltate and stalked, the surface thus more or less scabrous, blackish or dark gray above, brown to blackish below, all venation plane above, below with secondary veins prominulous and brochidodromous, tertiary venation plane (León *et al.* 22611) to intricately prominulous (Clemente *et al.* 4073); petioles 1–1.5 cm long, lepidote. *Inflorescence* of one to four terminal flowers, the pedicels 1.5 cm long, with conspicuously raised bracteole scars near middle, densely lepidote. *Flowers* with the calyx campanulate, bilabiate, 12–19 mm long, 8–10 mm wide, with ca. five prominent longitudinal ridges, densely lepidote outside, less densely lepidote inside, drying blackish; corolla (color unknown) more or less tubular-campanulate, 4.5–6 cm long, 0.8–1.2 cm wide at mouth of tube, the tube 3.5–5 cm long, the lobes 1 cm long, the tube essentially glabrous, with a few inconspicuous lepidote scales near apex, with a few short stiff trichomes on lobes and in floor of tube; pistil 2.5 cm long, the ovary conical, 3 mm long, 1.5 mm wide at base, very densely lepidote; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* (not seen; from León & Alain) linear-oblong, 7.5 cm long, 1.2 cm wide, lepidote.

Distribution (Fig. 44). Endemic to the serpentine barrens of the Moa region of Oriente, Cuba; below 100 m elevation.

Specimens examined. CUBA. GUANTÁNAMO: Mina Cromita, Cayoguán, 24 Jul 1944 (fls), *León & Alain 4073* (NY, US); El Coco, Moa, Jul 1947 (fl), *León et al. 22611* (GH, NY); La Brena, Jul 1947 (fls), *León & Clemente 23320* (GH, NY).

This species is closely related to *T. moaensis* and is likely to prove no more than a simple-leaved variant of that species.

26. *Tabebuia conferta* Urban, *Ark. Bot.* **17**(7): 54. 1921. Type. Haiti. Massif de La Hotte, 1400 m, *Ekman H600* (S).

Small tree to 12 m, branchlets thickish, somewhat flattened at nodes, lepidote when young, becoming longitudinally striate-wrinkled with rather loose light brown bark. *Leaves* 5-foliolate (sometimes 3-foliolate fide Urban), the leaflets elliptic, obtuse to abruptly acutish, rounded to truncate at base, the terminal 8–21 cm long, 4–11 cm wide, the laterals 5–8 cm long, 3–6 cm wide, coriaceous, the main veins impressed above, raised below, lepidote, rather sparsely above, more densely below usually with scattered brownish scales as well as more numerous whitish ones, strongly discoloured with upper surface dark brown and lower surface tannish or light brown; petiolules mostly 1–6 cm long (usually only 2–3 mm in basal leaflet pair), thickish, the petiole 5–10 cm long, drying dark with conspicuously pale lenticels. *Inflorescence* terminal, few-flowered, often a single dichotomy with two flowers, densely lepidote, drying dark and rough-looking. *Flowers* with the calyx tubular-campanulate, irregularly 5-dentate, with rather acute teeth, 18–23 mm long, 10–13 mm wide, drying blackish, densely lepidote, the corolla tubular-infundibuliform, red-purple with yellow in throat, 5–6.5 cm long, 1.3–2.1 cm wide at mouth of tube, the tube 4–6 cm long, with basal part well differentiated and much thicker, the lobes ca. 1 cm long, glabrous outside, sparsely pubescent with long lax trichomes in floor of tube, becoming glabrous towards base, densely villous with long matted trichomes at level of stamen insertion, the lobes sparsely ciliate; filaments ca. 4 cm long, the anther thecae subexserted, divaricate, 5 mm long; pistil ca. 4 cm long, the ovary linear-oblong, 6–7 mm long, 2 mm across, densely lepidote; disk annular-pulvinate, 1 mm long, 4 mm wide. *Fruit* a linear capsule, 15–17 cm long, 11–13 mm wide, acuminate, the calyx caducous, drying blackish, longitudinally striate-costate densely

lepidote with blackish scales; seeds thin, bialate, 6–10 mm long, 20–30 mm wide, the hyaline-membranaceous wings clearly demarcated from seed body.

Distribution (Fig. 44). Endemic to the now-destroyed cloud forests between 800 and 1400 m on Massif de La Hotte in southern Haiti.

Collections examined. HAITI. Massif de La Hotte, Ma Blanche, 1400 m, 8 Aug 1917 (st), *Ekman H600* (S), Torbee, ridge above La-Mare-Proux, 1300 m, 6 Dec 1925 (st), *Ekman H5218* (S); Limite Depts. Sud and Grand Anse, 18 km N of Camp Perrin, carretera Beaumont-Jeremie, 850 m, 18°22'N, 73°53'W, 11 Mar 1983 (fl, fr), *Zanoni et al. 25657* (JBSD—fragm., MO); Massif de la Hotte (oeste), 17 km N de Camp Perrin, camino a Jeremie, 30 Jan 1985 (fr), *Zanoni et al. 33224* (JBSD, MO).

The beautiful new collections by Zanoni et al. are the first fertile material of this very distinctive species which was previously known only from two sterile collections made over half a century ago. The leaves are the largest and the branchlets the thickest of any Antillean Bignoniaceae. The apparently hummingbird-pollinated flowers also turn out to be distinctive, characterized by a long gradually expanded tube, relatively short lobes, subexserted anthers, and especially the long coriaceous rather sharply 5-dentate calyx. For quick reference this species might be thought of as an overgrown version of *T. saulvallei*, especially in the color and texture of its leaflets. The flowers of *T. conferta* have a number of unusual features that might be expected in the ancestor that could have given rise to *Spirotecoma*.

27. *Tabebuia coralibe* Standley, *Trop. Woods* **36**: 18. 1933. Type. Colombia. Atlántico: El Paraíso, near Ponedera, 26 Mar 1933 (fl), *Dugand 390* (holotype, F; isotypes, F, MAD).

Tree (5–)15–30 m tall, to 40 cm dbh, the bark pale to dark gray, scaly, wood hard and heavy, the twigs subtetragonal, when young finely stellate-pubescent with sessile, more or less appressed, trichomes, eventually glabrescent. *Leaves* palmately (3–)5-foliolate, the leaflets ovate or obovate, obtuse to acuminate, obtuse to truncate at base, the terminal leaflet 3–11 cm long and 2.6–5 cm wide, lateral leaflets progressively smaller, entire, membranaceous, lepidote above and beneath, above stellate-puberulous along midvein, at least near base, below stellate puberulous at least in secondary nerve axils and

near base of midvein, usually along main veins and sometimes also sparsely over surface, drying olive; terminal petiolule 1.5–4(–5.5) cm long, the laterals shorter, the petiole 2–9 cm long, stellate puberulous with sessile more or less appressed trichomes. *Inflorescence* a several-flowered terminal panicle, usually contracted and more or less fasciculate, the branches tannish stellate, the bracts extremely reduced. *Flowers* with the calyx campanulate, 5-lobed, 6–11 mm long, 5–8 mm wide, rather finely tannish tomentose with stellate and mostly thick-stellate trichomes; corolla yellow with reddish pencilling in throat, when dried with the venation reticulate to the margins of the lobes, the dried tube and lobes yellowish to tannish indistinguishable in color, tubular-infundibuliform, 4.5–7 cm long, the tube 3–4 cm long and 1.5–2 cm wide at mouth, the lobes 1–2 cm long, glabrous outside, inside rather densely pilose with long lax trichomes in floor and throat and glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 2–3 mm long; ovary narrowly oblong, ca. 3 mm long, 1 mm wide, minutely glandular-papillose; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* a linear-cylindric capsule, 20–21 cm long, 1–1.1 cm wide, glabrescent, with a very few scattered lepidote scales and stellate trichomes, the surface irregularly prominuloustriate, also with a few raised projections (cf. *T. guayacan*), the calyx persistent; *seeds* thin, bilate, 0.6–0.7 cm long, 1.8–2.2 cm wide, the hyaline-membranaceous wings well-demarcated from seed body.

Distribution (Fig. 45). Endemic to deciduous forests of the dry region of northern Colombia in Atlántico and Bolívar Departments; below 100 m elevation.

Specimens examined. COLOMBIA. ATLÁNTICO: Finca El Paraíso, cerca de Ponedera, Feb 1933 (fl, fr), *Dugand 348* (F, US); Barranquilla, 1933 (st), *Dugand 390* (F); Finca El Paraíso, cerca de Ponedera, Mar 1937 (fl), *Dugand 390b* (MO, US), *Dugand 460* (F); entre Ponedera y Santa Rita, *Dugand 693* (F); Finca El Paraíso, Ponedera, Mar 1938 (fl), *Dugand 1179* (COL); 3 Aug 1943, *Dugand & Jaramillo 3451* (COL); 15 Jul 1954, *Dugand 4802* (COL). BOLÍVAR: Mun. Carmen de Bolívar, entre Carmen de Bolívar y Zambrano, 200 m, 26 Aug 1986 (st), *Cuadros & Gentry 3092* (JBGp, MO); Mun. Magangue, via Ceibal-La Pascuala y Proviencia, 30 Jan 1987 (fl), *Cuadros 3201* (JBGp, MO), *3203* (JBGp), *3205* (JBGp); Mun. Carmen de Bolívar, via Carmen-Zambrano; 31 Jan 1987 (fr), *Cuadros 3207*

(JBGp, MO). MAGDALENA: Entre Pivijay y Fundación, 11 Feb 1962 (fl), *Romero-Castañedo 9225* (COL).

Common names. Coralibe, lumbre, polvillo.

This species is very close to *T. chrysantha* and perhaps no more than a form of that species, characterized by unusually small, glabrescent leaflets, calyces finely tannish-puberulous with mostly thick-stellate trichomes, and nearly glabrescent fruits. *Tabebuia coralibe* is vegetatively similar to sympatric *T. billbergii* in the small leaflets with long slender petiolules but differs in the olive color of the dried leaflets, the vestiges of a stellate indumentum, and the more evenly puberulous calyx. This species has the characters that might be expected of a hybrid between *T. billbergii* and *T. chrysantha*, but there are enough morphologically homogeneous collections of this entity to suggest that, even should hybrid origin be documented, it is now adequately stabilized for taxonomic recognition. Were the Colombian collections here referred to *T. coralibe* instead from Amazonia or Guiana, I would not hesitate to refer them to *T. capitata*, whose separation from *T. chrysantha* is likewise problematic. However, the geographical disjunction and different ecology, coupled with minor differences in leaflet size and shape, support taxonomic recognition.

A problematic collection (*Dugand 145*, F) that was included as a paratype by Standley (1933) and formed the basis for his description of the fruit of *T. coralibe* is not included in the above description. The leaflets are of the same obovate, blunt-tipped shape as those of *T. coralibe* but are smaller (maximum of 4 × 3 cm), darker, and have more restricted appressed-stellate trichomes mostly on the petiolules and extreme base of midvein. The dehiscent fruit is about 30 cm long and 1 cm wide, mostly glabrous but with definite vestiges of a wooly tannish tomentum; the persistent calyx is densely tomentose with reddish trichomes. Dr. Dugand's notes indicate that he considers this conspecific with the type collection of *T. coralibe*, but it has quite a different aspect from other material assigned to that species. It has the features that would be expected of a hybrid between *T. billbergii* (which it resembles in the largely 3-foliolate leaves as well as their dark color and glabrescence), and *T. coralibe* or another member of the *T. chrysantha* complex.

28. *Tabebuia crispiflora* Alain, *Phytologia* 22: 171. 1971. Type. Dominican Republic. Pedernales: Aceitillar, Sierra de Baoruca, 1100 m, 13 Feb 1969 (fl), *Liogier 13844* (holotype, NY; isotypes, GH, IJ, P, US).

Shrub or treelet 0.6–3 m tall, the branchlets somewhat angled, flattened at nodes, more or less lepidote, sometimes with conspicuous raised whitish lenticels when young. *Leaves* 3–5-foliate, the leaflets oblong-elliptic to obovate, usually rounded at apex (sometimes bluntly apiculate or broadly retuse), truncate to subcordate at base, 2–11 cm long, 1–7 cm wide, very strongly coriaceous, the secondary venation plane or slightly impressed above, prominulous below, sparsely and inconspicuously minutely lepidote or lepidote punctate above, below more or less persistently lepidote, usually with mixture of dense whitish scales and scattered darker ones, drying olive, usually slightly darker above, the margin entire; terminal petiolule essentially lacking to 1.4 cm long, the basals subsessile to few mm long, the petiole 0.5–1.8 cm long, very thick, lepidote, often with raised white lenticels. *Inflorescence* a contracted terminal panicle, rather densely black-lepidote. *Flowers* with the calyx campanulate, irregularly 2(–4)-labiate, 8–14 mm long, 7–9 mm wide, blackish lepidote; corolla red or wine-red, narrowly tubular campanulate to broadly salverform, 3–5 cm long, 0.5–1.3 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 0.5–1 cm long, the tube glabrous outside, more or less conspicuously papillose glandular, the lobes sparsely ciliate, papillose puberulous in floor of tube inside and glandular villous at level of stamen insertion; stamens slightly included, the anthers held in upper third of throat, the thecae somewhat divergent, probably pendulous, 3 mm long; ovary linear, 4 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 2 mm long, 3–4 mm wide. *Fruit* linear-cylindric, 4.5–9 cm long, ca. 6–7 mm wide, rather subwoody, not conspicuously striate, black-drying, lepidote, the calyx persistent; *seeds* thin, bilate, 4–5 mm long, 10–14 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 44). Endemic to southwestern and southcentral Dominican Republic, mostly around Aceitillar on limestone intermixed with

bauxite, also on exposed ridges and cliffs in Peravia and San Cristobal Provinces; perhaps also on Cuba; 700–1300 m elevation.

Specimens examined. CUBA. Sin. loc., *Wright 3047* (BM, G).

DOMINICAN REPUBLIC. PEDERNALES: Sierra de Baoruco, Aceitillar, 18°8'N, 71°34'W, 27–29 Dec 1981 (fl), *Dod s.n.* (JBSD); Nizas, Aceitillar, 30 Mar 1961 (fl), *Jiménez 4455* (K, US); Cayo, 1300 m, Aceitillar, 9 Feb 1969 (fl), *Liogier 13667* (NY, US); Cueva Boucan Calice, 1100 m, E of Aceitillar, 13 Feb 1969 (fl), *Liogier 13844* (NY); Cayo, Aceitillar, 1300 m, 22 Feb 1969 (fl), *Liogier 14096* (NY, US), 26 Feb 1971 (fl), *Liogier 17921* (NY, US); Canote, Aceitillar, 1500 m, 24–25 Jul 1973 (fl, fr), *Liogier & Liogier 19671* (JBSD). **PERAVIA:** N of Bani, 13 km N of Cruce Santome con Sánchez, 18°20'N, 70°18'W, 720 m, 13 Apr 1985 (fl) *Gentry & Mejía 50809* (JBSD, MO); “Hoyo de Sánchez,” 10 km N of Sabana Indio on road to El Manaclar, 18°20'N, 70°22'W, 2900 ft, 6 May 1981 (fl), *Mejía et al. 13145* (JBSD, MO). **SAN CRISTÓBAL:** Fuerte de Resoli, 10 km N of San Cristóbal to Bani highway, 18°24'N, 70°12'W, 2000 ft, 24 Jun 1981 (fr), *Zanoni et al. 14981* (JBSD, MO).

This species is close to *T. ophiolitica*, the other percoriaceous-leaved Dominican species with similarly reduced petioles and petiolules, but differs from that species in narrower red corolla with subexserted or barely included anthers, lack of bracteate short-shoot branches, villous filament bases, and more conspicuous lepidote indumentum on leaflet undersurface.

The single old Cuba collection (*Wright 3047*) was the basis for Grisebach's report of otherwise Puerto Rican *Tabebuia* (as *Tecoma*) *haemantha* from Cuba. However, the Cuban collection has the more deeply included anthers and short petioles of Hispaniolan *T. crispiflora*. It is curious that this species has not been recollected in Cuba in this century and it is possible that a specimen mixup is involved, as happened with many of Wright's Cuban collections.

29. *Tabebuia cristata* A. Gentry, sp. nov. Type. Brazil. Espírito Santo: Reserva Florestal da CVRD, Linhares, Estrada Ipe Amarelo, km 0.456, lado esquerdo, 9 Nov 1984 (fl), *G. Farias 34* (holotype, CVRD; isotypes, MO–2, K).

Arbor ad 40 m altam. Folia palmatim 5-(6-)foliolata, foliolis obovatis vel oblongo-obovatis, integris, infra sparsim stellato-tomentosis, nervis confertim tomentosis. Inflorescentia paniculata, contracta, ramis dendroideo-rufes-

centibus. Flores calyce campanulato, stellato-tomentoso, conspicue porcato; corolla lutea, extus glabra vel trichomatibus stellatis infra sinis, intus fauce villosa. Capsula linearis, dense stellato-tomentosa.

Large emergent tree to 40 m tall and 50 cm dbh, the branchlets subterete, tannish stellate pubescent when young, glabrescent. *Leaves* palmately 5(–6)-foliolate, the leaflets obovate to oblong-obovate or rhombic-elliptic, acute to subacuminate at apex, basally obtuse or cuneate, the terminal leaflet 4–10 cm long, 1.7–4 cm wide, the laterals progressively smaller, entire, membranaceous, sparsely and inconspicuously lepidote above and below, above also somewhat glabrescently stellate-puberulous, the trichomes persisting at least on midvein, below persistently tannish stellate puberulous with sessile trichomes sparsely scattered over the clearly visible olive-greenish-drying surface and denser on the thus tannish-drying main veins, smooth or slightly roughish above; terminal petiolule 1–2.5 cm long, the petiole 2.5–9 cm long, tannish stellate-puberulous. *Inflorescence* a contracted few-flowered terminal panicle or sometimes the peduncle essentially absent, the pedicels 5–15 mm long, reddish dendroid-pubescent, with linear bracts and bracteoles 2–5 mm long. *Flowers* with the calyx campanulate, shallowly 5-lobed, 12–20 mm long, 8–12 mm wide, shortly tannish tomentose with stellate trichomes, conspicuously costate-ridged with ridges running from lobe apices to base, usually somewhat glabrescent apically between the ridges, the exposed surface drying pale or almost translucent; corolla yellow with reddish pencilling in throat, the venation of the lobes when dry “intermediate,” i.e., obvious but the lobes drying somewhat lighter than the tube, tubular-infundibuliform, 5.5–9 cm long, 1.5–2.5 cm wide at mouth of tube, the tube 4–6 cm long, the lobes 1–2 cm long, sometimes with a few stellate trichomes along veins on outside of tube just below sinuses, otherwise glabrous outside, the lobes sparsely or not at all ciliate, the sinuses and floor of throat pilose with rather long flexuous, in part branched multicelled trichomes, these extending clear to stamen insertion; stamens didynamous, the thecae divaricate, 2–2.5 mm long, ovary linear-oblong, 4 mm long, 0.6–1 mm wide, glabrous with a more or less lepidote-glandular surface; disk annular-pulvinate

with a distinct margin, 0.5 mm long, 2 mm wide. *Fruit* a linear-cylindric capsule, 25–28 cm long, 1.2–1.4 cm wide, densely tannish stellate-tomentose, the calyx persistent; *seeds* thin, bialate, 6–8 mm long, 1.8–3 cm wide, the hyaline-membranaceous wings clearly demarcated from seed body.

Distribution (Fig. 46). Dry or edaphically dry forest of northeastern Brazil; one collection from caatinga and three from the Linhares area (see Peixoto & Gentry, 1990). Below 100 m elevation.

Collections examined. BRAZIL. ESPÍRITO SANTO: Estrada do ipe amarelo, CVRD, Linhares, 1 Feb 1985 (st), Peixoto, Gentry et al. 3067 (K, MBM, MO, NY, RB, TEX, US), 22 Oct 1987 (fr), Folli 661 (MO); mun. de Serna, BR101, 10 km S de Nova Carapina, 5 Feb 1985 (fl), Peixoto, Gentry et al. 3524 (MO). PERNAMBUCO: Entre Belo Jardim e Brejo da Madre de Deus, Serra do Vento, 2 Nov 1956 (fl), Andrade-Lima 56-2614 (MO).

Common names. Ipe amarelo, pau d’arco amarelo.

Although rarely collected, this may be due more to its status as a large emergent tree than to its rarity. The road along which the type was collected is actually named for this tree: estrada ipe amarelo.

Tabebuia cristata is very closely related to *T. umbellata*, from which it differs most strikingly in the generally thinner, strongly cristate-ridged calyx. The calyces of both species tend to be glabrescent between the teeth but in *T. cristata* the exposed surface dries light or almost translucent while in *T. umbellata* it dries blackish. Another apparent difference is that the corolla lobes of *T. cristata* tend to dry lighter than the corolla tube, unlike *T. umbellata*. In the vegetative state the two species cannot be reliably separated, although there is a tendency for *T. cristata* leaves to dry a lighter olive with tannish rather than rufescent venation. However, collections of leaves of both species are so rare that vegetative characters are very difficult to evaluate. While it is possible that *T. cristata* is no more than an extreme form of *T. umbellata*, it seems to be very distinct ecologically, occurring in well-drained forest while *T. umbellata* is restricted to swamp forest. On balance it seems best to somewhat tentatively recognize this entity as taxonomically distinct.



FIG. 46. Distribution of continental *Tabebuia*. * = *T. cristata*; ▲ = *T. elliptica*; ⊙ = *T. fluviatilis*; ★ = *T. guayacan*; ● = *T. incana*.

30. *Tabebuia* × *del-riscoi* Borhidi, Act. Bot. Acad. Sci. Hung. 26: 22. 1980. Type. Cuba. Pinar del Río: Sierra del Rosario, Loma El Taburete entre Cayababos y Las Terrazas, 4 Jul 1974 (fl), Borhidi & Del Risco s.n. (HAC27843) (holotype, HAC; isotype, BP, not seen).

Tabebuia × *rosariensis* Borhidi, Act. Bot. Acad. Sci. Hung. 26: 23. 1980. Type. Cuba. Pinar del Río: Sierra del Rosario, Loma El Taburete, 250–300 m, 4 Jul 1974 (fl), Borhidi & Del Risco s.n. (HAC28022) (holotype, HAC; isotype, BP, not seen).

Small tree to 6–8 m tall, the leaves somewhat clustered toward branch apices, the older branch-

lets subterete with raised leaf scars. *Leaves* (in part from Borhidi, 1980) 1–3-foliolate, ovate to obovate (leaflets of trifoliolate leaves obovate), the apex obtuse to subacuminate, apiculate, the base rounded or obtuse, 4.5–7 cm long, 2.5–4 cm wide, coriaceous to thick coriaceous, the margin entire or subcrenulate, densely lepidote, concolorous; petioles 0.7–2.5 cm long, the terminal petiolule (when present) to 1 cm long. *Inflorescence* a single terminal flower, the pedicels to 1.5 cm long, lepidote. *Flower* with the corolla white, tubular-infundibuliform, 4–5 cm long. *Fruit* linear-cylindric, ca. 15 cm long, lepidote; *seeds* thin, bialate, 5 mm long, 25–30 mm wide, the wings hyaline-membranaceous.



FIG. 47. Distribution of Antillean *Tabebuia*. ▲ = *T. del-riscoi*; ● = *T. densifolia*; □ = *T. dominguiensis*; ★ = *T. dubia*; ⊕ = *T. elongata*; ● = *T. glaucescens*; ○ = *T. haemantha*.

Distribution (Fig. 47). Known only from the type locality on calcareous soil in open semideciduous forest of the Sierra del Rosario, Pinar del Río, Cuba.

This is almost certainly a hybrid between *T. lepidophylla* and *T. heterophylla* (or one of the compound-leaved species closely related to the latter). Characters cited by Borhidi as distinguishing *T. lepidophylla* from *T. del-riscoi* include uniformly simple leaves with narrower bases, a more densely lepidote undersurface, and revolute margin, larger 5-lobed calyx with acute lobes, magenta corolla color, and shorter capsule. The purported flower and fruit characters are of little or no taxonomic value since *T. lepidophylla* can have either white (usually) or pink flowers and has mostly 2–3-labiate calyces as small as 10 mm long, and fruits as long as 13 cm. Since the in part 3-foliolate leaves of this species give it a rather different aspect than *T. lepidophylla* and cause it to key out in a different part of the key, I have treated it as a species despite its prob-

able hybrid status. Apparently it forms part of a hybrid complex since an additional intermediate between *T. del-riscoi* and *T. angustata* was encountered in the same place and designated by its author as a hybrid. Moreover, all of the distinguishing characteristics of *T. del-riscoi* are exactly those that would be expected of a hybrid between *T. lepidophylla* and *T. heterophylla*.

31. *Tabebuia densifolia* Urban, *Ark. Bot.* 17(7): 53. 1921. Type. Haiti. Dept. du Sud, prope Port-a-Piment, *Ekman H398* (holotype, S; isotypes, K, S).

Tabebuia picotensis Urban, *Symb. antill.* 9: 265. 1924. Type. Cuba. Santiago de Cuba: Picote, in Sierra de Nipe, *Ekman 10114* (holotype, S; isotype, NY—fragm.).

Shrub or small, densely dichotomously branched *tree*, the branchlets terete, densely lepidote, the leaves usually clustered at the branch apices. *Leaves* simple, narrowly elliptic to ellip-

tic-oblong, acute or apiculate at apex (rarely obtuse in part) cuneate at base, 0.5–3 cm long, 0.2–0.8 cm wide, thick coriaceous, very densely lepidote above and below, conspicuously grayish on both surfaces; petioles ca. 1–2 mm long. *Inflorescence* a single terminal flower from branch apex, the pedicel 0.3–1 cm long. *Flowers* with the calyx campanulate, irregularly shortly 2–3-labiate, 5–10 mm long, 5–6 mm wide, densely lepidote but drying dark; corolla pink or whitish, tubular-infundibuliform, 3–4 cm long, ca. 1 cm wide at mouth of tube, the tube 2–3 cm long, the lobes almost 1 cm across, glabrous outside, the lobes ciliate, the tube pubescent in floor with short stiff trichomes, pilose at level of stamen insertion; ovary linear-oblong, tetragonal-angled, 2–3 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1 mm long, 2.5 mm wide. *Fruit* linear-cylindric, 4–5 cm long, ca. 5 mm wide, lepidote; *seeds* thin, bialate, 4–5 mm long, ca. 1.5 cm long.

Distribution (Fig. 47). Eastern Cuba, Haiti, and western Dominican Republic; dry scrubby forest, especially on limestone; 300–700 m elevation.

Specimens examined. CUBA. GUANTÁNAMO: Maisi, El Diamante, entre El Corajo y Río Ovando, 7 Jun 1982 (st), *Bisse s.n.* (HAJB47845) (HAJB). SANTIAGO DE CUBA: Bayate, ar. Picote, 550 m, 16 Jul 1916 (st), *Ekman 7390* (B, MO, S), 14 Mar 1918 (st), *Ekman 9140* (S); Picote, in Sierra de Nipe, 14 Nov 1919 (fl, fr), *Ekman 10114* (S), 2 Nov 1922 (fl), *Ekman 15602* (S); Monte Picote, S end of Sierra de Nipe, near Palmerito del Cauto, 400 m, 29 Jan 1956 (st), *Morton 9722* (US).

HAITI. Dept. Sud, prope Port-a-Piment, 27 Jul 1917 (fl, fr), *Ekman H398* (K, S); Montagnes du Trou d'Eau, Mône à Cabrits, Massif des Matheux, 400–500 m, 16 Jul 1924 (fl), *Ekman 912* (S, US); Massif du Nord, Hinche, Valley of Rivière Samaná, 300 m, *Ekman H6055* (S); Massif de la Hotte, group Mône Rochelois, Miragoane, 23 Nov 1926 (st), *Ekman H7228* (G, IJ, NY, S); 26 Mar 1927 (fl), *Ekman H7908* (GH, S); Massif de la Selle, Gauthier, E. of Fond-Parisien, 17 Apr 1928 (fl), *Ekman H9869* (B, K, NY, S, US); Mômes a Cabrites, 300 m *Holdridge 892* (NY); Montagnes Noires, Dept. Centre, 16 km desde Croix-des-Bouquets en carretera a Mirebalais, 18°36'N, 72°9'W, 480 m, 11 Nov 1982 (fl), *Zanoni et al. 24025* (JBSD, MO).

DOMINICAN REPUBLIC. AZUA: Sierra Martín García, 5 km S de Barrera, 11 Sep 1984 (fr), *Mejía et al. 1194* (JBSD, MO). INDEPENDENCIA: 4 km S of Puerto Escondido on road to Aceitillar, dry spiny forest, 720 m, 18°18'N, 71°32'W, 12 Apr 1985 (fl), *Gentry & Mejía 50803* (JBSD, MO); SSW Duverge, 10 km from Puerto Escondido, 19 Apr 1985 (fl), *Stahl & Lindstrom 233* (G, MO).

This simple-leaved species differs from *T. obovata* essentially in having leaves smaller, narrower, usually more apiculate and whitish below. At the other extreme it differs from *T. microphylla* essentially in having larger, more elongate, leaves.

32. *Tabebuia dominguensis* (Urban) Britton, Bull. Torrey Bot. Club **42**: 378. 1915.

Tecoma dominguensis Urban, Symb. antill. **7**: 376. 1912. Type. Dominican Republic. Barahona: In cuminum Nochebuena, 1800 m, *Fuertes 1480* (lectotype, NY; isotypes, MO, U).

Small to medium-sized *tree*, branchlets irregularly angled, with conspicuously raised petiole scars, lepidote when young. *Leaves* 3–7-foliolate, the leaflets narrowly obovate, more or less rounded at apex, sometimes obtusely apiculate, long cuneate at base, the terminal 3–8 cm long, 1.4–3.5 cm wide, the basal 2.3–5 cm long, 1.3–2.6 cm wide, coriaceous, the margins entire and very slightly revolute, usually slightly discolored and somewhat more olive above, very densely lepidote above and below, some of the scales reddish and slightly larger, smooth to the touch, conspicuously brochidodromous, the secondary veins plane or very slightly impressed above, prominulous below, the tertiary venation plane above and below; petiolules rather slender, the terminals 1–2 cm long, the laterals more or less undifferentiated from narrowly cuneate leaflet base or to 1 mm long, the petiole 2–5 cm long, lepidote but not densely so. *Inflorescence* of a few flowers, usually forked and 2-flowered or with a short-pedicellate central flower between these, the peduncle 1–6 cm long, the pedicels mostly ca. 1.5–2 cm (except the third central flower when present) usually with a pair of subulate bracteoles in upper half, densely lepidote with large sessile reddish scales. *Flowers* with the calyx campanulate, irregularly bilabiate, 15–21 mm long, 9–12 mm wide, densely lepidote with large sessile, reddish scales, drying brownish; corolla magenta to wine-colored, tubular-infundibuliform, lacking well-defined basal cylinder, the base ca. 5 mm across, 4.5–7 cm long, 1.2–2.5 cm wide at mouth of tube, the tube 3–5 cm long, the lobes 1–2 cm long, glabrous outside and inside except at base of filaments; pistil ca. 3 cm long, the ovary oblong-linear, 5–6 mm long, 2 mm wide, densely

lepidote; disc annular-pulvinate, slightly 5-lobed, 2 mm long, 4–5 mm wide. *Fruit* unknown.

Distribution (Fig. 47). Northern Barahona Peninsula area of Dominican Republic; from 500 to 1800 m.

Specimens examined. DOMINICAN REPUBLIC. BARAHONA: Noche Buena, 1800 m, in cacumine, Apr 1912 (fl), *Fuertes 1480* (MO, NY, U); 1.2 km E of Cruce Carretera Cabral-Polo, road to Cortico, 18°9'N, 71°15'W, 1130 m, *Gentry & Mejía 50712* (JBSD, MO); Montada Nueva, 7 km desde carretera Cabral-Polo, 18°7.5'N, 71°13.5'W, 4200–4400 ft, 4 May 1982 (st), *Zanoni 20369* (JBSD).

One additional collection is possibly referable here. This is *Ekman H15124* from the Península de Samaná, 500 m, Los Banaderos Prietos, limestone crag. Although this specimen is indicated as having pink flowers, which would suggest placement in *T. dominguensis*, the leaves are indistinguishable from those of white-flowered *T. polyantha*, which would be a far more likely identification on phytogeographic grounds.

33. *Tabebuia donnell-smithii* Rose, Bot. Gaz. 17: 418, pl. 26. 1892. Type. Guatemala. Escuintla, *Donnell-Smith 2070* (US).

Cybastax donnell-smithii (Rose) Seibert, Carnegie Inst. Wash. Publ. 522: 392. 1940.

Cybastax millsii Miranda, Bol. Soc. Bot. Mex. 26: 129. 1961. Type. Mexico. Chiapas, *Gomez Pompa 312* (holotype, MEXU; isotypes, U, US).

Roseodendron donnell-smithii (Rose) Miranda, Bol. Soc. Bot. Mex. 29: 43. 1965.

Roseodendron millsii (Miranda) Miranda, Bol. Soc. Bot. Mex. 29: 43. 1965.

Tabebuia millsii (Miranda) A. Gentry, Ann. Missouri Bot. Gard. 63: 75. 1976.

Tree to 35 m tall, the twigs subtetragonal, striate-wrinkled, glabrate. *Leaves* palmately 5–7-foliolate, the leaflets oblong-elliptic, acute to acuminate, the base truncate, to 28 cm long and 14 cm wide, usually smaller, serrate to entire or subentire, membranaceous to chartaceous, minutely scattered lepidote, puberulent below with mostly simple trichomes or more or less glabrate, usually with at least a few branched and simple trichomes along main veins below and midvein above, drying dark olive above, lighter olive below; petiolules to 7 cm long, the petiole to 26 cm long, mostly glabrate. *Inflorescence* an open terminal panicle with a well-developed central rachis, the lateral branches usually branching, rachis and branches puberulous with mostly

capitate trichomes, the bracts and bracteoles narrowly lanceolate to 1 cm long. *Flowers* with the calyx campanulate, 10–18 mm long, 5–12 mm wide, thinly membranaceous, irregularly bilabiate to 5-dentate, somewhat lepidote and puberulous with gland-tipped trichomes; corolla yellow, tubular-infundibuliform, 4.5–6 cm long, 1.2–1.8 cm wide at mouth of tube, the tube 3.8–4.5 cm long, the lobes 1–2 cm long, tube sparsely pubescent with glandular-lepidote scales and short gland-tipped trichomes, lobes almost glabrous, with a few scattered trichomes, tube inside glabrous except near level of stamen insertion; stamens didynamous, the thecae divaricate, 2 mm long; pistil ca. 2.5 cm long, the ovary linear-oblong, 3.5–5 mm long, 1.5 mm wide, densely and minutely lepidote-papillate, the ovules ca. 6-seriate in each locule; disk annular-pulvinate, 1 mm long, 2.5–3 mm wide. *Fruit* an elongate-linear capsule, 25–45 cm long, 1.4–3 cm wide, irregularly costate with 8–12 rather irregular longitudinal ribs, sparsely puberulous with minute, mostly unbranched sometimes gland-tipped trichomes, especially along the ridges; *seeds* thin, 0.9–1.2 cm long, 1.6–2.1 cm wide, the wings hyaline-membranaceous, completely surrounding and very sharply demarcated from the brownish seed body.

Distribution (Fig. 45). Mexico to El Salvador and Honduras; disjunct in central Bolívar, Venezuela, with one sterile collection from Córdoba, Colombia; sea level to 900 m elevation.

Representative specimens examined. MEXICO. CHIAPAS: 10–12 km SW of Colonia Agrónomos Mexicanos, Cerro Tres Picos, Mun. Villa Corzo, 8 Feb 1972 (fl), *Breedlove 23921* (F, DS, MICH, MO). **COLIMA:** Env. Colima, Apr 1913 (fl, fr), *Diguet 376* (LP, MICH). **JALISCO:** Chamela, Est. Biología, Mun. La Huerta, 22 May 1982 (fl), *Bullock 1149* (MO). **MICHOACÁN:** Near Aquila, Distr. Coalcoman, Jan 1942 (fl), *Hinton 16307* (LL, MICH). **NAVARRIT:** Rosa Morada, Dec 1926 (fl, fr), *González-Ortega 6683* (BR, G). **OAXACA:** Ubero, Jun 1937 (st), *Ll. Williams 9382* (MICH). **TABASCO:** Mun. Teapa, Puyacatengo, 1 km de Carretera Teapa-Tacotalpa, 6 May 1984 (fl), *Cowan et al. 4657* (MO). **VERACRUZ:** Santiago Tuxtla-Isla a Unos, Km 25, 2 Mar 1973 (fl), *Cedillo & Calzada 106* (F, MEXU, MO).

GUATEMALA. ESCUINTLA: Cuyuta, Apr 1890 (fl), *J. D. Smith 1147* (US). **RETALHULEU:** Retalhuleu, *Bernoulli & Cario 2052* (K). **SUCHITEPÉQUEZ:** Near Nahualate, Feb 1970 (fl), *Krukoff s.n.* (F, G, MICH, MO). **ZACAPA:** 16 km S of Zacapa, Dec 1970 (fl), *Harmon & Fuentes 5258* (MO).

EL SALVADOR. SAN SALVADOR: Finca Altamira, S of San Salvador, 26 Jan 1959 (fl), *Allen 7192* (LL).

SONSONATE: Sonsonate, Jan 1923 (fl), *Calderon 1441* (MO).

COLOMBIA. CÓRDOBA: Road from Fresquillo to Tierralta, 30 Jul 1988 (st), *Gentry & Cuadros 63954* (JBGP, MO).

VENEZUELA. BOLÍVAR: Reserva Forestal La Paragua, Feb 1970 (fl), *Blanco 643* (F, K, MV, VEN); San Francisco, Aug 1950, *Curran 1992* (MER); 1–7 km N of La Paragua toward Ciudad Piar, Jul 1975 (st), *Gentry & Berry 15071* (MO, VEN).

Local names. Mexico: primavera. Central America: palo blanco, copal, cortez, cortez blanco. Venezuela: comida de culebra, cacho de venado. English (timber trade): white mahogany, primavera.

Uses. Widely used as a timber tree. Extensively planted in moist parts of coastal Ecuador and more sporadically elsewhere.

Additional material now available convinces me that *T. millsii* should not be recognized as specifically distinct. The characters in fruit width, number of leaflets, and leaflet margin are all variable even within populations. It is noteworthy that the disjunct Venezuelan population is intermediate between the two Mexican forms. The recent discovery of this species in northern Colombia narrows the peculiar range disjunction from northern Central America to northern South America.

34. *Tabebuia dubia* (C. Wright ex Sauvalle) Britton ex Seibert, *Trop. Woods* 63: 8. 1940.

Tecoma dubia C. Wright ex Sauvalle, *Anal. Acad. Cien. Habana* 6: 319. 1873. Type. Cuba. Oriente: Sin. loc., *Wright 1479* (GH, photo MO).

Tabebuia crassifolia Britton, *Bull. Torrey Bot. Club* 42: 376. 1915. Type. Cuba. Oriente (Holguín): SE of Holguín, *Shaffer 1285* (holotype, NY; isotypes, MO, US).

Tree 5–10 or more meters tall, dichotomously or irregularly trichotomously branched, the branchlets terete, usually conspicuously irregular from the raised leaf scars, densely lepidote, usually conspicuously lenticellate. *Leaves* simple, usually whorled or opposite, sometimes subalternate, elliptic to elliptic-oblong or narrowly obovate, rounded to emarginate at apex (rarely subacute, e.g., *Alain 3373*), rounded to cuneate at base (2–)7–22 cm long, (1–)2–7.5(–10) cm wide, thick coriaceous, the margin more or less revolute, shiny and sparsely to densely lepidote above, duller and very densely lepidote below with overlapping scales, drying olive to brownish above,

somewhat lighter and more or less grayish or grayish olive below, tertiary venation obscure, plane above and below, secondary venation plane above and barely prominulous below, evenly brochidodromous (the closed loops sometimes completely immersed and not apparent below); petioles 1–3(–5) cm long, lepidote. *Inflorescence* a few terminal flowers, the pedicels 2–3.5 cm long, with inconspicuous caducous subulate bracteoles ca. 2 mm long in lower half, densely lepidote, subtended by subulate bracts ca. 3–4 mm long. *Flowers* with the calyx campanulate, bilabiate, 10–12 mm long, 6–9 mm wide, densely lepidote inside and outside, drying dark with a strong coppery sheen from the lepidote scales; corolla pinkish; tubular-infundibuliform, 4–4.5 cm long, 1–1.3 cm wide at mouth of tube, the tube 3–3.5 cm long, the lobes 1 cm long, tube more or less glabrous outside, at least toward base, usually with some rather large lepidote scales toward top of tube, inside scurfy puberulous with short stiff trichomes in throat, the lobes barely subciliate with a few inconspicuous short marginal trichomes; ovary oblong, tetragonal-angled, 3 mm long, 1.5 mm wide, very densely lepidote with large overlapping somewhat orangish white scales, these extending onto base of style; disc cupular, 1.5 mm long, 2 mm wide. *Fruits* (only 1 seen) 4.5 cm long, 1 cm wide, densely lepidote, the fusiform valve very thick and woody (possibly explosively dehiscent?), the calyx persistent; *seeds* thin, bialate, 5–6 mm long, ca. 3 cm wide, the clear hyaline wings sharply demarcated from the dark brown seed body.

Distribution (Fig. 47). Oriente Region of eastern Cuba, sea level to 1200 m, mostly on serpentine.

Specimens examined. CUBA. GUANTÁNAMO: Cayo Guan, vic. of Moa, 17–18 Apr 1945 (fls), *Acuña s.n.* (12712) (US); Monte La Brena, Moa, 5 Nov 1945 (st), *Acuña 13340* (HAC); Sierra de Moa, near Piedra La Vela, 1 Jan 1953 (fr), *Alain 3373* (NY); Pico Galano, Sierra del Frijol, 1200 m, 1 Jan 1954 (fls), *Alain 3777* (GH, NY, US); Moa, 26 Jun 1945 (fls), *Clemente 4345* (NY, US); Playa la Vacca, Moa, 15 Apr 1946 (fls), *Clemente 4944* (GH, NY); Baracoa, Lomas de Cuaba, 17 Jan 1915 (st), *Ekman 4302* (S); La Farola, via Sun, Baracoa, 9 Apr 1960 (fl), *López-Figueiras 570* (HAC); Cerro de Miraflores, Canonova, 15 Apr 1954, *López-Figueiras 1234* (HAC); Moa, Baracoa, 29 Aug 1917 (fr), *Roig 34* (NY); Cayo Chico, Moa, 19 Sep 1951 (st), *E. Smith 200* (HAC); Punta Gordo, Moa, *E. Smith 555* (HAC). HOLGUÍN: Sierra Saca la Lengua, Cristal, 26 May 1955 (fl), *Acuña & Zayas 19783* (HAC); S of

Sierra de Cristal, 28 Dec 1955 (st), *Alain & López-Figueiras 4662* (GH); Sierra de Nipe ad Piedra, 500 m, 17 Aug 1914 (fls), *Ekman 2467* (MO, S); Sierra de Nipe, Río Jimbambay, 23 Feb 1915 (st), *Ekman 4714* (S); Loma Estrella, 450 m, Sierra de Nipe, 25 Aug 1915 (st), *Ekman 6396* (S); entre Los Mulos y Corea, Sierra Cristal, 27 Aug 1959 (st), *López-Figueiras 225* (HAC); La Municipión, 10 Feb 1968 (fls), *Hadac 1566* (PR), sin. loc., *Gill 99* (NY); SE of Holguín, 9 Apr 1909 (fls), *Shafer 1285* (MO, NY, US); Sierra de Nipe, Sep 1965 (fr), *Yero 205* (HAC). LAS TUNAS: Zona de Puerto Padre?, *Curbelo 1931* (HAC).

Common name. Roble macho.

This is one of the most sclerophyllous-leaved species of the genus. It is close to *T. hypoleuca*, from which it differs in the thicker leaves which are not conspicuously white below, and also lacks the conspicuous and contrasting tertiary venation of that species. The leaf margin is much more involute and the pedicels longer. One collection, *Alain 3373*, is somewhat intermediate, with a tendency toward a noticeable tertiary venation, paler leaf undersurface, and unusually acutish apices. The single fruit valve seen of *T. dubia* is very unusual in its woody texture and short fusiform shape; it is strongly longitudinally curved, suggesting that it may be elastically dehiscent.

35. *Tabebuia elegans* Urban, Feddes Repert. 22: 48. 1925. Type. Cuba. Guantánamo (Oriente): Río Quibijan, Finca Sotolongo, *Ekman 4362* (holotype, S; isotypes, K, MO—fragm., NY).

Shrub or small *tree* to 5 m tall, dichotomously branched, the branches subterete or somewhat angled and flattened at nodes, lepidote with minute reddish or blackish trichomes, with a few conspicuous whitish lenticels when young. *Leaves* 3–7-foliolate, the leaflets narrowly elliptic to very narrowly oblong-elliptic, rounded to obtuse at apex, cuneate at base, the terminal (1.8–)4.5–9.5 cm long, (0.6–)0.8–2.2 cm wide, the laterals (0.8–)1.5–7 cm long, 0.4–1.8 cm wide, very strongly coriaceous, the secondary nerves plane above, subplane to slightly prominulous below, microscopically shiny above, inconspicuously scattered lepidote, below conspicuously lepidote with rather scattered blackish scales, drying olive gray to blackish above, olive gray or light brownish below, the margins entire, sometimes revolute; terminal petiolule 1–3.5 cm long, the basals 0.7–2 cm long; petiole 1.3–6.5 cm long, slender, less than twice as long as longest petiolule, lep-

idote. *Inflorescence* an open, few-flowered terminal panicle with long flexuous pedicels, rather resinous-shiny, sparsely lepidote with large scattered blackish peltate scales, bracts and bracteoles early caducous. *Flowers* with the calyx cupular, irregularly 2–3-labiate, 10–12 mm long, 5–9 mm wide, glandular-lepidote with dark-drying scales; corolla pink, rather narrowly tubular-campanulate, 4–4.5 cm long, 0.7–1 cm wide at mouth of tube, the tube 3–3.5 cm long, the lobes 0.6–1 cm long, glabrous outside, rather densely villous in throat, villous at level of stamen insertion; stamens deeply included, the thecae divaricate, 2–3 mm long; ovary linear-oblong, rather 4-angled, 4 mm long, 0.5 mm wide, lepidote; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* linear-cylindric, (?3–)4–12 cm long, 7–9 mm wide, the valves thin-coriaceous, longitudinally striate, densely black lepidote, drying blackish, subtended by persistent calyx; *seeds* thin, bialate, 5–7 mm long, 15–20 mm wide, the hyaline-membranaceous seed wings sharply demarcated from seed body.

Distribution (Fig. 48). Endemic to the Moa area of Holguín and adjacent northern Guantánamo Provinces (formerly part of Oriente), in easternmost Cuba. Probably rheophytic with many specimens indicated as growing along streamsides or on cliffs along streams; also pine-lands; near sea level to 800 m elevation.

Collections examined. CUBA. GUANTÁNAMO: Finca Sotolongo near Río Quibijan, 23 Jan 1915 (st), *Ekman 4362* (S); Baracoa, Cayo Coca, 15 Apr 1945 (st), *Acuña s.n.* (HAJB12718) (HAJB); Sta. Maria, Apr 1975 (st), *Alvarez & Claro s.n.* (HAJB25864) (HAJB); Cuchillo de Toa, Cayo Fortuna, *Bisse s.n.* (HAJB16739) (HAJB); Arroyo Maguana, Feb 1968 (bd), *Bisse & Kohler s.n.* (HAJB5574) (HAJB); Río Taco, *Bisse & Kohler s.n.* (HAJB3357) (HAJB); Arroyo Iberia, Baracoa, *Bisse & Kohler s.n.* (HAJB6389) (HAJB); Río Duabu cerca de Vega de la Palma, 21 Nov 1978 (fl), *Bisse et al. s.n.* (HAJB37164) (HAJB); Cayo Fortuna, 11 May 1983 (fl), *Bisse et al. s.n.* (HAJB49221) (HAJB); Sta. Maria, Río Jiguari, Apr 1975 (fl), *Claro s.n.* (HAJB25560) (HAJB). HOLGUÍN: Río Yagrumajes, 14 Apr 1945 (fl, fr), *Acuña 12716* (US); Cayo Coco, vic. of Moa, 15 Apr 1945 (fl), *Acuña 12717, 12718, 12719* (all US); Río Yagrumajes, 18 Jul 1944 (st), *Clemente & Alain 3880* (NY); 15 km SW of Compania de Moa mill, Jul 1941 (fl), *Howard 6048* (GH); pinelands, Moa, 22 Jul 1941 (st), *León et al. 20162* (NY); Cayoguan river valley, Moa, 30 Mar 1942 (fl), *Leon et al. 20922* (GH, NY); Cayoguan Mines, 18 Jul 1947 (fl), *Leon & Clemente 23156* (NY); La Melba, Sierra de Moa, 5 Apr 1970 (fl), *Lippold s.n.* (HAJB16552) (HAJB); Nuevo Mundo, 6 May 1973 (fl), *Alvarez & Berazain s.n.*



FIG. 48. Distribution of Antillean *Tabebuia*. □ = *T. elegans*; ● = *T. heterophylla*; ★ = *T. hypoleuca*.

(HAJB24337) (HAJB); Yananiguez, 16 Apr 1981 (fl, fr), Bisse *et al.* s.n. (HAJB44348) (HAJB); Río Moa, Calentura del Medio, 23 Apr 1981 (fl, fr), Bisse *et al.* s.n. (HAJB44913) (HAJB).

Very closely related to and intergrading with *T. moaensis* from which it differs in the generally narrower more cuneate-based leaflets, and longer more slender petiolules (especially on the basal leaflets). While the mostly 5–7-foliolate leaves with narrow leaflets and long slender petiolules give *T. elegans* a rather different aspect from typical *T. moaensis*, it may prove no more than a rheophytic variant, perhaps not worthy of specific rank.

The plant from north of Baracoas described as *T. perelegans* (see rejected species) is presumably a hybrid between *T. elegans* and *T. heterophylla* (or possibly *T. moaensis*). It has the narrow leaflets of *T. elegans* but with the basal leaflet pair subsessile with an oblique base as in most forms of *T. heterophylla*. The other distinguishing characters of *T. perelegans* are all shared with *T. elegans*, which grows in the same area and has almost completely overlapping dimensions. Only the 3–4 cm long fruit of *T. perelegans* is slightly, but hardly significantly, shorter than is the 4–12 cm long fruit of other material of *T. elegans*.

36. *Tabebuia elliptica* (A. P. de Candolle) Sandwith, *Candollea* 7: 253. 1936.

Bignonia elliptica Chamisso, *Linnaea* 7: 686. 1832. Type. Brazil. Sellow s.n. (B*, lectotype, K; isotype, HBG), non *B. elliptica* Thunberg, *Pl. bras. decas* 3(26): 34. 1821 which = *Ruellia macrantha*.

Tecoma elliptica A. P. de Candolle, *Prodr.* 9: 220. 1845. Type. Based on *Bignonia elliptica* Chamisso.

Sparattosperma psammophilum Martius ex A. P. de Candolle, *Prodr.* 9: 203. 1845. Type. Brazil. Praya da Villa Nova de Almeida, *Prince Vidensis* s.n. ex herb. Martius (BR).

Tecoma atrovirens A. P. de Candolle, *Prodr.* 9: 220. 1845. Type. Brazil. Bahia, *Blanchet 1905* (holotype G-DC (as s.n.); isotypes, BM, G).

Sparattosperma ellipticum (A. P. de Candolle) Bureau & K. Schumann in *Mart. Fl. bras.* 8(2): 362. 1897.

Tabebuia atrovirens (A. P. de Candolle) Standley, *Field Mus. Publ. Bot.* 11: 176. 1936.

Shrub to medium-size tree 2–20 m tall, the twigs terete to subtetragonal, lepidote, rather thick, the cortex usually smooth and drying a slightly reddish gray with contrasting large white lenticels. *Leaves* palmately (3–)5-foliolate, the leaflets oblong-elliptic to oblong-ovate, acute to short-acuminate at apex, rounded to truncate or subcordate at base, the terminal leaflet 4–18 cm long, 2–9.5 cm wide, lateral leaflets progressively smaller, entire, coriaceous to subcoriaceous, usually densely lepidote above and below, below also usually with scattered reddish scales as well as the dense more or less overlapping whitish ones, occasionally (*Spada 87*) densely pilose with simple trichomes over whole surface below; ter-

minal petiolule 0.5–5.5 cm long, the laterals shorter, the petiole 2.5–18 cm long, densely lepidote, also minutely and inconspicuously puberulous adaxially. *Inflorescence* a rather open (occasionally contracted) panicle, usually terminal from a branch dichotomy, lepidote, sometimes also slightly minutely puberulous, drying dark, the pedicels mostly 1–3 cm long, the bracts and bracteoles small, subulate, caducous. *Flowers* with the calyx tubular-campanulate, usually irregularly bilabiate, splitting to near middle, sometimes unevenly 3–5-lobed, the lobes usually apiculate-acuminate, 15–25 mm long, 8–16 mm wide, membranaceous, densely lepidote outside, less so inside, the lobe margins more or less pilose, usually densely pilose at least at apex and less so on inside of teeth; corolla white with yellow throat, tubular-infundibuliform, 4.5–8 cm long, the tube 3.5–6 cm long and 1.5–3 cm wide at mouth of tube, the lobes 1–2 cm long, glabrous outside or with a very few lepidote glands, the lobes slightly or not at all ciliate, inside sparsely pilose with thin weak trichomes on throat ridges, densely glandular-pilose at level of stamen insertion; stamens didynamous, the thecae divaricate, 4 mm long; pistil 2.5–4 cm long, the ovary linear, 6–7 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* a linear-cylindric capsule, gradually tapering to the base and apex, 17–28 cm long, 0.5–0.6 cm wide, subtended by the persistent calyx, the valves coriaceous, finely longitudinally costate, densely lepidote, drying dark brown or blackish; *seeds* thin, bialate, 0.4–0.5 cm long, 1.8–2.4 cm wide, the wings hyaline-membranaceous, clearly demarcated from the seed body.

Distribution (Fig. 46). Endemic to the restingas of coastal Brazil from Paraíba and Pernambuco to Espírito Santo; near sea level.

Representative specimens examined. BRAZIL. BAHIA: Rodovia Camacan-Canavieira, 30 km W of Canavieira, 11 Apr 1965 (fl), *Belem & Magalhães 779* (C, F, IAN, NY, UB); Salvador, Lagoa Abaete, 24 Jan 1965 (fl), *Belem & Mendes 246* (IAN, NY, UB); Km 10, Pontal-Oliveira, Mun. Ilhéus, 10 Feb 1985 (fl), *Gentry & Zardini 50006* (CEPEC, MO); 35 km NW of Salvador, 3 km NE of Itapoá, 19 Feb 1981 (fl), *Morawetz 110-19281* (MO). ESPÍRITO SANTO: Entre Colatina & São Mateus, 4 Nov 1953 (fl), *Duarte 3889* (CH, MO, RB); Reserva Florestal de Linhares, Estr. Flamengo, 18 Dec 1979 (fl, fr), *Folli 179* (MO), 12 Mar 1972 (bd), *Sucre & Soderstrom 8643* (MO, RB). PARAÍBA: Estrada, 20 Feb 1963 (fl), *Gomes et al. 1222* (RB); estrada Campiã Grande para João Pessoa, *Torgo s.n.*

(*HB14705*) (HB). PERNAMBUCO: Estrada Aldeia, 17 Mar 1952 (fl), *Lima 52-1006* (IPA); Goiana, Km 50 estrada Recife-Goiana, 28 Dec 1965 (fl, fr), *Lima 65-4344* (IPA, MO).

Local names. Pau d'arco, pau d'arco branco.

Intermediate between *T. insignis*, which it resembles in its dense lepidote indumentum and white flowers, and *T. roseo-alba*, which also has unusually narrow lepidote fruits and shares the noteworthy feature of pilose inner margins of the calyx. Important differentiating features from *T. roseo-alba* are the larger more membranaceous calyx and the 5-foliolate (rather than 3-foliolate) leaves.

37. *Tabebuia elongata* Urban, Feddes Repert. 22: 84. 1925. Type. Cuba. GRANMA: Nagua, *Ekman 14163* (holotype, S; photocopy, MO).

Tree, presumably dichotomously branched, the branchlets terete, lepidote with minute whitish scales. *Leaves* 3–5-foliolate, the leaflets narrowly oblong to narrowly oblong-elliptic, the apex obtuse to acute, the base rounded to truncate, the terminal 9–19 cm long, 2.4–5.3 cm wide, the basals 6–14.5 cm long, 1.8–4 cm wide, coriaceous, inconspicuously lepidote above, densely whitish lepidote below, also with scattered larger scales, no simple trichomes whatsoever, the secondary veins brochidodromous, prominulous below, plane or subimpressed above, the tertiary venation rather obscure, discolorous, drying dark brown above, light gray below with darker main veins, the margin somewhat erose, the terminal petiolule 0.5–2.2 cm long, 0.2 mm wide, the basals lacking or to 0.2 cm long, the petiole 2.7–8 cm long, densely lepidote. *Inflorescence, flowers, and fruits* unknown.

Distribution (Fig. 47). Southeastern Cuba. A local endemic of the northern foothills of the western Sierra Maestra; known only from two collections from Nagua on the Río Yara.

Specimens examined. CUBA. GRANMA: Nagua, Río Yara, 5 Jul 1922 (st), *Ekman 14163* (S); Mucará hill, Nagua, Jul 1922 (st), *León 11036* (NY).

Although known only from two sterile collections, this species seems to be distinct. It is quite unlike any collection of *T. heterophylla* in the large narrowly oblong, erose-margined leaflets with strongly discolorous lower surfaces. The elongate sessile basal leaflets are another distinguishing feature as are the unusually thick peti-

olules. While its discolorous lower surface recalls *T. bibracteolata*, which can have 3–5-foliolate leaves with sessile basal leaflets, the complete lack of simple trichomes argues strongly against such a relationship.

38. *Tabebuia fluviatilis* (Aublet) A. P. de Candolle, Prodr. 9: 215. 1845.

Bignonia fluviatilis Aublet, Hist. pl. Guiane 2: 655. 1775. pro parte. Type. French Guiana. *Aublet 200* (holotype, P-AD 12281; isotype, s.n., BM).

Bignonia aquatilis E. Meyer, Nova Acta Phys.-Med. Akad. Caes. Leop.-Carol. Nat. Cur. 12: 780. 1825. Type. Surinam. *Hostmann s.n.* (B*, lectotype, GOET [single leaf; mounted on same sheet as *Kegel s.n.* of 1857]; isotype, FI).

Bignonia digitata E. Meyer, Nova Acta Phys.-Med. Akad. Caes. Leop. Carol. Nat. Cur. 12: 782. 1825. Type. Guyana. Sophienburg, *Rodschied s.n.* (GOET?, not seen), not *Tecoma digitata* HBK.

Couralia fluviatilis (Aublet) Splitgerber, Tijdschr. Natuurl. Gesch. Physiol. 9: 15. 1842.

Zeyheria fluviatilis (Aublet) Miquel, Flora 25: 428. 1842. *Zeyheria digitata* (E. Meyer) Miquel, Flora 25: 431. 1842.

Tecoma aquatilis (E. Meyer) A. P. de Candolle, Prodr. 9: 225. 1845.

Tecoma meyeriana A. P. de Candolle, Prodr. 9: 221. 1845, nom. nov. for *Bignonia digitata* E. Meyer.

Tecoma fluviatilis (Aublet) Miquel, Stirp. surinam. select. 121. 1850.

Tabebuia aquatilis (E. Meyer) Sprague & Sandwith, Kew Bull. 1932: 21. 1932.

Shrubs or small *trees* to 8 m tall, the branchlets subterete to subtetragonal, lepidote when young. *Leaves* palmately 5-foliolate, the leaflets narrowly elliptic, acuminate, the base cuneate to rounded, the terminal leaflet to 26 cm long and 9.5 cm wide, the lateral leaflets smaller, entire, rigid-chartaceous, conspicuously lepidote below, inconspicuously and minutely lepidote or glabrous above, drying dark, typically with a reddish tint, the main veins above usually slightly lighter than surface; terminal petiolule to 8 cm long, the laterals shorter, the petiole to 16 cm long, lepidote or glabrous. *Inflorescence* a cyme or dense panicle, few-flowered, terminal on a reduced branch from the apex of a terminal dichotomy, the pedicels densely and irregularly lepidote, the scales rather loose and seen from the side resembling simple trichomes, bracts and bracteoles linear, 2–5 mm long. Calyx irregularly bilabiate, campanulate, 15–19 mm long, 7–14 mm wide, densely lepidote with reddish scales, sometimes also with darker glandular fields; corolla white, tu-

bular-infundibuliform, 7–9 cm long, 2.2–2.7 cm wide at mouth of tube, the tube 6.5–7 cm long, the lobes 1.5–2 cm long, glabrous outside and inside except at level of stamen insertion; stamens didynamous, the thecae divaricate, 3–4 mm long; pistil 3.8–4 cm long, the ovary oblong, 3 mm long, 1 mm wide, densely lepidote, the ovules irregularly 2–3-seriate in each locule; disk pulviniform, 1 mm long, 3 mm wide. *Fruit* an oblong-ovoid capsule, stipitate, acuminate, to 19 cm long (including the 4–5 cm long stipe and the 1 cm long acumen), 4 cm wide, conspicuously lepidote; *seeds* without wings, sometimes suborbicular, 1.7–2.2 cm long, 2.2–3 cm wide, the hilum round, 2–4 mm in diam.

Distribution (Fig. 46). Mostly along the edges of coastal rivers at the contact zone between fresh and salty water, from the mouth of the Orinoco in Delta Amacuro, Venezuela to Maranhão, Brazil; near sea level.

Representative specimens examined. VENEZUELA. DELTA AMACURO: Río Amacuro, Sierra Imataca, 9 Nov 1960 (fl, fr), *Steyermark 87423* (US, VEN); Dept. Antonio Díaz, Caño Araguabisi, 15 Oct 1977 (fl, fr), *Steyermark et al. 114641* (MO). MONAGAS: Puerto Caripito, Delta del Orinoco, Jun 1943 (fl), *Cardona 592* (VEN); Sucre border, Río San Juan, Distr. Maturin, Jan 1976 (fl), *Marcano-Berti 70-1-76* (MO).

GUYANA. Upper Rupununi River, near Dadanawa, 3 Jun 1922 (fr), *de la Cruz 1475* (C, MO); Essequibo River near Bartica, Oct 1899 (fl), *Jenman 7637* (NY); Essequibo, Demerara Region, near Wales, 4 Dec 1986 (fl), *Pipoly & Ameer 9089* (MO).

SURINAM. Upper Saramacca River, 13 Jan 1922 (st), *B. W. 5544* (NY); Swamp S of Nickerie River, near Post Utrecht, *Lanjouw & Lindeman 3421* (NY, U); Marawyne, Albina, 1851 (fl), *Wulfschlaegel 339* (BR).

FRENCH GUIANA. Route de Saint Laurent à Paul Isnard, Citron au PK 1181, 7 Sep 1983 (fl), *Jacquemin 2488* (CAY, MO); Rivière des Cascades, montagne des Chevaux, Jan 1967 (fl), *Oldeman B-884* (CAY, MO).

BRAZIL. AMAPÁ: Beira do Rio Oapoque, 6 Oct 1949 (fl), *Black 49-8430* (IAN); Rio Villa Nova, entre Magagão e Sumauma, 18 Aug 1951 (fr), *Frões & Black 27467* (IAN). AMAZONAS: Margem do Parana do Autaz-Mirim, 9 May 1966 (fl), *Mello 5* (INPA, MO). MARANHÃO: Maraçassume River Region, 12 Jul 1932 (fl), *Frões 1770* (C, F, G, LP, MICH, MO, NY, S, WIS). PARÁ: Beira do Rio Irituia, S. Miguel do Guama, 29 Oct 1948 (fl), *Black & Foster 48-3356* (IAN); IPEAN grounds, Belém, Dec 1974 (bd), *Gentry & Pinheiro 13109* (MO); Belém, beira do Rio Guama, 11 Jan 1951 (fl), *Pires 3109* (IAN, K).

Local names. Venezuela: watasabu; Surinam: courali; Guyana: hackooya, whoua-whoua.

This species is unusual in the corky water-

dispersed seeds with reduced wings, in the white flowers in few-flowered inflorescences, and in the corolla completely glabrous except at the stamen insertion. In vegetative condition it can be recognized by the characteristic slightly dull reddish tinge of the dry leaves.

A careful reconsideration of *Bignonia fluviatilis* leads me to the conclusion that this is the correct basionym for this species. Although Sprague & Sandwith (1932) rejected Aublet's *Bignonia fluviatilis* as of uncertain application, both Aublet's drawing and the type material on which it was based are clearly the species which in recent years has been widely known as *Tabebuia aquatilis*. Even the characteristic ecology is faithfully described. The only discordant note in Aublet's plate and description is the fruit, which does not look much like that of *T. aquatilis* nor of any other Bignoniaceae known to me. Indeed the illustrated fruit cannot be a reasonable facsimile of that of any bignon since the seeds are shown as being borne from the center of the septum rather than along its margins as well as being twisted 90 degrees from the actual orientation of all Bignoniaceae seeds. The rendition of the flowering branch is also far from perfect with the corolla shown as 4-lobed and the basal petiolules of the leaves as long as the terminal ones. Nevertheless, there can be no doubt whatsoever that, except for the fruit, the plant described and illustrated by Aublet is what Sprague & Sandwith called *T. aquatilis*. Perhaps the fruit is a schematic rendition of the fruit of this species as well, since it comes as close to that species as to any other. Moreover, there is a fruit of *T. fluviatilis* in the carpological collection at CAY that is a reasonable approximation to Aublet's drawing, allowing for a certain amount of artistic license. Even if the *Bignonia fluviatilis* fruit could be established to belong to some other taxon, I think that *B. fluviatilis* would have to be regarded as correctly applicable to this species which should once again be known as *T. fluviatilis*. Rejection of *B. fluviatilis* as a *nomen confusum* is especially unjustified since there is Aublet type material of this species at both BM and P. Accordingly I here resurrect *Tabebuia fluviatilis* as the correct name for this taxon.

39. *Tabebuia glaucescens* Urban, Feddes Reptert. 22: 85. 1925. Type. Cuba. Las Villas: Trinidad, Loma de Vigia, 29 Mar 1924 (fl, fr),

Ekman 18906 (lectotype, S; isotypes, NY, HAC (as *Ekman 18902*)).

Shrub, dichotomously branched, the branchlets terete, lepidote with both dark and light scales. *Leaves* 1–3-foliolate, the leaflets narrowly obovate to elliptic-oblong, more or less distinctly emarginate and with a minute apicule, cuneate to rounded at base, the terminal (or unifoliolate) 2.5–4.5 cm long, 0.8–2 cm wide, the basals 1–3 cm long, 0.5–1.3 cm wide, drying grayish olive above and below, rather thin coriaceous, densely whitish lepidote above and below, the secondary veins subplane above, conspicuously raised below, the margin distinctly erose; terminal petiolules to 0.3–0.5 mm long, the basal leaflets asymmetrically subsessile, the petioles 0.5–1 cm long. *Inflorescence* 2–5-flowered, openly dichotomous, lepidote with blackish scales. *Flowers* with calyx shallowly 2–3-labiate, 7–8 mm long, 4–5 mm wide, drying blackish, dark-lepidote; corolla pink, tubular-campanulate above the narrow base of tube, 3.5–4 cm long, 0.8–1 cm wide at mouth of tube, the tube ca. 3 cm long, the lobes ca. 0.8 cm long, scurfy puberulous in floor of tube, villous at stamen insertion, otherwise glabrous. Anthers held in upper half of tube, the thecae divaricate, 2.5 mm long; ovary linear, 4 mm long, 1 mm wide, densely blackish lepidote; disk annular pulvinate, 1 mm long, 2 mm wide. *Fruit* linear, 10–11 cm long, 5 mm wide, rather densely blackish lepidote, the calyx persistent; *seeds* thin, bialate, 3–4 mm long, 1.3–1.5 cm wide, the hyaline membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 47). Known only from the type from Trinidad, Sancti Spiritus (Las Villas) Province, Cuba.

In the absence of additional material it is difficult to evaluate *T. glaucescens*. It is conceivable that this could represent an extreme form of *T. lepidota* with thin-coriaceous leaflets with erose margins and mostly 3–4 mm long largely unifoliolate leaves, terminal petiolules on the 3-foliolate leaves and several-flowered inflorescences. It could also represent hybridization between *T. lepidota* and *T. sawallei* which has similar inflorescences and leaflet margins and is common in the area. The fruit is among the narrowest and the seeds the smallest of any *Tabebuia*; it is possible that this small size could be associated with hybrid infertility, since the seeds rather resemble

the small sterile seeds that often occur mixed with fertile seeds in the fruits of many species of *Tabebuia*.

40. *Tabebuia guayacan* (Seemann) Hemsley, Biol. centr.-amer., Bot. 2: 495. 1882. Figs. 49, 50.

Tecoma guayacan Seemann, Bot. voy. Herald 180. 1854. Type. Panama. Cruces, *Seemann H398* (holotype, BM; isotype, K).

Large tree to 50 m tall and 2 m dbh, the bark with vertical ridges, somewhat scaly between ridges, the wood extremely hard, the heartwood dark brownish olive, the sapwood contrastingly lighter; branchlets subtetragonal, glabrous or with a few stellate trichomes when young. *Leaves* palmately 5–7-foliolate, the leaflets lanceolate to ovate, acuminate, rounded to obtuse at base, the terminal 9–30 cm long and 3.7–15.5 cm wide, the laterals progressively smaller, membranaceous to chartaceous, minutely lepidote at least below, stellate-pubescent with multicellular usually 3-branched trichomes in axils of lateral nerves below; terminal petiolule 2.9–7.4 cm long, the lateral petiolules shorter, the petiole 7–23 cm long, glabrous. *Inflorescence* a terminal panicle, the flowers in groups of 2–3, the branches slightly reddish-stellate, the bracts reduced, caducous. *Flowers* with the calyx campanulate, irregularly 2–5-lobed, 7–15 mm long, 4–12 mm wide, sparsely stellate-pubescent with short thick trichomes; corolla yellow with reddish pencilling in throat, tubular-infundibuliform, 6–11 cm long, 1.2–2.2 cm wide at mouth of tube, the tube 3.5–5.7 cm long, the lobes 2.2–3.8 cm long, glabrous outside, pilose inside with long mostly branching 3–4-celled trichomes in the sinuses between lobes and from the four lower sinuses to the level of stamen insertion, also glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 2–3 mm long; pistil 2.4–3.3 cm long, the ovary linear, 3–5 mm long, 1.5–2.5 mm wide, glabrous to somewhat lepidote, sometimes slightly verrucose toward apex but without elevated glands, the ovules 8–10 seriate in each locule; disk cupular, 0.5–1 mm long, 3–4 mm wide. *Fruit* a linear-cylindric capsule, 29–61 cm long, 1–2.9 cm wide, essentially glabrous or inconspicuously lepidote or with very sparse thick-stellate pubescence, the surface usually irregularly and rather strongly mucronulate-

ridged; seeds thin, bialate, 0.9–1.1 cm long, 3.5–4 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 46). Southern Mexico to northwestern Venezuela, irregularly south along base of Andes (or disjunct?) to Amazonian Peru. Mostly in well-drained lowland tropical moist forest below 300 m alt.

Representative specimens examined. MEXICO. CHIAPAS: Mt. Ovando near Escuintla, 4 Feb 1936 (fr), *Matuda 6130 p.p.* (F, LL, MO, NY); Estación Lacandón, Palenque, 5 Sep 1951 (st), *Enriquez 7306* (MEXU). **OAXACA:** Ubeero, May 1937 (fl), *Ll. Williams 9232* (F, MO, US). **TABASCO:** San Juan Bautista, 3 May 1889 (fl), *Rovirosa 481* (NY, US). **VERACRUZ:** Río Soloxuchil entre Hnos. Cedillo y la Escuadra, 4 Apr 1974 (fl), *Vazquez et al. V375* (MO, XAL); Fortuno, Coatzacoalcos River, Mar 1937 (st), *Ll. Williams 8760* (F, US).

GUATEMALA. ALTA VERAPAZ: Cubilquitz, Mar 1901 (fl), *von Tuerckheim 7932* (M, NY, US). **IZABAL:** Quirigua, 15 May 1922 (st), *Standley 23951* (US).

BELIZE. CAYO: Vaca, 30 Apr 1938 (fl), *Gentry 2532pp* (F, LL, MEXU, MICH, TEX). **TOLEDO:** 6 mi W of Punto Gordo (st), *Gentry 8155* (F, MO); Jacinto Creek, 28 May 1933 (fl), *Schipp 1173* (F, G, MICH, MO, NY).

HONDURAS. ATLANTIDA: Lancetilla, 26 Mar 1947 (st), *Yale 82* (F). **GRACIAS A DIOS:** Camp Tiro, 2 mi NW of Bulebar, 23 Mar 1981 (fl), *Saunders 1096* (MO). **YORO:** Near Progresso, 24 Jan 1928 (st), *Standley 54976* (F, US).

NICARAGUA. CHONTALES: 4 km NW de Santo Domingo, 12 May 1984, *Grijalva 3797* (MO). **RÍO SAN JUAN:** 1 km N del Río Sta. Cruz, 27 Feb 1984, *Moreno 23415* (MO). **ZELAYA:** Braggman's Bluff, 2 Apr 1928 (fl), *Englesing 181* (F, K, NY); El Zapote, 40 km NE de Nueva Guinea, 25 Mar 1984 (fl), *Sandino 4913* (MO).

COSTA RICA. ALAJUELA: Upala, Canalete, Oct 1966 (st), *Jimenez S. 78* (CR, USJ). **HEREDIA:** Puerto Viejo, 19 Mar 1965 (fl), *Aubreville 16* (K, P); La Virgen, 20 Mar 1965 (fl), *Richards 6244* (K). **LIMÓN:** Above La Florida, 7 May 1943 (st), *Dayton & Barbour 3008* (MO). **PUNTARENAS:** Sin. loc., 19 Mar 1978 (fr), *Ocampo 1890* (CR). **SAN JOSÉ:** Sta. Rosa de Puriscal, 4 Feb 1973 (st), *Poveda 474* (CR).

PANAMA. CANAL ZONE: Near Gamboa, 16 Mar 1938 (fl), *Allen 728* (A, GH, US); Pipeline road near Gamboa airfield, 12 Oct 1971 (fl), *Gentry 2045* (MO); around Gamboa, 9 Feb 1911 (fl), *Pittier 2694* (BM, GH, NY, US). **CHIRIQUÍ:** Progreso, Jul 1927 (st), *Cooper & Slater 311* (F, NY, US). **COLÓN:** Río Boquerón, above Peluca Hydrographic Station, 22 Feb 1935 (fl), *Hunter & Allen 656* (G, GH, MO, NY, US). **DARIÉN:** 1 mi S of La Palma, 21 Feb 1972 (st), *Gentry 4287* (MO). **PANAMÁ:** Río Cristal, Playa Coronado, S of San Carlos, 12 Apr 1971 (fl), *Croat 14256* (MO).

COLOMBIA. ANTIOQUIA: Bolívar border, 28 Feb 1967 (st), *de Bruijn 1536* (COL, L, M, NY). **CHOCÓ:** Río Tigre, Serranía del Darién W of Unguia, 17 Jul

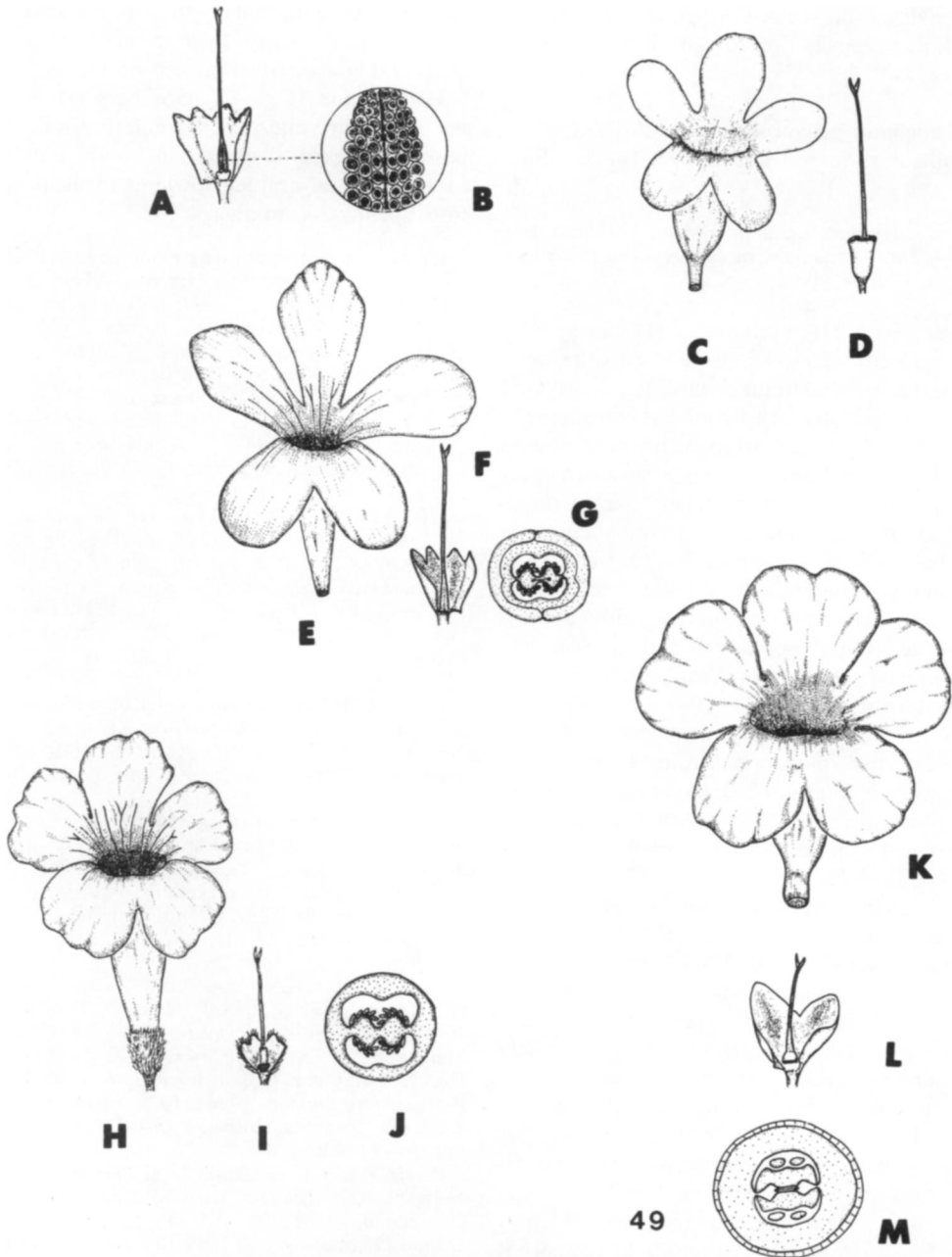


FIG. 49. *Tabebuia* flowers. A, B, *T. serratifolia*. A, calyx and pistil, $\times 1$; B, ovary surface, $\times 7$. C, D, *T. impetiginosa*. C, corolla, $\times 0.5$; D, calyx and pistil, $\times 1$. E-G, *T. guayacan*; E, corolla, $\times 0.5$; F, calyx and pistil, $\times 0.9$; G, ovary cross section, $\times 6$. H-J, *T. ochracea* ssp. *neochrysantha*. H, flower, $\times 0.5$; I, calyx and pistil, $\times 0.5$; J, ovary cross section, $\times 7$. K-M, *T. rosea*. K, corolla, $\times 0.5$; L, calyx and pistil, $\times 0.5$; M, ovary cross section, $\times 17$.

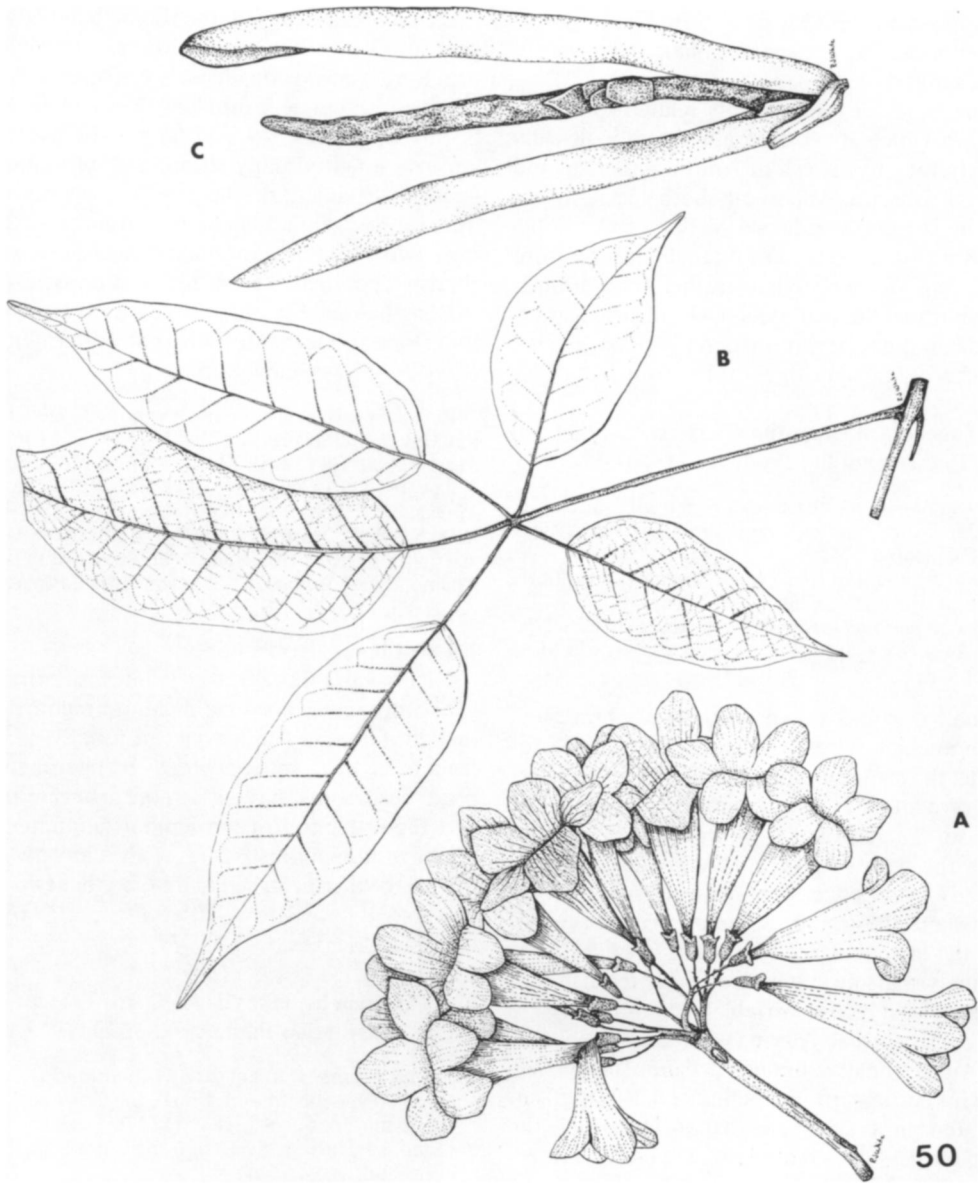


FIG. 50. *Tabebuia guayacan* and *T. striata*. A, B, *T. guayacan*. A, flowering shoot, $\times 0.5$; B, leaf, $\times 0.5$. C, *T. striata*, fruit, $\times 0.5$. (From *Flora of Panama*; A, Croat 5388; B, Gentry 4287; C, Gentry 1404.)

1975 (st), Gentry & Aguirre 15240 (COL, MO). CÓRDOBA: N of Tierralta, 30 Jul 1988 (fr), Gentry & Cuadros 63958 (MO). SANTANDER: 2 km S de Llanitas, 19 km N de Barrancabermeja, Jul 1975 (st), Gentry & Forero 15381 (COL, MO).

VENEZUELA. BOLÍVAR: La Isabel a Río Grande, El Palmar, Dto. Piar, Aug 1961 (bd), Conejos 60 (VEN). MÉRIDA: Between Aguas Calientes & Playa Grande, 30

Jan 1974 (fl), Gentry et al. 11043 (MO, VEN). TACHIRA: Santo Domingo del Tachira, 1 Feb 1982 (fl), Chacon 158 (MO). ZULIA: Machiques-Mision de Tocuco, Jul 1974 (fl), Berry & Wood 181 (MO).

PERU. MADRE DE DIOS: Cocha Cashu uplands, Manu Park, 28 Aug 1986 (fl), Nuñez 5963 (MO). UCAYALI: Pucallpa, Dtto. Galería, 14 Oct 1967 (fr), Caseres 3-JCB (MO).

Common names. Mexico: primavera, guayaacán; Venezuela: canaguato blanco, guayacan. Peru: tahuari.

This species is very closely related to *T. serratifolia* which it replaces almost allopatrically in extreme northwestern South America and Central America. Apparently both species occur together in the Magdalena Valley of Colombia and Amazonian Peru. The main differences from *T. serratifolia* are stellate (rather than simple) trichomes in the leaf axils, lack of raised warty glands on the ovary, more densely pilose throat, and sharply raised ridges on the fruit.

41. *Tabebuia haemantha* (Bertero ex Sprengel) A. P. de Candolle, Prodr. 9: 214. 1845.

Bignonia haemantha Bertero ex Sprengel, Syst. 2: 832. 1825. Type. Puerto Rico. Bertero s.n. (lectotype, G-DC; isotype, MO).

Tecoma haemantha (Bertero ex Sprengel) Grisebach, Cat. pl. Cub. 194. 1866.

Spathodea portoricensis Bello, Ann. Soc. Esp. Hist. Nat. 10: 293. 1881. Type. Puerto Rico. Cerro de la Mesa (not seen).

Small tree 2–6 m, dichotomously branched, the branchlets terete, lepidote. Leaves 3–5-foliolate, the leaflets oblong-elliptic, rounded to retuse or acutish at apex, rounded to subcordate at base, the terminal 4–17 cm long, 2.2–7 cm wide, the basals 1.5–8 cm long, 1–5 cm wide, strongly coriaceous, the venation macroscopically plane above, the secondary veins raised below, the lower surface somewhat irregular, very minutely sparsely and glabrescently reddish-lepidote, at least below, variable in color from olive to brownish, usually drying with a somewhat reddish tinge, mostly somewhat lighter below, the margins entire; terminal petiolule 0.5–2.5(–5) cm long, the basals subsessile to 0.5(–1) cm long, the petiolule 0.5–2.5(–5) cm long, the basals subsessile to 0.5(–1) cm long, the petiole 1–7 cm long, sparsely minutely reddish lepidote. Inflorescence a several-many-flowered terminal panicle, often on a leafless branch, blackish-lepidote. Flowers with the calyx narrowly campanulate, irregularly 2(–3)-lobed, 8–16 mm long, 4–6 mm wide, blackish-lepidote, corolla red, salverform-tubular, 4–4.5 cm long, 0.6–0.9 cm wide, the tube 3.5–4 cm long, the lobes 0.5–1 cm long, glabrous outside, the lobes slightly or not at all ciliate, very inconspicuously scurfy-puberulous in throat, long villous at level of stamen insertion; stamens

exserted or subexserted, the thecae barely divergent, ca. 3 mm long; ovary linear, tetragonal, 3 mm long, 1 mm wide, densely lepidote; disk patelliform-pulvinate, 1 mm long, 2 mm wide. Fruit linear-cylindric, 4.5–9.2 cm long, 6–12 mm wide, strongly longitudinally striate-costate, minutely lepidote, drying dark, the calyx persistent or caducous; seeds thin, bialate, 6–7 mm long, 20–29 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 47). Endemic to the moist limestone and serpentine areas of western Puerto Rico: 50–850 m elevation.

Representative specimens examined. PUERTO RICO. Coamo Springs, 17 Mar 1913 (fl), *E. Britton & Marble 2323* (NY, US); Maricao to Monte Alegreillo, 3 Apr 1913 (fl), *Britton et al. 2538* (NY, US); near Mayaguez, 8 Feb 1900 (fl), *Heller 4550* (A, GH, L, MO, NY, US); Maricao, 18 millas al sureste de Mayaguez, 20 Feb 1987 (fl), *Mejia et al. 2002* (MO); prope Coamo, monte Santana, 28 Dec 1885 (fl), *Sintenis 3221* (G, HBG, MO, NY).

Local name. Roble bobo.

Highly variable vegetatively but with extremely homogeneous, presumably hummingbird-pollinated, flowers. The leaves can usually be told from those of *T. heterophylla* by being somewhat more coriaceous, having a more truncate base, and the reduction of the lepidote indument to sparse minute reddish scales. *Tabebuia haemantha* can be distinguished from the other two red-flowered Puerto Rican *Tabebuia* species by its compound leaves.

42. *Tabebuia heptaphylla* (Vellozo) Toledo, Arq. Bot. Estado São Paulo, n.s., 3: 33. 1952.

Bignonia heptaphylla Vellozo, Fl. flumin. 251. 1829 (1825). Type illustration. Brazil. In silvis maritimis, Ic. Fl. flumin. 6: t. 48. 1831 (1827).

Tecoma ipe Martius, Syst. mat. med. bras. 55. 1843, nom. nud.

Tecoma eximia Miquel, Linnaea 22: 803. 1849. Lectotype: Brazil. Bahia, *Blanchet 3963*, leaves only (BR, C, G, K, MO, P, U).

Tecoma curialis Saldanha da Gama, Config. descr. orgãos fund. de Janeiro 1: 51. 1865. Type: Brazil. Rio de Janeiro: Mun. S. Fidelis and Campos (not seen).

Tecoma ipe Martius ex K. Schumann in Engler & Prantl, Pflanzenfam. 4(3b): 238. 1894. Type. Brazil. Rio Grande do Sul, Taquari, *Sellow 1239* (B*) (lectotype, Rio Grande do Sul, *Martius s.n.* (BR)).

Tecoma ipe var. *desinens* Sprague, Bull. Herb. Boissier, ser. 2, 5: 86. 1905. Type. Not indicated.

Tecoma ipe var. *desinens* f. *parviflora* Sprague, Bull. Herb. Boissier, ser. 2, 5: 86. 1905. Type. Paraguay.

- Ypacarai, Hassler 3200d (holotype, K; isotypes, G, S).
- Tecoma ipe* var. *desinens* f. *grandiflora* Sprague, Bull. Herb. Boissier, ser. 2, 5: 86. 1905. Type. Paraguay. San Bernardino, Hassler 3200e (K).
- Tabebuia ipe* (Martius ex K. Schumann) Standley, Trop. Woods. 36: 20. 1933.
- Tabebuia eximia* (Miquel) Sandwith, Lloydia 2: 213. 1939 (leaves only).
- Tabebuia avellanadae* var. *paulensis* Toledo, Arq. Bot. Estado São Paulo, n.s., 3: 1952. Type. Brazil. São Paulo: Alto da Serra, Hoehne 3445 (SP).
- Tabebuia impetiginosa* var. *lepidota* (Bureau) Toledo, Arq. Bot. Estado São Paulo, n.s., 3: 35. 1952.
- Handroanthus eximia* (Miquel) Mattos, Loefgrenia 50: 2. 1970.
- Handroanthus heptaphyllus* ("Martius") Mattos, Loefgrenia 50: 2. 1970.
- Handroanthus impetiginosus* var. *lepidotus* (Bureau) Mattos, Loefgrenia 50: 2. 1970.

Tree (2–)4–30 m tall, to 65 cm dbh, the bark shallowly to deeply longitudinally furrowed, the twigs subterete, glabrescent, the apices usually mealy pubescent with thick-stellate trichomes. *Leaves* palmately 5–7-foliolate, the leaflets broadly lanceolate to ovate or oblong-elliptic, more or less acuminate, cuneate to rounded or truncate at base, the terminal leaflet 3–16 cm long, 1.7–6 cm wide, the laterals progressively smaller, more or less evenly serrate even when mature, membranaceous to chartaceous, somewhat lepidote above and below, usually pubescent with simple trichomes in the axils of the lateral nerves below, drying black or blackish or dark greenish; terminal petiolule 2–5 cm long, the laterals progressively smaller, the petiole 4–11 cm long, glabrous or glabrescent, when young usually with a few lepidote scales and thick-stellate trichomes at least at apex above. *Inflorescence* a terminal panicle, usually more or less congested, the branches usually whitish or tannish from the mealy pubescence of thick-stellate trichomes, sometimes completely glabrescent and blackish. *Flowers* with the calyx cupular, truncate or slightly and bluntly 5-lobed, 4–11 mm long, 3–8 mm wide, mealy pubescent with thick-stellate trichomes or glabrescent except for lepidote scales, drying tannish when pubescent, black when glabrescent; corolla magenta, the throat yellow at anthesis, fading to purplish, tubular-campanulate, 4–6.5 cm long, 1–2.5 cm wide at mouth of tube, the tube 3–5.5 cm long, the lobes 0.8–1.5 cm long, puberulous with more or less irregularly branched multicellular trichomes out-

side, mostly glabrous inside, only slightly glandular-pubescent at stamen insertion; stamensodynamous, the thecae divaricate, 3 mm long; ovary oblong, 3 mm long, 1.2 mm wide, more or less lepidote; disk cupuliform, 0.5 mm long, 2.5 mm wide. *Fruit* an elongate-cylindrical capsule, attenuate at both ends, strongly striate-ridged, 9–47 cm long, 0.7–1.7 cm wide, the valves coriaceous, drying black or blackish, glabrous except for a few scattered inconspicuous lepidote scales; *seeds* thin, bialate, 0.5–0.9 cm long, 1.8–3.2 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from seed body.

Distribution (Fig. 51). The mata atlantica formation of coastal Brazil from Bahia to Rio Grande do Sul; also the Paraná drainage of Paraguay and northeastern Argentina and sparsely west to Bolivia in moist areas of the Chaco; below 1000 m elevation.

Representative specimens examined. **BRAZIL.** **BAHIA:** Mun. Ilhéus, area do CEPEC, Rodovia Ilhéus/Itabuna, 4 Feb 1986 (fl), *Hage & dos Santos 1887* (CEPEC, MO). **ESPÍRITO SANTO:** Estrada da Colonia 9, 64 km de Colatina, 8 May 1934 (st), *Kuhlmann 337 p.p.* (RB); Res. Fl. Linhares, correjo Rancho Alto, 29 Aug 1979 (fl), *I. Silva 66* (MO). **MATO GROSSO:** Faz. Miranda, perto do Rio Aquidauana, Pantanal, 18 Sep 1980 (fr), *Pires & Furtado 17168* (MO); Cuiaba-Coxipo, km 11, 8 Aug 1969 (fl), *Saddi 381* (CH). **MINAS GERAIS:** Parque das Aguas, 8 Jul 1968, *Monteiro 64* (GUA). **PARANÁ:** Rod. BR277, 5 km de Faz do Iguacu, 19 Jun 1967 (fl), *Hatschbach & Haas 16588* (F, L, MICH, MO, NY); Porto Guaira, Guaira, 22 Jun 1967 (fl), *Hatschbach & Haas 16632* (L, MBM, NY). **RIO GRANDE DO SUL:** Villa Manresa, 27 Sep 1950 (fl), *Rambo 48815* (MBM, S, US). **RIO DE JANEIRO:** Encosta do Corcovado, Jun 1912 (fl, fr), *Dionisio s.n.* (RB11222) (MO, RB). **SANTA CATARINA:** Ibirama, Beira do Rio, 26 Jan 1957 (fl), *Klein 2178* (G, WIS); Rio do Sul, Alto Matador, 30 Jan 1963 (fl), *Reitz 6381* (B, G, L, M, NY, UB). **SÃO PAULO:** Paranapincaba, Estação Biologica, 24 May 1963, *Souza 65861* (SP).

BOLIVIA. **BENI:** Ballivian, Espiritu, Rio Yacuma, 1 Oct 1979 (fl, fr), *Beck 2596* (MO); Rio Chapare-Mamore, Aug 1926 (fl), *Werdermann 2240* (MO, S).

PARAGUAY. **ALTO PARAGUAY:** San Pedro, Primavera, 11 Aug 1957, *Woolston 852* (S). **CANENDIYU:** Salto del Guaira versus Colonia Guadelupe, 9 Jan 1979 (st), *Bernardi 19412* (MO). **CENTRAL:** Lacus Ypacarai, Sep 1913 (fr), *Hassler 11864A* (C, G, MICH, MO, S). **CONCEPCIÓN:** Prope Concepción, Oct 1901 (fr), *Hassler 7691* (G, MO, S). **GUAIRA:** Villarica, 5 May 1928 (fl), *Jorgensen 3451* (C, F, LP, MO, US). **PARAGUARI:** Cordillera de Altos, 21 Sep 1902 (fl), *Fiebrig 123* (F, G, HBG, L); La Rosada, entrance to Parque Nac. Ybycui, 1 Oct 1985 (fr), *Gentry et al. 51909* (MO, PY). **PREIDENTE HAYES:** Trans-Chaco Highway, km 152–156, Río Verde, 2 Oct 1985 (fl, fr), *Gentry et al. 51995* (MO).

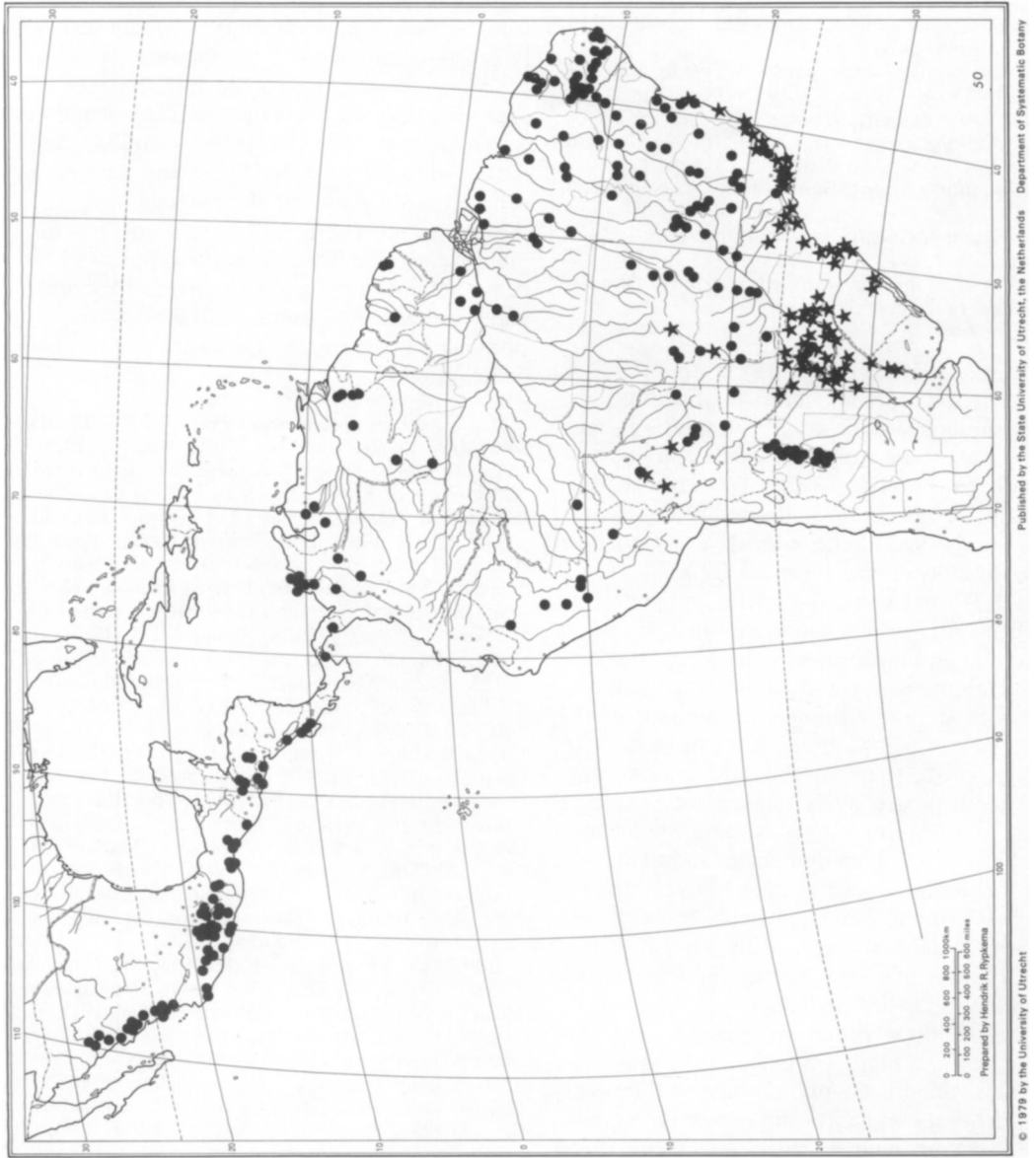


FIG. 51. Distribution of continental *Tabebuia*. ● = *T. impetiginosa*; ★ = *T. heptaphylla*.

ARGENTINA. CHACO: Los Telares, Sep 1917 (fl), *Jorgensen* 1962 (MO); Dep. 1 de Mayo, Colonia Benítez, 25 Aug 1937 (fl), *Schulz* 452 (CTES). **CORRIENTES:** Ruta 12 S of Corrientes, 29 Sep 1987 (fl), *Gentry et al.* 59444 (CTES, MO); Riachuelo, 10 km S de Corrientes, 3 Sep 1972 (fl), *Schinini & Pueyo* 5163 (LP, MBM, MO, WIS). **ENTRE RÍOS:** Concordia, Salto Grande, 11 Oct 1950 (fl), *J. Hunziker* 4428 (CTES, LP). **FORMOSA:** Estac. La Emilia, N de Mojón de Fierro, 24 Sep 1970 (fl), *Schulz* 17571 (CTES). **MISIONES:** Santiago, Est. La Soledad, 23 Sep 1962 (fl), *Pedersen* 6526 (BR, CTES, L, LP, S). **SANTA FE:** Pto. Ocampo, *Ragonese s.n.* (CTES).

Local names. Brazil: ipe roxo, ipe cabroe, pau d'arco roxo; Paraguay: lapacho, lapacho negro, taiti y zaiyú; Argentina: lapacho negro, ipe, lapacho, lapacho morado, lapacho crespo.

Uses. Frequently planted as an ornamental. The bark, rich in lapachol and related compounds, is reputed to cure cancer. The hard heavy wood is the most important timber of eastern Paraguay.

This species is extremely closely related to widespread *T. impetiginosa*. The two have been much confused and material of each has been treated as a variety of the other under a variety of names as attested by the excessive list of varietal synonyms for both species. Although none of the differentiating characters is very strong, the two are largely allopatric and seem to represent two different taxa when cultivated together (see Fabris, 1965). There is an apparent area of overlap between the two species around the fringes of the chaco region, but here they tend to be ecologically separated, at least in Bolivia, with *T. heptaphylla* confined to wet swampy areas while *T. impetiginosa* occurs in well-drained deciduous forest (S. Beck, pers. comm.). In the area of overlap in central Paraguay *T. heptaphylla* is usually a larger tree with more deeply furrowed bark, has thinner lighter-colored mostly smaller regularly serrate leaflets, thinner-valved smaller fruits (mostly 20–25 cm by 1.5–2.5 cm vs. 25–35 cm by 2–3 cm) and blooms later (late June–October vs. April–early August) (W. Hahn, pers. comm.); *T. heptaphylla* prefers moist lowland forest while *T. impetiginosa* mostly occurs in drier rocky areas.

43. *Tabebuia heterophylla* (A. P. de Candolle) Britton, Ann. Missouri Bot. Gard. 2: 48. 1915.

Bignonia leucoxylo Linnaeus, Sp. pl. ed. 1, 624. 1753. Type. Jamaica. Ex Hort. Cliff. (LINN 776.4), non

Tabebuia leucoxylo DC., Prodr. 9: 217. 1845, based on *Bignonia leucoxylla* Velloso; non *Bignonia leucoxylo* Linnaeus, Sp. pl., ed. 2, 870. 1763.

Bignonia pentaphylla Linnaeus, Sp. pl., ed. 2, 870. 1763, nom. nov. for *B. leucoxylo* L.

Bignonia leucoxylo Linnaeus, Sp. pl., ed. 2, 870. 1763.

Type illustration. Barbados. Plukenet, Phytographia, t. 200, fig. 4. 1692. Non *B. leucoxylo* Linnaeus, Sp. pl., ed. 1, 624. 1753.

Raputia heterophylla A. P. de Candolle, Prodr. 1: 734. 1824. Type. Puerto Rico. *Bertero s.n.* (G-DC).

Leucoxylo riparia Rafinesque, Sylva tellur. 77. 1838. Type. Jamaica. Based on *Bignonia leucoxylo* sensu Swartz (Obs. Bot. 233. 1791).

Leucoxylo acuminata Rafinesque, Sylva tellur. 77. 1838. Type. Jamaica. Based on the second *Bignonia leucoxylo* L. (Sp. pl. ed. 2).

Tabebuia triphylla A. P. de Candolle, Prodr. 9: 214. 1845. Syntypes. Virgin Islands. St. Thomas, *Bertero s.n.* (P), *H. Wydler* 28 (G-DC).

Tecoma triphylla Martius ex A. P. de Candolle, Prodr. 9: 215. 1845, nom. nud., pro syn.

Tecoma pentaphylla (Linnaeus) A. P. de Candolle, Prodr. 9: 217. 1845.

Tabebuia pentaphylla (Linnaeus) Hemsley, Biol. centr.-amer., Bot. 2: 495. 1882.

Tabebuia riparia (Rafinesque) Sandwith, Taxon 4: 44. 1955.

Tabebuia arenicola Britton, Bull. Torrey Bot. Club 42: 375. 1915. Type. Cuba. Oriente: Guantanamo Bay, Conde Beach, *Britton* 2142 (NY).

Tabebuia geronensis Britton, Bull. Torrey Bot. Club 42: 375. 1915. Type. Cuba. Isla de Pinos: Nueva Gerona, *Curtiss s.n. of May 1904* (NY).

Tabebuia curtissii Britton, Bull. Torrey Bot. Club 42: 375. 1915. Type. Cuba. Isla de Pinos: Nueva Gerona, *Curtiss s.n. of May 1904* (NY).

Tabebuia lucida Britton, Ann. Missouri Bot. Gard. 2: 48. 1915. Type. Puerto Rico. Mona Island, *Britton et al.* 1686 (holotype, NY).

Tabebuia camaguayensis Britton & Wilson, Mem. Torrey Bot. Club. 16: 107. 1920. Type. Cuba. Camagüey, *Britton & Cowell* 13110 (holotype, NY; isotype, US).

Tecoma eggessii Kranzlin, Feddes Repert. 17: 219. 1921. Type. Puerto Rico. Banadero, Sierra de Luquillo, 800 m, *Eggers* 984 (B*, isotypes, BR, HBG, M).

Tabebuia gonavensis Urban, Feddes Repert. 18: 196. 1922. Type. Haiti. Gonave Island, *Leonard* 3331 (GH).

Tabebuia leptopoda Urban, Feddes Repert. 18: 121. 1922. Type. Cuba. Pinar del Rio: Pinar del Cajalbana, *Ekman* 10461 (lectotype, S; isotype, NY—fragm.).

Tabebuia beyeri Urban & Ekman, Feddes Repert. 22: 84. 1925. Type. Cuba. Matanzas: Ceiba Mocha, *Ekman* 18579 (lectotype, NY; isotypes, HAC, S).

Tabebuia dictyophylla Urban, Feddes Repert. 22: 85. 1925. Type. Cuba. Matanzas: Pan de Matanzas, 400 m, *Ekman* 18458 (lectotype, S, NY—fragm.).

Tabebuia lindahlia Urban, Ark. Bot. Stockholm 21A(5): 95. 1927. Type. Haiti. Tortue Island, very common, *Ekman* H4261 (lectotype, S; isotype, S).

- Tabebuia brigandina* Urban & Ekman, Ark. Bot. Stockholm **22A(10)**: 68. 1929. Type. Haiti. Mórne Brigand, 500 m, *Ekman H2643* (S).
- Tabebuia pallida* ssp. *heterophylla* (A. P. de Candolle) Stehle, Caribbean Forest. 6, suppl. 338. 1945.
- Tabebuia pallida* ssp. *pentaphylla* (Linnaeus) Stehle, Caribbean Forest. 6, suppl. 338. 1945.
- Tabebuia heterophylla* (A. P. de Candolle) Britton ssp. *genuina* Stehle, Bull. Soc. Bot. France **93**: 30. 1946.
- Handroanthus pentaphyllus* (Linnaeus) Mattos, Loefgrenia **50**: 4. 1970.
- Tabebuia capotei* Borhidi, Act. Bot. Acad. Sci. Hung. **26**: 19. 1980. Type. Cuba. Pinar del Rio: Peninsula de Guanahacabibes, Oct 1977 (fl. fr), *Borhidi & Capote s.n.* (HAC27811) (holotype, HAC; isotype, BP (not seen)).

Shrub or small to large *tree* to 20 m or more, dichotomously branched, the branchlets terete, lepidote with uniformly small, mostly whitish sessile (occasionally in part subsessile) scales. *Leaves* mostly 3–5-foliolate, frequently with the basal leaves of some branchlets 1-foliolate, rarely (Tortue Island: *T. lindahlia*) mostly unifoliolate, the leaflets highly variable in size, shape, and texture, the terminal mostly more or less obovate or obovate-elliptic, the laterals usually elliptic or oblong-elliptic, the apex and base obtuse to rounded, the apex occasionally obtusely apiculate but never acuminate, occasionally slightly retuse (*T. camaguayensis*, also sometimes as result of individual injury), the terminal 1–16 cm long, 0.4–7.5 cm wide, the basals 0.7–12 cm long, 0.3–6 cm wide, more or less coriaceous, densely lepidote above and below, the scales all whitish or with a few scattered sessile reddish ones below (sometimes the undersurface distinctly whitish but only in Jamaica and the Cayman Islands), the secondary veins relatively inconspicuous and usually not strongly brochidodromous, plane above, raised below, the tertiary venation more or less plane above, varying from subplane to distinctly prominulous below, the margin usually entire, sometimes very slightly erose (= *T. lucida*, *T. dictyophylla*, *T. arenicola*); the terminal petiolule 0.2–5.5 cm long, the basals usually asymmetrically subsessile (occasionally the petiolule to 0.5–1 cm long), the petiole 0.5–8(–14) cm long, lepidote, usually drying tannish or grayish. *In-florescence* a few- to several(–many)-flowered terminal panicle, often reduced to one or two flowers, lepidote. *Flowers* with the calyx cupular, irregularly 2–3(–4)-lobate, 7–12 mm long, 5–8 mm wide, lepidote with sessile trichomes, frequently drying grayish; corolla lavender or pale

magenta to almost white (white to faintly pinkish on Jamaica: *T. riparia*), the throat yellow when fresh, fading to white, tubular-infundibuliform, 3.5–7 cm long, 1–2 cm wide at mouth of tube, the tube 3–5.5 cm long, the lobes 0.8–2 cm long, glabrous outside, scurfy puberulous in throat inside, strongly villous at level of stamen insertion, the lobes more or less ciliate; anthers included in lower part of tube, the thecae divaricate, 3 mm long; ovary linear, lepidote, 4 mm long, 1 mm wide, the ovules 2-seriate in each locule; disk annular-pulvinate, 1–1.5 mm long, 2 mm wide. *Fruit* a linear-cylindric capsule, attenuate toward base and apex, 7–20 cm long, 6–10 mm wide, the valves coriaceous, slightly to not at all striate-costate, densely lepidote, the calyx persistent; *seeds* thin, bialate, 7–9 mm long, 20–30 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 48). Extremely widespread and often very common throughout the Antilles; from sea level to 1000 m. Occurring on many different substrates, including limestone, serpentine, beaches, and palm savannas.

Representative specimens examined. UNITED STATES (naturalized). FLORIDA: Dade Co., Homestead, Seminole Pk., *Craighead s.n.* (FTG).

HONDURAS. SWAN ISLANDS: *C. Nelson s.n.*? (MO).

BAHAMAS. Little Exuma, Williams Town (perhaps originally planted), 27 Jun 1974 (fl), *Correll & Correll 42484* (FTG, MO).

CUBA. CAMAGÜEY: Near Camagüey, 2 Apr 1912 (fl), *Britton et al. 13110* (MO, NY, US); Lantayana, 23 Jun 1924 (st), *Ekman 19047* (B, MO, S). CIENFUEGOS: Santa Clara, distr. Cienfuegos, 5 Apr 1895 (fl), *Combs 11 p.p.* (GH). GRANMA: Trail to Pico Turquino, headwaters of Río Yara, 9 Jul 1985 (st), *Gentry 50921* (MO). GUANTÁNAMO: Imias, orillas de Río Imias, 5 Feb 1976, *Bisse et al. s.n.* (HAJB29638) (HAJB); Guantánamo Bay, 17 Mar 1909 (st), *Britton 2142* (NY). HABANA: Loma de la Pita, San Miguel de Casanova, 12 Oct 1923 (st), *Leon 11531* (GH, NY); Lomas de Nepomuceno, 13 Mar 1924 (st), *Leon 10116* (NY); Escaleras de Jaruco, 60 km SE of Habana, 5 Jul 1985 (fl), *Gentry 50846* (MO). HOLGUÍN: Holguín, El Paraíso, 27 Aug 1916 (st), *Ekman 7614* (B, NY, S). ISLA DE JUVENTUD: Vic. Los Indios, 10 Mar 1916 (st), *Britton et al. 15351* (NY); Nueva Gerona, 1904 (fl), *Curtiss s.n.* (NY); road from Nueva Gerona to Santa Bárbara, 23 Apr 1956 (fl), *Killip 45655* (GH, US). MATANZAS: El Palenque, Ceiba Mocha, 29 Feb 1924 (fl), *Ekman 18579* (NY, S). PINAR DEL RÍO: San Marcos, Cajalbana, La Palma, 17 Mar 1957 (fl), *Alain & Proctor 6193* (GH, NY). SANCTI SPIRITUS: Caimiabo, S of Sancti Spiritus, 29 Aug 1950 (fl), *Alain 1627* (NY). SANTIAGO DE CUBA: Sierra Maestra, 2 km oeste del Pico Palma Mocha, *Bisse & Rojas s.n.* (HAJB4466) (HAJB). VILLA CLARA:

Sagua, Santa Clara, 4 Sep 1903 (fl), *Britton & Wilson* 284 (NY).

CAYMAN ISLANDS. GRAND CAYMAN: S of Old Man Village, 9 Jun 1967 (st), *Brunt* 2133 (BM, US); Grape Tree Point, 17 Apr 1956 (fl), *Proctor* 15055 (BM, GH, IJ). LITTLE CAYMAN: Vic. of Salt Rocks, 8 Jul 1967 (fl), *Proctor* 28060 (BM, IJ, LL). CAYMAN BRAC: Spot Bay to North East Point, 8 Aug 1968 (fl, fr), *Proctor* 29054 (BM, IJ).

JAMAICA. CLARENDON: Round Hill, SW of Milk River, 4 Feb 1980 (st), *Gentry & Kapos* 28399 (MO); Portland Ridge, NE side, 15 Apr 1956 (st), *Stearn* 766 (A, BM). MANCHESTER: Near Great Bay, 3 mi SE of Alligator Pond, 3 Apr 1956 (fl), *Stearn* 640 (A, BM, S, UCWI). ST. ANDREW: Cane River below the Falls, 8 Apr 1956 (fl), *Stearn* 697 (A, BM); ST. ANN: Reynolds mine near Lydford P.O., 30 Jun 1955 (fr), *Howard & Proctor* 14209 (A). ST. CATHERINE: Great Goat Island, 19 Apr 1906 (fl), *Harris* 9214 (NY, UCWI, US); Port Henderson Hill between Apostles Battery and Lazaretto, 3 May 1956 (fl), *Stearn* 800 (A, BM). ST. ELIZABETH: Lovers Leap, near Yardley Chase, 6 Jun 1976 (fl), *Proctor* 36257 (MO). St. James Ironshore, Feb 1952 (st), *Robbins* 121 (UCWI). ST. THOMAS: Sea cliffs west of White Horses, 8 Mar 1957 (fl), *Proctor* 16249 (BM, MO).

HAITI. Ile La Gonave, betw. Mahautiere and Citadelle, 8 Feb 1927 (fl), *Ekman* 8894 (K, NY); Ile la Tortue, Montry, 25 Mar 1928 (fl), *Ekman* 9803 (GH, K, NY, S, US); La Valle, Tortue Island, 28 Dec 1928 (st), *Leonard & Leonard* 11608 (NY, US); Nord-Ouest, 5 km este de Mole St. Nicolas, carretera a Jean-Rabel, 3 Feb 1985 (fl), *Zanoni et al.* 33569 (JBSD, MO).

DOMINICAN REPUBLIC. BARAHONA: Paraiso (cult.), 12 Apr 1985 (fl, fr), *Gentry & Mejia* 50730 (JBSD, MO). DISTRITO NACIONAL: Isla La Piedra, Andres Boca Chica, 29 Oct 1981 (fl, fr), *Zanoni et al.* 17587 (JBSD); EL SEIBO: El Seibo (cultivated), 28 Apr 1981 (fl), *Zanoni et al.* 13007 (JBSD, MO). LA ROMANA: La Romana (cultivated), 6 Feb 1981 (fr), *Zanoni et al.* 10815 (JBSD).

PUERTO RICO. Island of Culebra, Culebra, 3 Mar 1906 (st), *Britton & Wheeler* 203 (S, US); Quebradillas, near Balneario Guanajataca, 4 Apr 1985 (fl), *Gentry & Zardini* 50439 (MO); Guanica Forest Reserve, 5 Apr 1985 (fl), *Gentry & Zardini* 50474 (MO); Isla Vieques, Half Moon Beach, 26 Nov 1981 (fr), *Hansen et al.* 9459 (UPR); 7 mi s of Caguas, 24 Jan 1899 (fl), *Heller* 314 (K, US); Sierra de Naguabo, Rio Prieto, 10 Aug 1914 (fl), *Shafer* 3670 (GH, NY); Jimenes, Sierra de Luquillo, Jun 1885 (fl), *Sintenis* 1658 (BM, C, G, M); prope Guanica, 13 Feb 1886 (fl, fr), *Sintenis* 3859 (BM, HBG, L); Lobos Island, 7 Aug 1968 (st), *Woodbury et al.* 1-132 (UPR).

VIRGIN ISLANDS. ST. CROIX: Below Maroon Ridge, 8 Apr 1985 (fl), *Croat* 61044 (MO); Buck Island Reef Nat. Mon., 22 Jun 1966 (st), *Little* 21535 (IJ). ST. JOHN: Boreau, 24 Feb 1906 (st), *Raunkiaer* 1895 (C). ST. THOMAS: Louisenhoi, Oct 1880 (fl), *Eggers* 200 (FI, G, HBG, L, M); Sugar Estate, 17 Feb 1914 (st), *Ostenfeld* 360 (C). VIRGIN GORDA: Roadsides on mountains, 5 Jan 1919 (st), *Fishlock s.n.* (GH).

LEEWARD ISLANDS. ANGUILLA: N of the Valley,

31 Dec 1958 (fl), *Proctor* 18555 (IJ), ANTIGUA: Upper Macarthy Valley, 12 Sep 1937 (st), *Box* 1062 (BM, MO); English Harbour, 4 Apr 1956 (fl), *A. Smith* 10439 (A, NY). BARBUDA: SW part of island, 6 Apr 1956 (fl), *A. Smith* 10460 (A, NY). ST. CHRISTOPHER: Near Basseterre, *Britton & Cowell* 424 (NY). ST. EUSTATIUS: 11 Apr 1885 (fl), *Suringer s.n. of 1885* (L). ST. KITTS: 17 May 1971, *Gillis* 10803 (FTG). ST. MARTIN: 1906 (fl), *Boldingh* 2555 (K, L).

WINDWARD ISLANDS. GUADELOUPE: Basse Terre, *Funck & Schlim* 23 (P); E of Vieux-Fort, Pte. du Vieux Fort, 20 Jul 1959 (fl), *Webster et al.* 9170 (MICH); Grand Terre, Porte d'Enfert, 13 Aug 1973 (fl, fr), *Sastre & Jeremie s.n.* (A). MARIE GALANTE: Near l'Etang Noir, *Proctor* 20966 (BM). MONTERRAT: Fox's Bay, 5 Jan 1961 (fl), *Howard & Howard* 15127 (A). DOMINICA: S of Mero, 1 Mar 1966 (fl), *Chambers* 2801 (MO); Scotts Head, Soufrière Bay, 17 Jul 1964 (fl, fr), *Wilbur et al.* 7589 (MICH, MO). MARTINIQUE: Pres Sainte Anne, Apr 1968, *Oldeman & Maurice* M34 (CAY, P); Valle de St. Pierre, 1870 (fl, fr), *Hahn* 253 (BM, BR, G, MO, P). ST. LUCIA: Mont du Cap, 16 Apr 1959 (fl), *Cowan* 1588 (NY, P). ST. VINCENT: St. Patrick Parish, Peters Hope, 20 Mar 1962 (fl), *Cooley* 8516 (GH). THE GRENADINES: Union Island, 26 Mar 1933 (st), *Cooper* 200 (GH). GRENADA: St. Georges, Dec 1904 (fl), *Broadway s.n.* (HBG, NY); Ballast Point near St. Georges, 24 Feb 1950 (fl), *Howard* 10699 (BM, GH, NY).

SOUTHERN DUTCH ANTILLES. CURAÇAO: Soto Garden (cultivated), Apr 1970 (fl, fr), *Arnoldo-Broeders* 3904 (MO).

TRINIDAD AND TOBAGO. TOBAGO: Orange Hill, 23 May 1951 (fl), *Herb. Trin.* 14713 (K).

Local names. Jamaica: Whitewood, yoke wood. Cayman Islands: whitewood. Cuba: Roble, roble de olor, roble blanco. Puerto Rico: roble, roble prieto. French West Indies: poirier, poirier des Antilles, poirier rouge, poirier blanc, poirier marbre. British Antilles: white cedar.

Uses. Widely cultivated as an ornamental; also used for timber. According to Hodge and Taylor (1957) it lasts especially well in salt water and is thus used for the ribs and sides of dugouts on Dominica, the wood also being employed in the construction of mortars, wooden bowls, and floors. It is also used medicinally. For example, on Dominica a plaster of the bark is used to cure corns and the leaves as a poultice on sores (Hodge & Taylor, 1957), and the leaves and bark are boiled as a cure for colds on St. Christopher (*Cooley* 8797).

This is probably the most variable of all species of *Tabebuia*. Its patterns of variation are extremely complex and I have here included extremes that would not seem possibly to be conspecific, but that are connected by a complete series of intergradations. Even many of the re-

lated species that are recognized intergrade with *T. heterophylla*, and many specimens cannot be assigned with certainty to a specific taxon. In adopting a rather broad concept of *T. heterophylla*, I have been strongly influenced by the fact that on Puerto Rico, where the flora is extremely well known, all botanists (Woodbury, pers. comm.; Vivaldi, pers. comm.; Liogier, pers. comm.) are in agreement that there is a single highly variable pink-flowered species, i.e., *T. heterophylla* (along with 3 red-flowered ones). In dry coastal scrub on Puerto Rico this species may have uniformly small leaves with terminal leaflets ca. 3×1 cm, while in moist interior forests terminal leaflets may be around 15×7 cm. The total variation in the complex is not much greater on Cuba, but it is partitioned much more discretely, often associated with ecotypic specialization, e.g., on serpentine. Hispaniola actually has more morphological variation in *Tabebuia* than does Cuba, although fewer species have been recognized; in part this is because the Hispaniolan species tend to be better defined so that there has been less temptation to describe minor variants.

Stehle (1946) has discussed the taxonomic problems entailed by such a polymorphic species, which he referred to as *T. pallida*. He suggests recognizing three subspecies—ssp. *genuina* for the small-leaved coastal scrub form, ssp. *pallida* for the widespread 3–5-foliolate form, and ssp. *dominicensis* for the unifoliolate form here treated as *T. pallida*. Stehle's concept of ssp. *pallida* cannot be given that name since the type illustration of *T. pallida* shows a unifoliolate plant. A new combination at the subspecific level based on the basionym of *T. riparia* (or on *T. triphylla* if the Jamaican population is considered subspecifically distinct) would then be needed.

I have tried very hard to recognize more species in this complex but find that not only is there instability in all the potential taxonomic characters and numerous intermediates between local morphotypes, but also that the variation is differently partitioned on different islands, so that the complex of characters that might define a species on one island varies in an overlapping manner from island to island. In such a situation it is patently impossible to construct a serviceable key except by lumping many of the more poorly differentiated entities.

This species also has nomenclatorial problems. The nomenclatorial confusion associated with *T. heterophylla* has been clearly elucidated by Sandwith (1954, 1955). Linnaeus himself began the confusion by splitting his *Bignonia leucoxylo*n of *Species Plantarum*, edition 1, in two in edition 2, unfortunately applying the new name, *B. pentaphylla* to most of the citations he had originally cited under *B. leucoxylo*n and applying *B. leucoxylo*n to a Miller (*Gardeners Dictionary*, ed. 7, 1759, *Bignonia* No. 10) citation “*Bignonia foliis imiis digitatis, superioribus simplicibus vel ternatis caule erecto arboreo*” that I here typify by *Houston s.n.*, Jamaica 1731 (BM) instead; Miller cited Plukenet's “*Leucoxylo*n arbor siliquosa, quinis foliis, floribus Nerii, alato semine,” also included in Linnaeus' *Species Plantarum* ed. 1 (sphalm Plum.) citation and no doubt the source of the epithet “leucoxylo.” Thus it might be argued that Linnaeus in effect lectotypified his original *Bignonia leucoxylo*n with the Plukenet reference, as indicated by his retention of the epithet “leucoxylo” when he decided that Plukenet's plant was different from the plants of Plumier, Catesby, Sloane, and Ray that were also cited in the original description and in the *Hortus Cliffortianus* from which the diagnostic phrase was taken. Linnaeus's (1763) amended *B. leucoxylo*n was said to have ovate acuminate leaflets while *B. pentaphylla* had obovate leaflets. However, Plukenet's (1692) figure shows a 5-foliolate leaf with leaflets that are elliptic and acutish (not acuminate).

It is indeed true that references pertinent to several *Tabebuia* species were included under *B. leucoxylo*n in *Species Plantarum*, ed. 1 (and before that in the *Hortus Cliffortianus*). Catesby's plant, excellently illustrated, is clearly *T. bahamensis*. Plumier (1703) referred to two plants, “*Bignonia arbor, pentaphylla flores roseo, major, siliquis planis*” and “*Bignonia arbor, pentaphylla, flore rosea, minor, siliquis angulatis*.” Thanks to the assistance of Dr. Alicia Lourteig, I have examined tracings of Plumier's original, never published, drawings of these two *Tabebuia* species. Although not indicated in the publication, the large-flowered smooth-fruited Plumier species is additionally characterized on the plates as “*In Ins. Antillanis. 'poirier'*” and is clearly *T. heterophylla* as here used. The second Plumier species with angulate fruit is indicated as “*Ins. Sto. Domingo*” and appears to be *T. calcicola*.

Britt. Although Linnaeus included both “flore . . . major & minor” in his Plumier citation, he excluded “siliquis angulatis” effectively excluding the Santo Domingo plant as a possible lectotype for the second *B. leucoxydon*. The Sloane and Ray citations refer to yet another plant, the Jamaican “white wood,” the species with obtuse leaflet apices that was treated by Sandwith (1955) and in the *Flora of Jamaica* (Adams, 1972) as *T. riparia*.

Linnaeus evidently intended to associate *B. leucoxydon* with Plukenet’s plant from whence its epithet had come. Thus one might argue that the Plukenet plate should be considered the type of *B. leucoxydon*, leaving *B. pentaphylla* as a perfectly valid name, with several discordant elements, one of which should be selected as lectotype. However, Sandwith (1954) considered that *Bignonia leucoxydon* of *Species Plantarum* edition 1 should be typified with the *Hortus Clifortianus* collection at LINN, making *B. pentaphylla* an illegitimate name change. In the interest of nomenclatural stability, I opt to accept Sandwith’s lectotypification, especially since the name *Tabebuia pentaphylla* (L.) Hemsl. has been widely used for the quite different continental species correctly known as *T. rosea*; resurrection of *T. pentaphylla* at this late date for an Antillean species would cause tremendous confusion.

There is a taxonomic problem associated with the Jamaican “white wood,” as well as the nomenclatural one. Sandwith (1954) considered *Tabebuia heterophylla* “wholly distinct” from the Jamaican “white wood.” Yet I am unable to discern any firm characters to differentiate it from the widespread Antillean plant. The only potential differences are the white flowers and generally narrower leaflets with more densely whitish lepidote leaf undersurfaces in the Jamaican population. However, white flowers occur in most normally lavender-flowered species of Bignoniaceae and very pale almost white flowers are known in some extra-Jamaican populations of *T. heterophylla*; some Jamaican collections are indicated by their collectors as having a slight pink tint (e.g., Stearn 743). Outside Jamaica, collections of *T. heterophylla* with the leaflets strongly whitish beneath are known only from the nearby Cayman Islands, where they are associated with the normal pink to lavender flower color. The character of whitish leaf undersurface is very inconstant, even in Jamaica, and occurs

in less than half the Jamaican collections. Moreover, *T. heterophylla* is exceedingly variable. I conclude that the Jamaican population is best included in *T. heterophylla* as well.

Other problem forms within *T. heterophylla* include *T. lindahlia* from Haiti which has predominantly unifoliate leaves with raised secondary veins and prominently raised-reticulate tertiary vein network below. This form approaches *T. berteroi*, and especially the Cuban form of that species (*T. anisophylla*).

Tabebuia beyeri, known only from the type from Matanzas, is supposed to be characterized by a raised midrib and sparsely lepidote leaves with the laterals having strongly asymmetric bases (Alain, 1957). However, the leaves of the type that I examined are strongly and conspicuously lepidote, especially the younger ones, the midribs of some leaflets are not raised at all, and some lateral leaflets have very weakly asymmetric bases. Since none of the characters used to define the species are consistent, even on the type, it can hardly be maintained. *Tabebuia arenicola*, a beach form from Oriente with rather small narrow leaves, is supposed to be distinguished by having a shinier surface and less conspicuous upper surface venation but the leaf surface of the type is actually duller than in most material of the *heterophylla* complex, while Matanzas material referred to this species has typically developed upper surface leaf venation. *Tabebuia dictyophylla*, from the karst area of Matanzas Province has the characteristic thin, strongly erose-margined intricately prominently veined leaflets typical of karst plants but does not seem worthy of specific recognition; the Pinar del Rio collections made by León & Alain and identified as this species are quite different, with thickly coriaceous, strongly emarginate leaflets, and belong in *T. lepidota* as here interpreted. *Tabebuia arimaoensis* which I have recognized as specifically distinct, is close to this form. *Tabebuia capotei* from the Guanahacabibes Peninsula of westernmost Cuba is apparently an ecotype of *T. heterophylla* characterized by unusually small leaflets with the venation below unusually prominent.

The large-leafleted forms (*T. leptoneura*, *T. elongata*, *T. shaferei* sensu León & Alain) from Cuba pose even worse problems. These plants seem distinct from other populations of *T. heterophylla* on Cuba, especially on the basis of the

longer basal petiolule and generally larger and sometimes more numerous leaflets, and I have treated them here as specifically distinct. Nevertheless, they are within the range of variation shown by the complex outside of Cuba. Alain (1957) recognized 10 species of this complex in Cuba, whereas I accept only four. He differentiated *T. leptoneura* as more densely scaly on the leaf undersides, *T. heterophylla* and *T. elongata* as having sessile basal leaflets, the latter distinguished by being long acuminate with thick petiolules, *T. shaferi* by basal leaflets with long narrow petiolules, and *T. geronensis*, *T. arenicola*, *T. leptopoda*, *T. beyeri*, and *T. dictyophylla* as having mostly 3-foliolate leaves separated by minor differences in leaflet size, texture and shape. The most widespread of these was supposed to be *T. shaferi* but much of the material identified with this name by Alain (in herb.) has very short basal petiolules. It is possible that extensive field work would show that more of these entities should be recognized, but, if so, many of the intermediate collections would have to be accounted for by hybridization. In the absence of such field study, I am unable to justify retention of these species even though many of them seem to represent reasonably discrete morphological clusters.

Several of the species described subsequent to the *Flora of Cuba* treatment probably represent hybrids between *T. heterophylla* and other Cuban *Tabebuia* species (see excluded species).

44. *Tabebuia hypoleuca* (Wright ex Sauvalle)
Urban, Symb. antill. 5: 497. 1908.

Tecoma lepidophylla (A. Richard) Grisebach var. *reticulata* Grisebach, Cat. pl. cub. 193. 1866. Type. Cuba. Guantánamo: Monte Verde, Wright 1341 p.p. (holotype, GOET; isotypes, G, HAC, K, MO, NY).

Tecoma hypoleuca Wright ex Sauvalle, Fl. Cuba 94. 1873. Type. Cuba. Guantánamo: Monte Verde, Wright 1341 p.p. (holotype, HAC; isotypes, G, GOET, K(2), MO, NY).

Tabebuia hypoleuca ssp. *nivea* Borhidi & Muñiz, Act. Bot. Acad. Sci. Hung. 17: 27. 1971. Type. Cuba. Santiago de Cuba: Turquino, Sierra Maestra, Muñiz & Borhidi s.n. (HAC27132) (holotype, SV; isotypes, BP, HAC).

Tabebuia acunana Borhidi & Muñiz, Bot. Közlem. 62: 76. 1975, nom. nov. for *T. hypoleuca* ssp. *nivea* Borhidi & Muniz.

Tree 3–10 m tall, dichotomously branched, the branchlets subterete, irregularly longitudinally

ridged, the leaf scars not conspicuously raised, lepidote, not noticeably lenticellate, when older with a peeling papery tannish surface layer. *Leaves* unifoliolate, opposite, tending to cluster at tips of branchlets, elliptic to elliptic-oblong, rounded to obtuse at apex (the midvein sometimes apiculate-extended), rounded to truncate or distinctly subcordate at base, 1–5(–7) cm wide, coriaceous, the margin more or less plane, minutely and somewhat caducously lepidote above, extremely densely white-lepidote over surface below, with dark-drying glands at base of midvein, the surface dull, not rough to the touch, drying uniformly olive above, white with conspicuously darker venation below (cf. *Arrabidaea candidicans*), the secondary veins festooned-brochidodromous; petiole 0.4–1.3 cm long, lepidote, somewhat flattened, jointed at base of blade. *Inflorescence* one or two terminal flowers, the pedicels less than 1 cm long, lepidote, with a pair of caducous linear bracteoles ca. 3 mm long below base of calyx. *Flowers* with the calyx campanulate, bilabiate, 8–14 mm long, 5–7 mm wide, the surface smooth, densely brownish lepidote, drying dark brown; corolla tubular-infundibuliform, 4–5 cm long, 1–1.5 cm wide at mouth of tube, the tube 3–3.5 cm long, the lobes 1–1.5 cm long, the tube glabrous outside except for a few lepidote scales near apex, rather strongly pubescent inside with flexuous trichomes; anther thecae divaricate, 2 mm long; pistil 2 cm long, the ovary linear, 4–5 mm long, 1 mm wide, densely lepidote; disk thick-pulvinate, slightly 5-lobed, 1 mm long, 2 mm wide. *Fruit* linear, 4.5–10 cm long, 0.7–1 cm wide, densely lepidote, drying brownish, conspicuously but irregularly vertically ridged, the valves thin; seeds thin, bialate, 4–5 mm long, 2–2.5 cm wide, the hyaline-membranaceous wings clearly demarcated from the dark brown body.

Distribution (Fig. 48). Oriente Region of eastern Cuba, mostly at higher altitudes in the Sierra Maestra; 350–1200 m elevation.

Specimens examined. CUBA. GUANTÁNAMO: Farallón de la Perla, 14 Feb 1911 (fl), *Shafer 8734* (K, NY, US); Monte Verde, Jan–Jul 1859 (fl, fr), *Wright 1341* (G, GOET, HAC, K, MO, NY). HOLGUÍN: Río Piloto, Sierra de Nipe, 350 m, 14 Mar 1915, *Ekman 5016* (MO, S). SANTIAGO DE CUBA: Loma del Gato, Sierra Maestra, 950 m, Aug 1944 (fl), *Alain 203* (GH), Dec 1920 (fl), *Clemente 560* (NY); Las Cuevas, Turquino, Sierra Maestra, *Borhidi & Muñiz s.n.*

(HAC27132) (HAC); Pinar de Papayo, 700 m, 23 Jun 1918 (st), *Ekman 9282* (MO, S); Loma del Gato, Sierra Maestra, 1000 m, Jul 1921 (fl), *Leon et al. 9882* (GH, NY); Gran Piedra, Sierra Maestra, 1000 m, Feb 1942 (fl), *León 20540* (US); La Siberia, Gran Piedra, 28 Jan 1953 (fl), *López-Figueiras 618* (US); El Dean, Huquini Peak, 3 Aug 1935 (fl), *Roig et al. 6727* (NY).

Local names. Roble macho, jilacho.

This species is quite distinct from the other species with large simple leaves on account of the conspicuously white undersurface with contrasting venation.

45. *Tabebuia impetiginosa* (Martius ex A. P. de Candolle) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. **11**: 176. 1936. Figs. 49, 52.

Tecoma impetiginosa Martius, Syst. mat. med. bras. **54**. 1843, nom. nud.

Tecoma impetiginosa Martius ex A. P. de Candolle, Prodr. **9**: 218. 1845. Type. Brazil. Piauí, *Martius 2446* (holotype, G-DC; isotype, M).

Tabebuia avellanadae Lorentz ex Grisebach, Symbol. fl. argent. **258**. 1879. Lectotype. Argentina. Salta: Oran, Tabacal, *Lorentz & Hieronymus 23* (GOET); syntypes, *Lorentz & Hieronymus 392, 657* (GOET), **488** (G).

Tabebuia palmeri Rose, Contr. U.S. Natl. Herb. **1**: 109. 1891. Type. Mexico. Sonora, *Palmer 320* (holotype, US; isotypes, GH, NY).

Tecoma impetiginosa var. *lepidota* Bureau, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn **1893**: 114. 1894. Type. Brazil. Rio de Janeiro: Rio de Janeiro, *Glaziou 11241* (C).

Tecoma adenophylla K. Schumann ex Bureau & K. Schumann in Martius, Fl. bras. **8(2)**: 412. 1897. Type. Brazil. Goyaz, *Glaziou 21841* (B*, BR, C, G).

Gelsemium avellanadae (Lorentz ex Grisebach) Kuntze, Rev. gen. pl. **3(2)**: 245. 1898.

Tecoma ipe var. *integra* Sprague, Bull. Herb. Boissier, ser. 2, **5**: 86. 1905. Type. Paraguay. *Hassler 3065* (K).

Tecoma ipe var. *integrifolia* Hassler, Rev. Inst. Parag. **3**: 166. 1901.

Tecoma ipe var. *integrifolia* f. *leucotricha* Hassler, Feddes Repert. **9**: 60. 1910. Type. Paraguay. Amambay: Pr. Estrella, *Hassler 10282* (holotype, G; isotypes, MICH, MO).

Tecoma avellanadae (Lorentz ex Grisebach) Spegazzini in Spegazzini & Girola, Cat. descr. maderas, An. Soc. Rural Argent. **1910**: 379. 1911.

Tecoma avellanadae var. *alba* Lillo, Seg. contr. arb. Argent. **13**. 1917. Type. Argentina. Jujuy: Perico, *Venturi 344* (LIL, not seen).

Tecoma integrum (Sprague) Chodat, Bull. Soc. Bot. Genève, ser. 2, **9**: 242. 1917.

Tabebuia nicaraguensis Blake, Contr. Gray Herb. **52**: 95. 1917. Type. Nicaragua. Hacienda Capuscus, *Baker 2258* (holotype, GH; isotypes, MO, US).

Tabebuia dugandii Standley, Trop. Woods **36**: 17. 1933.

Type. Colombia. Atlántico, *Dugand 345* (holotype, F; isotypes, MAD, US).

Tabebuia ipe var. *integra* (Sprague) Sandwith, Lloydia **2**: 213. 1939.

Handroanthus impetiginosus (Martius ex A. P. de Candolle) Mattos, Loefgrenia **50**: 2. 1970.

Handroanthus impetiginosus var. *leipdotus* (Bureau), Mattos, Loefgrenia **50**: 2. 1970.

Handroanthus avellanadae (Lorentz ex Grisebach) Mattos, Loefgrenia **50**: 3. 1970.

Tabebuia schunkevigoi Simpson, Fieldiana, Bot. **36**: 1. 1972. Type. Peru. Huánuco, *Schunke 2596* (holotype, F; isotypes, G, MICH, MO).

Tree to 30 m tall, 70 cm dbh, the bark relatively smooth, grayish, slightly longitudinally furrowed; wood dark brown, dense, the vessels containing yellow powder (lapachol); twigs subterete, glabrescent, the apices mealy pubescent. Leaves palmately 5(–7) foliolate, frequently anisophyllous, the leaflets ovate to elliptic, acuminate, cuneate to rounded or almost subcordate at base, the terminal leaflet 5–19 cm long, 1.5–8 cm wide, the laterals progressively smaller, when mature entire or slightly and irregularly serrate in upper half (in juveniles often more conspicuously and regularly serrate), membranaceous to chartaceous, somewhat lepidote above and below, pubescent with simple or forked trichomes at least in the axils of the lateral nerves below, sometimes pubescent along the midvein or over whole surface below; terminal petiolule 1–4.2 cm long, the laterals progressively smaller, the petiole 4–13 cm long, lepidote and puberulous. Inflorescence a terminal panicle, usually more or less congested, the flowers in groups of three, the branches whitish or tan from the mealy pubescence of thick-stellate trichomes. Flowers with the calyx cupular, truncate or slightly 5-lobed, 4–6(–9) mm long, 3–6 mm wide, mealy pubescent with thick-stellate trichomes; corolla magenta, the throat yellow at anthesis, fading to purplish, tubular-campanulate, 4–7.5 cm long, 1.2–5 cm wide at mouth of tube, the tube 2.5–5 cm long, the lobes 0.9–2 cm long, puberulous outside, inside with a few scattered simple trichomes in the tube, glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 2.5–3.5 mm long; ovary linear, 3–4 mm long, 1 mm wide, glabrous to lightly lepidote, the ovules ca. 4-seriate in each locule; disk cupuliform, 1–1.5 mm long, 2 mm wide. Fruit an elongate-cylindrical capsule, attenuate at both ends, 12–56 cm long, 1.3–2.6 cm wide,

glabrous; seeds thin, bialate, 1–1.6 cm long, 3.4–8 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from the seed body.

Distribution (Fig. 51). Northwestern Mexico to northwestern Argentina; mostly in seasonally dry deciduous or semideciduous forest, also scattered through drier parts of Amazonia; sea level to 1400 m.

Representative specimens examined. **MEXICO.** CHIAPAS: Mun. Ocozocoautla de Espinosa, Río de la Venta near Derna, 16 Dec 1972 (fl), *Breedlove & Thorne 30359* (DS, MO). GUERRERO: Sierra Madre del Sur, N of Río Balsas, Suriana, 12 Nov 1937 (fl), *Mexia 8802* (F, G, K, LL, MO, NY, US). JALISCO: Estación Chamela, Mun. La Huerta, 10 Dec 1976 (fl), *Magallanes 328* (MEXU). MÉXICO: Villaneda, 22 Feb 1935 (fl), *Hinton 7407* (G, K, MO, NY). MICHOACÁN: Tuzantla-Salitire, Dist. Zitacuaro, 22 Dec 1938 (fl), *Hinton et al. 13532* (K, 1MICH, US). MORELOS: Cocoyotla, Volcán-Guyacán, 11 Jan 1969 (fl), *Vazquez 2112* (MEXU). NAYARIT: Hwy. 15 64 mi S of Río Presidio, 19 Dec 1967 (fl), *Clarke et al. 1547-2* (MICH). OAXACA: Ginguola near Tehuantepec, 18 Dec 1957 (fl), *Smith 3226* (F, MEXU, MO, NY, US). PUEBLA: Acatlán a Izucar de Matamores, 69 km SE de Izucar de Matamoros, 5 Dec 1973 (fl), *Koch & Banda 73179* (CHAPA, MO). SINALOA: Nuevo Mundo, 26 Jan 1940 (fl), *H. Gentry 5370* (MICH, MO, NA). SONORA: Buropaco, Río Mayo, 28 Nov 1834 (fl), *H. Gentry 1164* (F, K, MEXU, MO, WIS).

GUATEMALA. CHIQUIMULA: Quebrada Shusho, above Chiquimula, 14 Oct 1940 (st), *Standley 74351* (F); El Progreso, around Barranquillo, 17 May 1942 (st), *Steyermark 46420* (F, US). ZACAPA: Gualán, 25 Jan 1927 (fl), *Record & Kuylen G117* (US).

EL SALVADOR. LA LIBERTAD: Km 71, La Libertad, *Allen s.n.* (F, NY). SAN MIGUEL: 200 m W of Hacienda Potrero Santo, S of Lake Olomega, 5 Feb 1942 (fl), *Tucker 904* (F, G, K, LL, MICH, NY, US).

HONDURAS. COMAYAGUA: Valle de Comayagua, 22 Dec 1973 (fl), *Hazlett 1158* (ENCF); 5 km E of La Paz, Valle Comayagua, 6 Dec 1982 (fl), *Hughes 237* (MO).

NICARAGUA. CHINANDEGA: Hacienda Campus-cus, 30 Jan 1903 (fl), *Baker 2258* (B, CH, DS, F, M, MICH, MO, NY, US).

COSTA RICA. GUANACASTE: 1 km S of Montenegro, 27 Jan 1969 (fl), *Gentry 341* (MO, WIS); Río Tenorito, Finca la Pacifica, 1 Feb 1969 (fl), *Gentry 367* (WIS).

PANAMA. DARIÉN: Golfo de San Miguel, Isla Cartagena near La Palma, 1 Feb 1972 (fl), *Gentry 3935* (MO). PANAMÁ: Vic. of Bejuco, 9 Feb 1939 (fl), *Allen 1630* (F, GH, MO, NY, US).

COLOMBIA. ATLÁNTICO: Puerto Colombia, 4 Mar 1965 (fr), *Dugand 6874* (NY, US); Los Pendales, Hacienda Riodulce, Jan 1946 (fl), *Dugand & Jaramillo 4140* (MO, NY, US). BOLÍVAR: Isla de Baru, entre Santa Ana y Playa Mojada, 25 Aug 1986 (st), *Cuadros & Gentry 3062* (JBG, MO); Isla de Baru, 8 Jan 1985 (fl, fr), *Cuadros 2028* (JBG, MO). MAGDALENA: Entre

Pivijay y Fundación, 11 Feb 1962 (fl), *Romero-Castañeda 9228* (COL, NY). SANTANDER: Entre Aratoca y Piedecuesta, 16 Jun 1962 (fl, fr), *Saravia et al. 943* (COL).

VENEZUELA. AMAZONAS: San Simón de Cocuy, 27 Apr 1974 (fl), *Morillo et al. 4058* (MO). BARINAS: 20 km N de Barrancas, Cruz Paredes, 28 Mar 1972 (st), *Marcano-Berti & Lezama 2976* (VEN). BOLÍVAR: N side of Cuyuni River, 18 Mar 1974 (fl), *Gentry et al. 10671* (MO, VEN). LARA: Carretera Carora-Baragua, Chiquinquirá, Torres, 6 Nov 1979 (fl), *Marcano-Berti et al. 295-979* (IPA, MO).

SURINAM. Sin. loc., 11 Oct 1967 (fl), *L.B.B. 11957* (BBS).

FRENCH GUIANA. Paramaka, Route de Cayenne, km 15.7, 26 Nov 1956 (st), *Service Forestier 7616* (CAY); Route de Cayenne PK 14,800, 21 Nov 1957 (st), *Service Forestier 7752* (P).

PERU. AMAZONAS: Mouth of Río Santiago, *Tessmann 3930* (NY). HUÁNUCO: Puerto Zungaro, Río Pachitea, 29 Jun 1987 (fl), *Gentry & Díaz 58603* (MO, USM). MADRE DE DIOS: Cocha Cashu Biological Station, Manu National Park, 4 Aug 1983 (st), *Gentry 43340* (MO, USM). SAN MARTÍN: 31 km S of Tarapoto, 18 Jul 1982 (fl, fr), *Gentry et al. 37698* (MO, USM).

BRAZIL. ACRE: Rio Macauhan, 24 Aug 1933 (fl, fr), *Krukoff 5637* (F, M, MICH, MO, NY). BAHIA: Marau, Estrada Ubaitaba-Ponta do Muta, 3 Feb 1983 (fl), *Carvalho & Plowman 1410* (MO); Mun. Formosa do Rio Preto, Malhadinha, 25 May 1984 (fl), *da Silva & Viegas 368* (CH, CTES). CEARÁ: Chapada do Araripe, Lagoa de Dentro, 26 Jul 1964 (fl), *Castellanos & Duarte 548* (MO). DISTRITO FEDERAL: Brasília, Bacia do Rio São Bartolomeu, 11 Jun 1980 (fl, fr), *Heringer et al. 1481* (MO, NY). GOIÁS: Bom Jesus, Jul 1974 (fl, fr), *Hatschbach 34595* (C, MBM, MO). MARANHÃO: Perizes, 6 Jul 1954 (fr), *Black et al. 54-16610* (IAN, IPA). MATO GROSSO: Rio Araguaia, 78 km S of Xavantina, 14 Jun 1966 (fl), *Irwin et al. 17131* (MO, UB). MATO GROSSO DO SUL: Cuyaba, Jan 1823 (st), *Riedel 1089* (LE). MINAS GERAIS: Lagoa Santa, Jul 1882 (fl), *Glaziou 12980* (BR, C, F, G). PARÁ: Peixeboi, Belém-Braganca, 22 Oct 1926 (fl, fr), *Ducke s.n. (RB22672)* (G, INPA, NY, RB, S). PARAÍBA: 3 km N de S. Jose dos Cordeiros, estr. para Taperoa, 29 Nov 1971 (fl, fr), *Lima et al. 1067* (IPA). PERNAMBUCO: Recife, mata de Dos Irmãos, 12 Oct 1967 (fl), *Lima 67-5078* (MO); Tapera, Dec 1930 (fl), *Pickel 140* (B, F, MO, WIS). PIAUÍ: Jacare, Jun 1912 (fl), *Luetzelburg 1678* (RB). RIO GRANDE DO NORTE: Mossoro, Arcati-Mossoro, 18 Sep 1978, *Fernandes s.n. (EAC4119)* (EAC). RIO DE JANEIRO: Rio Tavares, estrada para Lagoa Florianópolis, 19 Sep 1950 (fl), *Kuhlmann s.n. (RB73674)* (RB). SÃO PAULO: Valentim Gentil, 8 Jun 1964 (fl), *Pires 57916* (M, NY, S).

BOLIVIA. BENI: Prov. Ballivian, Espíritu, Río Yacuma, 9 Sep 1986 (fr), *Beck 5931* (MO). SANTA CRUZ: Prov. Andres Ibañez, 11 km E of Santa Cruz, 9 Jul 1987 (fl), *Nee & Coimbra 35092* (MO); Sara, Buenavista, 20 Jul 1925 (fl), *Steinbach 7171* (F, G, MO, S).

PARAGUAY. AMAMBAY: Sierra de Amambay, pr. Estrella, Mar 1908 (fl), *Hassler 10282* (G, MICH, MO). CENTRAL: Iacus Ypacaray, May 1913 (fl), *Hassler 11763* (C, G, L, MO). CHACO: Parque Nacional Defensores



FIG. 52. Some extremes in *Tabebuia*. **A**, *T. simplicifolia* with tiny simple leaves; **B**, *T. angustata* with large 5–7-foliolate leaves; **C**, *T. impetiginosa*, mass-flowering while leafless; **D**, *T. pumila* (type), a xylopodial subshrub; **E**, trunk and crown of *T. serratifolia*, closest relative of *T. pumila* [note tree climber half way up 30 m trunk].

del Chaco, Cerro León, 8 Aug 1983 (st), *Hahn 1564* (MO). **PARAGUARÍ:** Cerro Pelada, Jun 1988 (fl), *Balansa 3239* (C).

ARGENTINA. CHACO: Dep. 1 de Mayo, Colonia Benítez, 2 Nov 1957 (fr), *Schulz 8099* (CTES, MBM). **JUJUY:** Dep. S. Pedro, ingenio La Esperanza, 8 Nov 1974 (fr), *Krapovickas et al. 26581* (CTES, G, MBM, MO). **SALTA:** Dep. Oran, Zanja Honda, 21 Jul 1944 (fl), *Schulz & Varela 5295* (CTES, F). **TUCUMÁN:** Fa-

mailla, Quebrada Lules, Oct 1923 (fl), *Venturi 2208* (F, MO).

Local names. Mexico: (Sinaloa to Morelos) amapa, amapa prieta, amapa rosa; (Chiapas) roble cinero, roble serrano; (Michoacán, México) canafistula, canafistula cimarrona, canafistula bofa; (Oaxaca) macuil, palo de cortez; (Guerrero)

rosa morada; (Sonora) ta-wi-yo. Guatemala: cortez colorado. El Salvador: cortez negro. Colombia: cañaguata morado, roble morado, polvillo. Venezuela: polvillo, araguaney poi. Surinam: groenhart. Brazil: ipe roxo, ipe rosa, ipe preto, pão d'arco. Paraguay and Argentina; lapacho, lapacho rosado, taiii pichai.

As here interpreted this is one of four species with puberulous purple corollas. Of these, *T. barbata* is only distantly related, and newly described *T. selachidentata* has very different few-foliolate leaves with jaggedly serrate leaflets. Widespread *T. impetiginosa* is most closely related to *T. heptaphylla*, a species endemic to the mata atlantica of coastal Brazil and adjacent areas. None of the numerous names proposed for *T. impetiginosa* in different geographical regions seems worthy of specific recognition. The form from the cerrados (typical *T. impetiginosa*) has uniformly densely puberulous leaf undersurfaces and might be worthy of varietal recognition. However, the exact same pubescence type occurs as an occasional variant through much of the range of the species (e.g., in Mexico and Nicaragua) and there are intermediates as well. Therefore I have chosen not to formally distinguish the different densities of leaflet pubescence taxonomically. Should one wish to recognize glabrescent-leaved forms at varietal rank, a new combination based on Bureau's *Tecoma impetiginosa* var. *lepidota* would be needed.

A white-flowered form that occurs sporadically in northwest Argentina and is cultivated in Paraguay is sometimes recognized as var. *alba* but surely represents a form at most; probably all purple-flowered bignons have occasional white-flowered variants.

In subtropical South America glabrate forms have been much confused with *T. heptaphylla* (where see discussion).

46. *Tabebuia inaequipes* Urban; Symb. antill. 9: 265. 1924. Type. Cuba. Holguín (Oriente): Sierra de Nipe, Río Canapu, 25 Feb 1915 (st), *Ekman 4772* (holotype, S; isotype, NY).

Tree, the branchlets irregularly rather angularly ribbed, presumably dichotomously branched, rather minutely reddish lepidote or lepidote-punctate, with a few large whitish lenticels when young. *Leaves* simple or 2–3-foliolate, the leaflets narrowly oblong-elliptic, obtuse

to retuse at apex, rounded or obtuse at base, the lateral leaflet bases very asymmetrical, the terminal 9–19 cm long, 2–6.5 cm wide, the laterals when present similarly shaped but smaller (5–16 × 1.5–5.5 cm), very strongly coriaceous, the secondary veins plane above, prominulous below, microscopically shiny above, minutely lepidote or lepidote-punctate, below densely lepidote with minute whitish scales, drying olive to brown above, more or less reddish olive or grayish olive with lighter secondary veins below, the margins entire; terminal petiolule 1.5–3.5 cm long, the basals subsessile to 3 mm long; petiole 2–7 cm long, the basals subsessile to 3 mm long; petiole 2–7 cm long, striate-ridged, rather densely lepidote. *Inflorescence* a few terminal flowers, usually borne 2–3 per peduncle, rather densely lepidote with large dark reddish to blackish scales. *Flowers* with the calyx campanulate, irregularly shallowly 2–3-labiate, 10–14 mm long, 9–10 mm wide, lepidote with sessile darkish scales; corolla white, tubular-campanulate, 4–4.5 cm long, 1–1.5 cm wide at mouth of tube, the tube ca. 3 cm long, the lobes 1 cm long, glabrous outside, the lobes ciliate and also puberulous, conspicuously and rather laxly pubescent in throat, very sparsely pubescent at stamen insertion, stamens deeply included, the thecae divaricate, 3–4 mm long; ovary oblong, tetragonal, 4 mm long, 1.5 mm wide, densely lepidote; disk annular-pulvinate, 2 mm long, 3 mm wide. *Fruit* linear-oblong, 12–15 cm long, 14–17 mm wide, the valves woody, ca. 2 mm thick, with strongly raised medial and sutural ribs, rather sparsely lepidote, drying gray, the calyx persistent; *seeds* thin, bialate, 6–7 mm long, 30–35 mm wide, the hyaline-membranaceous wings sharply demarcated from seed body.

Distribution (Fig. 53). Endemic to serpentine barrens and charrascales in the Sierra de Nipe and Cuchillas de Baracoa of southeastern Cuba: to 700 m alt.

Specimens examined. CUBA. HOLGUÍN: Charrascales ad Río Canapu, Sierra de Nipe, 25 Feb 1915 (st), *Ekman 4772* (NY, S); crest of Sierra Nipe, 600–700 m, 16–17 Oct 1941 (fl, fr), *Morton & Acuña 3127* (US). GUANTÁNAMO: Serpentine barrens, km 22 from Sabanilla, S of Baracoa, 12 Jan 1956 (st), *Alain 5060* (GH).

Apparently distinct from closely related *T. moaensis* by the largely simple leaves, the compound leaves never more than 3-foliolate with subsessile basal leaflets. The only flowering spec-

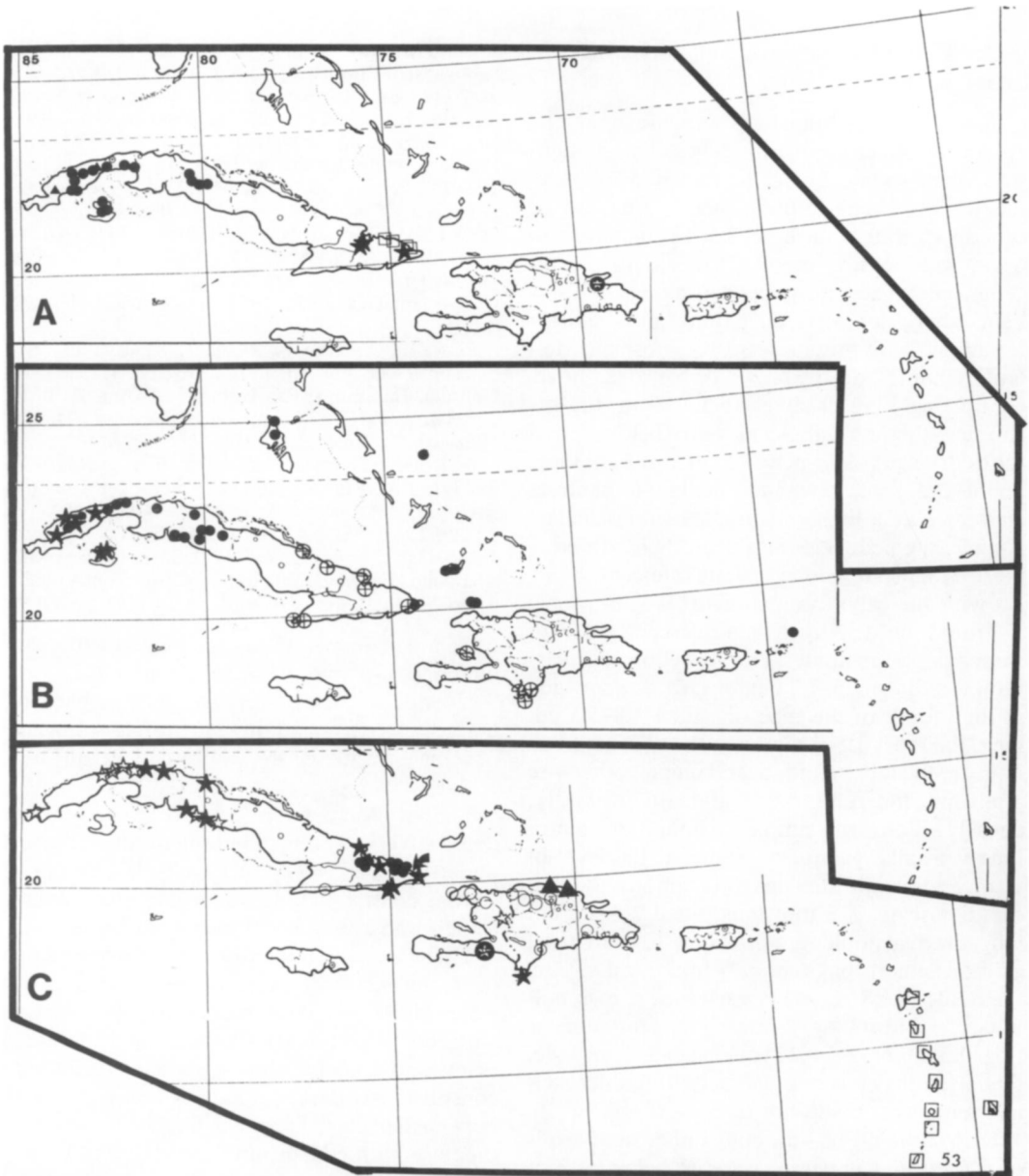


FIG. 53. Distribution of Antillean *Tabebuia*. A, ★ = *T. inaequipes*; ▲ = *T. jackiana*; ● = *T. leptoneura*; □ = *T. linearis*; ○ = *T. maxonii*. B, ★ = *T. lepidophylla*; ● = *T. lepidota*; ⊕ = *T. microphylla*. C, ● = *T. moaensis*; ○ = *T. multinervis*; ★ = *T. myrtifolia* var. *myrtifolia*; ☆ = *T. myrtifolia* var. *petrophila*; ☆ = *T. myrtifolia* var. *petrophila*; ○ = *T. obovata*; ▲ = *T. ophiolitica*; □ = *T. pallida*; ♣ = *T. polymorpha*.

imen of *T. inaequipes* has white flowers while all flowers of *T. moaensis* are recorded as pink. The fruit is also distinctly thicker-valved than in *T. moaensis* (or any other Antillean *Tabebuia*). The single sterile specimen from the Baracoa region has the leaflets drying a very different color be-

low, yellowish olive with darker veins, and may not be conspecific.

47. *Tabebuia incana* A. Gentry, Ann. Missouri Bot. Gard. 65: 732. 1978. Type. Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 29

Oct 1968 (fl), *Aluisio 236* (holotype, INPA; isotype, MO).

Tree to 30 m, branchlets subtetragonal, the epidermis rather loose, minutely stellate-tomentose when young. *Leaves* palmately 5-foliolate, the leaflets evenly elliptic, acute, rounded or broadly cuneate at the base, 3.5–12 cm long, 1.2–6 cm wide, entire, membranaceous to chartaceous, above stellate pubescent along the midvein, otherwise scattered lepidote, below densely tomentose with minute sessile or subsessile stellate trichomes, drying brown or blackish above, contrastingly tan or silvery below from the trichomes, the less pubescent veins below sometimes drying darker; petiolules 0.5–2.7 cm long, petiole 3.5–8 cm long, finely stellate-tomentose. *Inflorescence* a highly contracted subfasciculate panicle, the peduncles and pedicels hardly visible, less than 5 mm long, stellate rufescent. *Flowers* with the calyx campanulate, 5–8 mm long, 5–7 mm wide, densely stellate-rufescent, also with some simple trichomes; corolla yellow, tubular-infundibuliform, 6–7.2 cm long, ca. 1.5 cm wide at the mouth of the tube, the tube 4.8–5.5 cm long, the lobes 1.5–2 cm long, the tube glabrous outside, the lobes lepidote and ciliate, otherwise glabrous, the tube inside glabrous dorsally, densely villous with simple trichomes to 1.5 mm long ventrally, glandular villous at the level of stamen insertion; stamens didynamous, the thecae divaricate, 2–3 mm long; pistil 2.4–2.5 cm long, the ovary oblong, 5 mm long, 1.5 mm wide, glabrous, finely longitudinally impressed-striate, the ovules ca. 8-seriate in each locule; disk pulvinate, 0.7 mm long, 2 mm wide. *Fruit* a linear capsule, subterete 34–39 cm long, 0.9–1 cm wide, the calyx not persistent, glabrescently golden stellate tomentose; *seeds* not seen.

Distribution (Fig. 46). Poor rather sandy soils of central and upper Amazonia; below 500 m elevation.

Specimens examined. COLOMBIA. AMAZONAS: Pto. Nariño, Mar 1968 (st), *Diaz 12* (COL, CUVC).

ECUADOR. NAPO: Via Coca-Tiputini, Aug 1975 (st), *Little & Campaz s.n.* (Q).

PERU. LORETO: Jenaro Herrera, 9 Dec 1977 (fl), *Gentry et al. 21314* (MO); Alto Amazonas, Andoas, 15 Aug 1980 (fl), *Gentry et al. 29759* (MO); Yurimaguas, 5 km up Río Paranapura, Sep 1944 (fr), *Seibert 1945* (MO); Yurimaguas, *Tessmann 3770* (G, NY); Prov. Requena, J. Herrera, km 13, 31 Jul 1986 (st), *Vásquez & Jaramillo 7748* (MO); Quebrada Sucusari,

7 Oct 1986 (st), *Vásquez & Jaramillo 18127* (MO); Saboya, Río Pintuyacu, 19 Apr 1986 (st), *Vásquez et al. 7424* (MO). MADRE DE DIOS: Tambopata Nature Reserve, Ríos La Torre and Tambopata, 2 Jun 1987 (st), *Gentry et al. 58064* (MO, USM). SAN MARTÍN: Huallaga, entre Juanjui & Tingo de Saposoa, 5 Sep 1948 (fl), *Ferreya 4788A* (K, MO, USM); Picota, entre Bellavista y Chazuta, 17 Sep 1948 (fl), *Ferreya 4872* (MO, USM); Tocache Nuevo, 10 Mar 1979 (st), *Gentry et al. 25487* (MO, USM); 6 km S of Tarapoto, 18 Jul 1982 (st), *Gentry et al. 37682* (MO); 31 km S of Tarapoto, Río Huallaga, 20 Jul 1982 (st), *Gentry et al. 37803* (MO).

BRAZIL. AMAZONAS: Manaus, Reserva Florestal Ducke, 29 Oct 1968 (fl), *Aluisio 236* (INPA, UEC); Rio Uatuma, Itapiranga, Rio Uatuma, 27 Aug 1979 (fl), *Cid et al. 871* (NY); Manaus-Itacoatiara, km 104, May 1968 (st), *Coelho et al. s.n. (INPA21246)* (INPA); Manaus, Reserva Florestal Ducke, Oct 1970 (fl), *Rodrigues 8973* (INPA); Reserva Florestal Ducke, Jun 1966 (st), *Rodrigues & Osmarino 8139* (INPA). PARÁ: Belterra, 29 Jun 1947, *Black 47-969* (IAN, INPA); Belterra, 3 Jul 1947 (st), *Project 134 F-10* (US). RONDÔNIA: Brasília-Acre Highway, route to Nova Vida from Vilhena, 6 Sep 1963 (st), *Maguire et al. 56594* (COL, MO).

Common name. Peru: tahuari. Brazil: pau-d'arco, pou-d'arco, pau-d'arco amarelo.

Uses. The bark of this species has been reportedly used as an additive to the hallucinogenic beverage ayahuasca in Amazonian Peru (Luna, 1984).

The only Amazonian *Tabebuia* with a very fine dense silvery to tannish indumentum on the leaf underside. The closest relative is *T. arianae* of central coastal Brazil, which has more bullate leaflets and a longer, completely glabrous fruit.

There are two unidentified collections related to *T. incana* from Amazonian Venezuela but which differ in having more coriaceous leaflets with conspicuous black glands along the midvein below and a finely yellow-puberulous fruit with conspicuously darker glandular areas; the calyx is persistent in fruit and is finely yellowish tomentose with conspicuous glands as in *T. barbata*. These collections—*Williams 14900* (VEN) from Río San Miguel, Alto Río Negro, and *Huber 1861* (MO) from Canaripo, Río Ventuari—probably represent a new species which, in the absence of flowers, I have refrained from describing.

48. *Tabebuia insignis* (Miquel) Sandwith, Rec. Trav. Bot. Neerl. **34**: 224. 1937.

A variable species with at least three recognizable varieties.

Distribution (Fig. 54). Southern Colombia and Venezuela to the Guianas, south through most of non-coastal Brazil to Bolivia; sea level to 1700 m.

Tabebuia insignis is often locally common in the poorly drained swampy areas where it mostly occurs, and sometimes forms nearly pure stands. It is distinguished by the combination of white flowers with leaves and calyx completely glabrous except for lepidote scales. This species differs most strikingly from *T. fluviatilis*, the only sympatric species with palmately compound glabrous leaves and white flowers, in having winged wind-dispersed seeds. As here interpreted, *T. insignis* is vegetatively very polymorphic in leaf texture and number of leaflets. I have accorded varietal recognition to the unifoliolate and simple-leaved entities but have not attempted to recognize the differences in leaflet number, shape, and texture that characterize *T. dura*, *T. roraimae*, and other unnamed Guiana shield variants.

Key to the Varieties

1. Leaves mostly (3)–5–7-foliolate. . . . var. *insignis*.
1. Leaves simple or 1-foliolate.
 2. Leaves more than 14 cm long and 6 cm wide, mostly elliptic or elliptic-oblong, the base obtuse or broadly cuneate; secondary veins prominent below; Guayana to Amazonia. var. *monophylla*.
 2. Leaves less than 13 cm long and 4.2 cm wide, obovate to oblanceolate, cuneate-attenuate at base; secondary veins not raised below; Guayanan Colombia and adjacent Venezuela, mostly near Rio Orinoco. var. *pacimonensis*.

48a. *Tabebuia insignis* var. *insignis*.

- Tabebuia fluviatilis* Klotz in Schomburgk, Reise 3: 1085. 1848, non A. P. de Candolle. 1845, nom. nud.
- Tabebuia triphylla* Klotz in Schomburgk, Reise 3: 1085. 1848, non A. P. de Candolle, 1845, nom. nud.
- Tecoma insignis* Miquel, Stirp. surinam select. 122. 1850. Type. Surinam. Kappler 1697 (holotype, U).
- Tabebuia roraimae* Oliver, Trans. Linn. Soc., ser. 2, 2: 280, t. 45. 1887. Type. Guyana. Mt. Roraima, Mt. Roraima Exped. 64 (holotype, K; isotype, US).
- Gelsemium insigne* (Miquel) O. Kuntze, Rev. gen. 2: 480. 1891.
- Tecoma roraimae* (Oliver) K. Schumann in Engler & Prantl, Pflanzenfam. 4(3b): 238. 1894.
- Tecoma dura* Bureau ex K. Schumann in Engler & Prantl, Pflanzenfam. 4(3b): 238. 1894. Type. Guyana. Schomburgk 658 (B*, lectotype, K).
- Tecoma leucoxydon* (Linnaeus) Martius ex A. P. de

Candolle var. *salpingophora* Bureau & K. Schumann in Martius, Fl. bras. 8(2): 342. 1897. Type. Venezuela. Amazonas: Casiquiare, Spruce 3374 (B*, lectotype, K; isotypes, G, NY, W).

Tecoma albiflora Ducke, Arch. Jard. Bot. Rio de Janeiro 4: 175. 1925. Type. Brazil. Rio de Janeiro, Ducke s.n. (RB18173) (holotype, RB; isotypes, INPA, K, S, U, US).

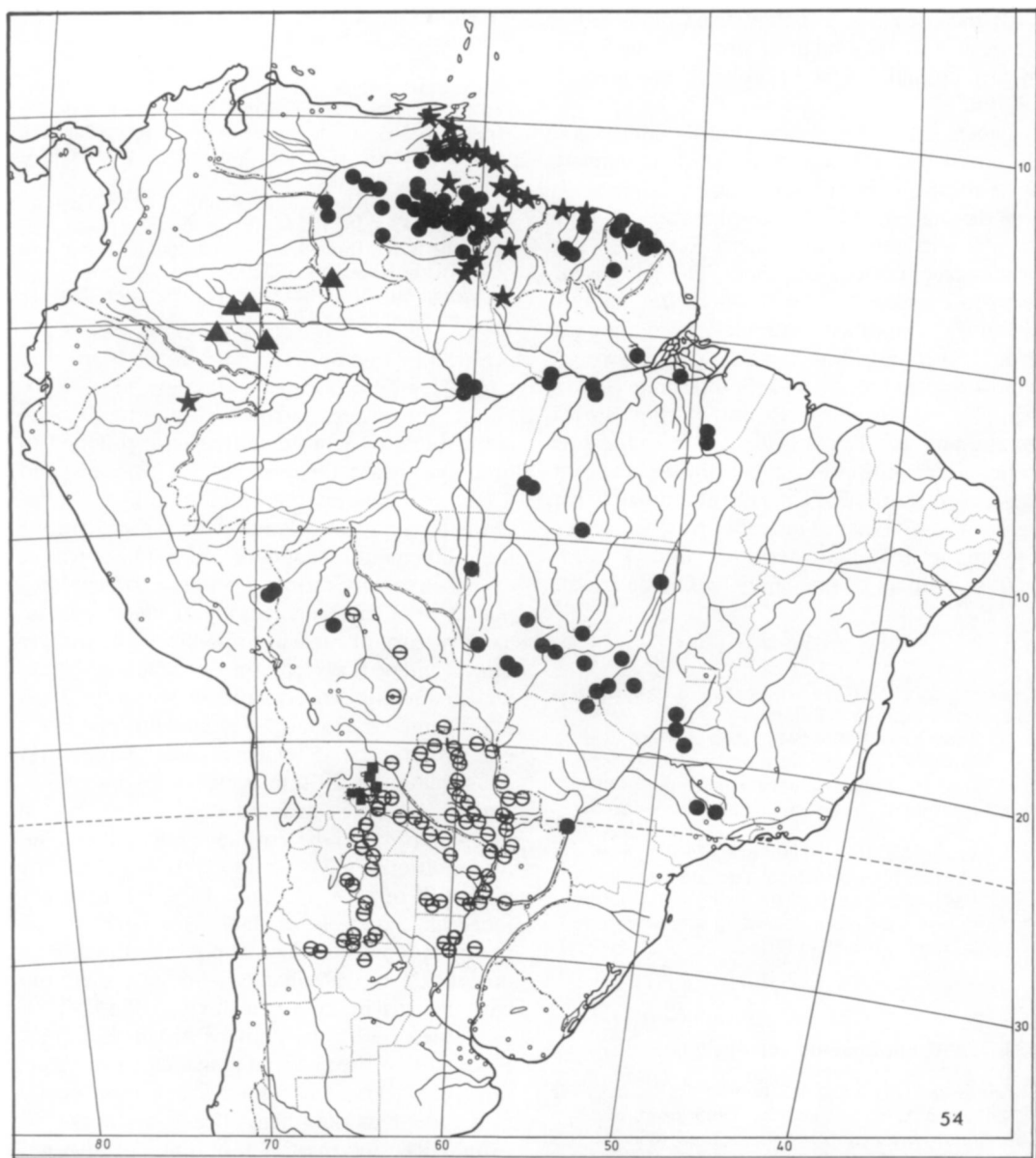
Bignonia dura Klotz ex R. Knuth, Feddes Repert., Beihefte 43: 638. 1827, nom. nud.

Tabebuia dura (Bureau ex K. Schumann) Sprague & Sandwith, Kew Bull. 1932: 21. 1932.

Handroanthus durus (Bureau & K. Schumann) Mattos, Loefgrenia 50: 4. 1970.

Shrub or *tree* up to 11 m tall, the branchlets terete, lepidote. *Leaves* palmately (3)–5–7-foliolate, the leaflets narrowly elliptic to oblanceolate, acute to acuminate, the base rounded to broadly cuneate, the terminal to 19 cm long and 8 cm wide, the laterals smaller, entire, chartaceous to coriaceous, lepidote above and below, the midvein and secondary nerves raised below, drying olive-gray; terminal petiolule to 5 cm long, petiole to 16 cm long, lepidote. *Inflorescence* an axillary corymb, usually few-flowered, the peduncle and pedicels lepidote, the bracts and bracteoles subulate, densely lepidote, with small buds at the same time as large buds and flowers. *Flowers* with the calyx campanulate, irregularly 2–3-labiate, 15–20 mm long, 11–14 mm wide, densely lepidote, eglandular or with scattered plate-shaped glands; corolla white, tubular-infundibuliform, 6.5–11 cm long, 1.4–2.5 cm wide at mouth of tube, the tube 4.5–8 cm long, the lobes 1.5–2.5 cm long, glabrous outside or with scattered lepidote scales, the lobes ciliate, lepidote inside, the tube inside glandular-puberulous with short trichomes in the throat, villous at level of stamen insertion; stamens didynamous, the thecae divaricate, 3.5 mm long; pistil 3.3–3.4 cm long, the ovary linear-oblong, 5–6 mm long, 1 mm wide, lepidote, the ovules 2-seriate in each locule; disk pulvinate, 1 mm long, 3 mm wide. *Fruit* a linear-oblong capsule, subterete, contracted toward base and apex, the calyx usually persistent, 20–24 cm long, 1.2–1.3 cm wide, conspicuously lepidote; *seeds* thin, bialate, 5–6 mm long, 2.5–3 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from the seed body.

Distribution (Fig. 54). Southern Colombia and Venezuela to the Guianas and south through most of Brazil to Bolivia; often in poorly drained places; near sea level to 1700 m.



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FIG. 54. Distribution of South American *Tabebuia*. ● = *T. insignis* var. *insignis*; ★ = *T. insignis* var. *monophylla*; ▲ = *T. insignis* var. *pacimonensis*; ■ = *T. lapacho*; ⊖ = *T. nodosa*.

Representative specimens examined. COLOMBIA. VICHADA: San Borja, Ventanas, Río Orinoco, 17 Mar 1971 (fl, fr), *Pinto & Sastre* 1263 (COL).

VENEZUELA. AMAZONAS: Cerro Sipapo, Paraque, 25 Dec 1948 (fl), *Maguire & Politi* 27899 (IAN, INPA, NY, US, VEN). BOLÍVAR: Río Karum, Río Paragua,

Apr 1945 (fl, fr), *Cardona* 1192 (NY, US, VEN); Kamarata-Uriman trail, Río Hacha, Salto Hacha, 28 Feb 1967 (fl), *Koyama & Agostini* 7318 (MO, NY, VEN); Auyan-Tepui, Río Kabak, 12 km W of Misión de Kamarata, 27 Feb 1978 (fl), *Steyermark et al.* 116068 (MO); Río Villacoa, Salto de Humito, 7 Jan 1956 (fl),

Wurdack & Monachino 41172 (S, US, VEN). **DELTA AMACURO:** Antonio Díaz, Caño Araguao, 17 Oct 1977 (st), *Steyermark et al. 114790* (MO).

GUYANA. Upper Mazaruni River, Adara River, trail to Pipilipai, 6 Sep 1960 (fl), *Tillett & Tillett 45301* (MO); Sukabi River, affl. Ireng R., Ando Falls, Pakaraima Mts., *Maguire et al. 46168A* (NY).

SURINAM. Saramacca, Kappel-Savanna, Tafelberg, 20 Feb 1961 (fl), *Kramer & Hekking 2949* (C, IJ, MO); Tafelberg, *Maguire 24639* (NY); Jodensavanne-Mapane Kreek area, Feb 1964 (fl), *Elburg s.n., F.S. 9849* (LL).

FRENCH GUIANA. Plain de Kaw, Crique Angélique, 13 Apr 1984 (fl), *de Granville 6784* (MO); Route Cayenne-St. Laurent, PK 220, 31 Jan 1983 (fl), *Creemers 7846* (CAY, MO); Cayenne-Regina Hwy., 5–6 km N of Rivière La Comte, 21 Feb 1985 (st), *Gentry & Zardini 50254* (MO).

PERU. MADRE DE DIOS: Tambopata, 30 km SSW of Puerto Maldonado, 21 Apr 1980 (fl, fr), *Barbour 4884* (MO); Tambopata, Explorer's Inn, junction of Ríos La Torre and Tambopata, 26 Jul 1985 (fl, fr), *Gentry et al. 51380* (MO, USM).

BRAZIL. AMAZONAS: Manaus, Igarapé Santa Maria, 4 Jan 1956 (fl), *Chagas & Coelho s.n. (INPA3262)* (INPA, MG); Manaus, Pensador, 10 Apr 1942 (fl), *Ducke 917* (F, IAN, MG, MO). GOIÁS: Rod. Morrinhos-Campos Novos, Morrinhos, 4 Oct 1976 (fl, fr), *Hatschbach 38910* (MO); 40 km S of Caiapônia, Serra do Caiapo, 26 Oct 1964 (fr), *Prance & Silva 59664* (MO, S). MATO GROSSO: Cachoeirão, Mun. Taranos, 13 Aug 1970 (fl, fr), *Hatschbach 24616* (C, MBM, MO); Barro do Garças, 45 km N, 15 Oct 1964 (fl), *Irwin & Soderstrom 6923* (MBM, MO, NY). MATO GROSSO DO SUL: Mun. Mundo Novo, 5 km de La Balsa, Rio Parana, 16 Dec 1983 (fl, fr), *Callejas et al. 1971* (MO). MINAS GERAIS: Ituiutiba, Faz. do Carralhu, 7 Jul 1944 (fl), *Macedo 401* (RB, S). PARÁ: Rio Jari, Monte Dourado, estrada para Munguba, 6 Nov 1969 (fl), *Cavalcante 2315* (MG, MO); Belém, Marabá, estrada do Amapá, Nov 1970 (fl, fr), *Coelho 65 (INPA28389)* (INPA, MO); Campos do Tigre, Faro, 21 May 1911 (fl, fr), *Ducke s.n. (RB18173)* (INPA, K, RB, S, U, US). RORAIMA: Serra do Sul, Venezuela frontier, Caju and Vista Geral, 3 Jan 1955 (fl), *Maguire & Maguire 40475* (K, NY); Roraima, Campos, Dec 1909 (st), *Ule 8761* (L, MG). SÃO PAULO: San Carlos, 4.5 km N of São Carlos, road to Ribeirão Preto, 18 May 1981 (fl), *Freitas Campos 4* (US); Mun. Mogi-Guaçu, Reserva Florestal du Fazenda Campininha (fl), *Gibbs & Leitão F., 2903* (UEC).

BOLIVIA. BENI: Ballivian, Espiritu, Río Yacuma, 27 Jul 1981 (fl, fr), *Beck 5495* (MO).

Local names. Venezuela: cacho de chivo, apamata, mahari tarkari, imauaritarkari.

48b. *Tabebuia insignis* var. *monophylla* Sandwith, *Rec. Trav. Bot. Neerl.* **34**: 225. 1937. Type. Based on *T. longipes* Baker.

Tabebuia longipes Baker. *Ic. Pl.* **18**: t. 1738. 1888. Type. Guyana. *Jenman 3723* (holotype, K; isotype, NY).

Small to large tree to 35 m. Leaves simple, elliptic, acute to short acuminate, the base rounded or very broadly cuneate, 14–25 cm long, 6–10 cm wide, entire, coriaceous to subcoriaceous, lepidote on both sides, the secondary nerves conspicuous and raised below, olive or olive-gray when dry, the main nerves contrastingly darker below; petiole 2–7 cm long, lepidote. Inflorescence and flowers as in *T. insignis* var. *insignis*. Fruit a capsule, as in *T. insignis* var. *insignis* but shorter, 12 cm long, 1.2 cm wide, the seeds 8–9 mm long, ca. 3 cm wide.

Distribution (Fig. 54). The Guyana region, especially in swampy forest near the coast, from extreme northeast Venezuela to Surinam; also found scattered through range of the species, especially in westernmost Amazonia; sea level to 500 m elevation.

Representative specimens examined. VENEZUELA. BOLÍVAR: Alto Río Cuyuni, Río Chicanan, 2 km S of Río Chibau, 1 Sep 1962 (fl), *Maguire et al. 53552* (MO). DELTA AMACURO: Asseradera El Morro, Atabuina, Caño Arature, 11 Apr 1959 (st), *Buza 7536* (NY, VEN); Río Acure, 13 Apr 1955 (fl), *Wurdack 337* (K, US). SUCRE: N del Lago de Guanoco, Aug 1955 (fl, fr), *Lasser & Vareschi 3943* (VEN).

GUYANA. Bartica, Essequibo River, 3 Sep 1922 (fr), *de la Cruz 1940* (F, MO, NY); Barima River, NW Distr., 19 Mar 1923 (st), *de la Cruz 3377* (F, MO, NY); Essequibo River, mouth of Onoro Creek, 15 Dec 1927 (fl), *A. Smith 2802* (F, MO, S).

SURINAM. Zanderij I., Dec 1942 (st), *Stahel 174* (CAY, MO, WIS); Zanderij I., 20 Nov 1919 (fl, fr), *w/o collector 4473* (U).

PERU. LORETO: Quistacocha, near Iquitos, 30 Dec 1975 (fl), *Ayala 893* (AMAZ, MO); Quistacocha, 17 Mar 1982 (fl), *Gentry et al. 36410* (AMAZ, MO).

BRAZIL. RORAIMA: São Marcos, entre los Ríos Tacutu-Uiraricuera, 3 Sep 1951. *Black 51-13261* (IAN); Boa Vista-Caracarahy, 3 Feb 1948 (fl), *Froes 22944* (IAN).

Local names. Venezuela: apamate, aheru.

48c. *Tabebuia insignis* var. *pacimonensis* Sandwith, *Mem. N.Y. Bot. Gard.* **9**: 365. 1957. Type. Venezuela. Amazonas: Río Pacimoni, *Maguire et al. 36671* (holotype, NY).

Shrub or small tree. Leaves simple, oblanceolate, obtusely cuspidate-acuminate, cuneate-attenuate at base, 8–13 cm long, 3–4.2 cm wide, entire, rigid-chartaceous with revolute margins, the lateral nerves plane and inconspicuous on the lower surface, inconspicuously lepidote-punctate above and below; petiole 1–1.5 cm long.

Inflorescence and *flowers* as in *T. insignis* var. *insignis*. *Fruit* a capsule.

Distribution (Fig. 54). Guayanan Colombia and adjacent Amazonian Venezuela, mostly near the Orinoco river.

Collections examined. COLOMBIA. AMAZONAS: Río Cahuinari, 31 Jan 1988 (fl), *Sanchez et al.* 45 (ARAR); Aracuara, Isla Mariname, zona de Caraguchal, 16 Apr 1986 (fl), *Torres et al.* 3296 (COL). VAUPES: Yurupari Falls, 10 Nov 1943 (fl), *Allen* 3170 (COL, MO); Yurupari, 3 Mar 1944 (fl), *Gutiérrez & Schultes* 925A (COL); Río Yi, 10 Dec 1952 (fr), *Romero-Castañeda* 3939 (COL).

VENEZUELA. AMAZONAS: Río Pacimoni, Maguire et al. 3671 (NY).

Several collections of *T. orinocensis* from the Puerto Ayacucho area were inadvertently cited under *T. insignis* var. *pacimonensis* in the *Flora of Venezuela* treatment.

49. *Tabebuia jackiana* Ekman ex Urban. Feddes Repert 22: 86. 1925. Type. Cuba. Pinar del Río: Prope Mendoza, 150 m, *Ekman* 16736 (holotype, S; isotypes, B, MO, NY, S).

Shrub or small dichotomously branched *tree*, the branchlets more or less terete, lepidote with small scales, especially densely at nodes, the leaves mostly clustered near branch apices. *Leaves* simple (one or two usually incompletely divided, 2–3-foliolate leaves occasionally also present), narrowly oblong, the apex obtuse to acutish and usually conspicuously apiculate, the base rounded to truncate or very slightly subcordate, 1.3–8 cm long, 0.7–2.4 cm wide, coriaceous, the margin slightly erose, lepidote with small scales above, below densely lepidote with individually poorly defined scales over surface and also with scattered larger conspicuous lepidote scales, gray to olive gray above, the secondary veins and tertiary venation paler than surface and prominent below, surface rough to touch above, the midvein impressed above, lateral leaflets rare, when present sessile, asymmetric, and sometimes not completely separated from central leaflet; petioles 0.2–1.0 cm long. *Inflorescence* of one or two flowers at a branch apex, the pedicel lepidote, 1–1.5 cm long, ebracteolate or with a pair of inconspicuous bracteole scars near base. *Flowers* (not dissected) with the calyx campanulate, irregularly 2–3-lobed, 7–13 mm long, 4–6 mm wide, drying dark with grayish lepidote scales; corolla white (fide Urban), infundibuliform, 3–

4.5 cm long, 0.7–1.5 cm wide at mouth of tube, the tube 2.5–3.5 cm long, the lobes 0.5–1 cm long, ciliate on lobes and sparsely puberulous with short trichomes on inner surface of lobes. *Fruits* unknown.

Distribution (Fig. 53). Known only from limestone rocks at low altitude in westernmost Cuba; below 200 m elevation.

Collections examined. CUBA. PINAR DEL RÍO: Mendoza, Cerro de Mendoza, on limestone, 150 m, 16 Jun 1923 (fl), *Ekman* 16736 (B, MO, NY, S); Guane, Sierra de Guane, Jurassic limestone mountain, in very exposed localities on highest top of Sierra, 14 Mar 1924 (fl), *Ekman* 18726 (HAC, S).

This species is known only from a few collections from near the western tip of Cuba. Although described by Urban as mostly unifoliolate, rarely 2–3-foliolate, Alain (1957) keys it out as having leaves mostly 3-foliolate with a parenthetical note that some leaves of this species are even 4-foliolate. Of the material I have seen, one isotype (NY) has one three-foliolate leaf, a second isotype has single 2-foliolate and three-foliolate leaves, and the holotype has one 2-foliolate and two 3-foliolate leaves; all other leaves are simple. The paratypes (*Ekman* 18726) include branchlets with uniformly simple leaves and others with a mixture of simple and 3-foliolate leaves or uniformly 2- and 3-foliolate leaves, the latter obviously in juvenile condition. It is possible that the two shoots with compound leaves, which also have a different smoother bark and large elliptical leaflets (to 4 × 2 cm with a 1.5 cm long petiole) represent a juvenile growth form, introgression from a sympatric species, or perhaps a mixed collection. The great majority of leaves seem to be simple rather than unifoliolate since there is no evident articulation and they fall with the petiole attached. The species is closest to uniformly simple-leaved *T. myrtifolia*, forming the westernmost and physiognomically most mesic element in the cline in leaf size, shape, and degree of scaling discussed under that species. It is also very close to *T. glaucescens* of Las Villas Province which differs in being largely 3-foliolate; the unifoliolate leaves of *T. glaucescens* are more obovate, cuneately narrowed toward the base and jointed at the petiole apex, the blade mostly falling detached from the petiole.

A note on one of the collections indicates that *T. calcicola*, which has similar leaflets but con-

sistently compound leaves, is common in the same area and it is possible that *T. jackiana* represents hybridization between *T. calcicola* and a simple-leaved species like *T. myrtifolia*.

50. *Tabebuia lapacho* (K. Schumann) Sandwith, *Lilloa* **14**: 136. 1948.

Tecoma lapacho K. Schumann, *Pflanzenfam.* **4(3b)**: 238. 1894. Type. Argentina. Salta: Between Oran and San Andrés, *Lorentz & Hieronymus* 278 (B*, lectotype, G; isotype, CORD (fide Fabris), K—drawing).

Tabebuia flavescens (Vellozo) Grisebach, sensu Grisebach, *Symb. fl. Argent.* 257. 1879, non Vellozo.

Tree 8–12 m tall; twigs subterete to subtetragonal, finely stellate puberulous when young, glabrescent. *Leaves* palmately 5(–7)-foliolate, the leaflets elliptic to obovate, obtuse to sharp-acuminate, rounded to truncate at base, the terminal leaflet 7–14 cm long, 2.5–7 cm wide, the lateral leaflets progressively smaller, more or less sharply serrate, at least in upper half, membranaceous to chartaceous, lepidote above and below, when young stellate and dendroid pubescent above and below, especially along main veins, becoming smooth and almost completely glabrescent; terminal petiolule 3–5 cm long, the laterals shorter, the petiole 5–13 cm long, tannish stellate pubescent to glabrate. *Inflorescence* a fairly open terminal panicle, the branches tannish villous mostly with dendroid trichomes, the bracts linear to 5 mm long. *Flowers* with the calyx campanulate, irregularly 5-lobed, 15–20 mm long, 6–10 mm wide, conspicuously stellate and short-dendroid pubescent, the tannish trichomes less than 1 mm long, the lobes pubescent only on midribs, leaving patches of the dark-drying calyx surface exposed; corolla yellow, drying with the lobes and tube more or less concolorous, varying from faded yellowish to black, tubular-infundibuliform, 5–6.5 cm long, the tube 3.5–4.5 cm long and 1.5–2 cm wide at mouth, the lobes 1–2 cm long, glabrous outside except for a few inconspicuous lepidote scales, inside rather densely pubescent in floor and throat with flat stiffly erect longish trichomes, especially in the sinuses of lower lobes and throat ridges, also glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divaricate, 3 mm long; ovary linear, 5–6 mm long and 1 mm wide, glabrous, drying dark, the surface somewhat glandular or minutely verrucose but not clearly lepidote; disk

patelliform-pulvinate, 1 mm long, 3 mm wide. *Fruit* (only 1 seen) a linear-cylindric capsule ca. 30 × 1.5 cm, glabrous, the valves thin, striate-ridged; seeds not seen.

Distribution (Fig. 54). Moist subtropical forest of the Río Tarija area of extreme northern Argentina and adjacent Bolivia; 1400–1750 m.

Specimens examined. **BOLIVIA.** **TARIJA:** O'Connor, 8.6 km NW of Entre Ríos, Tarija-Padcaya, 3 May 1983 (st), *Solomon* 10429 (MO); Narvaez-Entre Ríos, 2.8 km SE of Narvaez, 4 Oct 1983 (fl), *Solomon* 11031 (MO).

ARGENTINA. **JUJUY:** Dep. Ledesma, Lleguado a Abra de Canas, 13 Sep 1971, *Legname* 8583C (MCNS). **SALTA:** Oran, Río Pescado, 30 Sep 1946, *Castiglioni & Tinto* D2991 (K); Sta. Victoria, camino al Lipeo, 17 km de Las Toldos, 6 Sep 1971 (fl), *Legname* 8576C (MCNS); Dep. Santa Victoria, Caminos Toldos a Lipeo, 8 km de Lipeo, 4 Oct 1973 (fl), *Legname & Cuezco* 9727C (CTES), 16 Sep 1972 (fl), *Marmol & Cuezco* 9250 (CTES, MCNS); Tartagal, Campamento San Pedro, 16 Oct 1941 (fl), *T. Meyer* 15204 (K); Dep. Sta. Victoria, camino de Toldas a Lipeo, 12 km de Toldas, 19 Aug 1971 (fl, fr), *Vervoorst & Legname* 4497 (CTES, MCNS).

Local names. Lapacho amarillo.

As here interpreted, this is a narrow endemic of moist upland subtropical forest in the Oran area of Salta Province, Argentina and the adjacent part of Tarija, Bolivia. As thus narrowly interpreted, most of the Argentinian material cited by Fabris as *T. lapacho* is apparently referable to *T. ochracea*. These collections differ from *T. lapacho* in entire or slightly and shallowly toothed leaflets that are rough above (from persistent thick-based trichomes) and a shorter calyx without the conspicuous dark-drying patches of non-pubescent surface between the calyx lobes. The excellent recent series collected by Solomon in Tarija suggests that these concepts may intergrade and more collections, especially of fruits, are needed to clarify the situation.

51. *Tabebuia lepidophylla* (A. Richard) Greenman *in* Combs, *Trans. Acad. Sci. St. Louis* **7**: 451. 1897.

Bignonia lepidophylla A. Richard *in* de la Sagra, *Hist. Cuba* **11**: 104. 1850. Type. Cuba. Isla de Juventud (Isle of Pines), *Lanier s.n.* (not seen). Type illustration, A. Richard, *Hist. Cuba* t. 59.

Tecoma lepidophylla (A. Richard) Grisebach, *Mem. Amer. Acad.*, n.s. **8**: 524. 1862.

Shrub or small *tree* 0.3–3 m tall, the leaves somewhat clustered toward branch apices, the

branchlets ridged below leaves, more or less triangular in cross section, subterete with raised leaf scars when older. *Leaves* simple, in whorls of three, obovate to elliptic or oblanceolate, abruptly apiculate at apex (typically \pm truncate except the apicule, sometimes emarginate with a down-curved apicule), cuneate to rounded at base, 2–8.5 cm long, 0.8–4 cm wide, thick coriaceous, densely tannish lepidote below, less densely lepidote and brown or olive brown above, the secondary veins not evident to slightly prominulous below, with conspicuous glands near base of midvein below, the margin usually slightly involute, more or less serrulate toward apex; petioles 0.3–1.5 cm long. *Inflorescence* a single terminal flower or terminal fascicle of 2–5 flowers, the pedicels 0.3–1.8 cm long. *Flowers* with the calyx infundibuliform, irregularly 2–3-labiate, 10–16 mm long, 7–10 mm wide, drying dark but appearing tannish from the dense covering of large and small brownish lepidote scales outside, also lepidote inside; corolla white (usually) or pinkish, tubular-infundibuliform, 3.5–6 cm long, 1–2 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 0.5–1.5 cm long, lepidote with scattered large glandular scales outside, the lobes more or less ciliate with crisped multicellular trichomes, lobes puberulous to glabrous inside, the tube pilose in floor and at level of stamen insertion; anthers 3 mm long; ovary linear-oblong, densely tannish lepidote, 3 mm long, 1 mm wide; disk annular-pulvinate, 1 mm long, 2–3 mm wide. *Fruit* linear-cylindric, 6–13 cm long, 0.6–0.8 cm wide, densely lepidote, longitudinally ribbed, subtended by the persistent calyx; *seeds* thin, bilate, 5–7 mm long, 17–35 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Pine savannas of western Cuba, mostly below 100 m elevation.

Specimens examined. CUBA. ISLA DE JUVENTUD: Near Santa Fé, 27 Jul 1928 (st), *Ansovin 1015* (GH, NY); Las Tunas, 16 Mar 1916 (fl), *Britton & Wilson 15508* (NY, US); near Nueva Gerona, 11 Apr 1904 (fl, fr), *Curtiss 441* (BM, CM, G, GH, HAC, HBG, K, L, MO, NY, US); MacKinley, 4 Nov 1920 (fl, fr), *Ekman 12105* (S); near Nueva Gerona, 5 May 1910 (fl), *Jennings 6* (CM, MO, NY, US); km 10, hwy. from Nueva Gerona to Santa Fé, 29 Apr 1951 (fl), *Killip 41291* (US); Nueva Gerona, 8 Sep 1955 (fl), *Killip 45039* (US); road from Nueva Gerona to Santa Bárbara, 27 Apr 1956 (fl), *Killip 45688* (US); road to San Francisco de Las Piedras, 19 May 1957 (fr), *Killip 45890* (US); 2 km N of Nueva Gerona, 8 Feb 1956 (st), *Morton 9956*

(US); near San Pedro, 8 Feb 1956 (st), *Morton 10020* (US); near Nueva Gerona, 28 Jun 1900 (fl), *Palmer & Riley 863* (US), Jul 1900 (fl, fr), *Palmer 1023* (US); sin. loc., 25 Jun 1901 (st), *Taylor 179* (NY, US); Puerco Gordo, Jul 1865 (fl, fr), *Wright 1341pp* (GH, K, MO, S). PINAR DEL RÍO: Vic. of Herradura, 28 Aug 1910 (fl, fr), *Britton et al. 6444* (NY); vic. of Pinar del Río, 5 Sep 1910 (fl, fr), *Britton et al. 6981* (NY); Sierra de Cabra, 6 Mar 1911 (fl), *Britton et al. 9802* (NY); Herradura, 10 Apr 1920 (fl), *Ekman 10688* (B, MO, S); Paso Real, 30 Jun 1905 (fl), *Hermann 771* (BM, NY); Savanna San Julian, S of Guane, 29 Dec 1916 (fl), *León & Roca 6888* (NY); between San Diego and Cajalbana, 5 Apr 1915 (fl), *León & Charles 6893* (NY); savanna de Los Palacios, 7 Aug 1917 (fl), *León & Roca 7367* (NY); E of Cajalbana near La Palma, 17 Mar 1957 (fl, fr), *Proctor 16394* (IJ); near Mangas, 24 Jul 1937 (fr), *León 16943* (NY); Pinar del Río, 24 Apr 1903 (fr), *Shafer 303* (CM, HAC, NY); W of Guane, 24 Apr 1903 (fl, fr), *Shafer 10622* (NY); sin. loc., 8 Dec 1911 (fl), *Shafer 10849* (NY).

52. *Tabebuia lepidota* (Humboldt, Bonpland & Kunth) Britton, *Bull. Torrey Bot. Club* **42**: 377. 1915.

Bignonia lepidota Humboldt, Bonpland, & Kunth, *Nov. gen. sp. pl.* 3: 139. 1919. Type. Cuba. Habana: Between Havana and Regla, *Humboldt & Bonpland 1538* (B-WILLD).

Tecoma lepidota (Humboldt, Bonpland & Kunth) A. de Candolle, *Prodr.* **9**: 220. 1845.

Tabebuia coartata Urban, *Symb. antill.* **9**: 260. 1924. Type. Cuba. Pinar del Río: Loma de Cajalbana in cuabal, 10 Mar 1920 (st), *Ekman 10486* (holotype, S, NY—fragm.).

Tabebuia tortuensis Urban & Ekman, *Arkiv. Bot.* **21A(5)**: 95. 1927. Type. Haiti. Tortue Island, limestone terraces, 28 May 1925 (fl, fr), *Ekman H4148* (holotype, S; isotypes, G, K, MO—fragm., NY, S).

Tabebuia pergracilis Britton & Wilson ex Alain, *Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle"* **15**: 17. 1956. Type. Cuba. Sancti Spiritus (Las Villas): Loma de Ponciano, Grupo Sancti Spiritus, Santa Clara, *León & Clement 6702* (NY).

Shrub or small *tree*, usually to 4 m, occasionally to 6 m tall, dichotomously branched, the branchlets terete to subtetragonal, glabrescently lepidote, usually with both sessile and short-stalked peltate reddish scales. *Leaves* mostly 3–5-foliolate, frequently in part 1(–2)-foliolate, the leaflets oblong-elliptic to oblong-oblanceolate or narrowly obovate, more or less rounded but often sharply apiculate at apex, sometimes retuse, especially when larger, the base cuneate to rounded, the terminal 1.3–5(–6) cm long, 0.5–2(–2.5) cm wide, the basals 0.7–4 cm long, 0.3–2 cm wide, coriaceous to thick-coriaceous, varyingly lepidote above, densely lepidote below, usually

with a mixture of reddish brown and whitish sessile peltate scales, drying olive to dark brown above, brown to olive gray below, the secondary veins subplane and inconspicuous above and below, the surface smooth or slightly rough to the touch, the margin entire when on serpentine, often more or less erose when on limestone, usually more or less revolute, especially on serpentine; petiolules often not well-differentiated, the longest usually <3 mm long (rarely to 5 mm long, but only when the leaflets are strongly coriaceous and usually narrowly oblanceolate-oblong), the petioles short, 0.3–1(–1.5) cm long, often rather thickish and drying more or less yellowish-tan, densely lepidote, sometimes also with some stalked-lepidote scales or their simple stalk-residues. *Inflorescence* usually a single terminal flower or sometimes 2–3, densely lepidote, usually including a few short-stalked peltate trichomes, these mostly reddish and the inflorescence then somewhat rufescent. *Flowers* with the calyx irregularly shallowly 2–4-labiate, 7–15 mm long, 5–10 mm wide, densely lepidote with uniformly sessile scales, drying dark or somewhat rufescent; corolla white to lavender, tubular-infundibuliform above the narrow base of the tube, 3–5 cm long, 1–1.5 cm wide at mouth of tube, the tube 2.5–3 cm long, the lobes 1–1.5 cm long, glabrous outside, the lobes ciliate with multicelled trichomes, sparsely to conspicuously puberulous in throat with long thin-walled several-celled trichomes mostly along the plicae, only slightly villous at level of stamen insertion; anthers included deep inside tube, the thecae divaricate, 2 mm long; pistil ca. 1.5–2 cm long, the ovary linear-oblong, 3 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* linear cylindrical, the valves thin, the surface usually somewhat irregular, often inconspicuously striate, densely lepidote with sessile blackish peltate scales, 6–11 cm long, 5–7 mm wide, drying black or dark brown, the calyx persistent; *seeds* thin, bialate, 4–5 mm long, 15–22 mm wide, the hyaline membranaceous wings distinctly demarcated from seed body.

Distribution (Fig. 53). Serpentine barrens and palm barrens of Pinar del Río, Habana, Matanzas, and Las Villas Provinces, Cuba; also Tortue Island, Haiti, and the Bahamas; below 100 m elevation.

Representative specimens examined. BAHAMAS. ANDROS: Nicholl's Town, 5 Mar 1907 (st), *Brace 6765*

(NY); Prusen Pt., Song Ridge Cay, 17 Jun 1890 (st), *Northrop & Northrop 660* (A, K, NY). GREAT INAGUA: Smith's Thatch Pond, 23 Jul 1976 (fl), *Correll 47465* (IJ, MO, NY). INAGUA: 21 Oct 1970 (fl), *Gillis 9899* (FTG, MO). NORTH ANDROS: Bail Road, NW of Cardgill Creek, 8 Dec 1976 (fl), *Correll & Proctor 47843* (IJ). SAN SALVADOR: Watlin Island, *Worthington s.n.* (CM).

CUBA. CIENFUEGOS: Castillo de Jagua, Cienfuegos Bay, 25 Mar 1911 (fl), *Britton et al. 10287* (NY). GUANTÁNAMO: Loma del Esparto between Yauco and Cajobaba, 17 Jul 1924 (st), *León 12114* (NY). HABANA: South of Guanabacoa, 20 Feb 1905 (fl, fr), *Curtiss 653* (A, BM, HBG, K, L, MO, NY, US); Rotilla, near Santa Cruz de Norte, 35 km E of Habana, 6 Jul 1985 (fl), *Gentry 50879* (MO). MATANZAS: San Miguel de los Banos, 10 Oct 1950 (fl), *Alain 1635* (GH, NY); cuabal del Espuial, east of Cauasi, 28 Feb 1927 (fl), *León 12978* (NY). PINAR DEL RÍO: Loma Pelada de la Cajalbana, La Palma, 10 Feb 1951 (st), *Alain 1765* (HAC, NY); Loma de Cajalbana, 10 Mar 1920 (st), *Ekman 10486* (MO, NY, S). VILLA CLARA: Santa Clara, 21 Mar 1911 (fl), *Britton & Cowell 10169* (NY, US); Manacas, central highway, 15 Mar 1933 (fl), *Jack 8642* (A, NY, S).

HAITI. Isla de la Tortue, Pte. Ouest, Pte. Petit-Bois, 28 May 1925 (fl), *Ekman H4148* (G, K, MO, NY, S); Vic. of La Vallée, 3 May 1929 (fl), *Leonard & Leonard 15379* (A, GH, K, US).

VIRGIN ISLANDS. ANEGADA: West end, 31 Jul 1970 (fl), *D'Arcy 4841* (C, MO, US).

Local names. Bahamas: one toe. Cuba: roble sabanero, roble de sabana.

This is the small coriaceous-leaved extreme of the *T. heterophylla* complex. Besides leaf size and texture (which overlap with other forms related to *T. heterophylla*), *T. lepidota* is characterized by narrow, more oblanceolate, leaflets, often with an emarginate apex, shorter petiolules (even the terminal leaflet usually subsessile), shorter thicker petioles, and more revolute margins than other relatives of *T. heterophylla*. A large-leafleted extreme (terminal leaflet to 6 × 0.8 cm) has been described as *T. pergracilis* but the narrow oblanceolate subsessile and in part emarginate leaflets are exactly those of *T. lepidota*; indeed the unusually long leaflets of the type must represent a juvenile growth form since there is a typical *T. lepidota* leaf with small leaflets at the base of one of the branchlets. Collections from the Lesser Antilles (Anguilla, St. Martin, Barbuda) included in this species by Howard (in prep.) tend to have slightly larger dimensions than described here.

The leaf dimensions of *T. lepidota* are identical with those of closely related *T. maxonii* of the Dominican Republic; that species differs vegetatively mainly in a rough-feeling leaf surface. In

addition to leaves smooth to the touch, *T. lepidota* differs from *T. maxonii* in having a puberulous corolla throat and the usual presence of larger reddish scales scattered among the smaller whitish ones on the leaf underside.

The leaves of *T. lepidota* are very rarely (only in some Tortue Island collections) whitish below, unlike *T. bahamensis* and its allies. Although the distinguishing features of *T. lepidota* tend to be quantitative, and any one of them may be lacking in a particular specimen, together they give a generally recognizable *gestalt* that is reasonably correlated with ecology.

At the other extreme, *T. lepidota* also intergrades somewhat with simple-leaved species like *T. simplicifolia* (e.g., in the serpentine barrens of Cajalbana, Pinar del Río, *Alain 4498*, *Ekman 10473*) and *T. myrtifolia* (*Gentry 50879*, 35 km E of Habana). The latter collection was a single plant with an abnormal number of simple leaves growing completely intermixed with simple-leaved *T. myrtifolia* and could represent hybridization with that species. Predominantly unifoliolate and simple-leaved morphs are also prevalent in the Bahamas.

Other intermediates that may represent hybrid introgression include *Britton et al. 6046* (palm barren, city of Santa Clara) and *Jack 8609* (Hormiguero, Province of Santa Clara) which have very short petioles and sessile leaflets but with a more broadly oblong shape, *Ekman 12928* (Pinar del Río: Mariel, Cuatro Caminos, in a small Cuabal) which includes two very different leaf morphs, one with short sessile oblong leaflets (cf. the above), the other with "properly" shaped oblong-oblancheolate leaflets but the petiolules and petiole too long; and some specimens from palm barrens in Guanabacoa, Habana Province (*Curtis 653*, *Britton et al. 6257*, *Ekman 260*) which combine the leaflets slightly too broad with petiolules slightly too long. Another problem population is represented by *Ekman 7614* from charrascales at El Paraíso near Holguín, Oriente, which approaches *T. lepidota* in the smallish coriaceous mostly sessile leaflets (but mostly with a 3–4 mm terminal petiolule and ca. 1.5 cm long petiole); the leaflets are broader than in any material referred here to *T. lepidota*, although Urban identified the collection as this species.

Collections from limestone tend to have more erose margins and be less coriaceous. Nearly all the Cuban collections are from serpentine; the

only Cuban mainland collection known to be from limestone (*Gentry 50879*) has a slightly erose margin unlike other Cuban material of *T. lepidota* and supporting the inclusion of *T. tortuensis* and the Bahamas population, both with erose leaves, under this species. Liogier (in herb.) has suggested that *T. tortuensis* is conspecific with widespread Antillean *T. heterophylla*, but its narrowly oblong sessile leaflets agree better with *T. lepidota*.

53. *Tabebuia leptoneura* Urban, Symb. antill. 9: 259. 1924. Type. Cuba. *Wright 3043* (lectotype, K; isotypes, BM, GOET, MO, NY).

Small tree 3 to 12 m tall, dichotomously branched, the branchlets terete, lepidote with uniformly small sessile mostly reddish-centered scales. Leaves mostly 5-foliolate, sometimes in part 3-foliolate (one 7-foliolate leaf seen), the leaflets typically broadly elliptic, sometimes in part obovate or almost subrotund, the apex obtuse or rounded (rarely rather abruptly acutish), the base usually rounded or truncate, occasionally very broadly cuneate, the terminal 2.3–16 cm long, 1.3–11 cm wide (<2.3 times as long as wide), the basals 1.8–12 cm long, 1.3–9 cm wide, more or less coriaceous, varyingly but usually rather sparsely lepidote above and below, the scales whitish, drying brownish olive to dark brownish above, usually somewhat lighter below, the secondary veins somewhat prominent, inconspicuously brochidodromous, the margin entire, with a conspicuous basal glandular area below, the terminal petiolule (0.5–)1.5–5.5 cm long, the basal petiolules well-developed, (0.2–)0.4–3 cm long, the petiole (0.6–)3–13 cm long, lepidote, usually drying rather dark brownish. Inflorescence a few-flowered terminal panicle or reduced to one or two flowers, lepidote. Flowers with the calyx cupular, irregularly 2–5-labiate, 11–17 mm long, 6–10 mm wide, lepidote with sessile trichomes, usually drying rather dark; corolla white (Isle of Pines) to pale rosy or lavender, tubular-infundibuliform, 3.5–6.5 cm long, 1–1.5 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 1–2 cm long, glabrous outside, scurfy puberulous in throat inside, villous at level of stamen insertion, the lobes more or less ciliate; anthers included in lower half of tube, the thecae divaricate, 3 mm long; ovary linear, lepidote, 5–6 mm long, 1 mm wide; disk annular-pulvinate,

ca. 2 mm long and 2.5 mm wide. *Fruit* a linear-cylindric capsule, attenuate toward base and apex, 9–16 cm long, 8–14 mm wide, the valves coriaceous (type) or thin-coriaceous (usually), more or less striate-costate, rather densely minutely lepidote with small darkish scales, the calyx caducous (except in type and Havana area); *seeds* thin, bialate, 5–10 mm long, 17–23 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Western half of Cuba from Pinar del Río and the Isle of Pines to Las Villas. Mostly in swamps or swampy areas, sometimes in serpentine barrens (Cajalbana, San Miguel de Casanova) but then often noted as in a stream or swampy area; 0–500 m.

Collections examined. CUBA *Sin. loc.*, *Rugel 862bis* (NY), *Wright 1338 p.p.* (GOET, NY), *1339 p.p.* (BM, GH, NY), *3043* (BM, GOET, K, MO, NY). CIENFUEGOS: Cieneguita, 8 Jul 1895 (fl), *Combs 421* (GH, MO, NY); Vic. Soledad, Jun–Aug 1941 (fl), *Howard 5117* (GH, US); Belmonte, Soledad, 10 Sep 1926 (fl), *Jack 5433* (NY, US); San Blas, La Sierra, 600–1000 ft, 26 Apr 1930 (fl), *Jack 7967* (A); Caonao River, Soledad, Cienfuegos, 10 Mar 1928 (fl), *Rehder 1199* (A, S, US). HABANA: Batabano, 12 Apr 1912 (st), *Britton et al. 13351* (NY); Santiago de las Vegas, 13 Sep 1905 (fr), *Hermann 901* (NY); Playa del Rosario, S of Guines, 27 Jun 1917 (fr), *León & Roca 7284* (NY); Lagoon Ariguanabo, 14 Apr 1921 (fl), *León 9718* (NY); Loma de la Pita, San Miguel de Casanova, 13 Mar 1924 (st), *León 11610* (GH, NY), 20 Jun 1924 (fr), *León 11639* (NY), 15 Jul 1925 (fr), *León 12474* (GH, NY, US); Pimienta, W of Batabano, 12 Jun 1928 (st), *León 13399* (NY); Lomas de la Pita, San Miguel de Casanova, 16 Feb 1933 (st), *León & Roig 15916, 15917, 15919* (all NY); Peralta Estate, Batabano, Jun 1939 (st), *León 17358* (NY); Laguna de Castellano, 17 Apr 1904 (fl), *Wilson 1114* (NY, US). ISLA DE JUVENTUD: Nueva Gerona, May 1904 (fl), *Curtiss s.n.* (NY); Loma Daguilla, 3 Dec 1920 (st), *Ekman 12484* (S); Caleta Grande, 22 May 1910 (fl), *Jennings s.n.* (NY); Rio Callejon, 21 Dec 1955 (st), *Killip 45236* (US); 2 km N of Nueva Gerona, 2 Mar 1953 (st), *Killip 42973* (US); San Francisco de las Piedras, 19 May 1957 (fl), *Killip 45891* (US); 2 km N of Nueva Gerona, 0 m, 6–10 Feb 1956 (st), *Morton 9951* (US); Cerro Nueva Gerona, 200 m, 9 Feb 1956 (st), *Morton 10151* (US); near Nueva Gerona, 1 Jul 1900 (fl), *Palmer & Riley 932* (NY, US); *sin. loc.*, Jun–Jul 1901 (fl), *A. Taylor 180* (GH, MO, NY). PINAR DEL RÍO: Lomas de Soroa, 2–4 Jan 1952 (st), *Acuña & Alain s.n.* (NY); La Palma, Cajalbana, 3 Dec 1949 (st), *Alain 1202* (GH); Soroa, Jan 1952 (st), *Alain 2289* (NY); La Coloma, 29 Sep 1952 (fl), *Alain 2667* (GH, NY); Rangel, Sierra del Rosario, 500 m, 13 Oct 1956 (st), *Alain 6022, 6028* (both US); Laguna de Piedra, Candelaria, 17 Nov 1956 (fr), *Alain 6065* (GH, US); Artemisa, 14 Sep (st), *Earle & Wilson 1544* (NY); San Cristóbal, 29 Mar 1923 (st), *Ekman 16363* (B,

MO, NY, S); La Coloma, 28 Oct 1923 (st), *Ekman 17825* (S); El Brujo, N of San Cristóbal, May 1927 (fr, with calyx), *Fors 4370* (NY). VILLA CLARA: Near Loma Cruz, 23 Mar 1911 (fl, fr), *Britton et al. 10235* (NY); Aqueduct of Hanabanilla, Sep 1911 (fl), *E. Cuesta 216* (NY); Sagua la Grande, Chinchila, 20 Feb 1924 (fl), *Ekman 18542* (S).

Local name. Roble blanco, roble de yugo.

It is only tentatively and with much reluctance that I maintain *T. leptoneura* as specifically distinct from polymorphic *T. heterophylla*. Most of the material is sterile and some specimens are morphologically indistinguishable from extremes of *T. heterophylla*. It constitutes essentially that part of the *T. heterophylla* complex with the largest, broadest, most long-petiolulate leaflets. There are no obvious distinguishing features in the flowers; the fruit of two collections (*Wright 1339, Alain 6065*) has thinner valves than in *T. heterophylla* and the calyx is usually early caducous, but in the type and some other material the calyx is persistent and the fruit valves are thick-coriaceous just as in *T. heterophylla*. Probably the most consistent distinguishing feature of *T. leptoneura* is the presence of well-developed slender basal petiolules on the basal leaflets; there is also a tendency for the petiole and petiolules to dry darker than in *T. heterophylla*. The decision to treat *T. leptoneura* as a separate species is largely due to the occurrence of a very different form of *T. heterophylla* (*T. leptopoda, T. curtissii*) with mostly 3-foliolate leaves and mostly subsessile basal leaflets in the same part of western Cuba as *T. leptoneura*. Although ecological data are scant, *T. leptoneura* and *T. heterophylla* may be ecologically differentiated with the former growing in poorly drained swampy areas and the latter mostly in well-drained sites on limestone.

At the opposite extreme, *T. leptoneura* also intergrades with *T. angustata*, which has a similar thin-valved fruit with caducous calyx but differs in being almost always in part 7-foliolate with narrower (the terminal >2.4 times as long as wide) more oblong, acute to subacuminate leaflets with more or less erose margins. The terminal leaflet of *T. leptoneura* as here interpreted is <2.3 times as long as wide while that of *T. angustata* is >2.4 times as long as wide. There are a few collections from western Cuba, here attributed to *T. leptoneura*, which are distinctly subacuminate and thus approach *T. angustata*.

The most extreme of these is *Killip* 42973 from the Isle of Pines which has narrowly elliptic terminal leaflets 2.4 times as long as broad, with a distinctly subacuminate acumen; it is attributed to *T. leptoneura* on the grounds of uniformly 5-foliolate leaves and the fact that only that species occurs on the Isla de Juventud.

54. *Tabebuia linearis* Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De LaSalle" 15: 16. 1956. Type. Cuba. Oriente: Cerro de Miraflores, Cananova, *M. López F. 1235* (holotype, HAC; isotype, NY).

Tabebuia rigida Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De LaSalle" 15: 18. 1956; non *T. rigida* Urban, Symb. antill. 1: 404. 1899. Type. Cuba. Oriente: *Alain 3773* (holotype, HAC; isotype, NY).

Tabebuia lopezii Alain, Rev. Soc. Cubana Bot. 13: 61. 1956, nom. nov. for *T. rigida* Alain.

Shrub or small *tree* with trichotomous branching, the branchlets subterete to distinctly subtriangular, lepidote, the leaves clustered at branch apices, in not very well defined whorls of three. *Leaves* simple, narrowly oblong to linear-oblong, rounded at base and apex, 2–5 cm long, 0.6–1.2 cm wide, very thick coriaceous, densely grayish lepidote below, above olive, scattered glandular lepidote with the surface minutely lepidote, the margin strongly involute, the secondary veins not visible above, barely or not at all below; petiole 0.2–0.6 cm long; on young shoots occasionally much larger and the margins only slightly inrolled (? = *T. clementis*). *Inflorescence* a single terminal flower from branch apex, the pedicel lepidote, 1–1.7 cm long. *Flowers* with the calyx campanulate, irregularly bilabiate, 9–11 mm long, 5–8 mm wide, lepidote with large brownish scales having fringed margins; corolla tubular-infundibuliform, 3–5 cm long, ca. 1–2 cm wide at mouth of tube, the tube ca. 2.5–4 cm long, the lobes 0.5–1 cm long, glabrous, the lobes ciliate; stamens and pistil not examined. *Fruit* (only 1 seen) ca. 6 cm long, 1 cm wide, 3-valved (presumably an abnormality), the valves strongly woody, grayish lepidote, the calyx persistent; *seeds* thin, bialate, ca. 8 × 20 mm, the hyaline-membranaceous seed wings sharply demarcated from the seed body.

Distribution (Fig. 53). Endemic to serpentine barrens of the Moa area of easternmost Cuba; 0–300 m elevation.

Specimens examined. CUBA. GUANTÁNAMO: Baracoa, charrascos en el valle del Río Maravi, Feb 1968 (st), *Bisse & Kohler s.n. (HAJB 5581)* (HAJB); Baracoa, charrascos en el Valle del Río Maravi, *Bisse & Kohler s.n. (HAJB 5725)* (HAJB). HOLGUÍN: Pinares y charrascos de Playa la Vaca, al Norte de la loma Miraflores, 100–150 m, 29 Apr 1980 (st), *Alvarez et al. s.n. (HAJB 42291)* (HAJB); Charrascos al oeste de Yamanigüey, Moa, charrascas serpentinoso rocoso, 50 m, 7 May 1980 (st), *Alvarez et al. s.n. (HAJB 42982)* (HAJB); Charrascal al este del Cerro de Miraflores, Jun 1967 (st), *Bisse & Rojas s.n. (HAJB 4231)* (HAJB); Moa, Charrascales al este de Yamanigüey, *Bisse & Lippold s.n. (HAJB 11859)* (HAJB); Moa, Sierra de Moa, charrascal del Cayo Coco, 200–300 m, 13 Aug 1970 (fl), *Bisse & Lippold s.n. (HAJB 17607)* (HAJB); Moa, Charrascales de Playa la Vaca, *Bisse & Lippold s.n. (HAJB 17726)* (HAJB); Moa, Yamanigüey, charrascos al este, 29 Feb 1979 (fl), *Bisse et al. s.n. (HAJB 39905)* (HAJB); Charrascos al este de Yamanigüey, entronque Mina Potosi y Río Jaguani, 16 Apr 1981 (fl), *Bisse et al. s.n. (HAJB 44307)* (HAJB); Complejo Cerro Miraflores, Playa La Vaca, Charrascos, 150 m, 18 Apr 1981 (fr), *Bisse et al. s.n. (HAJB 44455)* (HAJB); Calentura del Medio, Zona de Cayo Coco, charrascales, *Bisse et al. s.n. (HAJB 44852)* (HAJB).

Although keyed out with the microphyllous species in the *Flora of Cuba*, *T. linearis* differs from them on account of its mostly longer, much thicker leaves and is probably closer to *T. simplicifolia* and *T. trachycarpa*. It has among the thickest, most revolute-margined leaves of any *Tabebuia*. It also has the woodiest fruit valves of any *Tabebuia* species. Previously known only from the type, recent collections by personnel associated with the Habana Botanical Garden indicate that it is a locally common endemic of the Oriente serpentine region.

Tabebuia lopezii apparently represents a juvenile growth form of this species, possibly with introgression from *T. moaensis*. The sterile type includes both simple and 3-foliolate leaves, both much larger than the leaves of typical *T. linearis*. However, conspicuously larger but otherwise identical leaves can sometimes be found growing at the apices of branches that have otherwise the typical small, thick-coriaceous leaves of *T. linearis* (e.g., *Bisse et al. HAJB 44852*). *Bisse & Kohler s.n. of Mar. 1968* uniformly has leaves that are wider and have only slightly revolute margins and is intermediate between typical *T. lopezii* and *T. linearis*.

55. *Tabebuia maxonii* Urban, Feddes Repert. 18: 370. 1922. Type. Dominican Republic. Sa-

maná: Isla San Gabriel, W of San Lorenzo, *Abbott 1280* (lectotype, NY; isotype, US).

Tabebuia samanensis Urban, Arkiv. Bot. Stockholm **22A(10)**: 68. 1929. Dominican Republic. Samaná: San Lorenzo Bay, *Abbott 2255* (lectotype, US; isotypes, BM, GH, NY, US).

Shrub or small *tree* 2–4 m tall, dichotomously branched, the branchlets terete, lepidote with sessile peltate whitish trichomes and/or some darker and in part short-stalked trichomes, sometimes with a few minute simple trichomes, presumably from the decapitated stalks of the latter. *Leaves* 3–5-foliolate, the leaflets narrowly oblong-elliptic to almost linear-oblong, apically rounded or retuse, usually with a minute mucro, the base cuneate to obtuse, the terminal 1.8–7 cm long, 0.3–1.7 cm wide, the basals 0.8–4 cm long, 0.2–1.3 cm wide, coriaceous, conspicuously lepidote above and below, above with large sessile whitish peltate scales, above with similar scales and also a denser covering of tiny poorly defined scales, drying olive to gray above, olive below, the margin revolute, sometimes slightly erose, the surface rough to the touch; all leaflets sessile or subsessile, the petiolules <3 mm long, petiole short, 0.5–2.5 cm long, usually with a combination of sessile whitish scales, mostly short-stalked reddish scales, and minute erect trichomes. Inflorescence 1–several-flowered, lepidote with sessile and short-stalked trichomes, drying blackish. *Flowers* with the calyx irregularly shallowly 2–3-labiate, 6–9 mm long, 4–6 mm wide, densely lepidote with mostly sessile and a few short-stalked scales, drying blackish; corolla pale to deep magenta, tubular-infundibuliform above the narrow base of tube, 2–3 cm long, 0.9–1.4 cm wide at mouth of tube, the tube 1.7–2.3 cm long, the lobes 0.5–0.7 cm long, glabrous outside and inside except for short thick trichomes around lobe margins and a very few glandular trichomes at level of stamen insertion; anthers deeply included, the thecae divaricate, 2 mm long, the connective enlarged; ovary linear-oblong, 3 mm long, 1 mm wide, densely tannish-lepidote, disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* linear-cylindric, 6–10 cm long, 5–7 mm wide, the valves thin, conspicuously longitudinally striate-costate, lepidote with blackish scales, drying blackish or dark brown, the calyx persistent; *seeds* thin, bialate, 4–5 mm

long, 15–18 mm wide, the hyaline-membranaceous wings distinctly demarcated.

Distribution (Fig. 53). Endemic to the Samaná Bay area of northern central Dominican Republic, on karst limestone near sea level.

Collections examined. DOMINICAN REPUBLIC. SAMANÁ: San Gabriel, sea level, 5–10 Apr 1921 (fl), *Abbott 1280* (NY); Samaná Bay, mainland opposite San Gabriel, sea level, 8 Apr 1921 (fl), *Abbott 1285* (US), 10 Apr 1921 (fl), *Abbott 1290* (US); San Lorenzo Bay, 27 Apr 1922 (fl), *Abbott 2255* (BM, GH, NY, US); Los Haitises, Boca del Infierno, very common, 24 Jun 1930 (fl), *Ekman 15401* (B, K, NY, S, TEX-LL, US), 25 Jun 1930 (st), *Ekman 15444* (B); Boca del Angel, San Lorenzo Bay, 14 Aug 1960 (st), *J. Jiménez 4225* (K); Los Haitises, sobre un cayo, 14 Apr 1965 (fl, fr), *J. Jiménez 5054* (NY); Bahía de San Lorenzo, Sabana de la Mar, 21–23 Jan 1972 (st), *Liogier 18442* (NY); San Gabriel Island, 9 Mar 1928 (fl), *Miller 1078* (BM, US). **DISTRITO FEDERAL:** Cultivated in Jardín Botánico, Santo Domingo, Apr 1985 (fl, fr), *Gentry 50823* (JBSD, MO).

A very characteristic species of the Samaná Bay area. Among Dominican Republic species it is easy to recognize by the characteristic sessile, narrowly oblong leaflets with more or retuse apices. It is closely related to *T. lepidota* (mostly Cuban but reaching Tortue Island, off Haiti), but can be distinguished from that species by the glabrous corolla tube interior, the generally rougher leaf upper surface, and uniformly small flowers.

56. *Tabebuia microphylla* (Lamarck) Urban, *Symb. antill.* **5**: 496. 1908.

Bignonia microphylla Lamarck, *Encyc.* **1**: 418. 1785. Type. Haiti. Type Illustration: Plumier, *Pl. Amer. t.* **55**, f. 2. 1756.

Tecoma microphylla (Lamarck) Urban *Symb. antill.* **7**: 377. 1912.

Tabebuia ostenfeldii Urban, *Dansk Bot. Arkiv.* **4(7)**: 10. 1924. Type. Dominican Republic: Beata Island. *Ostenfeld 342* (holotype, C; isotype, NY).

Tabebuia truncata Urban, *Symb. antill.* **9**: 266. 1924. Type. Cuba: Oriente, *Ekman 6582* (holotype, S; isotype, NY).

Tabebuia libanensis Urban, *Feddes Repert.* **22**: 88. 1925. Type. Cuba. Oriente (Holguín): Río Piloto, *Ekman 15838* (holotype, S; isotype, NY).

Shrub or small microphyllous *tree* 1–6 m tall, usually densely branched; branchlets slender or with the leaves clustered at tips of short-shoots. *Leaves* simple, broadly obovate to orbicular, rounded or obtuse at apex, more or less rounded

at base, 0.2–1.4 cm long, 0.2–0.7 cm wide, coriaceous, very densely lepidote above and below, the lower surface grayish or whitish, petioles less than 1 mm long. *Inflorescences* of one or two flowers usually at the apex of a short shoot, pedicels ca. 5 mm long, densely lepidote. *Flowers* with the calyx campanulate, irregularly shortly bilabiate, very densely grayish lepidote, 5–7 mm long, 4–6 mm wide; corolla light magenta, tubular-infundibuliform, 2.5–3.5 cm long, the tube 2–3 cm long, 0.6–1 cm wide at mouth of tube, the lobes ca. 0.5 cm across, glabrous outside, the lobes ciliate, the tube pilose basally within and at level of stamen insertion; stamens didynamous; pistil ca. 1.8 cm long, the ovary linear, 3 mm long, 0.8 mm wide, densely lepidote; disc annular-pulvinate, 1 mm long, 1.5 mm wide. *Fruit* linear-cylindric, (2–)2.5–8 cm long, 0.4–0.5 cm wide, lepidote, subtended by persistent calyx; *seeds* thin, bialate, 2–4 mm long, 10–12 mm wide, the hyaline membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Hispaniola and eastern Cuba (Oriente and adjacent Camagüey); dry sclerophyllous vegetation, especially on dogtooth limestone and along the coast; 0–350 m.

Specimens examined. CUBA. CAMAGÜEY: Ins. Cayo Sabiná, 17 Oct 1922 (st), *Ekman 15526* (B, MO). GRANMA: Ensenada de Mora, 27 Mar 1912 (fl), *Britton et al. 13052* (NY); Península de Cabo Cruz, S of Niquero, 17 Jan 1923 (st), *Ekman 16184* (S). GUANTÁNAMO: 5 km from Cajobabo to Jauco, 1 Jan 1956 (st), *Alain & Morton 5184* (GH); Mesa de Prado, Jauco, 1 Jul 1924 (fl), *León 12032* (GH, NY, US). HOLGUÍN: Banes, Puerto Rico, 18 Nov 1915 (st), *Ekman 6621* (NY, S); Sierra de Nipe, Río Piloto, 7 Sep 1922 (st), *Ekman 15838* (NY, S). LAS TUNAS: Puerto Padre, 27 Jul 1923 (fl), *Curbelo 297* (*Roig 6278*) (NY); Manigua, Puerto Padre, 24 Jul 1959 (fl), *López-Figueiras 22* (US).

HAITI. Ile La Gonave, Bouchie-Lagone, 16 Jul 1927 (fl), *Ekman H8690* (A, G, GH, IJ, LL, S, US); Gonave Island, Trou Louis, Aug 1927 (fl), *Eyerdam 226* (GH, MO, NY, US).

DOMINICAN REPUBLIC. BARAHONA: Trujín, sea level, *Abbott 1682* (US); Trujín, 8 Feb 1922 (fl), *Abbott 1709* (US); road from Juan López to Trujín, Trou-Nicolas, 11 Sep 1926 (fl), *Ekman H6234* (IJ, K, NY, S, US), (st), *Ekman H6934* (K, IJ, LL, NY, S, US). PEDERNALES: Beata Island, 22 Mar 1932 (fl), *Fairchild s.n.* (US), 11 Aug 1950 (fr), *Howard 12497* (A), 7 Aug 1950 (fl), *Howard 12509* (A, S, US), 16 Mar 1956 (fl), *Jiménez 3223* (US), 24 Mar 1959 (fl), *Jiménez 3774* (US), *Ostenfeld 342* (NY); between Oviedo and Cabo Rojo, 1 Apr 1961 (fl), *Jiménez 4531* (US); Vic. of Cabo Rojo, 11 Apr 1963 (fl), *Jiménez 4709* (US); from Cabo Rojo to Las Mercedes, 50 m, 12 Feb 1969 (fl), *Liogier*

13817 (NY); 4 mi N of Cabo Rojo, 20 m, 11 Nov 1969 (fl), *Liogier 16910* (NY, US); entre Oviedo y Pedernales, 100 m, 25 Jun 1975 (fl), *Avian & Liogier 23200* (NY).

Two species have been generally recognized on Hispaniola, the more densely branching specimens being referred to *T. ostensfeldii*, but these differences are surely ecotypic and even topotypic material of *T. ostensfeldii* (e.g., *Howard 12509*) shows the more open branching of extreme *T. microphylla*. Urban himself referred all microphyllous Hispaniolan collections to *T. ostensfeldii*, but the Plumier figure is unmistakably this plant on account of its broad leaves with rounded apices. Apparently a second microphyllous species on Hispaniola can be distinguished by its longer, apically pointed leaves. On Cuba, variation in the microphyllous *Tabebuia* species is more complex. At least ten taxa have been described. Of these, two—*T. libanensis* and *T. truncata*—are surely referable to *T. microphylla* on account of their short broadly ovate blunt-tipped leaves. The type and only known collection of *T. truncata* differs from other collections in having the leaves less densely lepidote beneath.

57. *Tabebuia moaensis* Britton, Bull. Torrey Bot. Club **42**: 374. 1915. Type. Cuba. Guantánamo (Oriente): Camp La Gloria, S of Sierra Moa, 24–30 Dec 1910 (fl), *Shafer 8264* (holotype, NY).

Tabebuia pachyphylla Britton, Bull. Torrey Bot. Club **42**: 373. 1915. Type. Cuba. Holguín (Oriente): Sierra de Nipe, Arroyo de Medio, 450–550 m, 24 Jan 1910 (fl), *Shafer 3645* (holotype, NY).

Tabebuia litoralis Urban, Symb. antill. **9**: 263. 1924. Type. Cuba. Guantánamo (Oriente): Moa, pinetis littoralibus, *Ekman 4516* (holotype, S).

Tabebuia excisa Urban, Symb. antill. **9**: 260. 1924. Type. Cuba. Holguín (Oriente): Sierra de Nipe, Río Piedra, 24 Jul 1914 (fl), *Ekman 2133* (holotype, S; isotype, NY).

Tabebuia potamophila Urban, Symb. antill. **9**: 259. 1924. Type. Cuba. Holguín (Oriente): Sierra de Nipe, Río Piloto, 20 Apr 1919 (fl, fr), *Ekman 9487* (holotype, S; isotype, B, MO, NY, S).

Tabebuia wrightii Urban, Feddes Repert. **22**: 83. 1925. Type. Cuba. Oriente: *Wright 3042* (lectotype, MO; isotypes, BM, GH).

Tabebuia zolyomiana Borhidi, Act. Bot. Acad. Sci. Hung. **26**: 15. 1980. Type. Cuba. Holguín (Oriente): Sierra de Nipe, Cayo Rey, Pinar del Bio, *Lopez Figueiras 1843* (holotype, HAC; isotypes, HAC, HAJB).

Shrub or small *tree* to 10 m tall, dichotomously branched, the branchlets generally subterete, sometimes slightly 4-angled, flattened at nodes, rather densely blackish or reddish lepidote, the bark tending to exfoliate, sometimes with conspicuous whitish lenticels when young. *Leaves* 3–5(–7)-foliolate (rarely in part simple) the leaflets oblong-elliptic to almost lanceolate-oblong, rounded or obtusely apiculate at apex (occasionally distinctly acuminate: *Shafer 1710*, *Ekman 9105*), rounded to subcordate at base, the terminal 3–14 cm long, 1.5–6(–7) cm wide, the laterals similarly shaped but smaller, very strongly coriaceous, the secondary veins plane above, plane or very slightly subprominulous below, microscopically shiny above, with scattered pustular-raised lepidote glandular areas, below with numerous tiny poorly defined whitish scales or papillae and scattered reddish lepidote glands (the tiny whitish scales usually not visible in older leaves), drying gray or darkish olive above, grayish olive or usually reddish olive with lighter secondary veins below, the margins entire, often revolute; terminal petiolule 0.3–4 cm long, the basals sessile or to 1 cm long; petiole 0.7–8 cm long, always much longer than longest petiolule, thick, shiny and resinous, also with scattered large lepidote trichomes. *Inflorescence* an open few-flowered terminal panicle, somewhat resinous-shiny, with large sessile peltate scales, the bracts and bracteoles linear, inconspicuous, caducous. *Flowers* with the calyx campanulate, irregularly 2–3-labiate, 7–18 mm long, 7–9 mm wide, glandular lepidote with dark-drying sessile scales; corolla pink, rather narrowly tubular-infundibuliform, 3–7 cm long, 1–2.5 cm wide at mouth of tube, the tube 2.5–5 cm long, the lobes 1–2 cm long, glabrous outside, usually with a few longish trichomes on lobe margin, rather densely scurfy puberulous in throat, villous at level of stamen insertion; stamens deeply included, the thecae divaricate, 3 mm long; ovary linear-oblong, not costate, 4 mm long, 1 mm wide, lepidote; disk annular-pulvinate, 1.5 mm long, 3 mm wide. *Fruit* linear-cylindric, 4–14 cm long, 7–10 mm wide, each valve rather thin-coriaceous, with strongly raised medial and sutural ribs, lepidote, drying black, the calyx persistent; *seeds* thin, bilate, ca. 5 × 17 mm, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Endemic to the serpentine area of Holguín Province (formerly part of Oriente), Cuba; from 0–700 m.

Collections examined. CUBA. HOLGUÍN: Moa, vic. Aeropuerto, 9 Apr 1945 (fl), *Acuña 12713*, *12714* (both US); Cayo Fortuna, Sierra de Moa, 800 m, Jul 1953 (fl), *Alain 3305* (GH, NY); Moa, *Bucher 88* (NY); seashore, Playa la Vaca, 14 Apr 1945 (fr, fl), *Clemente 4910* (GH, NY, US); Moa sawmill, 15 Apr 1945 (fl), *Clemente 4956* (NY); in pinetis ad litor. maris, Moa, 30 Jan 1915 (fr), *Ekman 4516* (S); 15 km SW of Moa mill, Jul 1941, *Howard 5880* (GH, NY); edge of Bahía de Moa, Jul 1941 (fl), *Howard 5987* (GH); airstrip, Moa, 21 Jul 1941 (fr), *León et al. 20125* (NY), *20126* (NY), *20127* (GH); Pinares de Moa, 26 Mar 1942 (fl), *León & Victorín 20763* (US); Punta Gorda, road to Cayoacán mines, 30 Mar 1942 (fl), *León et al. 20879* (NY), *20916* (NY); Pinelands, Moa, Apr 1943 (fl), *Victorín et al. 21762* (NY); Moa sawmill, 30 Jul 1945 (fl), *León et al. 22474* (NY); Playa de Moa, Jul 1947 (st), *León & Clemente 23284* (NY); Camp La Gloria, S of Sierra Moa, 24–30 Dec 1910 (fl), *Shafer 8264* (NY); Moa, 16–23 Apr 1943 (fl), *Victorín et al. 21479* (US); serpentine platform, 20°41'N, 74°56'W, 19 Jul 1951 (fl), *Webster 3820* (GH). Cananova region, Rio Saltadero, 24 Mar 1942 (fl), *León et al. 20657* (NY), *20658* (GH, NY); Cerro de Miraflores, Jul 1942 (fl), *León 21141* (GH, NY); Carrascal, Cerro Miraflores, 15–16 Apr 1954 (fl), *López F. 1260* (US); serpentine barrens, Cerro de Miraflores, Apr 1954 (fl), *Lopez F. 1305* (NY). Sierra de Nipe, Pinar de Mayarí, Arroyo Naranjo, 18 Apr 1940 (fl), *Carabia 3625* (NY); Salto del Sojo, 20 Apr 1940 (fl), *Carabia 3715* (NY); Loma La Bandera (fl), 22 Apr 1940 (fl), *Carabia 3796*, *3799* (both NY); Cayo del Rey, 22 May 1940 (fl), *Carabia 4066* (NY), 23 May 1940 (fl), *Carabia 4081* (NY); Mayari, May 1940 (fl), *Carabia 4083* (NY); Río Piedra, 500 m, 3 Jul 1914 (fl), *Ekman 1772* (B, S); Río Piloto, 21 Jul 1914 (fl), *Ekman 2113* (S); in uliginosis prope Río Piedra, 24 Jul 1914 (fl), *Ekman 2133* (NY, S); charrascales ad Río Piloto, 30 Jul 1914 (fl), *Ekman 2302* (S); Río Piedra, 500 m, 18 Feb 1916 (fl), *Ekman 6750* (B, S); Loma Mensura, 19 Feb 1918 (fl), *Ekman 9105* (MO); Río Piloto, 20 Apr 1919 (fl, fr), *Ekman 9487* (B, NY, S); La Mina, Mayari, 26 Jul 1940 (fl), *León & Alain 19144* (NY); Cayo Mujeres, 750 m, 6 Apr 1941 (fl), *León et al. 19803* (GH, NY, US); Pinelands, Mayari, 7 Apr 1941 (fl, fr), *León et al. 19952* (GH, NY); Cayo Rey, Pinar del Bio (fl), *López-Figueiras 1843* (HAC); Sierra de Nipe, 14–18 Mar 1944 (fl), *Marie-Victorin & Clemente 22074* (GH); Nipe Mts., 1500 ft, 2 Mar 1928 (fl), *Mitchell 10* (GH); crest of Sierra Nipe, 600–700 m, 16–17 Oct 1941 (fl), *Morton & Acuña 3128* (US); Arroyo del Medio, 450–500 m, 24 Jan 1910 (fl), *Shafer 3645* (NY); Pinales, E of Paso Estancia, 1–2 May 1909 (fr), *Shafer 1710* (GH, NY, US).

This represents a species complex of the serpentine area of eastern Cuba, defined by percoriaceous leaflets with the secondary veins plane or

barely prominulous below. Typically the leaflet undersurface dries a characteristic reddish olive. There are forms with large and small leaflets, and with mostly 3-foliolate or mostly 5-foliolate leaves. There are five potentially distinguishable forms: 1) large leaflets, mostly 3-foliolate but in part simple = *T. inaequipes*; 2) large 3–5(–7)-foliolate leaves = *T. pachyphylla* (including *T. potamophila*, and *T. excisa*); 3) fairly uniformly 3-foliolate leaves with small leaflets = *T. litoralis*; 4) 5(–7)-foliolate leaves with small to medium-sized leaflets = *T. moaensis* sensu stricto (including *T. wrightii* and *T. zolyomiana*); 5) 5–7-foliolate leaves with very narrow (to 8 cm long and 1.5 cm wide), long-petiollulate leaflets = *T. elegans*. A closely related plant with apparently uniformly simple leaves = *T. clementis*. The small-leafleted forms have smaller calyces (7–11 mm long vs. 9–18 mm) and slightly shorter fruits (6–12 mm long vs. 7–14) but there is much overlap. Both *T. moaensis* and *T. litoralis* are mostly from pineland and seashore vegetation in the Moa area while the large-leafleted forms are mostly from the Sierra de Nipe. However, the material from a third locality, Cerro de Miraflores, Cananova, is intermediate and varies from 5-foliolate with large leaflets to mostly simple-leaved (León *et al.* 2065), to small, 3–5-foliolate leaves. Moreover, there are a few collections from Moa (e.g., *Alain 3305*) with leaflets larger than in some Sierra de Nipe specimens.

Although the pattern of variation of the Sierra de Nipe collections is very complex, at least some of the specimens from that area (including the types of *T. potamophila* and *T. zolyomiana*) are surely conspecific with *T. moaensis*. At least one individual collection (León *et al.* 19803) spans the gamut from typical *T. moaensis* to large leaves like those of *T. pachyphylla*. I tentatively conclude that *T. pachyphylla* is best regarded as conspecific with the similarly thick-leaved taxon from lowland serpentine areas. However, *T. inaequipes* seems worthy of recognition (see under that species).

At the other extreme, *T. pachyphylla* merges into *T. shaferi*, a somewhat less sclerophyllous-leaved and mostly multifoliolate taxon from higher altitudes in the Sierra Maestra. Whether *T. pachyphylla* merits recognition as a distinct species intermediate between *T. shaferi* (including *T. oligolepis*) on the one hand and *T. moaensis* sensu lato on the other remains open to ques-

tion. Also problematic is whether the type of *T. shaferi* should go with the *T. pachyphylla* entity or with the cuneate-leafleted slender-petiolluled Sierra Maestra population sometimes segregated as *T. oligolepis*.

One collection is not included in the description or exsiccatae. *Ekman 9105* (S) from Loma Mensura, Sierra de Nipe has 5-foliolate leaves with distinctive lanceolate to narrowly ovate, coriaceous acuminate leaflets and prominulous secondary veins below; although highly anomalous, this may be an extreme form of *T. moaensis*.

58. *Tabebuia multinervis* Urban & Ekman, *Arkiv. Bot.* 22A(10): 67. 1929. Type. Haiti: Massif de la Selle prope Jacmel, Môme Cap-Rouge, solo dure calcario, 150 m, 24 Apr 1926 (fr), *Ekman H5953* (holotype, S; isotypes, IJ, K, S, US).

Small few-branched tree 2–3 m tall, the branches slightly compressed to subtetragonal, minutely grayish lepidote, otherwise glabrous. Leaves 3–5-foliolate, the leaflets linear-lanceolate, acutish at apex, cuneate at base, the terminal 6.5–19(–20) cm long, 0.9–2(–2.5) cm wide, the basals 1.5–8 cm long, 0.4–1.6 cm wide, subcoriaceous, minutely and not very densely grayish lepidote above and below, rough to the touch, drying dark olive above, pale olive with contrasting darker veins below, strongly brochidodromous, with 13–25 secondary veins on each side, the midvein and secondaries more or less impressed above and raised below, the tertiary venation strongly and intricately prominulous above and usually below, the margin conspicuously erose; terminal petiolule mostly 0.5–1(–1.2) cm long, the basal leaflets sessile, the petiole 1–4 cm long. Inflorescence one or two terminal flowers, the bracts and bracteoles caducous, not seen. Flowers not known, the calyx (in fruit) bilabiate, 11 × 7 mm, strongly blackish lepidote. Fruit (only 1 seen) linear cylindrical, 9.5 cm long, 0.6 (–0.7) cm wide, lepidote with blackish scales, somewhat striate-ribbed, subtended by the persistent calyx; seeds thin, bialate, 3–4(–6) mm long, 13–15 mm wide.

Distribution (Fig. 53). Haiti, apparently endemic to the Massif de la Selle, where said to be locally quite common; 100–300 m elevation. Known only from the type.

The above description includes parenthetical

dimensions taken from the original description and presumably based on a since-destroyed Berlin duplicate.

This species is apparently related to *T. calcicola* with which it shares the distinctively erose margin and coloration of the leaflet. It differs only in degree from the cuneate-leaved form of *T. calcicola* (*T. erosa*) from Massif de Matheu. However, the nearly linear leaflet shape of *T. multinervis* is so distinctive that recognition as a distinct species seems prudent, despite the paucity of material.

59. *Tabebuia myrtifolia* (Grisebach) Britton, Bull. Torrey Bot. Club **42**: 378. 1915.

A clinally varying species separable into two varieties mostly on the basis of density of the scales on the leaf undersurface.

Distribution (Fig. 53). Cuba, mostly on limestone. Perhaps also in eastern Hispaniola; 0–300 m elevation.

This species is not very well differentiated from *T. microphylla* and the two overlap in distribution in the Cuban Oriente. I have distinguished them entirely on the basis of leaf shape—mostly oblong and at least twice as long as wide in *T. myrtifolia* versus broadly obovate to suborbicular in *T. microphylla*.

The only Hispaniolan collections, from Beata Island, are somewhat intermediate, with most leaves oblong but some suborbicular. Here this species grows in the same area as typical *T. microphylla*, but on dog-tooth limestone, while *T. microphylla* occurs in flatter sandier areas.

Key to the Varieties

1. Leaves very densely whitish lepidote beneath, the surface invisible between the scales.
..... var. *myrtifolia*.
1. Leaves concolorous, sparsely to densely lepidote beneath, the surface visible between the scales.
..... var. *petrophila*.

59a. *T. myrtifolia* var. *myrtifolia*.

Tecoma myrtifolia Grisebach, Mem. Am. Acad. Arts Sci., n.s., **8**: 524. 1862. Type. Cuba. Matanzas: Prope Matanzas, *Rugel 863bis* (holotype, GOET; isotypes, HAC (as 612), K (s.n.), NY (as 612c et 863).

Tabebuia saxicola Britton, Bull. Torrey Bot. Club **48**: 343. 1922. Type. Cuba. Villa Clara (Las Villas): Sagua la Grande, 12 Aug 1920 (fl), *León & Loustalot 9477* (holotype, NY; isotype, US).

Tabebuia mogotensis Urban, Symb. antill. **9**: 267. 1924. Type. Cuba. Santiago de Cuba (Oriente): Mogote prope Palmarito, 10 Apr 1918 (fl), *Ekman 9168* (holotype, S; isotype fragments, NY).

Tabebuia truncata var. *stenophylla* Urban, Symb. antill. **9**: 266. 1924. Type. Cuba. Banes, Puerto Rico in dumetis solo calcareo, 11 Nov 1915 (fl, fr), *Ekman 6582* (holotype, S; isotype, NY).

Shrub or small microphyllous *tree* 2–3 m tall, branchlets terete, usually densely branched, repeatedly dichotomous, the ultimate branchlets often more or less spinescent. *Leaves* simple, mostly oblong to oblong-obovate (shorter broadly obovate leaves may also be present), rounded or retuse at apex, rounded at base, 0.4–1.8(–3) cm long, 0.2–0.8(–1.3) cm wide, coriaceous, very densely lepidote above and below, the lower surface distinctly whitish, petioles 1–2(–4) mm long, virtually absent on smaller leaves. *Inflorescences* of one or two flowers from the branch apices, pedicels 1–4 mm long, densely lepidote. *Flowers* with the calyx campanulate, irregularly shortly bilabiate, densely grayish lepidote, 4–8 mm long, 4–5 mm wide; corolla light magenta, tubular-infundibuliform, exactly as in *T. microphylla*. *Fruit* linear-cylindric, 5–12 cm long, 0.4–0.6 cm wide, densely lepidote, subtended by persistent calyx; *seeds* thin, bialate, 3–4 mm long, 14–15 mm wide, the hyaline membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Central and eastern Cuba, mostly on coastal cliffs or limestone; 0–300 m elevation. Perhaps also on Beata Island, off the south coast of Hispaniola.

Collections examined. CUBA. CIENFUEGOS: Guajimico, 21 Mar 1958 (st), *Alain 2827* (NY); Punta Diablo, Cienfuegos Bay, 19 Mar 1910 (fl), *Britton & Wilson 5674* (NY); Farallones de Guajimico, 24 Feb 1956 (fl), *Morton 10511* (US); Loma San Juan, Cienfuegos Bay, 11 Jul 1947 (fr), *Wood & Atchison 7414* (A). **GUANTÁNAMO:** Jauco, 15 Jan 1956 (st), *Alain & Morton 5196* (GH); Monte Cristi, *Bisse & Rojas s.n. (HAJB3524)* (HAJB); Mesa de Prado-Jauco, Baracoa region, 26 Jul 1924 (fl), *León 11718* (NY); Mesa del Chivo, Maisi, Jul 1938 (st), *León 18334* (GH). **HOLGUÍN:** Banes, Puerto Rico, 11 Nov 1915 (fl, fr), *Ekman 6582* (NY, S). **MATANZAS:** Cárdenas, Varadero, 13 Aug 1923 (st), *Ekman 17141* (AAU, S); Matanzas City, 18 Aug 1923 (fl), *Ekman 17209* (S); Punta Francés, tip of Uvero Beach Península, 7 Jul 1985 (fl), *Gentry 50905* (MO); Punta Brava, 1849 (fl), *Rugel 611* (BM, NY); sin. loc. 1849 (fr), *Rugel 612* (BM, K, L, NY); Matanzas, *Rugel 863bis* (GOET). **SANTIAGO DE CUBA:** El Uvero, Sierra Maestra, 3 Apr 1969 (st), *Bisse & Lippold s.n. (HAJB13380, HAJB14151)* (HAJB); Playa Casonal, Santiago de Cuba, *Bisse & Lippold s.n. (HAJB18204)*

(HAJB); El Morro, Santiago de Cuba, *Bisse & Rojas s.n. (HAJB2374)* (HAJB); El Morro, Santiago Bay, 10 Mar 1912 (fl), *Britton & Cowell 12542* (NY); Sardinero, Santiago, Jun 1948 (fl), *Clemente 5974* (GH, NY, US); Justici, near Siboney, 1 Sep 1948 (fl, fr), *Clemente 6247* (GH, NY); Aguadores, Santiago de Cuba, *Ekman 8455* (MO, S); Mogote prope Palmarito de Cauto, 300 m, 10 Apr 1918 (fl), *Ekman 9168* (NY, S); Santiago, El Morro, 6 Jul 1924 (fl), *Ekman 19190* (NY); Aguadores, Santiago, 11 Apr 1940, *León et al. 17690b* (NY); road to Morro Castle, 12 Apr 1940 (fl), *León et al. 17702* (GH, NY); camino de Siboney a Justisi, 11 Nov 1951 (fl), *Lopez 294* (US); Santiago de Cuba, 1 Apr 1954 (st), *Lopez 1183* (NY); cercanías de Palmarito de Cauto, 15 Apr 1956 (fl), *Lopez 2669* (US). **VILLA CLARA:** Sagua la Grande, 20 Feb 1924 (fl), *Ekman 18537* (B, MO, S); E of Castillo de Jagua, 1 Jul 1950 (st), *Howard et al. 257* (A); Gavilan, Soledad, *Jack 5716* (S), 13 Mar 1928 (fl), *Jack 5820* (NY, US); Sagua la Grande, 12 Aug 1920 (fl), *León & Roustalot 9477* (HAC, NY, US).

DOMINICAN REPUBLIC. PEDERNALES: Isla Beata, 2.5 km este del Campamento de la Marina de Guerra, 30 Aug 1985 (fl), *García & Pimentel 510* (JBSD, MO).

59b. *Tabebuia myrtifolia* var. *petrophila*
(Greenman) A. Gentry, comb. nov.

Tabebuia petrophila Greenman, Trans. Acad. Sci. St. Louis 7: 451. 1897. Type. Cuba. Havana: Faro Villa Nuevo, *Combs 601* (holotype, MO; isotypes, K, NY). *Tabebuia anafensis* Urban, Feddes Repert. 22: 87. 1925. Type. Cuba. Habana: Sierra de Anafe, *Ekman 16911* (holotype, S; isotype, NY).

Tabebuia anafensis ssp. *munizii* Borhidi, Act. Bot. Acad. Sci. Hung. 18: 41. 1973. Type. Cuba. Matanzas: Pan de Matanzas, *Muñiz s.n.* (holotype, SV; isotypes, BP, HAC).

Shrub or small *tree* to 5 m tall, usually densely branched, the branchlets terete, sometimes with spinescent tips. *Leaves* simple (rarely irregularly 2-foliolate in part), mostly oblong to oblong-obovate, rounded or retuse at apex, sometimes apiculate, rounded to cuneate (to subcordate in western part of range) at base, 0.5–3.5(–5) cm long, 0.2–0.9(–1.6) cm wide, coriaceous, densely lepidote above and below, concolorous, the upper and lower surfaces grayish olive, petioles 1–4 mm long. *Inflorescences* of one or two flowers from the branch apices, the pedicels 2–6(–10) mm long, lepidote. *Flowers* with the calyx campanulate, irregularly shortly bilabiate, to 3–4-labiate, densely grayish lepidote, 6–8(–10) mm long, 3–5 mm wide; corolla light magenta to whitish, tubular-infundibuliform, exactly as in *T. microphylla*. *Fruit* linear-cylindric, 6–10 cm long, 4–5 mm wide, lepidote, subtended by the persistent

calyx; *seeds* thin, bialate, 2–3 mm long, 10–15 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution. Central and western Cuba, mostly on limestone, also perhaps in central Haiti.

Collections examined. **CUBA. CIENFUEGOS:** La Vigia Hill, Trinidad, *Britton & Wilson 5524* (NY); Castillo de Jagua, *Britton & Wilson 5700* (NY); Guajimica, *Britton et al. 5979* (NY); Faro Villa Nueva, *Combs 601* (K, MO, NY); Gavilan, *Howard et al. 16* (K), *Jack 5716* (A, US); Farallones de Guajimico, *Morton 10478* (US), *10510* (US), *10504* (US); Guajimico Bay, *Proctor 16419* (A). **HABANA:** Sierra de Anafe, *Alain 6017* (MO); near Caimitio, *Ekman 13495* (MO, S); Casa Blanca, *Ekman 16880* (S); Sierra de Anafe, *Ekman 16911* (NY, S), *León & Roca 7148* (NY), *8816* (NY); Rotilla, near Santa Cruz de Norte, 35 km E of Habana, 6 Jul 1985 (fl, fr). *Gentry 50854*, *50878*, *50880*, *50881* (all MO); Playa de Marianao, *León 9085* (NY); Sierra de Anafe, *León 11488* (GH, NY, US), *León 11489* (NY), *León 11620* (NY); Esperon Mts., *León 13456* (NY). **MATANZAS:** Pan de Matanzas, 16 May 1970 (fl), *Muñiz s.n. (3885-4792, 3557)* (HAC). **PINAR DEL RÍO:** Sierra de Anafe, 200 m, Pena Blanca, *Alain 5320* (GH); Loma San Gabriel, Sierra de Anafe, *Ekman 13023* (S); Península de Guanahacabibas, *Ekman 18809* (S).

HAITI. Massif du Nord, Hinche, valley of Riviere Samana, 300 m, *Ekman H6055* (A, S).

There seems to be a complete clinal intergradation between *T. myrtifolia*, *T. petrophila*, and *T. anafensis*. Typical *T. myrtifolia*, which occurs mostly in Oriente, has the leaves discolorous and so densely lepidote beneath that the surface is invisible. Typical *T. petrophila* has the leaves concolorous and less densely lepidote with the lower surface clearly visible between the scales; this is the form commonly found in central Cuba. *Tabebuia anafensis* occurs in western Cuba in Habana and Pinar del Río Provinces and has the leaves even less densely lepidote. *Tabebuia jackiana* of Pinar del Río represents a large-leaved, only slightly lepidote, extreme of this same cline, but may be distinct enough for specific recognition. In Cienfuegos and Matanzas Provinces forms with both densely and sparsely lepidote leaves occur together, sometimes even in the same gathering, suggesting that the variation is varietal at best.

Alain (1957) recognized several additional segregates: uniformly shorter leaved forms as *T. mogotensis* (leaves densely whitish lepidote below) and *T. truncata* (leaves up to 2 cm long and gray below), longer-leaved forms as *T. saxicola* (leaves 2–4 cm long and densely white lepidote below). None of these segregates seems worthy of even

varietal recognition. Borhidi & Muñiz (1973) recognized this pattern but accorded the two extremes specific rank and the intermediates subspecific rank: from west to east, *T. anafensis* ssp. *anafensis*, *T. anafensis* ssp. *munizii*, and *T. petrophila*, the latter incorrectly substituted for *T. myrtifolia*. Without extensive field work, it is not at all clear that lumping this complex together as a single variable species is the best procedure. At any rate, any segregate taxa recognized must be based entirely on the vegetative differences, since the differences in fruit length and corolla and calyx size noted by Borhidi are correlated neither with geography nor the vegetative characters and are not of taxonomic significance.

It is not absolutely certain that *T. myrtifolia* itself is adequately differentiated from *T. microphylla* with shorter leaves and *T. densifolia* with elliptic apiculate leaves. In this light it is interesting that the only Haitian collection with long enough leaves to be classified as *T. myrtifolia* has the concolorous leaf undersurface of the western Cuban populations of var. *petrophila* whereas the Beata Island, Dominican Republic material here tentatively referred to *T. myrtifolia* var. *myrtifolia* has some branches with leaves indistinguishable from *T. microphylla*. This geographic pattern might suggest that both *T. myrtifolia* and *T. myrtifolia* var. *petrophila* represent no more than ecotypic differentiation of *T. microphylla*. Alternatively it is possible that the Hispaniolan collections represent hybridization of *T. microphylla* with *T. obovata* and *T. densifolia*, respectively.

60. *Tabebuia nodosa* (Grisebach) Grisebach, Symb. fl. argent. 258. 1879.

Tecoma nodosa Grisebach, Abh. Königl. Ges. Wiss. Göttingen 19: 175. 1874. Type. Argentina. Santiago del Estero: Las Aguilas, Dec 1871 (fl), Lorentz 38 (holotype, GOET; isotype, CORD (fide Fabris)).

Tabebuia nodosa var. *parviflora* Grisebach, Symb. fl. argent. 258. 1879. Type. Argentina. Salta: Dragones, oestl. v. Oran, Aug 1873 (fl), Lorentz & Hieronymus 578 (lectotype, GOET; isolectotypes, GOET, CORD).

Bignonia morongii Britton, Ann. N.Y. Acad. Sci. 7: 185. 1893. Type. Paraguay. Trinidad, Morong 276 (lectotype, NY; isolectotypes, K, MO, US).

Gelsemium nodosum (Grisebach) O. Kuntze, Rev. gen. pl. 3(2): 245. 1898.

Usually small rather rachitically branched tree 3–8(–15) m tall, the branchlets terete, the nodes of older branchlets with variously developed

short-shoots, more or less glabrescently lepidote. Leaves simple, oblanceolate to oblong-oblanceolate, the apex obtuse to rounded or rarely emarginate, the base cuneate, 0.5–6 cm long, 0.2–1.8 cm wide, entire, chartaceous to subcoriaceous, densely lepidote below, more or less glabrescently lepidote above, otherwise glabrous; petiole 2–5 mm long, lepidote, sometimes not well differentiated from leaf base. Inflorescence a single flower or cluster of 2–3 flowers at apex of short-shoot, the pedicels 3–6 mm long, lepidote, with pair of linear bracteoles near middle. Flowers with the calyx campanulate, 5-dentate, 4–9 mm long, 2–6 mm wide, strongly grayish lepidote, also lepidote inside; corolla lemon yellow, tubular-campanulate, 2–3(–5) cm long, 0.6–1(–1.5) cm wide at mouth of tube, the tube 1.5–2.5 cm long, the lobes ca. 0.5(–1.5) cm long, the tube sparsely scattered lepidote outside, the lobes with minute lepidote glands inside, the margins lanose-ciliate, sometimes also with some trichomes scattered on exterior and/or interior surface, the floor and throat puberulous with erect trichomes ca. 0.2 mm long, very inconspicuously short-glandular pubescent at stamen insertion; stamens didynamous, the anthers divaricate, 2 mm long, the connective somewhat thickened; pistil ca. 1.5 cm long, the stigma spatulate, the ovary linear, 4 mm long, ca. 0.7–1 mm wide, glabrous except for scattered inconspicuous lepidote scales; disk annular-pulvinate, 1 mm long, 2 mm wide. Fruit a linear-oblong capsule, subterete, 4–15 cm long, 0.6–0.8 cm wide, the valves coriaceous, glabrous except for a few inconspicuous lepidote scales; seeds thin, bialate, 0.5–0.7 cm long, 1.5–2 cm wide, the hyaline-membranaceous wings sharply demarcated from brownish seed body.

Distribution (Fig. 54). A very characteristic element of the chaco region from southwestern Brazil and Bolivia to Cordoba, Argentina; 30–1000 m elevation.

Representative collections examined. BRAZIL. MATO GROSSO DO SUL: Porto Murtinho, 27 Oct 1980 (fl, fr), Pires & Furtado 17340 (MO), 18 Mar 1985 (fl), Hatschbach & Zelma 49232 (MBM, MO).

BOLIVIA. BENI: Ballivian, Espíritu, Río Yacuma, 16 Oct 1980 (fr), Beck 5116 (MO); Trinidad, Misiones Guarayos, Sep 1926 (fl), Werdermann 2283 (MO, S). SANTA CRUZ: Fortín Madrejon-Fortín Ravelo, 19°20'S, 64°30'W (fr), Evrard 8133 (BR). TARIJA: Villamontes, 1924 (fl), Pflanz 4048 (B); Río Pilcomayo, Gran Chaco, 11 Nov 1910 (fl), Herzog 1080 (G, L).

PARAGUAY. AMAMBAY: Apa, Bellavista, Nov 1901 (fl), Hassler 8032 (G, MICH, MO). BOQUERÓN: Pto. Casado, Palo Santo, 25 Oct 1956 (fr), Pedersen 4187 (C, CTES, LP). CENTRAL: Trinidad, 11 Dec 1888 (fl), Morong 276 (K, MICH, MO, NY, US). CHACO: Parque Nacional Defensores del Chaco, Agua Dulce, 29 Oct 1980 (fl), Vavrek & Enciso 21 (MO, PY). CONCEPCIÓN: Prope Concepción, Aug 1901 (fl, fr), Hassler 7281 (G, MO). NEEMBUCÚ: Cucupaty, Humaita, 9 Nov 1978 (fr), Bernardi 18418 (MO). NUEVA ASUNCIÓN: Piste de Mariscal Estigarribia vers Cerro León, 6 Jun 1984 (fl), Billiet & Jadin 3326 (MO). PARAGUAI: Limpio, Sep 1898 (fl), Hassler 3234 (G). PRESIDENTE HAYES: Pozo Colorado, 2 Oct 1985 (fl), Gentry et al. 52000 (MO).

ARGENTINA. CATAMARCA: La Paz, El Barrial, 29 Dec 1946 (fl), Parizuela 70 (F). CHACO: Dep. Resistencia, Margarita Belem, 15 Jan 1946 (fl), Aguilar 670 (AAU, S); Las Brenas, FCCN, 18 Nov 1929 (fl), Venturi 9756 (LP, MO, S). CORDOBA: Cruz del Eje, 5 Jan 1900 (fl), Stuckert 8222 (G). CORRIENTES: Mburacaya, Estero San Lorenzo, 18 Dec 1947 (fl, fr), Pedersen 73 (BR, C, CTES, S); Dep. Empedrado, Estancia La Yela, 17 Nov 1977 (fl, fr), Pedersen 11993 (CTES, L, LP, MBM). FORMOSA: Dep. Bermejo, Laguna Yema, 6 Dec 1972 (fl), Marunak et al. 449 (CTES, LP, WIS). JUJUY: Dep. El Carmen, El Carmen, 15 Dec 1969 (fl, fr), Cabrera & Kiesling 20379 (C, LP). LA RIOJA: Dep. Capital, 16 km NW de Bazan, 19 Feb 1967 (fl), Okada 2856 (LP). MISIONES: Santa Rosa, Dec 1883 (fl), w/o collector s.n. (LP). SALTA: Salta to Cabeza del Buey, 25 Sep 1985 (st), Gentry et al. 51825 (MO). SANTA FE: Dep. Gral. Obligado, Lauteri, 9 Dec 1945 (fl), Maldonado 1678 (F, LP). SANTIAGO DEL ESTERO: Turena, 10 Oct 1939 (fl), Maldonado 207 (LP).

Common names. Brazil: labao, lavao; Argentina: palo cruz, uinaj, Martin Gil, toroguatay, palo sinvergüenza; guinah; Paraguay: pajagua eslabon.

Completely isolated in the genus, it is the only yellow-flowered *Tabebuia* species with simple leaves.

As already noted by Fabris (1965), large and small flowers can be found on the same plant and lack taxonomic value even at the varietal level.

There is a strong belief among campesinos that the flowering of this species predicts the coming of a rain. Aurelio Schinini (pers. comm.) assures me that this is not idle speculation and that he has personally observed this phenomenon.

61. *Tabebuia obovata* Urban, Symb. antill. 5: 495. 1908. Type. Haiti. Mörne Bonpere, Buch 710 (B*, NY—photo and fragments; lectotype, IJ).

Tabebuia apiculata Urban & Ekman, Ark. Bot. Stockholm 22A(10): 69. 1929. Type. Haiti. Presque Ile du

Nord-Oest, Mole St. Nicolas, Ekman H4473 (holotype, S; isotypes, MO, S). *Tabebuia perfae* Alain, Phytologia 25: 274. 1973. Type. Dominican Republic. Catalina Island, Liogier 18669 (holotype, NY; isotype, US).

Shrub or small *tree* to 8 m tall, dichotomously branched, the branchlets terete to subangulate, lepidote. *Leaves* unifoliolate (occasionally in part 3-foliolate), elliptic to narrowly elliptic to obovate, rounded to subacutish at apex, usually minutely apiculate, rounded to broadly cuneate at base, 0.8–5.5 cm long, 0.5–3.2 cm wide (in part to 8 × 4 cm in Ekman 9905), thick coriaceous, conspicuously lepidote above, very densely lepidote below, sometimes discolorous and lighter below from the lepidote scales, often some of the scales larger and drying dark so the undersurface appearing glandular punctate, margin entire, secondary venation brochidodromous and more or less raised below; petiole slender, 0.2–1 cm long, jointed at apex, the lateral leaflets (when rarely present) sessile. *Inflorescence* one to several terminal flowers, the pedicel 0.6–1.5 cm long, bibracteolate. *Flowers* with the calyx campanulate, shortly bilabiate, 8–13 mm long, 5–8 mm wide, drying blackish or brown; corolla whitish to magenta, narrowly tubular-infundibuliform, 2.5–5 cm long, 0.7–1.5 cm wide at mouth of tube, the tube 2–3.5 cm long, the lobes 0.5–1 cm long, glabrous outside, the lobes ciliate, sparsely puberulous with stiff trichomes on lobes and more densely in floor of tube, pilose at level of stamen insertion; anther thecae divaricate, 2–3 mm long; ovary oblong, 2–3 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1.5–2 mm long, 2–3 mm wide. *Fruit* longitudinally multicostate, narrowly cylindrical-fusiform, 5–10 cm long, 0.7–0.9 cm wide, densely lepidote, drying blackish, calyx persistent; *seeds* not seen.

Distribution (Fig. 53). Northern Haiti and western Dominican Republic; few collections from eastern Cuba; sea level to 400(–800) m, mostly on limestone or in open pinelands.

Specimens examined. CUBA. GUANTÁNAMO: Baitiquiri, camino a Mina Yeso, 19 Aug 1972 (st), Bisse & Rojas s.n. (HAJB2005500) (HAJB); Jauco River, S. Baracoa, León 11718 (HAC); Uvero Beach, Guantánamo region, 28 Jul 1951 (fl), Webster 3950 (GH).

HAITI. Mörne Bonpere, Jan 1901, Buch 710 (IJ, NY); Presqu'île du Nord-Oest, Mole St. Nicolas, 5 Jul 1925 (st), Ekman H4473 (MO, S); Ennery, road to Perroy, 17 Jun 1927 (fl), Ekman H8478 (S); Massif du

Nord, Gros Mórne, road to Port de Paix, 11 Mar 1928 (fl, fr), *Ekman H9673* (B, MO, S, TEX-LL, US); Plaine du Nord, Acul-Samedi, 29 Apr 1928 (fl, fr), *Ekman H9905* (MO, S); vic. of Ennery, Dept. l'Artibonite, 325–900 m, 18 Feb 1926 (fl, fr), *Leonard 9718* (GH, NY, US); Nord-Ouest, 5.5 km E de Mole St. Nicolas, 3 Jan 1985 (fl), *Zanoni et al. 33540* (JBSD, MO).

DOMINICAN REPUBLIC. **BARAHONA:** Prope Barahona, Apr 1912 (fl), *Fuertes 1490* (A, FI, G, K, NY, US). **DAJABÓN:** Near Partido, 150 m, 21 Oct 1969 (fl), *Alain 16431* (NY). **DISTRITO NACIONAL:** Sierra Prieta Villa Mella, 200 m, 26 May 1973 (fl), *Liogier & Liogier 19258* (NY), 2 May 1974 (fl), *21457* (C, JBSD, MO, NY, US), 24 Oct 1975 (fl), *24103* (JBSD, NY), 25 Mar 1982 (fr), *Mejía & Pimentel 19762* (JBSD), 13 Aug 1980 (fr), *Mejía & Zanoni 7859* (JBSD). **INDEPENDENCIA:** 6 km S of Pto. Escondido, Puerto Escondido-Acetitillar, 12 Apr 1985 (fl), *Gentry & Mejía 50800* (JBSD, MO). **LA ALTAGRACIA:** Boca de Yuma, sea level, *Liogier & Liogier 22952* (JBSD, NY); Isla Saona, 30 Nov 1977 (st), *Liogier et al. 27245* (JBSD), 5 Feb 1981 (fl), *Zanoni et al. 10765* (JBSD). **LA ROMANA:** Catalina Island, sea level, 2 Jul 1972 (fl), *Liogier 18669* (NY, US), 18671 (MO, NY); 8 Apr 1973 (fl), *Liogier & Liogier 18920* (NY); E of Punto Pérez, 15 Jul 1981 (fl, fr), *Zanoni et al. 15449* (JBSD). **PUERTO PLATA:** Puerto Plata, Nov 1905 (fl), *Gagzo s.n.* (HB). **SANTIAGO RODRIGUEZ:** Manción, 375 m, 28 Jun 1929, *Ekman H13028* (GH); Monción, 375 m, 11 Aug 1930, *Valeur 117* (MO, TEX-LL). **SANTIAGO:** Vic. Santiago, Mt. Palo Quemado, 1000 ft, 11 Jan 1946 (fl), *Allard 14532* (S, US); Jaiqui Picado, 20 mi W of Santiago, 300–400 m, 19 May 1969 (fl), *Liogier 15254* (GH, NY); Magua, Distr. San José de los Matos, 300–400 m, *Valeur 968* (K, TEX-LL, US).

Common name. Aceituno.

This is essentially a unifoliolate form of variable *T. berteroi* and occasional 3-foliolate leaves suggest that the two are not very distinct. They appear to intergrade (i.e., a few 3-foliolate leaflets in mostly unifoliolate populations) near Santiago, Dominican Republic (e.g., *Valeur 968*, with two completely unifoliolate duplicates at Kew but one (of two) branchlets of the Smithsonian collection partly 3-foliolate) and in northern Haiti (including *Ekman H4956* from the type locality).

The population on Catalina Island and the nearby coastal region has been segregated as *T. perfae* and has generally smaller leaves with more prominent secondary venation below and smaller lighter colored flowers. All of these characters (except the extreme in small calyx) occur independently elsewhere in the range of *T. obovata*. *Tabebuia apiculata*, described from sterile material, has the leaf apices more apiculate and the undersurface more whitish than in most collec-

tions of *T. obovata* but is surely not specifically distinct. One collection (*Ekman H9905*) has some of the leaves much larger (to 8 × 4 cm) but a second branch has normal-sized leaves. The few Cuban collections have the typical leaves of *T. obovata* and are surely conspecific with the Hispaniolan taxon.

62. *Tabebuia obscura* (Bureau & K. Schumann) Sandwith, Rec. Trav. Bot. Neerl. **34:** 226. 1937.

Tecoma obscura Bureau & K. Schumann in Martius, Fl. bras. **8(2):** 343. 1897. Type. Brazil. Amazonas: San Gabriel, *Spruce 1979* (B*, lectotype, K; isotypes, F, NY, W).

Tabebuia subtilis var. *schultesiana* Sandwith, Bot. Mus. Leaf. Harvard Univ. **17:** 96. 1955. Type. Colombia. Amazonas/Vaupes, *Schultes & Cabrera 16195* (K). *Tabebuia obscura* var. *schultesiana* (Sandwith) Sandwith in Dugand, Mutisia **25:** 16. 1956.

Handroanthus obscurus (Bureau & K. Schumann) Matos, Loeffgrenia **50:** 4. 1970.

Shrub or small *tree* to several meters tall, the branches subterete to subtetragonal, stellate pubescent when young. *Leaves* palmately 5-foliolate, the leaflets narrowly elliptic to oblong-elliptic, acute to acuminate, more or less rounded at base, the terminal leaflet to 15 cm long and 11 cm wide, the laterals smaller, entire, subcoriaceous, scattered lepidote above and especially below, above stellate-puberulous on the main nerves, below with stellate trichomes (and sometimes also with longer simple hairs) along the main nerves and sparsely over the surface (when young more densely stellate-tomentose over most of surface), drying olive-gray with conspicuous dark-drying glandular zones along the midvein below; petiolules to 4.5 cm long, the petiole to 13 cm long, reddish-stellate. *Inflorescence* a contracted few-15-flowered panicle, usually almost fasciculate, bracteate with subulate bracts 2–10 mm long, the pedicels tan, reddish-stellate, 4–8 mm long. Calyx campanulate, slightly 5-lobed, 8–14 mm long, 6–10 mm wide, conspicuously finely pubescent with thick-stellate trichomes, dark reddish, these less dense between the teeth, each tooth acute with a more densely pubescent striation descending from the apex; corolla yellow with reddish lines in the throat, tubular-infundibuliform, 5.5–8 cm long, 1.2–2 cm wide at mouth of tube, the tube 3.5–5.5 cm long, the lobes 1.5–2 cm long, glabrous outside except for some stellate trichomes on the lobes, the lobes

minutely glandular-lepidote, not ciliate, the throat pleats sparsely puberulous with short papillate trichomes, adaxially glabrous, villous at level of stamen insertion; stamens didynamous, the thecae divaricate, 2 mm long; pistil ca. 3 cm long, the ovary linear, 2–3 mm long, 1 mm wide, sparsely lepidote, the surface smooth; disk cupular, ca. 1 mm long, 1.5–2 mm wide. *Fruit* a linear capsule, terete, 24–35 cm long, 1.3–1.7 cm wide, tapering apically, the valves thin, longitudinally irregularly and finely striate ridged, finely stellate-tomentose, with conspicuous scattered dark-drying glandular zones, each one with a plate-shaped gland in center; *seeds* thin, bialate, 0.6–1 cm long, 2.2–3.6 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 55). Northwestern Amazonia, mostly along the upper Rio Negro and tributaries, south to Amazonian Peru. Terra firme forests, mostly occurring on poor sandy soils; also on *laja*, especially along rivers; near sea level to 500 m.

Representative specimens examined. COLOMBIA. AMAZONAS: Río Igará-Parana, La Chorrera, 14 Jun 1974, *Sastre 3357* (COL, MO); Río Apaporis, Vaupes border, 16 Sep 1951 (fl), *Schultes & Cabrera 14069* (COL, K, US). CAQUETÁ: 16 Jan 1944, *Gutiérrez V. & Schultes s.n.* (MED). GUAJINIA: (fl), *Espina et al. 194* (COL). META: Río Muco, Caño Caracaraté, 13 km S de San Pedro, 10 Apr 1945 (fl, fr), *Giovanni 11* (COL). VAUPES: Río Igarapé, E de Mitú, 20 Nov 1945 (fl), *Allen 3368* (F, G, MO, US); Mitu, lower Rio Kubiyu, 12 Nov 1976 (fl), *Zarucchi 2219* (MO).

VENEZUELA. AMAZONAS: 30–34 km S of Puerto Ayacucho, Tobogan de Selva, Jun 1975 (st), *Gentry & Berry 14537* (MO); Atures, Tobogan de la Selva, 14 May 1980 (fr), *Steyermark et al. 122565* (MO).

BRAZIL. ACRE: Mun. Mancio Lima, estrada para Barão, Km 30–52, 7–8°S, 72–73° W, 24 Oct 1984 (fr), *Cid et al. 5243* (MO, NY). AMAZONAS: Río Içana, Estirão Santana, 22 Mar 1952 (fl), *Frôes 27990* (IAN, INPA); Alto Rio Negro, Ilha do Maua, 9 Feb 1959 (fl), *Rodrigues 847* (IAN, INPA, MG); Rio Curicuriari, 13 Jul 1979 (fl), *Poole 1978* (MO).

PERU. LORETO: Capihuari, 5 km N of Andoas, 17 Nov 1979 (fr), *Gentry & Diaz 28196* (AMAZ, MO, USM); Quistococha, 26 May 1978 (fl, fr), *Gentry et al. 22278* (AMAZ, MO).

Local names. Colombia: palo de arco; Brazil: pao d'arco; Peru: tahuari.

This species is extremely close to *T. capitata*, from which it cannot be reliably distinguished vegetatively. The calyces of *T. obscura* are generally longer and narrower than those of *T. capi-*

tata with a redder indumentum and stronger tendency to slightly raised ribs. In addition, *T. obscura* tends to be a smaller tree and to have more persistently tomentose fruits and a stronger development of dark glandular areas in the lateral nerve axils of the leaflet undersurface. At least in Peru these two species seem ecologically distinct, with *T. capitata* occurring in clayey lateritic soils and *T. obscura* restricted to sandy soil.

It seems probable that the rheophytic form with narrow leaflets that has been separated as var. *schultesii* is no more than an ecotypic variant.

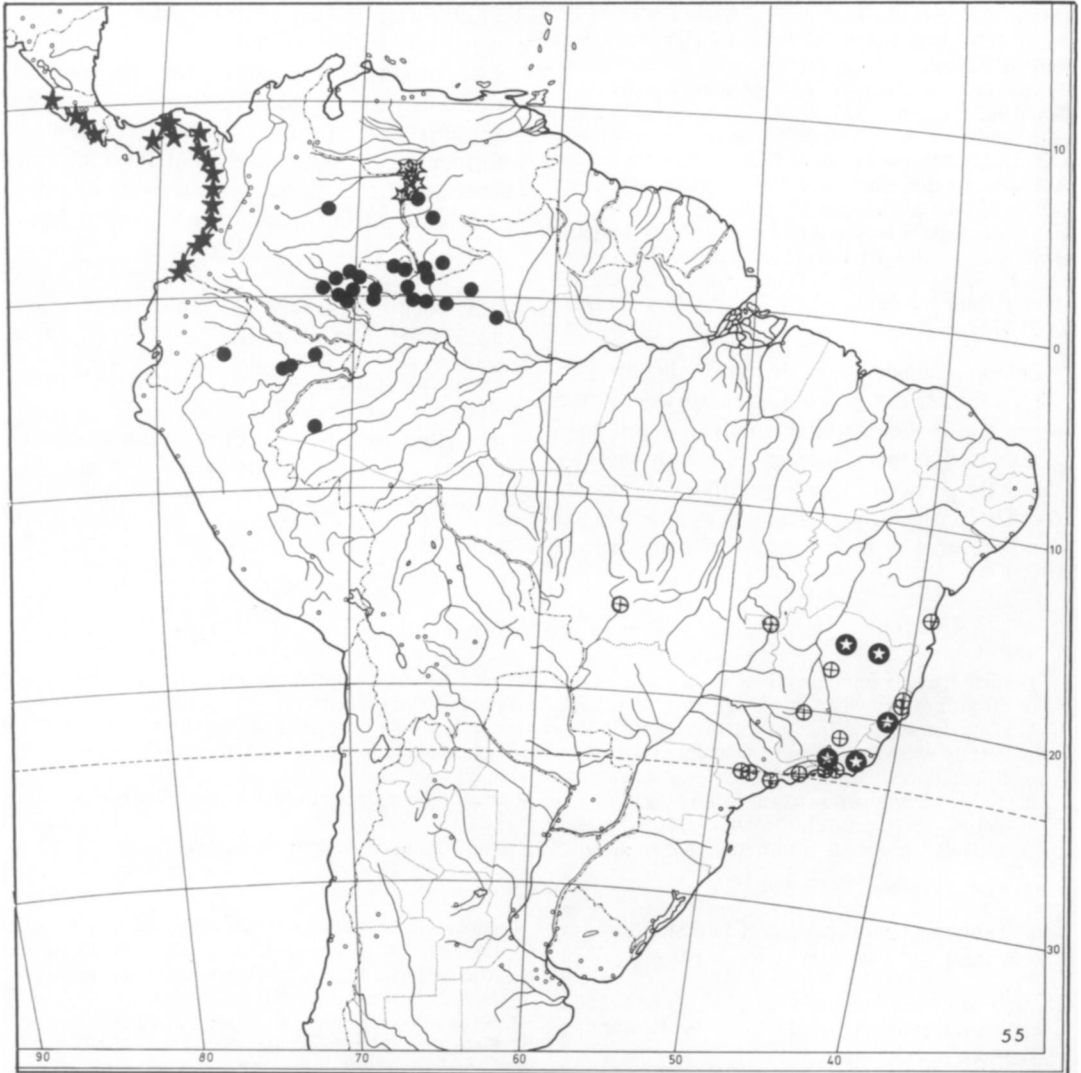
63. *Tabebuia obtusifolia* (Chamisso) Bureau, Vidensk Meddel. Dansk Naturhist. Foren. Kjobenhavn **1893**: 113. 1894.

Bignonia leucoxylla Vellozo, Fl. flumin. 252. 1829. Type illustration. Brazil. Rio Taguahy. Vellozo, Icones Fl. flumin. 6: t. 54. 1831, non *B. leucoxyllon* Linnaeus, Sp. Pl., ed. 1, 2: 624. 1753.

Spathodea obtusifolia Chamisso, Linnaea 7: 660. 1832. Type. Brazil. *Sellow s.n.* (lectotype G-DC; isotypes, K, W).

Tabebuia leucoxylla (Vellozo) A. P. de Candolle, Prodr. 9: 212. 1845.

Small tree 3–8 m, twigs subterete, lepidote. *Leaves* simple, obovate to obovate-elliptic, the apex rounded or obtuse, the base cuneate, 7–16 cm long, 2–7.5 cm wide, entire, often \pm revolute, coriaceous, densely lepidote above and below, otherwise glabrous, without glands at base of blade or with scattered glands not in a well-developed glandular field; petioles 1.5–3 cm long, lepidote. *Inflorescence* a rather few-flowered corymbose terminal panicle, densely lepidote, the flowers mostly in 2's, the branches very wide (ca. 0.5 cm) and flattened, the pedicels 3–5 cm long, bracts linear, to 2 mm long. *Flowers* with the calyx campanulate, bilabiate or subspathaceous ca. half the length, the lobes more or less toothed, 22–30 mm long, 10–14 mm wide, densely lepidote, longitudinally striate-costate, with plate-shaped glands in upper third; corolla greenish white, tubular-infundibuliform, curved forward, 5.5–10 cm long, 1.7–2.5 cm wide at mouth of tube, the tube 3.5–7 cm long, lobes 1.5–2.5 cm long, glabrous outside, puberulous on lobes inside, the tube glabrous inside even at stamen insertion; stamens didynamous, subexserted, the anther thecae parallel or slightly divergent, 5–6 mm long, the filaments ca. 3–3.5 cm long, in-



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FIG. 55. Distribution of continental *Tabebuia*. ● = *T. obscura*; ⊕ = *T. obtusifolia*; ☆ = *T. orinocensis*; ★ = *T. palustris*; ● = *T. pedicellata*.

sertion ca. 3 cm from base of corolla tube; pistil with the ovary linear-oblong, 5–7 mm long, 1.5–2 mm wide, densely lepidote, the ovules 2-seriate in each locule; disk very large, broadly patelliform, 1–2 mm long, 6–7 mm wide. *Fruit* linear-oblong, 16–19 cm long, terete, 1.5–2 cm diam., the valves relatively thick, densely lepidote, not at all striate-wrinkled, calyx deciduous; *seeds* bialate, 1.2–1.4 cm long, 3–3.5 cm wide, the wings

more or less hyaline with brownish striations, sharply demarcated from brown seed body.

Distribution (Fig. 55). Coastal Brazil from Bahia to São Paulo; also occasional farther inland with one collection from Mato Grosso; mostly near sea level.

Representative collections examined. BRAZIL. BAHIA: Ilhéus, CEPEC, 11 Mar 1969 (fl), *Almeida 393*

(MO). **ESPÍRITO SANTO:** Reserva Fl. da CVRD, Linhares, EST. X-a, 2 Aug 2979 (fl), *Folli 87* (MO); Est. Peroba-Amarela, 17 Aug 1981 (fl, fr), *Silva 253* (MO). **MATO GROSSO:** Chapada dos Guimares Salgadeira, 21 May 1983 (fl), *Oliveira Filho 89* (UEC). **MINAS GERAIS:** Rio Pamba, 28 Aug 1950 (fl, fr), *Heringer 2644* (MO, UB, UEC). **RIO DE JANEIRO:** Estr. Vista Chinesa, pr. A. Cachoeira dos Macacos, 6 Sep 1978 (fr), *Angeli 468* (MO); Rio de Janeiro, Jul 1863 (fl), *Glaziou 1477* (C, F, R); Morro de Nova Cintra, 18 Jul 1890 (fl, fr), *Neves-Armond 268* (MO, R). **SÃO PAULO:** Mun. Dois Corregos, 18 Sep 1981 (fl, fr), *Leitão Filho et al. 12932* (UEC); Guarei, Sarandi, (fl, fr), *Neves & Barbosa IPH-USP-81* (UEC).

Common names. Cova de onça, tabebuia.

This species differs from *T. cassinoides* in the larger conspicuously striate calyx, larger disk, subexserted anthers, thicker fruit with woodier valves, larger seeds, etc. Vegetatively it appears to differ consistently in lacking a well-developed glandular area at base of the leaf blade below.

To judge from the aspect of the flower, this species is likely bat-pollinated.

I was originally suspicious of the single records for the Distrito Federal at 1200 m (*Davis 60260*) and Mato Grosso (*A. Oliveira 89* (UEC)), but am informed by M. Vasconcellos of the Unicamp herbarium that the collections of Ary Oliveira are definitely from the Cuiaba region of Mato Grosso.

64. *Tabebuia ochracea* (Chamisso) Standley, Field Mus., Nat. Hist., Bot. Ser. **11**: 176. 1936.

A polymorphic species with at least three fairly well-defined geographical races.

Distribution (Fig. 56). El Salvador to northwestern Argentina, mostly in dry or seasonally dry forests; sea level to 1600 m elevation.

Key to the Subspecies

1. Leaflets sparsely tomentose below, the surface clearly visible between the trichomes, not strongly whitish or tannish except when very immature; Venezuela to Trinidad and Guyana. subsp. *heterotricha*.
1. Leaflets densely and finely whitish or tannish tomentose over whole undersurface, the surface macroscopically whitish or tannish, usually obscured by the trichomes; El Salvador to northwest Venezuela or Brazilian cerrado and adjacent subAmazonian regions.
 2. Calyx trichomes mostly ca. 1 mm long, the calyx indumentum somewhat caducous; Brazilian cerrado and adjacent subAmazonian dry forest areas. subsp. *ochracea*.
 2. Calyx trichomes to 7 mm long, not caducous; El Salvador to northwestern Venezuela. subsp. *neochrysantha*.

64a. *Tabebuia ochracea* (Chamisso) Standley ssp. ***ochracea***.

Tecoma ochracea Chamisso, *Linnaea* **7**: 653. 1832. Type. Brazil. *Sellow s.n.* (B*, lectotype, K; isotypes, HGB, G, L, W).

Tecoma hypodictyon A. P. de Candolle, *Prodr.* **9**: 217. 1845. Type. Brazil. Villa Barra, *Blanchet s.n.* (holotype, G-DC).

Tecoma heteropoda A. P. de Candolle, *Prodr.* **9**: 219. 1845. Type. Peru. Huánuco: Pozuzo, *Ruiz & Pavón s.n.* (holotype, G; isotypes, BR, F, K, P) (leaves only, mixed with flowers of *Tabebuia roseo-alba*).

Bignonia tomentosa Pavon ex A. P. de Candolle, *Prodr.* **9**: 219. 1845. nom. nud., pro syn.

Tecoma hassleri Sprague, *Trans. Proc. Bot. Soc. Edinburgh* **48**: 435. 1904. Syntypes. Paraguay. San Estanislao, *Hassler 4159* (lectotype, K; isotypes, G, GH, MO, P), *4164* (G, K, MICH, MO).

Tecoma grandiceps Kränzlin, *Feddes Repert.* **17**: 216. 1921. Type. Peru. Cuzco: Pomachaca, Urubamba Valley, 1200 m, *Weberbauer 5050* (B*, not seen).

Tecoma campinae Kränzlin, *Feddes Repert.* **17**: 215. 1921. Type. Brazil. São Paulo: Campinas, *Heiner 137* (not seen).

Tecoma hemmendorffiana Kränzlin, *Feddes Repert.* **17**: 224. 1921. Syntypes. Brazil. São Paulo: Santa Rita de Passa Quatro in campo arenoso, *Hemmendorff 2*, *Hemmendorff 190* (not seen).

Tabebuia hypodictyon (A. P. de Candolle) Standley, *Field Mus. Nat. Hist., Bot. Ser.* **11**: 176. 1936.

Handroanthus ochraceus (Chamisso) Mattos, *Loefgrenia* **50**: 2. 1970.

Tabebuia ochracea ssp. *heteropoda* (A. P. de Candolle) A. Gentry in *Prance, Biological Diversification in the Tropics* **132**. 1982.

Often rather gnarled and twisted *tree* 4–12(–25) m tall, the branchlets subtetragonal to subterete, stellate and short-dendroid puberulous when young with tannish trichomes, more or less glabrescent. *Leaves* palmately (3–)5-foliolate, the leaflets oblong-obovate to oblong-elliptic, obtuse or rounded to abruptly cuspidate-subacuminate, basally obtuse to truncate or shallowly subcordate, the terminal leaflet (1.5–)3–13 cm long, 2.3–9 cm wide (to 23 by 11 cm in juveniles), the laterals progressively smaller, entire or rarely



FIG. 56. Distribution of *Tabebuia ochracea*. ● = ssp. *ochracea*; ■ = ssp. *heterotricha*; ★ = ssp. *neochrysantha*; ⊖ = *T. ochracea/chrysantha* intermediates.

slightly obtusely dentate, chartaceous to coriaceous, more or less lepidote above and below, above also glabrescently stellate-puberulous (a few trichomes persisting at least along midvein), below densely and persistently stellate puberulous, the surface conspicuously light tannish from

the trichomes (less densely but still conspicuously stellate in juvenile plants), smooth above or gritty (from the trichomes) but never scabrous, the tertiary venation usually strongly intricately reticulate below; terminal petiolule 1–5(–7.5 in juveniles) cm long, the petiole 2.5–12(–25 in ju-

veniles) cm long, tannish stellate puberulous. *In-florescence* a dense contracted terminal raceme or reduced to subsessile cluster, the flowers subsessile or with pedicels to 1 mm long and tannish pilose with simple and slightly barbate trichomes. *Flowers* with the calyx campanulate, irregularly shallowly 5-lobed, 8–18(–20) mm long, 6–14(–20) mm wide, villous with tannish simple and weakly barbate trichomes, these mostly ca. 1 mm long (–3 mm in *Folli 39*), also with shorter stellate trichomes, the indumentum with a strong tendency to glabrescence; corolla yellow with reddish pencilling in throat, the venation of the lobes when dry usually inconspicuous and the yellowish lobes thus contrastingly lighter than the darker drying tube, tubular-infundibuliform, 4.5–9 cm long, 1–3.5 cm wide at mouth of tube, the tube 3.5–6 cm long, the lobes 1–3 cm long, mostly glabrous outside, usually with a few stellate trichomes along veins below sinuses and also sparsely on inside of lobes, the sinuses and floor of throat pilose inside with long simple somewhat flexuous multicelled trichomes, these mostly ca. 1 mm long, also more or less glandular-pubescent at stamen insertion; stamens didynamous, the thecae divergent, 3 mm long; pistil 2–2.7 cm long, the ovary oblong, 3–4 mm long, 1.5–2 mm wide, more or less glandular lepidote, also usually minutely puberulous; disk annular-pulvinate, 0.5–1 mm long, 3–4 mm wide. *Fruit* a linear-cylindric capsule, narrowing to base and apex, 12–30 cm long, 1.5–2.2 cm wide, usually golden tannish (occasionally rusty: *Folli 463*) villous with barbate and sparsely dendroid mostly ca. 2 mm long trichomes, also with shorter stellate hairs, the indumentum distinctly glabrescent (except *Folli 463*); *seeds* 0.8–1.1 cm long, 2.2–3.3 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from seed body.

Distribution (Fig. 56). A very typical element of the cerrado of central Brazil and adjacent regions; also occurring outside the cerrado but rarely inside closed canopy forest; near sea level to 1600 m elevation.

Representative specimens examined. **ECUADOR.** NAPO: Coca-Auca, Km 53, 400 m, 76°52'W, 0°50'S, 20 Aug 1979 (fl), *Holm-Nielsen et al. 19772* (AAU); via Coca-Tiputini, 240 m, 5 Aug 1975 (fl), *Little & Campuzano 58* (MO).

PERU. CAJAMARCA: Colosay, 15 Oct 1961 (fr), *Woytkowski 6937* (K, GH, MO). CUZCO: Maranura,

Convención, 1200 m, 9 Sep 1969 (fl, fr), *Chavez 553* (MO). HUÁNUCO: Pozuzo, *Ruiz & Pavon s.n.* (BR, F, K). JUNÍN: Tarma (fl), *Raymondi 2819* (USM). LAMBAYEQUE: 28 km E of Olmos, 1 Oct 1964 (fl), *Hutchison & Wright 6713* (US). LIMA (cult.): Lima Botanical Garden, 7 Jan 1946 (fl), *Seibert 2331* (MO).

BRAZIL. ACRE: 22 km from Rio Branco on road to Brasileia, 4 Oct 1980 (fl), *Lowrie et al. 376* (MO). AMAZONAS: Humaita, Fazenda Criação, 27 Jun 1966, *Lima 66-4668* (IPA). BAHIA: Maracas, Sep 1906 (fl), *Ule 7225* (B, HBG, L). CEARÁ: Chapada do Araripe, 8 km W of Crato, 15 Feb 1985 (st), *Gentry et al. 50174* (MO). DISTRITO FEDERAL: Aguas Emendadas, 40 km from Brasilia, 21 Jan 1978 (st), *Gentry 21426* (MO); Parque Nacional do Brasilia, 26 Aug 1965 (fl), *Heringer 10499* (IAN, MO, NY); Universidade de Brasilia, 2 Sep 1964 (fl), *Irwin & Soderstrom 5846* (MO, NY, UB). ESPÍRITO SANTO: Linhares, Reserva Florestal CVRD, 2 Oct 1978 (fl), *Folli 39* (MO), 3 Feb 1985 (st), *Peixoto, Gentry, et al. 3474* (MO). GOIÁS: Serra Dourada, *Glaziou 21836* (BR, G); Cristalina, 16 Feb 1965 (fl), *Heringer 10484* (IAN, UB). MARANHÃO: 3 km S of Loreto, 1 km S of Rio Balsas, Jun 1962 (fl), *Eiten & Eiten 4854* (MO, NY); Rio Tocantins, abaixo de Carolina, 29 May 1950 (fl), *Pires & Black 2479* (IAN). MATO GROSSO: Garapu, 2 Oct 1964 (fr), *Irwin & Soderstrom 6608pp* (MO, NY, UEC); 1 km S of Xavantina, 14 Aug 1967 (fl), *Ratter & Ramos R352* (K, P, UB). MATO GROSSO DO SUL: Fazenda Salina, Pantanal do Rio Negro, 8 Sep 1987 (fl), *Dubs 330* (MO). MINAS GERAIS: Fazenda da Cachoeira, Belo Horizonte, *Barreto 1830* (F, R); Fazenda Lagoa, Monte Belo, 7 Sep 1987 (fl), *Gentry & Vieira 59131* (MO, UEC); 25 km W of Alfenas, road to Ariado, 7 Sep 1987 (fl), *Gentry et al. 59156* (MO); between Sitio & Barbacena, *Glaziou 12983* (C, G, K); Marlieria, between Timoteo & Dionisio, 22 Sep 1975 (fl), *Heringer & Eiten 15126* (HB, MO, UB). PARÁ: Monte Alegre, 11 Dec 1908 (fl, fr), *Ducke 18190* (CH, MO); Santa Cruz dos Martirios, Araguaia, 9 Jun 1953 (fl), *Froes 30022* (IAN, K, S); cerrado near Peixeboi, 140 km E of Belém, Dec 1947 (st), *Gentry 13137* (MO). PARANÁ: Jaguariahyva in campo cerrado, 19 May 1914 *Dusen 383a* (MO). PERNAMBUCO: Entre Belo Jardim e Brejo da Madre de Deus, Serra do Vento, 2 Nov 1956 (fl, fr), *Lima 56-2613* (IPA, MO). PIAUÍ: Rio Gurgueia, Agreste, Jul 1912 (fl), *Luetzelburg 1382* (MO, RB). RIO DE JANEIRO: Guanabara, São Sebastião do Alto, estr. Macuco Valão do Barro, 24 Aug 1981 (fl, fr), *da Rocha 636* (MO). SÃO PAULO: Via Dutra, Rio de Janeiro to Campinas, 30 Aug 1987 (fl, fr), *Gentry 58770* (MO, UEC); Campinas, 550 m, 46°5'W, 22°55'S, 31 Aug 1987 (fl), *Gentry & El-Dash 58796* (MO, UEC); SSE de São Jose dos Campos, 29 Aug 1962 (fl), *Mimura 535* (NY, SP).

BOLIVIA. BENI: Ballivian, San Borja, 180 km NNW via Río Yacuma, 26 Jul 1981 (fl), *Beck 6980* (MO); Vaca Diez 35 km E of Riberalta, 12 Sep 1981 (fl), *Solomon 6238* (MO). LA PAZ: Iturralde, Luisita, W del Río Beni, 12 Mar 1984 (st), *Haase 217* (MO). SANTA CRUZ: Sara, Buenavista, 20 Sep 1926 (st), *Steinbach 6452* (F, G, MO).

PARAGUAY. AMAMBAY: Sierra de Amambay, Esperanza, Sep 1907 (fl), *Hassler 10607* (C, G, MICH,

MO). PARAGUARI: Parque Nacional Ybycui, 15 Oct 1978 (fr), *Bernardi 18053* (MO), 1 Oct 1985 (st), *Gentry et al. 51963* (MO, PY).

ARGENTINA. SALTA: Oran, Río Pescado, 30 Sep 1946 (fl), *Castiglioni & Tinto D2991* (K); Dep. Tartagal, Campamento San Pedro, 16 Oct 1941 (fl), *T. Meyer 15204* (K, MO).

Local names. Argentina: lapacho amarillo; Ecuador: guayacan; Bolivia: tajibo amarillo; Brazil: caraiba, ipe-caraiba, pau d'arco amarelo, ipe amarelo, ipe, piuva, piuvinha, ipe macaco, ipe do mata; Paraguay: tayu peruru, lapacho amarillo; Peru: tahuari, guayacan.

Although I have seen no authentic material of *T. campinae* nor *T. hemmendorffiana*, their description as related to *T. chrysotricha* but with densely whitish pubescent leaf undersurfaces leaves little doubt that both are conspecific with *T. ochracea* which is common in the Campinas area of São Paulo State.

This species tends to intergrade with *T. chrysotricha* (see discussion below and under that species). One atypical plant (*Folli 39, 463, Peixoto et al. 3474*) from Linhares, Espírito Santo has much redder pubescence and longer calyx trichomes approaching in pubescence color *T. chrysotricha* and in the length and form of trichomes *T. ochracea* ssp. *neochrysantha*; this is also the largest individual on record and the only collection clearly from intact closed canopy forest. It is not clear to what extent this represents ecotypic variation or an individual extreme.

As treated here, *T. ochracea* is a polymorphic species with allopatric populations in different parts of the neotropics treated as subspecies. All are held together by the villous calyx and fruit indumentum, the mature leaves of mature plants mostly smooth or smoothish above, the corolla throat pilose, the outside of the tube with at least a few stellate trichomes near base of lobes and the lobes (usually) drying a clear yellow contrasting with the darker drying tube. All of these forms also are conspicuously pubescent on the leaflet undersurfaces but the density of the leaflet undersurface indumentum varies geographically and is an important inter-subspecific differentiating character.

Several forms of *T. ochracea* that I have not formally recognized taxonomically deserve special mention. One of these is represented by a group of collections (*Irwin & Soderstrom 5062, 5846, Heringer 12168, 14825, 15952*) from the

Distrito Federal of Brazil that differ in having the dried corolla lobes strongly veined and concolorous with the tube as in *T. serratifolia* or *T. chrysantha*. Unfortunately, none of these collections has leaves, and the flowers seem otherwise identical with the sympatric typical form of *T. ochracea*. Especially interesting is *Heringer et al. 595* which has attached flowers with the typical clear-yellow-drying lobes but additional unattached flowers with strongly veined lobes. This collection also has unattached leaflets of typical *T. ochracea*. I suspect that the unattached corollas are from a different tree, although they could also represent an ageing phenomenon. At any rate, the occurrence of both corolla types under the same collection number would appear to rule out drying artifact as a potential explanation for this difference. It is possible that this group of collections represents hybrid introgression with *T. serratifolia* or *T. umbellata*.

The collections of *T. ochracea* from the southwestern part of its distribution also present an unresolved taxonomic problem. I have previously (Gentry, 1982c) referred these collections to *T. ochracea* ssp. *heteropoda*, but additional collections from dry parts of the Andean foothill area of Peru indicate that these populations are not adequately distinct from typical *T. ochracea* for taxonomic recognition.

Some of the material previously referred to *T. ochracea* ssp. *heteropoda* may be conspecific with *T. chrysantha* instead (see discussion under that species) and exclusion of these collections leaves the western populations of *T. ochracea* much more homogeneously similar to typical *T. ochracea*. The status of the collections from extreme northwestern Argentina that are here included in *T. ochracea* remains unclear. Most of the northwestern Argentina collections that were referred by Fabris (1965) to *T. lapacho* are more like *T. chrysotricha* or *T. chrysantha* on account of the leaflets rough above and relatively sparsely stellate-pubescent below. The corolla lobes have a tendency to have darker venation when dry, as in *T. chrysantha*, but unlike *T. ochracea* or *T. chrysotricha*. A few leafless collections from Argentina and Bolivia have the corolla lobes drying clear yellow and thus presumably belong to *T. ochracea* ssp. *ochracea*. I have seen no fruiting collections from this region. I suspect that part of the Argentinian/Bolivian collections will prove referable to *T. ochracea* and part to *T. chrysan-*

tha, on the basis of villous vs. short-tomentose fruit indumenta, respectively.

The following collections are representative of the unassigned *ochracea/chrysantha/chrysotricha* intermediates:

BRAZIL. MINAS GERAIS: Ituiutuba, Fda. Sta. Teresinha, (fl), *Muedo 725* (MBM). **SANTA CATARINA:** Brusque, 26 Sep 1948 (fl), *Reitz 3541* (B, MBM, MO, NY, S).

BOLIVIA. BENI: Vaca Diez, 18 km E of Riberalta, 21 Sep 1981 (fr), *Solomon 6379* (MO). **CHUQUISACA:** Cañon de Bojodes, 10 km N de Monteagudo, 18 Sep 1980, *Muhlbauer s.n.* (MO). **SANTA CRUZ:** Sara, 5 Sep 1925 (fl), *Steinbach 7218* (MO, S). **TARIJA:** Arce, ca. 2 hr N of Sidras, 25 Apr 1983 (st), *Solomon 10102* (CTES, MO).

PARAGUAY. ASUNCIÓN: San Lorenzo, 19 Aug 1893 (st), *Lindman A1873* (MO). **CENTRAL:** Ypacaray, Sep 1913 (fl), *Hassler 12266* (L, MO); Villa Elisa, 1 Oct 1967 (fl), *Pedersen 8454* (C, CTES, LP). **PARAGUARI:** La Rosada, Ybycui National Park, 1 Oct 1985 (fl), *Gentry et al. 51908* (MO, PY); Parque Nacional Ybycui, 22 Jul 1984 (st), *Hahn 2648* (MO, PY).

ARGENTINA. JUJUY: Ledesma, Sierra de Calilegua, 7 Sep 1927 (fl), *Venturi 5188* (LP, MO, US); Ledesma, Yuto, El Bananal, 19 Oct 1963 (fl), *Fabris 4550* (LP).

64b. *Tabebuia ochracea* ssp. *heterotricha* (A. P. de Candolle) A. Gentry, *Flora Venez* **8(4):** 391. 1982.

Bignonia heterotricha A. P. de Candolle, *Rev. Bignon.* (Biblioth. Univ. Genève) **22.** 1838, nom. nud.

Tecoma heterotricha A. P. de Candolle, *Prodr.* **9:** 219. 1845. Type. Venezuela: Caracas, *Vargas 36* (holotype, G-DC; isotype, L).

Tabebuia heterotricha (A. P. de Candolle) Hemsley, *Biol. centr.-amer., Bot.* **2:** 495. 1882.

Tabebuia blakeana Pittier, *Cat. Flora Venez.* **2:** 408. 1947, nom. nud.

Very similar to *T. ochracea* ssp. *neochrysantha* in flowers and fruits. Differs principally in the leaflet undersurfaces with dispersed-stellate trichomes (the surface clearly visible between the trichomes) and the resulting relatively concolorous dry leaf. There is also a tendency for the inflorescence to be less contracted and the calyx trichomes are mostly shorter and barbate rather than simple.

Distribution (Fig. 56). Trinidad, Guyana, and most of Venezuela; mostly in seasonally dry deciduous forest; sea level to 700 m elevation.

Representative specimens examined. COLOMBIA. VICHADA: Casuarito, across from Pto. Ayacucho, 3 Apr 1984 (fl), *Gentry & Stein 46288* (MO, VEN); Puerto Carreño, 4 Apr 1946 (fl), *Veze 2303* (VEN).

VENEZUELA. AMAZONAS: Behind Pto. Ayacucho airport, 4 Apr 1984 (fl), *Gentry & Stein 46364* (MO). **ANZOATEGUI:** 16 km E of Boca de Uchire, Jul 1975 (st), *Gentry & Berry 14796* (MO). **APURE:** Pedro Camejo, 5 km NW of Paso de Cinaruco, 1 May 1977 (fr), *Davidse & González 12463* (CTES, MO, VEN). **BOLÍVAR:** Upata-San Felix, 24–48 km NE de Los Rosos, 1 Aug 1965 (st), *Blanco 237* (NY, VEN); Río Paragua, 38–40 km N of Puerto Ayacucho, Jun 1975 (st), *Gentry & Berry 14702* (MO, US); El Palmar, 26 Apr 1940 (fl), *L. Williams 12894* (MICH, VEN). **CARABOBO:** Valencia, 31 Dec 1917 (fl), *Pittier 7696* (US). **DISTRITO FEDERAL:** Valley above Los Caracas, Jul 1975 (fl), *Gentry & Berry 14772* (MO). **FALCÓN:** Dist. Silva, Cerro Chichiriviche, 6 Sep 1974 (st), *Steyermark & Manara 110928* (MO). **GUARICO:** 20 km W of Santa María de Ipire, Jul 1975 (fr), *Gentry & Berry 15112* (MO). **MIRANDA:** 15 km W of Guarenas, Jul 1975 (fl), *Gentry & Berry 14790* (IJ, MBM, MO, VEN). **MONAGAS:** 33 km N of Caicara, road to San Antonia, Jul 1975 (st), *Gentry & Berry 14895* (MO, US, VEN). **PORTUGUESA:** Dtto. Araura, 5 km NE de Agua Blanca, 5 May 1984 (fr), *Aymard & Ortega 2522* (MO). **SUCRE:** Peninsula Paria, betw. Guacuco and Guarataro, 2 Dec 1979 (st), *Steyermark & Liesner 120985* (MO). **YARACUY:** Distr. Uraçhiche, Río Uraçhiche, 28 Feb 1981 (fl), *Steyermark et al. 124732* (MO). **ZULIA:** Machiques-Villa del Rosario, 21 Nov 1968 (fl), *Aristeguieta et al. 6799* (VEN).

TRINIDAD. Chacachacare Island, *Crueger 257* (K).

GUYANA. Western extremity of Kanuku Mts., Takutu River, 4 Mar 1938 (fl), *A. Smith 3090* (B, F, IAN, K, MAD, MO, S, US), 4 Mar 1938 (fr), *A. Smith 3334* (B, F, IAN, MAD, MO, NY, S, US).

Local names. Araguaney, flor amarilla, araguan, cornicabro, cañaguante negro, penda, koone ipipin (Panare).

64c. *Tabebuia ochracea* ssp. *neochrysantha* (A. Gentry) A. Gentry, *Ann. Missouri Bot. Gard.* **60:** 948. 1973. Figs. 49, 56.

Tabebuia neochrysantha A. Gentry, *Brittonia* **22:** 260. 1970. Type. Costa Rica. Guanacaste: 8 km N of Bagaces, 30 Jan 1969 (fl), *Gentry 355* (holotype, WIS; isotypes, BM, F, MO, UC, US).

Tabebuia chrysantha (Jacquin) Nicholson, *Dict. Gard.* **4:** 1. 1897, sensu Sandwith, non Jacquin.

Tree to 25 m tall and 50 cm dbh, the bark with dark furrows separating lighter ridges, the wood dark olive-brown with deposits of lapachol; branchlets subtetragonal, stellate-pubescent when young, more or less glabrescent. *Leaves* palmately 5-foliolate, the leaflets oblong-obovate to oblong-elliptic, abruptly acuminate to apiculate, basally obtuse to truncate, the terminal leaflet 5–22 cm long, 1.8–14.4 cm wide, the laterals progressively smaller, usually entire, sometimes more or less serrate when young, membranaceous, lep-

idote above and below, above also glabrescently stellate-puberulous, below densely and persistently stellate puberulous, the surface conspicuously light tannish from the trichomes (less densely but still conspicuously stellate in juvenile plants); terminal petiolule 0.8–5.8 cm long, the petiole 6–18 cm long, stellate puberulous. *Inflorescence* a contracted terminal panicle, the pedicels and peduncle hardly visible, stellate-pubescent and lanate. *Flowers* with the calyx campanulate, 5-lobed, 8–15 mm long, 5–10 mm wide, golden lanose-pubescent with a short stellate tomentum hidden by the lanose indumentum of long (to 7 mm) simple trichomes, these usually branching at extreme base; corolla yellow with reddish pencilling in throat, the venation of the lobes when dry inconspicuous and the lobes thus contrastingly lighter than the darker drying tube, tubular-infundibuliform, 4–8.3 cm long, 0.8–2.1 cm wide at mouth of tube, the tube 3–5.6 cm long, the lobes 1–2.4 cm long, glabrous outside except for a few trichomes at base of lobes, the floor of throat pubescent with rather short and flexuous trichomes, also glandular-pubescent at stamen insertion; stamens didynamous, the thecae divaricate, 1.5–2.5 mm long; pistil 2–2.7 cm long, the ovary linear, 3–5 mm long, 1.5–2 mm wide, lepidote to somewhat puberulous with simple and stellate trichomes, the ovules more or less 10-seriate in each locule; disk pulviniform, 1 mm long, 2–3 mm wide. *Fruit* a linear-cylindric capsule, narrowing to base and apex, 13–35 cm long, 1–1.5 cm wide, golden woolly-pubescent with long simple trichomes (or these stellate at extreme base), also with a short indumentum of stellate hairs; *seeds* 0.4–0.8 cm long, 1.8–2.9 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from seed body.

Distribution (Fig. 56). El Salvador to northwest Venezuela; mostly in seasonally dry deciduous forest; 0–1000 m elevation.

Representative specimens examined. EL SALVADOR. LA UNIÓN: Laguna de Maquigüe, 18 Feb 1922 (f), *Standley 20942* (NY, US).

HONDURAS. CHOLUTECA: Papelón, Río San Bernardo, Feb 1893 (f), *Shannon 5051* (US). EL PARAÍSO: Santa María, 13 May 1973 (fr), *Hazlett 93* (ENCF). FRANCISCO MORAZÁN: Zamorano, Río Capa Rosa, 11 Aug 1947 (st), *Williams & Molina 13237* (F, LL, MEXU, MO, US); Jicarito River, Río Yeguaré, 27 Jun 1948 (fr), *Glassman 1782* (F, NY).

NICARAGUA. BOACO: S of Tecolostote, 9 Jun 1984

(f), *Stevens 22926* (MO). CARAZO: Río Escalante, Carazo-Rivas border, 19 Nov 1976 (st), *Neill 1308* (MO). CHINANDEGA: Pto. Morazán, 7 Jul 1983, *Sandino & Martínez 4354* (MO). CHONTALES: Vic. Juigalpa, 4 Jun 1947 (fr), *Standley 9384* (F). ESTELÍ: E of Estelí, 11 May 1976 (f), *Neill 7190* (MO). GRANADA: Volcán Mombacho, 600 m, 14 Mar 1977 (f), *Neill 1560* (MO). LEÓN: 6 km Se de Ciudad Nagarote, 5 Mar 1983 (f), *Grijalva 2367* (MO). MANAGUA: Km 22, carretera Nueva a León, 8 Jul 1981 (st), *Sandino 879* (MBM, MO). MATAGALPA: Entre Sta. Juana y Rincón del Diablo, 6 Apr 1983 (f, fr), *Araguistáin 3475* (MO). RIVAS: Km 80, Puente Ochomogo, 25 Jan 1984, *Moreno & Stevens 22869* (MO).

COSTA RICA. ALAJUELA: 5 km E of Grecia, 17 Feb 1969 (f), *Gentry 474* (WIS). GUANACASTE: Finca la Pacífica, 26 Jan 1969 (st), *Gentry 313* (MO, WIS); Corobici, near Finca la Pacífica, 18 Feb 1969 (fr), *Gentry 477* (MO, WIS); Nicoya, 2 Apr 1900 (f, fr), *Tonduz s.n.* (HNCRI3889) (BM, CR, F, G, US). HEREDIA: Cartago, La Hulera, 3 Sep 1968 (f), *Córdoba 849* (CR, USJ). PUNTARENAS: Pan-Am Hwy. near Miramar turn-off, 21 Feb 1969 (st), *Gentry 520* (MO, WIS); between Quebrada Grande and Quebrada Guajiniquil near Buenos Aires, 1 Mar 1966 (f), *Molina et al. 18117* (F). SAN JOSÉ: Piedades de Santa Ana, 18 Jan 1935 (f), *Solis R. 129* (CR, F, MO).

PANAMA. CANAL ZONE: Junction of Chiva Chiva trail and Gaillard Hwy., 17 Mar 1972 (f), *Gentry 4786* (MO). COCLÉ: S of El Valle de Antón, 8 Apr 1947 (f), *Allen 4477* (G, MO). DARIÉN: Punta Patiño NNE of Garichiné, 4 Feb 1972 (st), *Gentry 4043* (MO). HERRERA: 20 mi E of Las Minas, 13 Dec 1971 (st), *Gentry 3146* (MO). PANAMÁ: Vic. Choiterra, 5 Mar 1939 (f), *Allen 1698* (F, GH, MO, NY, US). VERAGUAS: S of Santa Fe, 11 Dec 1971 (st), *Gentry 2937* (MO).

COLOMBIA. ATLÁNTICO: Galapa Road, 26 Feb 1932 (f), *Dugand 369* (F, MAD). BOLÍVAR: Mun. Zambrano (fr), *Cuadros 2574* (JBGp). CUNDINAMARCA: La Vega, Nocaima-La Hacienda, 15 Feb 1942 (f), *García-Barriga 10594* (COL, US); Facatativa-Honda, 28 km NW of Guaduas, 5 Mar 1977 (bd), *Gentry et al. 18119* (COL, MO). GUAJIRA: Maicao, 11 Nov 1980 (st), *Bunch et al. 350* (MO). MAGDALENA: Santa Marta, Jan 1898 (f), *H. Smith 1140* (BR, G, MO, US, WIS). PUTUMAYO: Mocoa-Umbria, 27 May 1935 (fr), *García-Barriga 4780* (COL, US). TOLIMA: Icononzo, 20 May 1976 (f), *García-Barriga 20967* (COL). VALLE: Cartago, 27 Feb 1977 (st), *Forero et al. 3600* (MO).

VENEZUELA. APURE: Poblado Biruaquita, carretera hacia Achaguas, Apr 1969 (f, fr), *Aristeguieta & Zabala 7077* (VEN). BOLÍVAR: Represa Guri, 2 Apr 1981 (f), *Liesner & González 11129* (MO). FALCÓN: Carretera Vacoa-Barira, 6 Mar 1979 (f), *Flora Falcón 464* (MO). MÉRIDA: Cardonales, 31 Aug 1966 (st), *Steyermark & Rabe 97019* (US, VEN). TACHIRA: S of La Mulata, 13 Nov 1979 (st), *Steyermark et al. 120234* (MO). TRUJILLO: 32 km NE of Trujillo, border with Lara, 30 Mar 1974 (f), *Gentry et al. 11015* (MO, VEN). YARACUY: Reserva Forestal Río Tocuyo, Falcón border, Aug 1970 (st), *Blanco 1003* (VEN). ZULIA: Dto. Páez, Misión de Guana, 5 Jun 1977 (fr), *Bunting 5124* (MO); Dto. Perija, carretera Maracaibo-Machiques, 12 Mar 1978 (f), *Bunting et al. 6245* (MO).

Local names. Central America: cortes, cortex, corteza; Honduras: san juan; Colombia: guayacán; Venezuela: flor amarilla, guayacan, vero, canaguante.

The northwesternmost race of *T. ochracea*, this plant is reduced to that species largely because of its similarly villous-pubescent fruit; the dense leaflet undersurface tomentum is similar to that of typical *T. ochracea* but much denser than in the other *T. ochracea* subspecies or in sympatric *T. chrysantha*.

65. *Tabebuia ophiolitica* Alain, *Phytologia* 22: 172. 1971. Type. Dominican Republic. Espallat: 4 mi E of Gaspar Hernández, 50 m, 28 Sep 1969 (fl), *Liogier 16148* (holotype, NY; isotypes, BM, IJ, US).

Shrub or small *tree* 1.5–5 m tall, irregularly dichotomously branched but with strong tendency for development of thick short-shoot at apex of dichotomy, the branchlets somewhat angled, flattened at nodes, more or less lepidote, the bark usually rather wrinkled and splitting, never conspicuously lenticellate. *Leaves* 3–5-foliolate, the leaflets oblong-elliptic, rounded or apiculate at apex, rounded to subcordate at base (the basal pair strongly asymmetric), 4–17(–21) cm long, 2–7(–9) cm wide, if 5-foliolate, the lowermost leaflet pair usually much smaller (2–6 × 1–4 cm) and subsessile, very strongly coriaceous, the secondary venation macroscopically plane or slightly impressed above, prominulous below, very sparsely and inconspicuously minutely lepidote above, below sparsely to noticeably minutely lepidote or lepidote glandular, drying olive, sometimes slightly darker above, the margins entire; terminal petiolule 0.2–2 cm long, the basals subsessile to 1 cm long, the petiole 0.5–1.5 (–2) cm long, very thick, conspicuously lepidote to very minutely and inconspicuously lepidote. *Inflorescence* a short-shoot fascicle of terminal flowers or with some pedicels bifurcate, the basal short shoot thick and conspicuously subulate-bracteate, the pedicels more or less glandular lepidote with black-drying scales. *Flowers* with the calyx campanulate, irregularly bilabiate or 2–5-dentate, 10–14 mm long, 7–9 mm wide, blackish lepidote; corolla pink to magenta, infundibuliform-campanulate, 3.5–4(–5.5 fide Alain) cm

long, 0.8–1.4 cm wide, the tube 2.5–3.5 cm long, the lobes ca. 1 cm long, glabrous outside, the lobes inconspicuously and incompletely ciliate, inconspicuously scurfy puberulous in throat, not villous at level of stamen insertion; stamens deeply included, the thecae divaricate, 3 mm long; ovary linear-oblong, conspicuously longitudinally costate, 4 mm long, 1.3 mm wide, minutely lepidote-glandular; disk annular-pulvinate, 1.5 mm long, 3 mm wide. *Fruit* linear-cylindric, 6.5–18 cm long, 18–10 mm wide, strongly longitudinally striate-costate, densely lepidote, drying dark brownish, the calyx persistent; *seeds* thin, bialate, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 53). Endemic to serpentine outcrops of northern Dominican Republic, 10–50 m altitude; known only from two localities at both of which it is locally common.

Specimens examined. DOMINICAN REPUBLIC. ESPALLAT: 8 km W of Gaspar Hernández, 19°38'N, 70°10'W, 10 m, 9 Apr 1985 (fl, fr), *Gentry & Zanon 50607* (JBSD, MO); 4 mi E of Gaspar Hernández, 50 m, *Liogier 16148* (BM, IJ, NY, US). PUERTO PLATA: Arroyo Frances, Puerto Plata, 13 Mar 1930 (fl), *Ekman H14385* (B, S, US); Loma Frances Viejo, W of Puerto Plata, 19°52'N, 70°45'W, 50 m, 9 Apr 1985 (fl, fr), *Gentry & Zanon 50633* (JBSD, MO); 27 Sep 1969 (fl), *Liogier 16136* (NY, US); Cofresi, Puerto Plata, 50 m, Jul 1978 (fl), *Liogier & Liogier 27716* (NY).

This species is vegetatively very like Puerto Rican *T. haemantha* and southern Dominican *T. crispiflora* in the thick coriaceous leaves with reduced petioles and petiolules. It differs from both by the light pink to magenta flower, typically infundibuliform-campanulate, with deeply included anthers and divaricate thecae. It differs from the Cuban equivalents in the shorter, thicker petioles (large-leafleted forms of *T. moaensis*) and non-bullate leaflets (*T. pinetorum*). Additional differences from *T. crispiflora* include lack of conspicuous lenticels on young growth, reduced inflorescence on bracteate short shoots, and absence of long trichomes near filament attachment. Although compared by Liogier (1971) with *T. conferta*, it is actually not very close to that large-leafleted long-petioled species. All of these species are pilose at the filament insertion, unlike *T. ophiolitica*.

66. *Tabebuia orinocensis* (Sandwith) A. Gentry, *Mem. N.Y. Bot. Gard.* 9: 29: 267. 1978.

Tabebuia insignis var. *orinocensis* Sandwith, Mem. N.Y. Bot. Gard. 9: 364. 1957. Type. Venezuela. Amazonas. Maguire et al. 37701 (holotype, K; isotypes, NY, US).

Tabebuia cassinoides sensu Schnee in Pittier et al., Cat. Flora Venez. 2: 409. 1947, non de Candolle.

Shrub or small *tree* to 8 m tall, the branchlets subterete, the surface wrinkled and somewhat angulate when dry. *Leaves* simple (rarely 3-foliolate in part), narrowly elliptic, the apex acute to obtuse or retuse, the base cuneate to rounded, 3–10 cm long, 1–3.4 cm wide, entire, subcoriaceous, conspicuously lepidote above and below, sometimes pilose below and along the main veins above; petiole 0.5–2 cm long, lepidote or lepidote and puberulous. *Inflorescence* usually a more or less terminal cyme of 2–4 flowers, the peduncle and pedicels lepidote, without young buds accompanying the adult flowers. *Flowers* with campanulate calyx, irregularly 2–3-labiate, 12–17 mm long, 8–11 mm wide, lepidote, eglandular; corolla white, tubular-infundibuliform, glabrous outside, usually with scattered lepidote scales, the lobes ciliate, densely glandular-lepidote inside, scurfy puberulous in the throat, pubescent at the stamen insertion; stamens didynamous, the thecae divaricate; ovary linear-oblong, 5 mm long, 1 mm wide, lepidote; disk pulvinate. *Fruit* a linear-oblong capsule, subterete, acuminate, the calyx persistent, 8–14(–16) cm long, 1.3–2 cm wide, conspicuously lepidote; *seeds* thin, bialate, 1.4–1.7 cm long, 3.5–4 cm wide, the wings hyaline-membranaceous, sharply demarcated from the seed body.

Distribution (Fig. 55). Endemic to the laja outcrops of the central Orinoco region around Puerto Ayacucho, Venezuela, and adjacent Colombia; 50–200 m elevation.

Representative collections examined. COLOMBIA. VICHADA: Behind Casuarito, across from Pto. Ayacucho, 3 Apr 1984 (fl, fr), *Gentry & Stein 46306, 46324, 46341* (all MO, VEN); Parque Nacional Natural El Tuparro, 27 Feb 1985 (fl, fr), *Zarucchi & Barbosa 3482* (MO), 1 Mar 1985 (fl), *Zarucchi & Barbosa 3517* (MO).

VENEZUELA. AMAZONAS: Atures, 20 km S de Pto. Ayacucho, 9 Feb 1985 (fl), *Carnevali & Guánchez 1482* (MO); Puerto Ayacucho, Jul 1975 (fr), *Gentry & Berry 14409* (MEXU, MO, VEN); 9 km S of Puerto Ayacucho, 28 Jun 1975 (fr), *Gentry & Berry 14442* (CTES, MO); Puerto Ayacucho, 18 Feb 1954 (fl), *Maguire et al. 37702* (K, MO, US, VEN), 13 Jan 1942 (fl, fr), *L. Williams 13809* (C, US, VEN). APURE: Pararuma, 29 Mar 1946 (fl, fr), *Vélez 2232* (VEN). BOLÍVAR: 30 km N of Puerto Ayacucho, Jun 1975 (fr), *Gentry & Berry*

14718 (MO, VEN); 1 km E of Río Orinoco betw. Río Horeda and Cerro Gavilán, 16 Dec 1955 (fl), *Wurdack & Monachino 39911* (NY, S, US, VEN).

Locally extremely abundant in its specialized habitat, which it shares with *T. pilosa* and *T. uleana*. *Tabebuia orinocensis* tends to grow in cracks in the bare laja rock or in the smallest soil pockets, while the other two species occur in larger soil accumulations.

This species is closely related to *T. insignis*, differing in a wider capsule, longer seed wings, sometimes pubescent leaves, flowering inflorescences lacking additional minute buds, precocious flowering, and more slender dried twigs with a conspicuously wrinkled surface. *Tabebuia orinocensis* is somewhat variable in leaflet number and pubescence. Most individual plants are rather uniformly simple-leaved or 3-foliolate and glabrous or puberulous but all combinations of these characters sometimes occur on a single plant and all forms were represented in every population studied.

67. *Tabebuia pallida* (Lindley) Miers, Proc. Roy. Hort. Soc. 3: 199. 1863.

Bignonia pallida Lindley, Bot. Reg. 12: tab. 965. 1826.

Type. St. Vincent. Cultivated, *Caley s.n.* (not seen, type illustration, Lindley, Bot. Reg. 12, Tab. 965).

Bignonia cranalis Krause, Beih. Bot. Centralbl. 32(2): 335. 1914. Type. Barbados. *Krause 18430* (B*).

Tabebuia dominicensis Urban, Feddes Repert. 19: 308. 1924. Dominica. La Plaine, *Ramage s.n.* (not seen).

Tabebuia pallida ssp. *dominicensis* (Urban) Stehle, Caribbean Forest. 6, suppl.: 338. 1945.

Tabebuia heterophylla (A. de Candolle) Britton ssp. *dominicensis* (Urban) Stehle, Bull. Soc. Bot. France 93: 33. 1946.

Tabebuia heterophylla ssp. *pallida* ("Miers") Stehle, Bull. Soc. Bot. France 93: 32. 1946, nomen.

Small to usually large *tree*, to 35 m tall (fide Stehle), dichotomously branched, the branchlets terete to subtetragonal, lepidote with small whitish sessile scales. *Leaves* unifoliolate, occasionally in part 3-foliolate, the leaflet oblong-elliptic, rounded to obtuse at apex, rounded to truncate at base, 4–20 cm long, 3–12 cm wide, coriaceous, lepidote above and below with small whitish pel-tate scales, sometimes also with a few scattered reddish ones below, olive to brownish, more or less concolorous, not very strongly brochidodromous, the surface more or less plane above and below; petiole 0.8–7 cm long, lepidote. *In-*

florescence terminal, few-several-flowered, the pedicels long and slender, lepidote with somewhat reddish sessile trichomes, with caducous bracteoles in lower half of pedicel. *Flowers* with the calyx cupular, irregularly 2-4-labiate, 10-17 mm long, 8-12 mm wide, rather sparsely lepidote with sessile peltate scales, drying blackish or blackish toward base and brownish toward apex; corolla lavender, tubular-infundibuliform, 5-8 cm long, 1.5-2.5 cm wide, tube 3-6 cm long, lobes 1.5-2 cm long, glabrous outside, rather strongly scurfy pubescent in throat, strongly villos at level of stamen insertion, the lobes more or less ciliate; anthers held in lower part of tube, the thecae divaricate, 3 mm long; ovary linear, somewhat tetragonal, densely lepidote, 5 mm long, 1 mm wide; disk annular-pulvinate, 1.5 mm long, 3 mm wide. *Fruit* linear-cylindric, 11-23 cm long, 8-11 mm wide, the valves inconspicuously longitudinally striate-costate, densely lepidote, drying darkish, the calyx persistent; *seeds* thin, bialate, 5-8 mm long, 20-25 mm wide, the hyaline-membranaceous wings sharply demarcated from body.

Distribution (Fig. 53). Endemic to the Lesser Antilles: Dominica, Martinique, Guadeloupe, Barbados, the Grenadines, St. Lucia, St. Vincent. On the larger islands, mostly on the wet windward slope where it can be the dominant species, constituting ca. 35% of the forest (Stehle, 1945); mostly below 100 m elevation.

Collections examined. BARBADOS: Dayrells, 10 Jul 1906 (fl, fr), *Dash 162* (NY); Barbados, Apr-Jun 1895 (fl), *Waby 59* (BM). LEEWARD ISLANDS. GUADELOUPE: Grande-Terre, Porte d'Enfert, 13 Aug 1973 (fl, fr), *Sastre & Jeremie 1970* (MO, P). DOMINICA: Saint Sauveur, south of Castle Bruce, 12 Jan 1966 (fl), *Chambers 2549* (MO); Salybia to Concorde Valley, 1 May 1940 (fl), *Hodge & Hodge 3292* (GH); St. David Parish, Bout Sable Bay, 13 Nov 1964 (fl), *Nicolson 1987* (MO, US); Reserve Caraibe, Bataca, 25 Apr 1946 (fl, fr), *Stehle 6091* (MO); St. David, Petite Soufrière Bay, 16 Jul 1977 (fr), *Stern & Wasshausen 2477* (MO); L'Anse Noire, 16 Jul 1964 (fr), *Wilbur 7518* (TEX-LL, MICH, MO, NY). ST. VINCENT: Mayero, Mar-Apr 1950 (fl), *Howard 11046* (NY). GRENADA: St. George's, Dec 1904 (fl), *Broadway s.n.* (NY). GRENADINES: Tobago Cays, 17 Mar 1956 (fl), *A. C. Smith 10153* (NY). MARTINIQUE: Macouba, 27 Nov 1940 (fr), *Holdridge 486* (NY); 30 Nov 1976 (fl, fr), *Larsen & Larsen 35571* (AAU). ST. LUCIA: Louvet, May 1972 (fr), *Sturrock 728* (A). ST. VINCENT: Bequia, Port Elizabeth, 31 Jan 1962 (fl), *Cooley 8281* (GH); Mayero, 16 Mar 1950 (fl), *Howard 11046* (MICH); between Biabou Bay and Yambou Head, 25 Jul 1967 (fr), *Sauer 4262* (WIS).

Local names. Martinique: poirier gris, poirier frise, poirier canelle, poirier du Nord. Guadeloupe: poirier du pays. Dominica: poirier. Barbados: white wood. Grenada: white cedar.

Uses. The wood used for furniture and construction.

Very tenuously distinguished from *T. heterophylla* by the larger, mostly uniformly 1-foliolate leaves (occasionally a few 3-foliolate) and (according to Stehle, 1946, who knew the plants in the field) the larger size (>20 m vs. <20 m) and usually shorter petiole (4-6 vs. 6-10 cm long). It is ecologically separated from *T. heterophylla* which occurs on the same islands but mostly on the drier leeward sides; however, the two intergrade and it is probable that *T. pallida* is not a true biological species. However, according to Stehle (1945) the wood of this species is lighter and less fibrous than that of *T. heterophylla*, the leaves are thicker and fleshier rather than coriaceous, the fruits are longer and thicker, and the corolla tends to be paler with a more undulating margin.

68. *Tabebuia palustris* Hemsley, Biol. centr.-amer., Bot. 2: 495. 1882. Type. Panama. Canal Zone: Río Grande swamp, Jun 1861 (fr), *Hayes 80* (holotype, BM; isotype, K).

Shrub or small *tree*, often twisted, to 4 m tall and 5 cm dbh., the bark smooth, pale gray, wood whitish and soft; twigs terete, lepidote. *Leaves* simple or 3-foliolate, the leaflets narrowly elliptic or oblong, acute, cuneate to subsessile, the terminal leaflet 10-19 cm long and 2.1-5.6 cm wide, lateral leaflets when present 5-19 cm long and 1.1-5.1 cm wide, subcoriaceous, densely lepidote beneath, less so above, gray-green when dry, the terminal petiolule 1-3.5 cm long, lateral petiolules when present 0.2-1.5 cm long, the petiole 2.3-10 cm long, lepidote. *Inflorescence* a 2-5-flowered terminal cyme on a reduced branch usually in a branch dichotomy, the pedicels and peduncle lepidote. *Flowers* with the calyx irregularly bilabiate or 3-labiate, cupular, 10-20 mm long, 4-10 mm wide, lepidote; corolla white with yellow throat ridges, tubular-infundibuliform, 5-7 cm long, 0.9-1.5 cm wide at mouth of tube, the tube 2.8-5.8 cm long, the lobes 0.8-1.8 cm long, glabrous outside, inside pubescent on throat ridges and at level of stamen insertion, sparsely so on lobes and in sinuses; stamens didynamous,

the thecae divaricate, 3 mm long; ovary linear-conical, 4.5–5 mm long, 1 mm wide, densely glandular-lepidote, the scales extending up the base of style, the ovules 2-seriate in each locule; disk pulvinate, 2 mm long, 3 mm wide. *Fruit* an oblong-cylindric capsule, attenuate at both ends, 8–11 cm long, 1.6–2.6 cm wide, densely lepidote, the calyx persistent; *seeds* suborbicular, thick, corky, brown, 1.4–1.8 cm long and 1.8–2.2 cm wide, wings essentially lacking.

Distribution (Fig. 55). Pacific coast mangrove swamps from Costa Rica to extreme northwestern Ecuador; near sea level.

Representative collections examined. COSTA RICA. GUANACASTE: Playa Coco, 15 Jul 1965 (st), *Croat 663* (MO). PUNTARENAS: Osa Península near Rincón, 17 Jul 1971 (fl), *Gentry 1227* (MO); Rincón de Osa, 9 Feb 1974 (fl), *Liesner 1921* (AAU, IJ, MO); Boca Paquita, 12 Jan 1898 (fl, fr), *Pittier 12035* (G, P, US).

PANAMA. CANAL ZONE: Miraflores Lock, Panama Canal, 10 Feb 1969 (fl, fr), *Gentry 422* (CTES, MO, WIS); Río Grande, 21 Jun 1938 (fl, fr), *Woodson et al. 760* (A, MICH, MO, NA, NY, US). COCLÉ: Vic. Penonome, 23 Feb 1908 (fl, fr), *R. Williams 292* (NY, US). DARIÉN: Río Sabanas below Santa Fe, 5 Feb 1972 (fl, fr), *Gentry 4080* (MO); Río Jaque, 10 Feb 1972 (st), *Gentry 4191* (MO). PANAMÁ: San José Island, 22 Jun 1945 (fl), *Erlanson 330* (GH, NA, U, US), 5 Oct 1944 (fr), *Johnston 2* (GH, US).

COLOMBIA. CAUCA: Río Guapi, Dec 1978 (fl), *I. Cabrera 3838* (CUVC). CHOCÓ: Río San Juan delta betw. Docordo and Pacific, 31 Mar 1986 (fl, fr), *Gentry 53859* (CUVC, MO); near El Valle, Jan 1973 (fl, fr), *Gentry & Forero 7376* (COL, MO); Mecana, N of Bahía Solano, 4 Mar 1983 (fl), *Gentry & Juncosa 40940* (COL, MO). NARIÑO: Cabo Manglares, 6 Jul 1952 (fl, fr), *Romero-Castañeda 3147* (AAU, COL); Tumaco, Jun 1955 (fr), *Romero-Castañeda 5135* (COL, MO). VALLE: Buenaventura, 19 Feb 1983 (fl, fr), *Gentry & Juncosa 40542* (AAU, COL, MO); Punta Arenas, N of Buenaventura Bay, 2 Jun 1944 (fl, fr), *Killip & Cuatrecasas 38623* (COL, F).

ECUADOR. ESMERALDAS: La Tola, 130 km N de Esmeraldas, 28 Jul 1984 (fr), *Dodson et al. 14583* (MO); Pichangal Island, 25 Jul 1967 (fl), *Jativa & Epling 2028* (NY, S).

This is the only shrubby species of *Tabebuia* in its distributional area. It is also the only white-flowered species in this region (except for the completely different hawk-moth pollinated *T. striata*), and the only one to have corky water-dispersed seeds with reduced wings.

69. *Tabebuia paniculata* Leonard, J. Washington Acad. Sci. **14**: 416. 1924. Type. Dominican

Republic. Samaná: Pilón de Azúcar, 11 May 1922 (fl), *Abbott 2330* (holotype, US).

Shrub or small *tree* to 6 m tall, dichotomously branched, often with terminally clustered leaves, the branchlets irregularly angulate, subterete, lepidote, also usually inconspicuously puberulous with minute trichomes, becoming tannish with a rather loose cortex when older, sometimes conspicuously flattened. *Leaves* 3–5-foliolate, the leaflets narrowly oblong to obovate or oblong-elliptic, obtuse to asymmetrically cuneate at the base, usually rounded at apex, sometimes retuse or apiculate, the terminal 3–14 cm long, 1.2–6.5 cm wide, the basals 2–12 cm long, 0.9–5 cm wide, thick-coriaceous, the margins essentially entire, sometimes slightly revolute, usually more or less cartilaginous, slightly discoloured, olive to brownish above, olive gray below, conspicuously but not very densely lepidote with whitish peltate scales above and below, very minutely puberulous with short single-celled trichomes at least on adaxial surface of petiole and base of midvein above, and sometimes along midvein below, the midvein (but usually not secondary veins) impressed above, secondary veins conspicuously brochidodromous and prominulous to prominent below, the tertiary venation lighter than surface but not raised or barely prominulous below, basal petiolules lacking to 3 mm long, terminal petiolules 0.5–1.5(–2) cm long, well-defined, the petioles rather thick, 0.5–2.5 cm long, always inconspicuously minutely puberulous with enation-like trichomes on adaxial surface, also densely lepidote. *Inflorescence* a several-branched terminal panicle or reduced to a few flowers clustered at branch apex, often on a more or less elongate terminal peduncle with conspicuous corky scars from fallen lower flowers, bracts and bracteoles linear, with at least a few peltate scales with very long flexuous multicelled stalks. *Flowers* with the calyx campanulate, bilabiate, rather thin, 7–10 mm long, 5–8 mm wide, drying blackish, densely lepidote with rather blackish scales; corolla white to light magenta, tubular-infundibuliform, 3.7–5.6 cm long, 1–2 cm wide, the tube 3–4 cm long, the lobes 1–1.5 cm long, completely glabrous outside and inside except at level of stamen insertion and some very minute and inconspicuous scurfy-papillose trichomes in floor of tube, the stamens didynamous, deeply included, the anthers divaricate, 2–3 mm long; ovary

linear-oblong, 4 mm long, ca. 1 mm wide, densely tannish lepidote, conspicuously tetragonal angled; disk pulvinate, 1 mm long, 2 mm wide. *Fruit* a linear-oblong capsule, 6–7 cm long, 6–8 mm wide, conspicuously longitudinally multicostate, subtended by the persistent calyx, drying blackish, densely lepidote with sessile blackish scales, also with a few larger, short-stalked peltate scales; *seeds* thin, flat, bialate, 5 mm long, 14–19 mm wide, the hyaline-membranaceous wings sharply demarcated from the brown seed body.

Distribution (Fig. 57). Dominican Republic. Endemic to the limestone hills of the Samaná Península, 0–500 m. Probably now on the verge of extinction; the last vestiges of natural vegetation on the Loma Pan de Azúcar had recently been burned when we visited this area in April 1985.

Collections examined. DOMINICAN REPUBLIC. SAMANÁ: Península de Samaná, Boca de Río San Juan, 17 May 1930 (st), *Ekman H15010* (B, S), 17 May 1930 (fl), *Ekman H15011* (B, GH, S, US); Cabo Cabrón, Pescadero del Cariste, Península de Samaná, 22 May 1930 (fl), *Edman H15065* (B, S); Península de Samaná, Samaná, Laguna Los Banaderos Prietos, 540 m, 28 May 1930 (st), *Ekman 15161* (B, S); vic. of Laguna, Pílon de Azúcar, 100–500 m, Samaná Península, 11 May 1922 (fl), *Abbott 2330* (US); E side of Loma del Río at San Juan at Playa del Valle, 19°17'N, 69°90'W, 15 m, 29 May 1980 (fl), *Mejia & Zanoni 6677* (JBSD); Loma Pan de Azúcar, NW de Santa Bárbara de Samaná, 19°15.5'N, 69°18'W, 100–490 m, 8 Dec 1982 (fr), *Zanoni et al. 24735* (MO).

Closely related to Haitian *T. buchii* from which it differs in the much less raised reticulate tertiary venation beneath, the non-erose leaflet margins, and in lacking the long-stalked peltate scales and/or their multicelled bases on the leaves, pedicels, and calyces. Vegetatively this species differs from *T. buchii* (and from the even more closely related *T. zanonii*, see below) in having the much shorter single-celled simple trichomes mostly restricted to the adaxial petiole surface.

70. *Tabebuia pedicellata* (Bureau & K. Schumann) A. Gentry, comb. nov.

Tecoma pedicellata Bureau & K. Schumann in Martius, Fl. bras. 8(2): 336. 1897. Type. Brazil. Rio de Janeiro, *Glaziou 1476* (lectotype, C, F negative 22109; isotypes, BR, C, K, MO, P) (flowers only).

Tecoma catinga Bureau & K. Schumann in Martius, Fl. bras. 8(2): 337. 1897. Type. Brazil. Minas Gerais:

Morro Vermelho, *Glaziou 12982* (holotype, P; isotypes; BR, C, K, P).

Handroanthus pedicellatus (Bureau & K. Schumann) Mattos, *Loefgrenia* 50: 4. 1970.

Handroanthus catinga (Bureau & K. Schumann) Mattos, *Loefgrenia* 50: 4. 1970.

Medium-sized to large tree 5–20 m tall, to 45 cm dbh, the branchlets subterete, slightly lepidote and minutely tannish stellate puberulous when young, glabrescent. *Leaves* 5–7-foliolate, the leaflets oblong to oblong-elliptic, more or less acuminate, obtuse or cuneate at base, the terminal 10–15 cm long, 4.5–7 cm wide, the laterals progressively smaller, entire, membranaceous, lepidote and sparsely stellate pubescent above and below; terminal petiolules 2.5–4 cm long, the petiole 7–10 cm long, minutely stellate puberulous in the dorsal groove. *Inflorescence* a somewhat contracted several-flowered terminal cluster, peduncle essentially absent, flowers on pedicels 3–5 mm long, tannish stellate-pubescent, also sometimes with some longer unbranched multicellular trichomes, flowering without leaves. *Flowers* with the calyx campanulate, irregularly shallowly 3–5-lobed, 5–8 mm long, 4–7 mm wide, shortly tannish tomentose with stellate trichomes; corolla yellow with reddish pencilling in throat, the venation of the lobes when dry inconspicuous, visible but not accentuated, the lobes thus mostly drying slightly lighter than the brownish tube, tubular-infundibuliform, 3–6.5 cm long, 1–2.5 cm wide at mouth of tube, the tube 2.5–4.5 cm long, the lobes 0.7–1.8 cm long, mostly glabrous outside except for a very few scattered lepidote scales, usually with a few stellate trichomes along veins just below lobes, the lobe margins not at all or slightly ciliate, pilose inside with long thin flexuous trichomes in floor of throat, these to about 1 mm long, also very slightly pubescent at stamen insertion; stamens didynamous, the thecae divaricate, 2 mm long; pistil 3 cm long, the ovary linear-oblong, 4 mm long, ca. 1 mm wide, densely minutely lepidote, especially toward base; disk annular-pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* unknown.

Distribution (Fig. 55). Lowland forests of coastal Rio de Janeiro State; also the caatinga of interior Minas Gerais; near sea level to 200 m elevation.

Collections examined. BRAZIL. ESPÍRITO SANTO: Santa Theresa, São João de Petrópolis, 1953 (fl), *Dal-*

colmo s.n. (MBML). MINAS GERAIS: MORRO Vermelho, *Glaziou 12982* (BR, C, K, P); Corrego 3 Irmãos, mun. Itaobim, 13 Sep 1984 (fl), *Hatschbach 48146* (MO). RIO DE JANEIRO: Rio de Janeiro, *Glaziou 1476* (BR, C, K, MO, P). Jacarepagua, Estr. Estiva, 10 Dec 1965 (fl), *Ferreira da Silva 27* (GUA, MO); Rua Conde de Bonfim, Rio de Janeiro, 24 Nov 1964 (fl), *Angeli 387* (GUA, MO), 22 Apr 1988 (st), *Ribeiro 1345* (MO); BR-101, 168 km S de Campos, 30 m, 30 Jan 1985 (fl), *Peixoto, Gentry et al. 3001* (MO).

Local name. Ipe amarelo.

Although this species is locally common in remnant forest patches northeast of Rio de Janeiro, it has been very rarely collected. It is closely related to *T. ochracea* and *T. chrysotricha*, differing from both in the small calyx with a short-stellate indumentum. *Tabebuia umbellata* has similarly short calyx pubescence but a longer calyx with the trichomes more rufescent and less uniformly distributed over the surface. The type material of *Tecoma pedicellata* represents a mixed collection with leaves of *T. chrysotricha*. In fact at BR and P there are sheets with leaves and attached flowers of *T. chrysotricha* as well as leafless flowering specimens of what is here lectotypified as *T. pedicellata*. Thus the leaves of *T. pedicellata* have remained unknown. The leaves described above are from a cultivated tree (*Ribeiro 1345*) and have not yet been positively connected to flowering material of *T. pedicellata*.

While identification of *T. catinga* of the caatinga with what would otherwise be a locally endemic species of the Rio de Janeiro area seems problematic on phytogeographic grounds, the two are morphologically extremely similar. *Hatschbach 48146* represents the only modern collection from the caatinga. In the absence of fruits and near absence of leaves, it is difficult to evaluate these taxa. Perhaps the range disjunction reflects more the general inadequacy of collecting than a biogeographic conundrum.

71. *Tabebuia pilosa* A. Gentry, Mem. N.Y. Bot. Gard. **29**: 268. 1978. Type, Venezuela. Amazonas: 14 km N of Samariapo on road to Puerto Ayacucho, laja outcrop, 100 m, 29 Jun 1975 (fr), *Gentry & Berry 14580* (holotype, MO; isotypes, VEN).

Shrub or small *tree* to 10 m tall, the branchlets terete, glabrous, with a very few large widely scattered lenticels. *Leaves* palmately 5-foliolate, the leaflets elliptic to narrowly ovate-elliptic, acute

to shortly acuminate, the base rounded, the terminal leaflet to 15 cm long and 7 cm wide, lateral leaflets smaller, subtire to inconspicuously crisped serrulate, chartaceous, villous below, lepidote but otherwise glabrous above, midrib raised above and below, secondary veins and ultimate veinlets impressed above and raised below, drying dark above, whitish gray below from the pubescence; terminal petiolule to 4 cm long, petiole to 12 cm long, glabrate. *Inflorescence* a few-many-flowered corymbose panicle, its branches lepidote with reddish scales and varying pilose, the bracts triangular, conspicuously white-pubescent-edged in bud; flowering when leaves deciduous. *Flowers* with the calyx campanulate, irregularly 3-4-labiate, 9-17 mm long, 7-12 mm wide, the lobes 2-3 mm long, densely lepidote, especially apically, with clusters of reddish-drying plate-shaped glands with raised margins at middle or in upper half; corolla white, tubular-infundibuliform, 7-10 cm long, 2-2.6 cm wide at mouth of tube, the tube 5-7 cm long, the lobes 1.5-2.5 cm long, glabrous outside except for scattered lepidote scales on tube, lobes ciliate and with a few lepidote scales inside near margins, the tube inside scurfy puberulous along throat ridges with short 0.1-0.3 mm long trichomes, villous at level of stamen insertion; stamens didynamous, the thecae divaricate, 3-5 mm long; pistil 2.5-4 cm long, the ovary linear-oblong, 3-4 mm long, 1 mm wide, densely lepidote, the ovules 2-seriate in each locule; disk pulvinate, 1-1.5 mm long, 2.5-3 mm wide. *Fruit* a linear-oblong capsule, 8-16 cm long, 2-2.4 cm wide, densely lepidote, the calyx persistent; *seeds* thin, bialate, 1 cm long, ca. 4 cm wide, the wings hyaline-membranaceous, clearly demarcated from body of seed.

Distribution (Fig. 58). Endemic to the laja outcrops of the Puerto Ayacucho area of southern Venezuela and adjacent parts of Guayanian Colombia and northern Brazil; 75-500 m elevation.

Specimens examined. COLOMBIA. META: La Macarena (Parte Sur), Rio Guayabero, Feb 1959 (fl), *García-Barriga & Jaramillo 17152* (AAU, COL, US). VICHADA: Casuarito, across from Pto. Ayacucho, 4 Apr 1984 (fl, fr), *Gentry & Stein 46299, 46326, 46346* (all MO, VEN); Tuparro, 9 Feb 1979 (fr), *Vincelli 987* (COL).

VENEZUELA. AMAZONAS: Puerto Ayacucho-Samariapo, alcabala Los Lirios, 30 Dec 1969 (fl), *Bunting 4265* (MV); 9 km S of Puerto Ayacucho, Jul 1975 (fr), *Gentry & Berry 14473* (MEXU, MO); 14 km N of

Samariapo, 29 Jun 1975 (fr), *Gentry & Berry 14580* (MO, RB); Atures, Puerto Ayacucho, 8 Dec 1977 (fl), *Huber 1372* (MO); carretera hacia Samariapo, 25 Jan 1978 (fl), *Huber 1423* (MO); Tobogan de la Selva 35 km SE of Puerto Ayacucho, 14 May 1980 (st), *Steyermark et al. 122503* (MO); Piedra Marimare, opposite Isla of Gallo, 19 Dec 1955 (fl), *Wurdack & Monachino 39990* (NY, US, VEN).

BRAZIL. RORAIMA: Dormida, Serra da Lua, 10 Jan 1969 (fl), *Prance et al. 9197* (M, MG, MO, P, R); km 211 W de Caracarai, Estrada Perimetral Norte, 26 Mar 1984 (fl), *Rodrigues et al. 10586* (NY).

Local names. Venezuela: cacho de venado.

72. *Tabebuia pinetorum* Britton, Bull. Torrey Bot. Club **42**: 374. 1915. Type. Cuba. Oriente (Guantánamo): Pine woods, Baracoa, Mar 1903 (fr), *Underwood & Earle 1362* (holotype, NY; isotype, NY).

Shrub or small *tree* 3–6 m tall, dichotomously branched, the twigs terete to angulate, with rather loose somewhat wrinkled bark, conspicuously lenticellate when young, sparsely lepidote, in part with short-stalked trichomes. *Leaves* 3(–4)-foliolate, the leaflets oblong to oblong-elliptic, rounded at apex, subcordate or asymmetrically cordate at base, the terminal 8–15 cm long, 4–8 cm wide, the basals 5–14 cm long, 2.3–9 cm wide, thick-coriaceous, strongly bullate, more or less glabrescently lepidote with scattered tiny reddish scales above and below, the margin entire to somewhat irregularly wavy, revolute; petiolules thick, the terminals 0.5–2 cm long, the basals 0.2–0.5 cm long, the petiole 1–3 cm long, lepidote with sessile and short-stalked peltate scales. *Inflorescence* 1–2 terminal long-pedicellate flowers, somewhat rufescently lepidote with sessile and short-stalked scales. *Flower* (only 1 seen) with calyx 6–10 mm long, 6–8 mm wide, very shallowly dentate, almost subtruncate, blackish lepidote, the corolla lilac (fide Britton), tubular-campanulate, 3 cm long, 0.8–0.9 cm wide at mouth, the tube 2.5 cm long, the lobes 0.5 cm long, glabrous outside, inside scurfy puberulous in floor, very sparsely long-pilose at level of stamen insertion; anthers held near middle of tube, divaricate, 3 mm long; ovary linear, strongly tetragonal, not obviously lepidote, 4 mm long, 1 mm wide; disk 1 mm long, 2 mm wide. *Fruit* linear-cylindric, attenuate at base and apex, 8–13 cm long; 7–11 mm wide, longitudinally striate-costate, sparsely lepidote, the surface minutely glandular-papillate, drying blackish, the

valves thick-coriaceous, the calyx persistent; *seeds* thin, bialate, 4–5 mm long, 15–19 mm wide, sharply demarcated from seed body.

Distribution (Fig. 57). Endemic to pine woods and charrascales in the Baracoa region of Oriente, Cuba; near sea level.

Specimens examined. CUBA. GUANTÁNAMO: Baracoa, charrascales prope Rio Joa, 28 Nov 1914 (st), *Ekman 3660* (S); Cuesta de Piedra, Baracoa, 23 Jul 1938 (fr), *León 18392* (NY); charrascales, Mesa de Prada, Jauco, 17 Jul–4 Aug 1924 (fl, fr), *León 11965* (HAC, NY); Baracoa, Mar 1903 (fr), *Underwood & Earle 1362* (NY).

Common name. Hoja bronca de peladero.

A very distinctive serpentine-soil endemic of easternmost Cuba, characterized by its conspicuously bullate, thick-coriaceous, subsessile leaflets.

73. *Tabebuia platyantha* (Grisebach) Britton, Bull. Torrey Bot. Club. **42**: 379. 1915.

Tecoma platyantha Grisebach, Flora Br. W.I. 447. 1861. Type. Jamaica. St. James: 1844 (fl), *Purdie s.n.* (K–2 sheets).

Tecoma brittonii Urban, Symb. antill. **5**: 496. 1908. Type. Jamaica. Troy, 660 m, *Harris 8827* (B*); topotype, Aug 1904 (st), *Harris 3183* (NY).

Tecoma brittonii var. *decussata* Urban, Symb. antill. **5**: 497. 1908. Syntypes. Jamaica. Catadupa, 460 m, *Harris 9164* (lectotype, NY; isotypes, BM, MO, US); Hampton, 730 m, 22 Apr 1904 (fl), *M. Harris 8627* (NY).

Tabebuia jamaicensis Britton, Bull. Torrey Bot. Club **42**: 376. 1915. Type. Jamaica. Vic. of Negril, 9 Mar 1908 (fl), *Britton & Hollick 2020* (holotype, NY; isotype, MO–fragm.).

Tree 10–20 m, dichotomously branched, the branchlets thick, terete, lepidote when young. *Leaves* 3–5-foliolate, the leaflets broadly to narrowly ovate or oblong-ovate, acutish (usually) to obtuse or rarely subacuminate at apex, truncate or subcordate at base, the terminal 8–35 cm long, 5–16 cm wide, the basals 4–17 cm long, 2.5–11 cm wide, coriaceous, rather densely and conspicuously lepidote below, less so above, drying grayish-olive or brownish-olive above, below drying olive to strongly whitish (only in Cockpit country), the main veins plane or slightly impressed above, raised below, the margin entire; petiolules 0.7–9.5 cm long, the petioles 5.5–18 cm long. *Inflorescence* a large open panicle with dichotomous branches, borne while the leaves deciduous; lepidote with blackish scales, the su-

bulate caducous bracts to almost 1 cm long. *Flowers* with the calyx campanulate, irregularly 2–4-labiate, 14–25 mm long, 13–18 mm wide, densely lepidote, usually with blackish scales; corolla white, the tube sometimes slightly yellowish or greenish, broadly infundibuliform-campanulate above a 8–12 mm long basal tube, 4–6 cm long, 2–3.5 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 1–2.5 cm long, the lower larger, thick with wrinkled borders, completely glabrous outside and inside except for the conspicuously villous area of stamen insertion; filaments ca. 2 cm long, the anthers subexserted, the thecae thick, divergent, 4–5 mm long; pistil ca. 4 cm long, the ovary linear, tetragonal, glandular-lepidote, 6 mm long, 1.5 mm wide, the ovules 2-seriate in each locule; disk annular-pulvinate, 3 mm long, 6 mm wide. *Fruit* linear-cylindric, longitudinally striate-costate, 20–30 cm long, 7–10 mm wide, drying black, densely black-lepidote, usually basally stipitate, the calyx persistent; *seeds* thin, bialate, 4–8 mm long, 15–27 mm wide, the hyaline-membranaceous wing sharply demarcated from seed body.

Distribution (Fig. 57). Endemic to Jamaica, occurring mostly on limestone; 80–1000 m elevation.

Collections examined. JAMAICA. MANCHESTER: Vic. of Shooters Hill, 1500 ft, 10 Jan 1958 (st), *Howard & Proctor 14978* (A, BM); Giddy Hall, Feb 1927 (fl), *I. Maxwell s.n.* (BM); Somerset Land Settlement, 2200 ft, 25 Feb 1956 (fl), *Stearn 356* (BM). ST. ANDREW: Coopers Hill, 2250 ft, 13 Jan 1957 (st), *Proctor 16121*; Cooper's Hill, 2200 ft, 15 Feb 1956 (fl), *Stearn 257* (BM). ST. ANN: Broom Hall Woods, 540–550 m, 6 Feb 1980 (fl, fr), *Gentry et al. 28442* (IJ, MO). ST. CATHERINE: 2 mi W of Lluidas Vale, Jan–Feb 1970 (fl, fr), *Proctor 31208* (BM, MO); Rodgate to Ipswich Road, 500 ft, 5 May 1977 (st), *Proctor 36822* (BM); St. James, *Purdie s.n.* (K). ST. ELIZABETH: Hampton, 22 Apr 1904 (fl), *M. Harris 8627* (NY); near Troy, 2000 ft, Aug 1904 (st), *W. Harris 8778* (NY); Lapland near Catadupa, 14 Feb 1906 (fl), *W. Harris 9164* (BM, NY, US); Mount Pleasant, Stony Hill, 1000–1200 ft, 21 Jul 1912 (st), *W. Harris 11127* (NY); Mount Charles, Giddy Hall, 1000 ft, 9 Mar 1956 (fl), *Stearn 422* (A, BM). TRELAWNY: Burnt Hill between Albert Town and Troy, 560 m, 1 Feb 1980 (st), *Gentry & Kapos 28315* (IJ, MO); 1.5 mi N of Warsop, 2000–2200 ft, 10 Sep 1960 (st), *Proctor 21363* (BM); Island View Hill, 1.5 mi N of Warsop, 2000–2200 ft, 10 Apr 1961 (st), *Proctor 22191* (BM, GH); 6 mi NNW of Accompong, 1100 ft, 27 Apr 1956 (fl), *Stearn 962* (BM). WESTMORELAND: Above Town Head, 250 ft, 27 Mar 1962 (fl, fr), *Adams 10936* (BM); Oxford, Cockpit Country, 13–18 Sep 1906 (st), *Britton 684* (NY); Negril and vic., 9–12 Mar 1908 (fl), *Britton & Hollick 2020* (NY).

Local name. Cro-cro.

Urban separated *Tecoma brittonii* from *T. platyantha* on the basis of its different-shaped elliptic-oblong leaves, 12–15 by 5–6 mm calyx, and a more narrowly infundibuliform rose-colored corolla. Although the cited collections are *T. platyantha*, this description better fits *T. rosea* and it is likely that Urban confused material of *Harris 8628*, which is *Tabebuia rosea* and 8627 which is *T. platyantha*; the leaves are extremely similar and the fertile material of both collections consists of detached flowers in packets, which could easily have become mixed.

It is possible that an apparent variant of this species from the cockpit country, which has a very much more conspicuously white leaflet underside and is represented only by sterile material should be accorded some kind of taxonomic recognition. All of the published names apply to the more widespread form with olive leaf undersurfaces.

Tabebuia platyantha has the largest, most coriaceous leaflets of any Jamaican *Tabebuia*. The leaflets tend to feel distinctly rough to the touch unlike other native Jamaican *Tabebuia* species or cultivated and naturalized *T. rosea*; it also differs vegetatively from *T. rosea* in the more oblong leaflet outline, shorter acumen and usually more or less subcordate base.

74. *Tabebuia polyantha* Urban & Ekman, Ark.

Bot. Stockholm **22A(10):** 64. 1929. Type. Dominican Republic. La Vega: Between Bonao and La Vega, *Ekman H5832* (holotype, S; isotypes, IJ, K, S, US, MO—xerox).

Tabebuia dolichopoda Urban & Ekman, Ark. Bot. Stockholm **22A(10):** 64. 1929. Type. Haiti. Massif du Nord, St. Louis du Nord, 950 m, *Ekman H3871* (holotype, S; isotype, S, MO—xerox).

Tabebuia nivea Liogier, Brittonia **20:** 151. 1968. Type. Dominican Republic. Samaná: Los Banaderos Prietos, *Ekman H14167* (holotype, NY; isotypes, A, B, G, GH, K, MO, S, US).

Large tree to 30 m tall, the branchlets irregularly terete, with a few conspicuous, round, raised lenticels when young, rather densely grayish lepidote. *Leaves* 5–7-foliolate, the leaflets narrowly obovate to oblanceolate, obtuse or rounded at apex, cuneate at base, the terminal 7–15 cm long, 3–6.4 cm wide, the basal pair 4–12 cm long, 1.5–4 cm wide, chartaceous to coriaceous, concol-

orous, drying gray or olive gray above and below, lepidote above and below, conspicuously and densely so when young, often rather sparsely so when mature, brochidodromous, the secondary veins plane above, prominulous below, tertiary venation plane above, usually more or less prominulous-reticulate below, petiolules slender, more or less lepidote, the terminals 1.5–4 cm long, the laterals often poorly differentiated, the petiole (3.5–)5–16 cm long. *Inflorescence* often borne precociously when tree is nearly leafless, terminal, usually openly corymbose paniculate and many-flowered sometimes reduced to few flowers, the bracteoles subulate and to 10 mm long but caducous before anthesis, conspicuously lepidote throughout. *Flowers* with the calyx campanulate, usually irregularly bilabiate, smooth, 10–22 mm long, 7–14 mm wide, drying somewhat tannish-gray from the scales; corolla white or palest pinkish white, in the latter case with noticeably pinkish-tipped buds, tubular-infundibuliform, 5–7 cm long, 2–3 cm wide at mouth of tube, the tube 3.5–5 cm long, glabrous outside, the lobes 2 cm long, somewhat ciliate, floor of tube conspicuously villous inside, sparsely villous at level of stamen insertion; stamens didynamous, the anther thecae divaricate, 3 mm long, deeply included; ovary linear, 5 mm long, 1 mm wide, very densely lepidote and conspicuously tan; disk cylindrical-pulvinate, 1.5 mm long, 2.5 mm wide. *Fruit* 7–23 cm long, 8–9 mm wide, terete, densely lepidote, drying grayish from the scales, conspicuously and evenly longitudinally striate-ridged, the calyx persistent; *seeds* thin, bialate, 5–8 mm long, 23–30 mm wide, the hyaline-membranaceous wings sharply demarcated from dark brown seed body.

Distribution (Fig. 57). Northern and Central Cordilleras of Hispaniola; from near sea level to 1000 m.

Specimens examined. HAITI. Massif du Nord, St. Louis du Nord, Môme Baron, 950 m, Apr 1925 (fl), *Ekman H3871* (S); Massif de la Hotte, Pestel, Môme Delcour, 1000 m, *Ekman H9005* (S); Lenite, Cayes road between Rivière aux Glaces and Camp Perrin, 3000 ft, 12 Jun 1941 (fl), *Seibert 1715* (MO).

DOMINICAN REPUBLIC. LA VEGA: between Bonao & La Vega, 200 m, *Ekman H5832* (IJ, K, S, US); near Güaigüi, 19°10'N, 70°32'W, 300 m, 9 Apr 1985 (fr), *Gentry & Zanoni 50647* (MO), 9 km W of La Vega, 19°1'N, 70°32'W, 340 m, 9 Apr 1985 (fl), *Gentry & Zanoni 50651* (JBSD, MO), 9 km NE of

Jarabacoa, 19°10'N, 70°34'W, 620 m, 9 Apr 1985 (fl, fr), *Gentry & Zanoni 50654* (JBSD, MO); Güaigüi, May 1960 (st), *J. Jiménez 4188* (K). MONTE CRISTI: Cordillera Central, Restauración, 550 m, 5 Jun 1926 (st), *Ekman H6261* (S). PUERTO PLATA: Loma Isabel de Torres, 750–800 m, Jun 1975 (fl), *Liogier & Liogier 23054* (NY). SAMANÁ: Los Bañaderos Prietos, 50 m, May 1930 (fl), *Ekman H15167* (A, B, C, GH, K, MO, NY, S, US), Jun 1960 (st), *J. Jiménez s.n.* (US). SAN CRISTÓBAL: Bayaguana, 150 m, 31 Mar 1973 (fl), *Liogier & Liogier 18860* (MO, NY), Feb 1974 (fl), *21254* (NY).

Both *T. dolichopoda* and *T. polyantha* were described in the same paper, the former from 950 m altitude in Haiti and the latter from 200 m in the central Dominican Republic. Both species were compared with *T. "pentaphylla"* (i.e., *T. heterophylla*), with *T. polyantha* distinguished by unspecified leaf features and the white corolla color, *T. dolichopoda* by a few-flowered inflorescence with longer pedicels and calyx. Examination of the types of the two species reveals that *T. dolichopoda* is no more than a depauperate form of *T. polyantha*. The "purple" flower color described for *T. dolichopoda* was based on an erroneous guess ("non accuratius examinata") since no color notes are recorded on the type and additional Haitian material is described as white-flowered. Originally Urban and Ekman apparently intended to describe the Samaná Peninsula plant as a third new species, *T. nivea*, and this most appropriate inedited herbarium name was later taken up by Liogier who compared it with much more distantly related *T. hotteana* (= *T. calcicola*) and *T. dominguensis*, overlooking the identity of the Samaná plant with *T. polyantha*.

This species was apparently once common and widespread in Hispaniolan moist forests below 1000 m altitude. This is the most extensively deforested life zone of the island and in the last half century *T. polyantha* has only been collected in four places—Samaná, Bayaguana, Loma Isabel de Torres above Puerto Plata, and the Jarabacoa-Güigüe area of La Vega Province. In the latter area it is restricted to a few remnant pockets of broad-leaved forest near the lower edge of the pine forest. The single remaining tree found by T. Zanoni in Samaná was dead when we revisited it in 1985.

This species tends to flower precociously and can be absolutely spectacular, the only abundantly mass-flowering *Tabebuia* species with white flowers. It would be an excellent candidate

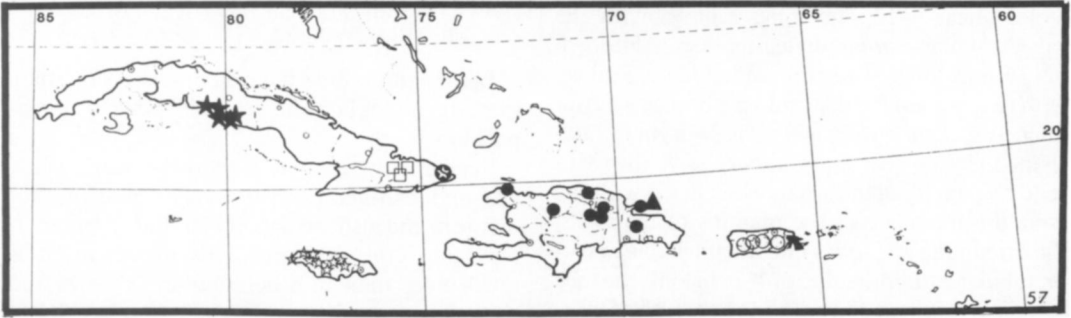


FIG. 57. Distribution of Antillean *Tabebuia*. \blacktriangle = *T. paniculata*; \bullet = *T. pinetorum*; \star = *T. platyantha*; \bullet = *T. polyantha*; \square = *T. pulverulenta*; arrow = *T. rigida*; \star = *T. sauvallei*; \circ = *T. schumanniana*.

for cultivation, especially in view of its near extinction in the wild.

75. *Tabebuia polymorpha* Urban, Symb. antill. 9: 262. 1924. Type. Cuba. Oriente (Guantánamo): Baracoa in rupibus calcareis ad Baracoa Bay, *Ekman 3574* (lectotype, S; isotype, NY).

Small tree, dichotomously branched, the branchlets terete, densely grayish lepidote when young, with a few large pale lenticels. Leaves 1–3(–5)-foliolate, often incompletely divided, the leaflets of compound leaves elliptic, rounded at base, rounded to acutish at apex, to 13 × 6 cm, the unifoliate leaflets ovate, truncate to somewhat cordate at base, rounded to acutish at apex, 4–12 cm long, 3–7 cm wide, very densely whitish lepidote below, less so above, discolorous, brownish or olive above, gray to whitish below, also minutely and inconspicuously puberulous with simple trichomes along main veins below, the margin entire; petioles 1–5.5 cm long. Flowers and fruits unknown.

Distribution (Fig. 53). Endemic to easternmost Cuba on coastal limestone in the Baracoa region.

Specimens examined. CUBA. GUANTÁNAMO: Baracoa Bay, 22 Nov 1914 (st), *Ekman 3574* (NY, S); Baracoa in rupibus calcareis, 10 Jan 1915 (st), *Ekman 4173* (S); Playuela ad litor. maris, Baracoa, 27 Jan 1915 (st), *Ekman 4469* (S).

This species is known only from sterile collections and is not very different from the *T. bibracteolata* complex with which it shares white leaf undersurfaces and the distinctive presence of simple trichomes (presumably from the stalks

of stalked-peltate scales) along the main veins below. Since the ecology is quite different (coastal limestone vs. upland serpentine), I do not feel that *T. polymorpha* should be subsumed under even a sensu lato *T. bibracteolata* without additional collections.

76. *Tabebuia pulcherrima* Sandwith, Lilloa 14: 133. 1948. Type. Argentina. Misiones, *Bertoni 2937* (holotype, K).

Handroanthus pulcherrimus (Sandwith) Mattos, Loefgrenia 50: 2. 1970.

Tecoma petropolitana Glaziou, Mem. Soc. Bot. France 3: 528. 1911. Type. Brazil. Rio de Janeiro: Petrópolis, *Glaziou 4734* (B).

Small to large tree 3–25 m tall, the twigs subtetragonal to terete, when young finely yellowish stellate-tomentose with thick-stellate trichomes, more or less glabrescent on older branchlets but with persistent lepidote scales. Leaves palmately 5(–7)-foliolate, the leaflets oblong-elliptic to obovate, rounded to short-cuspidate at apex, obtuse to rounded at base, the terminal leaflet 1.5–8 cm long, 1–4(–4.8) cm wide, lateral leaflets progressively smaller, entire, membranaceous, lepidote and sparsely stellate puberulous above, more or less glabrate except the main nerves, below persistently and very densely whitish stellate-tomentose, also with several dark-drying plate-shaped glands on the lamina surface near midvein; terminal petiolule 0.5–4 cm long, the laterals shorter, the petiole 1–6.5 cm long, lepidote and minutely stellate-pubescent. Inflorescence a rather contracted few-flowered terminal panicle, light tannish tomentose with stellate trichomes, the pedicels 0.5–1 cm long, the bracts and brac-

teoles linear 6–12 mm long. *Flowers* with the calyx tubular-campanulate, unevenly 5-lobed, 12–20 mm long, 5–12 mm wide, densely pilose with reddish-golden dendroid trichomes < 1 mm long, sometimes with a few dark-drying plate-shaped glands near margin; corolla yellow with reddish pencilling in throat, when dried with the venation reticulate to the margins of the lobes, the dried tube and lobes indistinguishable in color, tubular-infundibuliform, 4–7 cm long, the tube 3–5.5 cm long and 1–2 cm wide at mouth of tube, the lobes 1–1.5 cm long, glabrous outside, the lobes more or less ciliate, inside rather densely pilose with flexuous trichomes in floor and throat, glandular-pubescent at level of stamen insertion; stamens didynamous, the thecae divergent to divaricate, 3 mm long; pistil ca. 3 cm long, the ovary linear-oblong, 4 mm long, 1 mm wide, glabrous, the ovules 8-seriate in each locule; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* a linear-cylindric capsule, tapering to the base and apex, 10–18(–22 fide Sandwith & Hunt, 1974) cm long, 0.4–0.8 cm wide, the valves thin-coriaceous, finely yellowish stellate-tomentose, partially glabrescent to reveal a smooth barely striate surface; *seeds* thin, bialate, 0.2–0.4 cm long, 0.9–1.5 cm wide, the wings hyaline-membranaceous, clearly demarcated from the seed body.

Distribution (Fig. 58). Paraná basin of Misiones and Corrientes, Argentina and adjacent southern Paraguay and Brazil (Rio Grande do Sul and Santa Catarina), where mostly recorded as growing over rocks; also common in coastal restingas of Santa Catarina and Rio Grande do Sul; below 300 m elevation.

Representative specimens examined. BRAZIL. RIO GRANDE DO SUL: Porto Alegre, 4 Jan 1950 (fl, fr), *Rambo 45132* (B, P); Gravataí, 1 Dec 1950 (fl), *Rambo 49271* (B, S). RIO DE JANEIRO (?): Petrópolis, *Glaziou 4734* (B). SANTA CATARINA: Araranguá, Morro dos Consentes, 26 Nov 1980 (fl), *Krapovickas & Vanni 36962* (MBM); 10 km S of Ponta de Imbituba, 30 Dec 1966 (fl), *Lindeman & Haas 3790* (MO, RB); Itapiranga, Rio Peperiguacu, Linha Coqueiro, 17 Oct 1964 (fl), *L. Smith & Reitz 12679* (B, F, R); Palhoca, Enseada do Brito, 2 Nov 1956 (fl), *L. Smith et al. 7263* (B, MO, S).

PARAGUAY. ALTO PARANÁ: Colonia Mayntzhua, 1909 (fl), *Fiebrig 5439* (G, L, M). MISIONES: Est. La Soledad, Santiago, 23 Sep 1962 (fl), *Pedersen 6540* (C, CTES, L, LP).

ARGENTINA. CORRIENTES: San Martín, Co. Nazareno, 15 Feb 1979 (fl, fr), *Schinini et al. 17216* (C, MO). MISIONES: Villa Venecia, Rep. Leandro N. Alem,

19 Oct 1970 (fl), *Marunak 139* (C, LP, MBM, MO, TEX-LL, TRUJ, WIS).

Local names. Brazil: ipe da praia, ipe amarelo, ipe; Argentina: lapacho amarillo, lapachito, mapachillo.

Vegetatively characterized by the nearly white leaf undersurface from the very dense fine tomentum and also the darker glandular areas scattered near the midvein. This indumentum is much finer than in other southern species and similar to that of Amazonian *T. incana* or Guiana Highland *T. subtilis*.

If Glaziou's nomen nudum, *Tecoma petropolitana*, is correctly referred here, the range is extended significantly northward, but there is doubt about the locality information on Glaziou's collections.

77. *Tabebuia pulverulenta* Urban, Symb. antill. 9: 255. 1924. Type. Cuba. Oriente: Sierra de Nipe, 700 m, *Ekman 6737* (B*, lectotype, S; isotypes, B, MO, NY).

Tabebuia cuneifolia Urban, Symb. antill. 9: 257. 1924. Type. Cuba. Holguín: Sierra de Nipe, Loma de Estrella, *Ekman 2038* (B*, lectotype, S; isotypes, MO, NY).

Tabebuia revoluta Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De La Salle" 15: 17. 1956. Type: Cuba. Oriente (Holguín): Sierra de Nipe, Pinar de Bio, charascales, 31 Jan 1955 (st), *Lopez-Figueiras 1845* (HAC), non *T. revoluta* (Urban) Britton, Bull. Torrey Bot. Club 42: 378. 1915.

Tabebuia ophiticola Alain, Rev. Soc. Cub. Bot. 13: 9. 1956. nom. nov. for *T. revoluta* Alain, non Britton.

Shrub or small *tree*, dichotomously branched, the branchlets terete, more or less lepidote, at least when young, the scales lacking stalks. *Leaves* 5–9-foliolate, the leaflets oblanceolate, obtuse, more or less cuneate at base, the terminal 3–13 cm long, 0.7–4 cm wide, the basals 2.5–5 cm long, 0.6–2 cm wide, lepidote above, very densely lepidote below, also with some larger peltate scales, discolorous, olive to gray above, whitish below, midvein impressed above, raised below, the margins either revolute or erose; petiolules 0.5–2(–4) cm long, petiole 2–9 cm long. *Inflorescence* few-flowered, dichotomously branched but more or less umbellate in general form, drying blackish, lepidote with sessile and stalked-peltate scales, the bracts and bracteoles linear, to 6 mm long, usually with long linear multicellular trichomes, some of these with peltate terminal



FIG. 58. Distribution of continental *Tabebuia*. □ = *T. pilosa*; ★ = *T. pulcherrima*; ▲ = *T. pumila*; ● = *T. reticulata*; ⊕ = *T. riodescensis*; ● = *T. rosea*.

scales. *Flowers* with the calyx irregularly 2–3-labiate, 10–18 mm long, 5–10 mm wide, drying black, often longitudinally ridged, the corolla red-violet, tubular to very narrowly tubular-infundibuliform, 3.5–5.5 cm long, 0.5–1.5 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 1–1.5 cm long, glabrous outside, the floor of tube rather scurfy puberulous inside; anthers divaricate; pistil 2.5–3 cm long, the ovary linear-oblong, 4 mm long, 1.5 mm wide, very densely whitish lepidote; disk cylindrical-pulvinate, 2 mm long, ca. 3 mm wide. *Fruit* linear-cylindric, 7–13 cm long, 6–7 mm wide, densely glandular-lepidote, in part with short-stalked peltate trichomes, drying black, inconspicuously striate-

ribbed, subtended by persistent calyx; *seeds* thin, bialate, 3–4 mm long, 1.5–1.9 cm wide, the hyaline membranaceous seed wings strongly demarcated from seed body.

Distribution (Fig. 57). Endemic to serpentine “charrascales” in the Sierra de Nipe, Oriente, Cuba; mostly 700–1000 m elevation.

Specimens examined. CUBA. HOLGUÍN: Loma Mensura, Sierra de Nipe, 21 Apr 1960 (fl), *Alain & Acana 17967* (HAC); Loma de Estrella, Sierra de Nipe, 20 Jul 1914 (st), *Ekman 2038* (MO, NY, S); Sierra de Nipe, 700 m, 16 Feb 1916 (fl), *Ekman 6737* (B, MO, NY, S); Río Piloto, Sierra de Nipe, 10 Apr 1919 (fl), *Ekman 9519* (NY, S); Arroyo Canapu, Sierra de Nipe, 18 Feb 1955 (fl, fr), *Lopez-Figueiras 1877* (US); Loma El Gurugu, 24 Feb 1956 (fl, fr), *Lopez-Figueiras 2486* (US);

Loma Mensura, Sierra de Nipe, 25 Feb 1956 (fr), *López-Figueiras 2520* (HAC). SANTIAGO DE CUBA: Saca Lengua, Sierra de Micara, 26 Dec 1955 (st), *Alain & López-Figueiras 4544* (GH).

It is not at all clear whether this species is adequately separated from *T. bibracteolata* by its more numerous and narrower leaflets with either revolute or noticeably erose margins. Clearly, concurrently published *T. cuneifolia*, at least, is conspecific with *T. pulverulenta*, since the type of *T. pulverulenta* includes leaflets with both revolute and more or less erose non-revolute margins. Since the only collection of *T. cuneifolia* is sterile, I choose *T. pulverulenta* as the name for the combined taxon. *Tabebuia ophiticola*, with 5–7-foliolate leaves having narrow leaflets with revolute margins is also conspecific.

Tabebuia pulverulenta lacks the puberulous midveins (from decapitated peltate-stalked trichomes) of typical *T. bibracteolata*. The calyx and inflorescence also differ from that species in being black-drying rather than rufescent and usually with longitudinal ribs. Although there are very few records of flower color, it is possible that *T. pulverulenta* is a hummingbird-pollinated derivative of *T. bibracteolata* in the same manner that *T. sauvallei* seems to be related to *T. calicicola*.

The Berlin collection of *Ekman 6737* is a duplicate received after the war, so the Stockholm sheet is a better lectotype.

78. *Tabebuia pumila* A. Gentry, sp. nov. Type. Brazil. Minas Gerais: Diamantina, 15 km na estrada Diamantina-Conselheira, mata, 30 Aug 1981 (fl), *A. M. Giuliatti, J. Semir, N. L. Meneses, N. Giuliatti & A. J. Mattos s.n.* (CFCR 1857) (holotype, SP; isotype, MO). Fig. 52.

Suffrutex 0.6–1 m altus. Folia 1–3-foliolata, foliolis anguste oblongo-ellipticis, cuneatis, infra sparsim stellato-pubescentibus, pro parte maxima glabrescentibus. Inflorescentia contracta, pauciflora. Flores calyce campanulato, 5-dentato, sparsim stellato-rufescenti; corolla lutea, tubo extra intraque glabro. Capsula ignota.

Subshrub 0.6–1 m tall; branchlets glabrescently stellate-rufescent, the leaves clustered on young twigs at tip of leafless branches. *Leaves* 1-foliolate to 3-foliolate, the leaflets (or leaf blade) narrowly oblong-elliptic, 4–7(–11) cm long, 1–3(–6) cm wide, obtuse to acutish, cuneate at base,

the margins entire to irregularly finely serrate towards apex, glabrescently puberulous above with simple and stellate trichomes along midvein, below glabrescently stellate puberulous with few-branched reddish trichomes, at least toward base of main veins; petiole grooved above, 1–2 cm long, rufescent with variously few-branched and simple trichomes, petiolules non-existent in unifoliolate leaves and basal leaflets of 3-foliolate leaves, ca. 0.5 cm long on terminal leaflets of 3-foliolate leaves. *Inflorescence* a cluster of several subsessile flowers at the tips of slender leafless branches. Calyx campanulate, strongly 5-dentate, 4–5 mm long, 5–7 mm wide, puberulous at base with mostly few-branched stellate trichomes and a few simple trichomes, also very sparsely over surface; corolla yellow, tubular-campanulate, 5–5.5 cm long, 1.2–1.8 cm wide at mouth of tube, the tube ca. 4 cm long, the lobes ca. 1 cm long, virtually completely glabrous outside and inside, a very few short gland-tipped trichomes at level of stamen insertion; stamens didynamous, the anther thecae divaricate, 3 mm long; ovary oblong, somewhat tetragonal, 3 mm long, ca. 1 mm wide, glabrous, near apex slightly lepidote and with patelliform glands, the ovules 4-seriate in each locule; disk annular-pulvinate, 0.5 mm long, 2 mm wide. *Fruit* unknown.

Distribution (Fig. 58). Endemic to the campos rupestres of the Serra do Cipo region of Minas Gerais.

Specimens examined. BRAZIL. MINAS GERAIS: Diamantina, rod. Couto Magalhães, 17 Sep 1985 (fl), *Hatschbach & Kummrow 49779* (MBM, MO); Joaquim Felício, Serra do Cabral, 2 Sep 1985 (fl), *Kawasaki et al. s.n.* (CFCR8249) (MO); Minas Diamantina, Estrada para Mendanha, 12 km de Diamantina, 3 Aug 1985 (fl), *Mello-Silva et al.* CFCR7973 (SPF38939) (SPF); Minas Grão Mogol, Jambeiro, 7 km de Grão Mogol, 5 Sep 1985 (fl), *Mello-Silva et al.* CFCR8474 (SPF39804) (SPF).

This is the smallest known species of *Tabebuia*. According to Dra. A. M. Giuliatti (pers. comm.) it is locally common, and of uniformly subshrub habit, forming almost a carpet of yellow across the campos rupestres during its brief flowering season. Presumably, the short annual burst of flowering, typical of *Tabebuia*, is responsible for such a common and distinctive species having escaped previous collection.

Tabebuia pumila is related to *T. umbellata* and *T. serratifolia*, differing from both by the sub-

shrub habit, smaller more glabrescent calyx, uniformly unifoliolate to 3-foliolate leaves, and glabrous corolla throat.

79. *Tabebuia reticulata* A. Gentry, sp. nov. Type.

Brazil. Minas Gerais: Pedra Azul, fronteira com a Bahia, rupicola, calice campanulado, arroxeadado, com escamas pequenas, atropurpureas, pediculados, distribuidos em toda superficie, glandulas enceolados poucos, sobre os lacinias do calice, corola purpurea, com a base do tubo branca internamente com faixa amarela, without date, *R. Burle Marx s.n. (RB 152386)* (holotype, RB; MO—xerox and fragment).

Arbor parva 2–5 m alta. Folia simplicia, ovata vel ovato-oblongo, ad basem truncata, infra nervatura intricate prominenti, dense puberula trichomatibus simplicibus. Flores singulares, calyce campanulato, lepidoto, ciliato; corolla purpurea, tubo extra glabro, intra leviter puberulo. Capsula ignota.

Small tree 2–5 m tall; branchlets subterete, wrinkled-striate, with large scattered whitish lenticels, when young lepidote and with a few simple trichomes. Leaves simple, the blade ovate to ovate-oblong, acute or acutish, the base truncate, 4–13.5 cm long, 2–7 cm wide, minutely lepidote above, otherwise glabrous, below with the veins and veinlets intricately and conspicuously raised, densely puberulous with long simple, several-celled trichomes, drying olive above and light gray beneath, the petiole 0.6–1.5 cm long. Inflorescence terminal, 1-flowered, the pedicel lepidote with mostly stalked scales; bracts of terminal buds puberulous and white-edged (as in *T. roseo-alba*). Flowers with the calyx campanulate, ± obtusely 5-dentate, 13 mm long, 6–7 mm wide, glandular-lepidote with peltate scales, the margins of the scales often more or less ciliate-fringed, the calyx teeth ciliate inside near margin with simple trichomes; corolla purple with the base of the tube white, internally with yellow in throat, tubular-campanulate, bent above calyx, 5.5–6 cm long, 1–1.5 cm wide at mouth of tube, the tube 4–5 cm long, the lobes 1–1.5 cm long, glabrous or with a few lepidote scales outside, the lobes ciliate and minutely puberulous inside, the throat very slightly puberulous on floor inside and at level of stamen insertion; stamens didynamous, the anther thecae divaricate, 3–4 mm long, insertion 6–9 mm from base of corolla

tube; pistil ca. 3.8 cm long, the ovary linear-oblong, 4 mm long, 1.2–1.4 mm wide, densely lepidote with fringe-margined scales; disk pulvinate, ca. 2 mm long, 2.5 mm wide. Fruit not seen.

Distribution (Fig. 58). Endemic to edaphic “caatinga” on rock outcrops in Minas Gerais State near the border with Bahia; below 200 m elevation.

Additional collection examined. BRAZIL. MINAS GERAIS: Caatinga da base de afloramentos rochosas 4–6 km L de Pedra Azul, arv. 2–5 m alt., flor violaceo oscuro, 26 Aug 1958 (fl), *Magalhães 14141* (UB).

Local name. Ipe de flor roxa.

The remarkable pilose and intricately reticulate lower leaf surface of *T. reticulata* is similar only to *T. pilosa* of southern Venezuela and adjacent Colombia and Brazil. That species differs in uniformly 5-foliolate leaves, white flowers, and a non-puberulous, non-dentate calyx. Perhaps the closest relative of *T. reticulata* is *T. roseo-alba*, which is found in the same region and has similar flowers, white-lined inflorescence bracts, and puberulous-toothed (but smaller) calyces, but has mostly 3-foliolate leaves which are glabrescent to densely puberulous but never prominently reticulate beneath.

80. *Tabebuia revoluta* (Urban) Britton, Bull. Torrey Bot. Club 57: 378. 1915.

Tecoma revoluta Urban, Symb. antill. 7: 539. 1913. Type. Dominican Republic. La Vega: La Vega, Jarabacoa, 700 m, Jun 1912 (fl), *Fuertes 1804* (lectotype, NY; isotypes, BM, FI, K).

Shrub or small tree 2–5 m tall, dichotomously branched, sometimes densely so, the branchlets irregularly angled, usually raised at petiolar attachments, lepidote. Leaves 3–5-foliolate, the leaflets narrowly elliptic-oblong to oblanceolate (rarely obovate: *Jiménez 781*), rounded or retuse at apex (rarely merely obtuse: *Ekman 15124*), cuneate at base, the terminal 2.5–11 cm long, 0.7–4 cm wide, the basals 2–5 cm long, 0.6–2.2(–3) cm wide and usually subsessile, very coriaceous, usually with strongly revolute margins, slightly discolored, more or less olive above and tannish olive below, glabrous or inconspicuously lepidote-punctate above, below densely lepidote with whitish scales, also with scattered reddish brown scales, conspicuously brochidodromous, midvein impressed above, the secondary veins

raised below, plane or slightly impressed above, tertiary venation subprominulous below, not at all conspicuous nor noticeably reticulate; petioles 0–1.5 cm long, petioles 1–4 cm long, lepidote with both light and dark scales. *Inflorescence* of one or two terminal flowers, the pedicels lepidote, usually with a subulate bracteole at or below middle. *Flowers* with the calyx irregularly shallowly 2–3-lobate, 8–10 mm long, 4–6 mm wide, densely lepidote (some of the scales sometimes substipitate), drying dark; corolla deep red or crimson even inside throat, tubular-infundibuliform to almost salverform, 2–4 cm long, 0.5–1.3 cm wide at mouth of tube, the tube 1.5–2.5 cm long, the lobes ca. 0.5 cm long, glabrous outside and inside except for glandular trichomes at base of filaments, the lobes inconspicuously and minutely ciliate with short thick glandular trichomes; stamens didynamous, the filaments 0.5–1.5 cm long, the anther thecae divaricate, ca. 2 mm long; pistil ca. 2 cm long, the large lamellate stigmas ca. 2 mm × 1 mm; ovary linear-oblong, tetragonal-angled, 3 mm long, 1 mm wide, densely lepidote; disk annular-pulvinate, 1 mm long, 1.5 mm wide. *Fruit* a fusiform-cylindrical capsule, long-tapered at each end, 10–11 cm long, 5–8 mm wide, inconspicuously longitudinally ribbed, lepidote, the seeds thin, bialate, 6–7 mm long, 1.5–2.3 cm wide, the hyaline membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 59). Endemic to the Jarabacoa region of La Vega Province, Dominican Republic between (260–)500 and 1200 m, where it is extremely common locally as a dominant understory element in pine forest.

Specimens examined. DOMINICAN REPUBLIC. LA VEGA: Vic. Jarabacoa, 500–1200 m, 12 Jan 1946 (fl), *Allard 14531* (GH, US), 1700 ft, 24 Jan 1946 (fl), *Allard 14819* (S, US), 3500 ft, 20 Apr 1970 (fl), *Burch 2553* (MO), 700 m, 20 Feb 1929 (fl), *Ekman H14204* (B, S, TEX-LL, US), 700 m, Jun 1912 (fl), *Fuertes 1804* (BM, FI, K, NY); 2 km NE of Güaigüi, 19°12'N, 70°32'W, 400 m, 9 Apr 1985 (fl), *Gentry & Zanoni 50644* (JBSD, MO); Loma del Puerto, 260 m, 19°14'N, 70°34'W, 9 Apr 1985 (fl, fr), *Gentry & Zanoni 50653* (JBSD, MO); vic. Jarabacoa, 800 m, 23 Mar 1945 (fl), *J. Jiménez 781* (US), 11 Jun 1950 (fl), *J. Jiménez 2064* (US), 500 m, 17 Mar 1957 (fl), *J. Jiménez 3474* (K, US), 17 May 1970 (fl), *J. Jiménez 5817* (US), 450 m, 3 May 1968 (fl), *Liogier 11078* (NY), 400 m, 31 Aug 1968 (fl), *Liogier 12407* (GH); Constanza, Rio Grande, 21 Aug 1982 (fl), *Sauledo et al. 7523* (JBSD); 10 km NE of Jarabacoa, 15 Apr 1981 (fl), *Zanoni et al. 12540* (JBSD).

Most similar to *T. maxonii*, which has a similarly glabrous corolla interior and narrow leaflets, but differs from that species by the cuneate and petiolulate leaflet bases and narrow darker red corolla tube. Differs from sympatric *T. berteroi* most conspicuously in the different flower color and shape and also in having the leaflets not densely whitish below.

81. *Tabebuia rigida* Urban, *Symb. antill.* 1: 404. 1899. Type. Puerto Rico. Sierra de Luquillo, *Sintenis 1461* (lectotype, GH; isotypes, BM, C, G, K, L, US).

Shrub or small *tree* to 10 m tall and 15 cm dbh., the branchlets irregularly tetragonal with rather thick-ridged corky bark, without lenticels, lepidote or lepidote-punctate. *Leaves* unifoliate, opposite, elliptic, rounded to obtuse at base and apex, 3–15 cm long, 1.5–8 cm wide, thick-coriaceous, the margin revolute, conspicuously but not densely lepidote or lepidote-punctate above and below, the scales typically reddish orange, drying olive to olive-brown, darker above, festooned-brochidodromous; petioles 0.5–3 cm long, lepidote. *Inflorescence* an open few-flowered terminal panicle, often reduced to only two or three flowers, the pedicels 1.5–3.5 cm long, lepidote, almost always with the flowers in groups of three from a common peduncle, two lateral buds arising from the axils of tiny ca. 2 mm long bracts (which correspond to the “bracteoles” of *T. schumanniana*), bracteoles only on lateral pedicels. *Flowers* with the calyx tubular-campanulate, irregularly 2–3-lobate, 11–19 mm long, 4–10 mm wide, lepidote, drying brownish or blackish; corolla red or pinkish red, more or less tubular-salverform, 3–5 cm long, 0.5–1 cm wide at mouth of tube, the tube 2.5–4 cm long, the lobes 0.5–1 cm long, glabrous except for some lepidote scales on lobes, pubescent at level of stamen insertion; stamens didynamous, at least the longer pair more or less subexserted, the thecae divaricate, slender, ca. 3 mm long; ovary linear-oblong, strongly tetragonal angled, densely lepidote, 3–4 mm long, 1.2–1.5 mm wide; disk cylindrical-pulvinate, 1.5–2 mm long, 3 mm wide. *Fruit* linear, terete, 11–20 cm long, 0.6–0.9 cm wide, more or less longitudinally striate, lepidote, the calyx persistent; seeds thin, bialate, 5–8 mm long, 2.2–3 cm wide, the wings hyaline-membranaceous, sharply demarcated from the seed body.

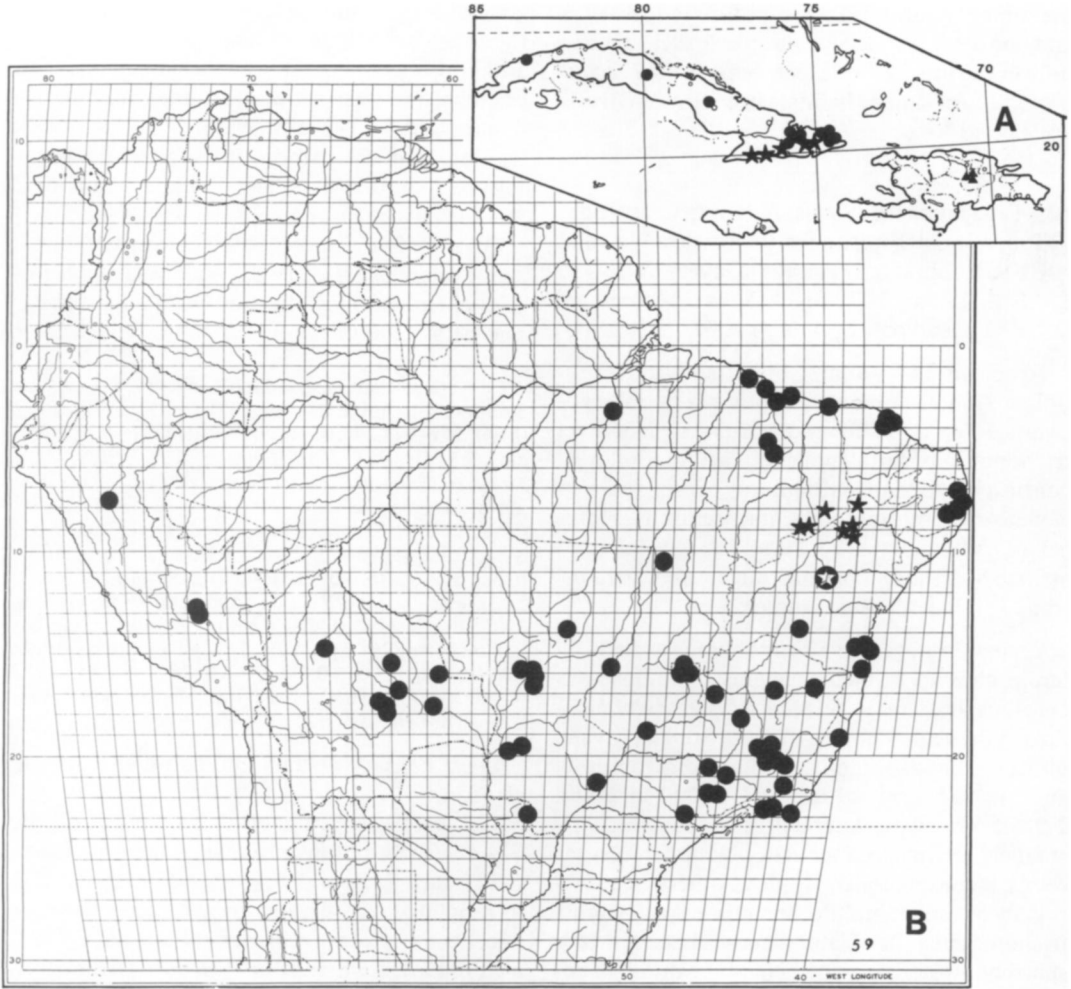


FIG. 59. Distribution of *Tabebuia*. **A**, Antillean *Tabebuia*; ▲ = *T. revoluta*; ● = *T. simplicifolia*; ★ = *T. shaferi*. **B**, South American *Tabebuia*; ● = *T. roseo-alba*; ● = *T. selachidentata*; ★ = *T. spongiosa*.

Distribution (Fig. 57). Luquillo Mountains of northeastern Puerto Rico; wet montane forest and cloud forest; 500–1050 m elevation.

Specimens examined. **PUERTO RICO.** Sierra de Naguabo, Barrio de Maizales, 800 m, 8 Mar 1914 (fl), Britton & Cowell 2174 (NY, US); El Yunque, 10 Mar 1966 (fl), Evans 35 (G, MEXU, NY); El Yunque, Mt. Britton area, 1 Mar 1985 (fl, fr), Gentry & Zardini 50360, 50361, 50373 (all MO); Yunque, 28 Aug 1913 (fl), Hess & Stevens 2833 (NY); El Yunque Rock, 5 Apr 1965 (fl), Howard & Nevling 15778 (A); Pico del Oeste, 1020 m, 24 Aug 1967 (fr), Howard 16625 (A); Mt. Britton, 600–1000 m, 20 Nov 1937 (fl), G. N. Jones 11043 (GH); Luquillo Mountains, 1020 m, Liogier 10074 (US); Pico del Este, 2 May 1979 (fl), Liogier 28323 (UPR); Mt. Britton, 3000 ft, 8 Aug 1950 (fl, fr),

Little 13544 (NY, US); El Yunque-El Hicaco, 2 Jul 1939 (fl), Otero 573 (A, MO); Mt. Britton summit, 15 Jun 1939 (fl), Otero 658 (MO); El Yunque, 3000 ft, 31 Dec 1937 (fl), Sargent B92 (US); Sierra de Naguabo, Rio Prieto, 690–1035 m, Aug 1914 (fl), Shafer 3599 (GH, MO, US); Luquillo Forest, 23 Nov 1954 (fl), Schubert & Winters 422 (GH); El Yunque, 24 Jun 1885 (fl), Sintenis 1461 (BM, C, G, GH, K, L, US); Mt. Britton, 23 Apr 1963 (fl), Wagner 233 (A); 19.4 km along route 191, 500 m, 3 Jul 1959 (fl), Webster et al. 8630 (US); Luquillo Mts., 12 Jul 1902 (fl), Wilson 178 (US).

Local name. Roble de sierra.

Locally dominant in the restricted habitat near the top of El Yunque. Characterized by the red,

presumably hummingbird-pollinated, flowers and the very coriaceous simple leaves. Differs only in the more elliptic leaf shape from *T. schumanniana* of similar habitats in central and western Puerto Rico.

82. *Tabebuia riodecensis* A. Gentry, sp. nov.

Type. Brazil. Espírito Santo: Reserva Florestal CVRD, Linhares, Estrada Gavea, X-2, km 7.810, 28 Aug 1979 (fl), *I. Silva 63* (holotype, CVRD; isotypes, MO, NY).

Arbor ad 35 m altam. Folia palmatim 5-foliolata, foliolis oblongo-ellipticis vel oblongo-ovatis, integris vel crenato-serrulatis, glabris vel trichomatibus simplicibus axillaribus. Inflorescentia corymboso-paniculata, ramis sparsim stellato-rufescentibus vel glabrescentibus. Flores calyce campanulato, 10–20 mm longo, tomento stellato sparso, fugi; corolla lutea, tubo extra intraque glabra. Capsula ignota.

Tree 6–35 m tall, to 50 cm dbh, the branchlets terete, glabrate or inconspicuously papillose-puberulous at extreme tip. *Leaves* palmately 5-foliolate, the leaflets oblong-elliptic to oblong-ovate, obtuse to acutish, the base rounded or obtusely cuneate, the terminal leaflet 4–12 cm long and 2.2–5.5 cm wide, lateral leaflets progressively smaller, entire to crenulate-serrulate, chartaceous, inconspicuously lepidote, otherwise mostly glabrous when mature, sometimes with simple trichomes in axils of lateral nerves beneath, very sparsely substellate pubescent along midvein below when very young, drying olive; petiolules 0.2–4 cm long, the petiole 3–7.5 cm long, more or less papillose-puberulous at least in adaxial groove, sometimes with minute substellate trichomes at petiole apex above. *Inflorescence* a rather contracted several-flowered corymbose panicle, the branches more or less minutely rufescent with stellate trichomes to almost glabrescent. *Flowers* with the calyx campanulate, irregularly shallowly 2–5-lobed, 10–20 mm long, (7–)9–16 mm wide, inconspicuously minutely lepidote, usually also minutely and fugaciously puberulous with appressed stellate-lepidote trichomes; corolla yellow, tubular-infundibuliform, 5.5–9 cm long, 1.5–2 cm wide at mouth of tube, the tube 4.5–6 cm long, the lobes 1–2 cm long, glabrous outside and inside except for a very few long flexuous trichomes in sinuses and

glandular trichomes at level of stamen insertion, the lobes not ciliate; stamens didynamous, the anther thecae divaricate, 3–4 mm long; pistil 3.5 cm long, the ovary conical to linear-oblong, 3–4 mm long, 1.2–2 mm wide, inconspicuously lepidote, sometimes more or less glandular warty toward apex; disk annular-pulvinate, 1 mm long, 3–4 mm wide. *Fruit* a capsule, unknown.

Distribution (Fig. 58). Known mostly from tall semievergreen forest in the Rio Doce Valley of coastal Brazil; one collection from adjacent Bahia; below 200 m elevation.

Collections examined. BRAZIL. BAHIA: Jussari, km 5 da rod. a Palmira, 23 Aug 1971 (fl), *T. Santos 1892* (MO). MINAS GERAIS: Rodovia BR-4, km 924, mata cipo, 27 Jun 1968 (fl), *R. Belém 3762* (CEPEC, MO). ESPÍRITO SANTO: Reserva Florestal da CVRD, Linhares, Estrada Carneiro, 31 Aug 1979 (fl), *Folli 100* (CVRD, MO); Estrada Mac. Pele de Sapo, km 4.935, 3 Sep 1981 (fl), *Folli 322* (CVRD, MO); Estrada Oiticica, km 0,186, 25 Jul 1978 (fl), *Silva 11* (CVRD, MO); Estrada Mac. Pele de Sapo, km 1.950, 24 Aug 1979 (fl), *Silva 56* (CVRD, MO); Estrada Gavea, km 8.045, 28 Aug 1979 (fl), *Silva 64* (CVRD, MO); Estrada Peroba-amarela, km 0,476, 17 Aug 1981 (fl), *Silva 252* (CVRD, MO); Estrada Orelha de Macaco, km 1,494, 9 Sep 1981 (fl), *Silva 257* (CVRD, MO).

Local names. Ipe amarelo, pau d'arco flor de algodão.

This species is extremely close to polymorphic *T. serratifolia* and my original inclination was to treat it as a form of that species. I am persuaded to recognize it as distinct by the excellent series of collections from the Reserva Florestal CVRD, near Linhares, where both *T. riodecensis* and typical *T. serratifolia* occur sympatrically. At Linhares this species is consistently differentiated from *T. serratifolia* by a much darker-drying corolla having a glabrous or nearly glabrous throat, more strongly contracted to the basal tube and with more strongly villous stamen insertion, and by a larger more glabrescent and truncate-based calyx. Although these differences are not very pronounced, the two taxa are also ecologically differentiated with *T. riodecensis* restricted to “floresta alta” and *T. serratifolia* to “mussununga” forest on sandy soils. Moreover, they have different common names and are uniformly differentiated by local botanists and “materos” using rather subtle differences in bark and growth form (R. Moraes de Jesus & A. Peixoto, pers. comm.). As thus interpreted, *T. riodecensis* is a narrow endemic of coastal Brazil, mostly re-

stricted to semievergreen forests in the Rio Doce Valley.

83. *Tabebuia rosea* (Bertoloni) A. P. de Candolle, Prodr. 9: 215. 1845. Fig. 49.

Tecoma rosea Bertoloni, Fl. guatemal. 25. 1840. Type. Guatemala. Escuintla, *Velasquez s.n.* (FI, fide Sandwith).

Tecoma mexicana Martius ex A. P. de Candolle, Prodr. 9: 218. 1845. Type. Mexico. *Karwinski s.n.* (M).

Sparattosperma rosea (Bertoloni) Miers, Proc. Roy. Hort. Soc. 3: 99. 1863.

Tabebuia mexicana (Martius ex A. P. de Candolle) Hemsley, Biol. centr.-amer., Bot. 2: 495. 1882.

Tabebuia pentapylla (Linnaeus) Hemsley, Biol. centr.-amer., Bot. 2: 495. 1882, non *Bignonia pentaphylla* Linnaeus.

Couralia rosea (Bertoloni) Donnell Smith, Bot. Gaz. 20: 9. 1895.

Tecoma evenia Donnell Smith, Bot. Gaz. 20: 8. 1895. Type. Guatemala. Santa Rosa, *Heyde & Lux 3110* (MO, US; leaves only).

Tecoma punctatissima Kränzlin, Feddes Repert. 17: 221. 1921. Type. Colombia. Cundinamarca: *Karsten s.n.* (B*, lectotype, W).

Tabebuia punctatissima (Kränzlin) Standley, Trop. Woods 36: 18. 1933.

Tree to 25 or 30 m tall and 1 m dbh, the bark narrowly vertically fissured with corky ridges, dark gray to blackish; wood superficially similar to oak, of medium density, light grayish brown with distinct striped pattern of brown paratracheal parenchyma, when fresh with faint sweet odor suggesting watermelon; twigs subtetragonal, lepidote, with thick pith. *Leaves* palmately 5-foliolate, often anisophyllous, the leaflets elliptic to elliptic-oblong, acute to acuminate, basally rounded to cuneate, the terminal leaflet 8–35 cm long and 3–18 cm wide, the laterals progressively smaller, entire, subcoriaceous to chartaceous, lepidote above and below, gray-green when dry, the terminal petiolule 3–11 cm long, the basal petiolules 0.2–2.4 cm long, the petiole 5–32 cm long, lepidote. *Inflorescence* a terminal panicle with a pair of subulate bracts subtending each dichotomy, the branches densely lepidote. *Flowers* with calyx cupular, bilabiate, 11–21 mm long, 6–12 mm wide, densely lepidote; corolla pinkish-lavender to magenta or almost white, the throat opening yellow, turning white, tubular-infundibuliform, 5–10 cm long, 1.5–3.2 cm wide at mouth of tube, the tube 3–5.8 cm long, the lobes 2–2.5 cm long, glabrous outside, the lobes ciliate, sparsely pubescent inside with small mostly uni-

cellular trichomes on throat ridges and gland-tipped trichomes at stamen insertion; stamens didynamous, the thecae divaricate, 2.5–3.5 mm long; pistil 1.9–3.2 cm long, the ovary linear, 5–8 mm long, 1 mm wide, densely lepidote, the ovules 2-seriate in each locule; disk tapered-cupular, 2–3 mm long, 3–3.5 mm wide. *Fruit* a linear-cylindric capsule, attenuate at both ends, 22–38 cm long, 0.9–1.5 cm wide, lepidote, the calyx usually persistent, *seeds* 0.7–1.0 cm long, 2.8–4.4 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 58). Southern Mexico to Venezuela and coastal Ecuador; occurs in a variety of habitats, but especially in somewhat swampy forest. Also widely cultivated; sea level to 1200 m elevation.

Representative specimens examined. MEXICO. CAMPECHE: Tuxpena, 11 Feb 1932 (fl), *Lundell 1317* (F, G, MICH, MO, NY, US). CHIAPAS: 13–15 km S of Ocozocoautla, Mun. Ocozocoautla de Espinosa, 17 Apr 1972 (fl), *Breedlove 24577* (DS, MEXU, MICH, MO). GUERRERO: Calavera, 6 Apr 1937 (fl, fr), *Hinton 10022* (F, MEXU, MO, NY, US). HIDALGO: Hujutla, Apr 1888 (fl), *Seler 663* (US). JALISCO: Estación Biológica Chamela, Mpio. La Huerta, 21 Mar 1978 (fl), *Magallanes 996* (MO). MICHOACÁN: Hacienda California, Apatzingan, 11 Aug 1941 (st), *Leavenworth & Hoogstraal 1445* (F, MO, NY). NAYARIT: Rancho de Navarrete, 1923 (fl, fr), *Ortega 24* (MEXU, US). OAXACA: Chacahua Bay, 21 Mar 1939 (fl), *Elmore D19* (F, MICH, NY, US). PUEBLA: Km 271 México-Tuxpara, 8 Jun 1962 (st), *Sarukhan et al. 2933* (MEXU). SAN LUIS POTOSÍ: Tamazunchale, 14 Jul 1937 (st), *Edwards 555* (F, MO, TEX). TABASCO: 15 km WNW of Paraíso, road to Playa Azul, Feb 1963 (fl, fr), *Barlow 1/3* (MICH, WIS). TAMAULIPAS: Vic. Tampico, 27 Apr 1910 (fl), *Palmer 305* (F, G, MO, NY, US). VERACRUZ: Laguna Encantada, 7 km NE de San Andrés Tuxtla, 26 Jan 1973 (fl), *Cedillo & Calzada 79* (F, MEXU, XAL). YUCATÁN: Celestan, 25 Feb 1956 (st), *Miranda 444* (MEXU).

GUATEMALA: ALTA VERAPAZ: Finca Yalpemech, 24 Mar 1942 (fl), *Steyermark 45293* (F). BAJA VERAPAZ: Hacienda San Jeronimo, May 1924 (fl), *Salas 496* (F). ESCUINTLA: Below Las Lajas, 9 Feb 1939 (st), *Standley 64795* (F). GUATEMALA: Joaquina, 30 mi from Guatemala City, 10 Feb 1917 (fl), *Popenoe 762* (NA). HUEHUETENANGO: Río Trapichillo between Democracia and Canyon of Chamushu, 24 Aug 1942 (st), *Steyermark 51228* (F, US). IZABAL: Morales, 8 Mar 1907 (fl), *Kellerman 6638* (F, MEXU, US). JUTIAPA: Vic. Jutiapa, 24 Oct 1940 (st), *Standley 75714* (F). PETÉN: Uaxactun, 28 Mar 1931 (fl), *Bartlett 12340* (F, MICH, NY, WIS). QUEZALTENANGO: Agua Caliente, 28 Mar 1922 (fl, fr), *Greenman & Greenman 5926* (MO). SAN MARCOS: Ocos, 15 Mar 1940 (fl), *Steyermark 37824* (F, MO). SANTA ROSA: Santa Rosa, Mar 1892 (st),

Heyde & Lux 3110 (MO, NY, US). **SOLOLÁ:** Near Patulul, 15 Feb 1906 (fl), *Kellerman 5784* (US). **SUCHITEPÉQUEZ:** Vic. Tiquisate, 17 Jun 1942 (st), *Steyermark 47649* (F). **ZACAPA:** Los Limones, 2 mi E of Gualan, 26 Jan 1927 (fl), *Record & Kuylen G127* (US).

BELIZE: **BELIZE:** Maskall, 10 Apr 1934 (fl), *Genite 1189* (F, LL, MICH, MO, NY, WIS). **CAYO:** Banana Bank, 16 Apr 1970 (fl), *Innes 284* (MO). **ORANGE WALK:** Indian Church, 15 May 1976 (fl), *Arnason et al. 17142* (MO). **STANN CREEK:** Stann Creek, 6 May 1931 (fl), *Schipp 730* (F, G, MICH, MO, NY). **TOLEDO:** Mofreddye Creek, near San Antonio, 10 Apr 1946 (fl), *Genite 5326* (TEX-LL).

EL SALVADOR. **LA LIBERTAD:** Coastal highway W of La Libertad, 28 Jan 1959 (fl), *Allen 7211* (MO, NY, US). **LA PAZ:** Hacienda Santo Tomás, Mar 1946 (fl), *Carlson 1101* (F). **SAN MIGUEL:** Laguna de Olomega, 20 Feb 1922 (fl), *Standley 20982* (MO, NY, US). **SAN SALVADOR:** Vic. San Salvador, 30 Mar 1922 (fr), *Standley 23623* (NY, US).

HONDURAS. **ATLÁNTIDA:** Lancetilla Valley, near Tela, 6 Dec 1927 (st), *Standley 54117* (F, US). **COMAYAGUA:** 65 km NW of Tegucigalpa, road to Comayagua, 26 Mar 1976 (fl), *Pilz & Pilz 1546* (AAU, MO). **COPÁN:** Rodezno, 3 May 1919 (fl, fr), *Whitford & Stadtmiller 60* (US). **EL PARAÍSO:** Yuscarán, 30 Apr 1977 (fl), *Ochoa 13A* (MO). **MORAZÁN:** Jicarito Creek, 12 Feb 1947 (fl), *L. Williams & Molina 11881* (F, MO). **MOSQUITIA:** Suji, 30 Oct 1966 (st), *Haufe et al. 28* (WIS). **OLANCHO:** Between Río Pueblo Viejo and Río Wampu, 3 May 1982 (fl), *Blackmore & Heath 2171* (MO). **SANTA BÁRBARA:** San Pedro Sula, May 1888 (fl), *Thieme 5388* (US).

NICARAGUA. **BOACO:** Near San Lorenzo, 13 km SE of Tecolostote, 4 Feb 1984 (fl), *Stevens 22853* (MO). **CARAZO:** Est. Biol. Chococentro, Carazo-Rivas, 4 Feb 1984 (fl), *Grijalva & Almanza 3566* (MO). **CHONTALES:** Carretera 7 between Boaca cutoff and Acoyapa, 18 Mar 1961 (fl), *Bunting & Light 728* (F). **ESTELÍ:** Sabana Larga, 13 Apr 1981 (fl), *Moreno 8114* (MO). **JINOTEGA:** NE of Wiwili, 13 Mar 1980 (fl, fr), *Araquistáin & Castro 1885* (MO). **MANAGUA:** 3.7 km NE of Masachapa, 4 Feb 1978 (fl), *Stevens 6254* (MO). **MATAGALPA:** Certo Musún, trib. Río Paiwas, 12 Feb 1979 (fl), *Stevens 12037* (MO). **NUEVA SEGOVIA:** Valle Casas Viejas, 6 km NE del Jicaro, 18 Apr 1980 (fr), *Araquistáin 2319* (MO). **RIVAS:** SE from San Juan del Sur, NW of Río La Flor, 17 Dec 1977 (fl), *Stevens 5496* (MO). **ZELAYA:** Braggman's Bluff, Ocongwas, 2 Apr 1928 (fl), *Englesing 182* (F, K, NY).

COSTA RICA. **ALAJUELA:** El Coyolar, 1 Apr 1924 (fl, fr), *Standley 40064* (US). **CARTAGO:** E of Tres Ríos, 3 May 1928 (fl), *Stork 1382* (F, WIS). **GUANACASTE:** Environs de Nicoya, Mar 1900 (fl, fr), *Tonduz 13852* (BM, CR, K, P, US). **HEREDIA:** Road to Río Frio 0–12 km from Puerto Viejo, 12 Jul 1971 (st), *Gentry 1175* (MO). **LIMÓN:** Inland from Cahuita, 23 Jul 1971 (st), *Gentry 1314* (MO). **PUNTARENAS:** Pan-American Hwy. at Esparta, 17 Feb 1969 (fl), *Gentry 1476* (MO, WIS). **SAN JOSÉ:** La Uruca, Mar 1890 (fl), *Biolley 2215* (BR, CR).

PANAMA. **BOCAS DEL TORO:** Chiriquí Lagoon Region, Punta Rovalo to Rovalo River, 24 Aug 1940 (fl),

Seibert 1564 (MO, US). **CANAL ZONE:** Barro Colorado Island, Peña Blanca Point, 5 Mar 1969 (fl, fr), *Croat 8394* (MO, SCZ). **CHIRIQUÍ:** Progreso, Jul 1927 (st), *Cooper & Slater 268* (F, US). **COCLÉ:** 2 mi N of El Valle, 9 Jan 1972 (st), *Gentry & Dwyer 3597* (MO). **COLÓN:** Road to Portobelo, 17 Sep 1971 (st), *Gentry 1772* (MO). **DARIÉN:** El Real, 5 Mar 1972 (fl), *Gentry 4579* (MO). **HERRERA:** S of Ocu, 13 Dec 1971 (st), *Gentry 3121* (MO). **PANAMÁ:** 2 mi W of El Llano, 6 Apr 1972 (fr), *Gentry 4962* (MO). **SAN BLAS:** Puerto Obaldía to Colombian border, 19 Aug 1971 (st), *Gentry 1528A* (MO). **VERAGUAS:** 1–2 mi above Santa Fe, 12 Dec 1971 (st), *Gentry 3039* (MO).

JAMAICA (Cult.). **ST. ANDREW:** Near Grove above Hope, 24 Mar 1904 (fl), *Harris 8628* (NY, UCWI); **ST. THOMAS:** Rocky Point Bay, 10 Jun 1975 (fl), *Proctor 36297* (IJ, MO).

WINDWARD ISLANDS (Cult.). **MARTINIQUE:** Forte-de France, Jardin, 19 May 1934, *Rodriguez 3790* (P).

COLOMBIA. **ANTIOQUIA:** Pavarando Grande, Río Pavarando, 4 Mar 1987 (fl, fr), *Fonnegra et al. 1699* (MO). **ATLÁNTICO:** Baranquilla-Santo Tomas, 29 Apr 1960 (fl, fr), *Mora 1397* (COL). **BOLÍVAR:** Mun. San Martín de Loba, 4 Apr 1916 (fl), *Curran 87* (MAD, S, US). **CAUCA:** Popayán: 14 Jan 1952, *Inst. de Parcelaciones 61* (COL). **CESAR:** 5 km W of Manauare, 13 Jan 1988 (st), *Gentry et al. 60731* (JBGp, MO). **CHOCÓ:** Río Atrato near Riosucio, Jan 1974 (fl), *Gentry 9239* (COL, MO). **CUNDINAMARCA:** Pacho-Río Negro, 24 Feb 1942 (fl), *García-Barriga 10738* (COL, US). **GUAJIRA:** Maicao, Arroyo Tabaco, 7 Mar 1981 (fl), *Arboleda et al. 419* (MO). **MAGDALENA:** Santa Marta, Feb 1898 (fl), *H. Smith 1142* (BR, F, G, L, MICH, MO, P, US). **NORTE DE SANTANDER:** Aguacaliente, San Luis (Cucuta), *Garganta 1112* (F). **SANTANDER:** Charala a San Gil, 29 May 1958 (fl), *Romero-Castañeda & Jaramillo s.n.* (COL). **VALLE:** Yotoco, Buga-Buenaventura, 25 Jul 1967 (fl), *García-Barriga 18818pp* (COL).

VENEZUELA. **ANZOÁTEGUI:** Km 227 on Caracas-Barcelona hwy., 16 km E of Boca de Uchire, Jul 1975 (st), *Gentry & Berry 14820* (MO). **APURE:** Guasdalito, Jun 1975 (st), *Gentry & Puig-Ross 14339* (MO). **ARAGUA:** Cagua, 10 Mar 1974 (fl), *Gentry 10321* (MO). **BARINAS:** Carretera La Yuca Obispo, Mun. Barrancas, 29 Apr 1978 (fl, fr), *Marcano-Berti et al. 40-4-78* (MO). **CARABOBO:** El Naípe, 14 Jun 1939 (fl), *L. Williams 11115* (US, VEN). **DELTA AMACURO** (Cult.): San Rafael, 23 Oct 1977 (fl), *Steyermark 115218* (MO). **DISTRITO FEDERAL:** Caracas, 17 Apr 1921 (fl), *Pittier 9503* (VEN). **FALCÓN:** Parque Nac. Quebrada de la Cueva El Toro, 21 Jun 1979 (fl), *Liesner et al. 7765* (MO). **GUÁRICO:** 13 km N of Altigracia de Orituco, Jul 1975 (fl, fr), *Gentry & Berry 15118* (MO). **MÉRIDA:** Otra Bauda, Jun 1953 (fl), *Bernardi 561* (FI, NY). **MIRANDA:** Cerros del Bachiller, 11 km SSE of El Guapo, 24 Mar 1978 (st), *Steyermark & Davide 116787* (MO). **MONAGAS:** Reserva Forestal de Guarapiche, 22 Feb 1978 (fl), *Castillo 723* (MO). **PORTUGUESA:** 30 km W of Guanare, 11 Mar 1982 (st), *Liesner et al. 12451* (MO). **SUCRE:** Distr. Benítez, between Guaraunos and Ajies, 18 Feb 1980 (fl), *Steyermark et al. 121292* (MO). **TACHIRA:** 20 km W de San Cristobal, 8 May 1953 (fl),

Little 15161 (VEN). YARACUY: Distr. Urachiche, W de Urachiche, 28 Feb 1981 (fl), *Steyermark et al. 124592* (MO). ZULIA: Santa Barbara, 18 Jan 1965 (fl), *Breteler 4418* (NY, US).

TRINIDAD and TOBAGO (Cult.). TOBAGO: Scarborough, 27 Apr 1909 (fl), *Broadway 2991* (MO).

GUYANA (Cult.). Georgetown Botanical Garden, 14 May 1986 (fl), *Pipoly 7344* (MO).

ECUADOR. GUAYAS: Capiera, along Río Daule, 22 km N of Guayaquil, 15 Jul 1986 (st), *Gentry & Dodson 54852* (MO); Hacienda Almos, S of Guayaquil, 11 Jul 1921 (fl), *Rowlee & Mixter 1238* (US).

BRAZIL (Cult.). DISTRITO FEDERAL: Brasília, 20 Aug 1977 (fl), *Heringer 16891* (HB). GOIÁS: Luziania, 5 Sep 1978 (fl), *Heringer et al. 17328* (MO).

Local names. Mexico: amapola (Nayarit and Sinaloa), macuiliz (southern Mexico to Honduras), maculiz (Tabasco), primavera, roble (Nayarit and Sinaloa), roble colorado, roble prieto (Oaxaca); Venezuela: apamate, roble.

Although it occurs exclusively on continental America, this species is most closely related to the Antillean taxa. It is the only continental *Tabebuia* species with lavender to magenta flowers and a glabrous corolla tube and lepidote but otherwise glabrous calyx. It is widely cultivated. When grown in the West Indies, it can be distinguished from closely related *T. heterophylla* and other local species by the uniformly 5-foliolate leaves with more acuminate elliptic leaflets.

84. *Tabebuia roseo-alba* (Ridley) Sandwith, Kew Bull. 1955: 597. 1955.

Bignonia roseo-alba Ridley, J. Linn. Soc. Bot. 27: 52. 1890. Type. Brazil. Fernando do Noronha, *Ridley, Lea, & Ramage 65* (holotype, K; isotypes, BM, US).

Tecoma odontodiscus Bureau & K. Schumann in Martius, Fl. bras. 8(2): 320. 1897. Type. Brazil. Rio de Janeiro, Tijuca, *Glaziou 7770* (lectotype, P; isotypes, C, K).

Tecoma papyrophloios K. Schumann in Martius, Fl. bras. 8(2): 411. 1897. Type. Brazil. Goiás: Corrego do Brejo, *Glaziou 21840* (lectotype, P; isotypes, BR, C, G, K).

Tecoma piutinga Pilger, Bot. Jahrb. 30: 196. 1901. Type. Brazil. Mato Grosso: Kulisehu, *Pilger 776* (B*). *Tecoma odontodiscus* Bureau & K. Schumann var. *paraguariensis* Hassler, Feddes Repert. 9: 60. 1910. Type. Paraguay. Esperanza, Sierra de Amambay, *Hassler 10593* (coll. *Rojas*) (holotype, G; isotypes, C, K, MICH, MO, P, US, W).

Tecoma mattogrossensis Kränzlin, Feddes Repert. 17: 222. 1921. Type. Brazil. Mato Grosso: Cuyaba, *Malme 2296, 2297* (B*, isotypes, S (not seen)).

Tecoma schumannii Kränzlin, Feddes Repert. 17: 223. 1921. Type. Brazil. Minas Gerais: Ribeirão dos

Bugres, pr. Caldas, *Regnell III-54* (B*, lectotype, S (photo K); isotype, P).

Tabebuia papyrophloios (K. Schumann) Melchior, Notizbl. Bot. Gart. Berlin 13: 500. 1937.

Tabebuia piutinga (Pilger) Sandwith, Lilloa 14: 136. 1948.

Tabebuia odontodiscus (Bureau & K. Schumann) Toledo, Arch. Bot. São Paulo 3: 32. 1952.

Tabebuia odontodiscus var. *violascens* Toledo, Arch. Bot. São Paulo 3: 32. 1952. Type. Brazil. Minas Gerais: Lavras, cultivado, *Heringer 82* (SP).

Handroanthus roseo-albus (Ridley) Mattos, Lofegrenia 50: 2. 1970.

Handroanthus odontodiscus (Bureau & K. Schumann) Mattos, Lofegrenia 50: 4. 1970.

Handroanthus odontodiscus var. *violascens* (Toledo) Mattos, Lofegrenia 50: 4. 1970.

Handroanthus piutinga (Pilger) Mattos, Lofegrenia 50: 4. 1970.

Tree 4–25 m tall, branchlets terete, sometimes flattened at nodes, more or less lenticellate at maturity, lepidote, otherwise glabrous or glabrate. *Leaves* uniformly 3-foliolate, the leaflets elliptic or rhombic-elliptic to ovate, usually obtuse to acutish, sometimes short-acuminate, rounded to broadly cunete at base, 2–15 cm long, 1.2–10 cm wide, chartaceous to subcoriaceous, somewhat lepidote above and below, usually also puberulous along midvein above, below conspicuously pilose with simple trichomes in the axils of the secondary veins, sometimes also with simple trichomes scattered along the main veins or over the entire undersurface, drying more or less olive, usually lighter below; petiolules 0.1–3.5 cm long, petiole 1.5–9 cm long, lepidote, usually also slightly puberulous above. *Inflorescence* terminal, contracted and more or less fasciculate, with conspicuous subulate bracts and bracteoles 3–9 mm long, these drying grayish and lepidote with conspicuous whitish margins from the densely pilose cobwebby flexuous marginal trichomes. *Flowers* with the calyx campanulate, 2–3-labiate, 5–17 mm long, 4–8(–11) mm wide, drying black or dark brown, densely lepidote, sometimes also with scattered simple trichomes, always densely cobwebby pilose with flexuous matted trichomes on the lobes; corolla white to pink, tubular-infundibuliform, 2.5–7 cm long, 0.9–2 cm wide at mouth of tube, the tube 2–5 cm long, the lobes 0.6–2 cm long, glabrous outside except for a few scattered dark-drying plate-shaped glands, the lobes ciliate, pubescent inside and in throat with long weak, flattened trichomes, pilose with glandular trichomes at level

of stamen attachment; stamens didynamous, the anther thecae divaricate, 3 mm long; pistil 2–3 cm long, the ovary linear-cylindric, 3–5 mm long, ca. 1 mm wide, densely lepidote and with larger lepidote glands, some of the scales distinctly petalate-stalked; disk cupular, distinctly shallowly 5-lobed, 0.5–1 mm long, 1.2–2 mm wide. *Fruit* a slender capsule, 13–24 cm long, 0.5–0.7 cm wide, lepidote, drying grayish or brownish, the calyx persistent; *seeds* thin, bialate, 5–6 mm long, 2.5–3 cm wide, the hyaline wings sharply demarcated from the brownish body.

Distribution (Fig. 59). Eastern and Central Brazil and adjacent Paraguay and Bolivia, disjunct in Peru; mostly in dry areas, in moist climates generally restricted to edaphically dry sites; near sea level to 1150 m.

Representative collections examined. COLOMBIA. VALLE (cultivated): Cali, *Duque-Jaramillo 1741* (US). PERU. Cuzco: Convención, Maranura, 9 Sep 1969 (fl), *Chavez 557* (MO); Santa Ana, May 1865 (fl), *Raymond 11669* (USM); Convención, Quillabamba, Hda. Macamango, 6 Oct 1958 (fl), *Vargas 12310* (CUZ). SAN MARTÍN: Alto Río Huallaga, Dec 1929, *L. Williams 6687* (F, MO).

BRAZIL. BAHIA: Itapebi, 2.5 km N da Faz. Ventania, 26 Sep 1979 (fl), *Hage et al. 309* (MO); Ilhéus, km 22 Ilhéus-Itabuna, 25 Jan 1983 (fl), *E. dos Santos 32* (MO). CEARÁ: Fortaleza, Aldeota, 17 Dec 1954 (fl), *Ducke 2382* (EAC, IPA); Praia de Soure, near Fortaleza, 17 Feb 1985 (fr), *Gentry et al. 50216* (EAC, MO). DISTRITO FEDERAL: Brasília, campus da Universidade, 8 Jul 1973 (fl), *Heringer 12834* (HB, MO, UB, UEC). ESPÍRITO SANTO: Estrada de Normique, 13 Nov 1953 (fl), *Duarte 3966* (MO, RB, UEC). FERNANDO NORONHA: Alto do Morro Frances, 18 Oct 1955 (fl), *Lima 55-2158* (IPA). GOIÁS: Corrego do Brejo, 20 Feb 1895 (fl, fr), *Glaziou 21840* (BR, C, G, P); Rio Javaes, 27 Jul 1978 (fl), *Pires & Santos 16240* (MO). MARANHÃO: São Luiz, Olho d'Água, 1 Nov 1948 (fl), *Ducke 2179* (IAN, MG, RB). MATO GROSSO: Vale de Sonhos, 80 km N of Barra do Garças, 21 Aug 1972 (fl), *Ratter et al. 2160* (NY, UB). MATO GROSSO DO SUL: Fazenda Salina, Pantanal do Rio Negro, 22 Oct 1987 (fr), *Dubs 453* (MO). MINAS GERAIS: MORRO Vermelho, 10 Jul 1882 (st), *Glaziou 12981* (BR, C, F, G, P); Ituiutaba, Fda. Vovo Pedro, 17 Sep 1944 (fl), *Macedo 531* (MBM, MO). PARÁ: Região Garotire, Mun. Altamira, 7 Jul 1962, *J. Silva 734* (IAN). PARAÍBA: Estrada entre Campina Grande e João Pessoa, Feb 1962, *J. Gomes et al. 1227* (MO). PERNAMBUCO: Tapeira, Feb 1936 (fl, fr), *Sobrinho, V. s.n.* (IPA). PIAUÍ: Sobradinho, 2 Oct 1973 (fl), *Sucre et al. 10241* (CH). RIO DE JANEIRO: Cap Frio, Jul 1833 (fl), *Luschnath s.n.* (BR). SÃO PAULO: Piracicaba, 26 Sep 1967 (fl, fr), *Hoehne 6267* (MO).

BOLÍVIA. BENI: Prov. Ballivian, Estancia El Porvenir, 250 m, 14°49'S, 66°25'W, 18 Nov 1985 (st), *Solomon 14784* (MO). SANTA CRUZ: Prov. Andres Iba-

nez, 2 Oct 1981 (fl), *Beck 7156* (MO); Sara, Buenavista, Sep 1924 (fl), *Steinbach 6452A* (MO).

PARAGUAY. AMAMBAY: Sierra de Amambay, Sep 1907 (fl), *Hassler 10593* (C, G, MICH, MO, P, US, W).

Local names. Bolivia: tajibo blanco. Brazil: taipoca, itaipoca, tadumo, ipe branco, ipe-branco, ipe roxo, ipe rosa, piuxinga, pau d'arco peroba, ipe preto.

Uses. Sometimes cultivated as an ornamental; used for "tabua, taco, friso e ripas."

Characterized by the uniformly 3-foliolate leaves and (in flower) by the white to pink corolla and white cobwebby pubescence of the calyx lobes and bracteoles. The fruits are the narrowest of any sub-Amazonian *Tabebuia*, being equalled only by *T. billbergii* of northern South America.

85. *Tabebuia sauvallei* Britton, Bull. Torrey Bot. Club 42: 377. 1915, nom. nov. for *Tecoma sanguinea* C. Wright, non *Tabebuia sanguinea* A. P. de Candolle.

Tecoma sanguinea C. Wright in Sauvalle, Anales Acad. Ci. Méd. Habana 6: 320. 1870. Type. Cuba. Sancti Spiritus (Las Villas): Río Caburni, near Trinidad, *Wright s.n.* (lectotype, NY; isotypes, GH (as 3640), MO, NY, US).

Large shrub or small tree to 10 m tall, dichotomously branched, the branchlets terete, longitudinally striate-ridged, rather densely lepidote when young, completely glabrous when older. *Leaves* 3–5-foliolate, the leaflets elliptic to narrowly obovate, rounded to retuse at apex, the base obtuse to broadly cuneate, the terminal 3.5–6.5(–10) cm long, 1.8–3(–4.5) cm wide, the basals 1.3–4(–6) cm long, 0.8–2.5(–3) cm wide, often asymmetric and/or subsessile, coriaceous, densely lepidote above and below, with scattered reddish brown scales as well as the whitish ones, drying grayish above and tannish below, venation brochidodromous, the midvein and usually the secondaries impressed above, raised below, usually with domatiate nerve axils below, the tertiary venation distinctly prominulous below, the margin usually distinctly erose; petiolules 0.3–2 cm (or more or less lacking on basal leaflets), the petiole 0.7–7 cm long. *Inflorescence* a dichotomously branching panicle or reduced to 2–3-flowers, densely lepidote, drying blackish or dark brown, usually with inconspicuous 2–3 mm long subulate bracts and bracteoles. *Flowers* with calyx irregularly and shallowly 2–3-labiate, 9–13

mm long, 5–8 mm wide, densely lepidote, the corolla deep wine red to purple, tubular to very narrowly and evenly tubular-campanulate with a poorly differentiated basal part of tube, 2.5–4 cm long, 0.5–1 cm wide at mouth of tube, the tube 2–3 cm long, the lobes 0.5–1 cm long, glabrous outside, inside pubescent with rather long lax trichomes in throat, the lobes sparsely ciliate; filaments ca. 2.5 cm long, their bases bulbously enlarged and pubescent, the anthers subexserted or barely included, the thecae divaricate, 2–3 mm long; ovary tetragonal, linear-oblong, 3 mm long, 1 mm wide, densely lepidote; disk cylindrical-pulvinate, 1.5 mm long, 2 mm wide. *Fruit* linear-cylindric, 7–9 cm long, 6–8 mm wide, lepidote, the surface rather rough and usually somewhat striate-ribbed, subtended by persistent calyx, drying blackish; *seeds* thin, bialate, 4–5 mm long, 15–18 mm wide, the hyaline-membranaceous wings sharply demarcated from the seed body.

Distribution (Fig. 57). Endemic to the Trinidad Mountains of south central Cuba; mostly (500)–600–1200 m in karst limestone.

Specimens examined. CUBA. CIENFUEGOS: San Blas, La Sierra, above Las Vegas de Matagua, 2500 ft, 7 Apr 1928 (fl), *Jack 5965* (A, NY); Las Lagunas, Buenos Aires, 2500 ft, 6 Dec 1928 (fl), *Jack 6885* (A, NY), 10 Apr 1929 (fl), *Jack 7206* (A, NY, S, US); Gavinas, Buenos Aires, 2500–3500 ft, 10 Apr 1930 (fl, fr), *Jack 7891* (A, NY, US); Las Vegas de Matagua, 22 Feb 1956 (st), *Morton 10552* (US); Buenos Aires, 7 May 1932 (fl), *Roig & Acuna 6120* (NY); cultivated, Soledad, Apr 1934 (fl), *Walsingham s.n.* (NY). SANCTI SPIRITUS: Obispo Hill, Banao Mts., 6 Apr 1918 (st), *León & Roca 8129* (NY); Río Carbuni, Manacal, near Trinidad, *Wright s.n.* (GH (as 3640), NY, US). VILLA CLARA: Santa Clara province, Río Hanabanilla, Finca Playetas, 600 m, 14 Feb 1924 (fl), *Ekman 18483* (B, F, G, MO, NY, S); Loma de la Vigía, Trinidad, 29 Mar 1924 (fl), *Ekman 18908* (S); La Vigía Hill, 14 Mar 1910 (fl), *Britton & Wilson 5526* (NY).

Local name. Roble guayo.

Alain (1957) misinterpreted this species. The plant described by Wright and represented by his type material has dark red, probably hummingbird-pollinated flowers with a distinctive corolla shape and subexserted anthers. However, most of the material assigned to this species in the *Flora of Cuba* and by León and Alain (in herb.) belongs to vegetatively similar *T. calcicola* which has the typical light pink to purplish West Indian *Tabebuia* flower. I cannot always distinguish these two species in vegetative condition, though *T. sauvalliei* generally has lighter drying leaves with

more erose margins than does *T. calcicola*. As thus interpreted, *T. sauvalliei* is a local endemic of the Trinidad Mountains.

86. *Tabebuia schumanniana* Urban, Symb. antill. 1: 404. 1899. Type. Puerto Rico. Prope Utuado, *Sintenis 6500* (holotype, B; isotypes, BM, BR, C, G, GH–2, HAC, HBG, K, L, M, MO, NY, S–3, US).

Tecoma schumanniana (Urban) Urban, Symb. antill. 7: 539. 1912.

Small tree 2–5 m (–8 m fide Little et al., 1974) tall, the branchlets irregularly subtetragonal, vertically ridged, elenticellate, lepidote, the leaf scars with raised bases. *Leaves* unifoliolate, opposite, usually clustered towards branch tips, obovate to oblanceolate or oblong-oblanceolate, obtuse to rounded at apex, obtusely cuneate at base, 3–21 cm long, 1–8 cm wide, coriaceous, the margin very slightly revolute, lepidote or lepidote-punctate, inconspicuously above, conspicuously but not densely below, with a glandular area at base of midvein, drying olive to olive-brown, brochidromous; petioles 0.5–3 cm long, lepidote. *In-florescence* a few terminal flowers, the pedicels (1.5–)3–6 cm long, lepidote, usually unbranched, with a pair of 2–5 mm long linear bracteoles near middle, subtended by linear bracts to 1 cm long, occasionally forked. *Flowers* with the calyx campanulate, bilabiate, 9–20 mm long, 6–10 mm wide, lepidote, drying blackish; corolla red, more or less tubular-salverform, 4–5.5 cm long, 0.6–0.9 cm wide at mouth of tube, the tube 3–4 cm long, the lobes ca. 1 cm long, completely glabrous except for dense glandular trichomes at level of stamen insertion; stamens didynamous, at least the longer pair subexserted, insertion 3–4 mm from base of tube, the thecae divaricate, thick, 3 mm long; pistil 3–3.5 cm long, the ovary linear, somewhat tetragonal, densely lepidote, 4–6 mm long, 0.8–1 mm wide; disk broadly patelliform, 1 mm long, 3–4 mm wide. *Fruit* (in part from Little et al., 1974) linear, terete, 9–17 cm long, 0.8–1 cm diam., lepidote, the calyx persistent; *seeds* thin, bialate, 5–6 mm long, 2–3 cm wide, the wings hyaline-membranaceous, sharply demarcated from the brown seed body.

Distribution (Fig. 57). Mountains of western and central Puerto Rico; locally common in dwarf and montane forests from 500 to 1500 m.

Specimens examined. PUERTO RICO. Mt. Morales, near Utuado, 19 Mar 1906 (fl), *Britton & Marble 1069* (US); Rio de Maricao, 500–600 m, 2 Apr 1913 (fl), *Britton et al. 2467* (US); Maricao National Forest, 3 Apr 1985 (fl), *Croat 60917* (MO), Nov–Dec 1963 (fl), *Duke 7057* (MO), *Duke 7088* (US), *Duke 7116* (MO); summit of Cerro de la Punta, 4350 ft, Mar 1926 (fl), *Gleason & Cook P-32* (NY); Guavate-Patillas Trail, 19 Apr 1940 (fl), *Gregory 22* (NY); Cerro de La Punta, Bosque Toro Negro, Jan 1963 (fl), *Howard & Nevling 15432* (A), 1000–1100 m, Jan 1979 (fl), *Liogier et al. 28300* (NY, UPR), 16 Aug 1950 (fl), *Little 13678* (NY), Mar 1937 (fl), *I. Vélez 1090* (NY), May 1960 (fl), *Woodbury s.n.* (NY); Guayabota, S. Lorenzo to Patillo, 19 May 1933 (fl), *Liogier & Martorell 34331* (UPR); Cerro Vuestia Madre, Sierra de Cayey, 10 Mar 1979 (fl), *Liogier et al. 29918* (UPR); Maricao forest, Jan 1963 (fl), *Howard & Nevling 15353* (A), *Little 13427* (NY), 28 Apr 1935 (fl), *Sargent 402* (US), Utuado, 16 Mar 1887 (fl), *Sintenis 6500* (B, BM, BR, G, GH, HAC, HBG, K, L, M, MO, NY, S, US); Maricao forest, 27 Nov 1982 (fl), *Tredwell 753* (MO), 5 Apr 1968 (fl), *Wagner 1464* (A), 9 Apr 1969 (fl), *Wagner 1842* (A); Monte del Estado, Apr 1963 (fl), *Woodbury 3426* (NY, UPR); Toro Negro, May 1960 (fl), *Woodbury s.n.* (UPR).

Local names. Roble colorado, roble de sierra, roble cimarron.

Specimens from Cerro de la Punta, Bosque Toro Negro, approach *T. rigida* in leaf shape and thickness but have the patelliform disk and generally unbranched inflorescence of this species.

87. *Tabebuia selachidentata* A. Gentry, sp. nov.

Type. Brazil. Bahia: Mun. Sento Se, 10°11'S, 41°25'W, RADAM folha SC.24-A, ponto 37F, 9 Sep 1981 (fl), *G. Pinto 349/81* (holotype, MO; isotype, HRB).

Arbor parva. Folia 1–3-foliolata, foliolis late ovatis, plusminusve cordatis, irregulatim acute serratis, leviter lepidotis. Inflorescentia contracta, pauciflora. Flores calyce campanulato, resinoso, ad basem puberulo; corolla magentea, ex-tus sparsim puberula. Capsula ignota.

Small tree, the twigs subtetragonal, glabrescent except for a few lepidote scales, the extreme apices with thick-stellate trichomes but these completely covered by a clear resinous secretion. Leaves unifoliolate to 3-foliolate, the leaflets broadly ovate, acute to more or less acuminate, the base more or less cordate, the terminal leaflet 4–8 cm long, 3–6 cm wide, the laterals when present smaller, jaggedly and irregularly dentate, coriaceous, somewhat lepidote above and below, above also minutely papillose, below with the surface somewhat obscured by a thin resinous

secretion, drying dark olive above, pale olive below; terminal petiolule to 1 cm long, the lateral leaflets often sessile, the petiole 2–4 cm long, glabrous except for a few lepidote scales. Inflorescence a terminal cluster of a few sessile or subsessile flowers, lepidote and mealy-puberulous from the tiny thick-stellate trichomes. Flowers with the calyx cupular, very slightly and bluntly 5-lobed, 4–5 mm long, 4–5 mm wide, mealy pubescent with thick-stellate trichomes only near base, the rest of surface obscured by resinous secretion, drying black; corolla magenta, the throat with yellow patches at anthesis, tubular-campanulate, ca. 5 cm long, 1–1.5 cm wide at mouth of tube, the tube ca. 4 cm long, the lobes ca. 1 cm long, sparsely but distinctly puberulous outside, somewhat papillose at mouth of throat, otherwise mostly glabrous inside; stamens not observed; ovary oblong, 3 mm long, 1 mm wide, glandular secretory, drying black; disk annular-pulvinate with an upturned margin, 0.5 mm long, 2 mm wide. Fruit unknown.

Distribution (Fig. 59). Known only from the type from interior Bahia in carrasco vegetation on rocks.

Local name. Pau-d'arco.

Clearly related to *T. impetiginosa* and *T. heptaphylla* in the magenta corolla with the tube puberulous outside. Vegetatively strikingly distinct from these and from all other *Tabebuia* species in the few-foliolate leaves with coriaceous, jaggedly serrate leaflets somewhat similar to the leaves of *Ilex opaca*. Other differences include the cordate leaflet base and the resinous exudate that covers the terminal buds and to a lesser extent much of the rest of the plant. The flowers differ from *T. impetiginosa* and *T. heptaphylla* in the much less densely puberulous corolla tube.

88. *Tabebuia serratifolia* (Vahl) Nicholson, Dict. Gard. 4: 1. 1887. Figs. 52, 60.

Bignonia serratifolia Vahl, Eclog. amer. 2: 46. 1798. Type. Trinidad. *Ryan 11* (C).

Bignonia flavescens Vellozo, Fl. flumin. 252. 1829 (1825). Type illustration. Brazil. Icones Fl. flumin. 6: t. 51. 1831.

Bignonia araliacea Chamisso, Linnaea 7: 683. 1832. Type. Brazil. *Sellow s.n.* (B*, lectotype, G-DC; isotypes, HBG, K, NY, P, US).

Tecoma serratifolia (Vahl) G. Don, Gen. syst. 4: 224. 1838.

Tecoma araliacea (Chamisso) A. P. de Candolle, Prodr. 9: 221. 1845.

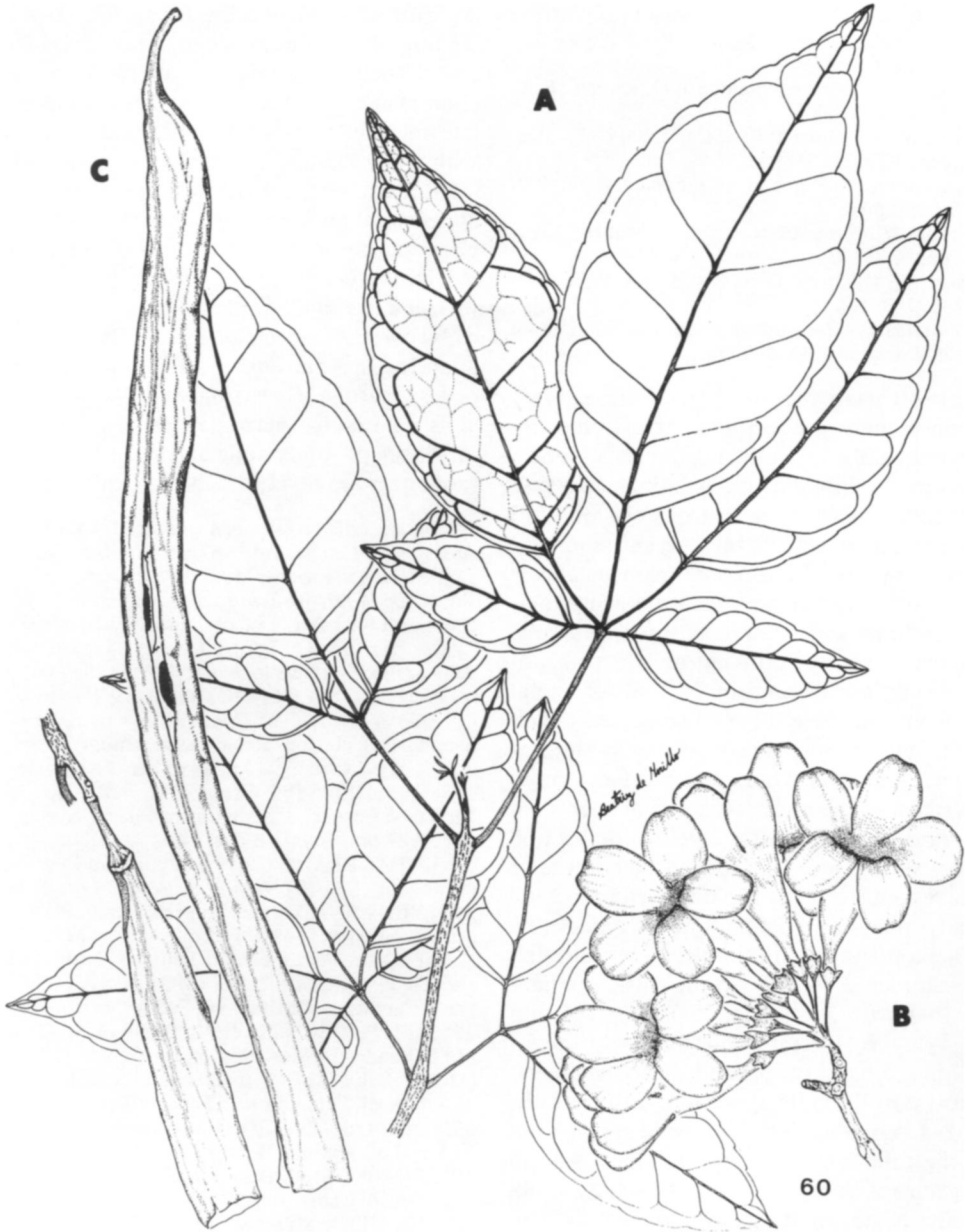


FIG. 60. *Tabebuia serratifolia*. **A**, leafy twig, $\times 0.5$; **B**, flowering shoot, $\times 0.5$; **C**, fruit, $\times 0.5$. (From *Flora de Venezuela*; **A,C**, Gentry et al. 10982; **B**, Gentry et al. 10456.)

Tecoma conspicua A. P. de Candolle, Prodr. 9: 221. 1845. Type. French Guiana. *Richard s.n.* (P).
Bignonia conspicua Richard ex A. P. de Candolle, Prodr. 9: 2212, nom. nud., pro syn.
Tecoma flavescens (Vellozo) Martius ex A. P. de Candolle, Prodr. 9: 216. 1845.
Tecoma patrisiana A. P. de Candolle, Prodr. 9: 221. Type. French Guiana. *Patris s.n.* (G-DC).

Tecoma speciosa A. P. de Candolle, Prodr. 9: 218. 1845. Type. Brazil. *Martius 446* (holotype, M; isotypes, K, G-DC—fragm.).
Tecoma nigricans Klotz in Schomburgk, Reisen 3: 1159. 1848, nom. nud.
Tabebuia araliacea (Chamisso) Morong & Britton, Ann. N.Y. Acad. Sci. 7: 190. 1893.
Tecoma atractocarpa Bureau & K. Schumann in Mar-

- tius, Fl. bras. **8(2)**: 326. 1897. Type. Brazil. Minas Gerais: Chapadão de S. Marco, *Riedel 2889* (B*, isotype, K).
- Gelseminum araliaceum* (Chamisso) O. Kuntze, Rev. gen. **3(2)**: 245. 1898.
- Gelseminum speciosum* (A. P. de Candolle) O. Kuntze, Rev. gen. **3(2)**: 245. 1898.
- Tabebuia monticola* Pittier, Cat. Flora Venez. **2**: 409. 1947, nom. nud.
- Handroanthus araliaceus* (Chamisso) Mattos, Loefgrenia **50**: 2. 1970.
- Handroanthus flavescens* (Vellozo) Mattos, Loefgrenia **50**: 2. 1970.
- Handroanthus atractocarpus* (Bureau & K. Schumann) Mattos, Loefgrenia **50**: 2. 1970.

Tree to 30 m tall, the branchlets terete, glabrate or inconspicuously puberulous at extreme tip. *Leaves* palmately 5–7-foliolate, the leaflets elliptic to narrowly elliptic-ovate, acuminate, the base rounded, the terminal leaflet to 18 cm long and 7 cm wide, lateral leaflets smaller, entire to conspicuously serrate, chartaceous, inconspicuously lepidote, otherwise mostly glabrous when mature, sometimes with a few inconspicuous simple trichomes at base of midvein above, with noticeable simple trichomes in the axils of lateral nerves beneath, these often fringing well-developed domatia (in cerrado sometimes softly simple puberulous over whole undersurface), more or less stellate or substellate-pubescent only when very young, drying gray to olive; petiolules to 5 cm long, petiole to 10 cm long, usually more or less puberulous at least adaxially. *Inflorescence* a usually many-flowered corymbose panicle, its branches tomentose with simple, forked and stellate trichomes. *Flowers* with the calyx campanulate, shallowly 3–5-lobed, (5–)8–11(–16) mm long, (5–)6–11(–14) mm wide, sparsely pubescent with scattered simple and thick-stellate trichomes; corolla yellow, tubular-infundibuliform, 8–12 cm long, 2–3.5 cm wide at mouth of tube, the tube 6–9 cm long, the lobes 2–3 cm long, glabrous outside, the lobes usually somewhat ciliate, the throat weakly pilose within with long (to 0.8 mm) flexuous trichomes, mostly along throat ridges (sometimes completely glabrous in cerrado population), pubescent at level of stamen insertion; stamens didynamous, the anther thecae divaricate, 3 mm long; pistil 3.5–4 cm long, the ovary linear-oblong, 4 mm long, 1–1.5 mm wide, warty-roughened and glandular warty especially toward apex, often scattered-lepidote or with a few stellate trichomes, the ovules many-seriate in each locule; disk pulvinate, 1 mm long,

2.5 mm wide. *Fruit* a linear capsule, (8–)12–60 cm long, 1.6–2.4 cm wide, more or less glabrate, usually with a few widely scattered lepidote trichomes and sometimes a very few simple or stellate ones, the valves thick, subwoody, smooth or with a few scattered warty lumps; *seeds* bialate, 0.8–1.1 cm long, 2.4–3.5 cm wide, the wings hyaline-membranaceous in outer half, brownish at base, sharply demarcated from darker seed body.

Distribution (Fig. 61). Colombia to Bolivia, the Guianas, and southeastern Brazil. Ecologically diverse, especially in the Brazilian mata atlantica; in Amazonia mostly occurring in more or less seasonal forests on well-drained lateritic soils, but in sub-Amazonian Brazil also occurring on richer or sandy soils and even into the cerrado; near sea level to 1200 m elevation.

Representative collections examined. COLOMBIA. AMAZONAS: Leticia, Jul 1967 (st), *Plowman & Martin 126* (MO). ANTIOQUIA: Mun. de Caucaisia, road to Nechí, 14 Dec 1986 (fl), *Zaruchi & Echeverry 4536* (MO). CALDAS: 14–21 km N of La Dorada, 7 Mar 1977 (st), *Gentry et al. 18141* (MO). CUNDINAMARCA: Río Magdalena, Pto. Bogotá-Pto. Salgar, 5 Mar 1977 (st), *Gentry et al. 18116* (COL, MO). GUAINÍA: Puerto Inirida (st), *Gentry et al. 10963* (MO). NORTE DE SANTANDER: Sarare, Río Cubugon, 16 Nov 1941, *Cuatrecasas 13261* (COL). SANTANDER: 24 km W of San Vicente de Chucurí, 25 Jul 1975 (fr), *Gentry & Forero 15431* (MO). VICHADA: Casuarito, across from Puerto Ayacucho, 3 Apr 1984 (st), *Gentry & Stein 46300* (MO).

VENEZUELA. AMAZONAS: 9 km S of Puerto Ayacucho, Jul 1975 (fr), *Gentry & Berry 14486* (MEXU, MO, VEN). ANZOÁTEGUI: Río Guerecual, SW of Gergantín, 14 Mar 1945 (fl), *Steyermark 61493* (VEN). APURE: Distr. Páez, Selva de Cutufi, 8 Nov 1982 (st), *Davidse & González 21857* (MO). BARINAS: Río Caparo, Puente de Piedras, 10 Feb 1954 (fl), *Bernardi 1162* (FI, MO, SCNLS, VEN). BOLÍVAR: 14–25 km N of El Dorado, 15 Mar 1974 (fl, fr), *Gentry et al. 10455* (MO, VEN); SE of Cerro Pichado, N of Las Nieves, 45 km N of Tumeremo, 1 Feb 1961 (fl), *Steyermark 88951* (K, UB, US, VEN). CARABOBO: Aquita de Dios 11 km E of Bejuma, 29 Mar 1974 (fl, fr), *Gentry et al. 10982* (MBM, MO). DISTRITO FEDERAL: E of Los Caracas, vic. of Osuma, Jul 1975 (fl), *Gentry & Berry 14753* (IJ, MO, VEN). MÉRIDA: 2–3 km above dam on Río Guaimaral, 16 Mar 1981 (fl), *Liesner & González 10661* (MO). MIRANDA: 36 km W of Boca de Uchire, 14 Mar 1974 (fl), *Gentry et al. 10370* (MO). SUCRE: Cumana and Nurucual, 6 Mar 1966 (fl), *Steyermark 95127* (US, VEN). TACHIRA: 6 km W of Santo Domingo, 31 Mar 1974 (fl), *Gentry et al. 11107* (MO, VEN). TRUJILLO: 27 km NE of Valerita, 18 km NE of Sabana Grande, 30 Mar 1974 (fl, fr), *Gentry & Puig-Ross 14291* (MO). YARACUY: Distr. Bruzual, cerca de Quibayo, 12 Mar 1981 (st), *Steyermark et al. 124914* (MO). ZULIA: Dto. Bolívar, 9 km SE of El Pensado, 4 Feb 1980 (fl), *Bunting 8685* (MO).

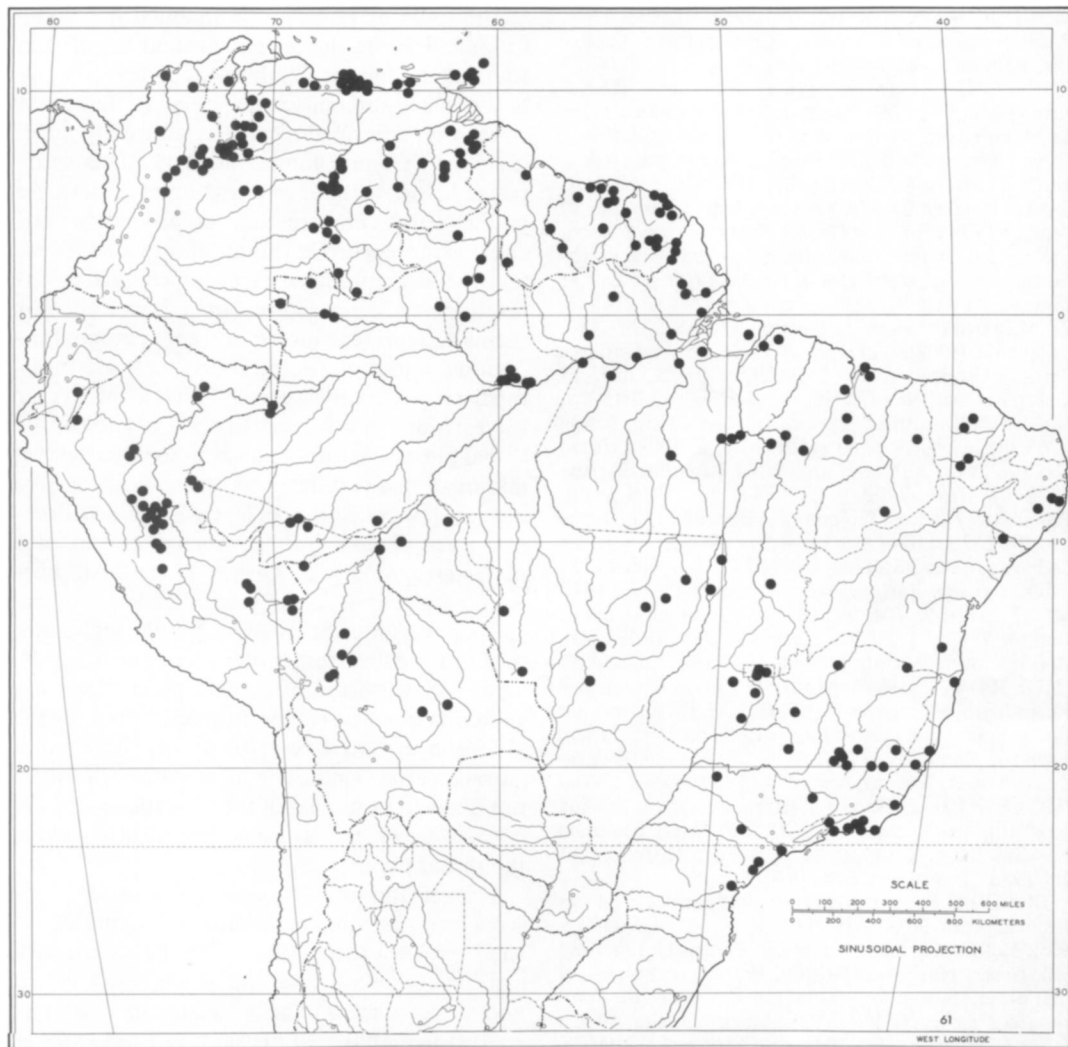


FIG. 61. Distribution of *Tabebuia serratifolia*.

TRINIDAD and TOBAGO. Chacachacare, 3 Apr 1921 (fl), Britton *et al.* 2688 (GH); sin. loc., Broadway 3187 (G, L), Fendler 524 (BM, K, P).

GUYANA. Moraballi Creek, Sandwith 612 (K, P).

SURINAM. Lelydorp, Oct 1942 (st), *BW* 101 (MAD, MO, WIS); Sectie O, 24 Sep 1915 (fr), *Boschwezen* 714 (U).

FRENCH GUIANA. Massif des Emerillons, 15 Sep 1980 (fl), *Cremers* 6679 (CAY, MO); Maroni, 1877 (fl), *Mélinon* 213 (F, MO, P); Montagne de Mahury, Ile d' Cayenne, 22 Feb 1985, *Gentry & Zardini* 50303 (CAY, MO).

ECUADOR. MORONA-SANTIAGO: Cerca Bomboiza, Centro Chumpias, 17 Sep 1985 (fl), *Shakaim* 22 (MO).

PERU. AMAZONAS: Quebrada Cinkan, 12 km N of Río Cenepa, Oct 1972 (fl), *Berlin* 235 (MO). HUÁNUCO:

Pachitea, Dist. Honoria, Sep 1967 (fr), *Schunke* V. 4 (MO); Bosque Nacional de Iparia, 14 Sep 1967 (fl), *Schunke* V. 2157 (F, G). JUNÍN: Río Colorado-Chanchamayo, 7 Feb 1983 (st), *Gentry et al.* 40119 (MO, USM). LORETO: Prov. Alto Amazonas: Yurimaguas-Tarapoto road, 15 km SW of Yurimaguas, 10 Oct 1985 (st), *Gentry et al.* 52207 (MO, USM). MADRE DE DIOS: Puerto Maldonado, 25 Aug 1983 (fl, fr), *Gentry* 43731 (AMAZ, MO). PASCO: Prov. Oxapampa, Puerto Laguna, 13 Sep 1984 (fl), *Smith* 8397 (MO, USM). SAN MARTÍN: Mariscal Cáceres, Tocache Nuevo, Nov 1969 (fl), *Schunke* V. 3621 (G, MO). UCAYALI: Ca. 20 km W of Pucallpa, 15 Jun 1987 (fl), *Gentry & Diaz* 58350 (MO, USM).

BRAZIL. ACRE: Mouth of Río Macauhan, 15 Aug 1933 (fr), *Krukoff* 5518 (MO, U, US). AMAPÁ: Roche

Mon Pere, 4 Oct 1960 (fl), *Irwin et al. 48638* (IAN, IMG). AMAZONAS: Rio Purus, Rio Curuquete, Cachoeira Republica, 25 Jul 1971 (fl), *Prance et al. 14579* (INPA, MO). BAHIA: Reserva Florestal de Porto Seguro, 7 Mar 1988 (fl), *Farias 157* (MO). CEARÁ: Serra de Maranguape, 31 Dec 1954 (fl), *Ducke 2390* (EAC, IPA). DISTRITO FEDERAL: Brasília, Rio Preto, 10 Aug 1963 (fl), *Heringer 9251* (MO, NY, UB). ESPÍRITO SANTO: Reserva CVRD, Linhares, Estr. Jacaranda, 30 Sep 1987 (fl), *Farias 143* (MO); Santa Tereza, Reserva Biológica de Nova Lombardia, 5 Feb 1985 (fr), *Peixoto, Gentry et al. 3501* (MO). GOIÁS: Entre Estacas et Jaragua, 23 Aug 1895 (fl), *Glaziou 218142* (BR, C, G, P). MARANHÃO: Fazenda Bacaba, 5 km S of MA119, 6 Oct 1980 (fr), *Daly et al. D517* (MO). MATO GROSSO: Serra do Roncador, Rio Sete Setembro 3 km from Garapu, 3 Oct 1964 (fr), *Prance & Silva 59269* (F, M, NY, S, UB); north of Xavantina, Base Camp, 5 Aug 1968 (fl), *Richards 6588* (IAN, MO, P, UB). MINAS GERAIS: Distrito Ilheu, Fazenda de Tabunha, 21 Aug 1930 (fl), *Mexia 4992* (F, G, MICH, MO, P, S, WIS). PARÁ: Rio Tapajos, Goiana, 26 Sep 1922 (fr), *Ducke s.n. (RB18182)* (INPA, RB); 4–5 km W São Francisco do Para toward Castanhal, Dec 1974 (st), *Gentry 13162* (MO). PARANÁ: Fartura, Mun. Morretes, 11 Nov 1977 (fl), *Hatschbach 40499* (MBM, MO). PERNAMBUCO: Bonito, 29 Jan 1970 (fl), *Lima 70-5683* (IPA, MO). PIAUÍ: Campo Maior, 11 Aug 1979 (fl), *Salgado 80* (MO). RIO DE JANEIRO: Morro de Viuva, Botafago, 9 Jul 1876 (fl), *Glaziou 8807* (BR, C, F, G, P). RONDÔNIA: Porto Velho to Cuiaba Hwy, vic. Santa Barbara (fl), *Prance & Ramos 6948* (INPA, NY, S). RORAIMA: Perto do boca do R. Ajarani, Apr 1974 (fl), *Pires et al. 14390* (MO). SÃO PAULO: Botucatu, Fazenda Lageado, 30 Aug 1979 (fl), *Yanagizawa s.n. (SP8958)* (MO). SERGIPE: Fazenda Barra da Onca, 3 km de Poço Redondo, 13 Jul 1983 (fl), *Fonseca 558* (IPA).

BOLÍVIA. BENI: Prov. Ballivian, San Borja 64 km hacia Espiritu, 26 Aug 1985 (fl), *Beck 12184* (MO). LA PAZ: Yolosa-Caranavi below San Pedro, 15 Jan 1984 (st), *Gentry et al. 44257* (MO); Prov. Nor Yungas, N of Yolosa on road to Caranavi, 6 Oct 1984 (fl), *Solomon & Escobar 12469* (MO). PANDO: Cobija, 19 km toward Porvenir, Aug 1945 (fr), *Seibert 2112* (MO). SANTA CRUZ: Sara, Buenavista, 1 Sep 1925 (fl), *Steinbach 7211* (F, G, MO, S).

Common names. Venezuela: cachovenado, araguaney, vero, flor amarillo, araguaney pui, chacaradanga, acapro, puy, araguaney acapro; Surinam: koone; Brazil: ipe, ipe amarelo, ipe do campo, ipeuva, pao d'arco amarelo; ipe ovo de macuco.

This is a very widespread and variable species. Although it does not extend into the trans-Andean region or Central America, *T. guayacan* is essentially an allopatric replacement (see discussion under that species). In southern Brazil this species is extremely variable. I here recognize the two most extreme forms as *T. riocensis* and *T. pumila* (where see discussion).

The most extreme forms retained in *T. serratifolia* occur in the cerrado around Brasilia. In some plants the corolla throat is completely glabrous inside (except for glandular trichomes at stamen insertion), the calyx is unusually small (as short as 5 mm long), and the leaflets softly pilose below with simple trichomes. Elsewhere in the genus, the presence or absence of trichomes in the corolla throat (and to a lesser extent the leaflet undersurface) is a character warranting specific separation, but in the cerrado this seems to represent merely intrapopulational individual variation. Some individuals are intermediate with very sparsely pilose throats or leaves; moreover the variation in leaf and corolla throat pubescence does not seem to be correlated (although this is difficult to evaluate since there are very few collections of leaves). *Tecoma atractocarpa* represents the hairy-leaved cerrado form of *T. serratifolia* (e.g., *Gentry 21376*). All diagnostic features (e.g., crenulate leaflet margins, softly puberulous below with simple trichomes, fugaceous calyx tomentum, lepidote capsule) agree with this form of *T. serratifolia*. However, should taxonomic recognition be desired for the glabrous-throated cerrado plant, the epithet "atractocarpa" cannot be used. Although I have not dissected a corolla of the type specimen, *Tecoma atractocarpa* is clearly described as having the throat pilose.

The cerrado population of *T. serratifolia* presents an interesting parallel to *T. uleana* of the southern Venezuelan "lajas." In the latter case a glabrous corolla throat and strongly pilose leaf undersurface seem to be correlated in an ecologically differentiated segregate that I recognize as a distinct species, *T. uleana*; in the cerrado exactly the same variation occurs but appears to be without ecological or taxonomic significance.

This species is the national tree of Brazil and the emblem of the Brazilian Botanical Society (Pabst, pers. comm.; Gentry et al., 1984). For a discussion of its confusion with *T. vellosi* see that species.

89. *Tabebuia shaferi* Britton, Bull. Torrey Bot. Club 42: 372. 1915. Type. Cuba. Oriente (Santiago de Cuba): Pinales SE of Paso Estancia, *Shafer 1710A* (holotype, NY; isotype, NY).

Tabebuia oligolepis Urban, Symb. antill. 9: 257. 1924. Type. Cuba. Oriente (Granma): Sierra Maestra, La

Bayamesa, 1100–1400 m, *Ekman 7208* (lectotype, S; isotypes, NY, S).

Tabebuia maestrensis Urban, *Symb. antill.* 9: 255. 1924. Type. Cuba. Oriente (Granma): Sierra Maestra, 1350 m, 8 Apr 1915 (st), *Ekman 5323* (lectotype, S; isotype, NY—frag.).

Tree to 20 m, dichotomously branched, the branchlets terete to more or less angled, the leaves tending to cluster apically, the nodes usually conspicuously raised below each leaf, sparsely lepidote with irregular reddish sessile and in part short-stalked peltate scales. *Leaves* 5–9-foliolate, the leaflets narrowly obovate to elliptic, rounded or minutely retuse at apex, rounded to cuneate or minutely subcordate at base, the terminal 2–9.5 cm long, 0.6–4 cm wide, the basals 1–6 cm long, 0.4–2.5 cm wide, sometimes with a much smaller sessile basal pair, coriaceous, slightly scattered-lepidote above, below rather sparsely and minutely impressed-lepidote or lepidote-punctate, olive gray to brownish, usually with the secondary veins lighter beneath, more or less concolorous or slightly darker above, plane above, the tertiary venation minutely prominulous below, smooth to the touch, the margin entire, not revolute; petiolules long and slender, the terminal (0.3–)0.5–2.5 cm long, the basals 0.2–1 cm long, the petiole 0.5–10 cm long, sparsely lepidote. *Inflorescence* a few terminal flowers, rather sparsely lepidote with large darkish, sessile peltate scales. *Flowers* with the calyx openly campanulate, 10–14 mm long, 8–14 mm wide, irregularly shallowly 5-lobate to almost subtruncate, lepidote with sessile blackish scales, drying blackish; corolla pinkish to whitish, tubular-infundibuliform, glabrous outside, inside scurfy puberulous in throat and villous at level of stamen insertion, the lobes very sparsely or not at all short-ciliate; anther thecae held below middle of tube, thick, divaricate, 3–4 mm long; pistil ca. 2.5–3 cm long, the ovary linear-oblong, 4–5 mm long, 1.5 mm wide, very densely reddish-tan lepidote, disk patelliform-pulvinate, 1.5 mm long, 3–4 mm wide. *Fruit* linear-cylindric, 8–14 cm long, 9–12 mm wide, somewhat woody, sparsely lepidote, drying dark brownish, irregularly or not at all longitudinally wrinkled, the calyx persistent; *seeds* thin, bialate, 4–5 mm long, ca. 2 cm wide, the hyaline-membranaceous seed wings sharply demarcated from seed body.

Distribution (Fig. 59). Endemic to the Sierra Maestra of Oriente, Cuba at altitudes of

(650–)950–1400 m. This is one of the commonest species in mixed *Pinus*-broadleaf forest dominated by *Cyrilla racemosa* along the top of the eastern ridge line of the Sierra Maestra.

Specimens examined. CUBA. GRANMA: Bartolome Maso, Minas del Frio a Monpie, 24 Apr 1978 (fl), *Bisse et al.*, s.n. (*HAJB37240*) (*HAJB*); between Loma Joaquin et Punto de Palma, 1300 m, 8 Apr 1915 (st), *Ekman 5323* (S); Sierra Maestra, Finca La Reunión, 650 m, 29 Mar 1916 (fl), *Ekman 7015* (S); La Bayamesa inter Río Oro et Río Jao, 1100–1400 m, 5 May 1916 (fl), *Ekman 7208* (MO, NY, S); divide between Río Yara and Río Plata, 1000 m, 12 Jul 1922 (fl), *Ekman 14237* (S); divide between Río Yara and Río Palmamocha, 1100 m, 18 Jul 1922 (st), *Ekman 14407* (S); trail to Pico Turquino, Alto de Naranjo, S of Yara, 900–950 m, 20°00'N, 76°52'W, 9 Jul 1985 (fl), *Gentry 50933* (MO); Alto de Naranjo to Alto de Limon, 2–7 km E of parqueadero, 1100–1250 m, 22°01'N, 76°52'W, 11 Jul 1985 (fl, fr), *Gentry & Lavin 50993, 50993A* (both MO); Loma del Gato, 1000 m, Jul 1921 (st), *León 10016* (GH, HAC, NY); Loma del Gato, Cobre Range, 950 m, 11 Jul–14 Aug 1921 (st), *León et al. 10579* (NY); Valley of Yara River, *León 11045* (NY). GUANTÁNAMO: Monte Cristi, *Bisse & Kohler s.n. (HAJB9356)* (*HAJB*). SANTIAGO DE CUBA: Sierra Muta, El Uvero, *Bisse & Lippold s.n. (HAJB13573)* (*HAJB*); Río La Plata, *Bisse & Lippold s.n. (HAJB19357)* (*HAJB*); top of Loma del Gato, Sierra Maestra, 1000 m, Dec 1920 (fl), *Clement 561* (NY, US); La Alcarraza, 18 Jul 1946 (fr, fl), *Clemente 5111* (NY); Loma del Gato, Sierra Maestra, Mar 1931 (fl), *Clemente 5517* (NY); Alto de Valenzuela, 4500 ft, 5–8 Apr 1955 (fl), *López-Figueiras 2022* (NY); Alto de Valenzuela, Maestrica, 4200 ft, 5–8 Apr 1955 (fl), *López-Figueiras 2043* (*HAJB*, NY); Pinales, SE of Paso Estancia, 1–2 May 1909 (fl, fr), *Shafer 1710A* (NY).

This species differs from *T. heterophylla* in the more numerous longer-petioled leaflets, the less extensive covering of lepidote scales, the thicker pulvinate disk, and the woodier brownish fruit valves. The form of *T. heterophylla* that most closely approaches *T. shaferi* is *T. gonavensis* of Gonave Island, Haiti, which has similarly round-tipped, narrowly obovate, rather long-petiolulate leaflets. This species is even closer to *T. polyantha* of Hispaniola but that species is precociously flowering, has larger more lepidote petioles, plane leaf undersurfaces except for the barely (or not at all) prominulous secondary veins, more conspicuously lepidote grayish or tannish-drying calyces and inflorescences, and a longer less woody, more densely lepidote and evenly costate fruit.

The type of *T. shaferi* has more broadly elliptic leaflets than other collections referred here and has truncate to subcordate leaflet bases. It is from the northern foothills of the Sierra Maestra from

an unspecified altitude, but seems to be conspecific with this upland plant. As thus interpreted, *T. shaferi* is a narrow endemic of the cloud forests of upper elevations in the Sierra Maestra. This interpretation is very different from that of Alain (1957) who included in *T. shaferi* much material from other provinces that I would refer to *T. heterophylla*.

90. *Tabebuia simplicifolia* Carabia ex Alain, Contr. Oc. Mus. Hist. Nat. Colegio "De LaSalle" 15: 18. 1956. Type. Cuba. Oriente (Holguín): Sierra de Nipe, Mayari, *Carabia 3701* (holotype, HAC; isotypes, MO, NY).

Fig. 52.

Shrub 3–4 m tall, dichotomously branched, the leaves loosely clustered toward branch apices, the branchlets subterete. *Leaves* simple, opposite, elliptic to obovate, emarginate, very rarely inconspicuously apiculate (Alain & Clemente 1025), cuneate to rounded at base, 1.4–5.5 cm long, 0.5–2.7 cm wide (at least some more than 2 cm long), thick coriaceous, lepidote above and below, more or less concolorous, drying olive brown above and below; petioles 0.3–1 cm long. *Inflorescence* one or two flowers from the branch apices, the pedicels 10–18 mm long. *Flowers* with the calyx infundibuliform, more or less regularly bilabiate to irregularly 2–3-labiate, 8–12 mm long, 5–7 mm wide, densely lepidote but drying blackish, not lepidote inside; corolla pinkish, tubular-infundibuliform, 2.5–4 cm long, 1–1.2 cm wide at mouth of tube, the tube 2–3 cm long, the lobes 0.5–1 cm long, glabrous or with a few lepidote glands outside, puberulous on inside of lobes and in throat with rather stiff trichomes; pistil 2–2.5 cm long, the ovary oblong, densely lepidote, 2–3 mm long, 1.2 mm wide; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* narrowly cylindrical, 5.5–15 cm long, 0.6–0.9 cm wide, strongly longitudinally ribbed, densely lepidote, drying dark brown to blackish, the calyx caducous or persistent; *seeds* not seen.

Distribution (Fig. 59). Mostly in serpentine barrens in the Sierra de Nipe and Moa regions of eastern Oriente; also known from single collections from Camagüey, Matanzas, and Villa Clara Provinces and from an apparent disjunct population at Cajalbana, Pinar del Río; 100–900 m elevation.

Collections examined. CUBA. CAMAGÜEY: Camagüey to Santayana, 4 Apr 1909 (fl, fr), Britton 2362 (NY). GUANTANAMO: Playa Vaca, vic. of Moa, 11 Apr 1945 (st), Acuna 12711 (US); Charrascos, La Esmeralda, Cananova, 21 Jul 1949 (fl), Alain & Clemente 1025 (GH, NY, US); Sierra de Moa near Piedra la Vela, 1 Jul 1953 (fr), Alain 3334 (NY); Peña Prieta, Moa, 30 Dec 1953 (st), Alain 3617 (GH, NY); Jaragua Falls, Cayoguan, 21 Jul 1944 (st), Clemente & Alain 4023 (NY); Baracoa, prope Río Joa, 28 Nov 1914 (fl), Ekman 3673 (S); El Coco, Moa, 3 Aug 1945 (fl), León et al. 22625 (GH, NY); Franklyn Mine, Moa region, 20 Jul 1947 (fl), León & Clemente 23181 (NY), 23209 (GH, NY). HOLGUÍN: Sierra de Nipe, Cayo del Rey, 16 Apr 1940 (fl), Carabia 3567 (MO, NY), 3575 (NY); Monte La Plancha, Sierra de Nipe, 19 Apr 1940 (fl), Carabia 3701 (MO, NY); Pinar de Mayari, Sierra de Nipe, 20 Apr 1940 (st), Carabia 3744 (NY); Loma de Mensura, 21 Apr 1940 (st), Carabia 3768 (NY). Sierra de Nipe, Loma Mensura, 850 m, 19 Oct 1914 (fl), Ekman 3169 (S); Sierra Azul, 500–700 m, Ekman 4389 (S); Sierra de Nipe, Loma Mensura, 900 m, 16 May 1915 (fl), Ekman 5722 (G, HAC, S, US); Sierra de Nipe, Bio-trail, 500 m, 20 Feb 1918 (st), Ekman 9132 (G, NY, S), 27 Apr 1919 (st), Ekman 9582 (B, G, MO, S, US); Sierra de Nipe, Loma Mensura, 800 m, 12 Jul 1919, Ekman 9728 (S), 850 m, 16 Oct 1919 (fr), Ekman 9937 (S); Sierra de Cristal Mts., 1925 (fl), Kluge s.n. (NY); La Bandera, 4 Apr 1941 (st), León et al. 19747 (GH, NY); Charrascos de la Loma del Winch, 24 Feb 1956 (fl), López 2490, 2491 (both US). PINAR DEL RÍO: La Palma, Cajalbana, 3 Apr 1954 (fl), Alain 3886 (GH, HAC, NY); La Cajalbana, 15 Jul 1950, Clemente & Alain 7327 (HAC); on top of Cajalbana, 6 Apr 1915 (fl), León & Charles 4265 (NY). SANTIAGO DE CUBA: Sierra de Micara, 650 m, 3 Mar 1916 (st), Ekman 6765 (B, K, S); Monte Picote near Palmarito del Cauto, 400 m, 29 Jan 1956 (st), Morton 9725 (US). VILLA CLARA: Near Santa Clara city, 28 Jun 1931 (st), León 14935 p.p. (US); sin. loc., Wright 1341 p.p. (GH, K, NY) (5 species included under this number).

As in other Cuban *Tabebuia* complexes it is not always obvious where to draw the lines between *T. simplicifolia* and related species. Urban treated this species as a simple-leaved form of *T. lepidota*. The disjunct population at Cajalbana, Pinar del Río, identified by Alain (in herb.) as *T. lepidophylla*, is closer to *T. simplicifolia* as here defined, despite the presence of an apiculus on some leaves. This may be a uniformly simple-leaved form of *T. lepidota*. Indeed, *T. simplicifolia* itself may eventually prove better regarded as a simple-leaved morph of *T. lepidota*.

Tabebuia simplicifolia is also very similar to *T. obovata* from which it differs most obviously in concolorous distinctly emarginate leaves which are smooth to the touch above. A form with subsessile oval leaves rough above and with the

venation raised below from Jauco, Baracoa region (León 12422) has been given an unpublished name, and is intermediate with *T. obovata*. *Morton 9725* is intermediate between this form and *T. simplicifolia*, having the typical leaf shape and petiole but the venation raised beneath.

There is also a collection intermediate between *T. simplicifolia* and *T. linearis* (Clemente & Alain 4023 from Jaragua Falls, Cayoguan, Moa region) which has the leaves barely emarginate to rounded apically and 2.5–5.7 cm long by 0.8–1(–1.6) cm wide. Even though the leaf shape approaches *T. linearis*, the leaves are not discolored below and the collection seems better referred to *T. simplicifolia*.

91. *Tabebuia spongiosa* Rizzini, Rodriguesia 28: 172. 1976. Type. Brazil. Piauí: São João do Piauí, 3 Oct 1973 (fl), *D. A. Lima 13247* (holotype, RB).

Tree to ca. 8 m tall and 20 cm dbh, the bark peeling in long strips, the branchlets slender subterete, stellate tomentose with mostly few-branched trichomes when young, glabrescent. *Leaves* 3-foliolate, the leaflets oblong-elliptic, obtusely acutish, rounded or obtuse at base, the terminal leaflet to 5.5 cm long and 2 cm wide, lateral leaflets smaller, entire, membranaceous, above more or less glabrescently stellate puberulous with few-branched (in part T-shaped) trichomes, below, densely and persistently viscid-pubescent with stalked stellate trichomes, also with some simple trichomes, discolorous, drying light tannish below, darker above; terminal petiolule 0.2–0.6 cm long, the laterals <2 mm long, the petiole 1–3 cm long, persistently tannish tomentose with few-branched stellate trichomes. *Inflorescence* borne while tree leafless, a contracted more or less fasciculate few-flowered terminal cluster, the stellate-puberulous pedicels 0.3–1 cm long, bracts and bracteoles not evident. *Flowers* with the calyx cupular, shallowly 5-dentate, rather thick, distinctly 5-angled, 5–7 mm long, 3–4 mm wide, densely reddish tomentose with stellate trichomes; corolla yellow with reddish pencilling in throat, tubular-infundibuliform, 2.5–3.5 cm long, the tube 2–3 cm long, ca. 0.6–0.8 cm wide at mouth, the lobes ca. 0.5 cm long, glabrous outside except for a few scattered inconspicuous lepidote scales, densely pilose in

throat and floor of tube with long somewhat flexuous trichomes; stamens didynamous, the thecae divaricate, 1.5 mm long; ovary linear-cylindric, 2–2.5 mm long, lepidote with a smooth surface. *Fruit* a linear-cylindric capsule, tapering to base and apex, 11–27 cm long, 1.1–1.2 cm wide, the valves thin, subcoriaceous, glabrous except for some sparsely scattered lepidote scales, finely and inconspicuously striate-rigged; *seeds* not seen.

Distribution (Fig. 59). Endemic to the caatinga of northeastern Brazil from the Pernambuco/Bahia border to southeastern Piauí; near sea level to 450 m elevation.

Specimens examined. BRAZIL. BAHIA: Entre Rajada e Lago, 21 Jun 1952 (st), *Lima & Magalhães 52-1058* (ESA, IPA, MO). PERNAMBUCO: Petrolina, 23 Jun 1983 (st), *Coradin 5968* (MO); Petrolina, 350 m, 8 Nov 1956 (fl), *Lima 56-2622* (IPA, MO); Ouricuri, 25 Nov 1959 (fr), *Lima 59-4242* (IPA). PIAUÍ: S. Raimundo Nonato, Barreirinha, 18 Dec 1978, *Fernandes s.n. (EAC5150)* (EAC); Mun. S. João do Piauí, 3 Oct 1973 (fl), *Lima 13247* (RB); 31 km de São Raimundo Nonato para Bom Jardim, 5 Dec 1971 (fr), *Lima 1199* (ESA, IPA, MO).

Local name. Cascudo.

A distinctive species related to *T. ochracea* but differing in the small flowers, tiny thick 5-angled calyces, 3-foliolate leaves with small rather viscid leaflets, and glabrous fruit. Reportedly bark exfoliating in long strips is a striking field character.

92. *Tabebuia stenocalyx* Sprague & Stapf, Kew Bull. 1910: 196. 1910. Type. Trinidad. Government House grounds, *Broadway 2888* (holotype, K; isotypes, GH, NY, P (*s.n.*), US).

Tree 8–25 m tall, sometimes with buttresses, the branchlets subterete, lepidote when young. *Leaves* simple, elliptic to oblong-obovate, rounded to obtuse or subcuspidate apically, rounded to cuneate at base, 6–20 cm long, 2.5–9 cm wide, entire, the margins frequently somewhat revolute, coriaceous to subcoriaceous, lepidote above and below, otherwise glabrous, conspicuously glandular at base of midvein below, drying olive to grayish; petiole lepidote, 1–3 cm long. *Inflorescence* a raceme or racemose panicle, densely lepidote, terminal, the bracts spatulate, to 2.5 cm long and 3 mm wide, the pedicels 1.5–2.5 cm long. *Flower* with the calyx tubular, (18–)25–40 mm long, 5–12 mm wide, bilabiate to subspa-

thaceously split 3–8 mm, one of the lobes with three denticulations, the other two, weakly 5-striate with the striations ending in the teeth, densely lepidote, usually also with plate-shaped glands; corolla white, salverform, 6–9.5 cm long, 0.5–0.7 cm wide at mouth of tube, the tube very narrowly cylindrical, 5–8 cm long, the lobes 1.7–2 cm long, mostly glabrous outside, lepidote and with patelliform glands at apex of tube and base of lobes, the tube apex densely papillose-puberulous inside, the rest of the tube glabrous; stamens didynamous, inserted 4.5–5 cm from base of tube, the thecae more or less parallel, 4 mm long; ovary oblong, densely lepidote, the ovules 2-seriate in each locule; disk short-cupular, 1 mm long, 2 mm wide. *Fruit* a linear-oblong capsule, subterete, narrowed at base and apex, 14–19 cm long, 1.1–2 cm wide, densely lepidote, the calyx persistent, spathaceously split along one side; *seeds* flat, bialate, to 1.3 cm long, 3.5–4 cm wide, the wings hyaline-membranaceous.

Distribution (Fig. 62). Guayana region from the extreme eastern corner of Venezuela to Amapa, Brazil; also disjunct in coastal Brazil from Bahia to Espírito Santo and probably Rio de Janeiro. In coastal Brazil it prefers swampy areas where it can grow intermixed with the much commoner *T. cassinoides*; near sea level to 500 m elevation.

Representative specimens examined. VENEZUELA. BOLÍVAR: El Palmar, 17 Feb 1959 (fl), *Bernardi 7106* (SCNLS, VEN); entre el Caño Maracapra y Campamento La Esperanza, Reserva Forestal La Paragua, Feb 1970 (st), *Blanco 765* (VEN); E de El Palmar, 12 Jul 1964 (fl), *Marcano-Berti 286* (MO, VEN). DELTA AMACURO: E of Río Grande, E of El Palmar, Jul 1975 (fr), *Gentry & Berry 14936* (MO, VEN); E de Río Grande, ENE de El Palmar, 16 May 1964 (fl), *Marcano-Berti 148* (BR, MO, P, S, US, VEN); 33 km ENE de El Palmar, 7 Feb 1964 (fl), *Steyermark 93076* (L, M, P, S, US, VEN).

TRINIDAD and TOBAGO. TRINIDAD: Long Stretch Forest, *Ayliffe 14734* (K); Aripe Savanna, 4 Nov 1963, *Carrick 1128* (K); Mt. Harris, 18 Jul 1929, *Marshall 12222* (K).

GUYANA. Mathews Ridge, Barima River, 4 Feb 1955, *Cowan 39379* (K); Kanuku Mts., 31 Mar 1938 (fl, fr), *A. Smith 3497* (B, F, G, MO, P, S).

FRENCH GUIANA. Montagne de Kaw, 14 Dec 1954 (fl), *Cowan 38837* (K, P).

BRAZIL. BAHIA: Km 9 pontal-Oliveira road, Mun. Ilhéus, 10 Feb 1985 (fr), *Gentry & Zardini 50021* (MO); Itacare, 15 Feb 1978 (fr), *T. dos Santos et al. 3176* (CEPEC, MO). ESPÍRITO SANTO: Reserva Florestal CVRD, Linares (fl, fr), *Folli 628* (MO); Mun. Vila Velha, Lagoa do Milho, *Peixoto et al. 346* (RB).

PERNAMBUCO: Recife, 14 Feb 1952 (fl), *Lima 52-979* (IPA, K); Pontas de Pedra depois São Lorenzo, 12 Dec 1967 (fl), *Lima 67-5157* (IPA, MO). RIO DE JANEIRO: Serra de Petrópolis, Feb 1966 (st), *Duarte 9673* (RB); Estr. Vista Chinesa, km 7, 30 Jun 1977 (fl), *Vianna 1086* (MO).

Common names. Venezuela: palo blanco, purguillo blanco, guachamaca, guachimaca.

A very distinctive species with narrowly tubular hawk-moth pollinated flowers and simple leaves. Its only close relative is *T. striata* of northwestern Colombia (see discussion under that species).

93. *Tabebuia striata* A. Gentry, Ann. Missouri Bot. Gard. 60: 953. 1973. Type. Panama. San Blas: Puerto Obaldia, 18 Aug 1971 (fr), *Gentry 1484* (holotype, MO; isotypes, AAU, FTG).

Fig. 50.

Tree 5–25 m tall, the branchlets subterete, lepidote when young. *Leaves* simple, elliptic to oblong-obovate, rounded to obtuse or subcuspidate apically, cuneate at base, (6–)9–38 cm long, 3.5–13 cm wide, entire, coriaceous to subcoriaceous, lepidote above and below, otherwise glabrous, conspicuously glandular at base of midvein below, drying olive to grayish; petiole lepidote, 1–6 cm long. *Inflorescence* a raceme or racemose panicle, terminal, lepidote, the bracts spatulate, to 2.5 cm long, the pedicels 1–2 cm long. *Flowers* with the calyx tubular, 25–33 mm long, 6–10 mm wide, bilabiate to subspathaceously split 5–12 mm, the lobes sometimes minutely denticulate, usually weakly 5-striate with the striations ending in the teeth, densely lepidote, usually also with scattered plate-shaped glands; corolla white, salverform, 7–9 cm long, 0.7–1.5 cm wide at mouth of tube, the tube very narrowly cylindrical, 4.5–7 cm long, the lobes 1.5–3.5 cm long, glabrous outside, with patelliform glands at apex of tube and base of lobes, the lobes minutely lepidote-glandular, more or less scurfy puberulous toward apex, the tube glabrous inside; stamens didynamous, subexserted, the thecae more or less parallel, 4–5 mm long; ovary oblong, densely lepidote, 5–6 mm long, 1 mm wide; disk pulvinate, not clearly differentiated from ovary base, 1 mm long, 2 mm wide. *Fruit* a linear-oblong capsule, subterete, slightly narrowed at base and apex, 12–37 cm long, 2–3 cm wide, the valves woody, densely lepidote, drying blackish, the calyx persistent, spathaceously split along one

side, to 3.5 cm long, more or less 5-striate; *seeds* flat, bialate, 1–1.8 cm long, 2–5 cm wide, the wings hyaline-membranaceous at tip, brown at base, the base not clearly demarcated from seed body.

Distribution (Fig. 62). The Chocó region of northwestern Colombia and adjacent eastern-most Panama, east into northern Antioquia; lowland wet forest; 0–500 m elevation.

Collections examined. PANAMA. CANAL ZONE: Summit Garden, cultivated, 10 Mar 1977 (fl), *Gentry 18217* (MO), 28 Feb 1975 (fl), *Mori & Kallunki 4895* (MO). SAN BLAS: Mountains above Puerto Obaldia, 18 Aug 1971 (fr), *Gentry 1483, 1484, 1488* (all MO).

COLOMBIA. ANTIOQUIA: Mun. San Luis, Cañon del Rio Claro, 325–500 m, 50°53'N, 74°39'W, 1 Apr 1984 (fr), *Cogollo 1543* (JAUM, MO), alt. 330–400 m, 23 Mar 1985 (fr), *Cogollo 2022* (JAUM, MO). CHOCÓ: Bahía Solano, 0 m, 4 Aug 1976 (fl, fr), *Gentry & Fallen 17162* (AAU, COL, MO), 5 Aug 1976 (fl), *Gentry & Fallen 17211* (COL, MO); between Mecana and Bahía Solano, 5 m, 6°15'N, 77°25'W, 9 Mar 1983 (fl), *Gentry & Juncosa 41112* (JAUM, MO).

This presumably hawk-moth pollinated species is very closely related to *T. stenocalyx*, but otherwise quite isolated in the genus. The main differentiating feature from *T. stenocalyx* is the throat completely glabrous (rather than papillose-puberulous) inside. The corolla tube is also slightly wider at the mouth and the fruit is broader (>2 cm wide vs. <2 cm wide). The striate calyx emphasized in the original description turns out to be of minimal taxonomic significance.

94. *Tabebuia subtilis* Sprague & Sandwith, Kew Bull. 1932: 23. 1932. Type. Guyana. Mazaruni River, Rio Kuratung, *Alston 353* (holotype, K).

Tree to 15 m, the branchlets subterete, stellate-rufescent to glabrescent. *Leaves* palmately 3–5-foliolate, the leaflets narrowly elliptic to obovate, acuminate to rounded, the base cuneate to rounded, 2–16 cm long, 1.1–8 cm wide, entire, chartaceous to coriaceous, scattered lepidote above and below, more or less glabrescently puberulous with stellate hairs along the main veins on both sides and over the surface below, the principal nerves prominent below, more or less plane above, drying olive to blackish; petiolules 0.2–4.5 cm long, the petiole 1.5–9 cm long, stellate-rufescent. *Inflorescence* a contracted terminal panicle, few-flowered, stellate-rufescent, the pedicels conspicuous, 0.5–1 cm long, with linear

bracts 3–10(–20 fide Sandwith) mm long, stellate rufescent. Calyx campanulate, 10–17 mm long, 9–12 mm wide, 5-dentate, conspicuously and densely stellate-rufescent, the pubescence denser in lower half, each tooth with a central area marked by denser pubescence; corolla yellow, tubular-infundibuliform, 5–7.5 cm long, 1.3–2.2 cm wide at mouth of tube, the tube 4.2–5.5 cm long, the lobes 1–1.5 cm long, the tube glabrous outside, the lobes ciliate and somewhat lepidote, the tube densely villous inside with long trichomes, mostly in the sinuses of the lobes, especially below the lateral sinuses, villous at level of stamen insertion; stamens didynamous, the thecae divaricate, 2–2.2 cm long; pistil 3.2–3.8 cm long, the ovary linear-oblong, 3.5–6 mm long, 1–1.5 mm wide, somewhat scattered glandular-lepidote, sometimes partially puberulous, not rough-surfaced, the ovules ca. 8-seriate in each locule; disk pulvinate, 1 mm long, 3–4 mm wide. *Fruit* an elongate-linear capsule, 26–50 cm long, 1–1.2 cm wide, irregularly striate, minutely stellate-puberulous, the calyx persistent; *seeds* bialate, 0.4–1.8 cm long, 1.7–4 cm wide, the wings hyaline-membranaceous.

Distribution (Fig. 62). Guayana Highlands of Guyana and adjacent Bolívar, Venezuela, typically growing around the forest margin and in upland savanna gallery forest; 420–1700 m elevation.

Specimens examined. VENEZUELA. BOLÍVAR: Río Apacora, 23 Aug 1954, *Bernardi 1550* (MER); Caroni, base del Ikabaru, 4 Oct 1946 (fl, fr), *Cardona 1728* (NY, US, VEN); Cerro Uaipan, Alto Caroni, Oct 1947 (fl), *Cardona 2254* (US, VEN), Feb 1948 (fl), *Cardona 2434* (VEN); Río Apongua 2, km 151–152 S of El Dorado, Gran Sabana, 16 Mar 1974 (st), *Gentry et al. 10521* (MO, VEN); Río Tarata, km 147–148 S of El Dorado, Gran Sabana (fl), *Gentry et al. 10545* (MO, VEN); Quebrada Urayaparuta, 6 Sep 1986 (fr), *Hernández 443* (MO); Arautameru, 13 Sep 1986 (fl), *Hernández 463* (MO); 35 km NNE of Ikabaru, 16 Feb 1986 (fl), *Huber 11313* (NY); Distr. Roscio N sector de Gran Sabana, 7 Mar 1983 (fl), *Huber & Entralgo 7404* (MO); 17 km E of El Puaji, Río Las Ahallas, 29 Oct 1985 (fl, fr), *Liesner 19115* (MO); Uaiapan-Tepui, 27 Jan 1948 (fl), *Phelps & Hitchcock 355* (NY); Gran Sabana, cumbre de Uaipan, 27 Jan 1948 (fl), *Phelps & Hitchcock 445* (NY, VEN); San Isidro Kavanayen, Dto. Sifontes, 21 Apr 1986 (bd), *Picón 1074* (MO); Cerro Venamo, SE of Campamento 125 (fl), *Steyermark & Nilsson 425* (K, NY); cumbre del Cerro Guaiquinima, Río Carapo, 23 May 1978 (fr), *Steyermark et al. 117389* (MO).

GUYANA. Mazaruni River, Kurupung River, Aug 1953 (fl, fr), *Alston 353* (K); Potaro River, Tumatumari



FIG. 62. Distribution of South American *Tabebuia*. ● = *T. stenocalyx*; ★ = *T. striata*; ◐ = *T. subtilis*.

Falls, Aug 1925 (fl), *Jenman 7393* (K); Coobanatak, Oct (fl), *Jenman 7461* (K); Pakatout Falls, Mar (fl), *Jenman 5189* (K); Potaro River below Tukheit, *Maguire & Fanshaw 23493, 23494* (both NY, P).

Local name. Arawing-yek (Acawai).

The type from Guyana has the leaf undersurface densely finely tomentose and distinctly whitish. Only the easternmost Venezuelan collections share this indumentum; the more western collections tend to be predominantly 3-foliolate and almost glabrescent below, thus becoming virtually indistinguishable from lowland *T. capitata* except that the few scattered stellate trichomes of the leaflet undersurface are whitish and flat-

tened. In addition, the calyx of *T. subtilis* is usually larger than in *T. capitata* and the ovary less densely lepidote.

95. *Tabebuia trachycarpa* (Grisebach) K. Schumann, Pflanzenfam. 4(3b): 236. 1894.

Tecoma trachycarpa Grisebach, Cat. pl. cub. 192. 1866. Type. Cuba. Oriente: Sin. loc., *Wright 3039* (holotype, GOET; isotypes, BM, G, GH, HAC, K, MO, NY—fragm.).

Tabebuia cowellii Britton, Mem. Torrey Bot. Club 16: 107. 1920. Type. Cuba. Oriente (Guantánamo): Conde Beach, Guantánamo Bay, 17 Mar 1909 (fr), *Britton 2132* (holotype, NY; isotype, US).



FIG. 63. Distribution of Antillean *Tabebuia*. ★ = *T. trachycarpa*; ● = *T. vinosa*; ● = *T. zanonii*.

Tabebuia savannarum Britton, Mem. Torrey Bot. Club 16: 107. 1920. Type. Cuba. Camagüey: Savannas near Camagüey, 2 Apr 1912 (fl), Britton & Cowell 13202 (holotype, NY; isotype, HAC).

Shrub or small *tree* to 5 m tall, densely trichotomously branched, the branchlets more or less terete, usually with numerous whorls of three short shoots along a central axis. *Leaves* simple, mostly in whorls of three, usually clustered at tips of short shoots, oblong-oblongeolate to almost orbicular, emarginate, not apiculate, cuneate to rounded at base, 0.5–4.5(–5) cm long, 0.4–1.4(–2) cm wide, coriaceous, conspicuously but not densely lepidote below, inconspicuously lepidote glandular above, more or less concolorous, olive to grayish above and below, the margin entire, often revolute, petioles 0–3 mm long. *Inflorescence* one to several terminal flowers from the short-shoot apices, the pedicels 0.5–1 cm long. *Flowers* with the calyx infundibuliform, irregularly bilabiate to 3-labiate, 6–11 mm long, 3–8 mm wide, conspicuously lepidote but drying blackish, also somewhat lepidote inside; corolla pink, tubular-infundibuliform, 3–4.5 cm long, 1–1.5 cm wide at mouth of tube, the tube 2.5–3.5 cm long, the lobes ca. 1 cm long, glabrous outside, the lobes sparsely ciliate, puberulous on inside of lobes and in throat; pistil 20–23 mm long, the ovary oblong, densely tannish lepidote, 3 mm long, 1 mm wide; disk cupular-pulvinate, 1 mm long, 1.5 mm wide. *Fruit* narrowly cylindrical, 5–13 cm long, 0.5–0.7 cm wide, lepidote, drying blackish to brownish, not ridged, macroscopically somewhat rough-surfaced, the calyx caducous; *seeds* bialate, 4–5 mm long, 17–24 mm wide, the hyaline-membranaceous wings sharply differentiated from the body.

Distribution (Fig. 63). Eastern and central Cuba in coastal thickets and on limestone and serpentine; mostly below 100 m elevation.

Representative specimens examined. CUBA. CAMAGÜEY: Savannas near Camagüey, 2 Apr 1912 (fr), Britton & Cowell 13162 (MO, NY); Finca La Mariposa al norte de Florida, 13 May 1956 (fl), Dahlgren & Lopez-Figueiras 2722 (US); Santayana, in carrascales, 23 Jun 1924 (fl), Ekman 19022 (B, MO, S); Cromo NE of Camagüey City, 6 Apr 1940 (fl), León & Marie-Victorin 17639 (GH, NY); Cayo Romano, Silla de Cayo, 9 Oct 1909 (st), Shafer 2515 (GH, K, NY, US). GUANTÁNAMO: Cerro de Cananova near Cerro de Miraflores, 19 Jul 1949 (fl, fr), Alain & Clemente 995 (GH, NY, US); Imias, La Chivera, 10 May 1980 (fr), Alvarez *et al. s.n.* (HAJB43034) (HAJB); Baracoa, Maisi, Mesa del Chivo, May 1968 (st), Bisse & Kohler *s.n.* (HAJB9022) (HAJB); between Jauco and Cajobabo, 17 Jul 1924 (fl), León 12064 (GH, NY). LAS TUNAS: Coast at La Yaya, Puerto Padre, 22 May 1930 (fl), Curbelo *s.n.* (Roig 5105) (NY); Victoria de las Tunas, 27 Oct 1922 (fl), Ekman 15587 (S); Sabanalamar, Manati, 6 Jul 1932 (fl), León 15731 (GH, NY). SANCTI SPIRITUS: Savannas, Caimiabo SE of Sancti Spiritus, 29 Aug 1950 (fl), Alain 1597 (GH, NY); Santiago de Cuba, limestone cliffs at Aguadores, 4 Nov 1917 (st), Ekman 8683 (B, K, S); El Morro, Santiago, 6 Jul 1924 (fl), Ekman 19195 (AAU, B, NY, S). VILLA CLARA: Palm barren, city of Santa Clara, 29 Mar 1910 (fl), Britton *et al.* 6186 (NY).

The combination of small simple leaves and trichotomous branching distinguishes this species. The narrowest-leaved extremes (*T. cowellii*) occur only in the Oriente region but there are too many intermediates to accord them taxonomic recognition. The Sancti Spiritus populations have many non-emarginate leaves and are very similar to forms of *T. myrtifolia* var. *petrophila*. Some leaves of this population (León 4103) can reach 5 × 2 cm.

The AAU sheet of *Ekman 19195* has a few 3-foliolate leaves and may represent introgression from *T. lepidota*.

96. *Tabebuia uleana* (Kränzlin) A. Gentry, Mem. N.Y. Bot. Gard. 29: 279. 1978.

Tecoma uleana Kränzlin, Feddes Repert. 17: 217. 1921. Type. Brazil. Roraima: Serra de Pracoma, Feb 1909 (fl), *Ule 7970* (B*, lectotype, K; isotypes, G, L, US).

Tree to 20 m high, the branches terete, glabrescent, striate. *Leaves* palmately 5-foliolate, the leaflets elliptic-ovate, acute to acuminate, the base rounded, the terminal leaflet to 16 cm long, 18.5 cm wide, the lateral leaflets smaller, subtire or irregularly serrulate, chartaceous, softly pilose with simple trichomes below, lightly pilose above, drying olive; terminal petiolule to 6 cm long, the petiole to 10 cm long, pilose. Flowering while leafless, the *inflorescence* a few-flowered panicle, reddish-stellate. *Flowers* with the calyx campanulate, irregularly 5-lobed, ca. 8 mm long, 8 mm wide, short-stellate, with reddish trichomes; corolla yellow, tubular-infundibuliform, similar to *T. serratifolia* but glabrous outside and inside except at level of stamen insertion; stamens didynamous, the thecae divaricate, 2.5 mm long; pistil ca. 2.8 cm long, the ovary oblong, 3 mm long, glabrous somewhat roughened. *Fruit* linear, terete, 10–50 cm long, 1.6–1.8 cm wide, glabrous, the valves rather thick and smooth, very finely substriate; *seeds* bialate, 0.8–0.9 cm long, 4.4–4.9 cm wide, the wings hyaline-membranaceous, conspicuously demarcated from the brown seed body.

Distribution (Fig. 64). Southern Venezuela and adjacent Guyana and Roraima, Brazil, mostly on laja outcrops; 100–200 m elevation.

Specimens examined. COLOMBIA. META: La Macarena, (fl), *Nishimura s.n.* (MO). VICHADA: Parque Nacional Natural El Tuparro, 5 Mar 1985 (fl), *Zarucchi & Barbosa 3582* (FMB, MO).

VENEZUELA. AMAZONAS: 15 km N of San Juan de Manapiare, Nov 1975, *Berry 1659* (MO, VEN); Atures, Garcitas 20 km S de Puerto Ayacucho, 9 Feb 1985 (fl), *Carnevali & Guánchez 1483* (MO, VEN); 14 km N of Samariapo on road to Puerto Ayacucho, Jun 1975 (fr), *Gentry & Berry 14583* (MO, VEN); 3 km SW of Base Camp, Cerro Sipapo, 8 Feb 1949 (fl), *Maguire & Politi 28834* (MO, VEN); Cerro de la Neblina, Río Yatua, 4 Nov 1957 (fl), *Maguire et al. 41989* (K, NY). BOLÍVAR: 30 km N of Puerto Ayacucho, Jun 1975 (st), *Gentry & Berry 14728* (MO).

GUYANA. Dadanawa, South Rupununi, *T. Davis*

1687 (NY); Kanuku Mts., 4 Mar 1938 (fr), *A. Smith 3100* (B, F, G, P).

BRAZIL. RORAIMA: SEMA Ecological Reserve, Ilha de Maraca, 22 Sep 1987 (st), *Milliken et al. M586V* (MO), 24 Feb 1987 (st), *Ratter et al. R5415V* (MO), 25 Feb 1987 (st), *Ratter et al. R5453V* (MO); Ilha de Maraca, Santa Rosa, 9 Mar 1987 (st), *Ratter et al. R5597V* (MO); Ilha de Maraca, Rio Uraricoera, Furo de Maraca, 23 Aug 1987 (fl), *Silva & Lima R5810* (MO); Serra de Pracoma, Feb 1909 (fl), *Ule 7970* (G, K, L, US).

A species apparently restricted to the laja outcrops of the western Guayana shield region. It is closely related to *T. serratifolia*, differing in the absence of pubescence inside the corolla throat and in the leaves densely puberulous below; the leaf pubescence is of simple trichomes unlike nearly all the other yellow-flowered *Tabebuia* species.

97. *Tabebuia umbellata* (Sonder) Sandwith, Lilloa 14: 136. 1948.

Tecoma umbellata Sonder, Linnaea 22: 562. 1849. Type. Brazil. Minas Gerais, prope Caldas, 3 Oct 1864 (fl), *Regnell II. 195* (sphalm. 197 by Sonder) (B*, isotypes, BR, P, S, UPS).

Tecoma eximia Miquel, Linnaea 22: 803. 1849. Type. Brazil. Bahia, *Blanchet 3963*, flowers only (BR, C, G, K, MO, P, U).

Tecoma umbellata var. *lanceolata* Bureau & K. Schumann in Martius, Fl. bras. 8(2): 335. 1897. Type. Brazil. Rio de Janeiro: Serra d'Estrella, prope Mandioca, 25 Aug 1878 (fl), *Glaziou 9533* (B*, lectotype, P; isotypes, C, G, K, MO).

Tabebuia eximia (Miquel) Sandwith, Lloydia 2: 213. 1939 (flowers only).

Tabebuia umbellata var. *lanceolata* (Bureau & K. Schumann) Toledo, Arq. Bot. Estado São Paulo 3(1): 35. 1952.

Handroanthus umbellatus (Sonder) Mattos, Loefgrenia 50: 2. 1970.

Handroanthus umbellatus var. *lanceolatus* (Bureau & K. Schumann) Mattos, Loefgrenia 50: 2. 1970.

Handroanthus eximius (Miquel) Mattos, Loefgrenia 50: 2. 1970 (flowers only).

Tree 5–25 m tall, the branchlets subterete, lepidote and short-stellate tomentose when young, glabrescent. *Leaves* palmately 5-(7)-foliolate, the leaflets narrowly obovate to oblong-elliptic, obtuse to acuminate, obtusely cuneate to rounded at base, the terminal leaflet to 8(–10) cm long and 3(–3.5) cm wide, lateral leaflets progressively smaller and less obovate, entire, membranaceous, persistently lepidote above and below, when young also stellate-rufescent above and below with mostly few branched (in part simple at

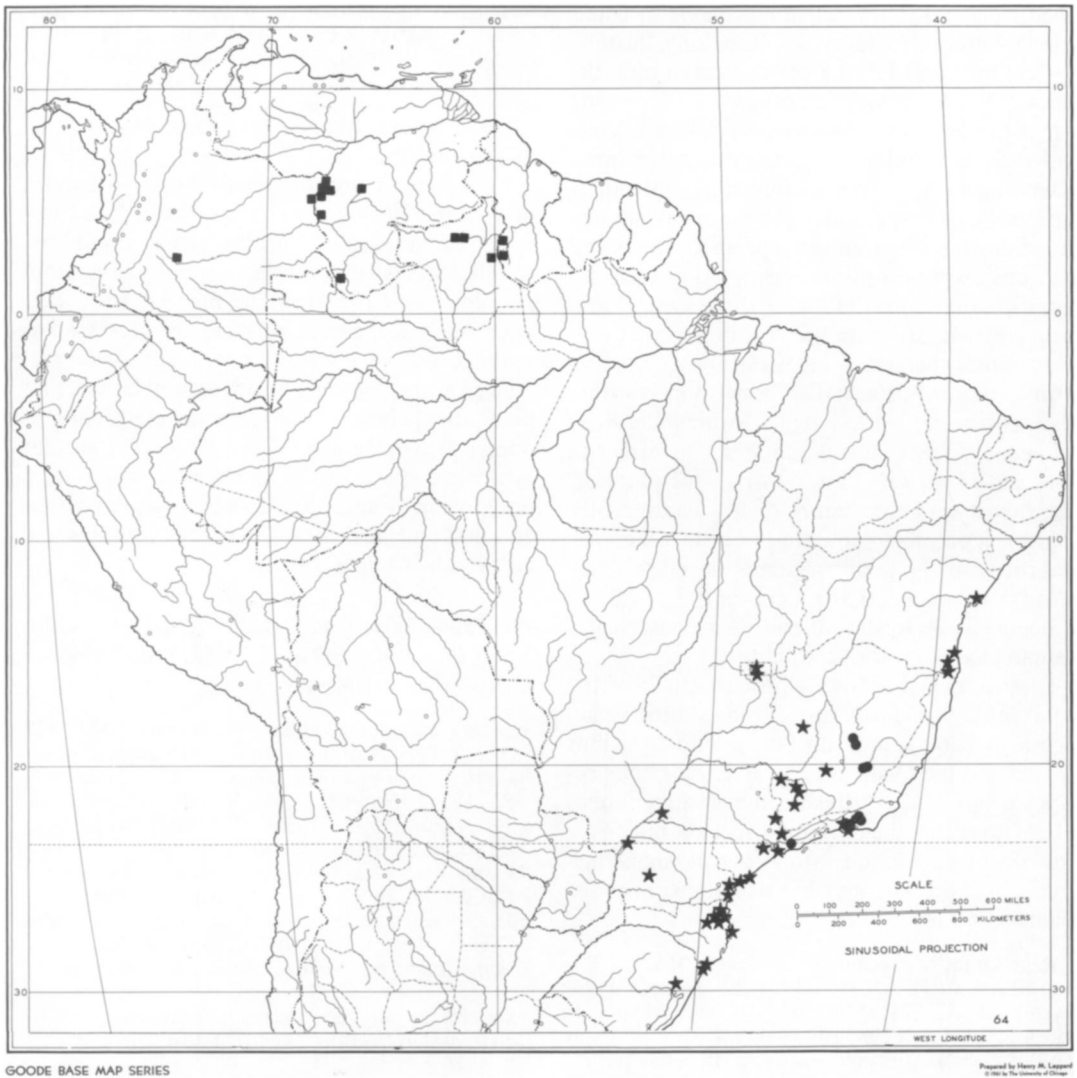


FIG. 64. Distribution of South American *Tabebuia*. ■ = *T. uleana*; ★ = *T. umbellata*; ● = *T. vellosi*.

least above) trichomes, especially along the main veins, partially glabrescent but some stellate trichomes persisting at least on the midvein above and in the nerve axils and sparsely along midvein below; terminal petiolule 0.5–2 cm long, the laterals shorter but even the lowermost (0.3–)0.4–0.9 cm long, the petiole 3–7 cm long, persistently reddish or tannish tomentose from stellate and short-dendroid trichomes. *Inflorescence* a contracted more or less fasciculate terminal cluster usually of 3–12 flowers with stellate-rufescent

pedicels 0.5–1 cm long, the bracts and bracteoles reduced and caducous, <2 mm long. *Flowers* with the calyx campanulate, irregularly shallowly 5-dentate, (0.8–)10–18 mm long, (5–)6–14 mm wide, thick-stellate rufescent, the minute reddish-tan trichomes concentrated at base and in lines descending from points of teeth, the rest of calyx sparsely to not at all pubescent and drying contrastingly darker; corolla yellow with reddish pencilling in throat, when dried with the venation reticulate to the margins of the lobes, the

dried tube and lobes indistinguishable in color, tubular-infundibuliform, 5.5–9 cm long, the tube 4–7 cm long and 1.5–3.5 cm wide at mouth, the lobes 1.5–2.5 cm long, glabrous outside, inside rather densely pilose in throat and floor of tube with long flattened somewhat flexuous trichomes extending to near stamen insertion, not otherwise noticeably glandular-pubescent at stamen insertion, the lobes ciliate margined, otherwise glabrous except for minute scattered glands; stamens didynamous, the thecae divaricate, 3 mm long; ovary linear-cylindric, 5–7 mm long, 1 mm wide, rather sparsely or inconspicuously lepidote with a smooth surface; disk bowl-shaped with a distinct rim, ca. 1 mm long, 2–3 mm wide. *Fruit* a linear-cylindric capsule, tapering to base and apex, 26–55 cm long, (0.6–)0.9–1.1(–1.2) cm wide, the valves very thin, more or less chartaceous, sparsely lepidote or lepidote-punctate, otherwise glabrous, finely and irregularly striate-ridged; *seeds* thin, bialate, 0.5–0.7 cm long, 1.5–2.5 cm wide, the wings hyaline-membranaceous, clearly demarcated from the seed body.

Distribution (Fig. 64). Through much of the “mata atlantica” formation of coastal Brazil from Bahia to Rio Grande do Sul, inland to Minas Gerais and the Distrito Federal. Ecologically restricted (always?) to fresh-water swamp forests where it is often the dominant species, but never growing in association with *T. cassinoides* which grows in more oligotrophic situations; near sea level to 760 m.

Representative specimens examined. BRAZIL. BAHIA: Ilhéus, CEPEC, 7 Nov 1968 (fl), Almeida & dos Santos 207 (CEPEC, MO); BR-101 near crossing of Rio Aliança, 8 Feb 1985 (fl), Gentry & Zardini 49960 (CEPEC, MO). DISTRITO FEDERAL: Brasília, Jardim Zoológico, 31 Aug 1965 (fl), Heringer 10520 (IAN, IMO); Reserva Ecológica IBGE, Brasília, 6 Aug 1979 (fl), Heringer et al. 1780A (MO). MINAS GERAIS: Fazenda Queimada Grande, Mun. Monte Belo, 7 Sep 1987 (fl), Gentry et al. 59133, 59135 (both MO); Cidade Passos, Aug 1867 (fl), Regnell III-903 (BR). PARANÁ: Jacarehy, 1 Oct 1914 (fl), Dusen 18146 (F, K, L, MICH, MO, P); Saquarema, Mun. Morretes, 25 Jan 1985 (fr), Gentry & Zardini 49843 (MBM, MO); Rio de Nunes, Mun. Antonio, Sep 1975 (fl), Hatschbach 37035 (C, M, MBM, MO). RIO GRANDE DO SUL: S. Leopoldo, 21 Oct 1951 (st), Rambo 51317 (B). RIO DE JANEIRO: Mun. Mage, Centro de Primatologia, 16 Oct 1984 (fl), H. Lima 2206 (RB); Estrada Rio-Petrópolis, 11 Nov 1939 (fl), Lutz 1511 (R, U). SANTA CATARINA: Brusque, Mata S. Pedro, 22 Nov 1952 (st), Klein 275 (MBM); Morro dos Conventos, Ararangua, 29 Oct 1959 (fl), Reitz & Klein 4137 (G, M); Matador

Rio do Sul, 13 Sep 1958 (fl), Reitz & Klein 7152 (BR, G, M). SÃO PAULO: Campos do Butantan, Aug 1946 (fl), Joly s.n. (K); Parque Estadual do Morro do Diabo, Mun. Teodoro Sampaio, Pickels.n. (SPSF10572) (MO).

Local names. Ipe amarelo, ipe da varzea, ipe da vargem, ipe.

This is the common yellow-flowered species of swamp *Tabebuia* in coastal Brazil. It is characterized vegetatively by the rather small narrow-based leaflets with persistently tomentose petiolules and petioles. The flowers, with their large finely tomentose calyces, are very similar to those of *T. chrysantha* ssp. *pluvicola* of Central America and western South America but that plant always has at least some stellate trichomes on its usually broader fruit. The most similar sympatric species is *T. serratifolia*, which does not grow in swamps, lacks stellate vegetative trichomes, and has thicker, woodier capsules and an even less tomentose calyx.

98. *Tabebuia vellosi* Toledo, Arq. Bot. Estado São Paulo, n.s. 3(1): 34. 1952, nom. nov. for *Bignonia longiflora* Vellozo.

Bignonia longiflora Vellozo, Fl. flumin. 252. 1829 (1825). Type illustration. Brazil. Rio de Janeiro: silvis maritimis Pharmacopolitans, Ic. Fl. Flum. 6: 5. 52. 1831. Neotype. Brazil. Rio de Janeiro: Mun. Teresópolis, 100 m, 31 Jan 1978 (fl), Peixoto & Gentry 935 (MO, RB).

Tecoma alba Chamisso var. *subdenudata* Bureau, Dansk Naturhist. Foren. Kjobenhavn 1893: 115. 1893. Lectotype. Brazil. Rio de Janeiro: Serra dos Orgãos, *Glaziou 8213* (BR, C, G, K, R, US).

Tecoma longiflora (Vellozo) Bureau & K. Schumann, in Martius, Fl. bras. 8(2): 324. 1897 (excluding cited specimens), non *Tecoma longiflora* Grisebach (1866). *Handroanthus vellosi* (Toledo) Mattos, Lofegrenia 50: 2. 1970.

Shrub or tree 2–20 m tall, the bark smooth and pale, the branchlets subtetragonal, stellate-rufescent when young, glabrescent, the cortex tending to wrinkle and split when older. *Leaves* palmately 5–7-foliolate, the leaflets oblong-elliptic to obovate, obtuse to acutish, rounded to truncate at base, the terminal leaflet to 15 cm long and 6 cm wide, lateral leaflets progressively smaller, conspicuously serrate, membranaceous to chartaceous, inconspicuously lepidote above and below, glabrescently stellate pubescent above (usually persistently so on midvein), below rather densely dendroid floccose when young, the surface tannish from the trichomes, partially gla-

brescent except along main veins; terminal petiole 1.5–4 cm long, the laterals shorter, the petiole 3–21 cm long, stellate tomentose to partially glabrescent. *Inflorescence* a contracted more or less fasciculate terminal panicle, the branches reddish villous with a short indument of stellate trichomes and a longer one of slender simple trichomes, the bracts and bracteoles hidden by the indumentum. *Flowers* with the calyx campanulate, irregularly 2–5-lobed, 14–20 mm long, 10–14 mm wide, reddish villous with long slender simple trichomes 1–2 mm long, also with a shorter stellate indumentum; corolla tubular-infundibuliform, 5–8 cm long, yellow with reddish pencilling in throat, when dried with the venation reticulate to the margins of the lobes, the dried tube and lobes indistinguishable in color, the tube 4–5 cm long, 1.5–2.5 cm wide at mouth of tube, the lobes 1–2 cm long, glabrous outside, inside rather densely pubescent in floor and throat with flat flexuous trichomes, ca. 1 mm long, glabrous at level of stamen insertion, the lobes strongly (Minas Gerais) or not at all ciliate; stamens didynamous, the thecae divergent, 2.5–3 mm long; ovary oblong, 4 mm long, 2 mm wide, glabrous; disk annular pulvinate, 1 mm long, 3 mm wide. *Fruit* a linear-cylindric capsule, tapering to the base and apex, 10–40 cm long, 1.3–1.5 cm wide, the valves coriaceous, densely pubescent with a rusty short-stellate tomentum and a longer villous one of simple trichomes; *seeds* 0.5–0.7 cm long, 1–2 cm wide, the rather short wings hyaline-membranaceous.

Distribution (Fig. 64). Coastal Brazil from Paraná to Minas Gerais and Rio de Janeiro, mostly in montane forest above 1000 m.

Specimens examined. BRAZIL. MINAS GERAIS: Carara, trail to Cascatinha, 1300 m, 20°15'S, 43°30'W, 16 Jan 1985 (fr), Gentry, Zardini & Farney 49602, 49603 (both MO, RB); Mun. Jaboticatubas, km 126–129, Lagoa Santo-Conceição do Mato Dentro, 10–22 Aug 1972 (fl), Joly & Semir 3000, 3283, Semir et al. 4326 (all UEC); Carara, 16 Jul 1980 (bd), Tales 269 (BHMH). PARANÁ: Curitiba, in silvula, 900 m, 26 Aug 1914 (fl), Dusén 15440 (MO). RIO DE JANEIRO: Cachoeira do Rancho Frio, 1400 m, Serra dos Orgãos, 23 Aug 1940 (st), Brade 16619 (CH, MO, RB); Serra dos Orgãos, 4 Oct 1876 (fl), Glaziou 8213 (BR, C, G, K, R, US); Friburgo, Curuzu, Aug 1940 (fl), Iglesias s.n. (UFMT); Teresópolis Bairo Aporoes, 15 Aug 1954, Lutz s.n. (R); Friburgo, Apr 1971 (st), Manoelito s.n. (CPFCN 8128) (GUA); Mun. de Teresópolis, alto soberbo, 1000 m, 31 Jan 1978 (fl), Peixoto & Gentry 935 (MO, RB). SÃO PAULO: Capital, Cidade Jardim, 26 Sep

1932 (fl), Hoehne s.n. (SPF17121) (MO); Salesópolis, Estação Biológica de Boraceia, 20 Aug 1965 (fl), Mattos 12457 (SP).

Common name. Ipe-preto.

Tabebuia vellosi has been much confused with *T. serratifolia* (see Gentry et al., 1984). As originally intended by Toledo and subsequently accepted in Brazil it is synonymous with *T. serratifolia*. Nevertheless the name was proposed as a *nomen novum* for *Bignonia longiflora* Vellozo and must thus be based on interpretation of Vellozo's plate in the absence of any actual Vellozo collections. This plate represents quite a different species from *T. serratifolia*.

De Candolle (1845) was the first author to suggest that *Bignonia longiflora* Vellozo might be conspecific with *Tabebuia serratifolia*. He placed it tentatively, with a query, under what he called *Tecoma speciosa*, i.e., the same widespread species now universally known as *Tabebuia serratifolia*. In the *Flora Brasiliensis* Bureau and K. Schumann (1897) maintained Vellozo's species as distinct, treating it as *Tecoma longiflora* (Vell.) Bur. & K. Schum., but also included in it material of *T. serratifolia*; in the *Flora Brasiliensis* most material of *Tabebuia serratifolia* was treated under its synonym *Tecoma araliacea*, putatively differentiated by shorter corollas and by flowering with the leaves, rather than precociously, as in *Tecoma longiflora*. The poorly chosen key character of precocious flowering led to much confusion, since mass-flowering *Tabebuia* species can flower either with or without leaves, depending on environmental stimuli and varying in the same tree from year to year and even from branch to branch. Even worse, corolla size is notoriously variable in large-flowered Bignoniaceae. Subsequent to the faulty *Flora Brasiliensis* treatment, many large-flowered or precociously flowering collections of *T. serratifolia* from coastal Brazil were identified as *Tabebuia* (or *Tecoma*) *longiflora*.

However, Vellozo's original *B. longiflora* is a later homonym of *Bignonia longiflora* Cav. (1799), the basionym for the Ecuadorian plant now known as *Macranthisiphon longiflorus* (Cav.) K. Schum. Moreover, the epithet "longiflora" cannot be used in either *Tecoma* or *Tabebuia* for the Brazilian species since it is predated by use of the same epithet for an Antillean species (*Tecoma longiflora* Griseb. (1866) = *Tabebuia lon-*

giflora (Griseb.) Greenm. (1897) = *Ekmanianthe longiflora*). When Toledo proposed the *nomen novum* *T. vellosi*, he followed then current usage in accepting the large-flowered and small-flowered plants of *T. serratifolia* as specifically distinct. Subsequently *T. serratifolia* (as *T. vellosi*) was selected as the symbol of the Brazilian Botanical Society and the prime candidate for Brazilian national tree.

While *T. vellosi* has no claim to recognition as Brazil's national flower or tree, it does turn out to be the valid name for a species of *Tabebuia*. The identification of Vellozo's plate has remained unclear. The salient features include consistently 7-foliolate leaves with sharply and closely serrate leaflets having many secondary veins. These are exactly the features that characterize the collections cited above which thus represent the rediscovery a century later of the plant illustrated by Vellozo.

This species is most closely related to *T. carolinensis*, but that species differs consistently in the smaller less membranaceous much more glabrescent leaflets, a shrub habit, and lacking the long simple trichomes of the calyx and fruit.

99. *Tabebuia vinosa* A. Gentry, *Moscoso* 5: 136. 1989. Type. Dominican Republic. La Vega: 11.6 km S of Constanza, 1880 m, 10 Apr 1965 (fl), *Gentry & Zanoni 50673* (holotype, MO; isotypes, JBSD, MO, to be distributed).

Small rather rachitic tree or treelet 2.5–6 m tall, the branches terete with enlarged nodes, when young coarsely rufescent with lepidote and stalked lepidote trichomes, with a few large conspicuous lenticels. *Leaves* (3–)5–7(–9)-foliolate, the leaflets obovate to narrowly obovate, rounded or truncate at apex, cuneate to broadly cuneate at base, the terminal, 2.5–10 cm long, 0.8–6 cm wide, the basals (of 5) 2–7 cm long, 0.5–4 cm wide, if 7-foliolate, the lowermost pair smaller and often subsessile, coriaceous, sometimes with a revolute margin, smooth to the touch above and below, typically drying slightly discolorous, more reddish brown above and olive brown below, lepidote (sometimes in part lepidote-punctate) above and below, the scales small and reddish, rather scattered, conspicuously brochidodromous, the secondary veins plane or impressed above, prominent beneath, the tertiary veins plane above, plane or somewhat prominulous below;

petiolules thickish, coarsely and somewhat glabrescently rufescent with lepidote and stalked lepidote trichomes, terminals 0.5–1.5 cm long, the laterals mostly not clearly differentiated from cuneate leaflet base, the petiole thick, 1–7 cm long. *Inflorescence* terminal, several-flowered, irregularly racemose or narrowly paniculate, typically with subulate bracts up to 10 mm long subtending lateral branches or pedicel bases and subulate bracteoles up to 8 mm long in upper part of pedicel, the pedicels and bracts and rachis conspicuously coarsely rufescent with lepidote and stalked-lepidote trichomes. *Flowers* with the calyx cupular, irregularly shallowly 5-dentate to bilabiate, longitudinally ribbed, 11–20 mm long, 8–12 mm wide, drying dark, more or less rufescent with a mixture of sessile and stalked-lepidote trichomes; corolla deep wine-colored (white in *Zanoni et al. 28332*) with whitish trichomes in throat when fresh, rather narrowly tubular infundibuliform, 3–6 cm long, 0.8–2 cm wide at mouth of tube, the tube 2–4 cm long, the lobes 0.5–1.5 cm long, glabrous outside, inside densely pilose with long trichomes in throat and villous at level of stamen insertion; stamens didynamous, the anther thecae subexserted, divaricate, 3 mm long; ovary linear, 4–5 mm long, 1 mm wide, densely whitish lepidote; disk annular-pulvinate, 1 mm long, 3 mm wide. *Fruit* (only 1 seen) 8–9 cm long, ca. 11 mm wide, terete, lepidote, also with a very few short-stipitate lepidote trichomes, drying blackish, with several prominulous longitudinal ridges, subtended by the persistent calyx; *seeds* bialate, 7–9 mm long, 2.2–2.5 cm wide, the hyaline-membranaceous wings sharply demarcated from the brown seed body.

Distribution (Fig. 63). Endemic to the Cordillera Central of the Dominican Republic from (1000–)1200–1900 m in altitude in mixed pine-broadleaf cloud forest, the highest altitude of any Hispaniolan *Tabebuia*.

Specimens examined. DOMINICAN REPUBLIC. AZUA: Loma Nalga de Maco, steep hard limestone, 1700–1800 m, 8 Jun 1926 (st), *Ekman H6296* (S). LA VEGA: El Cajón, Pinar Bonito Road, 1850 m, 16–19 Oct 1981 (fl), *D. Dod s.n.* (JBSD); 10–11 km S of Constanza, 18°50'N, 70°45'W, 1730–1850 m, 10 Apr 1985 (fl), *Gentry & Zanoni 50664* (JBSD, MO); 11.6 km S of Constanza, 18°51'N, 70°45'W, 1880 m, 10 Apr 1985 (fl), *Gentry & Zanoni 50673* (JBSD, MO); Ciénaga de la Culata, 1700 m, 16 May 1959 (fl), *J. Jiménez 4008* (K); Alto Casabito, Bonao, 1200–1300 m, 30 Mar 1974, *Liogier & Liogier 21491* (JBSD), 27 Mar 1977 (fl),

26613 (NY); Loma de Sal, Jarabacoa, 1200 m, 16 Jul 1975 (fl), *Liogier & Liogier 23631* (JBSD); 5.4 km S and 4.6 km W of Constanza, road to Pinar Parejo, 18°50'N, 70°45'W, 5750 ft, 24 Feb 1982 (fl), *Zanoni et al. 19387* (MO); 6 km de La Sal, 19°4'N, 70°34'W, 3600 ft, 14 Apr 1982, *Zanoni et al. 20082* (MO). PERUVIA: Loma de La Valvacoa, arriba El Guineal, 18°28'N, 70°22'W, 1300–1775 m, 14 Jul 1982 (fl), *Zanoni et al. 21623* (JBSD); entre Arroyo La Represa y Loma de Los Palos Mojados, arriba El Bejucal, 18°37'N, 70°35'W, 1200–1500 m, 4 Aug 1982 (fl, fr), *Zanoni et al. 22256* (JBSD), El Tope, Loma Rodríguez, 18°26'N, 70°18'W, 1320–1510 m, 29 Dec 1983 (fl), *Zanoni et al. 28232* (JBSD); Arroyo Parra, 12 km de San José de Ocoa, 18°34'N, 70°27'W, 1000 m, 30 Dec 1983 (fl), *Zanoni et al. 28332* (JBSD). SANTIAGO: Manción, top of Monte Gallo, mossy forest 1825 m, 19 Jun 1929 (fl), *Ekman H12920* (S).

Perhaps most closely related to *T. dominiguensis* and to Cuban *Tabebuia bibracteolata*; differing from the latter in the stalked peltate trichomes not “decapitated” and in the smooth leaflets, not whitish to grayish below. It is most similar to *T. dominiguensis* of the Barahona Peninsula from which it differs in the conspicuous stalked peltate trichomes of the inflorescence, the thicker petiolules and broader thicker leaflets, and especially the conspicuous trichomes in the corolla throat. Some of the collections were identified as *T. revoluta* or *T. cf. revoluta* but it differs from that species in much larger flowers, broader leaflets, and the pilose inside of the corolla throat.

100. *Tabebuia zanonii*, A. Gentry, Moscosoa 5: 138. 1989. Type. Dominican Republic. El Seibo: Los Haitises, Naranjo Arriba, en los cayos cercanos al poblado, 19°5'N, 69°34.5'W, 0–10 m alt., 28 Oct 1982 (fl), *Mejia & Pimentel 23957* (holotype, JBSD; isotype, MO—frag.).

Shrub or small *tree* 2.5–7 m tall, dichotomously branched: lepidote with reddish and/or whitish sessile or subsessile peltate scales, usually also sparsely puberulous with a few minute unicellular trichomes, more or less lenticellate when young. *Leaves* 3–5-foliolate, the leaflets oblanceolate-oblong to oblong-elliptic, obtuse to rounded at base and apex, sometimes apiculate, the terminal 5.5–16 cm long, 1–6 cm wide, the basals 2.5–12 cm long, 1.2–4.5 cm wide, coriaceous, the margins more or less erose, concolorous, olive-brownish, rather sparsely peltate-lepidote above and below with uniformly sessile scales, always puberulous with minute single-

celled trichomes at least along midvein below and sometimes (*Liogier & Liogier 24693*) over surface, not noticeably rough to the touch, brochidodromous, the secondary veins plane or slightly impressed above, strongly raised below, the tertiary venation immersed but slightly prominent below; petiolules 2–13 mm long, the laterals leaflets sessile or subsessile, the petioles 0.8–2.5 cm long, thick, minutely simple puberulous but apparently lacking any stalked-peltate scales. *Inflorescence* a reduced terminal panicle with several 2–3-flowered pedicels or reduced to a few separate flowers, lepidote with black peltate scales, these in part very short-stalked, the bracts and bracteoles linear, with at least a few long-stalked peltate scales with long flexuous bases. *Flowers* with the calyx campanulate, rather thin, irregularly 2–4-lobed, 10–11 mm long, 5–6 mm wide, densely lepidote with sessile and subsessile blackish peltate scales, drying blackish; corolla deep pinkish red to wine red, narrowly tubular-infundibuliform, 2.5–3.5 cm long, 0.7–1 cm wide at mouth, the tube ca. 2 cm long, the lobes ca. 0.5 cm long, papillose-ciliate, strongly papillose-puberulous in throat, the stamen insertions very sparsely villous, the anthers slightly included, divaricate, 2.5 mm long, pistil ca. 2 cm long, the ovary linear, 3–4 mm long, 1 mm wide, densely black lepidote-glandular; disk annular-pulvinate, 1 mm long, 2 mm wide. *Fruit* (immature) linear, 13 cm long, longitudinally striate, the calyx persistent, drying blackish, with sessile and short-stalked black peltate scales.

Distribution (Fig. 63). Endemic to Los Haitises, the karst limestone region on the south side of the Bahía de Samaná; near sea level.

Specimens examined. DOMINICAN REPUBLIC. EL SEIBO: Los Haitises, La Manaclita, limestone crag, 2 Jul 1930 (st), *Ekman H15532* (B, S); una isleta, Los Haitises, Bahía de Samaná, 23 Jan 1976 (fl), *Liogier & Liogier 24693* (JBSD); Los Haitises, la costa cerca la boca de Bahía de San Lorenzo, Caño Salado, 19°5'N, 69°28–29'W, 0–5 m alt., 9 Nov 1983 (st), *Zanoni & Pimentel 27903* (JBSD, MO); Bahía Samaná, 19°5'N, 69°29'W, 2–3 m alt., 8 Jan 1986 (fl, fr), *Zanoni et al. 35959* (JBSD).

As here interpreted, this is a locally endemic species intermediate between *T. paniculata* of the Samaná Peninsula and *T. buchii* of northern Haiti. Its leaves have minute single-celled simple trichomes (along with the numerous sessile lepidote scales) on the leaflet undersurfaces, at least

along the main veins and sometimes over the whole surface. Thus the trichomes are exactly like those of *T. paniculata*, but in that species they are restricted to the adaxial petiole surface and the base of the midvein above; in *T. buchii* there are trichomes over the leaf undersurface but these are much longer and mixed with long-stalked peltate scales. The tertiary venation below is more prominulous than in *T. paniculata* but less so than in *T. buchii*, and the very slightly erose leaflet margins are also intermediate between the strongly erose ones of *T. buchii* and the entire ones of *T. paniculata*. The most distinctive feature of *T. zanonii* is its flowers which are smaller and narrower than in *T. paniculata* and are deep rose-red or wine-red rather than white to pale pink; presumably this reflects a switch from bee-pollination in *T. paniculata* to hummingbird-pollination in *T. zanonii*. *Tabebuia buchii* has longer, reportedly light pink flowers, as in *T. paniculata* but these are more narrowly campanulate, as in *T. zanonii*. Other distinctions between *T. zanonii* and *T. paniculata* are slightly included vs. deeply included anthers and a strongly papillose puberulous corolla floor and very slightly villose stamen insertions vs. nearly glabrous corolla floor and strongly villose stamen insertions. The relationship between *T. zanonii* and *T. paniculata* is very similar to that between *T. sauvalei* and *T. calcicola*, in each case apparently reflecting a similar switch in pollination syndrome.

Rejected Species

- Tabebuia calderonii* Standley, J. Washington Acad. Sci. **14**: 244. 1924. Type. El Salvador. Sonsonate, *Calderón 1666* (US). = *Adenocalymna inundatum* Martius ex A. P. de Candolle.
- Tabebuia chapadensis* S. Moore, Trans. Linn. Soc., Ser. **2**: 422. 1895. Type. Brazil. Mato Grosso: Serra da Chapada, *Moore 79* (Holotype, BM). = *Arrabidaea corallina* (Jacquin) Sandwith.
- Tabebuia cordata* Benthham, Bot. voy. Sulphur **129**. 1844. Type. Panama. Darién, *Barclays n.* (holotype, K). = *Martinella obovata* (Humboldt, Bonpland & Kunth) Bureau & K. Schumann.
- Tabebuia citrifolia* A. P. de Candolle, Prodr. **9**: 213. 1845. Type. Brazil. Bahia, *Blanchet 2351* (holotype, G-DC; isotype, NY). = *Anemopaegma citrifolium* (A. P. de Candolle) Baillon ex Bureau & K. Schumann in Martius, Fl. bras. **8(2)**: 132. 1896.
- Tabebuia dentata* Miers, Proc. Roy. Hort. Soc. **3**: 199. 1863. Based on *Spathodea ilicifolia* Seemann. Type. Brazil. *Lobb s.n.* (not seen). = *Velloziella dracocephaloides* (Vellozo) Baillon.
- Tabebuia dracocephaloides* (Vellozo) Miers, Proc. Roy. Hort. Soc. **3**: 199. 1863. = *Velloziella dracocephaloides* (Vellozo) Baillon.
- Tabebuia lanceolata* A. P. de Candolle, Prodr. **9**: 213. 1845. Syntypes. Brazil. Rio de Janeiro: Rio de Janeiro, *Lund 170* (G-DC); *Guillemin 97* (G-DC, MO, P). = *Mansoa lanceolata* (A. P. de Candolle) A. Gentry.
- Tabebuia latifolia* A. P. de Candolle, Prodr. **9**: 213. 1845. Type. French Guiana. Cayenne. Collector not indicated (G-DC). = *Martinella obovata* (Humboldt, Bonpland & Kunth) Bureau & K. Schumann.
- Tabebuia mansoana* A. P. de Candolle, Prodr. **9**: 214. 1845. Type. Brazil. Mato Grosso: Cujaba, *Manso s.n.* (G-DC). = *Callichlamys latifolia* (L. Richard) K. Schumann, non *Bignonia latifolia* L. Rich.
- Tabebuia micrantha* Kränzlin, Feddes Repert. **17**: 215. 1921. Type. Brazil. *Mosen 3662* (K, type photo). = *Schlegelia parviflora* (Oersted) Monachino.
- Tabebuia neurophylla* Miquel, Linnaea **26**: 219. 1853. Type. Surinam. *Kappler 1957* (holotype, U; isotypes, C, FI, P, UPS). = *Arrabidaea patellifera* (Schlechtendahl) Sandwith.
- Tabebuia perelegans* Borhidi, Act. Bot. Acad. Sci. Hung. **26**: 15. 1980. Type. Cuba. Guantánamo: Río Baez, cerca de Los Naranjos, 1–3 Aug 1975 (fl, fr), *J. Bisse et al. s.n.* (HAJB26886) (holotype, HAJB; isotypes, BP, HAC, JE). Apparently a hybrid between *T. heterophylla* and *T. elegans* (where see discussion).
- Tabebuia pisoniana* (A. P. de Candolle) Miers, Proc. Roy. Hort. Soc. **3**: 199. 1863. = *Melloa quadrivalvis* (Jacquin) A. Gentry.
- Tabebuia* × *rosariensis* Borhidi, originally described as a hybrid between *T. del-riscoi* and *T. angustata*, is here included for convenience in the synonymy of *T. del-riscoi*, itself only very provisionally maintained.
- Tabebuia rufinervis* A. P. de Candolle, Prodr. **9**: 213. 1845. Lectotype. Colombia. Santa Marta,

Bertero s.n. (G-DC, M). = *Callichlamys latifolia* (L. Richard) K. Schumann.

Tabebuia sanguinea A. de Candolle, Biblioth. Universelle Genève, ser. 2, 17: 15. 1838. Type. Brazil. Lund 785 (G-DC), non C. Wright in Sauvalle. = *Fridericia speciosa* Martius.

Tabebuia xanthophylla A. P. de Candolle, Prodr. 9: 214. 1845. Type. Brazil. Alto Amazonas, prope Japura, Martius 2967 (G-DC, M). = *Spathicalyx xanthophylla* (A. P. de Candolle) A. Gentry.

TECOMA

22. *Tecoma* Jussieu, Gen. pl. 139. 1789. Type species. *T. stans* (Linnaeus) Jussieu ex Humboldt, Bonpland & Kunth.

Stenolobium D. Don, Edinburgh Philos. J. 9: 264. 1823. Type. *S. castanifolium* D. Don = *T. castanifolia* (D. Don) Melchior non *Stenolobium* Bentham (Leguminosae).

Tecomaria Spach, Hist. Nat. Vég. 3: 137. 1840. Type. *T. capensis* (Thunberg) Spach.

Kokoschkinia Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 22: 33, t. 2. 1849. Type. *K. paniculata* Turczaninow = *T. castanifolia* (D. Don) Melchior.

Shrubs or small *trees* (rarely subsucculent in *T. capensis*). *Leaves* simple, 3-foliolate or imparipinnately compound, the leaflets serrate. *Inflorescence* a terminal raceme or racemose panicle. *Flowers* with the calyx cupular, with five shallow, often apiculate deltoid lobes; corolla yellow or orange-red, tubular-campanulate to narrowly tubular-salverform, glabrous outside, the stamens exserted or included, the anthers divaricate to basally divergent, glabrous or pilose; pollen grains single, oblong, 3-colporate, the exine microreticulate; ovary narrowly cylindrical, more or less lepidote, the ovules 2-seriate in each locule; disk cupular-pulvinate to pulvinate-cylindrical. *Fruit* a linear capsule, somewhat compressed parallel to the septum but dehiscing perpendicular to it, the valves smooth, more or less glabrous; *seeds* thin, bialate, the wings hyaline-membranaceous, sharply demarcated from the seed body.

A genus of 14 species, 2 in Africa and 12 in the Neotropics. The neotropical species range from extreme southern United States through Central America and the Antilles south through Andean South America to northern Argentina. One of the African species is widely cultivated

in the Neotropics and both are included in this treatment.

Tecoma is a taxonomically difficult group with poorly demarcated species mostly differentiated by variable and often complexly overlapping vegetative characters. There are two basic species groups, one with narrowly tubular orange or red-orange hummingbird-pollinated flowers and one with campanulate yellow bee-pollinated flowers. The yellow-flowered group consists of one wide-ranging polymorphic species, *T. stans*, and three geographically restricted segregates—one with simple leaves in western Ecuador, one with 3-foliolate leaves in northwestern Peru and southwestern Ecuador, and one with slightly more obtuse leaflets at higher altitudes in the Andes of Peru and Bolivia.

The hummingbird-pollinated group is restricted to the central Andes, from Peru to northern Chile and Argentina, and appears to be undergoing active evolutionary divergence with more or less recognizable but confusingly overlapping morphotypes isolated in different inter-Andean valleys. In attempting a taxonomic treatment of these taxa, I have been guided almost as much by geography as morphology. As here delimited, each hummingbird-pollinated species has a unique and allopatric range, even though several species thus include a few aberrant collections which exhibit morphological features that usually characterize a different species. For example, collections with long-exserted anthers from the Apurimac Valley are referred to local *T. arequipensis* (which they match vegetatively) rather than to *T. cochabambensis*, and a single collection with small black-drying acuminate and sharply serrate leaflets from the Marañón drainage is referred to local *T. rosifolia* (which tends to have a similarly curved corolla tube) rather than to Bolivian-Argentinian *T. tenuiflora*. I have attempted to include such variants in the key, even though this means that some key characters are somewhat overlapping. The extent to which their existence compromises specific recognition of the various allopatric populations remains an open question, especially since all species tested, including members of the two different pollination guilds, appear to be interfertile (Gentry, 1990: 120).

I here follow van Steenis (1977) in reducing African *Tecomaria* to *Tecoma*, contrary to my earlier opinion (Gentry, 1977). Although estab-

lished custom supports the recognition of two genera, characters for differentiating them are vanishingly few. The only separating character of potential generic significance is fusion of the apical portion of the thus divergent-based anthers with the filament apex in *Tecomaria*, but not *Tecoma*. Although the neotropical *Tecoma* species have uniformly divaricate anther thecae, other bignon genera that similarly include both bird- and bee-pollinated species often have the thecae varying from divaricate in the bee-pollinated taxa to pendulous and more or less parallel in the bird-pollinated ones. Thus the change from divaricate to pendulous thecae would not seem to be a very fundamental one, and the subsequent partial fusion of the apical part of the *Tecomaria* thecae does not seem, on balance, to warrant

generic separation. *Tecoma* and *Tecomaria* are interfertile (see Gentry, 1990), also supporting their merger. Indeed the similarities of *Tecomaria* with *Tecoma* are so great that Seemann (1863) argued that the South African species must not be truly native but an introduction from the New World, and treated the hummingbird-pollinated New World *Tecoma* species as belonging in *Tecomaria* rather than as congeneric with the bee-pollinated neotropical species. Although it is now obvious that Seemann's (1863) third-hand observations were flawed and *T. capensis* is native only to southern Africa, modern analysis of angiosperm biogeography in the light of plate tectonics (e.g., Raven & Axelrod, 1974) no longer makes such a distribution implausible.

Key to Species

1. Corolla yellow, abruptly tubular-campanulate above a narrowly cylindrical tube base; anthers sparsely pilose or puberulous, held near middle of corolla tube; leaf rachis not winged; southern United States to Argentina.
 2. Leaves simple to 3-foliolate; calyx 3–4 mm long; corolla tube <3(–3.5) cm long; below 500 m altitude; coastal Ecuador and northwestern Peru.
 3. Leaves simple; Guayas to Esmeraldas, Ecuador. 3. *T. castanifolia*.
 3. Leaves mostly 3-foliolate; northwestern Peru and adjacent Ecuador. 14. *T. weberbaueriana*.
 2. Leaves mostly pinnately 5–9-foliolate; calyx (4–)5–7 mm long; corolla tube mostly >3 cm long; 0–3500 m alt.; widespread.
 4. Leaflets mostly lanceolate and acuminate, usually either membranaceous or densely velutinous below; sea level to 2800 m, widespread.
 5. Leaflets 4–10 times as long as wide; leaves occasionally subbipinnate with the lowermost leaflets pinnatifidly parted; southwestern United States and northern Mexico. 11b. *T. stans* var. *angustata*.
 5. Leaflets mostly <4 times as long as wide; uniformly simply pinnate; South Florida and central Mexico south to Argentina.
 6. Leaflets discolorous, densely velutinous below; mostly above 1500 m. 11c. *T. stans* var. *velutina*.
 6. Leaflets concolorous, almost glabrous to sparsely puberulous below; mostly below 1500 m. 11a. *T. stans* var. *stans*.
 4. Leaflets elliptic with obtuse to acutish apices, chartaceous to subcoriaceous, glabrate to slightly puberulous below; 1500–3500 m, Peru and south Ecuador. 10. *T. sambucifolia*.
1. Corolla red or red-orange, tubular salverform, very gradually expanding toward mouth from a not strongly differentiated tube base; anthers glabrous, exerted or subexserted; leaf rachis often narrowly winged; Peru to Argentina; also in Africa.
 7. Anther thecae fused at apex to each other and to the extended connective, divergent at base; southeastern Africa, also cultivated.
 8. Calyx <8 mm long; South Africa and southernmost Mozambique; also widely cultivated. 2. *T. capensis*.
 8. Calyx >10 mm long; tropical East Africa south to northernmost Mozambique. 8. *T. nyassae*.
 7. Anther thecae divaricate, not fused to connective; Andean South America, very rarely cultivated.
 9. Leaves mostly or altogether simple; calyx puberulous with erect trichomes; corolla lobes conspicuously glandular lepidote, pilose near margins. 12. *T. tanaeciflora*.
 9. Leaves mostly or altogether pinnately compound; calyx glabrous or sparsely minutely lepidote except the ciliate margin; corolla lobes not at all or inconspicuously glandular-lepidote, otherwise glabrous except the ciliate margin.
 10. Leaflets obovoid, <1 cm long, coriaceous, the apex truncate with broadly triangular teeth; northern Chile and south tip of adjacent coastal Peru. 5. *T. fulva*.
 10. Leaflets narrowly obovoid to lanceolate or oblong-elliptic, in part usually >1 cm long,

membranaceous to subcoriaceous, the apex obtuse to acuminate, the teeth various; Argentina to northern Peru.

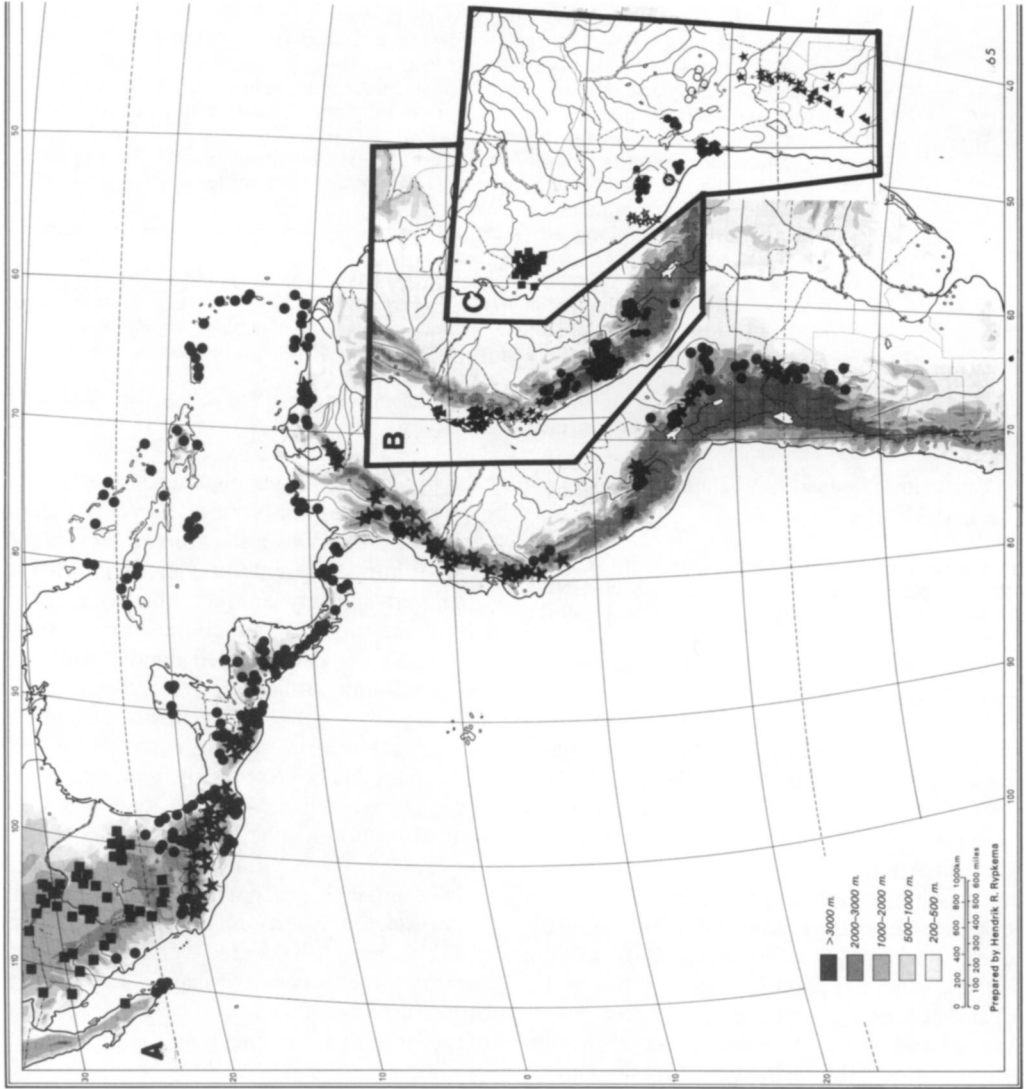
11. Leaflets drying dark gray or blackish above, usually either strongly puberulous below or with sharp close-together teeth.
 12. Northern Peru; leaflets subcoriaceous, mostly obtuse at apex and densely puberulous below, mostly obtusely serrate; calyx persistent in fruit; corolla tube usually noticeably curved. 9. *T. rosifolia*.
 12. Bolivia to northern Argentina; leaflets membranaceous to chartaceous, acute to acuminate at apex, usually glabrous below, mostly very sharply serrate; calyx caducous in fruit; corolla tube not obviously curved. 13. *T. tenuifolia*.
11. Leaflets drying light olive above and below when mature (if immature and blackish, glabrous below and with bluntly triangular teeth).
 13. Leaflets bluntly and shallowly serrate or serrulate; anthers held exactly in mouth of tube and arranged evenly around tube mouth; ovary densely lepidote; fruit <7 cm long; seeds <15 mm wide; Ica, Peru below 1200 m. 7. *T. guarume*.
 13. Leaflets sharply and/or coarsely serrate; anthers exserted or subexserted, held against roof of tube; ovary glabrous or sparsely lepidote; fruit >6 cm long; seeds >14 mm wide; Peru to Argentina above 1200 m.
 14. Corolla 4–5 cm long; 1200–2700 m in central Bolivia to northwest Argentina; leaflets shallowly or remotely serrate.
 15. Anthers strongly exserted; lateral leaflets obtuse, finely serrate, mostly petiolulate; Cochabamba area of Bolivia. 4. *T. cochabambensis*.
 15. Anthers mostly subexserted; lateral leaflets subcutish, remotely serrate with shallow teeth, almost always sessile; Argentina to southern Bolivia. 6. *T. garrocha*.
 14. Corolla 5–7.5 cm long; 2200–3300 m in southern Peru to northern Bolivia; leaflets finely or conspicuously serrate. 1. *T. arequipensis*.

1. *Tecoma arequipensis* (Sprague) Sandwith, Kew Bull. 1953: 454. 1954.

Stenolobium arequipense Sprague, Bot. Jahrb. 42: 177. 1909. Type. Peru. Arequipa: Chancani, 2300 m, *Weberbauer 1430* (K); lectotypified by Macbride (1961).

Shrub 1–4 m tall, the branchlets usually glabrous, sometimes slightly lepidote or very minutely puberulous. *Leaves* pinnate, 5–15-foliate (rarely the lowermost leaflets pinnatifid and the leaf sub-bipinnate in Beni Valley), the leaflets variably serrate (the teeth obtuse and triangular in Arequipa populations, more finely and acutely serrate in Apurimac and Beni Valleys), lanceolate to oblong-elliptic, apically obtuse (at least the laterals), basally broadly to narrowly cuneate, the laterals 0.3–2(–3.5) cm long, 0.2–1(–1.5) cm wide, the terminal slightly larger (to 3.7 × 1.7 cm) and occasionally subacute, chartaceous, lepidote or lepidote-punctate above and below, otherwise glabrous, the rachis very slightly winged, the petiole mostly 1–2.5 cm long, mostly glabrous, sometimes with a few minute trichomes at leaflet insertions, the lateral petiolules to 5 mm long, sometimes poorly differentiated or absent, especially on upper leaflets. *Inflorescence* a terminal raceme, usually rather few-flowered, often borne on short leafy branches along the rather wand-like stems, usually completely glabrous ex-

cept for a few inconspicuous lepidote scales. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1 mm long teeth more or less apiculate (4–)5–9 mm long (including teeth), (2–)3–5 mm wide, very sparsely lepidote, otherwise glabrous except the more or less ciliate margin, usually also with a few plate-shaped glands; corolla with red to red-orange tube, orange to red-orange lobes, and usually a yellow or yellow-orange throat, broadly salverform-tubular, slightly and gradually expanded above a weakly demarcated 1–1.5 cm long basal tube, 5–7.5 cm long, 0.7–1.4 cm wide at mouth of tube, the tube 4.5–7 cm long, the lobes 0.5–1 cm long, completely glabrous outside and inside except for glandular trichomes below stamen insertion, the lobes ciliate-margined; stamens subexserted (very rarely distinctly exserted), the thecae divaricate, 3 mm long, glabrous, usually curved, usually held against top of tube mouth, the connective slightly apiculately extended; pistil 5–7.5 cm long, the ovary linear-oblong, 4 mm long, 0.6–1 mm wide, lepidote; disk annular-pulvinate, 1 mm long, 1.5 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 6–10 cm long, 6–10 mm wide, glabrous or with a few inconspicuous lepidote scales; *seeds* thin, bialate, 6–9 mm long, 15–20 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.



Distribution (Fig. 65). Southern Peru and northern Bolivia. Mostly dry slopes of inter-Andean valleys especially of tributaries of the Apurimac and northern tributaries of the Beni; 2000–3300 m altitude.

Representative collections examined. PERU. APURIMAC: Abancay, Cunyac, 5 Aug 1954 (fl, fr), *Ferreyra* 9837 (MO, USM); Río Calhuanca, 15–17 km NW of Chalhuanca, 25 Jun 1978 (fl, fr), *Gentry et al.* 23352 (AAU, MO, USM). AREQUIPA: Cerros de Arequipa, 12 Nov 1947 (fl, fr), *Ferreyra* 2582 (LP, MO, USM). AYACUCHO: Outskirts of Ayacucho, Oct 1935 (fl), *West* 3673 (MO).

BOLIVIA. LA PAZ: La Paz, 1889 (fl, fr), *Bang* 7 (MICH, MO, MSC); Obrajes, 15 Apr 1919 (fl), *Buchtien* 561 (HBG, MO); Murillo, 2 km SE of Mecapaca, 17 Jul 1981 (fl, fr), *Solomon* 5837 (MO). SANTA CRUZ: Pojos, Nov 1928 (fl), *Steinbach* 8612 (MO).

Common names. Ayacucho: pichus.

It is convenient to start with geographically and morphologically intermediate *T. arequipensis* as a reference point against which to compare the other hummingbird-pollinated species of *Tecoma*. *Tecoma fulva*, restricted to Peru's southernmost Tacna Department and adjacent Chile, differs in the more coriaceous leaflets with truncate apices and a few broadly triangular teeth but the most extreme forms of *T. arequipensis*, from Arequipa Department, are quite similar except in leaflet texture. To the northwest, *T. arequipensis* is replaced by *T. guarume* in Ica Department, characterized by more membranaceous leaflets usually with reduced teeth and by having the anthers dispersed around mouth of the corolla tube. Also to the northwest, *T. tanaeciflora*, of northwest Arequipa Department is differentiated by (mostly?) simple leaves. *Tecoma arequipensis*, as here interpreted, reaches south to La Paz, Bolivia, being replaced to the south by *T. cochabambensis* and *T. garrocha*. The Cochabamba area population, here treated as *T. cochabambensis*, differs only in a shorter corolla with more conspicuously exerted anthers; *T. garrocha* has a similarly short corolla (to 5 cm long) but with mostly subexserted anthers, also differing in more acute-tipped uniformly sessile lanceolate lateral leaflets. *Tecoma rosifolia* and

T. tenuiflora differ from the *T. arequipensis* complex in the leaflets being generally more finely and sharply serrate and drying blackish above. The former has subcoriaceous obtuse-tipped leaflets that are usually densely puberulous below; the latter has membranaceous or chartaceous acute- to acuminate-tipped leaflets that are glabrescent to somewhat puberulous.

As discussed above, *T. arequipensis* shows much local differentiation. Most collections from each of the three main geographic regions in which it is represented—Arequipa region, Apurimac Valley, and La Paz region—can be recognized morphologically by nuances of leaflet shape, texture, and margin. However, in each area there are extreme forms that overlap with extremes from the other regions. Apparently, this complex is currently undergoing active evolutionary divergence (Gentry, 1979) but treatment of the as yet morphologically overlapping geographic entities as species or even subspecies may be a few thousand years premature.

2. *Tecoma capensis* (Thunberg) Lindley, Bot. Reg. 13: t. 1117. 1827.

Bignonia capensis Thunberg, Prodr. pl. cap. 2: 105. 1800. Type. South Africa. *Thunberg s.n.* (UPS).

Tecomaria capensis (Thunberg) Spach, Hist. nat. vég. 9: 137. 1840.

Tecomaria krebisii Klotzsch in Peters, Naturw. Reise Mossambique Bot. 193. 1862–1864. Type. South Africa. (B*, not seen).

Tecomaria petersii Klotzsch in Peters, Naturw. Reise Mossambique Bot. 192. 1861. Type. Mozambique. Lourenço Marques (Maputo) (B*, not seen).

Gelseminum capense (Thunberg) O. Kuntze, Rev. gen. pl. 2: 479. 1891.

Shrub or subshrub, sometimes subscaudent, the branches flexuous. *Leaves* opposite, pinnately compound, usually 7–11-foliolate, the leaflets elliptic to suborbicular, apically usually rounded or obtuse except the often acute terminal leaflet, basally rounded or abruptly cuneate, sessile, ca. 1.5 cm long and 1 cm wide, serrate, membranaceous, puberulous at least along main veins, the axils usually with tufts of branched trichomes. *Inflorescence* a raceme or racemose pan-

FIG. 65. Distribution of *Tecoma*. A, *Tecoma stans*; ● = var. *stans*; ■ = var. *angustata*; ★ = var. *velutina*. B, Bee-pollinated species; ▲ = *T. castanifolia*; ★ = *T. weberbaueriana*; ● = *T. sambucifolia*. C, Hummingbird-pollinated species; ■ = *T. rosifolia*; ☆ = *T. guarume*; ● = *T. arequipensis*; ● = *T. tanaeciflora*; ◆ = *T. fulva*; ○ = *T. cochabambensis*; ▲ = *T. garrocha*; ★ = *T. tenuiflora*.

icle. *Flowers* with the calyx cupular, 5-toothed, 5–7 mm long, 4–5 mm wide, more or less puberulous, ciliate with scattered plate-shaped glands in the upper half; corolla orange to red-orange, tubular, slightly curved, 3.5–5 cm long, 0.6–0.7 cm wide at the mouth, mostly glabrous, the lobes ciliate; stamens more or less equal in length, anthers exerted, the thecae ca. 3 mm long, apically fused to each other and to the extended connective, divergent for $\frac{1}{2}$ – $\frac{2}{3}$ of their length, the slender filament attached ca. 1 mm from fused end of the thecae; pistil 5.5–6.5 cm long, the ovary oblong, glabrous; disk cupular-pulvinate. *Fruit* a linear capsule (seed rarely set in neotropics), (5–)7–12 cm long, 7–10(–12) mm wide, subtended by the persistent calyx, the surface slightly minutely lepidote, strongly irregularly wrinkle-ridged; *seeds* in two rows, thin, bilate with hyaline-membranaceous wings.

Distribution. Native to South Africa and adjacent southernmost Mozambique but commonly cultivated in the subtropics and at higher altitudes in the Neotropics.

Common names. Argentina: garzota, estruendo.

3. *Tecoma castanifolia* (D. Don) Melchior, Ber. Deutsch. Bot. Ges. 59: 26. 1941.

Stenolobium castanifolium D. Don, Edinburgh Philos. J. 9: 264. 1823. Type. Ecuador. Guayas, Ruiz & Pavón 765 (G, F neg. 26207).

Bignonia serrata Pavon ex D. Don, Edinburgh Philos. J. 9: 264. 1823, nom. nud., pro syn.

Delostoma stenolobium Steudel, Nomencl. bot. 1: 487. 1840, nom. nov. for *S. castanifolium* D. Don.

Bignonia castaneaeifolia (D. Don) A. P. de Candolle, Prodr. 9: 145. 1845.

Tecoma gaudichaudii A. P. de Candolle, Prodr. 9: 223. 1845. Type. Ecuador. Guayas: Guayaquil, Gaudichaud 47 (holotype, G; isotype, P).

Kokoschkinia paniculata Turczaninow, Bull. Soc. Imp. Naturalistes Mosc. 22: 34. 1849. Type. Ecuador. Guayas: Guayaquil, Jameson 516 (K).

Stenolobium stans var. *castaneaeifolium* (D. Don) Seemann, J. Bot. 1: 88. 1863.

Shrub to 4 or 5 m tall. *Leaves* simple, very rarely 3-foliolate in part on young branches, serrate, lanceolate, acute to acuminate, cuneate at base, 4–20 cm long, 1–7 cm wide, puberulous beneath with simple rather kinky trichomes to almost completely glabrate; petiole 0.6–3 cm long. *Inflorescence* a terminal raceme, the rachis and pedicels puberulous to glabrate. *Flowers* with the

calyx cupular, evenly 5-dentate, the teeth ca. 1 mm long, 3–3.5 mm long, 2–3 mm wide, variously pubescent from essentially glabrous to scattered lepidote to sparsely pilose, the margin often ciliate, usually with some plate-shaped glands near margin; corolla yellow, tubular-campanulate above a narrowed base, 3–4.5 cm long, 0.8–1.1 cm wide at mouth of tube, the tube 2.3–3 cm long, the lobes 0.5–1 cm long, lobes glabrous except for ciliate margins, the tube glabrous outside, sometimes lepidote at top of throat inside, puberulous with short inconspicuous trichomes in floor of throat and at level of stamen insertion; stamens didynamous, inserted ca. 6 mm from base of tube, the anther thecae divaricate, 2–2.5 mm long, the connective extended ca. 0.5 mm, sparsely pubescent with short gland-tipped trichomes and a few scattered longer trichomes, the filaments 0.8–1.5 cm long, the staminode ca. 2 mm long; pistil 2–2.6 cm long, the ovary narrowly cylindrical, 2 mm long, 0.7 mm wide, minutely lepidote, the ovules 2-seriate in each locule; disk cupular-pulvinate, 0.5 mm long, 1 mm wide. *Fruit* a linear capsule, tapering to ends, subterete when fresh, 7–31 cm long, 4–5 mm wide, glabrous; *seeds* thin, bilate, 3–4 mm long, 1.5–2.4 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Endemic to the dry part of coastal Ecuador, mostly from Guayas and southern Manabi; with a disjunct population in the disjunct patch of dry forest near the town of Esmeraldas; 0–200 m elevation. Perhaps also between 1000 and 1300 m in Loja and/or in northwestern coastal Peru.

Representative collections examined. ECUADOR. ESMERALDAS: Esmeraldas, 31 May 1955 (fl), *Asplund 16546* (B, NY, S); Atacames, 25 km SO de Esmeraldas, 6 Sep 1965 (fl, fr), *Little & Dixon 21008* (MO, NY). **GUAYAS:** 79 km W of Guayaquil, road to Salinas, Feb 1974 (fr), *Gentry 10003* (MO); NE of Chanduy, 19 Mar 1973 (fl), *Holm-Nielsen et al. 2221* (AAU, F, MBM, MO, NY, S). **LOJA:** Empalme-Celica, 5 km W of Empalme, 12 Feb 1977 (fl), *Harling et al. 15401* (MO). **MANABI:** Near Puertoviejo, Oct 1974 (fl, fr), *Gentry et al. 12196* (MO); Tosagua-Bachillero, 12 Aug 1979 (fl), *Holm-Nielsen et al. 18845* (AAU).

PERU. PIURA: Chulucamas, 21 Mar 1953 (fl), *Soukup 4196* (USM).

This is the only yellow-flowered *Tecoma* with simple leaves. However, nearly all pinnately compound *Tecoma* species have a few of the basal leaves of most branches simple, and oc-

casional variants, especially in cases where a plant has been obviously stressed (browsed?), may have only these basal simple leaves, at least on some branches. Thus the few entirely simple-leaved collections from Loja and northwestern Peru are perhaps variants of *T. weberbaueriana*, rather than disjunct representatives of *T. castanifolia*.

4. *Tecoma cochabambensis* (Herzog) Sandwith, Kew Bull. 1953: 455. 1954.

Gelsemium garrocha (Hieronymus) O. Kuntze var. *rubrum* O. Kuntze, Rev. gen. pl. 3(2): 245. 1898. Type: Bolivia. Santa Cruz: Sierra de Santa Cruz, 2600 m, Kuntze s.n. (MO).

Stenolobium cochabambense Herzog, Meded. Bot. Mus. Herb. Rijksuniv. Utrecht 29: 42. 1916. Type: Bolivia. Cochabamba, Herzog 2462 (holotype, L; isotypes, G, S; F negative 26216).

Shrub 1.5–4 m tall, the branchlets glabrous or very slightly and inconspicuously lepidote. *Leaves* pinnate, mostly 3–7-foliolate, commonly with a pair of simple leaves at bases of branchlets, the leaflets rather closely serrate with the shallow teeth mostly rather obtuse, lanceolate to narrowly oblong-elliptic, apically usually obtuse, occasionally acutish, especially the terminal one, basally cuneate, the laterals 0.7–3 cm long, 0.3–0.8 cm wide, the terminal leaflet (or simple leaves) slightly larger (to 4 × 1.5 cm), lepidote-punctate above and below, otherwise glabrous, the rachis canaliculate and very slightly winged, the petiole mostly 1–3 cm long, glabrous, the lateral petioles at least of basal leaflet pair mostly 1–3 mm long. *Inflorescence* a terminal raceme, often borne on short leafy branches along the rather wand-like stems, glabrous. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1-mm long teeth more or less apiculate, 4–5 mm long (including teeth), 2–3 mm wide, sparsely lepidote, otherwise glabrous except the ciliate margins, sometimes also with a few plate-shaped glands; corolla red or red-orange outside and on lobes, the tube inside yellow-orange, salverform-tubular, slightly and gradually expanded above a ca. 1 cm long basal tube, 4–5 cm long, 0.5–0.9 cm wide at mouth of tube, the tube 3.5–4 cm long, the lobes 0.5–0.8 cm long, completely glabrous outside and inside except for glandular trichomes below stamen insertion, the lobes ciliate-margined and conspicuously puberulous in sinuses; stamens conspicuously exerted (usually exceeding tube by ca. 1 cm), the thecae divaricate, 3–4 mm long,

glabrous, the connective very slightly apiculate extended; pistil 4.5–5.5 cm long, the ovary linear-oblong, ca. 4 mm long, 1 mm wide, minutely lepidote; disk annular-pulvinate, 0.5 mm long, ca. 1.2 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 5–8 cm long, 6–7 mm wide, glabrous or with a few inconspicuous lepidote scales, also with scattered inconspicuous lenticels: *seeds* thin, bialate, 5–6 mm long, 14–18 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Dry Andean slopes of Cochabamba area of central Bolivia; 1800–2700 (–2900) m.

Representative collections examined. BOLIVIA. COCHABAMBA: 60 km E of Epizana, 5 Dec 1976 (fl, fr), Davidson 3786 (MO); Taquina-Cochabamba, Dec 1928 (fl), Steinbach 8778 (MO). **SANTA CRUZ:** San Isidro-Comarapa, Oct 1928 (fl), Steinbach 8309 (MO).

This species is a somewhat dubious segregate, being intermediate, both geographically and morphologically, between *T. arequipensis* and *T. garrocha*. It differs from *T. garrocha* in the anthers more strongly exerted and the leaflets more finely serrate with lateral leaflets more obtuse and at least the basal leaflets noticeably petiolulate. It differs from most collections of *T. arequipensis* in the shorter corolla and strongly exerted stamens, but there are occasional *T. arequipensis* variants in the Apurimac valley with strongly exerted anthers. *Tecoma cochabambensis* differs from Bolivian material of *T. arequipensis* in the shorter calyx and less sharply serrate leaflet margins but some Peruvian collections of *T. arequipensis* are similar. In addition *T. cochabambensis* is ecologically distinct, occurring mostly at lower altitudes than *T. arequipensis*.

5. *Tecoma fulva* (Cavanilles) D. Don, Gen. syst. 4: 224. 1838.

Bignonia fulva Cavanilles, Icones descr. pl. 6: 672, pl. 580. 1799. Type: Chile. Tarapaca: Arica, Nee s.n. (not seen); type illustration, Cavanilles, Icones t. 580. *Bignonia meyeniana* Schauer, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19, suppl. 1: 366. 1843. Type: Peru. Tacna: Tacna, 700 m, Meyen s.n. (B*, not seen).

Tecomaria fulvum (Cavanilles) Seemann, J. Bot. 1: 19. 1863.

Stenolobium fulvum (Cavanilles) Sprague, Fl. Capensis 4(2): 448. 1904.

Shrub 1.5–4 m tall, the branchlets more or less sparsely puberulous and lepidote, the trichomes mostly simple, some forked. *Leaves* pinnate, (7–)11–21-foliolate, the leaflets small, obovoid, serrate with broadly triangular teeth in apical half, apically rounded, broadly cuneate to rounded at base, (0.1–)0.2–1 cm long, 0.1–0.7 cm wide, coriaceous, progressively smaller apically, lepidote, sparsely and irregularly puberulous with minute thickish trichomes, petiolules absent, rachis conspicuously narrowly winged, sparsely puberulous at least along midvein below, petiole 0.5–2.5 cm long, marginate or unwinged. *Inflorescence* a terminal raceme or cluster of several subterminal racemes in uppermost leaf axils, the flowers tending to cluster towards apex, more or less pilose with stiffish trichomes. *Flowers* with the calyx cupular, evenly 5-dentate, the apiculate teeth ca. 1 mm long and with central costa extending onto calyx, also sparsely puberulous, at least on tooth margins and sometimes over surface; corolla red-orange, narrowly salverform-tubular, slightly and gradually expanded apically, 5–6 cm long, 0.8–1 cm wide at mouth, the tube 4.5–5.5 cm long, the lobes 0.5 cm long, glabrous outside, inside glabrous except for a few trichomes below stamen insertion, the lobes ciliate with multicelled trichomes; stamens subexserted, held in mouth of tube, the thecae somewhat divergent, pendulous, 4 mm long, glabrous or with a very few inconspicuous trichomes, the connective apiculate extended ca. 0.5 mm; pistil 5–6 cm long, the ovary linear, 3–4 mm long, 1 mm wide, glabrous; disk pulvinate-cylindric, 1 mm long, 1.5 mm wide. *Fruit* a linear capsule, tapering at ends, 7–12 cm long, 6–7 mm wide, glabrous; *seeds* thin, bialate, 5–7 mm long, 20–25 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). The Atacama Desert region of northern Chile and southernmost coastal Peru; mostly along dry stream-beds; 150–2230 m alt.

Collections examined. PERU. TACNA: Tacna, 14 km toward sea, Río Caplina, 20 Jun 1979 (fl, fr), Beck 2019 (MO); Tarata, 1 km N of Quilla, 28 Nov 1964 (fl, fr), Hutchison & Wright 7164 (MO).

CHILE. TARAPACA: Valley of Azapa, 12 Jul 1977 (fl, fr), Zollner 9470 (MO).

Common names. Chuve.

Vegetatively very distinctive as the smallest-leafted species of the genus, and especially by

the nearly truncate leaflet apices with a few broadly triangular teeth.

6. *Tecoma garrocha* Hieronymus, Bol. Acad. Nac. Ci. Córdoba 4: 402. 1882. Type. Argentina. Catamarca. Lorentz & Hieronymus 417 (B*, lectotype, K).

Stenolobium guarracha Hieronymus ex Bureau & K. Schumann in Martius, Fl. bras. 8(2): 315. 1897, nom. nud.

Gelseminum garrocha (Hieronymus) O. Kuntze, Rev. gen. pl. 3: 245. 1898.

Gelseminum garrocha (Hieronymus) O. Kuntze var. *bicolor* O. Kuntze, Rev. gen. pl. 3(2): 245. 1898. Syntypes: Argentina. Jujuy, Kuntze s.n. (not seen); Bolivia. Río Tapacari, 3000 m, Kuntze s.n. (not seen).

Stenolobium garrocha (Hieronymus) R. E. Fries, Arkiv. Bot. Stockholm 6(11): 16. 1907.

Shrub or small *tree* 2–5 m tall, the branchlets slightly lepidote to inconspicuously and minutely puberulous. *Leaves* pinnate, (3–)5–9-foliolate (occasionally also with a pair of simple leaves at bases of branchlets), the leaflets rather remotely serrate with the shallow teeth obtuse or the tooth tips slightly reflexed, lanceolate to narrowly oblong-elliptic, apically usually obtuse, occasionally narrowly acutish, especially the terminal one, basally cuneate, the laterals 0.5–5 cm long, 0.3–1.5 cm wide, the terminal slightly larger (to 5.5 × 1.5 cm), lepidote or lepidote-punctate above and below, otherwise glabrous, the rachis slightly canaliculate to very slightly winged, the petiole mostly 1–3 cm long, glabrous except a few minute trichomes along adaxial groove, the lateral petiolules absent or very rarely to 1–2 mm long on basal leaflets. *Inflorescence* a terminal raceme, often borne on short leafy branches along the rather wand-like stems, glabrous or very inconspicuously lepidote or puberulous. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1-mm long teeth sometimes slightly apiculate, 4–5 mm long (including teeth), 2–3 mm wide, very sparsely lepidote, otherwise glabrous except the more or less ciliate margins; corolla with yellow to orange tube and red or red-orange lobes, very narrowly tubular-infundibuliform, slightly and gradually expanded above a 1–1.5 cm long basal tube, 4–5 cm long, 0.7–0.9 cm wide at mouth of tube, the tube 3–4.5 cm long, the lobes 0.5–1 cm long, tube completely glabrous outside and inside except for glandular trichomes below stamen insertion, the lobes ciliate-margined, especially puberulous in sinuses; stamens exserted or sub-

exserted, the thecae divaricate, 3–3.5 mm long, glabrous, the connective slightly apiculate extended; pistil 4–5 cm long, the ovary linear-oblong, 3–4 mm long, 1 mm wide, lepidote; disk annular-pulvinate, 0.5 mm long, 1.5 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 7–11 cm long, 7–9 mm wide, glabrous or with a few inconspicuous lepidote scales, also with scattered inconspicuous lenticels; *seeds* thin, bialate, 6–7 mm long, 14–18 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Dry Andean slopes, mostly along streambeds, northwestern Argentina and southern Bolivia; 700–2900 m.

Representative collections examined. BOLIVIA. CHUQUISACA: Camataqui, Feb 1904 (fl, fr), *Fiebrig 307 p.p.* (B, MO); Camargo 13 km hacia Villa Abecia, 24 Mar 1979 (fl, fr), *Beck 691* (MO). POTOSÍ: Prov. C. Saavedra, entre Millares y Retiro, 3 Oct 1985 (fl), *García et al. 578* (MO). SANTA CRUZ: Sierra de Santa Cruz, May 1892 (fl, fr), *Kuntze s.n.* (NY). TARIJA: Tojo, 26 Apr 1968 (fl), *Fabris & Crisci 7429* (LP).

ARGENTINA. CATAMARCA: Quebrada de Belen, 22 Apr 1969 (fl), *Cabrera & Fabris 20025* (LP). JUJUY: El Carmen, Perico, Río Perico, 6 Jan 1971 (fl, fr), *Krapovickas & Cristóbal 17509* (LL, MO). LA RIOJA: Dep. Chilecito, Sammy Huari, Jan 1959 (fl, fr), *Dawson & Guerrero 3149* (LP). SALTA: La Vina, Garganta del Diablo, 48 km NE of Cafayate, 20 Sep 1985 (fl, fr), *Gentry 51708* (MO). TUCUMÁN: Tucumán, Oct 1948 (fl), *Fabris 163* (LP).

Common names. Garrocha, guaran colorado.

This is perhaps no more than a southern form of polymorphic *T. arequipensis* from which it differs in more lanceolate, acute-tipped, nearly always uniformly sessile leaflets and a shorter corolla tube. This is the older name should the two be treated as conspecific.

A form from Jujuy, Argentina (e.g., *Eyerdam & Beetle 22342*, *Schreiter 5117*) is reported to have the corolla reddish orange outside, but the corolla is longer (to 5.5 cm) and broader (to 1.3 cm wide at mouth) than in other *T. garrocha* collections. The anthers are held just inside the tube mouth. These plants are also unusual in having a preponderance of simple and 3-foliolate leaves. Since the floral characters are intermediate between those of *T. garrocha* and *T. stans*, I suspect that these may represent hybridization, but it is possible that they represent an incipient independent switch of a population of *T. stans* to hummingbird pollination.

7. ***Tecoma guarume*** A. P. de Candolle, Prodr. 9: 224. 1845. Type. Peru. Locality not indicated, presumably Ica, *Pavón s.n.* (G; F negative 26210).

Tecoma alata A. P. de Candolle, Biblioth. Univ. Genève 24. 1838. Type. Peru. *Pavón s.n.* (G), nom. nud. *Bignonia guarume* Dombey ex A. P. de Candolle, Prodr. 9: 225. 1845, nom. nud., pro syn. Type. Peru. *Dombey 388 p.p.* (G-DC, K).

Bignonia alata Pavon ex A. P. de Candolle, Prodr. 9: 224. 1845, nom. nud., pro syn.

Gelsemium alatum (A. P. de Candolle) O. Kuntze, Rev. gen. pl. 2: 479. 1891.

Tecomaria alata (A. P. de Candolle) Baillon ex K. Schumann, Nat. Pflanzenfam. 4(3b): 230. 1894.

Stenolobium alatum (A. P. de Candolle) Sprague in Thiselton-Dyer, Fl. capensis 4(2): 448. 1904.

Shrub 1.5–3 m tall, the branchlets glabrous except for a few minute lepidote scales, occasionally very minutely and inconspicuously puberulous. *Leaves* pinnate, 5–11-foliolate (rarely with simple leaves subtending a bifurcation, these sometimes irregularly lobed), the leaflets very bluntly and shallowly serrate, sometimes barely serrulate, elliptic to oblanceolate, apically obtuse (at least the laterals), basally cuneate, the laterals 0.8–3 cm long, 0.4–1.4 cm wide, the terminal slightly larger (to 4 × 2 cm) and occasionally somewhat acutish, chartaceous, lepidote or lepidote-punctate above and below, the rachis narrowly winged, the petiole mostly 1–2 cm long, glabrous except for inconspicuous lepidote scales and a few minute trichomes at leaflet insertions, the lateral petiolules poorly defined, mostly 1–3 mm long, frequently absent on upper leaflets. *Inflorescence* a terminal raceme, or several racemes from axils of terminal leaves, sometimes more or less paniculate with lower node of raceme giving rise to pair of shorter subsidiary racemes, sparsely and inconspicuously lepidote, sometimes also very minutely scattered-puberulous. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1–3 mm long teeth conspicuously apiculate, 3–6 mm long (including teeth), 2–3 mm wide, very sparsely lepidote, otherwise glabrous except the more or less puberulous margin, plate-shaped glands absent; corolla with red to red-orange tube, orange to yellow-orange lobes and usually a yellow throat, broadly salverform-tubular, slightly and very gradually expanded above a weakly demarcated 1–1.5 cm long basal tube, 5–6.5 cm long, 0.8–1.1 cm wide at mouth of tube, the tube 4.5–6 cm long, the lobes 0.4–

0.5 cm long, completely glabrous outside and inside except for glandular trichomes at and below stamen insertion, the lobes ciliate-margined, more densely pilose in sinuses; stamens held exactly in mouth of tube, the thecae divaricate, 3 mm long, glabrous, straight, evenly dispersed around mouth of tube, the connective slightly apiculately extended; pistil 5–6 cm long, the ovary linear-oblong to narrowly ovate, somewhat keeled, 3 mm long, 1–1.2 mm wide, densely lepidote; disk annular-pulvinate, 0.5 mm long, 1.2 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 5.5–7 cm long, 6–8 mm wide, noticeably scattered-lepidote or lepidote-punctate; *seeds* thin, bialate, 4–6 mm long, 9–15 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Endemic to Ica Department, Peru, where occurring in sandy areas, especially along rivers; from 450–1200 m alt. (also one collection from “nahe den Meere”).

Representative collections examined. PERU. ICA: Boca de la Achirana, 480–600 m, 6 Aug 1953 (fl), *Angulo 1982* (MO, USM); Guadalupe, bosque de las Chacras, 4 Dec 1951 (fl, fr), *Cerrate 902* (MO, USM); S of Ica, 26 May 1956 (fl), *Ferreyra 11783* (MO, US); Bustillos, camino de Reyes, 400–500 m, 1 Dec 1957 (fl), *Ferreyra 12830* (MO, USM); Santa Cruz entre Palpa e Ica, 500 m, 24 Sep 1958 (fl), *Ferreyra 13458* (MO, USM); Pan American Hwy. N of Ica, 18 Sep 1957 (fl, fr), *Hutchinson 1327* (MO); Orongo, 5 Apr 1948 (fl), *Luna & Pascual s.n.* (MO, USM); Ica, Jul 1923 (fl), *Maisch 239* (MO, USM); Pampanos, Prov. Pisco, 1200 m, 24 Sep 1938 (fl), *Vargas 9301* (MO); Pisco, 600–700 m, May 1910 (fl, fr), *Weberbauer 5365* (B); Lomas, 15°30'–15°40'S, 4 May 1911 (fl), *Weberbauer 5731* (B).

Common name. Cahuato.

There has been much confusion as to the correct application of this name. The type of *Tecoma guarume* is a Pavón collection in the general herbarium at Geneva (FM negative 26210), not the Dombey specimen so labelled in the same herbarium (FM negative 7675), which is *Tecoma sambucifolia*. This identification was already pointed out by Macbride (1961). The Pavón collection, but not the Dombey one, agrees with the protologue in 5-jugate leaves (in part), narrowly winged petiole, and a laxly paniculate terminal inflorescence (actually a central raceme with two subsidiary basal racemes from a pair of reduced leaves). It has been annotated as “*Tecoma guarume* DC., *Bignonia alata* Pavon, *Bignonia coronillaefolia*.” Unfortunately the Dombey specimen

is also identified as *Tecoma guarume* DC. as well as with the unpublished name *Bignonia guarume* Dombey. Even though the specific epithet comes from the Dombey collection, the identification of this collection with the plant described by de Candolle as *T. guarume* was always tentative as indicated by the question mark placed after it in de Candolle’s synonymy.

Tecoma guarume is close to *T. arequipensis* and has sometimes been considered conspecific. It differs in the broader thinner more shallowly serrate or serrulate leaflets, disposition of the anthers around the mouth of corolla tube, the densely lepidote ovary, and generally shorter fruits and smaller seeds.

8. *Tecoma nyassae* Oliver in Hooker, *Icones pl.*, pl. 1351. 1881. Type. Tanzania. N of Lake Nyassa, *Thomson s.n.* (holotype, K).

Tecoma shirensis Baker, *Bull. Misc. Inf. Kew* **1894**: 30. 1894. Type. Malawi. Shire Highlands, *Buchanan 219* (lectotype, K; isolectotype, BM; MO negative 4267) lectotypified by Brummitt, 1974.

Tecomaria nyassae (Oliver) K. Schumann, *Nat. Pflanzenfam.* **4(3b)**: 230. 1894.

Tecomaria shirensis (Baker) K. Schum. in Engler, *Pflanzenwelt Ost-Afr.* C: 363. 1895.

Tecoma whytei C. H. Wright, *Bull. Misc. Inf. Kew* **1897**: 275. 1894. Type. Malawi. Zomba Plateau, *Whyte s.n.* (holotype, K; MO negative 4268).

Tecoma nyikensis Baker, *Bull. Misc. Inf. Kew* **1898**: 159. 1898. Type. Malawi. Nyika Plateau, *Whyte 112* (holotype, K; MO negative 4266).

Tecomaria rupium Bullock, *Bull. Misc. Inf. Kew* **1931**: 274. 1931. Type. Tanzania. Dodoma Distr., N of Mpwapwa, *Greenway 2425* (holotype, K; MO negative 4265).

Tecomaria capensis ssp. *nyassae* (Oliver) Brummitt, *Bull. Jard. Bot. Nat. Belg.* **44**: 421. 1974.

Distribution. Tropical East Africa from easternmost Angola, southern Zaire and Tanzania south to Zambia, Malawi, and northern Mozambique.

Although this African species has not to my knowledge been cultivated in the Neotropics, it is included here to complete the treatment of *Tecoma*. Distribution maps for both this species and *T. capensis* are given by Brummitt (1974) who concluded that the two taxa should be treated as subspecies. However, these two African plants seem abundantly distinct. In addition to a much larger calyx, *T. nyassae* has a more strongly bilabiate corolla with a shorter tube and the reflexed lower lobes about as long as the tube;

T. capensis always has the tube much longer than the reflexed lower lobes. The fruits of *T. nyassae* are generally shorter (4–9 cm) and perhaps broader ((0.8–)0.9–1.3 cm) than those of *T. capensis* (7–12 by 0.7–1.0(–1.2) cm) and have a smooth (rarely very finely subverrucose) surface as opposed to the conspicuously wrinkled-striate fruit of the latter. Another difference is in habit with *T. capensis* a small shrub tending to become somewhat scandent, while *T. nyassae* is a large shrub or small tree (to 7 m tall, fide Brummitt). Moreover, the two species are easily distinguishable vegetatively with the usually larger leaflets of *T. nyassae* mostly ovate, very shallowly serrate, and even the lower pairs usually acute or acutish, while the usually smaller ones of *T. capensis* are mostly elliptic, strongly serrate, and at least the lateral leaflets are more or less obtuse. While there is some overlap in leaf characters, these do not occur in parallel (e.g., all obtuse-leafleted specimens of *T. nyassae* have very shallow serrations) and all of the numerous specimens at MO can be assigned to one or the other species on purely vegetative criteria. I conclude that *Tecoma nyassae* is specifically distinct from *T. capensis*.

9. *Tecoma rosifolia* Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. 3: 143. 1819. Type. Peru (presumably). “Chillo, 1350 m” fide protologue, *Humboldt & Bonpland s.n.* (P).

Tecoma azaleiflora Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. 3: 142. 1819. Type. Peru. Piura: Sondorillo, Huancabamba, 1000 m, *Humboldt & Bonpland 3545* (holotype, B-WILLD).

Tecomaria roseifolia (Humboldt, Bonpland & Kunth) Seemann, J. Bot. 1: 20. 1863.

Stenolobium huancabambae Kranzlin, Bot. Jahrb. 54, Beibl. 119: 23. 1916. Type. Peru. Cajamarca: Huancabamba, Shumaya, 1700–1800 m, *Weberbauer 6279* (B*, lectotype, US; isotypes, GH, NY).

Shrub 0.5–3 m tall, the branchlets puberulous. *Leaves* pinnate, (3–)5–9-foliolate, the leaflets closely serrate, elliptic to elliptic-ovate, apically obtuse to subacuminate, basally cuneate to rounded, the laterals 0.6–3(–4) cm long, 0.4–1.5(–1.8) cm wide, equal-sized, the terminal slightly larger and more acute (to 6.5 × 2 cm), scattered lepidote above and usually densely puberulous below and sometimes sparsely above, occasionally glabrescent and almost completely glabrous or sparsely puberulous mostly along and near

midvein below, subcoriaceous, drying blackish to dark gray or grayish olive above, usually paler below from the indumentum, the rachis canaliculate, the petiole mostly 0.5–2 cm long, puberulous, the lateral petiolules 1–3(–5 in Angulo 2106) mm long. *Inflorescence* a terminal raceme or several racemes in axils of uppermost leaves, puberulous with suberect trichomes or almost completely glabrous. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1 mm long teeth apiculate, 3–4 mm long, 2–3 mm wide, sparsely lepidote, otherwise glabrous or with a few minute trichomes along margin; sometimes with a few large plate-shaped glands; corolla orange or red-orange, the throat often orange-yellow with reddish lines, salverform-tubular to very narrowly tubular-campanulate, the narrowly cylindrical basal tube usually well-differentiated, the upper part usually slightly curved, gradually expanded apically, 3.5–5.5 cm long, 0.6–1.0 cm wide at mouth of tube, the tube 3–5 cm long, the lobes 0.5–0.7 cm long, completely glabrous outside and inside except for gland-tipped trichomes below stamen insertion, the lobes ciliate, also slightly puberulous in sinuses; stamens usually subexserted, with anthers held at top of tube, sometimes distinctly exserted, the thecae divaricate, 3 mm long, glabrous, the minute connective not obvious; pistil 3.5–5 cm long, the ovary linear-oblong, 3 mm long, 0.7 mm wide, lepidote-glandular; disk cupular-pulvinate, 0.8 mm long, 1 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 8–15 cm long, 5–9 mm wide, glabrous or with a few inconspicuous lepidote scales; *seeds* thin, bialate, 5–7 mm long, 17–25 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Northern Andean Peru in the dry valleys of the Rio Marañón and Huancabamba drainage; 750–2800 m elevation.

Representative collections examined. PERU. AMAZONAS: 15 km N of Chachapoyas, Río Utcubamba, road to Bagua, 17 Jun 1978 (fl), *Gentry et al. 23228* (MO); Bongara, road S from Pte. Ingenio to Chachapoyas, 25 Feb 1976 (fl), *Plowman 5549* (F, MO). CAJAMARCA: Cutervo, 26 Aug 1963 (fr), *Ferreya 5387* (MO, USM); Olmos-Marañón, km 81, Prov. Jaén, 21 May 1953 (fl), *López-M. et al. 4067* (LP, MO, TRUJ).

Common names. Fresno, fresnillo, hada.

An extremely common shrub of roadsides and disturbed areas in the Huancabamba depression. Extremely variable in leaf shape and pubescence,

the hummingbird-pollinated *Tecomas* of northern Peru apparently constitute a single polymorphic species. Contrary to Macbride (1961), I here separate Bolivian and Argentinian *T. tenuiflora* from *T. rosifolia*; that species differs in a straighter more salverform corolla and membranaceous usually glabrescent acuminate leaflets. *Angulo 2106* has glabrate long-petioled sharply serrate acuminate leaflets exactly like those of *T. tenuiflora* but the curved corolla tube of *T. rosifolia*; it is assigned to the latter largely on geographical grounds.

The original description of this species cites a collection from Chillo near Quito, Ecuador, but that is the only record from Ecuador and it now seems evident that some kind of mixup must have occurred. The type collection of *T. rosifolia* at P is clearly the Peruvian plant to which the name is here applied. Humboldt and Bonpland did collect *T. stans* var. *velutina* (as *T. sorbifolia*) near Quito and *T. rosifolia* (as *T. azaleaeflora*) in Peru's Huancabamba Valley; thus it is possible that a specimen mixup occurred, especially since *T. azaleaeflora*, noted as being extremely similar to *T. rosifolia* (and not differentiable from it by the original description), is one of the very few HBK. bignons. of which there is no authentic collection at Paris.

10. *Tecoma sambucifolia* Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. 3: 143. 1819. Type. Peru. Montan, *Humboldt & Bonpland 3672* (P).

Stenobium sambucifolium (Humboldt, Bonpland & Kunth) Seemann, J. Bot. 1: 88. 1863.

Shrub 1–3(–4.5) m tall, the branchlets glabrous except for a few inconspicuous lepidote scales to puberulous. *Leaves* pinnate, (1–)3–11-foliolate, the leaflets closely serrate, elliptic, apically obtuse to more or less acute, basally cuneate, the laterals 0.8–4(–5.5) cm long, 0.3–1.8(–2.3) cm wide, equal-sized, the terminal slightly larger and more acute (to 8.5 × 3.5 cm), scattered lepidote above and below, usually puberulous below, at least along midvein and sometimes sparsely over surface, above usually slightly puberulous along base of midvein, often with a few tiny marginal trichomes, occasionally completely glabrous, chartaceous to paler olive below, the rachis canaliculate, the petiole mostly 1–6 cm long, glabrous to puberulous, usually with kinky, in part

branching, trichomes, the lateral petiolules 1–6 mm long. *Inflorescence* a terminal raceme or several racemes in axils of uppermost leaves or with two racemose basal branches from lower node of the terminal raceme, more or less lepidote, otherwise almost completely glabrous to rather densely puberulous, in part with forked or branching trichomes. *Flowers* with the calyx cupular, evenly 5-denticulate, the ca. 1 mm long teeth apiculate, 4–6 mm long, 3–5 mm wide, usually sparsely lepidote and otherwise glabrous except a few minute trichomes along margin, sometimes also conspicuously puberulous with twisting trichomes, usually with a few large plate-shaped glands near margin; corolla yellow with reddish pencilling in throat, tubular-campanulate above a narrowed base, 2.5–4.5(–5) cm long, 0.8–1.4(–1.7) cm wide at mouth of tube, the tube 2–3.5(–4) cm long, the lobes 0.5–1 cm long, completely glabrous outside, inside puberulous with rather scurfy, in part gland-tipped, trichomes in floor of tube, also gland-tipped pubescent at stamen insertion, the lobes more or less ciliate, becoming strongly pilose with kinky trichomes in sinuses; stamens included, didynamous, the thecae divaricate, 3–4 mm long, sparsely pilose or puberulous, the extended connective 0.5 mm long; pistil 2.5–3.5 cm long, the ovary linear-oblong, 2–3 mm long, 1 mm wide, glabrous; disk cupular-pulvinate, 0.5 m long, 1.5 m wide. *Fruit* a linear capsule, tapering at ends, the calyx caducous, 10–31 cm long, 16–12 mm wide, glabrous or with a few inconspicuous lepidote scales, strongly raised-lenticellate, the pale lenticels contrasting with dark brown surface; *seeds* thin, bilate, 7–10 mm long, 15–27 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Andes of Peru and southernmost Ecuador, mostly occurring in dry-mesic parts of inter-Andean valleys; from 1500–3500 m.

Representative collections examined. ECUADOR. AZUAY: Pasaje Santa Isabel-Girón, Río Jubones, 600–1600 m, 7 May 1974 (fl), *Harling & Andersson 14412* (GB, MO).

PERU. ANCASH: Río Santa, S of Huaráz, 11 Jul 1982 (fl, fr), *Gentry et al. 37471* (MO, USM). **APURIMAC:** Chincheros, *Ferreya 2809* (MO, USM). **AREQUIPA:** Jura, Prov. Arequipa, 23 Mar 1970 (fl), *Lopez M. 7375* (LP, TRUJ). **AYACUCHO:** 4 km NE of Tambo, 2 Dec 1970 (fl, fr), *Luteyn & Lebrón-Luteyn 6341* (AAU, MO). **CAJAMARCA:** Carretera entre Huamachuco y

Tayabamba, entre Chagual y Aricapampa, 24 Oct 1986 (fl), Díaz 2191 (MO, USM); Prov. Contumaza, Las Chirimoyas (San Benito-Yeton), 3 Feb 1985 (fl), Sagastegui et al. 12483 (F, MO). Cuzco: 51 km E of Cuzco on road to Paucartambo, 28 Jun 1978 (fl, fr), Gentry et al. 23404 (G, MO, USM). HUÁNUCO: Huánuco, Ambo, Hda. Quicacan, 29 Jan 1950 (fl), Ferreyra 6558 (MO, USM). JUNÍN: Prov. Tarma, Tarmatambo, 5 Aug 1952 (fl), Tovar 1088 (LP, MO, USM). LA LIBERTAD: Hdo. Cochabamba, Prov. Huamachuco, 26 Jun 1958 (fl), Lopez M. & Sagastegui 2779 (LP, MO). LAMBAYEQUE: Entre La Florida y Cayalti, 11 Oct 1986 (fl), Díaz 2102 (MO, USM). LIMA: Churín, Prov. Cajatambo, 21 Jun 1949 (fl, fr), Ferreyra 6167 (MO, USM).

Common names. Cajamarca: huaraula; La Libertad: cando; Lima: yerckana; Huancavelica: huaranhuay; Cuzco: kalawala, huaranhuai.

This is a higher altitude replacement for *T. stans* from which it differs consistently only in the elliptic (rather than lanceolate) leaflets with non-acuminate (but sometimes distinctly acute) apices. A form from 3000 m in Huancavelica (Plowman & Davis 4640, Tovar 1397) has especially acute-tipped nearly lanceolate leaflets and is separable from *T. stans* only on faith. Collections from the Apurímac Valley and Urubamba Valley in southern Peru also tend to be intermediate between *T. stans* and *T. sambucifolia*. Like *T. arequipensis*, *T. sambucifolia* shows allopatric differentiation in leaf shape and pubescence in different inter-Andean valleys, but these differences seem too minor and overlapping for taxonomic recognition. In fact, *T. sambucifolia* itself may not be adequately differentiated from *T. stans* for specific recognition.

11. *Tecoma stans* (Linnaeus) Jussieu ex Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. 3: 144. 1819.

Distribution (Fig. 65). Southern Florida and southernmost Arizona and Texas south through the Antilles and Central America to northern Argentina. Sea level to 2800 m elevation (above 1500 m almost entirely var. *velutina*). Also widely cultivated.

Key to the Varieties

1. Leaflets 4–10 times as long as wide; leaves occasionally subbipinnate with the lowermost leaflets pinnatifidly parted; southwestern United States and northern Mexico. . . . var. *angustata*.
1. Leaflets mostly <4 times as long as wide; uni-

formly simply pinnate; South Florida and central Mexico south to Argentina.

2. Leaflets discolorous, densely velutinous below; mostly above 1500 m. . . . var. *velutina*.
2. Leaflets concolorous, almost glabrous to sparsely puberulous below; mostly below 1500 m. . . . var. *stans*.

11a. *Tecoma stans* var. *stans*. Fig. 66.

Bignonia stans Linnaeus, Sp. pl., ed. 2, 2: 871. 1763. Type illustration. Haiti(?). Plumier Pl. amer. t. 54. 1756.

Tecoma incisa Sweet, Hort. brit., ed. 1. 284. 1827, nom. nud. Type. Trinidad (not seen).

Bignonia frutescens Miller ex A. P. de Candolle, Prodr. 9: 224. 1845, pro syn.

Bignonia incisa Hort. ex A. P. de Candolle, Prodr. 9: 224. 1845, pro syn.

Tecoma stans var. *apiifolia* Hort. ex A. P. de Candolle, Prodr. 9: 224. 1845. Type. Guadeloupe. Bertero s.n. (G-DC).

Stenolobium stans (Linnaeus) Seemann, J. Bot. 1: 88. 1863.

Stenolobium stans var. *pinnatum* Seemann, J. Bot. 1: 89. 1863. Type. Panama. Seemann 558 (BM).

Stenolobium stans var. *apiifolium* (A. P. de Candolle) Seemann, J. Bot. 1: 89. 1863.

Gelsemium stans (Linnaeus) Kuntze, Rev. gen. 2: 479. 1891.

Stenolobium stans var. *multijugum* R. E. Fries, Ark. Bot. Stockholm 1: 401. 1903. Syntypes. Argentina. Jujuy: Isla in Sierra Santa Barbara, Fries 338 (S, not seen); Piquete, Río San Francisco, Fries 338a (not seen).

Stenolobium quinquejugum Loesner, Feddes Repert. 16: 210. 1919. Type. Mexico. Guerrero, Langlasse 478 (K).

Shrub or small *tree* to 10 m tall and 25 cm dbh., the bark dark, ridged, the branchlets lepidote, somewhat subpuberulous, more or less terete, drying dark brown when young, light brown when mature. *Leaves* 3–9-foliolate, the first pair of leaves on a branch often simple or 1-foliolate, the leaflets opposite, serrate, lanceolate, apically acute to acuminate, basally cuneate, the terminal leaflet frequently attenuate, 2.4–15 cm long, 0.8–6 cm wide, progressively larger distally, the terminal leaflet 4–20 mm long, membranaceous, somewhat lepidote above and below, simple-puberulous at least along the midvein, frequently puberulous below at the base of the secondary veins and sometimes very slightly over the leaflet surface, especially in the nerve axils; petiole 1–9 cm long, slightly lepidote, puberulous at the leaflet bases. *Inflorescence* a terminal or subterminal raceme of up to 20 flowers, only a few flowers opening at a time, pedicels and rachis

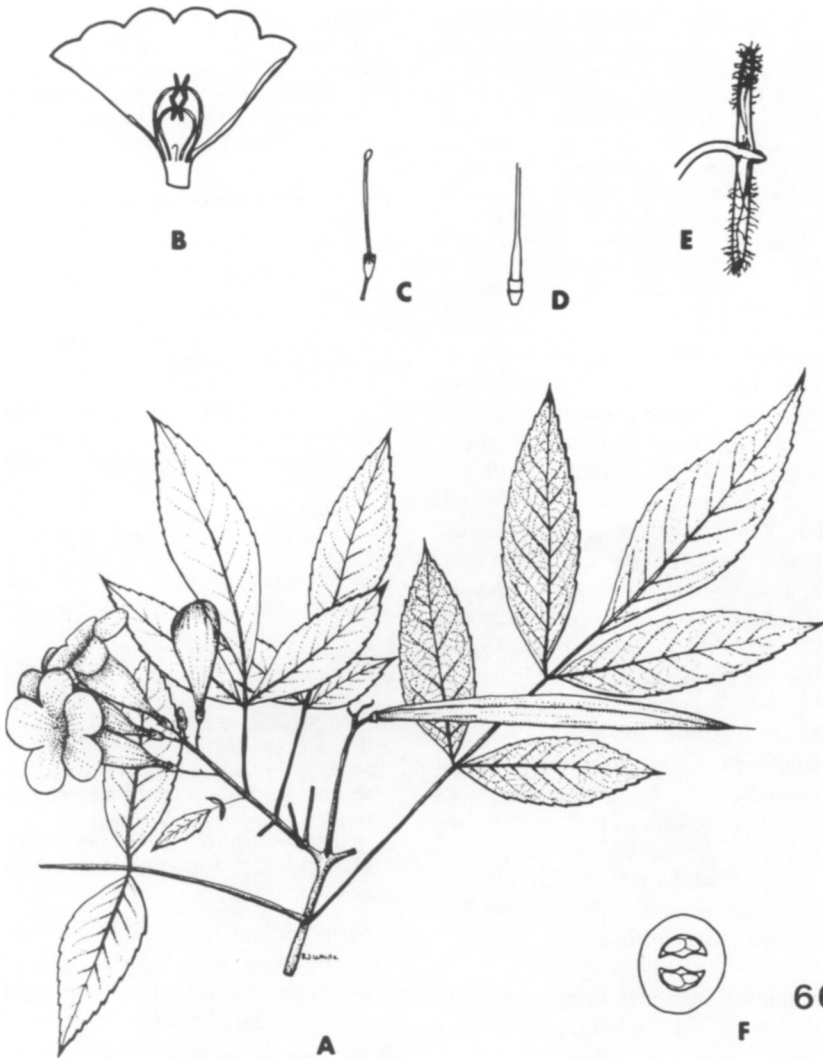


FIG. 66. *Tecoma stans*. A, flowering and fruiting shoot, $\times 0.5$; B, corolla split open, $\times 0.5$; C, calyx and pistil, $\times 0.5$; D, ovary and disk, $\times 1.5$; E, anther, $\times 5$; F, ovary cross section, $\times 12.5$. (From *Flora of Panama*; Gentry 2895.)

lepidote. *Flowers* with the calyx elongate-cupular, evenly 5-dentate, the teeth ca. 1 mm long, apiculate, 3–7 mm long, 3–4 mm wide, somewhat lepidote throughout, the margin ciliate, with conspicuous sunken submarginal glands; corolla yellow (occasionally slightly orangish yellow) with reddish lines in throat, tubular-campanulate above a narrowed 0.9–1 cm long base, 3.5–5.8 cm long, 1.2–2.4 cm wide at mouth of tube, the tube 3–4.3 cm long, the lobes 1–1.5 cm long, glabrous outside, inside glabrous except for gland-

tipped trichomes at level of stamen insertion and twisted trichomes in sinuses and on throat ridges; stamens included, didynamous, the anther thecae divaricate, 3–4 mm long, sparsely pilose; pistil 3–3.5 cm long, the ovary narrowly cylindrical, 3 mm long, 1 mm wide, somewhat glandular-lepidote, the ovules 2-seriate in each locule; disk cupular-pulvinate, 1 mm long, 1 mm wide. *Fruit* a linear capsule, tapering at the ends, subterete when fresh, the calyx caducous, 7–21 cm long, 5–8 mm wide, the surface lenticellate, more or

less glabrous, sometimes slightly and inconspicuously lepidote; seeds 3–5 mm long, 2.4–2.7 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Throughout the range of the species except the northwesternmost part (southern Arizona, Texas, northern Mexico) and parts of the central Andes (especially Ecuador). Mostly from sea level to 1500 m, occasionally to 2200 m or more. Also widely cultivated.

Representative collections examined. UNITED STATES. FLORIDA: Collier Co., Fakahatchee Bay, Shell Island, 2 Apr 1979 (fl), *Lorenz 84* (FTG); Dade Co., Miami, 9 Mar 1975 (fl, fr), *Hill 2533* (CLEMS, FTG); Monroe Co., Key Largo, 25 Oct 1973 (fl), *Correll et al. 40289* (FTG).

MEXICO. BAJA CALIFORNIA: 16 mi S of La Paz, 23 Mar 1935 (fl, fr), *Shreve 7204* (MICH, MO). CAMPECHE: Campeche, Champotou, 19 Oct 1981 (fl, fr), *Chan & Ucan 957* (XAL-M). CHIAPAS: Mun. Ocozocoautla de Espinosa, 1 km N of Ocozocoautla, 25 Sep 1971 (fl), *Breedlove 19829* (DS, MO); Mun. Venustiano Carranza, Acala Pugilitik road, 7 Nov 1967 (fl), *Ton 3242* (DS, MEXU, MSC). COLIMA: 5 mi S of Colima, 26 Nov 1959 (fl), *McVaugh & Koelz 1081* (MICH). DISTRITO FEDERAL: Cerro de Xochitepec, Aug 1969 (fl), *Magana 131* (MO). DURANGO: Tobar, 28 May 1906 (fl), *Palmer 234* (CM, MO). GUERRERO: Galeana, Atoyac, 22 Nov 1937 (fl), *Hinton 10950* (G, LL, MO). HIDALGO: Mun. Jacala, 25 Jun 1939 (fl, fr), *Chase 7147* (MICH, MO). JALISCO: 6 mi NW of Lagos de Moreno, Aug 1975 (fl), *Davidse & Davidse 9943A* (MEXU, MO). MÉXICO: 1 mi N of Ixtapan, Aug 1972 (fl, fr), *Dunn et al. 20441* (MO). MICHOACÁN: Aquila, Distr. Coalco-man, 11 Dec 1941 (fl), *Hinton et al. 16142* (FI, LL, MICH). MORELOS: Cañón de Lobos, 4 Dec 1970 (fl), *Vazquez 2783* (MEXU). NUEVO LEÓN: Alamar to Puerto Blanco, 15 mi SW of Galeana, 23 Jul 1934 (fl), *Mueller & Mueller 1178* (MEXU, MICH). OAXACA: Distr. Teposcolula, camino a Chilapa, 8 Aug 1981 (fl), *Lorence et al. 3713* (MEXU, MO). PUEBLA: 9 km NW of San Lorenzo, Aug 1975 (fr), *Davidse 9311* (MO). QUERETARO: Sin. loc., *Agniel 10336* (MO). QUINTANA ROO: Kohunlich, Othón P. Blanco, 13 Nov 1980 (fl), *Calzada et al. 6897* (XAL-M). SAN LUIS POTOSÍ: 9 km E of Ciudad del Maíz, 2 Oct 1965 (fr), *Roe et al. 2359* (MICH, WIS). SINALOA: Signal Hill, Mazatlán, Sep 1925 (fl), *Mexia 93* (MO). SONORA: San Bernardo, Río Mayo, Oct 1934 (fl, fr), *H. Gentry 1066* (MO, WIS). TABASCO: Between Río Tonalá and Santa Ana, 21 Jun 1963 (fl, fr), *Barlow 32/25* (MICH). TAMAULIPAS: S of Tampico, 11 Nov 1975 (fl, fr), *Lasseigne 4891* (MEXU, MICH, MO). VERACRUZ: Tres Valles, 26 Oct 1967 (fl), *Martínez-Caldéron 1540* (CHAPA, F, MEXU, MICH, MO). YUCATÁN: Chichen Itza, 8 Jun 1932 (fl), *Steere 1062* (MICH). ZACATECAS: Pedernalillo, near Guadalupe, Aug 1948 (fl, fr), *Dressler 279* (MO).

GUATEMALA. BAJA VERAPAZ: Salama, 9 Dec 1946 (fr), *Clover 9605* (MICH). EL PROGRESO: 39 km E from Guatemala City, Feb 1970 (fl), *Harmon & Fuentes 1835*

(MO). GUATEMALA: Near Amatitlán, Dec 1938 (fl), *Standley 61419* (F, MO). HUEHUETENANGO: Río San Juan Ixtan, E of San Rafael Petzal, Jan 1941 (fr), *Standley 82860* (F, MO). PETÉN: Lake Petén Itza between San José and Chachaclun, 24 Jan 1971 (fl, fr), *Contreras 10384* (F, LL). SACATEPEQUEZ: Finca El Hato, NE of Antigua, Dec 1938 (fl), *Standley 61211* (F, MO). ZACAPA: Gualán, Jan 1905 (fl), *Deam 383* (MO).

EL SALVADOR. AHUACHAPÁN: Vic. Ahuachapán, Jan 1922 (fl), *Standley 19904* (MO). SAN SALVADOR: Apulo, Lago Ilopongo, 20 Oct 1950 (fl), *Rohweder 3262* (MO). SONSONATE: Nahuizalco, Feb 1898 (fl), *Hatman 117* (FI).

HONDURAS. CHOLUTECA: Bella Vista, 17 Nov 1946 (fl), *Williams & Molina 10876* (F, MICH, MO). COMAYAGUA: Between Siguatepeque and Villa Chiquas, Sep 1974 (fl), *Hazlett 2035* (MO). EL PARAÍSO: 20 km N of Morolica, 17 Mar 1982 (fl, fr), *Hughes & Styles 107* (MO). FRANCISCO MORAZÁN: 5 mi E of Tegucigalpa, 2 Aug 1946 (fl), *Williams & Molina 10202* (F, LL, MICH). ISLAS DE LA BAHÍA: Isla de Roatán, 13 Mar 1978 (fr), *Nelson & Romero 4526* (MO). LA PAZ: Río Viejo, Cani, 5 Mar 1971 (fl), *Zambrano & Hernández 5341* (MO). YORO: Santa Rita de Yoro, 21 Apr 1971 (fl), *Hernández & Mancías 1083* (MO).

NICARAGUA. CHINANDEGA: Chinandega, 12 Jan 1903 (fl), *Baker 2303* (A, G, K, L, MO). ESTELÍ: 99 km N of Estelí, 25 Dec 1978 (fl, fr), *Stevens 11229* (MO). GRANADA: Isla Zapatera, Sta. María a El Bambu, 24 Jan 1982 (fl, fr), *Sandino 2129* (MO). LEÓN: Quebrada de Agua & El Portillo, 21 Sep 1980 (fl), *Stevens & Montiel 17887* (MO). MADRÍZ: Cerro Quisuca, 22 Nov 1979 (fl), *Stevens & Grijalva 16103* (MO). MANAGUA: Lake Managua near Managua, Feb 1922 (fl), *Greenman & Greenman 5667* (MO). MASAYA: Parque Nacional Volcán Masaya, 29 Sep 1977 (fr), *Stevens 4275* (MO). MATAGALPA: Entrada a Terrabona, 20 Feb 1981 (fl), *Moreno 7090* (MO). NUEVA SEGOVIA: 3 km E de San Fernando, 16 Jan 1982 (fl), *Moreno 14505* (MO). RIVAS: Isla de Ometepe, Los Rodeos y Los Mojones, 14 Mar 1981 (fl), *Sandino 598* (MO). ZELAYA: Cerro Waylawas, 16 Mar 1978 (fr), *Stevens 7403* (MO).

COSTA RICA. ALAJUELA: 8 mi SW of San Ramón, 23 Jan 1968 (fl), *Wilbur & Stone 9925* (LL, MO, PAN). CARTAGO: Santa Rosa, Turrialba, 16 Jun 1967 (fl), *Córdoba 657* (USJ). GUANACASTE: Playas del Coco, 30 Jan 1969 (fl, fr), *Gentry 354* (MO, WIS). HEREDIA: Río Virilla, 20 Dec 1937 (fl), *Allen 558* (CR, MO). PUNTA RENAS: Boruca, Dec 1891 (fl, fr), *Tonduz 4731* (CR, G, US). SAN JOSÉ: Río Torres pres San Francisco, 4 Jan 1893 (fl, fr), *Tonduz 7298* (BM, CR, US).

PANAMA. CANAL ZONE: Sosa Hill, 10 Dec 1971 (fl), *Gentry 2895* (MO). Chiriquí: Boquete, 2 Aug 1969 (fl), *Sánchez 9* (PAN). COCLÉ: Santa Clara Beach, 7 Aug 1938 (fr), *Woodson et al. 1704* (A, MICH, MO). COLÓN: Culebra Island, 10 Oct 1961 (fl, fr), *Duke 4633* (MO, US). DARIÉN: NE of Garachine, 4 Feb 1972 (fl, fr), *Gentry 4057* (MO). LOS SANTOS: Playa de La Concepción, 24 Dec 1966 (fl, fr), *Burch et al. 1259* (F, GH, K, MO, NY, PA, PAN, SCZ, UC, US). PANAMÁ: San José Island, 5 May 1945 (fr), *Erlanson 75* (GH, US).

BAHAMAS. Harbour Island, 29 Dec 1969 (fl, fr), *Lewis 7533* (MO). INAGUA: Sin. loc., 12 Mar 1890 (fl),

Hitchcock s.n. (MO). New Providence, 3 Sep 1952 (fl), *Reis 237* (MICH).

CUBA. HABANA: Near Habana, 14 Dec 1904 (fl), *Curtiss 565* (G, HBG, L); Río Bacunayagua, 60 m, 6 Jul 1985 (fr), *Gentry 50853* (MO). CIENFUEGOS: Playa El Inglés between Cienfuegos and Trinidad, 7 Nov 1954 (fl), *Hatheway 1045* (B). MATANZAS: Matanzas, Jan 1849 (fl, fr), *Rugel 59* (L, MO). SANTIAGO DE CUBA: Santiago de Cuba, 18 Oct 1916 (fl), *Ekman 7962* (MO, S).

CAYMAN ISLANDS. GRAND CAYMAN: *Proctor 15085* (IJ).

JAMAICA. MANCHESTER: Round Hill, 4 Feb 1980 (fl), *Gentry & Kapos 28379* (MO). ST. ANDREW: Hope River plain 1 mi E of Mona, 16 Oct 1957 (fl), *Yuncker 17096* (G, MICH). ST. ELIZABETH: 1 mi E of Black River, 20 Feb 1963 (fl, fr), *Adams 12279* (UCWI). ST. JAMES: Vic. of Montego Bay, *Maxon & Killip 1651* (B). ST. THOMAS: Bull Bay, 27 Mar 1961 (fl, fr), *Adams 924* (UCWI).

HAITI. Derrière de Port-au-Prince, 27 May 1979 (fl), *D'Arcy 13381* (MO); Morne l'Hôpital, 15 Feb 1942 (fl), *Holdridge 986* (MICH, MO).

DOMINICAN REPUBLIC. BARAHONA: 12 km S of Cabral, 11 Apr 1985 (fl), *Gentry & Mejia 50689* (MO). PEDERNALES: Aceitillar, Sierra de Barouca, 30 km N of Pto. Cabo Rojo, 12 Apr 1985 (fl), *Gentry & Mejia 50786* (MO); San Juan, N of San Juan, 9 Sep 1946 (fl), *Howard & Howard 8856* (MICH). SANTIAGO: Valle del Cibao, Las Lavas, 1 Nov 1930 (fl), *Ekman H16094* (B, LL).

PUERTO RICO. Mun. Guayama, 19 Nov 1985 (fl, fr), *Taylor 6483* (MO); Fajardo Pt., Apr 1965 (fl, fr), *Wagner 826* (FI).

VIRGIN ISLANDS. St. Croix, 23 May 1923 (fl, fr), *Thompson 41* (G). St. Thomas, Pollyberg, 15 Jul 1880 (fl), *Eggers 107* (B, FI, G, L). Tortola, south side of Chalwell, 21 Oct 1965 (fl), *D'Arcy 261B* (MO).

LEEWARD ISLANDS. ANTIGUA: Orange Valley, 17 Oct 1937 (fl), *Box 1179* (BM, MO). GUADELOUPE: Basse-Terre, 30 Apr 1974 (fl), *Sastre & Sastre 2749* (MO, P). SABA: Ladder, 21 Apr 1885 (fl), *Suringar s.n.* (L).

WINDWARD ISLANDS. DOMINICA: St. Joseph Parish, Tarou Cliffs, 27 Oct 1964 (fl), *Nicholson 1859* (MO, US). GRENADA: St. Georges, 9 Nov 1904 (fl), *Broadway s.n.* (MO). MARTINIQUE: Sin. loc., Dec 1867 (fl, fr), *Hahn 254* (FI, G, L). ST. LUCIA: Soufrière, 14 Jul 1945 (fl), *P. Beard 1173* (MO).

SOUTHERN DUTCH ANTILLES. CURAÇAO: Hato plantage, 13 Jan 1885 (fl), *Suringar s.n.* (L).

COLOMBIA. ANTIOQUIA: Medellín, Quebrada la Hueso, *Uribe-Urbe 1180* (COL). ATLÁNTICO: Puerto Colombia, 7 Jan 1948 (fl), *Barkley & Gutierrez 1861* (NY). BOLÍVAR: Isla de Baru entre Santa Ana y Playa Mojana, 25 Aug 1986 (fr), *Cuadros & Gentry 3056* (JBGP, MO). BOYACÁ: Valle de Soata, *Cuatrecasas & Garcia-Barriga 1062* (COL). CUNDINAMARCA: Hacienda Patasia, Pacho, *Garcia-Barriga 12540* (COL). HUILA: 6 km SE de Altamira, Jan 1974 (fr), *Gentry et al. 9003* (COL, MO). MAGDALENA: Santa Marta, 1898 (fl), *H. Smith 346* (G, L, LL, MICH, MO). SANTANDER: Entre Málaga y Concepción, Río Servita, *Cuatrecasas*

& *Garcia-Barriga 9359* (COL). TOLIMA: 40 km E de Chaparral, *G. Smith 1315* (COL). VALLE: Río Dagua Valley W of Lobo Guerrero, 26 Mar 1986 (fr), *Gentry et al. 53587* (CUVC, MO).

VENEZUELA. ARAGUA: Maracay, 6 Aug 1963 (fl), *Montaldo 3540* (MO, MV). CARABOBO: Valencia, 15 Aug 1920 (fl), *Pittier 9031* (VEN). DISTRITO FEDERAL: Guaira a Caracas, entre Ojo de Agua & El Paujil, 1 Feb 1925 (fl, fr), *Pittier 11671* (G, VEN). FALCÓN: Bolívar, 2–4 km W of Carrizalito, 19 Oct 1985 (fl), *Van der Werff & Wingfield 7463* (MO). GUÁRICO: San Juan de Los Morros, 16 Feb 1953 (fl, fr), *Gines 2325* (MV). LARA: Cerca de Barquisimeto, 1 Jun 1925 (fl), *Saer 244* (VEN). MÉRIDA: Estantes, 11 Nov 1953 (fl, fr), *Little 15866* (VEN). MIRANDA: Near Cua, 6 Mar 1974 (fl, fr), *Gentry 10227* (MO). MONAGAS: Near Guanaguana, 24 Oct 1948 (fl), *Maguire et al. 27238* (NY). NUEVO ESPARTA: El Valle, 18 Jul 1901 (fl, fr), *Miller & Johnston 220* (MO, NY, US). SUCRE: Paria Península betw. Guacuco and Guarataro, 2 Dec 1979 (fl), *Steyermark & Liesner 120990* (MO). ZULIA: Maracaibo, 16 Jun 1977 (fr), *Bunting 5166* (MO).

TRINIDAD. Patos Island, 26 Jun 1932 (fr), *Broadway 8958* (MO).

PERU. AMAZONAS: 13 km N of Leimebamba, valley of Río Utcubamba, 17 Jun 1978 (fl), *Gentry et al. 23240* (MO, USM). APURÍMAC: Río Chalhuanca, 14–17 km NW of Chalhuanca, 25 Jun 1978 (fl, fr), *Gentry et al. 23351* (MO, USM). LAMBAYEQUE: S of Olmos on old Pan American Hwy., 11 Jun 1987 (fl, fr), *Gentry & Díaz 58340* (MO, USM).

BOLIVIA. CHUQUISACA: H. Siles, Monteagudo, 11 Mar 1981 (fr), *Beck 6406* (MO). COCHABAMBA: Valle de Cochabamba, Prov. Cercado, Apr 1966 (fl), *Steinbach 25* (MO). SANTA CRUZ: Prov. Andrés Babiñez, 11 km S of Santa Cruz, 25 Aug 1987 (fl, fr), *Nez 35754* (MO, NY). TARIJA: Prov. O'Connor, 7 km NW of Entre Rios, 3 May 1983 (fl), *Solomon 10433* (MO).

ARGENTINA. CATAMARCA: Andalgalá, Oct 1915 (fl), *Jorgensen 1525* (MO). JUJUY: Ledesma, Calilegua, 15 Oct 1963 (fl), *Fabris 4427* (LP); San Pedro, Río San Francisco, 10 Oct 1929 (fl, fr), *Venturi 9559* (LP, MO). SALTA: Parque Nacional El Rey, 25 Sep 1985 (fl), *Gentry et al. 51804* (MO). SANTIAGO DEL ESTERO: Capital, camino al Parque Aguirre, 2 Nov 1950 (fr), *Job 2777* (LP). TUCUMÁN: Tucumán, Oct 1941 (fl), *Borsini 18236* (B, FI, MO).

Common names. Mexico: west coast (Sinaloa to Guerrero): tronadora, trompeta, gloria, trompetilla, corneta amarilla, retamo, retama, estamasuchil; Oaxaca: palo de arco, tulasuchil; eastern and east-central region (Tamaulipas to Chiapas): san pedro, flor de san pedro, angel, borla de san pedro; Yucatan Peninsula: sauco amarillo, flor amarillo, (Maya) canlol, canlol-che, kanlo, kanlol; Puebla (Nahuatl): nixtamalazo, nixtamaxochitl, nextamalxochitl. Guatemala: timboco, timboque, San Andres, barreto (Jutiapa), chacte (Quecchi). El Salvador: tache, tasto,

San Andres, marchucha, tagualaishte. Nicaragua: flor amarilla, sardinillo. Costa Rica: vainilla, candelillo. Panama: copete. British Antilles: trumpet flower, yellow elder. Virgin Islands: ginger thomas. Cuba, Puerto Rico: roble amarillo, sauco amarillo. Colombia: fresno, chirlobirlos, palo hueso. Venezuela: fresnillo, flor amarillo, Maria Luisa. Peru: huaranhuai. Argentina: garrocha, garanguay amarillo, guarán-guarán.

This species is widely cultivated as an ornamental and is the national flower of the Bahamas. The wood was formerly used for making bows in Mexico (Standley, 1926). The roots have been used as a diuretic and also to make beer in Mexico; a decoction of flowers and bark is used for stomach pains; also used as an antisyphilitic and vermifuge and to cure diabetes (Standley, 1926).

A form from Jujuy, Argentina (e.g., *Eyerdam & Beetle 22342*, *Schreiter 5117*) is reported to have the corolla reddish orange; this form also has a more narrowly campanulate corolla than typical *T. stans*, has the anthers held fairly near the tube mouth, and has a preponderance of simple and 3-foliolate leaves. It might represent hybridization with *T. garrocha*.

11b. *Tecoma stans* var. *angustata* Rehder, Mitt.

Deutsch. Dendrol. Ges. **1915**: 227. 1915. Type. United States. Texas: El Paso, *Jones 4187* (A).

Stenolobium incisum Rose & Standley, Contr. U.S. Natl. Herb. **26**: 174. 1913. Type. Mexico. Chihuahua, *Pringle 960* (US).

Tecoma incisa (Rose & Standley) I. Johnston, J. Arnold Arb. **21**: 264. 1940.

Stenolobium tronadora Loesner, Feddes Repert. **16**: 210. 1919. Type. Mexico. Durango, *Palmer 131* (lectotype, MO).

Shrub or small *tree* 1–5 m tall. Differs from typical *T. stans* in the narrower more sharply and deeply serrate leaflets, these narrowly lanceolate to almost linear, usually long-acuminate, 1.6–7(–10) cm long, 0.4–1.5(–1.9) cm wide, sometimes in part deeply pinnatifid and the leaf thus sub-bipinnate.

Distribution (Fig. 65). Occupies the northwestern extreme of the range of *T. stans* in southernmost Arizona, the Big Bend area of Texas, and northern Mexico (Chihuahua, Coahuila, Durango, Baja California, Nuevo León, Sonora, Zacatecas).

Representative collections examined. UNITED STATES. ARIZONA: Pima Co., Quinlan Mts., 3500 ft,

8 Oct 1944 (fl), *Gould et al. 2827* (MO); Santa Cruz Co., Santa Catalina Mts., 3000–4000 ft, 30 Jul 1881 (fl), *Pringle 13817* (MO). NEW MEXICO: Floridas, 30 Aug 1895 (fr), *Mulford 1112* (MO); Dona Ana Mts., 28 Oct 1906 (fr), *Standley s.n.* (MO). TEXAS: Brewster Co., Chisos Mountains, Blue Creek Canyon, 1370 m, 30 Jun 1931 (fl, fr), *Moore & Steyermark 3296* (MO). El Paso Co., below El Paso, 17 Aug 1846 (fl, fr), *Wislizenus 98* (MO). Hudspeth Co., Eagle Peak, 7 Jul 1943 (fl), *Waterfall 4911* (MO). Jeff Davis Co., 14 mi SE of Kent, 14 Jun 1938 (fl), *Ownbey & Ownbey 1632* (MO). Presidio Co., 20 mi N of Lajitas, Fresno Canyon, 29 May 1938 (fl), *Cutler 1894* (MO).

MEXICO. BAJA CALIFORNIA: 4 mi SE of Triunfo, Distr. del Sur, 18 Feb 1947 (fl, fr), *Constance 3163* (LL, MEXU, MO). CHIHUAHUA: Base de Sierra de La Campana, 80 km N de Chihuahua, 19 Oct 1974 (fl, fr), *Rzedowski 32329* (CHAPA, MEXU). COAHUILA: Hwy. 53, 5 mi E of El Puesto Toes Caminus, NW of Muzquiz, 3 Aug 1971 (fl), *Reveal et al. 2599* (MEXU, MICH). DURANGO: 33 mi W of Bermejillo, road to Zarca, Jun 1946 (fl, fr), *Morley 629* (FI, MO). NUEVO LEÓN: Rancho Resendez, Lampazos, Jun 1937 (fr), *Edwards 340* (MO). SINALOA: Mesquite, 21 Nov 1933 (fl, fr), *H. Gentry 924M* (MICH). SONORA: Río de Bavispe, La Palmita betw. Granados and Bacadehuachi, 7 Jul 1940 (fl, fr), *White 2926* (MEXU, MICH). ZACATECAS: Puerto de la Paja, 20 km WSW of Valparaiso, 30 Oct 1963 (fl, fr), *Feddema 2251* (MICH, MO).

Common names. Palo de arco (Chihuahua, Sonora), tronadora (Durango, Zacatecas).

This narrow-leafleted form intergrades with typical *T. stans* in central Mexico and perhaps does not even merit varietal status.

11c. *Tecoma stans* var. *velutina* A. de Candolle, Prodr. **9: 224. 1845. Syntypes. Cultivated in Hort. Madrid, de Mexico (G-DC), cultivated in Jard. Sarme (G-DC).**

Tecoma mollis Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. **3**: 144. 1819. Type. Mexico. Guanajuato, *Humboldt & Bonpland s.n.* (P).

Tecoma sorbifolia Humboldt, Bonpland & Kunth, Nov. gen. sp. pl. **3**: 144. 1819. Type. Ecuador. *Humboldt & Bonpland XVII* (holotype, B-WILLD).

Stenolobium molle (Humboldt, Bonpland & Kunth) Seemann, J. Bot. **1**: 91. 1863.

Gelseminum molle (Humboldt, Bonpland & Kunth) Kuntze, Rev. gen. pl. **3(2)**: 245. 1898.

Tecoma fabrisii T. Meyer, Lilloa **33**: 12. 1968. Type. Argentina. Salta: Dep. Santa Victoria, entre Toldos y Río Condado, 2 Mar 1951, *T. Meyer 17951* (LIL, not seen).

Identical to *T. stans* var. *stans* except for more pubescence throughout, especially the leaflets which are velutinous below. The leaflets also tend to be more subcoriaceous and less acuminate than in typical *T. stans*.

Distribution. An occasional to frequent variant in the Mexican and Guatemalan range of *T. stans*, mostly 1500–2600 m, rarely as low as 1000 m. In South America, where it has often been considered specifically distinct, it is restricted to the Andes, mostly from western Venezuela and Colombia to northern Peru, sporadically south to northernmost Argentina, mostly at higher altitudes (1500–2800 m in Peru and Ecuador, as low as 1200 m in Colombia and Venezuela) than *T. stans* var. *stans*.

Representative collections examined. **MEXICO.** CHIAPAS: 3 mi NW of Comitán, 10 Aug 1962 (fl), Webster et al. 12941 (LL, MEXU, MICH, MO). DISTRITO FEDERAL: Guadalupe, Valle de Mexico, 8 Jun 1866 (fl, fr), Bourgeau 36 (B, C, L, M, NY). GUANAJUATO: 26 km ESE de Tarimoro, Mun. Tarmoro, 14 Oct 1974 (fl), Flores 175 (MEXU). GUERRERO: Dto. de Alarcón, Buenavista de Cuellar, Nuñez s.n. (MEXU). HIDALGO: 10 km E de Ixmiquilpan, 26 Aug 1965 (fl), Gonzalez Q. 2895 (LL, MICH, MSC). JALISCO: Near Guadalajara, 16 Oct 1889 (fl), Pringle 2428 (M, MEXU, MO, MSC, NY). MÉXICO: Volcán, Temascaltepec, 11 Mar 1932 (fl), Hinton 2483 (MO). MICHOACÁN: Morelia, 26 Oct 1911 (fl, fr), Arsène et al. 6047 (B, NY). MORELOS: Near Yautepec, 21 Nov 1903 (fl), Pringle 11661 (C, L, LL, MO). OAXACA: 18 km SE de Miahuatlan, 16 Feb 1965 (fl, fr), Rzedowski 19667 (MEXU, MICH). QUERETARO: 80 km NE of Queretaro, road to Pinal de Amoles, 24 Apr 1949 (fl, fr), McVaugh 10344 (G, LL, MEXU, MICH, MO). SAN LUIS POTOSÍ: SW de Venadito, Mpio de Zaragoza, 12 May 1957 (fl), Rzedowski 8701 (MICH). VERACRUZ: Acultizincó, 1 May 1937 (fl), Matuda 1108 (MEXU, MICH, MO). ZACATECAS: 14 km N of Valparaíso, Mun. Valparaíso, 8 Jun 1971 (fl, fr), González G. 350 (MEXU).

GUATEMALA. EL PROGRESO: La Cumbre, 11 Dec 1943 (fl, fr), Vera-Santos 2685 (MICH). GUATEMALA: Antigua, 1905 (fl, fr), Kellerman s.n. (MICH). IZABÁL: Agua Caliente, Mar 1922 (fl, fr), Greenman & Greenman 5963 (MO). QUEZALTENANGO: Quezaltenango (fl), Standley 84819 (F, G). SACATEPEQUEZ: 2 mi SW of Alotenango, 26 Jul 1977 (fl, fr), Croat 42000 (MO).

COLOMBIA. ANTIOQUIA: Río Cauca Valley, 29 km NW de Antioquia, 9 Oct 1977 (fl), Gentry & León 20310 (COL, MO). CAUCA: Popayan, 23 Feb 1937 (fl), Sneider 1242 (G). CUNDINAMARCA: 3 km NW de Guaduas, 5 Mar 1977 (fl), Gentry et al. 18062 (MO). HUILA: San Agustín and vic., 1 Jan 1943 (fl), Schultes & Villarreal 5316 (MO, U). NARIÑO: Río Mayo Valley near Cauca border, 26 Apr 1980 (fl), Gentry 28796 (MO). SANTANDER: Rentería et al. 691 (NY). VALLE: Entre Piendamó y Tunia, 28 Apr 1969 (fl, fr), Espinal & Ramos 3532 (CUVC, MO).

VENEZUELA. MÉRIDA: Carretera La Azulita-Ejido, 4 Apr 1950 (fl, fr), Velasco & Ramia 646 (MV). TACHIRA: 3 km from La Grita, road to Tovar, 8 Oct 1965 (fl), Breteler 4637 (CUVC, MG, MO, VEN).

ECUADOR. AZUAY: Chullabamba: 10 km N of

Cuenca, 6 Oct 1981 (fl), Dodson & Dodson 11612 (MO). CHIMBORAZO: Cañón of the Río Chanchán near Hui-gra, 7 May 1945 (st), Camp E-3132 (MO). IMBABURA: Hacienda Piman, between Ibarra and Chota, 27 May 1973 (fl, fr), Holm-Nielsen et al. 6522 (MO). LOJA: Vilcabamba-Yangana, km 12–15, 21 Apr 1980 (fl, fr), Harling & Andersson 18455 (MO). PICHINCHA: Mitad del Mundo, 3 Mar 1974 (fl), Gentry 10225 (MO). TUNGURAHUA: Above Puela, 14 Apr 1939 (fl), Pentland & Summers 411 (MO).

PERU. APURIMAC: Abancay, Curahuasi, 17 Dec 1975 (fl, fr), Chavez A. 3375 (MO). CAJAMARCA: Olmos y Jaén, abra Porculla, 8 Oct 1986 (fl, fr), Díaz 2085 (MO, USM). CUZCO: Anta, Limatamba, 21 Feb 1948 (fl), Vargas C. 7072 (MO). PIURA: 40–43 km E of Olmos on road to Pucara, 10 Jun 1978 (fr), Gentry et al. 22662 (MO).

BOLIVIA. COCHABAMBA: Machaco-Río Ayucaya, 140 km N de Cochabamba, 30 May 1980 (fl), Muhlbauer s.n. (MO). LA PAZ: Prov. Inquisivi, 6 km SE of Inquisivi, 18 Mar 1988 (fl, fr), Nee 36698 (MO, NY); Sorata, Feb 1886 (fl), Rusby 1128 (MICH, MO, NY, WIS).

ARGENTINA. SALTA: Orán, Quebrada El Cebilar, 8 Dec 1972 (fr), Marunak et al. 514 (LP, MO, WIS); Santa Victoria, betw. Condado and Toldos, 12 Feb 1956 (fl), Hjerting et al. 217 (C, LP).

Common names. Mexico: tronadora. Guatemala: timbaco. Ecuador: cholán, fresno. Peru: ciarhirachero, huaranhuai.

The extremes seem distinct enough for specific recognition and in South America this pubescent-leaved form has often been treated as *T. sorbifolia*. Restricted to the Andes from western Venezuela to northwest Argentina, it is both ecologically and geographically separated from the more glabrescent-leaved typical *T. stans* through most of its range. Although the South American distributional pattern might suggest specific or at least subspecific recognition, similarly pubescent-leaved forms of *T. stans* also occur in Mexico where they certainly warrant no more than varietal recognition, since intermediate degrees of pubescence are also common. Similarly, in Argentina there are intermediates (e.g., topotypic Hjerting et al. 217 (LP)) between the pubescent extreme, there known as *T. fabrisii*, and typical *T. stans*.

12. *Tecoma tanaeciiiflora* (Kränzlin) Sandwith, Kew Bull. 1953: 455. 1954.

Stenolobium tanaeciiiflorum Kränzlin, Bot. Jahrb. 54, Beibl. 119: 22. 1916. Type. Peru. Arequipa: Aplao, near Chuquibamba, Weberbauer 6844 (B*, lectotype, US; isotypes, GH, MO).

Shrub 3 m tall, the branchlets puberulous and minutely lepidote. *Leaves* simple, closely and rather obtusely serrate, narrowly elliptic to oblong-lanceolate, apically obtuse or rounded, basally cuneate or rounded, 1–5.5 cm long, 0.3–2.2 cm wide, scattered lepidote punctate above and below, puberulous along midvein above and below, also minutely puberulous along margin, chartaceous, drying olive, the petiole 0.5–2 cm long, puberulous. *Inflorescence* a terminal raceme, rather densely puberulous with stiffish suberect trichomes. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1 mm long teeth apiculate, 5–6 mm long, 3–4 mm wide, minutely lepidote and sparsely puberulous, also with a few large plate-shaped glands; corolla orange-red (presumably), salverform-tubular with a ca. 1.5 cm long poorly differentiated basal tube, the upper part of tube not at all or very slightly curved, gradually expanded apically, 5.5–6 cm long, 0.8–1 cm wide at mouth of tube, the tube 5–5.5 cm long, the lobes ca. 5 mm long, the tube outside sparsely minutely lepidote, otherwise glabrous or very sparsely and inconspicuously scurfy puberulous, pubescent inside at stamen insertion, the lobes strongly ciliate, also pilose around margins and especially in and below sinuses inside, the inner surface conspicuously glandular-lepidote; stamens subexserted, the anthers held exactly at level of mouth, the thecae divaricate, 3–4 mm long, glabrous, the minute connective slightly extended; pistil ca. 5.5 cm long, the ovary linear, 5–6 mm long, minutely lepidote; disk annular-pulvinate, 0.7 mm long, 1.5–2 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx persistent, 7–8 cm long, 6 mm wide, inconspicuously lepidote; *seeds* thin, bialate, 4–5 mm long, 9–12 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Narrowly endemic to the Chuquibamba area of Arequipa Department, Peru, at ca. 1400 m altitude; perhaps also the Sierra de Aguas Blancas in Bolivia.

Collections examined. PERU. Sin. loc., 5 Feb 1928 (fl), *Poole 1151* (B). AREQUIPA: Aplao, 1400 m, below Chuquibamba, *Weberbauer 6844* (GH, MO, US).

BOLIVIA. ? Sierra de Aguas Blancas, 2200 m, 5 Feb 1928 (st), *Troll 1151* (B).

Apparently a very rare species, well characterized by the unique combination of narrowly tubular, presumably hummingbird-pollinated, flowers and simple leaves. It is just possible that

this is a hybrid between *T. arequipensis* and *T. sambucifolia*. Except for the simple leaves, all of the unusual characters for a hummingbird-pollinated species (mostly relating to the greater pubescence of vegetative and floral parts) are typical of *T. sambucifolia* and other yellow-flowered species. Macbride (1961) included several more or less sympatric collections with partially compound leaves in this species and Weberbauer (quoted by Kränzlin, 1916) reported pinnate-leaved plants growing near the type. The seed bodies of the type collection are unusually small for the genus and could be infertile, another indication that the type might be part of a hybrid complex. On the other hand, discovery of a similarly simple-leaved and unusually pubescent plant in Bolivia might suggest that the distinctive combination of characters that distinguishes this species is stabilized, since there is no obvious reason that simple leaves and unusually strong pubescence should be associated in the absence of genetic continuity. It is also possible that the sterile Bolivian collection represents an unusual extreme of one of the yellow-flowered species (see discussion under *T. castanifolia*). Clearly more collections are needed to resolve the status of *T. tanaeciflora*¹.

13. *Tecoma tenuiflora* (A. P. de Candolle) Fabris, *Revista Mus. La Plata, Secc. Bot.* **9**(43): 306. 1965.

Bignonia tenuiflora A. P. de Candolle, *Prodr.* **9**: 166. 1845. Type. Bolivia. *D'Orbigny 481* (P) (F neg. 39936).

Gelsemium amoenum O. Kuntze, *Rev. gen. pl.* **3**(2): 245. 1898. Type. Bolivia. Santa Cruz. Same as var. a, i.e., *G. amoenum* var. *tomentosum*.

Gelsemium amoenum O. Kuntze var. *pubescens* O. Kuntze, *Rev. gen. pl.* **3**(2): 245. 1898. Type. Bolivia. Santa Cruz: Sierra de Santa Cruz, 1600 m, *Kuntze s.n.* (NY).

Gelsemium amoenum O. Kuntze var. *tomentosum* O. Kuntze, *Rev. gen. pl.* **3**(2): 245. 1898. Type. Bolivia. Sierra de Santa Cruz, 1600 m, *Kuntze s.n.* (NY).

Stenolobium amoenum (O. Kuntze) K. Schumann, *Just's Bot. Jahreshb.* **26**(1): 372. 1899.

Shrub 1–2.5 m tall, the branchlets slightly lepidote to minutely puberulous. *Leaves* pinnate, (3–)5–13-foliolate, the leaflets sharply and closely serrate with the tooth tips oriented toward leaflet apex, elliptic, apically acute to acuminate,

¹ The Bolivian material will be described as *T. beckii* A. Gentry.

basally cuneate to rounded, membranaceous to chartaceous, the laterals 0.5–4.5 cm long, 0.2–1.9 cm wide, equal-sized, the terminal slightly larger (to 5 × 2.5 cm), scattered lepidote especially below, also puberulous below at least along main veins and sometimes sparsely over surface, above glabrous except along puberulous midvein to scattered puberulous, the rachis slightly marginate but unwinged, the petiole mostly 1–2 cm long, puberulous, the lateral petiolules absent or to 1 mm long. *Inflorescence* a terminal raceme or several racemes in axils of uppermost leaves (occasionally paniculate with two racemose lower branches), puberulous. *Flowers* with the calyx cupular, evenly 5-denticulate, the 1–3 mm long teeth long apiculate, 3–6 mm long (including teeth), 2–3 mm wide, sparsely lepidote, otherwise glabrous to puberulous with flexuous trichomes; corolla red or dark red-orange, narrowly salverform-tubular, slightly and gradually expanded apically (4–)5–6.5 cm long, 0.7–0.9 cm wide at mouth of tube, the tube 4–6 cm long, the lobes 0.4–0.7 cm long, completely glabrous outside and inside, the lobes ciliate, also slightly puberulous in sinuses; stamens subexserted, held at or just below mouth of tube, the thecae divaricate, 3 mm long, glabrous or with a very few inconspicuous trichomes, the connective apiculate extended 1 mm; pistil 4–6 cm long, the ovary linear-oblong, 3 mm long, 1 mm wide, glabrous; disk cupular-pulvinate, 0.5 mm long, 1 mm wide. *Fruit* a linear capsule, tapering at ends, the calyx caducous, 6–10(–15) cm long, 6–10 mm wide, glabrous or with a few inconspicuous lepidote scales, also with scattered inconspicuous lenticels; *seeds* thin, bialate, 5–7 mm long, 12–15 mm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Southern Bolivia and northwestern Argentina, 1400–2500 m.

Representative collections examined. BOLIVIA. CHUQUISACA: Azero, Carandayti, 13 Apr 1977 (fl, fr), *Krapovickas & Schinini 31290* (LP, MO); Zudanez, Tarabuco 7 Mar 1981 (fl, fr), *Beck 6233* (MO). TARIJA: Mendez, 10 km SW of Tomatas, 10 May 1983 (fl, fr), *Solomon 10626* (MO).

ARGENTINA. JUJUY: Santa Barbara, entre Santa Clara y El Fuerte, 21 Nov 1970 (fl), *Cabrera & Fabris 21046* (LP); Capital, Sierra de Zapla, 15 Nov 1980 (fl), *Cabrera et al. 32047* (MO). SALTA: Santa Victoria, Los Toldes, 22 Apr 1968 (fl, fr), *Fabris & Crisci 7342* (LP). SANTA FE: Dep. Anta, Las Lajitas a Lumborras, 4 Dec

1971 (fl), *Parada et al. 589* (MCNS). SANTIAGO DEL ESTERO: Dep. Guasayan, Sierra de Guasayan, Sta. Catalina to Lavalle, 25 May 1980 (fr), *Pedersen 12833* (CTES).

Common names. Guarán colorado, guaranguay del cerro.

Very close to *T. rosifolia* of northern Peru from which it differs in a straighter corolla tube, more acute, thinner, lateral leaflets, usually glabrous below, and a caducous calyx in fruit. The northernmost collections (e.g., *Beck 6233, 6263, and 6748*) from Santa Cruz and Chuquisaca Departments of Bolivia are intermediate. They have leaflets more coriaceous and densely puberulous below, that differ from those of *T. rosifolia* (but not from *Angulo 2063* nor *Nee & Vargas 37445*) only in sharper serrations and more acute apices.

14. *Tecoma weberbaueriana* (Kränzlin) Melchior, Ber. Deutsch. Bot. Ges. **59**: 26. 1941.

Stenolobium weberbauerianum Kränzlin, Bot. Jahrb. **54**, Beibl. **119**: 23. 1916. Type. Peru. Piura: E of Piura, 700 m, *Weberbauer 6005* (lectotype, GH; isotype, US).

Shrub 1.8–2.5 m tall; branchlets terete, glabrous. *Leaves* mostly 3-foliolate, simple at base of some inflorescences, the leaflets serrate, lanceolate-elliptic, acute, cuneate at base, minutely scattered lepidote, otherwise glabrous, sometimes puberulous beneath, the terminal leaflet usually more or less attenuate at base, 2.5–12 cm long, 0.7–4.5 cm wide, the lateral leaflets sessile or subsessile, petiole 1.5–3.5 cm long, glabrous or puberulous. *Inflorescence* compounded of several terminal racemes. *Flowers* with the calyx cupular, evenly 5-dentate, the teeth ca. 1 mm long, 3–3.5 mm long, 2–3 mm wide, variously pubescent from essentially glabrous to scattered lepidote to sparsely pilose; corolla yellow, tubular campanulate above a narrowed base, 3–3.5 cm long, 1–1.2 cm wide at mouth of tube, the tube 2.5–3 cm long, the lobes 0.5–1 cm long, lobes glabrous except for ciliate margins, the tube glabrous outside, puberulous with short inconspicuous trichomes in floor of throat and at level of stamen insertion; stamens didynamous, the anther thecae divaricate, 2–2.5 mm long, the connective slightly extended; pistil with ovary narrowly cylindrical, 2–3 mm long, 1 mm wide, glabrous; disk cupular-pulvinate, 0.5 mm long, 1 mm wide. *Fruit* a linear capsule, acute at both ends, somewhat flattened, 10–18 cm long, 5–6

mm wide, finely striate, glabrous; *seeds* thin, bilobate, 0.4–0.5 cm long, 1.5–2.1 cm wide, the wings hyaline-membranaceous, sharply demarcated from seed body.

Distribution (Fig. 65). Algarrobal vegetation of dry coastal region of northwestern Peru (Piura and Tumbes) and adjacent Ecuador; 150–500 m alt.

Representative specimens examined. **ECUADOR.** GUAYAS: Capeira, N of Guayaquil, 15 Sep 1981 (fl), *Dodson & Dodson 11238* (MO). **LOJA:** Catacocha-Macara, 50 km SW of Catacocha, 8 Feb 1977 (fl), *Harling et al. 15158* (MO).

PERU. LAMBAYEQUE: Lambayeque, Pampa de Olmos, *Ferreya 12199* (MO, USM); 14 km S of Olmos along Pan Am. Hwy., 9 Jun 1978 (fl), *Gentry et al. 22533* (MO). **PIURA:** Entre Canchaque y Serran, *Ferreya et al. 10941* (MO, USM).

This species is intermediate between *T. castanifolia* and *T. stans* and may be no more than a distinctive geographic race of the latter characterized by 3-foliolate leaves. Where *T. weberbaueriana* and *T. castanifolia* grow together near Guayaquil (Dodson & Gentry, 1991) *T. weberbaueriana* appears to be a larger tree while the much commoner *T. castanifolia* is uniformly shrubby. In northwestern coastal Peru this is the common form of *Tecoma*, but there are also occasional pinnate-leaved plants referable to *T. stans*. Although the corolla and calyx of *T. weberbaueriana* are smaller than typical for *T. stans*, there is some overlap and specific recognition of the former is very tentative.

REJECTED SPECIES

Tecoma lateriflora Martius, *Flora* 24, Beibl. 2: 51. 1841. Type. Brazil. Minas Gerais: *Martius 532* (holotype, M; isotypes, G-DC, NY). = *Cuspidaria lateriflora* (Martius) A. P. de Candolle.

Tecoma moritziana Kränzlin, *Feddes Repert.* 17: 218. 1921. Type. Venezuela. Bolívar: Palmar, *Moritz 238* (not seen). = *Arrabidaea grosourdyana* (Baillon) Sandwith.

Tecoma setulosa Grisebach, *Cat. pl. cub.* 193. 1866. = *Cordia leucosebastiana* Grisebach.

ZEYHERIA

23. *Zeyheria* Martius, *Nov. gen. spec. pl.* 2: 65. 1826. Type species. *Zeyheria montana*.

Zeyheria Martius corr. A. P. de Candolle, *Biblioth. Univ. Genève* 14. 1838.

Shrubs to trees, the bark often rather thick and vertically fissured, lacking pseudostipules or interpetiolar glandular fields, the branchlets stellate pubescent. *Leaves* palmately (3–)5-foliolate, usually with sessile basal leaflets, strongly discolorous, densely tannish or grayish stellate tomentose below. *Inflorescence* a dichotomously branched terminal panicle with conspicuous linear bracts. *Flowers* brownish or tannish outside, yellowish to dark orangish or purplish inside, the calyx bilabately split to near base, the corolla not contracted to narrower tube at base, the lobes narrow and almost valvate in bud, densely stellate-tomentose outside, glabrous inside except at stamen insertion; stamens didynamous, the thecae divergent to divaricate, glabrous, the filaments glabrous or pubescent; style glabrous or sparsely pubescent, the ovary globose to ellipsoid, densely stellate-pilose, sometimes stipitate, the ovules multiseriate in each locule; disk puberulous, annular-pulvinate at base of stipe or fused with base of ovary. *Fruit* a round to broadly obovoid capsule, slightly compressed, densely tannish tomentose, verrucose with spine-like enations; *seeds* thin, more or less orbicular with the hyaline wing surrounding the rather large body.

A South American genus of two species, mostly in drier parts of sub-Amazonian Brazil but ranging west to Bolivia.

Although usually spelled *Zeyhera* (following de Candolle 1838, 1845 and Bureau & K. Schumann, 1897), the original spelling is *Zeyheria*.

Key to Species

1. Leaves thick-membranaceous, the lower surface whitish-gray with intricately raised tertiary venation; corolla broadly campanulate, <1.5 cm long; fruit >9 cm wide; deciduous forest. 2. *Zeyheria tuberculosa*.
1. Leaves coriaceous; lower surface tan with tertiary venation obscured by indument; corolla tubular-cylindric, >2.5 cm long; fruit <6 cm wide; cerrado. 1. *Zeyheria montana*.

1. *Zeyheria montana* Martius, *Nov. gen. sp. pl.* 2: 66. Apr–Jun 1826. Type. Brazil. Minas Gerais, *Martius 533* (lectotype, M; isotype, G); syntypes. Brazil. São Paulo, *Martius 956* (BR, G, G-DC, K, L, NY).

Bignonia digitalis Vellozo, Fl. flumin. 251. 1829. Type illustration. Brazil. Campis apricis mediterraneis trans-alpinis. Icon. Fl. flumin. 6: t. 47. 1831.
Spathodea montana (Martius) Sprengel, Syst. Veg., ed. 16, 4(2): 237. 1827.
Zeyhera velloziana Miens, Proc. Roy. Hort. Soc. 3: 201. 1863, nom. nov. for *Bignonia digitalis* Vellozo.
Jacaranda quinquefolia Steudel ex A. de Candolle, Prodr. 9: 233. 1845, nom. nud., pro. syn.
Zeyhera digitata ("Vellozo") Hoehne, Ind. Bibl. Num. Pl. Col. Com. Rondon. 365. 1952, non *Zeyhera digitata* (E. Meyer) Miquel, Flora 25: 431. 1842.
Zeyhera digitalis (Vellozo) L. B. Smith & Sandwith, Kew Bull. 1953: 455. 1954.

Shrub or *subshrub* 1–3 m tall; the branchlets subtetragonal, tending to be somewhat 4-sulcate, tannish-tomentose with stellate trichomes. *Leaves* 5-foliolate, the leaflets oblong-obovate to narrowly elliptic-oblong or oblanceolate, obtuse to acutish at apex, the base broadly cuneate to asymmetrically truncate, 4–25 cm long, 1–9 cm wide, entire, coriaceous, the tertiary venation subappressed above, hardly apparent below from the very dense tomentum, above slightly lepidote, sparsely stellate puberulous mostly near the main veins, below very densely stellate-tomentose, drying strongly discolorous, dark olive above, pale tan below; petiole 3–25 cm long, longitudinally striate-ridged, densely tannish stellate, the petiolules 0–5 cm long, the lateral pair usually very reduced. *Inflorescence* a dichotomously branching terminal panicle with a well-developed central axis, stellate-tomentose, each dichotomy subtended by a puberulous linear bract 0.5–2 cm long. *Flowers* tannish or brownish outside, yellow inside, the calyx irregularly 2–3-dentate, bilabiate split to near base on at least one side, 12–20 mm long, densely tannish stellate tomentose; corolla rather thick, tubular-cylindric, the tube very slightly narrowed toward base, 2.5–5 cm long, 0.7–1.5 cm wide at mouth of tube, the tube 2–4 cm long, the lobes 0.5–1 cm long, narrow and almost valvate in bud, tube and lobes densely stellate tomentose outside, inside mostly glabrous, stiff-pilose at stamen insertion, also papillose-surfaced below insertion; filaments sparsely pilose, the bases expanded and more densely pilose, the anthers subexserted, slightly divergent, pendulous, ca. 3 mm long; ovary ellipsoid above a 2–3 mm long basal stipe, densely puberulous, ca. 4 × 3 mm, the stipe merging into a puberulous annular disk 1 mm long and 3 mm wide. *Fruit* an orbicular capsule, with a well-

developed 1–1.5 cm long basal stipe, 3.5–6 cm long (without stipe), 3–6 cm wide, ca. 1.5 cm thick, densely tannish stellate-tomentose, the surface verrucose from irregular short spine-like projections; *seeds* thin, suborbicular, to 3.5 cm in diam., the large round body completely surrounded by an hyaline-membranaceous wing.

Distribution (Fig. 67). Brazilian shield, where mostly restricted to the cerrado and allied formations, 350–1000 m elevation.

Representative specimens examined. BRAZIL. BAHIA: Espigão Mestre, 6 Mar 1972 (fl), *Anderson et al.* 36710 (MO, NY, UB); 3 km N of Rio de Contas, Jan 1974 (fl), *Harley 15374* (K, M, MO). DISTRITO FEDERAL: Aguas Emendadas, 21 Jan 1978 (fl), *Gentry 21418* (MO); Chapada da Contagem, 30 km NE of Brasilia, 19 Sep 1965 (fl), *Irwin et al.* 8476 (COL, NY). GOIÁS: Chapada dos Veadeiros, 7 km N of Alto Paraiso, 4 Mar 1973 (fl), *Anderson et al.* 6271 (MO, NY, UB). MARANHÃO: São João dos Patos, 1 May 1978 (fl), *A. Fernandes & Mattos s.n.* (EAC3866) (EAC). MATO GROSSO: Rio Araguaia, 2 km NE of Xavantina, 7 Jun 1966 (fl), *Irwin et al.* 16708 (MO, NY). MINAS GERAIS: 1 km E of Rio Pandeiros, road to Januaria, 18 Apr 1973 (fl), *Anderson 9124* (MO, NY, UB); sin. loc., Apr 1840 (fl), *Clausen s.n.* (F, G, L, NY). PARÁ: Santa Cruz dos Martiros, reg. do Araguaia, 16 Jun 1953 (fl), *Froes 30063* (IAN). PARANÁ: Pico de Cajuru, 15 km SE of Jahuaraiava, 4 Mar 1966 (fl), *Lindeman & Haas 1452* (MO). PIAUÍ: Asreite, *Luetzelburg 1405* (M). São Paulo: 10 km SSE de São Jose dos Campos, *Mimura 281* (G, NY, UB, WIS).

Common names. Mandioquinha do campo, Bolsa de pastor.

One of the most characteristic cerrado species, easily distinguished from *Z. tuberculosa* by its larger flowers and smaller fruits and stature.

2. *Zeyheria tuberculosa* (Vellozo) Bureau, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1893: 115. 1893. Fig. 68.

Bignonia tuberculosa Vellozo, Fl. flumin. 251. 1829. Type illustration. Brazil. Rio de Janeiro: Pharmacopolis. Icon. Fl. flumin. 6: t. 46. 1831.
Jacaranda tuberculosa (Vellozo) Steudel, Nomencl. bot., ed. 2, 1: 795. 1841.
Zeyhera kuntzei K. Schumann in Kuntze, Revis. gen. pl. 3(2): 246. 1898. Type. Bolivia. Velasco, *Kuntze s.n.* (not seen).

Shrub or *tree* 3–20 m tall, to 25 cm dbh with thick vertically fissured bark; branchlets subtetragonal, rather thick and corky, when young tomentose with stellate trichomes, glabrescent. *Leaves* (3–)5-foliolate, the leaflets oblong-ob-

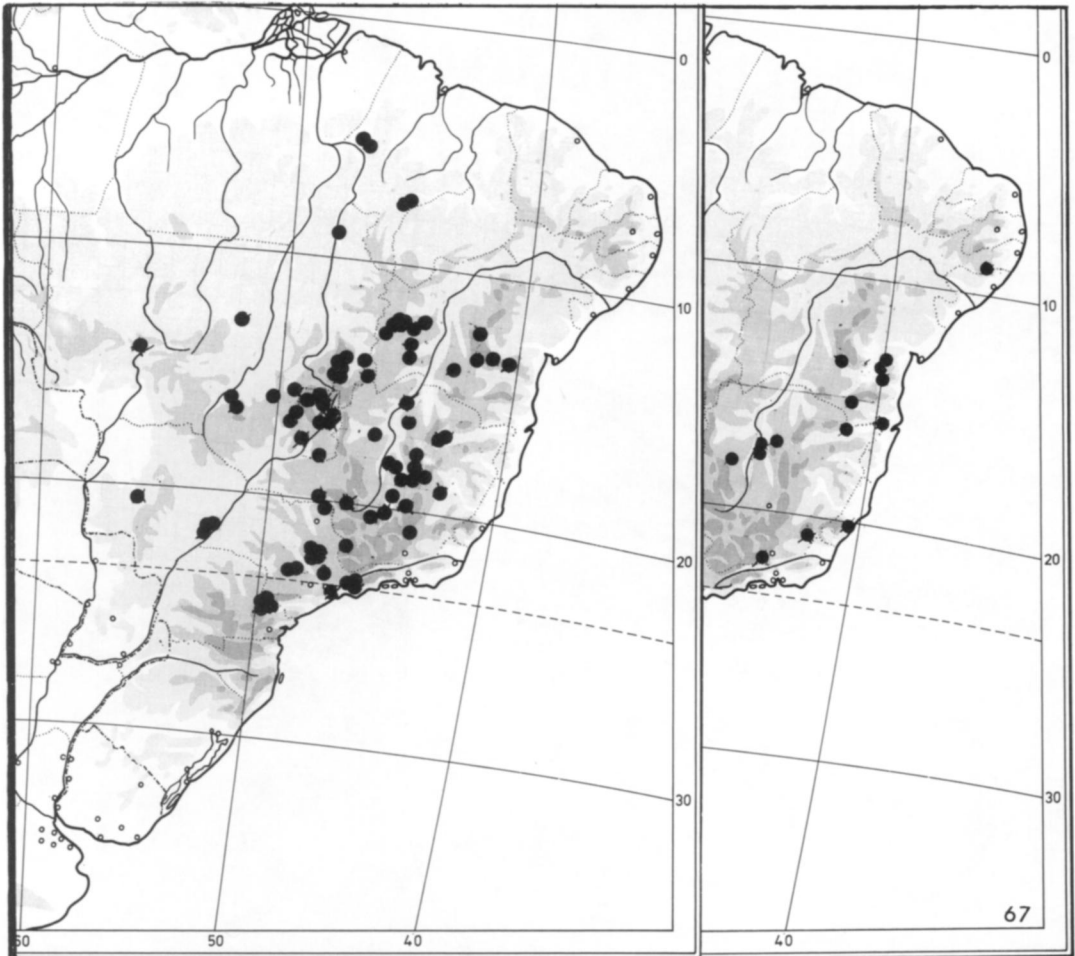


FIG. 67. Distribution of *Zeyheria*. A, *Z. montana*. B, *Z. tuberculosa*. (Recent collection from Santa Cruz, Bolivia not mapped.)

ovate, obtuse to cuspidate-acuminate at apex, rounded to truncate at base, 4–18 cm long, 2–9.5 cm wide, entire or very remotely and irregularly subserrate toward apex, thick-membranaceous, minutely and intricately bullate with the tertiary venation impressed above and raised below, densely puberulous below with stellate and dendroid trichomes, above more sparsely puberulous with stalked-stellate trichomes, drying strongly discolorous, dark olive above, pale grayish below; petiole 4–20 cm long, tannish puberulous with stellate trichomes, the petiolules 0.3–4.5 cm long, the lateral pair usually very reduced. *Inflorescence* a broad dichotomously

much-branched terminal panicle, densely stellate puberulous, each dichotomy subtended by a puberulous linear bract 0.5–2 cm long. *Flowers* brownish or tannish to yellowish outside, orange to somewhat reddish or purplish inside, the calyx bilabiate split to base, each lobe ovate, acute, 4–5 mm long, densely but somewhat glabrescently stellate tomentose; corolla broadly campanulate without a narrow basal tube, rather bilabiate with narrow lobes, 1–1.5 cm long, 0.8–1 cm wide at mouth of tube, the tube 0.8–1 cm long, the lobes 0.3–0.4 cm long, tube and lobes densely stellate-tomentose outside, glabrous inside; filaments glabrous, inserted near tube base,

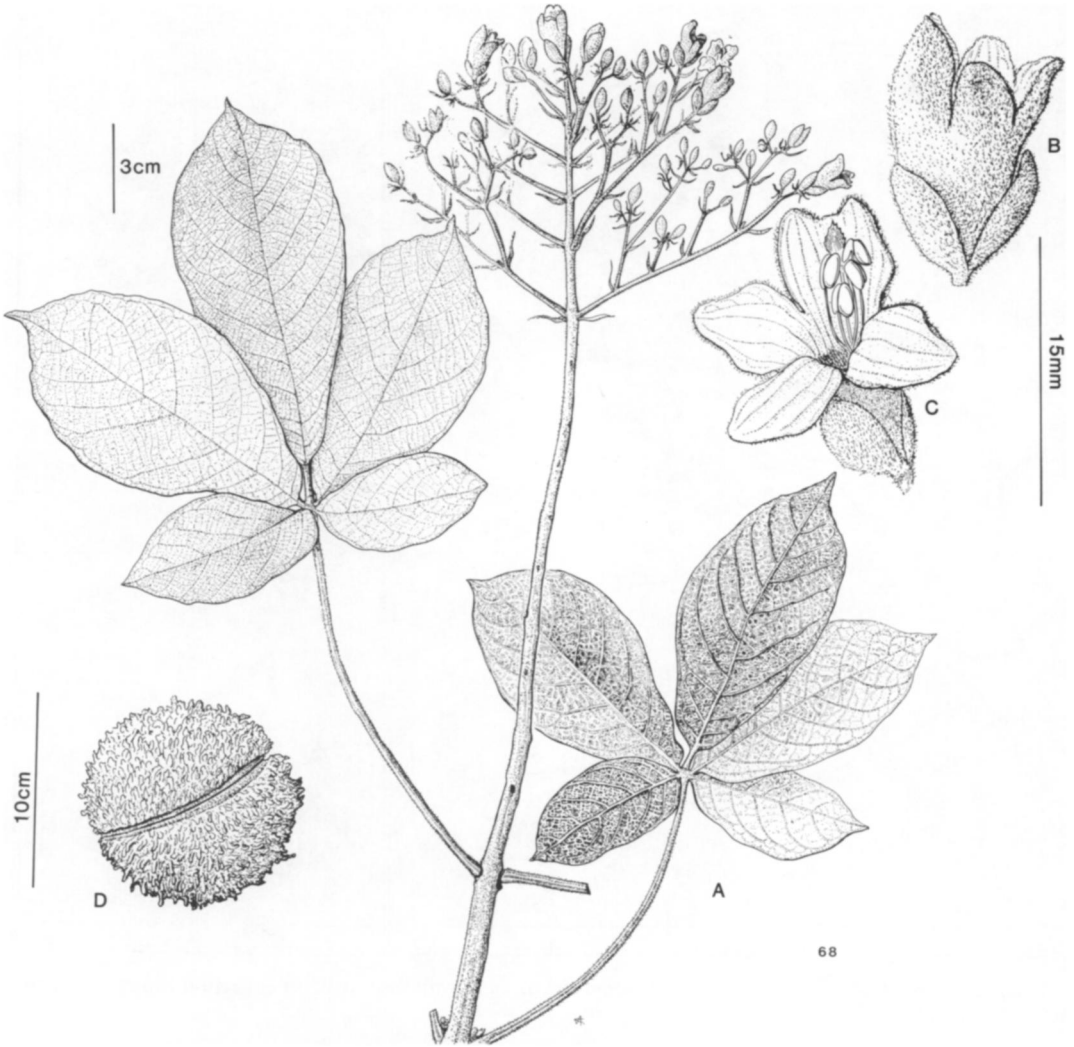


FIG. 68. *Zeyheria tuberculosa*. A, flowering shoot; B, C, flowers; D, fruit. (A–C, *Suares dos Santos* 2556; D, *Krapovickas & Schinini* 37105.)

the anther thecae divaricate, thick, ca. 1 mm long; ovary broadly obovoid, densely stellate-pilose, ca. 2 mm long and wide; disk not obviously differentiated from base of ovary. *Fruit* a broadly obovoid to round capsule, somewhat compressed, 9–13 cm long, 9–11 cm wide, ca. 4 cm thick, covered with numerous irregularly projecting soft spiny enations to 1 cm long, the surface tannish stellate tomentose; *seeds* thin, elliptic to suborbicular, to 4 cm long and 5 cm broad, the large round seed body 1.5–2 cm in diam., with a distinctly verrucose surface, surrounded

on three sides by broad hyaline-membranaceous wing with strong brownish striations in basal part.

Distribution (Fig. 67). Deciduous “mata atlantica” forests of southeastern Brazil from São Paulo to Pernambuco; apparently disjunct in Bolivia; 50–1000 m elevation.

Representative specimens examined. BRAZIL. BAHIA: Encruzilhada, Rio Parod, 23 May 1968 (st), *Belém 3615* (IAN, MO, NY); 6 km from Maracas, Contendas do Sincora, 14 Feb 1979 (fl), *Mattos-Silva et al. 243* (NY). CEARÁ: Viçosa do Ceará, Serra da Ibiapaba, 14 Jun 1979 (fl), *A. Fernandes et al. s.n. (EAC6490)* (EAC).

ESPÍRITO SANTO: Vitoria para Linhares, 19 Feb 1965 (fl), *Duarte 8832* (MO, NY). **MARANHÃO:** BR230, estrada para Pastos, S. João dos Patos, 20 Apr 1980 (fl), *A. Fernandes & Nunes s.n. (EAC8458)* (EAC). **MINAS GERAIS:** Varzea da Palma, Faz. de Mãe d'Água, 25 Nov 1962 (fl), *Duarte 7412* (MO, RB). **PERNAMBUCO:** Quipapa, Uzina Agua Branca, 12 Jul 1950 (fl), *Lima 50-585* (IPA, MO). **PIAUI:** Depois do Pontão, limite Maranhão/Piauí, 21 Feb 1979 (fl), *A. Fernandes et al. s.n. (EAC5633)* (EAC). **SÃO PAULO:** Santa Genebra Forest Reserve, near Campinas, 26 Aug 1987 (st), *Gentry & Silva 58676* (MO).

BOLIVIA. SANTA CRUZ: Prov. Andres Babiñez, 6 km NW of Terevinto, 17°41'S, 63°25'W, 450 m, 29 Aug 1987 (fr), *Nee & Coimbra 35842* (MO).

Common names. Brazil: culhoes de bode, ipe branco, buxo de boi. Bolivia: jopo de mono.

REJECTED SPECIES

Zeyheria surinamensis Miquel, *Linnaea* **18**: 250. 1844. Lectotype. Surinam. Flumen Suriname, *Focke 230* (U, isotype K). = *Paragonia pyramidata* (L. Richard) Bureau.

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NUMERICAL LIST OF TAXA

1. *Argylia*
 1. *A. adscendens* A. de Candolle
 - 1a. *A. adscendens* var. *adscendens*
 - 1b. *A. adscendens* var. *viridis* (Philippi) Gleisner & Ricardi
 2. *A. bifrons* Philippi
 3. *A. bustillosii* Philippi
 4. *A. checoensis* (Meyen) Johnston
 5. *A. farnesiana* Gleisner & Ricardi
 6. *A. geranioides* A. de Candolle
 7. *A. glutinosa* Philippi
 8. *A. potentillifolia* A. de Candolle
 9. *A. radiata* (Linnaeus) D. Don
 10. *A. robusta* Sandwith
 11. *A. tomentosa* Philippi
 12. *A. uspallatensis* A. de Candolle
2. *Astianthus*
 1. *A. viminalis* (HBK.) Baillon
3. *Campsidium*
 1. *C. valdivianum* (Philippi) Skottsberg
4. *Campsis**
 1. *C. radicans* (Linnaeus) Seemann*
5. *Catalpa*
 1. *C. brevipes* Urban
 2. *C. longissima* (Jacquin) Dumont-Courset
 3. *C. macrocarpa* (A. Richard) Ekman ex Urban
 4. *C. purpurea* Grisebach
6. *Chilopsis*
 1. *C. linearis* (Cavanilles) Sweet
 - 1a. *C. linearis* subsp. *linearis* var. *linearis*
 - 1b. *C. linearis* subsp. *linearis* var. *tomenticaulis* Henrickson
 - 1c. *C. linearis* subsp. *arcuata* (Fosberg) Henrickson
7. *Cybistax*
 1. *C. antisiphilitica* (Martius) Martius
8. *Delostoma*
 1. *D. dentatum* D. Don
 2. *D. gracile* A. Gentry
 3. *D. integrifolium* D. Don
 4. *D. lobbii* Seemann
9. *Digomphia*
 1. *D. ceratophora* A. Gentry
 2. *D. densicoma* (Martius ex A. de Candolle) Pilger
 3. *D. laurifolia* Bentham
10. *Ekmanianthe*
 1. *E. actinophylla* (Grisebach) Urban
 2. *E. longiflora* (Grisebach) Urban
11. *Godmania*
 1. *G. aesculifolia* (HBK.) Standley
 2. *G. dardanoi* (J. C. Gomes) A. Gentry
12. *Jacaranda*
 1. *J. acutifolia* Humboldt & Bonpland
 2. *J. arborea* Urban
 3. *J. bracteata* Bureau & K. Schumann
 4. *J. brasiliana* (Lamarck) Persoon
 5. *J. bullata* A. Gentry
 6. *J. caerulea* (Linnaeus) Jussieu
 7. *J. campinae* A. Gentry & Morawetz
 8. *J. carajasensis* A. Gentry
 9. *J. caroba* (Vellozo) A. de Candolle
 10. *J. caucana* Pittier
 - 10a. *J. caucana* ssp. *caucana*
 - 10b. *J. caucana* ssp. *glabrata* A. Gentry
 - 10c. *J. caucana* ssp. *sandwithiana* A. Gentry
 - 10d. *J. caucana* ssp. *calycina* A. Gentry
 11. *J. copaia* (Aublet) D. Don
 - 11a. *J. copaia* ssp. *copaia*
 - 11b. *J. copaia* ssp. *spectabilis* (Martius ex DC.) A. Gentry
 12. *J. cowellii* Britton & Wilson
 13. *J. crassifolia* Morawetz
 14. *J. cuspidifolia* Martius ex DC.
 15. *J. decurrens* Chamisso
 16. *J. duckei* Vattimo
 17. *J. eglei* Sandwith
 18. *J. ekmanii* Alain
 19. *J. glabra* (A. de Candolle) Bureau & K. Schumann
 20. *J. grandifoliolata* A. Gentry
 21. *J. hesperia* Dugand
 22. *J. intricata* A. Gentry & W. Morawetz
 23. *J. irwinii* A. Gentry
 24. *J. jasminoides* (Thunberg) Sandwith

* = non-native taxa.

25. *J. macrantha* Chamisso
 26. *J. macrocarpa* Bureau & K. Schumann
 27. *J. micrantha* Chamisso
 28. *J. microcalyx* A. Gentry
 29. *J. mimosifolia* D. Don
 30. *J. montana* Morawetz
 31. *J. morii* A. Gentry
 32. *J. mutabilis* Hassler
 33. *J. obovata* Chamisso
 34. *J. obtusifolia* Humboldt & Bonpland
 34a. *J. obtusifolia* ssp. *obtusifolia*
 34b. *J. obtusifolia* ssp. *rhombofolia* (G. F. Meyer) A. Gentry
 35. *J. orinocensis* Sandwith
 36. *J. oxyphylla* Chamisso
 37. *J. paucifoliolata* Martius ex A. de Candolle
 38. *J. poitaei* Urban
 39. *J. praetermissa* Sandwith
 40. *J. puberula* Chamisso
 41. *J. pulcherrima* Morawetz
 42. *J. racemosa* Chamisso
 43. *J. rufa* Manso
 44. *J. rugosa* A. Gentry
 45. *J. selleana* Urban
 46. *J. simplicifolia* K. Schumann
 47. *J. sparrei* A. Gentry
 48. *J. subalpina* Morawetz
 49. *J. ulei* Bureau & K. Schumann
13. *Pandorea**
 1. *P. jasminoides* (Lindley) K. Schumann*
14. *Paratecoma*
 1. *P. peroba* (Record & Mell) Kuhlmann
15. *Perianthomega*
 1. *P. vellozoi* Bureau
16. *Podranea**
 1. *P. ricasoliana* (Tanfani) Sprague*
17. *Romeroa*
 1. *R. verticillata* Dugand
18. *Sparattosperma*
 1. *S. catingae* A. Gentry
 2. *S. leucanthum* (Vellozo) K. Schumann
19. *Spathodea**
 1. *S. campanulata* Beauvois*
20. *Spirotecoma*
 1. *S. apiculata* (Britton) Alain
 2. *S. holguinensis* (Britton) Alain
 3. *S. rubriflora* (Leonard) Alain
 4. *S. spiralis* (Wright ex Grisebach) Pichon
21. *Tabebuia*
 1. *T. acrophylla* (Urban) Britton
 2. *T. alba* (Chamisso) Sandwith
 3. *T. angustata* Britton
 4. *T. arianae* A. Gentry
 5. *T. arimaensis* Britton
 6. *T. aurea* (Manso) Bentham & Hooker f. ex S. Moore
 7. *T. bahamensis* (Northrop) Britton
 8. *T. barbata* (E. Meyer) Sandwith
 9. *T. berteroi* (A. de Candolle) Britton
 10. *T. bibracteolata* (Grisebach) Britton
 11. *T. billbergii* (Bureau & K. Schumann) Standley
 11a. *T. billbergii* ssp. *billbergii*
 11b. *T. billbergii* ssp. *ampla* A. Gentry
 12. *T. botelhensis* A. Gentry
 13. *T. brooksiana* Britton
 14. *T. buchii* (Urban) Britton
 15. *T. bullata* A. Gentry
 16. *T. bureavii* Sandwith
 17. *T. calcicola* Britton
 18. *T. caleticana* A. Gentry & D. Albert
 19. *T. capitata* (Bureau & K. Schumann) Sandwith
 20. *T. cassinoides* (Lamarck) A. de Candolle
 21. *T. catarinensis* A. Gentry
 22. *T. chrysantha* (Jacquin) Nicholson
 22a. *T. chrysantha* ssp. *chrysantha*
 22b. *T. chrysantha* ssp. *meridionalis* A. Gentry
 22c. *T. chrysantha* ssp. *pluvicola* A. Gentry
 23. *T. chrysea* Blake
 24. *T. chrysotricha* (Martius ex DC.) Standley
 25. *T. clementis* Alain
 26. *T. conferta* Urban
 27. *T. coralibe* Standley
 28. *T. crispiflora* Alain
 29. *T. cristata* A. Gentry
 30. *T. × delriscoi* Borhidi
 31. *T. densifolia* Urban
 32. *T. dominguensis* (Urban) Britton
 33. *T. donnell-smithii* Rose
 34. *T. dubia* (C. Wright ex Sauvalle) Britton ex Seibert
 35. *T. elegans* Urban
 36. *T. elliptica* (A. de Candolle) Sandwith
 37. *T. elongata* Urban
 38. *T. fluviatilis* (Aublet) A. de Candolle
 39. *T. glaucescens* Urban
 40. *T. guayacan* (Seemann) Hemsley
 41. *T. haemantha* (Bertero ex Sprengel) A. de Candolle
 42. *T. heptaphylla* (Vellozo) Toledo
 43. *T. heterophylla* (A. de Candolle) Britton
 44. *T. hypoleuca* (Wright ex Sauvalle) Urban
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 47. *T. incana* A. Gentry
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 49. *T. jackiana* Ekman ex Urban
 50. *T. lapacho* (K. Schumann) Sandwith
 51. *T. lepidophylla* (A. Richard) Greenman
 52. *T. lepidota* (HBK.) Britton
 53. *T. leptoneura* Urban
 54. *T. linearis* Alain
 55. *T. maxonii* Urban
 56. *T. microphylla* (Lamarck) Urban
 57. *T. moaensis* Britton
 58. *T. multinervis* Urban & Ekman
 59. *T. myrtifolia* (Grisebach) Britton
 59a. *T. myrtifolia* var. *myrtifolia*
 59b. *T. myrtifolia* var. *petrophila* (Greenman) A. Gentry

60. *T. nodosa* (Grisebach) Grisebach
 61. *T. obovata* Urban
 62. *T. obscura* (Bureau & K. Schumann) Sandwith
 63. *T. obtusifolia* (Chamisso) Bureau
 64. *T. ochracea* (Chamisso) Standley
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 64b. *T. ochracea* ssp. *heterotricha* (A. de Candolle) A. Gentry
 64c. *T. ochracea* ssp. *neochrysantha* (A. Gentry) A. Gentry
 65. *T. ophiolitica* Alain
 66. *T. orinocensis* (Sandwith) A. Gentry
 67. *T. pallida* (Lindley) Miers
 68. *T. palustris* Hemsley
 69. *T. paniculata* Leonard
 70. *T. pedicellata* (Bureau & K. Schumann) A. Gentry
 71. *T. pilosa* A. Gentry
 72. *T. pinetorum* Britton
 73. *T. platyantha* (Grisebach) Britton
 74. *T. polyantha* Urban & Ekman
 75. *T. polymorpha* Urban
 76. *T. pulcherrima* Sandwith
 77. *T. pulverulenta* Urban
 78. *T. pumila* A. Gentry
 79. *T. reticulata* A. Gentry
 80. *T. revoluta* (Urban) Britton
 81. *T. rigida* Urban
 82. *T. riodocensis* A. Gentry
 83. *T. rosea* (Bertoloni) A. de Candolle
 84. *T. roseo-alba* (Ridley) Sandwith
 85. *T. sauvallei* Britton
 86. *T. schumanniana* Urban
 87. *T. selachidentata* A. Gentry
 88. *T. serratifolia* (Vahl) Nicholson
 89. *T. shaferi* Britton
 90. *T. simplicifolia* Carabia ex Alain
 91. *T. spongiosa* Rizzini
 92. *T. stenocalyx* Sprague & Stapf
 93. *T. striata* A. Gentry
 94. *T. subtilis* Sprague & Sandwith
 95. *T. trachycarpa* (Grisebach) K. Schumann
 96. *T. uleana* (Kränzlin) A. Gentry
 97. *T. umbellata* (Sonder) Sandwith
 98. *T. vellosi* Toledo
 99. *T. vinosa* A. Gentry
 100. *T. zanonii* A. Gentry
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 1. *T. arequipensis* (Sprague) Sandwith
 2. *T. capensis* (Thunberg) Lindley*
 3. *T. castanifolia* (D. Don) Melchior
 4. *T. cochabambensis* (Herzog) Sandwith
 5. *T. fulva* (Cavanilles) D. Don
 6. *T. garrocha* Hieronymus
 7. *T. guarume* A. de Candolle
 8. *T. nyssae* Oliver*
 9. *T. rosifolia* HBK.
 10. *T. sambucifolia* HBK.
 11. *T. stans* (Linnaeus) Jussieu ex HBK.
 11a. *T. stans* var. *stans*
 11b. *T. stans* var. *angustata* Rehder
 11c. *T. stans* var. *velutina* A. de Candolle
 12. *T. tanaeciflora* (Kränzlin) Sandwith
 13. *T. tenuiflora* (A. de Candolle) Fabris
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 Woodbury, R. O., 594 (21-43); 3426, 3427 (21-86); 4320 (21-41); I-132, I-243 (21-43); W1263 (22-11a); s.n. 01963 (21-86); s.n. (21-9); s.n. (21-86).
 Woodson, R. E., 760 (21-68); 768 (21-40); 1552, 1704 (22-11a).
 Woodworth, R. H., 732 (21-40).
 Woolston, A. L., 852 (21-42); 946 (21-60); 1128 (21-64a); 3236 (21-45).
 Wormer, D., 797 (22-6).
 Worth, 15837, 16265 (1-9); 16402 (1-8); 16476 (1-9); 16535, 16595 (1-1); 16693 (1-1b).

- Worthington, s.n. (21-52).
 Woytkowski, F., 417 (21-19); 5396, 5413, 5498 (12-19); 5600 (7-1); 5951, 6323 (12-19); 6934 (7-1); 6937 (21-64a); 7041 (22-9); 7776 (8-3); 7906 (12-19); 34225, 34225 (8-3); 34414 (12-11b); 34417 (21-88); 34566 (21-22).
 Wright, C., 155=3038 (20-4); 360 (12-2); 386 (21-10); 484, 485 (21-9); 630 (10-2); 1041=3045 (10-1); 1042 (21-17); 1338 p.p. (21-53); 1338 p.p. (21-3); 1338 p.p. (20-3); 1339 p.p. (21-3); 1339 p.p. (21-53); 1339 p.p. (21-10); 1341 p.p., 1341 p.p. (21-44); 1341 p.p. (21-51); 1341 p.p. (21-52); 3029 (21-95); 3034 (12-6); 3037 (21-10); 3038 (20-4); 3039 (21-95); 3040 (22-11a); 3041 p.p. (21-17); 3041 p.p. (21-7); 3042 (21-57); 3043 (21-53); 3044 (10-2); 3045 (10-1); 3047 (21-28); s.n., s.n., s.n. (21-10); s.n. (21-85); s.n. (21-52).
 Wright, Capt., s.n., s.n. (11-1); s.n. (21-83).
 Wullschlaegel, H. R., 339 (21-38); 340 (21-88); 345 (21-43); s.n. (22-2).
 Wunderlin, R. P., 10160 (22-2).
 Wurdack, J. J., 337 (21-48b); 364 (21-33); 515 (8-3); 34152 (9-2); 39464 (12-11b); 39490 (21-83); 39619 (12-34b); 39769 (12-35); 39911 (21-66); 39990 (21-71); 40873 (12-34a); 41172 (21-48a); 41237 (21-88); 41365 (12-35); 41413 (21-64b); 42694 (21-8); 43500 (12-34b); s.n. (21-83).
 Wydler, s.n. (21-43).
 Wynd, F. L., 80, 427 (6-1); 466 (22-11b); 708 (6-1).
 Wynter, L., 2542 (21-43); s.n. 01957 (22-11a).
 Yale, 82 (21-40).
 Yanagizawa, Y., SP8969 (21-64a); s.n. (SP8958) (21-88); s.n. (SP8967) (12-36); s.n. (SP8968) (12-15); s.n. (SP8970) (21-24); s.n. (SP8990) (23-1).
 Yepez-Agredo, F. F., 1035 (11-1).
 Yepez-Agredo, S., 2 (8-3); 368 (22-11c); 695 (12-21).
 Yero, M., 203, 205 (21-34); 585 (20-2); 673 (20-1); 900 (12-2); 26513 (12-6).
 Yjjasz, E., 233 (22-11c).
 Yong, G., 99 (22-11a); 236 (21-64c).
 Young, K., 90 (21-48a); 270 (7-1); 920 (22-10); 1206 (22-9); 1272 (8-3); 2840 (22-10).
 Youngpeter, J., 35 (22-11b); 75 (6-1).
 Yuncker, T. G., 17096 (22-11a); 17105 (22-2); 18127 (22-11a); 18133 (21-83).
 Yunis, E., At015 (22-11a).
 Zabala, S., 381 (22-6).
 Zak, V., 1971 (22-11c); 2600, 2675, 2735 (8-3); 3344 (22-11c).
 Zambrano, M., 5341 (22-11a); 5366 (21-83).
 Zanoni, T., 7033 (12-38); 7188, 7291, 8535, 9788 (10-2); 10765 (21-61); 10815 (21-43); 11408 (21-55); 11415 (21-83); 11492 (21-43); 11875 (12-38); 12304, 12482 (21-9); 12540 (21-80); 12646 (21-9); 12732 (21-1); 12755 (12-38); 12801 (21-1); 13007 (21-43); 13340 (21-1); 13383 (21-9); 14935 (12-29); 14981 (21-28); 15449 (21-61); 15552, 15641 (21-1); 16530 (10-2); 17587 (21-43); 17998 (21-9); 19387 (21-99); 19470 (12-38); 19478 (21-15); 19861 (21-9); 19862, 19957 (21-15); 20082 (21-99); 20369 (21-32); 20523 (12-18); 20808 (21-56); 21168 (21-55); 21623 (21-99); 22131 (21-9); 22256 (21-99); 22976 (21-9); 23478 (12-38); 24025 (21-31); 24735 (21-69); 25189 (10-2); 25306 (21-9); 25390 (12-38); 25593, 25594 (21-9); 25657 (21-26); 26708, 27575 (21-9); 27903 (21-100); 28232, 28332 (21-99); 33181 (21-17); 33225, 33429 (21-26); 33451 (21-43); 33540 (21-61); 33555 (21-17); 33569 (21-43); 35959 (21-100); 36114 (10-2); 36457, s.n. 01982, s.n. 01982 (21-9).
 Zapata, E., 2042 (22-11a).
 Zapata, S., 79 (22-13).
 Zappi, D. C., CF9342 (12-9).
 Zardini, E. M., 91, 119 (1-10); 1290 (21-45).
 Zarucchi, J. L., 1319, 1965, 2100, 2118 (9-2); 2219 (21-62); 3482, 3517 (21-66); 3560 (12-34a); 3582 (21-96); 3621A (12-34a); 3700 (21-8); 3741 (12-11b); 4199 (12-21); 4536 (21-88); 5501 (22-11c); 6426 (12-10a).
 Zaruma, J., 256 (12-11b); 365 (21-22c).
 Zavaleta, P., 8669 (6-1).
 Zegarra Z., R., 273 (22-5); 306 (1-9).
 Zehntner, D., 34 (21-6); 378 (11-2); 597, 2038 (21-45).
 Zelaya, H., 1802, s.n. 01969 (22-11a).
 Zetek, J., 5085 (12-11b).
 Zizumbo, D., 408 (21-45); 469 (22-11a); 576 (21-45).
 Zola B., M. G., 336, 368, 507, 535, 687 (12-29); 736 (22-11a).
 Zollner, O., 9470 (22-5); 10677 (1-1b); 11333, 11668, 12056 (1-9); 12397 (1-1).
 Zuloaga, F. O., 364 (12-29).
 Zumbo, D., 1136 (22-11a).

WOOD ANATOMY OF TECOMEAE¹

by

GRACIELZA DOS SANTOS² AND REGIS B. MILLER³

INTRODUCTION

The wood anatomy of Bignoniaceae has been studied but little, and that mostly over 50 years ago (Record & Mell, 1924; Record & Hess, 1940, 1943). Still today there have been no comprehensive systematic studies undertaken of the anatomy of the secondary xylem in Bignoniaceae. In this chapter the systematic wood anatomy of *Tabebuia* and its close relatives in the tribe Tecomeae, and the potential application of the data obtained to classification of the group are discussed. Intra and inter generic relationships are assessed based on the wood anatomy data. An attempt is made to delimit groups of related taxa within *Tabebuia*.

MATERIALS AND METHODS

Eleven of the 14 arborescent genera of Tecomeae exclusively native to the Neotropics (*Cyrtostax*, *Delostoma*, *Digomphia*, *Ekmanianthe*, *Godmania*, *Jacaranda*, *Paratecoma*, *Romeroa*, *Tabebuia*, *Tecoma* (sensu stricto), and *Zeyheria*) including 139 specimens of 56 species, were examined in the course of this study. No wood specimens were available for *Astianthus*, *Sparatosperryma*, *Spirotecoma* and the mostly north temperate genera *Catalpa* and *Chilopsis* were also

excluded from this study. Most specimens were accompanied by herbarium vouchers which were identified by A. H. Gentry. Available exsiccatae for each species examined are listed in Table I.

The terminology, procedures, and methodology used in this investigation follow those adopted by the International Association of Wood Anatomists (IAWA Committee, 1964; IAWA Committee, 1989). The anatomical descriptions follow Pernia and Miller's (1991) adaptation of the IAWA list of features for hardwood identification to the DELTA system (Dallwitz & Paine, 1986).

Wood anatomical techniques used are those described by Kukachka (1977) and Carlquist (1982). Vessel element length, vessel diameter, libriform fiber (throughout the text called fiber) length, and ray height were measured with sonic digitizer equipment (Quirk, 1981). Twenty-five randomly selected cells were measured for each character on each specimen. Average, minimum, and maximum values were obtained. Vessel element length and fiber length were measured from slides of macerated material while vessel diameters were measured from transverse sections and ray height from tangential sections.

Vessels per mm² (transverse section), rays per linear mm (tangential section) and the number of storied ray tiers per mm (tangential section) were measured with the light microscope. Data were taken from five different fields of the slide for each character of each specimen.

Following Miller (1981) and IAWA (1989), tests for the presence or absence of natural saponins (froth test) and aluminum (chrome azurol-S test) were applied. Burning splinter test, fluorescence of heartwood as well as water and ethanol extracts: fluorescence and color have also been used as an aid for identification. The basic specific gravity was calculated for each sample following Heinrichs and Lassen's (1970) method.

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Table 1
Wood specimens examined

Species ^a	Collector ^b	Collection locality	Herbarium ^c	Xylarium ^d
<i>Tabebuia</i>				
<i>alba</i> (Chamisso) Sandwith	Reitz and Klein 3974	Brazil—Santa Catarina	MAD ^e	SJRw ^f 5199
<i>angustata</i> Britton	J. J. Caw Tree J18	Jamaica	None ^g	MADw 33921
<i>aurea</i> (Manso) Bentham & Hooker	? ^h	Brazil—Para	?	SJRw 38240
<i>aurea</i>	?	?	None	MADw 27569
<i>barbata</i> (E. Meyer) Sandwith	Krukoff 1469	Brazil	NY	MADw 27417
<i>barbata</i>	A. Ducke 153	Brazil	MAD	SJRw 22613
<i>barbata</i>	Maguire Wurdack & Keith 41572	Venezuela	NY	SJRw 52310
<i>berteri</i> (A. de Candolle)	E. C. Leonard 1726	Haiti	US	SJRw 4841
Britton				
<i>berteri</i>	A. Dugand G. 260 B.S.	Colombia	MAD	SJRw 22549
<i>berteri</i>	A. Dugand G. 479	Colombia	MAD	SJRw 23906
<i>berteri</i>	A. Dugand G. 505	Colombia	MAD	SJRw 27078
<i>berteri</i>	A. Gentry; H. Cuadros 68259-5	Colombia	JBGP	MADw 46324
<i>billbergii</i> (Bureau & Schumann)	A. Rimbach 62	Ecuador	MAD	SJRw 20755
Standley				
<i>capitata</i> (Bureau & K. Schumann)	Stahel 114	Surinam	MAD	SJRw 41180
Sandwith				
<i>capitata</i>	Record 580B?	Surinam	MAD	SJRw 5801
<i>capitata</i>	Krukoff 5049	Brazil	NY	MADw 18606
<i>capitata</i>	R. Froes 1975	Brazil	NY	MADw 18506
<i>chrysantha</i> (Jacquin) Nicholson	A. Dugand G. 1011	Colombia	MAD	SJRw 33757
<i>chrysantha</i>	E. L. Little Jr. 6211	Ecuador	MAD	SJRw 40895
<i>chrysantha</i>	E. L. Little Jr. 6631	Ecuador	MAD	SJRw 40985
<i>chrysea</i> Blake	Stern & Chamber 130	Panama	MAD	SJRw 51624
<i>chrysea</i>	A. Dugand G. 711	Colombia	MAD	SJRw 28534
<i>chrysea</i>	H. M. Curran SN	Venezuela	F	MADw 7733
<i>chrysea</i>	A. Dugand G. 74	Colombia	MAD	SJRw 22526
<i>coralibe</i> Standley	A. Dugand G. 693	Colombia	MAD	SJRw 28518
<i>coralibe</i>	A. Dugand G. 460	Colombia	MAD	SJRw 23912
<i>coralibe</i>	R. Espina & J. Giacometto A201	Colombia	MAD	SJRw 20976
<i>coralibe</i>	L. Williams 9007	Mexico	F	MADw 7856
<i>donnell-smithii</i> Rose	L. Williams 9382	Mexico	MAD	JSRw 34830
<i>donnell-smithii</i>	L. Williams 8734	Mexico	F	MADw 27518
<i>donnell-smithii</i>	L. Williams 9458	Mexico	F	MADw 27520
<i>donnell-smithii</i>	L. Williams 9522	Mexico	F	MADw 7792

Table 1
Continued

Species ^a	Collector ^b	Collection locality	Herbarium ^c	Xylarium ^d
<i>dubia</i> (C. Wright ex Sauvalle) Britton ex Seibert	D. Matthews & Wm. Crosby 44	Cuba	MAD	SJRw 9198
<i>fluviatilis</i> (Aublet) A. de Candolle	Luis Carlos B. Lobato 447	Brazil, Para	MG	MADw 46325
<i>haemantha</i> (Bertero ex Sprengel)	Miller 1646 & USW 6073	Puerto Rico	US	SJRw 53921
<i>heptaphylla</i> (Vellozo) Toledo	Stearns 869	Argentina	MAD	MADw 11675
<i>heptaphylla</i>	Whitford 63	Brazil, Espirito Santo	MAD	SJRw 3260
<i>heptaphylla</i>	H. M. Curran 710	Argentina	MAD	SJRw 1717
<i>heptaphylla</i>	M. Noverraz 13	Argentina	MAD	SJRw 14970
<i>heterophylla</i>	J. S. Beard 246	Dominica	GH	SJRw 49519
<i>heterophylla</i>	Stem 2437, USW 35485	Dominica	MAD	MADw 24146
<i>heterophylla</i>	W. L. Stern, D. Wasshausen 2477 USW 35519	Dominica	MAD	MADw 24178
<i>heterophylla</i>	W. P. Dramer 1	Puerto Rico	?	SJRw 1384
<i>heterophylla</i> (A. de Candolle) Britton	Longwood 10	Puerto Rico	RPPR	MADw 17449
<i>heterophylla</i>	Goytia 165	Puerto Rico	Inst. Trop. Forestry	MADw 23169
<i>impetiginosa</i> (Marius ex A. de Candolle) Standley	Krukoff 5637	Brazil	Rio Piedras NY	MADw 19122
<i>impetiginosa</i>	H. N. Whittford & J. Pinzon 6	Colombia	MAD	SJRw 409
<i>impetiginosa</i>	A. Dugand G. 710	Colombia	MAD	SJRw 28533
<i>insignis</i> (Mique) Sandwith	A. Ducek 363	Brazil	MAD	SJRw 40094
<i>insignis</i>	Aitken 990	British Guiana	MAD	SJRw 21128
<i>insignis</i>	Aitken 991	British Guiana	MAD	SJRw 21130
<i>insignis</i>	T. H. Gill 7	British Guiana	MAD	SJRw 12333
<i>insignis</i>	Louisiana State University 48	Guyana	?	MADw 714
<i>lepidophylla</i> (A. Richard) Greenman	Fors 952	Cuba	?	MADw 13966
<i>lepidota</i> (Humboldt Bonpland & Kunth) Britton	Bro. Leon 13306	Cuba	MAD	SJRw 16289
<i>leptoneura</i> Urban	Fors 26	Cuba	MAD	SJRw 13363
<i>maxonii</i> Urban	Abbott 1280	Dominican Republic	GH	MADw 19502
<i>myrifolia</i> (Grisebach) Britton	G. C. Bucher 2	Cuba	MAD	SJRw 15997
<i>nodosa</i> (Grisebach) Grisebach	H. M. Curran 34	Argentina	MAD	SJRw 14990
<i>nodosa</i>	?	Argentina	?	SJRw 1051
<i>obtusifolia</i> (Chamisso) Bureau	Serv. Florestal São Paulo 16	Brazil	?	MADw 11669

Table 1
Continued

Species ^a	Collector ^b	Collection locality	Herbarium ^c	Xylarium ^d
<i>ochracea</i> (Chamisso) Standley	A. Dugand G. 548	Colombia	MAD	SJRw 27086
<i>ochracea</i>	H. M. Curran 2	Brazil	MAD	SJRw 4672
<i>ochracea</i>	H. Pittier 12357	Venezuela	MAD	SJRw 10344
<i>orinocensis</i> (Sandwith) A. Gentry	L. Williams 13809	Venezuela	F	MADw 27491
<i>pulcherrima</i> Sandwith	Reitz, Klein 7263	Brazil	HBR	MADw 18163
<i>revoluta</i> (Urban) Britton	? Tatto 3	Dominican Republic	?	SJRw 8700
<i>rosea</i> (Bertoloni) A. de Candolle	H. Kuylen G. 57	Guatemala	MAD	SJRw 3670
<i>rosea</i>	?	Guatemala	MAD	SJRw 8888
<i>rosea</i>	L. Williams 11115	Cuba	NY	SJRw 9030
<i>rosea</i>	L. Williams 9470	Venezuela	F	MADw 27527
<i>rosea</i>	Steyermark 45923	Mexico	F	MADw 16051
<i>roseo-alba</i> (Ridley) Sandwith	Curran 18	Guatemala	F	MADw 16030
<i>savallei</i> Britton	Fors 1270	Brazil, Bahia	MAD	SJRw 4688
<i>serratifolia</i> (Vahl) Nicholson	H. M. Curran 16	Cuba	?	MADw 14455
<i>serratifolia</i>	?	Brazil	MAD	SJRw 4686
<i>serratifolia</i>	Stahel 101	Brazil	F	SJRw 21239
<i>serratifolia</i>	J. M. Pires	Surinam	MAD	SJRw 41168
<i>serratifolia</i>	Navy Project 498	Brazil	MAD	SJRw 45745
<i>stenocalyx</i> Sprague & Stapf	?	Surinam (Navy Project)	MAD	SJRw 45758
<i>stenocalyx</i>	Bernardi 7106	British Guiana	?	SJRw 43857
<i>stenocalyx</i>	L. Marciano Berti 148	Venezuela	MER	MADw 24289
<i>stenocalyx</i>	A. C. Mith 3497	Venezuela	MER	MADw 23205
<i>stenocalyx</i>	R. S. Cowan 39379	British Guiana	MAD	SJRw 35960
<i>trachycarpa</i> (Grisebacht) K. Schumann	?	British Guiana	MO	SJRw 50111
<i>uleana</i> (Kranzlim) A. Gentry	A. C. Smith 3100	Cuba	?	SJRw 26543
<i>Jacaranda</i>		British Guiana	MAD	SJRw 35799
<i>arborea</i> Urban	Crosby & Mattheus 61	Cuba	MAD	SJRw 9215
<i>caucana</i> Pittier	Stern et al. 743	Panama	MO	SJRw 54717
<i>caucana</i>	J. Cuatrecasas 17661	Colombia	VALLE	SJRw 43254
<i>caucana</i>	A. Dugand 1018	Colombia	MAD	SJRw 33762
<i>caucana</i>	H. M. Curran 162	Colombia	MAD	SJRw 1606
<i>coerulea</i> (Linnaeus) Jussieu	J. G. Jack 7315	Cuba	MAD	SJRw 16766
<i>copaia</i> (Aublet) D. Don	Cabrera 41	Colombia	MAD	MADw 37924
<i>copaia</i>	Cabrera 40	Colombia	MAD	MADw 37923
<i>copaia</i>	Cabrera 42	Colombia	MAD	MADw 37925

Table 1
Continued

Species ^a	Collector ^b	Collection locality	Herbarium ^c	Xylarium ^d
<i>copaia</i>	A. C. Smith 3474	British Guiana	MAD	SJRw 35952
<i>copaia</i>	J. Cuatrecasas 15264	Colombia	MAD	SJRw 42849
<i>obtusifolia</i> Humboldt & Bonpland	?	British Guiana	?	SJRw 46393
<i>obtusifolia</i>	A. C. Smith 3125	British Guiana	MAD	SJRw 35817
<i>obtusifolia</i>	A. C. Smith 2119	British Guiana	MAD	SJRw 35464
<i>obtusifolia</i>	Wurdack & Addley 42694	Venezuela	NY	SJRw 54136
<i>puberula</i> Chamisso	Reitz & Klein 3682	Brazil, Santa Catarina	MAD	SJRw 51988
<i>puberula</i>	O. Handro 28168	Brazil	MAD	SJRw 23445
<i>puberula</i>	?	Brazil, São Paulo	?	SJRw 3140
<i>puberula</i>	H. M. Curran 720	Argentina	MAD	SJRw 1724
<i>Tecoma</i>				
<i>capensis</i> (Thunberg) Lindley	A. Rimbach 832	Ecuador	MAD	SJRw 34183
<i>castanifolia</i> (D. Don) Melchior	?	?	?	SJRw 27574
<i>garrocha</i> Hieronymus	?	Argentina	?	SJRw 32082
<i>stans</i> (Linnaeus) Jussieu ex Humboldt	A. Dugand G. 53	Colombia	MAD	SJRw 22505
<i>stans</i>	Ll. Williams 12254	Venezuela	F	MADw 27571
<i>stans</i>	?	Guatemala	MAD	SJRw 10061
<i>stans</i>	Stern & Brizicky 475	?	MAD	SJRw 51258
<i>stans</i>	A. Rimbach 22	Ecuador	MAD	SJRw 19488
<i>Ekmanianthe</i>				
<i>actinophylla</i> (Grisebach) Urban	Bro. Leon 14358	Cuba	NY	MADw 39399
<i>actinophylla</i>	A. J. Fors 11	Cuba	MAD	SJRw 13572
<i>longiflora</i> (Grisebach) Urban	?	Haiti	?	SJRw 19543
<i>Zeyheria</i>				
<i>montana</i> Martius	Coronel Pacheco 2762	Brazil, Minas Gerais	?	SJRw 42613
<i>tuberculosa</i> (Vellozo) Bureau	Eberhard Schmidt, 143	Bolivia	M	SJRw 50220
<i>Cybisax</i>				
<i>antisyphilitica</i> (Martius) Martius	Reitz, Klein 7354	Brazil	HBR	MADw 21906
<i>antisyphilitica</i>	Schunke 4450	Peru	F, NY, US	MADw 38445
<i>antisyphilitica</i>	?	Brazil, São Paulo	?	SJRw 42602

Table 1
Continued

Species ^a	Collector ^b	Collection locality	Herbarium ^c	Xylarium ^d
<i>Delostoma</i>				
<i>integrifolium</i> D. Don	A. Rimbach 120	Ecuador	MAD	SJRw 22822
<i>integrifolium</i>	M. Acosta-Solis 6694	Ecuador	?	MADw 16619
<i>integrifolium</i>	M. Acosta-Solis 11648-A	Ecuador	F	MADw 27432
<i>Digomphia</i>				
<i>densicoma</i> (Marius ex A. de Candolle) Pilger	Nee 31168	Venezuela	NY	MADw 44266
<i>Godmania</i>				
<i>aesculifolia</i> (Humboldt, Bonpland & Kunth) Standley	Breedlove 9563	Mexico	DS	MADw 23824
<i>aesculifolia</i>	Record & Kuylen 129	Guatemala	MAD	MADw 27438
<i>aesculifolia</i>	L.L. Williams 10233	Venezuela	F	MADw 27439
<i>aesculifolia</i>	Williams 13256	Venezuela	F	MADw 27440
<i>aesculifolia</i>	Record & Kaylen 129	Guatemala	?	SJRw 10080
<i>aesculifolia</i>	A. C. Smith 3368	British Guiana	MAD	SJRw 35913
<i>aesculifolia</i>	L.L. Williams 10233	Venezuela	?	SJRw 36262
<i>aesculifolia</i>	?	Mexico	?	SJRw 48062
<i>Paratecoma</i>				
<i>peroba</i> (Record & Mell) Kuhlmann	World Colombian Exposition 1893	Brazil	?	MADw 27472
<i>peroba</i>	Whitford & Silveira 59	Brazil	MAD	SJRw 3257
<i>peroba</i>	Sterns 1265	Brazil	MAD	MADw 11672
<i>Romeroa</i>				
<i>verticillata</i> Dugand	Romero Castañeda & Jaramillo 3390	Colombia	F	SJRw 49522
<i>verticillata</i>				

^a Species followed by the author's name.^b Refers to the collector and his number.^c Abbreviations follow those recommended by Holmgren et al. (1981) in Index Herbariorum.^d Abbreviations follow those recommended by Stern (1988).^e Refers to the herbarium maintained at the U.S. Forest Products Laboratory, Madison, Wisconsin, which combines the preexistent U.S. Forest Products Laboratory Herbarium with the herbarium formerly at Yale University School of Forestry (Y).^f Refers to the Samuel J. Record Memorial Wood Collection formerly cited as Yw and formerly at Yale University School of Forestry, now maintained at the U.S. Forest Products Laboratory, Madison, Wisconsin.^g Refers to specimens collected without accompanying herbarium material.^h No information is available.

RESULTS

Detailed generic descriptions including macroscopic and microscopic features follow. Genera are arranged in decreasing order by the number of species studied. Table I lists the more important features for fibers and vessel elements and Table II lists the more important macroscopic and ray features. A key to genera/groups of *Tabebuia* is given. Before the generic descriptions, a summary of features common to all the genera is provided.

It is noteworthy to mention that some members of Bignoniaceae are known to have storied structure (Record & Mell, 1924; Record & Hess, 1943; Carlquist, 1988). In this study various degrees of storying have also been reported in several genera of Tecomeae as mentioned in the generic description below. It is known that this variation can be an ontogenetic byproduct, which in this study can not be assured since most xylium wood samples do not contain information on the location along the pith-to-bark radius.

Generic Descriptions

Common features for all the genera

Macroscopic features. Heartwood not fluorescent; chrome azurol-S test negative; froth test negative; and odor indistinct.

Microscopic features. Perforation plates typically simple with occasional occurrence of foraminated type. Intervessel pits alternate, circular, and nonvestured; vessel-ray pitting with a distinct border, similar to intervessel pits in size and shape. Helical thickenings absent in fibers and vessel elements. Fiber pitting simple; vascular or vascentric tracheids absent. Rays not of two distinct sizes. Aggregate rays, sheath cells, tile cells, and perforated ray cells absent; disjunctive ray parenchyma cell walls indistinct. Prismatic crystals, druses, and silica absent. Oil or mucilage cells, intercellular canals, and tubes absent. Included phloem absent.

Key to Genera and to Groups of *Tabebuia*

- | | |
|--|--|
| 1. Rays heterocellular. | 2 |
| 1. Rays homocellular. | 5 |
| 2. Fibers septate. | 3 |
| 2. Fibers not septate. | 4 |
| 3. Rays 2–5 cells wide, 5–9 per mm; fibers 945–1145 μm in length; vessel elements 408–531 μm in length. | <i>Delostoma</i> . |
| 3. Rays 2–3 cells wide; 8–15 per mm; fibers 625–742 μm in length; vessel elements 209–286 μm in length. | <i>Tecoma</i> . |
| 4. Vessels angular in transverse section; rays very high, up to 686 μm ; small intervessel pits, 3–4 μm in diameter. | <i>Romeroa</i> . |
| 4. Vessels circular in transverse section; rays relatively short, up to 400 μm ; large intervessel pits, 8–14 μm in diameter. | <i>Jacaranda puberula</i> . |
| 5. Lapachol present. | 6 |
| 5. Lapachol absent. | 10 |
| 6. Lapachol abundant; parenchyma abundant forming large, sometimes concentric bands. | 7 |
| 6. Lapachol very little, parenchyma vascentric. | 8 |
| 7. Basic specific gravity high (greater than 0.74); intervessel pits 8–14 μm in diameter. ... | <i>Tabebuia</i> Group I. |
| 7. Basic specific gravity low (less than 0.40) to medium (0.40–0.74); intervessel pits 4–8 μm in diameter. | <i>Godmania</i> . |
| 8. Wood semi-ring porous; dark colored heartwood. | <i>Ekmanianthe</i> . |
| 8. Wood not semi-ring porous; light colored heartwood. | 9 |
| 9. Rays irregularly storied to non-storied; vessels without a particular arrangement; tyloses and crystals present. | <i>Tabebuia chrysea</i> . |
| 9. Rays storied; vessels in very wavy arrangement; tyloses and crystals absent. | <i>Zeyheria</i> . |
| 10. Axial parenchyma vascentric and aliform confluent, mostly of winged type. | 11 |
| 10. Axial parenchyma aliform confluent, mostly of lozenge type, abundant, forming wide discontinuous bands. | 14 |
| 11. Rays non-storied; parenchyma aliform-confluent, mostly of winged type. ... | <i>Jacaranda</i> spp. <i>Digomphia</i> . |
| 11. Rays storied to non-storied; parenchyma vascentric not aliform or confluent. | 12 |
| 12. Rays and axial elements distinctly storied. | <i>Tabebuia nodosa</i> . |
| 12. Rays and axial elements irregularly storied to non-storied. | 13 |

13. Rays 2–3 cells wide; axial parenchyma 2–4 cells per strand; 53–96 vessels per mm²; dark colored heartwood. *Paratecoma peroba*.
13. Rays 3–5 cells wide, sometimes up to 8 cells wide; axial parenchyma 4–6 cells per strand; 11–27 vessels per mm²; light colored heartwood. *Tabebuia donnell-smithii*.
14. Paratracheal parenchyma in very wide (up to 20 or more cells wide), mostly concentric bands enveloping the vessels, alternating with fibrous bands. *Cybistax*.
14. Paratracheal parenchyma normally in discontinuous bands, not more than 15 cells wide. 15
15. Rays of two very different sizes, from 181 to 766 μm in height. *Tabebuia fluviatilis*.
15. Rays not of two distinct sizes. 16
16. High variability within a species in ray height (1–26 cells), width (uniseriate to 4 cells wide), and storied structure (storied, irregularly storied, and non-storied). *Tabebuia* Group III.
16. Rays relatively uniform in height, width, and storied structure (irregularly storied to non-storied). . . . 17
17. Rays exclusively or mostly uniseriate, occasionally with a small portion biseriate. *Tabebuia* Group II, Subgroup B.
17. Rays mostly biseriate, occasionally uniseriate. *Tabebuia* Group II, Subgroup A.

Tabebuia

Description based on 87 specimens of 36 species.

Macroscopic features. Heartwood color varying from whitish to dark greenish brown or blackish. Sapwood color light brown to cream or tan and either similar to, or distinct from heartwood. Water extract mostly not fluorescent (except in *T. angustata* and *T. billbergii*); extract mostly colorless to shade of brown (red in *T. heterophylla* and *T. impetiginosa*). Ethanol extract fluorescent to not fluorescent; extract mostly colorless or shade of brown to yellow. Burning splinter test full ash, white to gray. Basic specific gravity varying from low (less than 0.40) in *T. obtusifolia* to high (greater than 0.74) in several species (e.g., *T. serratifolia*, *T. barbata*, *T. chrysantha*).

Microscopic features. Growth rings distinct to indistinct, diffuse-porous. Vessels mostly in short radial multiples, occasionally in diagonal and/or radial pattern; 11 vessels per mm² in *T. stenocalyx* and *T. donnell-smithii* to 168 per mm² in *T. nodosa*; 53 μm in diameter in *T. billbergii* to 180 μm in *T. insignis*; 173 μm in length in *T. billbergii* to 455 μm in *T. insignis*. Perforation plates simple, sporadically foraminated. Intervessel pits 3–14 μm in diameter forming several distinct groups: 3–4 μm (e.g., *T. roseo-alba*); 5–6 μm (e.g., *T. dubia*); 6–8 μm (e.g., *T. nodosa*); 8–10 μm (e.g., *T. alba*); 10–12 μm (*T. ochracea*); 10–14 μm (*T. billbergii*). Tyloses common only in *T. chrysea*, *T. donnell-smithii* and *T. fluviatilis*. Fibers nonseptate, thin to very thick-walled; 618 μm in length in *T. aurea* to 1556 μm in *T. serratifolia*. Rays homocellular, 3 per mm in *T. donnell-smithii* to 20 per mm in *T. aurea*; uni-

seriate (e.g., *T. insignis*) to 5 cells wide (occasionally 8) in *T. donnell-smithii*; 105 μm in height in *T. billbergii* to 401 μm in *T. insignis*. Rays typically not of two distinct sizes. Rays and/or axial parenchyma storied to non-storied or sometimes irregularly storied; 3–7 tiers per mm. Paratracheal parenchyma scanty or vasicentric (*T. donnell-smithii*, *T. nodosa*, *T. chrysea*) to abundantly aliform-confluent. Aliform parenchyma mostly lozenge type (Fig. 1A). Banded parenchyma more than three cells wide, in narrow lines up to three cells wide, and marginal. Axial parenchyma mostly one to four cells per strand. Calcium oxalate crystals (acicular, styloid, elongate, and of different shapes) occasionally present in some species (e.g., *T. chrysea*, *T. insignis*, *T. rosea*). More than one crystal of about the same size per ray cell.

Jacaranda

Description based on 19 specimens of 6 species.

Macroscopic features. Heartwood whitish to gray. Sapwood color not distinct from heartwood (in *J. caucana*, the only species available with heartwood). Water and ethanol extract not fluorescent; extracts colorless to shade of brown. Burning splinter test full ash, white to gray. Basic specific gravity low (less than 0.40) to medium (0.40–0.74).

Microscopic features. Growth rings distinct except for *J. puberula*; diffuse-porous. Vessels generally without specific pattern; 8 vessels per mm² in *J. caucana* to 50 per mm² in *J. coerula* and *J. puberula*; 64 μm in diameter in *J. obtusifolia* to 261 μm in *J. copaia*; 236 μm in length in *J. obtusifolia* to 703 μm in *J. copaia*. Inter-

APPENDIX—Table I
Vessel elements and fiber features for Bignoniaceae

Species	# Specimens	Vessel Elements				Fibers	
		Frequency ^a (per mm ²)	Diameter ^a (μ m)	Length ^a (μ m)	Pit size ^b (μ m)	Length ^a (μ m)	Septate
<i>Tabebuia</i>							
Group I							
<i>alba</i>	1	43	63	186	8–10	684	— ^c
<i>barbata</i>	3	14–33	94–114	226–241	8–10	912–1071	—
<i>billbergii</i>	5	46–122	53–72	173–218	10–14	628–907	—
<i>capitata</i>	4	24–37	91–98	253–286	8–10	1045–1130	—
<i>coralibe</i>	3	49–73	70–101	177–207	7–8	719–866	—
<i>chrysantha</i>	4	20–134	56–126	207–277	8	764–1307	—
<i>heptaphylla</i>	4	68–136	72–117	228–307	12–14	976–1445	—
<i>impetiginosa</i>	3	19–77	72–120	228–299	12	1132–1540	—
<i>ochracea</i>	3	79–94	68–89	203–245	10–12	886–1363	—
<i>pulcherrima</i>	1	48	59	178	10–12	885	—
<i>serratifolia</i>	5	21–49	86–133	245–381	10–12	915–1556	—
<i>uleana</i>	1	34	102	297	12	1249	—
<i>Tabebuia</i>							
Group II							
Subgroup A							
<i>angustata</i>	1	43	72	279	4–6	911	—
<i>berteroi</i>	1	53	58	214	3–4	665	—
<i>haemantha</i>	1	43	63	214	3–5	695	—
<i>leptoneura</i>	1	53	77	246	5–6	843	—
<i>maxonii</i>	1	102	55	280	4	661	—
<i>orinocensis</i>	1	22	95	277	4–5	776	—
<i>Tabebuia</i>							
Group II							
Subgroup B							
<i>aurea</i>	2	12–17	105	268–307	4–6	618–806	—
<i>dubia</i>	1	33	126	305	5–6	947	—
<i>insignis</i>	5	14–21	110–180	386–455	5–6	1137–1291	—
<i>lepidophylla</i>	1	76	81	242	4–5	754	—
<i>lepidota</i>	1	76	81	242	4–5	754	—
<i>myrtifolia</i>	1	48	71	236	4	897	—
<i>obtusifolia</i>	1	19	120	391	4	886	—
<i>revoluta</i>	1	76	73	312	4	720	—
<i>trachycarpa</i>	1	116	67	283	4	863	—
<i>Tabebuia</i>							
Group III							
<i>heterophylla</i>	6	26–69	88–101	262–350	4–5	737–1034	—
<i>rosea</i>	6	10–38	116–162	313–386	5–7	893–1189	—
<i>roseo-alba</i>	1	72	85	332	3–4	1167	—
<i>sauvallei</i>	1	95	90	232	4–5	781	—
<i>stenocalyx</i>	5	11–51	66–91	333–343	3–4	804–1382	—
<i>Tabebuia</i>							
<i>chrysea</i>	3	96–145	59–84	192–321	6–7	786–895	—
<i>Tabebuia</i>							
<i>donnell-smithii</i>	5	11–27	84–158	269–345	5–8	890–1048	—
<i>Tabebuia</i>							
<i>fluviatilis</i>	1	42	102	281	3–4	885	—
<i>Tabebuia</i>							
<i>nodosa</i>	2	149–168	59–65	191–216	6–8	853–911	—

APPENDIX—Table I
Continued

Species	# Specimens	Vessel Elements				Fibers	
		Frequency ^a (per mm ²)	Diameter ^a (μm)	Length ^a (μm)	Pit size ^b (μm)	Length ^a (μm)	Septate
<i>Jacaranda</i>							
<i>arborea</i>	1	35	106	426	8	1160	—
<i>caucana</i>	3	8–32	77–132	278–434	8–10	802–1121	—
<i>coerula</i>	1	50	108	313	8	740	—
<i>copaia</i>	5	9–20	168–261	424–703	8–10	816–1308	—
<i>obtusifolia</i>	4	15–19	64–100	236–434	8–10	724–1082	—
<i>puberula</i>	4	31–50	70–101	350–507	8–14	783–1193	—
<i>Tecoma</i>							
<i>capensis</i>	1	195	48	286	4	742	+ ^c
<i>castanifolia</i>	1	44	78	233	4	677	+
<i>garrocha</i>	1	86	74	270	3–4	665	+
<i>stans</i>	5	44–113	45–113	209–262	3–4	625–679	+
<i>Ekmanianthe</i>							
<i>actinophylla</i>	2	* ^d	118–223	240–283	7–8	763–963	—
<i>longiflora</i>	1	*	163	292	7–8	1004	—
<i>Zeyheria</i>							
<i>montana</i>	1	30	90	287	6	1219	—
<i>tuberculosa</i>	1	82	69	252	6–7	1154	—
<i>Cybistax</i>							
<i>antisiphilitica</i>	3	39–66	52	221–251	4–6	826–1112	—
<i>Delostoma</i>							
<i>integrifolium</i>	3	64–92	66–80	408–531	4–5	945–1145	+
<i>Digomphia</i>							
<i>densicoma</i>	1	9	136	614	10	1329	—
<i>Godmania</i>							
<i>aesculifolia</i>	8	24–64	83–102	266–296	4–8	710–1032	—
<i>Paratecoma</i>							
<i>peroba</i>	3	53–96	86–93	279–290	8	1044–1384	—
<i>Romeroa</i>							
<i>verticillata</i>	1	67	59	634	3–4	1030	—

^a Average of mean values. Single numbers represent values from only one specimen.

^b Minimum and maximum values.

^c Character absent.

^d Wood semi-ring porous (following IAWA list of microscopic features for hardwood identification, 1989).

^e Character present.

vessel pits mostly 8–10 μm in diameter, *J. puberula* (8–14 μm). Tyloses observed in *J. caucana*. Fibers nonseptate, thin to thick-walled; 724 μm in length in *J. obtusifolia* to 1308 μm in *J. copaia*. Rays homocellular, except for *T. puberula* which has rays heterocellular with mostly 1–2 rows of upright or square cells; 4 per mm in *J. copaia* to 19 in *J. coerula*; 1–3 cells in width; 219 μm in height in *J. obtusifolia* to 733 μm in *J. copaia*.

Storied structure absent. Paratracheal parenchyma aliform to aliform confluent; when aliform mostly of winged type, occasionally lozenge type. Banded parenchyma, in narrow lines up to three cells wide and marginal. Axial parenchyma mostly four cells per strand except for *J. copaia*, which has six to twelve cells per strand. Calcium oxalate crystals (acicular, styloid, elongate, and of different shapes) present in *J. arborea* and *J.*

APPENDIX—Table II
Rays and macroscopic features for Bignoniaceae

Species	# Specimens	Rays					Macroscopic features			
		Frequency* (per mm)	Height* (μ m)	Width (in cell)	Storied	Hetero- cellular	Basic spec. grav.	Lapa- chol	Tylo- ses	Crys- tal
<i>Tabebuia</i>										
Group I										
<i>alba</i>	1	8–13	148	2–3	\pm^b	– ^c	* ^d	# ^e	–	–
<i>barbata</i>	3	7–10	139–153	2	+	–	H ^f	+ ^g	–	–
<i>billbergii</i>	5	8–14	105–135	2	+	–	H	+	–	–
<i>capitata</i>	4	7–11	163–175	2–3	+	–	H	+	–	–
<i>coralibe</i>	3	10–19	112–127	1–2	+	–	H	#	–	+
<i>chrysantha</i>	4	9–18	158–177	1–2	+	–	H	+	–	+
<i>heptaphylla</i>	4	5–10	148–199	3	+	–	H	+	–	–
<i>impetiginosa</i>	3	7–11	141–196	2–3	+	–	H	+	–	–
<i>ochracea</i>	3	8–11	148–161	2–3	+	–	H	+	–	–
<i>pulcherrima</i>	1	12–14	138	2–3	+	–	H	#	–	–
<i>serratifolia</i>	5	6–11	159–253	2–3	+	–	H	+	–	–
<i>uleana</i>	1	5–9	212	2–3	+	–	H	#	–	–
<i>Tabebuia</i>										
Group II										
Subgroup A										
<i>angustata</i>	1	7–11	166	1–2	\pm	–	M ^h	–	–	–
<i>berteroi</i>	1	14–16	124	1–2	\pm	–	*	–	–	–
<i>haemantha</i>	1	8–10	165	1–2	–	–	*	–	–	–
<i>leptoneura</i>	1	11–16	142	1–2	\pm	–	M	–	–	+
<i>maxonii</i>	1	8–11	142	1–2	–	–	M	–	–	–
<i>orinocensis</i>	1	9–11	172	1–2	–	–	*	–	–	–
<i>Tabebuia</i>										
Group II										
Subgroup B										
<i>aurea</i>	2	10–20	159–176	1	\pm	–	M	–	–	–
<i>dubia</i>	1	9–12	184	1	\pm	–	M	–	–	–
<i>insignis</i>	5	5–10	237–401	1	–	–	M	–	–	+
<i>lepidophylla</i>	1	11–13	136	1	–	–	M	–	–	–
<i>lepidota</i>	1	12–16	136	1–2	\pm	–	M	–	–	–
<i>myrtifolia</i>	1	7–12	129	1	–	–	*	–	–	+
<i>obtusifolia</i>	1	12–15	236	1	\pm	–	L	–	–	–
<i>revoluta</i>	1	6–8	140	1	–	–	*	–	–	+
<i>trachycarpa</i>	1	11–16	144	1	–	–	*	–	–	+
<i>Tabebuia</i>										
Group III										
<i>heterophylla</i>	6	7–16	145–235	1–3	+ \pm – ^j	–	M	–	–	+
<i>rosea</i>	6	5–11	232–301	1–4	+ \pm –	–	M	–	–	+
<i>roseo-alba</i>	1	9–15	274	1–3	\pm	–	M	–	–	+
<i>sauvallei</i>	1	6–10	162	2–3	\pm	–	M	–	–	+
<i>stenocalyx</i>	5	5–12	218–349	1–3	–	–	M	–	–	+
<i>Tabebuia</i>										
<i>chrysea</i>	3	8–11	198–211	2–3	\pm –	–	M	+	+	+
<i>Tabebuia</i>										
<i>donnell-smithii</i>	5	3–5	234–284	3–5	\pm –	–	M	–	+	–
<i>Tabebuia</i>										
<i>fluviatilis</i>	1	8–11	181	2–3	\pm	–	M	–	+	–

APPENDIX—Table II
Continued

Species	# Specimens	Rays					Macroscopic features			
		Fre- quency ^a (per mm)	Height ^a (μ m)	Width (in cell)	Storied	Hetero- cellular	Basic spec. grav.	Lapa- chol	Tylo- ses	Crys- tal
<i>Tabebuia nodosa</i>	2	11–16	137–149	2–3	+	–	M	–	–	+
<i>Jacaranda arborea</i>	1	10–12	368	1	–	–	*	–	–	+
<i>caucana</i>	3	12–15	329–350	1–2	–	–	L-M	–	+	+
<i>coerula</i>	1	15–19	302	1	–	–	M	–	–	–
<i>copaia</i>	5	4–8	315–733	2–3	–	–	L-M	–	–	–
<i>obtusifolia</i>	4	12–18	219–314	1	–	–	M	–	–	–
<i>puberula</i>	4	8–15	238–400	2–3	–	+	M	–	–	–
<i>Tecoma capensis</i>	1	10–14	170	2–3	–	+	*	–	–	–
<i>castanifolia</i>	1	12–15	196	2	–	+	M	–	–	+
<i>garrocha</i>	1	8–12	235	2–3	–	+	–	–	+	–
<i>stans</i>	5	8–12	190–244	2–3	–	+	M	–	+	+
<i>Ekmanianthe actinophylla</i>	2	6–8	187–274	2–3	\pm –	–	H	–	+	–
<i>longiflora</i>	1	6–8	224	2–3	\pm –	–	H	+	+	–
<i>Zeyheria montana</i>	1	8–10	195	2–3	+	–	M-H	+	–	–
<i>tuberculosa</i>	1	9–11	177	2–3	+	–	H	+	–	–
<i>Cybastax antisiphilitica</i>	3	9–11	204–227	2–3	\pm –	–	M	–	–	+
<i>Delostoma integrifolium</i>	3	5–9	191–274	2–5	–	+	M	–	–	–
<i>Digomphia densicoma</i>	1	6–10	219	2	–	–	M	–	–	–
<i>Godmania aesculifolia</i>	8	5–10	151–215	2–3	\pm \pm	–	L-M	+	–	+
<i>Paratecoma peroba</i>	3	4–9	241–402	2–3	\pm –	–	M	–	+	+
<i>Romeroa verticillata</i>	1	4–8	686	3–4	–	+	M	–	–	+

^a Average of mean values. Single numbers represent values from only one specimen.

^b Rays and axial elements irregularly storied.

^c Character absent.

^d *Sample too small to determine the basic specific gravity.

^e #Heartwood not available.

^f High basic specific gravity.

^g Character present.

^h Medium basic specific gravity.

ⁱ Low basic specific gravity.

^j Storied structure present; rays and axial elements irregularly storied; storied structure not present.

caucana. More than one crystal of about the same size per ray cell.

Tecoma

Description based on 8 specimens of 4 species.

Macroscopic features. Heartwood whitish or gray to shade of yellow. Sapwood color not distinct from heartwood. Water extract not fluorescent. Ethanol extract fluorescent (blue); extracts colorless or shade of brown. Burning splinter test full ash, white to gray. Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings distinct to indistinct; diffuse-porous. Vessels without arrangement or with a slight tendency toward diagonal and/or radial pattern; 44–195 per mm²; 45–113 in diameter; 209–286 in length. Intervessel pits 3–4 μm in diameter. Tyloses common. Fiber septate; mostly thin to thick-walled; 625–742 μm in length. Rays heterocellular, one or 2–4 rows of upright or square cells; 8–15 per mm; 2–3 cells in width; 170–244 μm in height; rays and axial parenchyma non-storied. Paratracheal parenchyma scanty to vasicentric. Banded parenchyma marginal. Axial parenchyma two to four cells per strand. Calcium oxalate crystals (acicular, styloid, elongate, and of different shapes) present in *T. castanifolia* and *T. stans*. More than one crystal of about the same size per ray cell.

Ekmanianthe

Description based on 3 specimens of 2 species.

Macroscopic features. Heartwood brown. Sapwood color distinct from heartwood. Water extract fluorescent (blue in *E. actinophylla* and green in *E. longiflora*). Ethanol extract fluorescent (bright green in *E. actinophylla* and light green in *E. longiflora*). Burning splinter test full ash, white to gray. Basic specific gravity high (greater than 0.74).

Microscopic features. Growth rings distinct; semi-ring porous. Vessels 118–223 μm in diameter; 240–292 μm in length. Intervessel pits 7–8 μm in diameter. Tyloses present. Fibers not septate. Thin to thick to very thick-walled; 763–1004 μm in length. Rays typically homocellular; 6–8 per mm; 2–3 cells in width; 187–274 μm in height. Rays and axial parenchyma irregularly storied or storied structure absent. Paratracheal parenchyma scanty to vasicentric. Banded pa-

renchyma marginal. Axial parenchyma two to four cells per strand. Crystals absent.

Zeyheria

Description based on 2 specimens of 2 species.

Macroscopic features. Heartwood brown. Sapwood color distinct from heartwood. Water extract not fluorescent; extract strong red. Ethanol extract fluorescent (greenish); extract yellow. Burning splinter test full ash, bright white to yellow brown. Basic specific gravity medium (0.40–0.74) to high (greater than 0.74).

Microscopic features. Growth rings distinct; diffuse-porous. Vessels in tangential bands (very wavy); 30–82 per mm², 69–90 μm in diameter; 252–287 μm in length. Intervessel pits 6–7 μm in diameter. Tyloses absent. Fibers not septate; very thick-walled; 1154–1219 μm in length. Rays homocellular; 8–11 per mm; 2–3 cells in width; 177–195 μm in height. All rays storied. Paratracheal parenchyma vasicentric. Banded parenchyma marginal. Axial parenchyma two to four cells per strand. Crystals absent.

Cybistax

Cybistax antisyphilitica (Martius) Martius.

Description based on 3 specimens.

Macroscopic features. Heartwood shade of yellow; sapwood mostly similar to heartwood. Water and ethanol extract not fluorescent; extracts colorless to shade of brown. Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings distinct to indistinct. Vessels in tangential bands (a distinct pattern with very wide concentric bands of vessels and parenchyma alternating with bands of fibers); 39–66 per mm²; 52 μm in diameter; 221–251 μm in length. Intervessel pits 4–6 μm in diameter. Tyloses absent. Fibers very thick-walled; 826–1112 μm in length. Rays homocellular (the marginal rows composed of enlarged procumbent cells); 9–11 per mm; 2–3 cells wide (occasionally uniseriate); 204–227 μm in height. Rays and/or axial elements irregularly storied or non-storied; 5 tiers per mm. Paratracheal parenchyma aliform and aliform-confluent. Aliform parenchyma lozenge type. Banded parenchyma more than three cells wide. Axial parenchyma two to four cells per strand. Calcium oxalate crystals (acicular, styloid, elongate, and of different

shapes) present. More than one crystal of about the same size per ray cell.

Delostoma

Delostoma integrifolium D. Don.

Description based on 3 specimens.

Macroscopic features. Heartwood brown; sapwood distinct from heartwood (not sufficient for chemical tests). Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings distinct to indistinct; diffuse-porous. Vessels without specific pattern (occasionally with tendency towards radial arrangement); 64–92 per mm²; 66–80 μm in diameter; 408–531 μm in length. Intervessel pits 4–5 μm in diameter. Tyloses absent. Fibers septate; thin to thick-walled; 945–1145 μm in length. Rays heterocellular, one row of upright or square cells; 5–9 per mm; 2–5 cells wide (mostly 3 cells wide); 191–274 μm in height. Storied structure absent. Paratracheal parenchyma scanty. Banded parenchyma marginal. Axial parenchyma four cells per strand. Crystals absent.

Digomphia

Digomphia densicoma (Martius ex A. de Candolle) Pilger.

Description based on 1 specimen.

Macroscopic features. Heartwood not available, therefore color, fluorescence and chemical tests could not be done. Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings indistinct; diffuse-porous. Vessels 9 per mm²; 136 μm in diameter; 614 μm in length. Intervessel pits 10 μm in diameter. Tyloses absent. Fibers thin to thick-walled; 1329 μm in length. Rays homocellular; 6–10 per mm; 2 cells wide; 219 μm in height. Storied structure absent. Paratracheal parenchyma vascentric and aliform-confluent. Aliform parenchyma winged. Axial parenchyma four cells per strand. Crystals absent.

Godmania

Godmania aesculifolia (Humboldt, Bonpland & Kunth) Standley.

Description based on 8 specimens.

Macroscopic features. Heartwood brown to shade of red; sapwood distinct from heartwood.

Water extract not fluorescent; extract red. Ethanol extract fluorescent (greenish yellow); extract brownish to yellow. Basic specific gravity low (less than 0.40) to medium (0.40–0.74).

Microscopic features. Growth rings distinct; diffuse-porous (sometimes with a slight tendency towards semi-ring porous). Vessels in very wavy tangential bands (enveloped by wide parenchyma bands); 24–64 per mm²; 83–102 μm in diameter; 266–296 μm in length. Intervessel pits mostly 5–7 μm in diameter (MADw 27439 4 μm in diameter and MADw 23824 7–8 μm in diameter). Lapachol deposits present (observed in SJRw 35913 and SJRw 48062, the only specimens available with heartwood). Tyloses absent. Fibers thin to thick-walled; 710–1032 μm in length. Rays homocellular (the marginal rows with enlarged procumbent cells); 5–10 per mm; 2–3 cells wide. Rays and axial elements storied to irregularly storied (MADw 27438, MADw 27440, SJRw 35913, and SJRw 10080 are well storied); 4–5 tiers per mm. Paratracheal parenchyma abundant aliform-confluent. Aliform parenchyma lozenge type (sometimes not well defined because of the wide bands). Banded parenchyma more than three cells wide and marginal. Axial parenchyma mostly two to four cells per strand (fusiform cells occasionally present in MADw 27438, SJRw 48062, and SJRw 10080; more than 4 cells occasionally present in MADw 23824). Calcium oxalate crystals (acicular, styloid, elongate, and of different shapes) present. More than one crystal of about the same size per ray cell.

Paratecoma

Paratecoma peroba (Record & Mell) Kuhlmann.

Description based on 3 specimens.

Macroscopic features. Heartwood brown (sometimes with a reddish hue); sapwood distinct from heartwood. Water extract not fluorescent; extract colorless to shade of brown (in SJRw 27472 the water extract is slightly reddish-brown). Ethanol extract fluorescent (bright green); extract yellow. Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings distinct to indistinct; diffuse-porous. Vessels only slightly in diagonal and/or radial pattern; mostly in short radial multiples; 53–96 per mm²; 86–93 μm in diameter; 279–290 μm in length. Intervessel pits 8 μm in diameter. Tyloses common. Fibers very

thick-walled; 1044–1384 μm in length. Rays homocellular; 4–9 per mm; 2–3 cells wide (occasionally 4 cells wide); 241–402 μm in height. Rays and/or axial elements irregularly storied or storied structure absent; 4 tiers per mm. Paratracheal parenchyma vasicentric. Banded parenchyma marginal. Axial parenchyma two to four cells per strand. Calcium oxalate crystals (acicular, styloid, elongate, and of different shapes) present. More than one crystal of about the same size per ray cell.

Romeroa

Romeroa verticillata Dugand.

Description based on 1 specimen.

Macroscopic features. Heartwood not available, therefore color, fluorescence and chemical tests could not be done. Basic specific gravity medium (0.40–0.74).

Microscopic features. Growth rings distinct; diffuse-porous. Vessels in short radial multiples; 67 per mm^2 ; 59 μm in diameter; 634 μm in length. Intervessel pits 3–4 μm in diameter. Tyloses absent. Fibers thin to thick-walled (mostly thin-walled); 1030 μm in length. Rays heterocellular, one row of upright or square cells and heterocellular, 2–4 rows of upright or square cells; 4–8 per mm; 3–4 cells wide; 686 μm in height. Storied structure absent. Paratracheal parenchyma scanty to vasicentric. Axial parenchyma four cells per strand (cells very elongated). Calcium oxalate crystals of various shapes (mostly small) present. More than one crystal of about the same size per ray cell.

DISCUSSION AND CONCLUSIONS

Relationships Within Tribe Tecomeae

This study suggests that most of the 11 genera treated are fairly distinct anatomically. The following is a detailed discussion of the relationships among the genera. For complete anatomical data, see Appendix Tables I and II and the description under results.

Tabebuia

Tabebuia is morphologically the most variable genus of Bignoniaceae (Gentry, pers. comm.);

likewise its wood has a wide range of character states. It was possible to subdivide the 36 species studied into three major groups (I, II, III). Only four species (*T. donnell-smithii*, *T. chrysea*, *T. fluviatilis*, and *T. nodosa*) did not fit this classification and are left out of the suggested groups.

Group I is composed mostly of large trees (up to 40 m tall) and is confined to continental tropical America, with the exception of *T. billbergii*, which also occurs on a few West Indian islands, and a few species like *T. alba*, which grow mostly in subtropical forests. With the exception of *T. heptaphylla*, *T. impetiginosa*, and *T. barbata*, which have a magenta corolla with a yellow throat, all the other species are yellow flowered. Eleven of the species placed in this group occur in dry habitats; the exception is *T. barbata*, which occurs mostly in blackwater inundated forests.

Macroscopically *Tabebuia* Group I has a very distinctive wood by the combination of three features: (1) the wood is very dense and has high basic specific gravity (greater than 0.74), (2) the olive brown to blackish heartwood is sharply distinct from the whitish, pinkish or yellowish sapwood, and (3) there is an abundance of yellow powder deposits (lapachol) in the heartwood vessels (for more detail on lapachol see Paterno, 1882; Hooker, 1896; and Fieser, 1927). Microscopically, this group is also very distinct and easy to recognize by the combination of four features: large intervessel pits, storied structure, fiber wall thickness, and ray width. Species of this group have the largest intervessel pits (8–14 μm in diameter) (Fig. 2A) of all *Tabebuia*. All species of this group have very thick-walled fibers. Except for *T. alba* which has irregularly storied elements, all species have a well defined storied structure (Fig. 2B).

Group II comprises the majority of *Tabebuia* species studied. The species of this group are shrubs or small trees mostly from the West Indies. Most of these species have white or pinkish corollas, but some have red flowers. The placement of *T. aurea* in this group is interesting. This is the only yellow flowered species in Group II and one of very few yellow flowered species that does not occur in Group I; it is also allied to the pink flowered species by various morphological characters (Gentry, 1992). This group was subdivided in subgroups A and B based on ray width. The species of subgroup A are characterized by having rays 1–2 cells wide, but with predominantly biseriate rays. On the other hand, sub-

group B comprises species with predominantly uniseriate rays and only occasionally has biseriate rays (Fig. 3A). *Tabebuia lepidota*, although having more biseriate rays than the other species of subgroup B, seems to be better placed in this subgroup than in subgroup A mostly because of the similarity (with Group II) in ray shape and arrangement.

Macroscopically, species of both subgroups have medium basic specific gravity (0.40–0.74) and light brown to reddish brown heartwood, which is not very distinct from the sapwood. Lapachol is not present in the heartwood vessels.

Microscopically, species of this group are easy to recognize. They have very small to relatively medium-sized intervessel pits (3–6 μm in diameter) (Fig. 2C), the rays and axial elements are irregularly storied and sometimes non-storied; and fibers are mostly thin to thick-walled. Exceptions with respect to the thickness of fiber walls are *T. lepidophylla*, *T. myrtifolia*, and *T. orinocensis*, which have thick to very thick-walled fibers, and *T. maxonii* and *T. revoluta*, which have very thick-walled fibers. *Tabebuia obtusifolia* is the only species of *Tabebuia* studied that has very thin-walled fibers.

Group III is the most widespread in geographic distribution and most variable in morphological and anatomical features. This group contains the polymorphic *T. heterophylla*, the most variable morphologically of all species of *Tabebuia* (Gentry, 1992). Species of this group range from Central America and the West Indies to tropical South America and, have white or pinkish to lavender or occasionally wine-red corollas. These species occur in a variety of habitats, including limestone and serpentine substrates, cerrado, and swampy areas.

Macroscopically, there is not much variability among the woods of the species of Group III. They all have a medium specific gravity (0.40–0.74). The heartwood color varies from pale yellow to brown, or whitish, and the sapwood is not very distinct from the heartwood. There is no lapachol in the heartwood vessels.

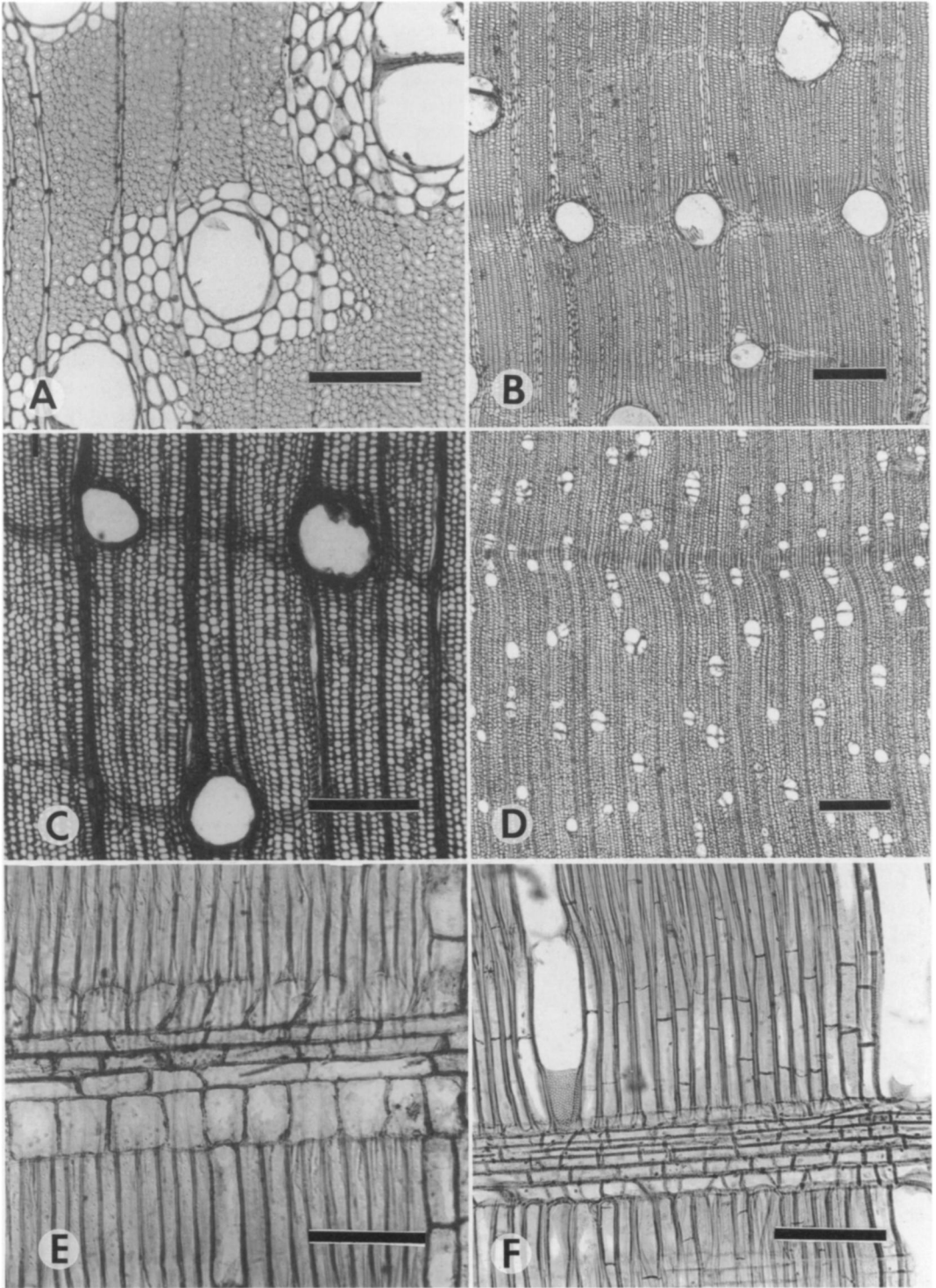
The species of this group are the most variable microscopically. It was decided to place these species together not only because all of them are highly variable within a species, but also because they show the same pattern of variability. The major anatomical inconsistency within a species is found in ray width and height, abundance of parenchyma, and storied structure. Within a species there is not much variation in intervessel pit size, although in the group it varies from 3 to 7 μm in diameter. With regard to storied structure, *Tabebuia heterophylla* and *T. rosea* are the most variable species (Fig. 3B). Some specimens of these two species show a well defined storied structure, some are irregularly storied, and some are nonstoried. In ray width, there is also high variability, from one to four cells. *Tabebuia rosea* is the most variable species of *Tabebuia* in ray width. Also noteworthy is *T. stenocalyx*, which varies from rays exclusively uniseriate to 2–3 cells in width. Species of this group also show an incredible variability in ray height. For example, both *Tabebuia rosea* and *T. stenocalyx* have rays one to a few, and more than 26 cells in height. Finally, there is also a high degree of variability in parenchyma abundance within a species. For example, in *T. rosea* the bands of paratracheal parenchyma vary from very narrow lines to very wide bands.

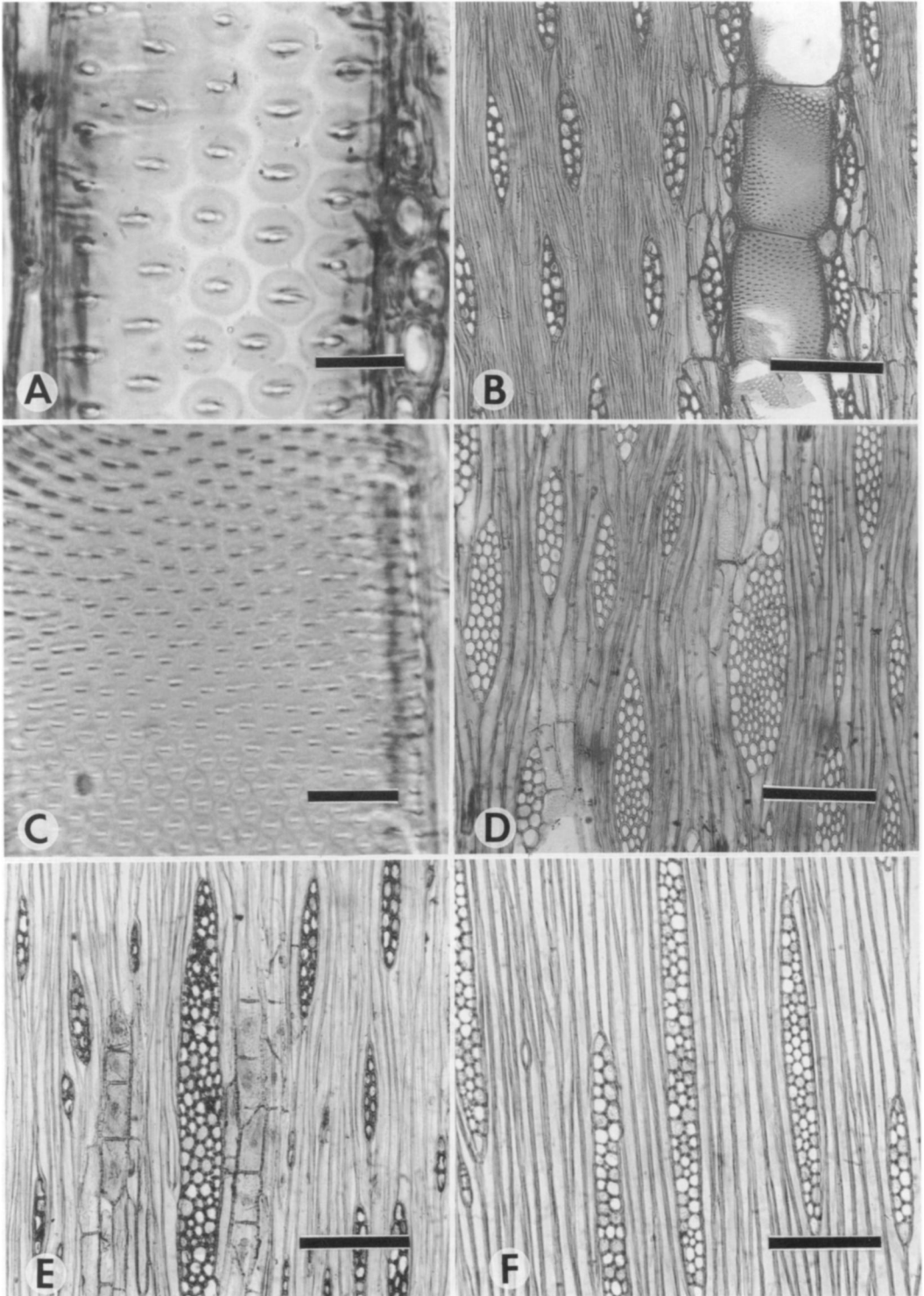
There are three yellow flowered species of *Tabebuia* (*T. chrysea*, *T. donnell-smithii*, and *T. no-*

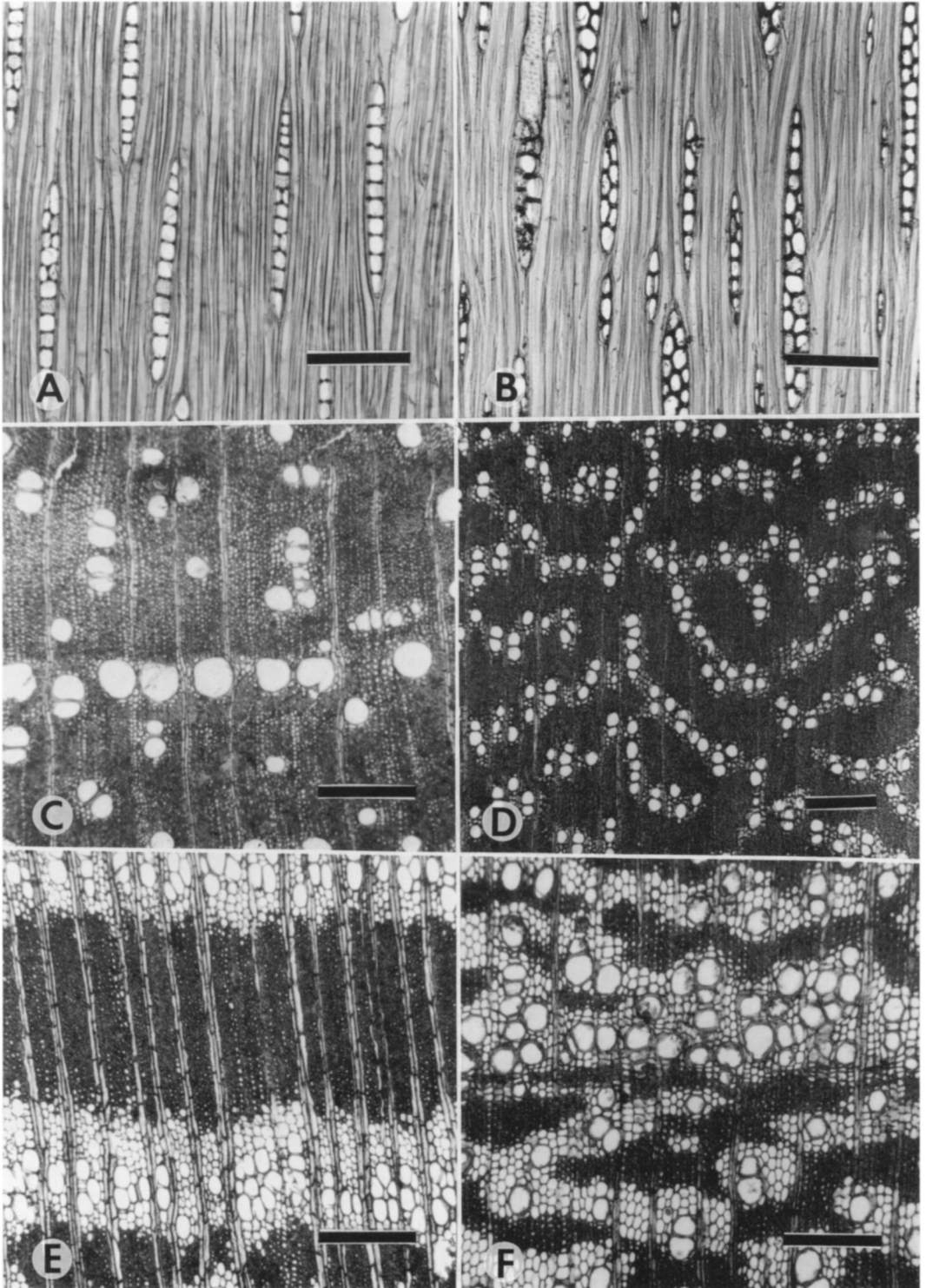
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FIG. 1. Paratracheal axial parenchyma, heterocellular rays; and septate fibers. **A**, *Tabebuia barbata* (*Tabebuia* Group I). Paratracheal parenchyma typically aliform lozenge type. **B**, *Jacaranda copaia*. Paratracheal parenchyma aliform-confluent, mostly winged type with a slight tendency towards lozenge type. **C**, *Jacaranda copaia*. Parenchyma aliform-confluent typically winged type. **D**, *Romeroa verticillata*. Scanty paratracheal parenchyma. Figure A–D transverse section. **E**, *Jacaranda puberula*. Ray heterocellular. **F**, *Delostoma integrifolium*. Septate fibers. Figure E–F radial section.—Scale bar = 400 μm in A; 1 mm in B, D; 300 μm in C, F; 200 μm in E.

FIG. 2. Intervessel pits and taxon specific variation in ray characteristics as seen in tangential sections. **A**, *Tabebuia billbergii* (*Tabebuia* Group I). Large (10–14 μm in diameter), alternate intervessel pits. **B**, *Tabebuia barbata* (*Tabebuia* Group I). Rays and axial elements storied, rays exclusively two cells wide. **C**, *Tabebuia angustata* (*Tabebuia* Group II). Small (4–6 μm in diameter), alternate intervessel pits. **D**, *Tabebuia donnell-smithii*. Rays very wide, non-storied. **E**, *Tabebuia fluviatilis*. Rays of two distinct size classes. **F**, *Romeroa verticillata*. Rays mostly very tall.—Scale bar = 40 μm in A, C; 400 μm in B; 300 μm in D–F.







dosa) and one white flowered species (*T. fluviatilis*) that anatomically do not fit into any of the groups suggested above. *Tabebuia chrysea* is the only yellow flowered species not placed in Group I that has at least some lapachol in the heartwood vessels and rays 2–3 cells wide. Macroscopically, it differs from those species in Group I by having medium basic specific gravity (0.40–0.74), and a yellowish heartwood. Microscopically, one of the main differences is that *T. chrysea* has vasicentric paratracheal parenchyma, while species of Group I have abundant paratracheal parenchyma which is sometimes in very wide bands. This species also has smaller intervessel pits (6–7 μm in diameter), 2–6 cells per parenchyma strand, and rays and axial parenchyma irregularly storied to non-storied.

Tabebuia donnell-smithii is another yellow flowered species with vasicentric parenchyma. Macroscopically, it is similar to the species of Groups II and III. What makes this species unique is the unusual pattern of rays. This species has the widest rays (3–5, occasionally 8 cells wide) in *Tabebuia* (Fig. 2D). This is also the species of *Tabebuia* with the most cells (4–6) per parenchyma strand.

Taxonomically isolated *Tabebuia nodosa*, although a yellow flowered species with storied structure, rays 2–3 cells wide and very thick-walled fibers, does not fit in Group I, mainly because it has vasicentric paratracheal parenchyma and smaller intervessel pits (6–8 μm in diameter). It also has a medium basic specific gravity (0.40–0.74) and light colored wood. Gentry (1990) allies it with *T. aurea*, the anomalous yellow flowered species of Group II, but anatomically it does not fit well in that group. The main reason for not including *T. nodosa* in Group II is that the latter is characterized by the abundance of paratracheal parenchyma and an indistinctly storied structure.

Macroscopically, *Tabebuia fluviatilis*, like *T. donnell-smithii*, is not much different from the species of Groups II and III. However, microscopically it differs markedly from any other *Tabebuia* species by the presence of very tall rays (518 μm) contrasting with the much shorter ones (181 μm) (Fig. 2E), a pattern not found in any other Tecomeae. Although consistently present, these taller rays are very few in relation to the shorter ones so that in Appendix II we have included the ray height for the latter only.

Among the *Tabebuia* species studied, only the anatomically isolated taxa (*T. chrysea*, *T. donnell-smithii*, and *T. fluviatilis*) have tyloses. For *T. nodosa*, the other anatomically isolated taxon, the presence of tyloses could not be determined because of the lack of heartwood.

Jacaranda

In general, *Jacaranda* is anatomically fairly homogeneous. Taxonomically, the genus is divided into two sections, *Monolobos* and *Dilobos*, based on 1- and 2-thecate anthers, respectively. The only representative species of section *Dilobos* treated in this study is *J. puberula*, which is quite distinct from the other species, supporting the intrageneric taxonomy. This is the only species of *Jacaranda* with heterocellular rays. It has much larger intervessel pits (8–14 μm in diameter) than the other species and the rays are 2–3 cells wide. Within section *Monolobos*, the widespread secondary growth species *J. copaia* is the most variable and distinctive species. *Jacaranda copaia* has by far the largest vessel diameter in the genus. The other *Monolobos* species have mostly exclusively uniseriate rays, whereas *J. copaia* has rays mostly 2–3 cells wide. Another distinctive feature, not only for the genus but also for the whole tribe Tecomeae, is that this species

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FIG. 3. Ray size variation within species; vessel arrangement, porosity; and paratracheal parenchyma. A, *Tabebuia insignis* (*Tabebuia* Group II, Subgroup B). Rays mostly uniseriate with only small biseriate portion. B, *T. rosea* (*Tabebuia* Group III). Ray height variable. C, *Ekmanianthe actinophylla*. Wood semi-ring porous, axial parenchyma scanty to vasicentric. D, *Zeyheria tuberculosa*. Vessels in very wavy tangential to diagonal pattern, wood diffuse-porous, parenchyma vasicentric. E, *Cybistax antispythitica*. Vessels in wide tangential bands enveloped by very wide concentric bands of parenchyma, alternating with bands of fibers. F, *Godmania aesculifolia*. Vessels in tangential pattern, wood diffuse-porous, parenchyma in wide discontinuous bands. Figure A, B tangential section; C–F transverse section.—Scale bar = 300 μm in A; 200 μm in B; 700 μm in C, E, F; 1 mm in D.

has the most cells (6–12) per strand of axial parenchyma.

Macroscopically, *Jacaranda* is not much different from the species of *Tabebuia* Groups II and III. Microscopically, it resembles the species of *Tabebuia* Group I in relation to the large intervessel pits (8–14 μm in diameter). *Jacaranda* completely lacks any storied structure and its paratracheal parenchyma, when aliform-confluent, is characteristically of the winged type (Fig. 1B,C).

Tecoma

In the treatment of this genus we have included the African *T. capensis*, usually generically segregated as *Tecomaria*, which proved to be very much like the New World species, supporting Gentry's (1992) suggestion that the African and Neotropical species of this alliance are congeneric.

Tecoma and *Delostoma* are the only two genera of Tecomeae with septate fibers and heterocellular rays. It is interesting to note that nearly all the species of these two genera with heterocellular rays are montane, as are many populations of *Jacaranda puberula*, the only other species of Tecomeae with heterocellular rays (but differing in lacking separate fibers).

Tecoma is so homogeneous that it was difficult to separate the species based solely on wood anatomical characteristics. The species of this genus are also difficult to separate morphologically. Gentry (1982) considers this genus "incredibly difficult taxonomically."

Ekmanianthe

This genus shares several macroscopic and microscopic features with species of *Tabebuia* Group I. These are: very dark heartwood, sharply distinct from the light colored sapwood, lapachol present in the heartwood vessels (though mostly sporadic in nature), high basic specific gravity (greater than 0.74), relatively large intervessel pits (7–8 μm in diameter), and rays 2–3 cells wide. The main difference between *Ekmanianthe* and *Tabebuia* Group I is the pattern of paratracheal parenchyma, storied structure, and vessel arrangement. *Ekmanianthe* has very little paratracheal parenchyma (scanty to vasicentric), nearly lacks storied structure, and is semi-ring porous (Fig. 3C).

Although their flowers are very different, the two species of *Ekmanianthe* are so homogeneous anatomically that to separate them it was necessary to use mostly macroscopic features based on chemical tests.

Zeyheria

This genus, like *Ekmanianthe*, shares several features with species of *Tabebuia* Group I. These features are: dark colored heartwood which is very distinct from the light colored sapwood, high basic specific gravity (greater than 0.74), presence of lapachol (although sporadic), storied structure, rays 2–3 cells wide, and fibers very thick-walled.

Zeyheria is the only yellow flowered genus with vasicentric parenchyma, well defined storied structure, and relatively small intervessel pits (6–7 μm in diameter), but these features are shared with the anomalous simple leaved *Tabebuia*, *T. nodosa*.

This genus is differentiated from all species of *Tabebuia* especially by the tangential arrangement of vessels, which occur in a very wavy pattern (Fig. 3D). The two species of *Zeyheria* are very homogeneous, differing mostly in the frequency of vessels per mm^2 and chemically in the burning splinter test.

Cybistax

Cybistax shares several features with species of *Tabebuia* Group II. These features are: light colored heartwood, medium basic specific gravity (0.40–0.74), rays 2–3 cells wide with occasional uniseriate rays, and relatively small intervessel pits (4–6 μm in diameter). It is distinct from any other species of Tecomeae in the unusual vessels, parenchyma and fiber arrangement. The wide concentric bands of parenchyma envelope the vessels and alternate with large concentric bands of fibers, an arrangement found in no other Tecomeae (Fig. 3E).

Delostoma

As previously noted, *Delostoma* differs from the other genera (except *Tecoma*) in having the combination of heterocellular rays and septate fibers. *Delostoma* differs from *Tecoma* mainly in ray width, which varies from 2–5 cells in *Delostoma*, and by the complete lack of storied struc-

ture. It also has much longer tracheary elements than *Tecoma*.

Digomphia

Anatomically there are neither macroscopic nor microscopic differences between *Digomphia* and *Jacaranda*. Of the species of *Jacaranda* analyzed the wood of *Digomphia* is most like those of section *Monolobos* with homocellular rays. Within section *Monolobos*, *Digomphia* is closest to *J. copaia* on account of its relatively wide rays.

Godmania

Godmania, much more than any other genus, is very similar to the species of *Tabebuia* Group I. At first glance the wood of this genus could easily be confused with species of *Tabebuia* Group I, based on the abundance of lapachol in the dark colored heartwood. Microscopically, *Godmania* is also very similar to *Tabebuia* Group I by the abundance of paratracheal parenchyma (Fig. 3F), rays 2–3 cells wide and presence of storied structure, although the latter is not well defined in some specimens. *Godmania* differs from *Tabebuia* Group I, by having low (less than 0.40) to medium (0.40–0.74) basic specific gravity, much smaller intervessel pits (4–8 μm in diameter), and thinner-walled fibers (thin to thick-walled).

Paratecoma

Paratecoma also shares some features with species of *Tabebuia* Group I. These features are: dark colored heartwood distinct from the light colored sapwood, relatively large intervessel pits (8 μm in diameter), and rays mostly 2–3 cells wide. The main difference, however, from the species in *Tabebuia* Group I, is the lack of lapachol and the presence of vasicentric paratracheal parenchyma.

Romeroa

Romeroa is a completely distinct genus, with the longest tracheary elements in the tribe Tecomeae. *Romeroa* is also sharply differentiated from any other genus of Tecomeae by the very high rays (Fig. 2F) 3–4 cells wide, very long vessel elements, and by the very elongate axial parenchyma cells. It is also distinctive in having very small intervessel pits (3–4 μm in diameter) and very little paratracheal parenchyma (Fig. 1D).

Diagnostic Value of the Characters Used

For the tribe Tecomeae only a few wood anatomical characters seem to be of diagnostic value at the generic level. With the exception of the long tracheary elements of *Romeroa*, most quantitative values are quite variable, which make them of little use for diagnostic purposes. Qualitative features such as growth rings, vessel arrangement, tyloses, crystals, and chemical tests such as ethanol and water fluorescence are very unreliable. However, for each genus or group of *Tabebuia* there are some macro and/or microscopic diagnostic features.

Tabebuia Group I is characterized by the extremely abundant lapachol in the blackish, dense heartwood; large intervessel pits (8–14 μm in diameter), and well defined storied elements. Group II and Group III can be recognized by the combination of light colored heartwood, hardly distinct from the sapwood; abundance of paratracheal parenchyma; very small to relatively medium sized intervessel pits (3–6 μm in diameter); rays and axial parenchyma irregularly storied to non-storied. For *Tabebuia* Group II subgroups A and B the diagnostic features relate mostly to ray width. In subgroup A the rays are mostly 1–2 cells wide, while in subgroup B the rays are exclusively uniseriate or with only a small portion biseriate. For Group III the only diagnostic feature is the high degree of variability, even in a single section of a slide, in ray width, height, and storied structure.

Jacaranda and *Digomphia* are easy to identify mainly by the winged paratracheal parenchyma combined with large intervessel pits (8–14 μm in diameter) and non-storied structure. *Jacaranda puberula* is distinct from the other *Jacaranda* species in having heterocellular rays (Fig. 1E).

Tecoma and *Delostoma* stand out from the other genera by the presence of heterocellular rays and septate fibers (Fig. 1F). Quantitative values such as vessel element and fiber length as well as ray width are the most important characters to separate these two genera. *Delostoma* has much longer tracheary elements and wider rays than *Tecoma* (see Tables I and II).

For *Ekmanianthe* the outstanding feature is the presence of semi-ring porous vessel arrangement coupled with little lapachol in the dark, heavy heartwood, and the presence of vasicentric

parenchyma. *Zeyheria* is easily distinguished by the peculiar very wavy vessel arrangement, vasicentric parenchyma and well defined storied structure.

Godmania can easily be identified by the abundance of lapachol in the relatively light weight heartwood and very small to medium-sized intervessel pits (4–8 μm in diameter).

Romeroa is distinct in Tecomeae because of the extremely long tracheary elements, very tall rays, vessels somewhat angular in transverse section, scanty paratracheal parenchyma and very small intervessel pits (3–4 μm in diameter).

For *Cybistax* the most diagnostic feature is the very wide concentric bands of parenchyma enveloping the vessels, which alternate with fiber bands. *Paratecoma* can be distinguished by the dark colored heartwood with complete lack of lapachol, parenchyma vasicentric and medium-sized intervessel pits (8 μm in diameter).

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