

STUDIES IN THE GENUS *COCCOLOBA*, VII.
A SYNOPSIS AND KEY TO THE SPECIES IN MEXICO
AND CENTRAL AMERICA

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THE ONLY COMPLETE MONOGRAPH of the genus *Coccoloba* was prepared by Gustav Lindau and published in Engler's *Botanische Jahrbücher* 13: 106–229. 1890. Since that time many additional species have been described in the genus as the result of extensive collecting by botanists in Mexico and in the several countries of Central America. Paul Standley revised *Coccoloba* as it occurs in Mexico in his treatment of the trees and shrubs of Mexico published in 1922. More recently Standley with Julian Steyermark treated the species of Guatemala as part of their series of papers on the flora of Guatemala. In addition, lists of species, some with critical notes, will be found in the following papers. Other papers and citations are included in the text.

- ALLEN, P. Preliminary index to the trees of the Golfito-Palmar area, Costa Rica. 37. 1952.
- SMITH, J. D. *Enumeratio plantarum Guatemalensium* 6: 36. 1903.
- STANDLEY, P. C. *Flora of the Panama Canal Zone*. *Contr. U.S. Nat. Herb.* 27: 170. 1928.
- . *Flora of Yucatan*. *Publ. Field Mus. Bot.* 3: 252–253. 1930.
- . *Flora of the Lancetilla Valley, Honduras*. *Publ. Field Mus. Bot.* 10: 180–181. 1931.
- . *Flora of Costa Rica*. *Publ. Field Mus. Bot.* 182: 413–414. 1937.
- and S. CALDERÓN. *Lista preliminar de las plantas de El Salvador*. 98. 1925.
- and S. J. RECORD. *The forest and flora of British Honduras*. *Publ. Field Mus. Bot.* 12: 125–127. 1936.
- YUNCKER, T. G. *A contribution to the flora of Honduras*. *Publ. Field Mus. Bot.* 17: 361. 1938.
- . *Flora of the Aguan Valley and the coastal regions near La Ceiba, Honduras*. *Publ. Field Mus. Bot.* 9: 286. 1940.

In general, the genus *Coccoloba* has been overdescribed in Mexico and Central America. Of the eighty names which have been applied in published form, only thirty-three species are recognized in this paper. In large part this tendency to excessive description is due to floristic treatments which deal individually with the many small countries of Central America. Many species which were considered endemic in adjacent countries have proved to be identical instead. Several West Indian species are now recognized in the Central American flora and the corresponding Central American name has been reduced to synonymy. Seven species had been described on the basis of sterile branches from adventitious shoots. All of these have now been associated with fertile material and these names placed

in synonymy. Fortunately only one such name had to be retained with a sterile holotype specimen. The failure to recognize the unisexual condition of the plants led to the duplication of specific names and several such species have now been properly associated. Two new species are described and one species has been removed from synonymy and re-established at the species rank.

Lindau in his monograph treated the species from Mexico and Central America in three sections of the genus. While these sections are useful in a preliminary assignment of species within the genus, the sections can not be maintained. When sufficient material is examined, intermediates are found and the sections grade indistinguishably into one another.

In the previously published studies ¹ of the genus *Coccoloba* in the West Indies I had the advantage of extensive field work and an intimate knowledge of the variation found in the living plant. Much of the information gained in studying the West Indian species has been applied to the current study.

Many of the experienced field botanists who have described species of *Coccoloba* in Mexico and Central America have regarded the flowers as being perfect. The extensive group of herbarium specimens I have seen, as well as the living plants I have studied in Mexico and Honduras, clearly indicates, however, that the flowers are unisexual or functionally so. The pistillate flowers are normally borne singly at each nodule of the inflorescence rachis or rarely in clusters of two or three. The stamens of such flowers are rudimentary and included. The staminate flowers with pollen-producing, exserted stamens are borne in clusters of three or more.

Only a few species of Mexico and Central America have heavily coriaceous leaves or leaves much reduced in size. The leaves tend to be more pubescent than those of West Indian species. The variation in size between leaves of normal shoots and/or adventitious shoots is similar in the West Indies and in Central America. The leaves of adventitious shoots are larger, thinner and on longer petioles than those of normal shoots. Short-shoots, or at least shoots of limited growth, occurring laterally on the branches may also produce leaves smaller in size than those of shoots of normal growth. Pubescence varies with age of the leaf.

An adequate understanding of the species is best obtained from a study of staminate and pistillate flowers, fruits and leaves from both normal and adventitious shoots. I am grateful to the several collectors indicated in the text who made special efforts to get complete material for me. I have also been fortunate to be able to study nearly all the types of the species considered in this paper. I am particularly grateful to the directors and curators of the Botanisches Museum, Berlin; the Jardin Botanique de l'État, Brussels; the Royal Botanic Gardens, Kew; the Chicago Natural History Museum, Chicago; the Botanische Staatssammlung, Munich; and the University Herbarium, University of Michigan, Ann Arbor, for the significant materials sent for this study. Equally valuable but less authen-

¹ Jour. Arnold Arb. 30: 388-424. 1949; 37: 317-339. 1956; 38: 81-106. 1957; 38: 211-242. 1957; 39: 1-48. 1958; 40: 68-93. 1959.

tic specimens were received on loan from the other herbaria designated by the standard abbreviations given in Index Herbariorum.

Distribution of recognized species of *Coccoloba* in Mexico and Central America

	GREATER ANTILLES	MEXICO	GUATEMALA	BR. HONDURAS	EL SALVADOR	HONDURAS	NICARAGUA	COSTA RICA	PANAMA	SOUTH AMERICA	LESSER ANTILLES
<i>acapulcensis</i>		×	×	×		×		×			
<i>acuminata</i>			×			×	×	×	×		
<i>barbadensis</i>		×	×		×						
<i>belizensis</i>			×	×		×	×				
<i>caracasana</i>		×	×		×		×	×	×		
<i>chiapensis</i>		×				×					
<i>cozumelensis</i>		×	×	×			×				
<i>darienensis</i>									×		
<i>diversifolia</i>	×	×	×								
<i>goldmannii</i>		×									
<i>hondurensis</i>		×	×	×		×					
<i>humboldtii</i>		×									
<i>lasseri</i>									×		
<i>lehmannii</i>								×	×	×	
<i>liebmannii</i>		×									
<i>lindeniana</i>		×									
<i>lindaviana</i>						×					
× <i>lundellii</i>				×							
<i>manzanillensis</i>									×		
<i>matudai</i>		×									
<i>montana</i>		×	×	×	×						
<i>nicaraguensis</i>							×				
<i>novogranatensis</i>			×						×	×	×
<i>obovata</i>								×	×	×	
<i>padiformis</i>								×	×	×	
<i>parimensis</i>									×	×	
<i>reflexiflora</i>		×	×	×		×					
<i>spicata</i>		×		×							
<i>standleyana</i>								×			
<i>swartzii</i>	×			×		×					×
<i>tuerckheimii</i>			×			×	×	×	×		
<i>uvifera</i>	×	×	×	×	×	×	×	×	×	×	×
<i>venosa</i>	×	×	×		×	×	×	×		×	×

The following list contains the names used for species of *Coccoloba* in Mexico and Central America. These names either were used in floras, lists or monographic treatments or apply to taxa based on specimens collected

in this area. The generic name *Coccoloba* has been conserved. *Coccolobis* is regarded as an orthographic variant and all binomials published under this spelling are also known as *Coccoloba*. The many transfers made by Otto Kuntze to the genus *Uvifera* have been omitted. All of the names in this list are discussed in the text under the recognized specific name. Varieties which are treated as distinct from the species are listed below. Varieties not listed are transferred with the species.

Campderia floribunda = *Coccoloba venosa*

C. lindeniana = *Coccoloba lindeniana*

C. mexicana = *Coccoloba venosa*

C. nematostachya = *Coccoloba manzanillensis*

Coccoloba acapulcensis Standley

C. acuminata HBK.

C. alagoensis major = *C. venosa*

C. allenii = *C. lehmannii*

C. anisophylla = *C. chiapensis*

C. barbadensis Jacquin

C. belizensis Standley

C. bracteolosa = *C. parimensis*

C. browniana = *C. acapulcensis*

C. cardiophylla = *C. acapulcensis*

C. caracasana Meisner

C. changuinolana = *C. lehmannii*

C. chiapensis Standley

C. colonensis = *C. reflexiflora*

C. coronata = *C. spicata*

C. corozalensis = *C. swartzii*

C. cozumelensis Hemsley

C. darienensis Howard

C. diversifolia Jacquin

C. emarginata = *Neomillspaughia emarginata* (Gross) Blake

C. escuintlensis = *C. montana*

C. excelsa glabra = *C. parimensis*

C. excoriata = *C. venosa*

C. floribunda = *C. venosa*

C. fluviatilis = *C. barbadensis*

C. gentlei = *C. swartzii*

C. goldmannii Standley

C. grandifolia Standley = *C. lehmannii*

C. guatemalensis = *C. tuerckheimii*

C. hirsuta = *C. belizensis*

C. hondurensis Lundell

C. humboldtii Meisner

C. jurgenseni = *C. barbadensis*

C. lancifolia = *C. diversifolia*

C. lapathifolia = *C. lehmannii*

C. laurifolia = *C. diversifolia*

Coccoloba lasserii Lundell

C. latifolia = *C. tuerckheimii*

C. lehmannii Lindau

C. leptostachya = *C. barbadensis*

C. liebmanni = *C. lehmannii*

C. lehmannii Lindau

C. lindaviana Howard

C. lindeniana (Bentham) Lindau

C. lundellii = *C. × lundellii*

C. × lundellii Standley

C. macrophylla = *C. rugosa*

Desfontaines

C. manzanillensis Beurling

C. manzinellensis = *C. manzanillensis*

C. marginata = *C. hondurensis*

C. masoni = *C. barbadensis*

C. matudai Lundell

C. mayana = *C. barbadensis*

C. molinae = *C. venosa*

C. montana Standley

C. nematostachya = *C. manzanillensis*

C. nicaraguensis Standley & L. Williams

C. nivea = *C. venosa*

C. novogranatensis Lindau

C. oaxacensis = *C. barbadensis*

C. obovata HBK.

C. orizabae = *C. humboldtii*

C. padiformis Meisner

C. parimensis Bentham

C. petrophila = *C. humboldtii*

C. pubescens = *C. lehmannii*

C. roseiflora = *C. padiformis*

C. reflexiflora Standley

C. riparia = *C. obovata*

C. sessiliflora = *C. barbadensis*

C. schiedeana = *C. barbadensis*

C. schippii = *C. montana*

C. spicata Lundell

C. steyermarkii = *C. montana*

C. standleyana Allen

C. strobilulifera = *C. acuminata*

C. suborbicularis = *C. × lundellii*

C. swartzii Meisner

Coccoloba tuerckheimii Donnell Smith
C. umbilicata = *C. pyrifolia*
 Desfontaines
C. uvifera Linnaeus
C. venosa Linnaeus

Coccoloba waittii = *C. novogranatensis*
C. wercklei = *C. acapulcensis*
C. yucatanica = *C. cozumelensis*
Uvifera lehmanni = *Coccoloba*
lehmannii

The following is a synoptic key to the species of Mexico and Central America. To be fully applicable, the key requires both flowers and fruit. It does not apply to sterile material, particularly that of adventitious shoots.

Following the key, the species are listed in alphabetical order with a citation of specimens seen and a discussion of the nomenclature adopted. The countries are considered in order from north to south, with the states, provinces, districts, etc., in each country being listed alphabetically.

KEY TO THE SPECIES

1. Petioles arising from above the base of the ocrea, the diameter of the leaf scar smaller than the distance from the base of the leaf scar to the base of the ocrea.
 (Species inadequately known: Leaves lanceolate-ovate, deciduous, the young leaves turning black on drying. *C. nicaraguensis*.)
2. Inflorescence paniculate.
 3. Inflorescence branches few; leaf base rounded or cordate; fruit spherical, rounded at the base. *C. lasserii*.
 3. Inflorescence many-branched; leaf blade acute at the apex, the base decurrent on the petiole; fruit oval, stalked at the base.
 *C. tuerckheimii*.
2. Inflorescence racemose or spicate.
 4. Inflorescence racemose.
 5. Leaves narrowly oblong to narrowly elliptic. *C. lindaviana*.
 5. Leaves cordate, elliptic or obovate-elliptic.
 6. Leaves cordate, the base strongly cordate, occasionally peltate; flowering and fruiting pedicels 5–15 mm. long; fruit globose, 1 cm. diameter, or abnormally obovoid and 2.5 cm. long; ocreae splitting longitudinally, flaring, the petiole appearing winged at the base; the inflorescence ocrea often appearing spathe-like.
 *C. acapulcensis*.
 6. Leaves elliptic to obovate-elliptic, flowering and fruiting pedicels shorter; ocrea not flaring if split.
 7. Leaves usually narrowed to a cordate-auriculate base; ocreolae conspicuous, papery, flaring; flowers never reflexed; fruit globose, conspicuously coronate. . . *C. novogranatensis*.
 7. Leaves rounded at the base or narrowed to an obtuse base; ocreolae small and inconspicuous, the flowers commonly reflexed; fruit narrowed at the base and obtuse, at most slightly coronate, at the apex. *C. reflexiflora*.
 4. Inflorescence spicate, the fruits essentially sessile.
 8. Leaves tan-colored when dry, the petioles usually grayish green; leaf blades acute to obtuse at the apex; fruit globose, obtuse at the apex. *C. spicata*.

8. Leaves and petioles turning dark brown or black on drying; leaf blades acuminate at the apex; fruit elongate, the achene stoutly coronate at the apex. *C. obovata*.
1. Petioles arising from the base of the ocrea, the base of the leaf scar at or close to the base of the ocrea.
(Species inadequately known: *C. standleyana*.)
9. Inflorescence paniculate.
 10. Flowering pedicels stout, not exceeding the ocreolae; young stems, ocreae and inflorescence rachis conspicuously puberulent or tomentose to pilose on adventitious shoots, the pubescence golden or chestnut-colored; the terminal buds large, conspicuously club-shaped, swollen and rounded at the apex, the ocrea of the terminal bud commonly subcalyptrate; fruit globose, not narrowed to a stalk at the base, obtuse or rounded, not coronate, at the apex. *C. belizensis*.
 10. Flowering pedicels tenuous, exceeding or up to twice the length of the ocreolae; young stems, ocreae and inflorescence rachis puberulent, the pubescence commonly noticeable only with a lens; the terminal bud slender, acute at the apex, the ocrea splitting laterally; mature fruits not known. *C. matudai*.
9. Inflorescence racemose or spicate.
 11. Inflorescence racemose; the flowers and fruits borne on pedicels which exceed the bracts and the ocreolae.
 12. Lianas; leaf blade umbonate between the veins. . . . *C. parimensis*.
 12. Trees or shrubs, at most the ends of the branches rarely scrambling.
 13. Leaves as broad as or broader than long, orbicular to broadly oblong, apex rounded to emarginate.
 14. Fruits 1–2.5 cm. long, obtuse or rounded at the apex, at most very slightly coronate, usually slightly stalked at the base.
 15. Leaves usually much broader than long, the base strongly cordate with one lobe of the blade usually slightly overlapping the petiole. *C. uvifera*.
 15. Leaves usually orbicular, the base of the blade essentially rounded or obtuse. *C. × lundellii*.
 14. Fruits less than 1 cm. long.
 16. Fruit strongly coronate at the apex, the base rounded; leaf blades persistently pubescent only along the midrib and primary veins or glabrate.
..... *C. barbadensis* hybrid.
 16. Fruit elongate, the perianth lobes distinct on the upper 1/3 or 1/2 of the fruit; leaf blades persistently pubescent on the lower surface.
..... *C. goldmannii*.
13. Leaves noticeably longer than broad.
 17. Leaves elliptic-lanceolate in outline, acuminate to long-acuminate at the apex, cuneate or rounded to an obtuse asymmetrical base; petioles 2–6 mm. long.
..... *C. chiapensis*.
 17. Leaves not of this type.
 18. Foliar ocreae 3–5 cm. long, membranaceous or

chartaceous, silky pubescent, fruit coronate at the apex, the crown surrounded by the distinct perianth lobes, these fused below. *C. manzanillensis*.

18. Foliar ocreae 1–2 cm. long, coriaceous, or if chartaceous, not silky pubescent.

19. Achene surrounded by the expanded perianth lobes, these free nearly to the base.

20. Leaves elliptic to elliptic-oblong, the flower clusters distinct on the inflorescence rachis. *C. lehmannii*.

20. Leaves narrowly oblong or obovate-oblong, the inflorescence of closely associated flower clusters and these not clearly distinct on the rachis and not appearing interrupted.

21. Leaves obovate-oblong, broadest above the middle; midrib and veins usually pubescent below, blades persistently barbate in the axils of the primary veins. *C. venosa*.

21. Leaves narrowly oblong, broadest at middle; leaves glabrous below.
. *C. darienensis*.

19. Achene surrounded by the expanded hypanthium, the perianth lobes coronate or surrounding the upper third of the achene.

22. Fruit conspicuously coronate.

23. Leaves lanceolate-ovate in outline, ocreae glabrous; pedicels in fruit several times as long as the thickness of the inflorescence rachis.
. *C. diversifolia*.

23. Leaves broader, ovate-oblong to obovate-elliptic in outline, ocreae puberulent; fruiting pedicels not longer than the thickness of the inflorescence rachis.

24. Fruiting pedicels shorter than the ocreolae; leaves usually rounded or with a short, bluntly acute apex, concolorous.
. *C. barbadensis*.

24. Fruiting pedicels slightly longer than the ocreolae; leaves usually with a short but sharply acuminate apex, dark or black on the upper surface and lighter below. *C. hondurensis*.

22. Fruit obtuse at the apex, the perianth lobes imbricate over the obtuse apex of the achene.

- 25. Leaves persistently pubescent below, the margin entire but usually conspicuously crispate to undulate.
..... *C. liebmannii*.
- 25. Leaves glabrous, the ocreae or petioles puberulent or glabrous, margin of the blade entire or flat or slightly recurved but not crispate-undulate.
- 26. Ocreolae conspicuous in flower and fruit, membranaceous and flaring; fruit as broad as or broader than long, rounded to slightly stalked at the base, slightly acute at the apex.
..... *C. montana*.
- 26. Ocreolae small and inconspicuous, appressed and not flaring; fruit longer than broad, rounded or obtuse at the apex and the base.
- 27. Upper leaf surface with the ultimate venation conspicuously reticulate when dry, the ocreae and petioles puberulent. . . . *C. humboldtii*.
- 27. Upper leaf surface plain between the primary veins, the ultimate venation not evident; ocreae and petioles glabrous.
..... *C. padiformis*.
- 11. Inflorescence spicate, the pedicels shorter than the bracts and ocreolae in flower and fruit or, if protruding beyond the ocreolae, the visible portion less than the diameter of the inflorescence axis.
- 28. Inflorescence rachis swollen at the flower clusters and tapering below them, the flowers appearing at an acute angle to the axis; the lobes of the perianth expanded in fruit and covering at least the upper half of the achene. *C. acuminata*.
- 28. Inflorescence rachis of uniform thickness and not expanded to each flower cluster, the flowers borne flat or at right angles to the axis.
- 29. Ocreolae conspicuous in flower and fruit, membranaceous or chartaceous.
- 30. Leaves narrowly oblong, acute to acuminate at the apex; fruit not known. *C. lindeniana*.
- 30. Leaves broadly oblong to orbicular, often broader than long, the apex rounded or emarginate; the lobes of the perianth expanded in fruit and covering more than half of the achene. *C. caracasana*.
- 29. Ocreolae small, not conspicuous in flower or fruit; the

hypanthium surrounding the achene in fruit, the perianth lobes imbricate or coronate.

31. Leaves narrowly ovate to ovate-lanceolate, generally cordate at the base, rarely rounded or obtuse, acuminate at the apex, generally drying to a pale tan color, the petioles usually grayish when dry, the petioles and ocreolae puberulent but rarely tomentose; the blades 3–9 cm. long. *C. cozumelensis*.
31. Leaves rounded or obtuse at the base, acute or obtuse at the apex, the blades turning dark on drying, the petiole almost black when dry; glabrous (in Central America).
32. Leaves of fertile branches generally with blades 12–20 cm. long and 8–12 cm. broad; inflorescences densely flowered; fruit obtuse at the apex and only slightly coronate. *C. hondurensis*.
32. Leaves of fertile branches usually with blades 7–11 cm. long and 5–6.5 cm. broad; inflorescence axis sparsely flowered, the flower clusters distinct and separated; fruit rounded at the apex and distinctly coronate. *C. swartzii*.

Coccoloba acapulcensis Standley, Proc. Biol. Soc. Wash. 33: 66–67. 1920.

Coccoloba cardiophylla Standley, Publ. Field Mus. Bot. 8: 8. 1930.

Coccoloba browniana Standley, Trop. Woods 10: 4. 1927.

Coccoloba wercklei Standley, Publ. Field Mus. Bot. 4: 304. 1929.

It is unfortunate that the oldest name applicable to this species is based on anomalous material. To the present, *Coccoloba acapulcensis* has been distinguished by the peltate leaves and the large fruits. The collections cited below, made since the type collection of the species, show clearly that leaves with peltate, cordate or rounded bases may be found on the same shoot. Miranda (Anal. Inst. Biol. México 14: 29. 1943) reports that peltate leaves appear abundantly on all young specimens of *C. acapulcensis* but that the cordate base is more frequent on older plants. The fruits of this species are larger than is usual in the genus *Coccoloba*; however, the fruits of the holotype appear to be abnormal, the probable result of an insect attack. Similar abnormal pedicels also occur on the type specimens of the other species which I have examined and which I now consider to be synonymous with *C. acapulcensis*.

Lundell (Lloydia 2: 83. 1939) placed *Coccoloba cardiophylla* in the synonymy of *C. browniana* and reported the affinities of the species to be with *C. wercklei*, of Costa Rica, and *C. acapulcensis*, of Guerrero, Mexico. In the original description of *C. wercklei* Standley suggested that his new species is a relative of the Honduran *C. browniana* but distinct from it in that *C. browniana* bears pedicels only 5 mm. long. The series of specimens cited, however, shows the full range of variation in the length of the pedicel between flowering and mature fruiting conditions, as well as the differences

in the pedicel length of the male and female flowers. It is clear to me that all four species must be grouped together under the oldest accepted name, which is *C. acapulcensis*.

México. GUERRERO: Acapulco, *MacDaniels* 249 (F), *Haenke* 1120 (F), 1125 (F), *Palmer* 399 (US-type of *C. acapulcensis*; GH, NY); Tecpán de Galiana, *Hinton* 14118 (F, GH). YUCATÁN: Chichén Itzá, *Bequaert* 28 (A, F), *C. L. & A. A. Lundell* 7471 (DS, F, MICH), 7513 (A, DS, F, MICH); Kancabdzonot, *Gaumer & sons* 23865 (DS, F, GH), 23905 (F); Quintana Roo, *C. L. & A. A. Lundell* 7644 (MICH); Ebtún, *C. L. & A. A. Lundell* 7534 (A, DS, F, MICH); without specific location, *Gaumer* 24013 (F-type of *C. cardiophylla*; A, GH). **Guatemala.** EL PROGRESO: Barranquilla, *Steyermark* 46428 (F). HUEHUETENANGO: Between Democracia and canyon of Chamusú, *Steyermark* 51229 (F); Paso del Boquerón, *Steyermark* 51152 (F). JUTIAPA: Quebrada above Ovejero, *Standley* 77647 (F). **British Honduras.** ORANGE WALK DISTRICT: Honey Camp, *Lundell* 514 (A, DS, F, GH). **Honduras.** COMAYAGUA: Comayagua, *Standley & Chacón* 5126 (F), 5383 (F), 5484 (F), 6012 (F); El Banco, *Rodriguez* 2374 (F, GH); Río Selguapa, *Rodriguez* 2616 (F, GH); Siguatepeque, *Yuncker, Dawson & Youse* 6138 (F, GH, MICH). YORO: Coyoles, *Yuncker, Koepper & Wagner* 8071 (F, GH, MICH); Olanchito, *Record & Kuylén* H-54 (US-type of *C. browniana*; GH, Y). **Costa Rica.** El Coyolar, *Wercklé* s.n. (US 865109-type of *C. wercklei*); San Pedro de San Ramón, *Brenes* 21872 (F).

Coccoloba acuminata HBK. Nov. Gen. 2: 176. 1817.

Coccoloba acuminata var. *pubescens* Lindau, Bot. Jahrb. 13: 193. 1890.

Coccoloba acuminata var. *glabra* Lindau, l.c. 194.

Coccoloba strobilulifera Meisner, Fl. Bras. 5(1): 25. 1855.

Lindau was correct in concluding that *Coccoloba strobilulifera* Meisner is the same as *C. acuminata*. I have examined the specimens cited by Meisner and Lindau and have also seen this species in the field. On the basis of these observations, I find it impossible to recognize the two varieties that Lindau established on a characteristic of the pubescence. The variation in the amount of pubescence seems to be related to the age and vigor of the plant. Pubescence is present on the young leaves and shoots but is less conspicuous, or the hairs are broken off so that only the clear hair bases remain, on older specimens. Certainly all intermediate stages can be found between the material cited by Lindau as *C. acuminata* var. *pubescens* and that cited as var. *glabra*.

In addition to the material cited below, I have seen collections from Colombia, Venezuela, British Guiana, Brazil, Ecuador and Peru. The type is *Humboldt* 1479, collected along the Río Magdalena, near Mompox, Colombia. Lindau did not select a type for his var. *glabra*, but the type of *C. strobilulifera* Meisner is *Moritz*, without number and without definite locality in Colombia. Lindau places this species in synonymy under his var. *glabra*.

Guatemala. IZABAL: Quebradas, *Pittier* 8592 (GH); between Bananera and Sioux Station, *Steyermark* 38986 (F, MICH). **Honduras.** ATLÁNTIDA: Near Tela, *Mitchell* 82 (F, GH); near Tela, *Standley* 54710 (A, F); La Fragua, *Standley*

55720 (F); vicinity of Tela, *Standley* 56867 (F); vicinity of San Alejo, *Standley* 7771 (F); between Tela and Lancetilla, *Yuncker* 4645 (A, F, GH, MICH). CORTÉS: La Lima, *Johansen* 45 (A, F); Río Piedras near San Pedro Sula, *Molino* 3417 (F); La Lima, *Standley & Chacón* 7556 (F), *Williams & Molina* 12485 (F). YORO: Near Progreso, *W. D. Hottle* 1 (F), *Record & Kuylen* H-44 (GH), *Standley* 55013 (A, F); Coyoles, *Yuncker, Koepper & Wagner* 8034 (F, MICH), 8061 (F, GH, MICH). Department unspecified: Coyol, *Carleton* 495 (A, GH); Highland Creek, Pto. Sierra, *Wilson* 84 (F). NICARAGUA. ZELAYA: La Esperanza, Río Grande, *Molina* 2109 (F), 2136 (F, GH). Department unspecified: Region of Braggman's Bluff, *Englesing* 183 (F, Y), 229 (F, Y). COSTA RICA. ALAJUELA: Vicinity of Capulín, Río Grande de Tárcoles, *Standley* 40189 (F). PUNTARENAS: Canton de Osa, Palmar Norte to Cañablancal, *Allen* 5226 (GH, MICH). PANAMÁ. CANAL ZONE: Barro Colorado Island, *Aviles* 74, 976 (F), *L.H. & E.Z. Bailey* 616 (GH), *Bangham* 378 (A, F), *Starry* 223 (F), *Wilson* 22, 140 (F), *Woodworth & Vestal* 397 (A, F); Juan Mina, Chagres River, *Bartlett & Lasser* 16321 (MICH); Gamboa Reach, *Maggs II* 39 (F); Frijoles, *Maxon* 4707 (F, GH); Gamboa, *Pittier* 2608 (F, GH, MO); Upper Chilibre River, *Seibert* 1510 (MO); Quebrada Bonita, *Steyermark & Allen* 17194 (MICH, MO). DARIEN: Tucuti, Chepigana, *M. E. & R. A. Terry* 1381 (A, F, MO); Yape, *Allen* 850 (F, GH, MO); location unspecified, *MacBride* 2676 (F). Province unspecified: Maume & Gorgone, *Wagner s.n.* (M); Marraganti, *Williams s.n.* (NY). Location unspecified: *Weddell s.n.* (GH, P).

Coccoloba barbadensis Jacquin, Enum. 36. 1760, Obs. Bot. 1: 18. *pl.* 8. 1764; Howard, Jour. Arnold Arb. 37: 317-339. 1956.

Coccoloba barbadensis var. *mexicana* Meisner, DC. Prodr. 14: 153. 1856.

Coccoloba schiedeana Lindau, Bot. Jahrb. 13: 187. 1890.

Coccoloba jurgenseni Lindau, Bot. Jahrb. 13: 188. 1890.

Coccoloba leptostachya Benthham, Bot. Sulph. 159. 1856.

Coccoloba oaxacensis Gross, Repert. Sp. Nov. 12: 219. 1913.

Coccoloba mayana Lundell, Bull. Torrey Club 64: 547. 1937.

Coccoloba masoni Lundell, Lloydia 2: 8. 1939.

Coccoloba fluviatilis Lundell, Contr. Univ. Mich. Herb. 7: 8. 1942.

In the second paper of this series (Jour. Arnold Arb. 37: 317-339. 1956), I considered the correct identification and application of the names *Coccoloba swartzii* Meisner and *C. barbadensis* Jacq. The former name had been overlooked by recent workers on the floras of the Antillean Islands and the latter name had been misapplied. I concluded that the material which is properly called *C. swartzii* was first identified by Lindau as *C. barbadensis* and that later he and all recent authors on the West Indian flora used the name *C. diversifolia* Jacq. for the same material.

Coccoloba barbadensis Jacq. was described twice by Jacquin, first in his Enumeratio, and later, supported by an illustration, in his Observationum Botanicarum. A definite location was not given for the species and recent authors have assumed from the name that the island of Barbados was implied. However, in the British Museum (Natural History) there are two sheets which can be referred to the Jacquin description and illustration and these are significant in the correct application of the name. One of

these, from the Miller herbarium, is obviously the material illustrated by Jacquin. Moreover, it bears the Houston catalogue reference which Jacquin cites in the synonymy of his *Coccoloba barbadensis*. Houston collected in Campeche (Yucatán) and his specimen is accurately matched in many of the collections cited below.

In his monograph of the genus *Coccoloba* for De Candolle's Prodrômus, Meisner assumed that *C. barbadensis* came from the West Indies and so created a variety, *C. barbadensis* var. *mexicana*, for a Schiede specimen from Mexico. Lindau (Bot. Jahrb. 13: 187. 1890) recognized the variety as a species which he named *Coccoloba schiedeana*, citing in synonymy *C. barbadensis* var. *mexicana* Meisner. Lindau cited additional material, all of which, with the exception of one collection, I have now seen. These are all clearly comparable to the original Jacquin material; thus, *C. barbadensis* Jacq. must henceforth be considered in the flora of Mexico and Central America.

Of the two old specimens in the British Museum (Natural History), one represents a sterile adventitious shoot and the other a vigorous shoot with an old inflorescence from which the fruits have fallen. In all probability, therefore, it will be impossible to describe the fruit which accompanied this original sheet. However, with a knowledge of the variation found in other species of *Coccoloba* in such characteristics as leaf shape, size of petiole, presence or absence of pubescence and length of fruiting pedicels, it is possible to make an accurate comparison with more recent collections. It is clear that *C. barbadensis* has puberulent to tomentose ocreae and inflorescence rachises, although in age these become glabrous. Also, the leaves are coriaceous and the leaf shape, particularly at the base, is variable. As in other species of *Coccoloba*, the plants are dioecious and the pistillate flowers, and later the fruits, are borne on short pedicels which in length barely exceed the ocreolae. The fruit, coronate at the apex, is rounded at the base and not attenuated into a stipe.

The variations with age and environment in these characteristics have caused *Coccoloba barbadensis* to be described many times. Seven species are assigned to the synonymy of *C. barbadensis* in this paper alone. Three additional apparently unpublished names have been applied to the specimens in various herbaria. The original variety which Meisner described is also placed in synonymy with the species. Three of these newly recognized synonyms represent only sexual variations, i.e., staminate versus pistillate plants, in the comparisons given by the original authors. Two species were originally distinguished through the failure of the author to recognize the loss of, or to see the residual, pubescence. One species was based on an abnormal fasciation of the inflorescence and two others were based on size and texture differences of the leaves. When considered alone or with only the material cited by the original authors, several of the species which I have reduced to synonymy might well represent clones or local populations. When considered with the wealth of material cited below, the differences become of little taxonomic value. It appears desirable to treat *Coccoloba barbadensis* as a widespread species of central and southern Mexico

and northern Central America, recognizing the considerable variation in leaf size, shape and texture.

Two excellent series of collections by Dr. Robert Dressler made in the states of Veracruz and Guerrero, Mexico, show the variation in leaf-size, -shape and -pubescence to be found on single plants.

Coccoloba leptostachya Benthham has been a troublesome name. Benthham described this plant, without citing a collection, in reporting on the Botany of the Sulphur Expedition. The locality was given as Libertad in Colombia, and recent collections from Colombia and Panama have been assigned to this species. However, examination of the type material in the Herbarium at the Royal Botanical Gardens at Kew shows clearly that the specimen on which Benthham based the species is a Barclay collection which represents *C. barbadensis*. Other species from the Sulphur voyage reportedly collected in "Libertad in Colombia" have more recently been recognized as Central American and, in several instances, the collection is believed to have come from Libertad in El Salvador. *Coccoloba leptostachya* appears to me to be a similar example of the incorrect citation of a locality. The recent collection *Carlson 563* (F) from "Finca Santa Emilia west of La Libertad at or near sea level" in El Salvador is a perfect match for the Barclay specimen. No material comparable to the type of *C. leptostachya* has been seen from Colombia.

In his monograph Lindau distinguishes *Coccoloba jurgenseni* from *C. schiedeana* on the basis of a glabrous inflorescence rachis in the former and a pubescent one in the latter. The distinction is inadequate, especially since the holotype of *C. jurgenseni*, *Jurgensen 157* (c) shows a slight puberulence within the range of variation expected in this genus.

Coccoloba oaxacensis Gross was reduced to the synonymy of *C. schiedeana* by Standley in his treatment of the trees and shrubs of Mexico. He reported at the time that he had "seen no material of *C. oaxacensis*, and it may be a distinct species." I have examined the holotype in the Berlin herbarium but find no reason to maintain *C. oaxacensis* as a species.

Coccoloba mayana Lundell was based on a staminate flowering specimen collected by Lundell on the bank of the Río San Pedro de Martir above El Paso in the Department of Petén, Guatemala. Lundell reported that the species was found only in wet soils on river banks and around "aguadas." *Coccoloba mayana*, he states, "is related to *Coccoloba schiedeana* Lindau, from which it differs in having longer racemes, nodes 1- or 2-flowered, larger flowers, and suborbicular perianth lobes." None of these characteristics is of specific value. At best, *C. mayana* as conceived by Lundell is an ecological variation, distinct only in having smaller and thinner leaves, but it does not seem to be worth a subspecific category. *Coccoloba barbadensis* is a variable species and, judging from the collections seen, occurs primarily in drier areas. Plants from other departments in Guatemala show larger leaves of thinner texture and are thus intermediate between the type collection of *C. mayana* and *C. barbadensis*.

Coccoloba masoni Lundell was based on a collection by H. L. Mason from Maria Magdalena Island of the Tres Marias Islands off the coast of

Nayarit, Mexico. Lundell recognized the dioecious condition of the flowers, the obovate or oval leaf shape and the pilose pubescence in the axils and on the veins of the leaves as distinguishing characteristics of this species. Two other collections from the same island group, one made earlier and one made later than the Mason specimen, show more clearly the range of variation in leaf-shape and -pubescence and indicate that *C. masoni* and the Mason collection on which it is based are the same as *C. barbadensis*. Only a few recent floras have recognized the dioecious nature of *Coccoloba*. At present it appears that all species are functionally unisexual and the dioecious character is not of specific value in the case of *C. masoni*.

In describing *Coccoloba fluviatilis*, Lundell placed his new species in a group which included *C. jurgenseni* and *C. mayana*, both of which are here included in *C. barbadensis*. Lundell felt that *C. fluviatilis* was distinct because of "large glabrous leaves, subcordate at the base, the stout petioles up to 1.7 cm. long, the glabrous rachis of the inflorescences, and the subsessile fruits." However, all of the size and shape characteristics mentioned by Lundell can be found in many of the single collections cited. The "glabrous" characteristic, however, is an error, for pubescence can be found on the terminal buds and in the axils of the leaves on the holotype, although the plants do become glabrate in the clonal material which Lundell studied.

Seler 1642 from Arroyo de San Carlos, in Mexico, was designated by Gross as the type of an apparently unpublished species named for the large, fasciated inflorescence axis. Many of Gross' new species have been published in obscure papers, so it is possible that this name may be in print. The fasciated inflorescence rachis is relatively common in other species of the genus and has been seen in three additional collections cited below. The Seler collection is clearly identical with the material assigned to this species.

The collection by Edward Palmer which was distributed with the letter "G" in place of a collector's number bears an unpublished name attributed to Rose. This name refers to the sessile flowers, but the collection is not distinct from *C. barbadensis*.

The specimen attributed to Galeotti and numbered 7218 has been cited and annotated by Lindau as *C. schiedeana*. The material, however, is a mixed collection containing in part *C. barbadensis* and *C. venosa*.

México. CAMPECHE: Champotón, *Flores 1934* (F); Mundo Nuevo, *Karwinsky 733b* (LE). CHIAPAS: Escuintla, *Matuda 2028* (A, DS, F, MICH); Javalinero, Palenque, *Matuda 3634* (A, F, MICH); Malpaso, near Siltepec, *Matuda 4517* (MICH-type of *C. fluviatilis*; A, F); Chicomuselo, *Matuda 15627* (F); Montecristo, *Matuda 15948* (F); Nandolopez, Acapetahua, *Matuda 16642* (BR, F); Mojarra, Tonalá, *Matuda 17139* (F); Mapastepec, *Matuda 17517* (F); Monserrate, *Purpus 275* (LE, US). COLIMA: Paso del Río, *Emrick 168* (F); Manzanillo, *Ferris 6209* (DS), *Palmer "G"* (B, GH, NY); Colima, *Palmer 90* (A, C, MICH). GUERRERO: La Mina near Atoyac, *Dressler 1798a, 1798b, 1798c* (GH); Vallecitos, Montes de Oca, *Hinton 10209* (DS, MICH), *10221* (DS, LE, MICH); Vallecitos, Llano de Oca, *Hinton 11781* (DS, LE, MICH); Sierrita, El Limón,

Galeana, *Hinton* 14137 (F, GH); Chilpancingo, *Kenoyer* C-277 (MICH); La Copradilla, *Langlassé* 134 (B, GH); El Trienta, C.L. & A.A. *Lundell* 12588 (MICH); Dos Arroyos, *Nelson* 7029 (GH, NY); Acapulco, *Palmer* 344 (A, GH), 602 (A, F, GH, MICH). JALISCO: Navidad, *McVaugh* 11903 (MICH); Tuxpan, *Mexia* 1051 (A, F, GH). MICHOACÁN: San Naranjillo, Coalcomán, *Hinton* 13943 (GH); La Placita, *Turner* 2028 (MICH). NAYARIT: Acaponeta, *Rose* 1414 (NY), *Rose, Standley & Russell* 14399 (NY); Magdalena Island, Tres Marias Islands, *Elmore* 1B3 (F, MICH), *Nelson* 4315 (GH), *Mason* 1806 (F-holotype of *C. masoni*; A, DS, GH, MICH), *Maltby* 167 (NY); San Blas, *Ferris* 5331 (A, DS); Ixtlán, *Viereck* 1193 (US). OAXACA: Rincón San Antonio, *Endlich* (B-holotype of *C. oaxacensis*); Dunes del'Oc. Pacifique, *Galeotti* 7218, in part (BR, K, P); Pinotepa Nacional, *Jurgensen* 157 (G-type *C. jurgenseni*; F-photo & fragment; B, K); Between Llano Grande and Pinotepa, *Nelson* 2334 (GH); Puerto Angel, *Reiche* 574 (M); Arroyo de San Carlos, *Seler* 1642 (B, GH); Almoloya, *L. Williams* 9906 (F, W). SINALOA: Labradas, *Ferris & Mexia* 5291 (A, DS). VERACRUZ: Laguna Encantada, east of San Andrés Tuxtla, *Dressler* 1804a, 1804b, 1804c (GH), *Nelson* 452 (A); Tantoyuca, *Ervendberg* 364 (GH, K, P); Savana de Mata de Don Juan, *Karwinsky* 734, 735 (LE); Tajín, Papantla, *Kelley* 65a (GH); Laguna Tamiahua, south of Tampico, *LeSueur* 100 (F); location unspecified, *Liebmann s.n.* (B); Mirador, *Ross* 802 (M); Tierra Blanca, *Ross* 883 (M); Zacualpan, *Purpus* 12022 (F, MICH); Rancho Camarón, *Purpus* 13068 (A, F, GH, MICH); Fortin, near Zacualpan, *Purpus* 2428 (A, F, GH); Papantla, *Schiede s.n.* (LE-type of *C. barbadensis* var. *mexicana* and *C. schiedeana* by implication; B). State unspecified: location unspecified, *Houston s.n.* (BM-type of *C. barbadensis*); *Sessé & Mociño* 950, 5434 (F).

Guatemala. ESCUINTLA: Naranjo, *J. Donnell Smith* 2496 (F, GH); San José, *Standley* 63998 (F); Río Guacalate, northwest of Escuintla, *Standley* 89345, 89350 (F, MICH); Río Michatoya, southeast of Escuintla, *Standley* 89054, 89060 (F, MICH). HUEHUETENANGO: Ciénaga de Lagartero below Miramar, *Steyermark* 51488 (A, F). PETÉN: La Libertad, *Aquilar* 275 (F, MICH, W), 313 (A, MICH), *Lundell* 3230 (F, GH, MICH), 3212, 3340 (F, MICH); El Paso, *Lundell* 1498 (MICH-holotype of *C. mayana*; DS, GH). QUEZALTENANGO: Río Ocosito, *J. Donnell Smith* 1481 (F, GH). RETALHULEU: Champerico, *Standley* 66593, 66602, 66631 (F); between Nueva Linda and Champerico, *Standley* 87699, 87721 (F); Retalhuleu, *Standley* 88818 (F). SAN MARCOS: Ocós, *Steyermark* 37780 (F). SANTA ROSA: Guazacapán, *Standley* 78603 (F); Chiquimulilla, *Standley* 78785, 79175, 79243 (F); La Sepultura, west of Chiquimulilla, *Standley* 79378 (F). SUCHITEPÉQUEZ: South of Tiquisate, *Steyermark* 47807 (F).

Salvador. AHUACHAPÁN: Ahuachapán, *Standley & Padilla* 2615 (F). *Standley* 20313 (GH, MICH). LA LIBERTAD: Libertad, *Barclay s.n.* (K-type of *C. leptostachya*), *Carlson* 563 (F). SANTA ANA: Santa Ana, *Standley* 20404 (GH). SONSONATE: Acajutla, *Standley* 21895, 21974 (GH).

The following collections are also assigned to *Coccoloba barbadensis*, but probably represent a hybrid complex. The specimens are all staminate, with sterile, insect-infested fruits on tenuous pedicels twice as long as the ocreolae. The leaves appear to be more coriaceous and the margins are revolute. The leaves are shiny on the upper surface, although this may be an artifact of preservation.

Guatemala. ALTA VERAPAZ: Laguna Sapalá, *Steyermark* 44899 (F). PETÉN:

Laguna Petexbatúm, *Steyermark* 46224 (A, F); Along Río Santa Mónica between Cedral and Ceibal, *Steyermark* 46040 (F, MICH), 46160 (F).

The series of collections cited below appears to represent a different hybrid population limited to the state of Sinaloa and found only in the coastal areas. The probable parents are *Coccoloba barbadensis* Jacq. and *C. uvifera* L., although in general the leaves are smaller than in either of these. Leaf texture, as well as the size and shape of the fruit, indicate a relationship to *C. barbadensis*. The leaf shape, especially at the base and apex of the blade, and the venation show similarities to *C. uvifera*. However, in contrast with most of the recognized *C. uvifera* hybrids from the West Indies and with *C. × lundellii* of Central America, *C. uvifera* seems to be the less dominant parent in this hybrid. Fruits of two types have been found, one essentially globose but strongly coronate and the other more or less oblong and obtusely to slightly coronate at the apex. The first type closely approaches the fruit of *C. barbadensis* and all fruits opened have fully developed embryos and endosperm. The second type shows the influence of *C. uvifera* and all fruits examined had either rudimentary seed development or were sterile.

Mexico. SINALOA: Altata, *Rose* 1359 (NY); Culiacán, *J. Gonzalez Ortega* 6583 (DS, GH, M), *Palmer* 1518 (GH, NY); Elota, *J. Gonzalez Ortega* 5879 (DS, GH, M); La Concha, *Gentry* 6804 (F, GH); Mazatlán, *Howell* 10559 (A), *Rose, Standley & Russell* 14035 (NY); Villa Union, *Rose, Standley & Russell* 13953 (NY); locality unspecified, *J. Gonzalez Ortega* 7203 (F).

Most of these specimens were identified as *Coccoloba goldmanii* or *C. masoni*. The former is a distinct species, but is known from the type and one other collection. It may, in fact, be related here as part of this hybrid population or be one of the parents in place of *C. barbadensis*. *Coccoloba* needs a special study in Sinaloa and southern Chihuahua. *Coccoloba masoni* Lundell is clearly referable to typical *C. barbadensis* Jacq.

Coccoloba belizensis Standley, *Trop. Woods* 16: 38. 1928.

Coccoloba hirsuta Standley, *Publ. Field Mus. Bot.* 4: 303. 1929.

Coccoloba belizensis Standley is a clearly defined species and one which is easily recognized. The relatively large, globular terminal buds with tawny to chestnut-brown pubescence are distinctive even on sterile or adventitious shoots. The pubescent inflorescence is branched and consists of racemes arranged as a panicle of nearly equal branches. The leaf size varies considerably in fertile material as well as on sterile shoots which are presumably adventitious. Both staminate and pistillate plants are represented in the collections cited. The mature achene is surrounded by a fleshy perianth which seems to be formed by the equal enlargement of the perianth lobes and the hypanthium.

In the Berlin Herbarium there is a specimen studied by Gross which bears an unpublished herbarium name honoring the collector, Campbell. Much of Gross' work on *Coccoloba* appeared as small notes in miscellaneous

papers. Thus it is possible that this specific name has been published and, if so, it antedates *C. belizensis*.

Coccoloba hirsuta Standley was based on sterile material. The type, *Standley 54802*, as well as the cotype *52823*, was collected in the Lance-tilla Valley, near Tela, Honduras. Standley noted the undesirability of basing species on sterile material, but felt that this species was easily recognizable by the "copious long pubescence of the leaves." In their treatment of the genus *Coccoloba* for the Flora of Guatemala (*Fieldiana Bot.* 24: 114. 1946) Standley and Steyermark continued to recognize *C. hirsuta* as a distinct species, referring to, but not citing additional specimens from, Guatemala and thus extending the range. I have seen two collections from the Department of Izabal, *Steyermark 38185* and *Standley 72945*, which are among those which must have been seen by Standley and Steyermark. These authors suggest that *C. hirsuta* "will be found to have paniced racemes, and to be closely related to *C. Tuerckheimii*." I am unable to distinguish between material annotated "*C. hirsuta*" by Standley and Steyermark and cited by Standley and that of occasional sterile specimens which the same authors assigned to *C. belizensis*. Such collections as *C. & W. von Hagen 1344* from the Department of Colón, Honduras, and *Lundell 2756* from the Department of Petén, Guatemala, approach *C. hirsuta* in the amount and type of pubescence. The Von Hagen collection is sterile and was taken from a 75–100-foot tree. This specimen may be an adventitious shoot comparable to the type of *C. hirsuta*, for the terminal bud is the same in size and shape, but there is less copious pubescence on the stem and much less on the leaves. The Lundell collection grades easily into fertile material which can be clearly defined as *C. belizensis* and which is found in the same area.

Guatemala. ALTA VERAPAZ: Chirreacté, *Standley 91620, 91672* (F); between Sachaj and Sacacac, *Steyermark 45157a* (F). IZABAL: between Bananera and La Presa in Montaña del Mico, *Steyermark 38185, 38186* (F); Escoba, *Standley 72945* (F). PETÉN: La Libertad, *Lundell 3463* (F, MICH); Monte Santa Teresa, *Lundell 2736* (F), *2756* (MICH). **British Honduras.** COROZAL DISTRICT: San Roque, *Gentle 554* (F); Corozal, Orange Walk Rd., *Gentle 4967* (F, MICH); Corozal, Pachacan Rd., *Lundell 4784* (A, F, MICH). EL CAYO DISTRICT: San Agustin, *Lundell 6812* (F, GH, MICH). ORANGE WALK DISTRICT: Honey Camp, *Lundell 637* (DS, F, GH, MICH, US). STANN CREEK DISTRICT: Carib Reserve, *Gentle 3088* (MICH); Mullins River, *Gentle 3365, 3369* (A, MICH); Silk Grass Creek Reserve, *Gentle 2982* (MICH); Stann Creek, *Gentle 2964* (A, MICH); Stann Creek Valley, *Stevenson 7* (US-holotype; A, F, Y). TOLEDO DISTRICT: Jenkins Creek, *Gentle 4080* (A, MICH). District unspecified: Belize, *Campbell 117* (B); Crique Negra, *Stevenson 104* (F, Y); All Pines, *Schipp 794* (A, F, GH, MICH); Tower Hill Estate, *Karling 14* (F, GH). **Honduras.** ATLÁNTIDA: Lance-tilla Valley near Tela, *Howard, Briggs, et al. 451* (A), *Standley 52823* (F), *53555* (A, F), *54802* (F-type of *C. hirsuta*; A); San Alejo, *Standley 7971* (F); San Juan near Tela, *Yuncker 4817* (A, F, MICH); Tela, *Standley 53402* (A, F). COLÓN: Guarunta, *C. & W. von Hagen 1344* (F). **Nicaragua.** Eastern Nicaragua, *Shank 93* (Y).

Coccoloba caracasana Meisner, DC. Prod. 14: 157. 1856.

Coccoloba caracasana forma *glabra* Lindau, Bot. Jahrb. 13: 211. 1890.

This species was formerly considered to have orbicular leaves, but the large number of specimens examined indicates that a broadly oblong leaf is more characteristic than a strictly orbicular one. Considerable variation in leaf size and shape is found in the species. Leaves of adventitious shoots may have nearly ovate blades up to 34 cm. long and 28 cm. wide on petioles to 4 cm. long. The straw-colored ocreolae are membranaceous, with several occurring at each nodule because of the presence of numerous flowers, several of which are frequently aborted. In fruit the lobes of the perianth expand to cover more than the upper half of the achene.

The forma *glabra* which Lindau described is scarcely worthy of recognition since the density and persistence of the pubescence varies in single collections and on single plants.

In addition to the specimens cited below, the species is known from Venezuela and Colombia and possibly farther south along the Andes. The type has been cited both as *Humboldt* 732 and as *Bonpland* 732. One collection cites only Caracas, Venezuela, as the locality, while another bears a label referring to the "valley of Araguensibus."

México. CHIAPAS: Las Garzas, Acapetagua, *Matuda* 2677 (A, DS, F, MICH), 2806 (A, MICH); Mapastepec, *Matuda* 17516 (F); Tapachula, *Matuda* 17704 (F). **Guatemala.** ESCUINTLA: Iztapa, *J. R. Johnston* 1171 (F); San José, *Standley* 64232 (F, MICH), 64019, 64190 (F). JUTIAPA: Between Trapiche Vargas & Asunción Mita, *Steyermark* 31792 (F). RETALHULEU: Between Nueva Linda and Champerico, *Standley* 87673 (F). SANTA ROSA: Santa Rosa, *Ørsted* 668 (M); Capulín, *Standley* 79592 (F); Los Cerritos region, Capulín, *Standley* 79607, 79563 (F, MICH). SUCHITEPÉQUEZ: Tiquisate, *Steyermark* 47700 (F). **El Salvador.** LA PAZ: Zacatecoluca, *Calderon* 305 (GH). LA UNIÓN: Laguna de Maquigüe, *Standley* 20977 (GH). SAN MIGUEL: San Miguel, *Standley* 21139 (GH); Laguna Jaguay, San Miguel, *Fassett* 28813 (A); Laguna de Olomega, *Standley* 20990 (GH). SAN SALVADOR: San Salvador, *Renson* 139 (NY), *Standley* 23611 (F, GH). SAN VICENTE: San Vicente, *Standley* 21261 (F, GH), *Standley & Padilla* 3702 (F). SANTA ANA: Hacienda la Barra, *Carlson* 1031 (F). SONSONATE: San Antonio del Monte, *Standley* 22171 (GH). **Nicaragua.** CHINANDEGA: Chichigalpa, *Standley* 11187, 11334 (F). CHONTALES: Juigalpa, *Standley* 9302, 9305 (F). GRANADA: Granada, *Baker* 2435 (A, MICH). LEÓN: La Paz, *Baker* 2272 (GH). Locality unspecified: *C. Wright s.n.* (GH); *Ørsted* 670, 671 (C). **Costa Rica.** GUANACASTE: between Bebedero and Taboga, *Brenes* 12562 (F); Filadelfia, *Echeverria* 295 (F); Nicoya, *Tonduz* 13799 (F, G, GH), 13974 (G, GH); Isla de Chira, *Valerio* 1467 (F); Santa Ana de Nicoya, *León* 989 (F). Province unspecified: Los Loros, *Brenes* 22056 (F). Locality unspecified: *Hoffmann* 292 (B), *Warscewicz s.n.* (B). **Panamá.** CANAL ZONE: Ancón, *Pittier* 2730 (US); Gorgas Memorial Laboratory grounds, *White* 106 (F, GH, MO); Río Agua Salud near Frijoles, *Piper* 5848 (GH); Victoria Fill near Miraflores Locks, *Allen* 1701 (F, GH, MO, NY). CHIRIQUÍ: Progreso, *Cooper & Slater* 270 (F). LOS SANTOS: La Jagua, *Bartlett & Lasser* 16382 (MICH). PANAMÁ: Sabanas Road, *Gillespie P-34, P-34a* (DS); Chepo, *Kluge* 25 (F, NY).

Coccoloba chiapensis Standley, Proc. Biol. Soc. Wash. 33: 67. 1920.

Coccoloba anisophylla Standley, Publ. Field Mus. Bot. 4: 303. 1929.

Coccoloba anisophylla was based on sterile material, but Standley reported that "the form of the leaves is quite different from that of any other Central American species." On studying the material cited by Standley and being unable to distinguish *C. chiapensis* from *C. anisophylla*, I have referred the latter to the synonymy of *C. chiapensis*. This species is distinct in having leaves which are oblong to elliptic, broadest near the middle, tapering to an acuminate apex and narrowing to an abruptly obtuse and asymmetrical base. Only staminate flowers are known for this species and additional material is needed. Sterile specimens may resemble *C. novogranatensis* but can be distinguished by the basal origin of the petiole and by the pubescence.

México. CHIAPAS: Finca Irlanda, Purpus 7699 (US-holotype of *C. chiapensis*; B, GH, NY); location unspecified, Purpus 7599 (GH, NY). Honduras. ATLÁNTIDA: Lancetilla Valley near Tela, Standley 53260 (F-holotype of *C. anisophylla*; A), 53364, 54840 (A, F).

Coccoloba cozumelensis Hemsley, Biol. Am. Centr. 4: 108. 1887.

Coccoloba yucatanica Lindau, Bot. Jahrb. 13: 190. 1890.

Coccoloba cozumelensis is readily recognized but difficult to define and separate in a key. The species seems amply distinct on the basis of the pale tan color of the leaves which often dry a lighter yellow-brown on the lower surface, and the sessile fruits which are obtuse at the apex with the perianth lobes not at all coronate. Also, the petioles are puberulent and along the midrib and veins on the lower leaf surface there is a characteristic crispate pubescence.

Some specimens of *Coccoloba cozumelensis* grade into the Central American phase of *C. swartzii* and it is possible that a hybrid complex exists in coastal areas where these species occur together. Since I have insufficient material to resolve this problem, the key characteristics used here apply to plants represented by the distinctive holotypes of each.

Two recent collections from the state of Chiapas are referred here. One collection, Margery C. Carlson 2071, made at Tuxtla Gutiérrez, is annotated as a new species by Standley and Williams. The name used refers to the tenuous spike. This collection, in flowering condition, is intermediate between typical material of *C. cozumelensis* and specimens referred to *C. spicata*, but other than the larger leaves of Carlson 2071, I find no reason for recognizing the collection as a new species. The second collection, Dressler 1408, from El Real, Chiapas, is intermediate between typical *C. cozumelensis* and the Carlson collection.

Standley placed *Coccoloba yucatanica* in the synonymy of *C. cozumelensis*. I have re-examined authentic material of this and confirm his decision.

México. CAMPECHE: Tuxpeña, Lundell 853 (A, DS, F, GH, MICH). CHIAPAS:

Tuxtla Gutiérrez, *Carlson 2071* (F, NY); El Real, east of Ocosingo, *Dressler 1408* (GH). QUINTANA ROO: Cozumel, *Gaumer 18* (B-holotype of *C. yucatanensis*; GH, K); Cobá, *C.L. & A.A. Lundell 7804* (A, DS, F, M, MICH), 7830 (A, DS, F, MICH). TABASCO: Reforma, Balancán, *Matuda 3173* (A, MICH). **British Honduras.** BELIZE DISTRICT: Maskall, *Gentle 1068* (A, F, GH, MICH), 1349 (A, F, MICH). COROZAL DISTRICT: San Antonio, *Bartlett 13031* (A, F, MICH), *Lundell 4815* (A, F, MICH); Corozal, *Gentle 524* (F, MICH). EL CAYO DISTRICT: Little Mountain Pine Ridge, *Bartlett 13060a* (MICH); Mountain Pine Ridge, San Agustín, *Lundell 6648* (DS, F, GH, MICH). ORANGE WALK DISTRICT: Honey Camp, *Meyer 50* (F). **Guatemala.** IZABAL: Río Dulce, *Wilson 387* (F). PETÉN: Carmelita, *Egler 42-249* (F); La Libertad, *Lundell 3570* (F, GH, MICH).

Coccoloba darienensis, sp. nov.

Arbor, 12 m., ramulis teretibus, glabris; ocreis chartaceis, oblique truncatis, 1 cm. longis, glandulis (?) resinosis, adpressis; petiolis ad basem ocreis gerentibus, teretibus, supra canaliculatis, glabris, 7-11 mm. longis; laminis anguste oblongis vel lanceolati-oblongis, apice acutis vel breviter acuminatis, basi acutis, 10.5×3.5 vel 14.5×5 cm. longis latisque glabris, tenuiter coriaceis, nerviis primariis 9 vel 10, arcuato-adscentibus; inflorescentibus racemosis, 8-14 cm. longis, floribus crebris, nodulis confluentibus, pedunculis 1 cm. longis, rachis striatis, puberulentibus; floribus ignotis, bracteis ovatis vel oblongis, apice obtusis, 1 mm. longis, puberulentibus vel breviter pilosis, ocreolis membranaceis, raro bracteolisque puberulentibus vel apice ciliatis; pedicellis fructiferis 1 mm. longis, glabris; fructu ovoideo basi rotundato, 5-6 mm. longo, 5 mm. diametro, obtuse trigono, hypanthio non manifesto, lobis perianthii ad basem distinctibus, late ovatis, imbricatis, acheniis nitidis, nigris.

Panamá. DARIEN: Pinogana, *P. H. Allen 934* (GH-type; F, MO).

This collection had been identified as *Coccoloba acuminata*, which is certainly a related species. The strongly divided fruiting perianth would allow this species to be placed in Lindau's section *Campderia*. *Coccoloba darienensis* is distinct from *C. acuminata* on the many-flowered inflorescence in which the flowers are confluent, not clustered, and the axis is terete but striate or grooved and not swollen below each nodule. Furthermore, *C. darienensis* differs in the evident fruiting pedicels, while *C. acuminata* can be regarded as having only spicate inflorescences without evident pedicels in fruit.

Coccoloba diversifolia Jacquin, Enum. Pl. 19. 1760.

Coccoloba laurifolia Lundell, Bull. Torrey Club 66: 594. 1939, and authors, possibly Jacquin, Hort. Schoenbr. 3: 9, t. 267. 1798.

Coccoloba lancifolia Lundell, Bull. Torrey Club 66: 593. 1939.

I have previously discussed the proper application of the epithet *Coccoloba diversifolia* Jacq. (Jour. Arnold Arb. 30: 421-424. 1949). All recent publications, however, have used *C. laurifolia* Jacq. for material more prop-

erly called *C. diversifolia*. *Coccoloba laurifolia*, based on material from Caracas, Venezuela, was described and illustrated by Jacquin, but I have been unable to find any collections from northern South America which exactly duplicate the characteristics which he illustrated. It is probable that *C. laurifolia* is the same as *C. diversifolia*, described by Jacquin twenty-eight years earlier. Oddly enough, no specimens of this which could be attributed to Jacquin have been seen in European herbaria, although a few specimens collected from cultivated plants and labelled "*C. laurifolia* Jacq." are present in the herbaria at Berlin, Leningrad and Geneva. However, all of these are true *C. diversifolia* and fail to compare favorably with the original illustration of *C. laurifolia* Jacq.

Lundell compares *Coccoloba lancifolia* with the original description of *C. laurifolia*, reporting that his new species differs in its small, lanceolate and pointed leaves. *Coccoloba diversifolia*, as its name implies, is a variable species in respect to leaf shape, but in all the characteristics which I can observe, it is the same as *C. lancifolia*. In their treatment of the genus for Guatemala (Fieldiana Bot. 24: 114. 1946), Standley and Steyermark placed *C. lancifolia* Lundell in synonymy of *C. laurifolia*, but without comment. I concur with their decision, but call the species *C. diversifolia* Jacq. The small leaf size and the pointed apex can be found in many populations of *C. diversifolia*, especially in Cuba, the Bahamas and the Florida Keys.

This is the first time that this common West Indian species has been recognized in Central America and Mexico.

México. QUINTANA ROO: Lago San José, *Frère Arsène s.n.* (B). SAN LUIS POTOSÍ: Tamazunchale, *Edwards 921* (F). **Guatemala.** ALTA VERAPAZ: Cerro Cinajá, *Steyermark 45669* (A, F, MICH). IZABAL: Bay of Santo Tomás, *Steyermark 39232* (F), *39351* (F, MICH), *39357*, *39363* (F).

British Honduras. COROZAL DISTRICT: Location unspecified, *Gentle 231* (F, MICH, NY); Consejo, *Lundell 4945* (F, MICH). District unspecified: Jacinto Hills, *Schipp 1200* (MICH-holotype of *C. lancifolia*; A, GH, W).

Coccoloba emarginata Jacquin, Enum. Syst. Pl. 37. 1760.

This species was described by Jacquin in 1760 and illustrated in his *Observationum Botanicarum* in 1764 (*tab. 9*). It is based on a specimen from the herbarium of Mygind but no locality is given. The species was compared with the Hispaniolan *Coccoloba leoganensis* Jacq., which I have recognized (*Jour. Arnold Arb.* 39: 28–30. 1958), but which is better known in that flora as *C. rotundifolia* Meisn., a later homonym. Lindau was unable to place the Jacquin species and so listed it as of uncertain identity.

The situation here is similar to that of *Coccoloba barbadensis*. The specimen which Jacquin described must have come from the Yucatán Peninsula of Mexico. The illustration, although of a sterile plant, is an excellent one and is obviously the same as *Neomillspaughia emarginata* (Gross) Blake (*Bull. Torrey Club* 48: 84. 1921), the basionym of which is *Podopterus emarginatus* Gross (*Repert. Sp. Nov.* 12: 218. 1913). Gross' species is

based on *Seler 5600* from Yucatán, Mexico. Since the combination has already been made, I can only add *Coccoloba emarginata* Jacquin to the synonymy of *Neomillspaughia emarginata* (Gross) Blake and thereby dispose of a troublesome and misplaced ancient epithet in the genus *Coccoloba*.

Coccoloba goldmanii Standley, Contr. U.S. Nat. Herb. 23: 245. 1922.

This distinctive species from the drier areas of northern Mexico has not been recollected in the past sixty years. Cited below are the Goldman collection made in 1898 and the Hartman collection made in 1891. The latter was misidentified as *Coccoloba orizabae*. *Coccoloba goldmanii* is recognized by the nearly orbicular leaves which are persistent short pubescent below and which possess a conspicuous network of veins on the lower surface. The flowers are unknown. The ellipsoidal fruits are not coronate and the lobes of the fruiting perianth cover the upper half of the achene, the hypanthium the lower half.

México. CHIHUAHUA: Apajcachi, *Hartman 535* (GH). SINALOA: Valley of Río Fuerte, *Goldman 245* (US-holotype; GH).

Coccoloba hondurensis Lundell, Bull. Torrey Club 66: 591. 1939.

Coccoloba marginata J. Donnell Smith, Enum. Plant. Guat. 6: 36. 1903, not Benth.

In describing this species, Lundell states, "the specimens show considerable variation, especially in leaf shape, inflorescence, and fruits but all appear to be referable to a single species. . . . Collections of *C. hondurensis* have been referred to *C. schiedeana* Lindau, *C. marginata* Benth., *C. barbadensis* Jacq., and *C. leptostachya* Benth. I have not been able to associate the species with any of these."

It is unfortunate that Lundell did not state how he distinguished *C. hondurensis* from the other species he lists. Standley and Steyermark (Fieldiana Bot. 24: 116. 1946) refer *C. hondurensis* to the synonymy of *C. schiedeana* Lindau in their treatment of the genus for Guatemala. I regard *C. schiedeana* Lindau as identical to *C. barbadensis* Jacq. I hesitate to follow Standley and Steyermark in reducing *C. hondurensis*, for there is a problem here which I cannot solve, even with abundant herbarium material. I prefer to keep *C. hondurensis* as a distinct species and to call this problem to the attention of field workers for further study. Material cited below as *C. hondurensis* is easily recognized, but difficult to define or to separate in a key. For the present, *C. hondurensis* can be recognized when dry by the dark brown or black upper leaf surface which contrasts with the lighter-colored lower surface. The inflorescences are usually twice as long as the subtending leaves. The fruiting pedicels are slightly more tenuous and seem relatively longer than those of *C. barbadensis* and the apex of the fruit, while coronate, is more obtuse than is general in *C. barbadensis*. Usually such distinctions are not valid in this difficult genus and I am maintaining this as a distinct species for temporary convenience only.

Further study should be rewarding, for *C. hondurensis* may prove to be either a variety of *C. barbadensis* or of hybrid origin.

México. OAXACA: Tehuantepec, *L. Williams* 9906 (Y). VERACRUZ: Fortuno, Coatzacoalcos River, *L. Williams* 8701 (Y). **Guatemala.** ALTA VERAPAZ: Río Sebol, near Carrizal, *Steyermark* 45785 (F). IZABAL: Quiriguá, *Standley* 23867, 23988, 24547, 24601 (GH), 72249 (F); Puerto Barrios, *Standley* 72143 (F); Salomón Creek, south of Bananera, *Steyermark* 38934 (F). PETÉN: Río Cancuén, *Steyermark* 45925 (A, F); Río Machaquilla, north of El Cambio, *Steyermark* 45928 (F).

Honduras. ATLÁNTIDA: Vicinity of Tela, *Bangham* 212 (A); *Chickering* 233 (F, MICH), *Howard, Briggs et al.* 452, 503, 504, 505, 506, 507 (A), *Salvoza* 810 (A), *Standley* 53716, 54476, 54481, 54752, 56598, 56659 (A, F); La Ceiba, *Yuncker, Koepper & Wagner* 8295 (F, GH). COLÓN: Cuyamel, *Carleton* 598 (US). SANTA BÁRBARA: San Pedro Sula, *J. Donnell Smith* 5433 (A, F, GH, M). Dept. unspecified: Puerto Sierra, *Wilson* 74 (NY), 562 (F, GH, NY).

British Honduras. BELIZE DISTRICT: Quamina Creek, Manatee, *Gentle* 3437 (A, MICH); Cornhouse Creek, Manatee River, *Bartlett* 11275 (F, MICH); Sibun River, *Bartlett* 11361 (GH, MICH); Northern River, *Gentle* 897 (A, F, MICH). EL CAYO DISTRICT: Little Cocquericot, Belize River, *Lundell* 3995 (MICH), 3996 (MICH-holotype; F), 3997 (GH, MICH). STANN CREEK DISTRICT: Sarawee Pine Ridge, *Gentle* 2699 (A, F, MICH), 2748 (A, F, MICH); Mullins River Road, *Gentle* 2731A (A, F, MICH); Carib Reserve, *Gentle* 2734 (A, F, MICH), *s.n.* (A, MICH, WIS); Stann Creek Valley, *Gentle* 2733 (A, F, MICH), 2735 (A, F, MICH, WIS), 2737, 2738 (A, F, MICH), *s.n.* (MICH); Middlesex, *Gentle* 2820, 2874, 2878, 2887 (A, MICH), 3011, 3018 (A, F, MICH); Silk Grass Creek Reserve, *Gentle* 2989 (A, MICH); Big Eddy Ridge, *Gentle* 3348 (A, MICH); Mt. Cow Vayyel, *Gentle* 3538 (A, MICH); Silk Grass Creek Reserve, *Record BH-20* (Y); Middlesex, *Schipp* 453 (A, F, GH, MICH). TOLEDO DISTRICT: Swasey Branch, Monkey River, *Gentle* 3716, 3584 (A, MICH). District unspecified: Manatee Lagoon, *Peck* 255 (GH).

Coccoloba humboldtii Meisner, DC. Prodr. 14: 163. 1856.

Coccoloba orizabae Lindau, Bot. Jahrb. 13: 189. 1890.

Coccoloba humboldtii var. *longipedicellata* Gross, Repert. Sp. Nov. 12: 219. 1913.

Coccoloba petrophila Brandegees, Univ. Calif. Publ. Bot. 10: 404. 1924.

Meisner cited two collections in the original description of this species, *Humboldt* 4484, which is in the Willdenow Herbarium as No. 7705, and *Berlandier* 105, collected near Tampico. Although the Humboldt specimen in the Willdenow herbarium at Berlin bears no specific locality beyond "Mexico," this should be selected as the lectotype. A second specimen collected by Humboldt is in the Paris herbarium and bears the number 4484, with the locality given as "Vera Cruz." Unhappily, this specimen was identified and annotated by Lindau as *Coccoloba nutans*, an entirely different species.

Coccoloba orizabae Lindau was distinguished by Lindau in a key to the species on the shape of the leaf blade, especially the narrowed base and the

acuminate apex. The type of this species was *Bourgeau* 2822 from Orizaba, Veracruz.

Gross distinguished his new variety *Coccoloba humboldtii* var. *longipedicellata* by the longer pedicels and the inflorescence rachis as long as the leaves. Gross failed to appreciate the dioecious character of the species and based his variety on a staminate plant, in contrast to the holotype, which is a pistillate plant. The variety is clearly included within the range of variation of the Humboldt type collection and, as more recent collections demonstrate, should be included within the species.

Coccoloba petrophila was described by Brandegee in a report on Purpus collections from Mexico. *Purpus* 8872 from Camerón, Veracruz, was selected as the type. No discussion was given of the distinctions or affinities of the species. Another collection, *Purpus* 8736, made at the same time and location, was not seen, or at least not cited, by Brandegee. Subsequently Purpus collected additional material assigned to this species from near Los Conejos (16425, 16430) and Rancho Remudadero (10967). The last number was suggested to be a wide-leaved variety in Brandegee's herbarium notes. These Purpus collections, together with *Seler* 4482, show the extremes of variation to be expected in *C. humboldtii*, as well as the intermediate forms which made a continuous series from former concepts of *C. humboldtii* to *C. petrophila* and *C. orizabae*. Several of the Purpus collections also show thin-textured immature leaves of varying sizes and shapes. It is in such specimens as *Purpus* 16425 that transitions to the thin-textured acuminate-tipped leaves of *C. orizabae* can be found.

In his treatment of the trees and shrubs of Mexico, Standley places both *Coccoloba orizabae* and *C. humboldtii* in a division of his key headed "rachis of the inflorescence glabrous." In all of the material cited below, the young inflorescence rachis is subtomentose, but at maturity is puberulent or glabrate. The same is true of the ocreae. The original descriptions of the three species and the variety fail to mention pubescence.

México. SAN LUIS POTOSÍ: Las Canoas, *Pringle* 5111 (A, GH). VERACRUZ: Tampico, *Berlandier* 105 (A, B, LE, P), 201 (LE), *Palmer* 322 (GH, NY); Veracruz, *Galeotti* 109 (BR), *Juzepczuk* 1116 (F, LE), *Gorrin* s.n. (LE); Colipa, *Karwinsky* s.n. (LE); Laguna Tamiahua, *LeSueur* 100 (GH), 101 (F); Orizaba, *Bourgeau* 2822 (B-holotype of *C. orizabae*; P); Pánuco River near Ebano, *LeSueur* 102 (F, GH); Pacho, *Liebmann* s.n. (LE); Coatzacoalcos, *Orcutt* 3162 (DS, F, GH); Pueblo Viejo, *Palmer* 443 (F, G, GH, NY); Camerón, *Purpus* 8736 (GH, NY, US), 8872 (GH-isotype of *C. petrophila*); Rancho Remudadero, *Purpus* 10967 (B, F); Zacualpan, *Purpus* 12022, in part (DS); Los Conejos, *Purpus* 16425 (A, F, LE), 16430 (A, F); Puerto de Alvarado, *Seler* 4482 (B-holotype of *C. humboldtii* var. *longipedicellata*; GH); Mocambo, *Troll* 59 (M); Alvarado, *Schubert & Rojas* 1844a (A); location unspecified, *Humboldt* 4484 (B-Herb. Willd. 7705, lectotype; P).

Coccoloba lasserii Lundell, Contr. Univ. Mich. Herb. 6: 10. 1941.

This species is regarded as endemic to Panama and is perhaps not distinct from *Coccoloba tuerckheimii* Donn. Sm. For the present, *C. lasserii*

may be recognized by the paniculate inflorescence of few branches, the leaves with short, stout petioles and the blades which, while narrowed below the middle, are truncate or abruptly rounded at the base. Finally, the fruits known for *C. lasseri* are rounded at the base. In contrast, *C. tuerckheimii* has a paniculate inflorescence of many more branches, leaves with longer, tenuous petioles and blades cuneate at the base with fruits narrowed to a short stipe at the base.

Panamá. COCLÉ: Aguadulce, *Pittier 4989* (F); Penonomé, *Williams 357* (NY). HERRERA: Chitré, *Allen 1111* (F, GH, MO); Mangle Bejuco, *Steyermark, Allen & Dodge, s.n.* (F). PANAMÁ: Bejuco, *Allen 2542* (A, F); Panamá Nat. Highway, Las Lajas Bridge, *Bartlett & Lasser 16638* (MICH); Río Pacora, *Bartlett & Lasser 16946* (MICH-holotype); Balboa to Chamé, *Dodge, Hunter, Steyermark & Allen 16732* (MO); Punta Paitilla, *Standley 26265* (A). Province unspecified: *Duchassaing s.n.* (P).

Coccoloba liebmanni Lindau, Bot. Jahrb. 13: 189. 1890.

Coccoloba lapathifolia Standley, Contr. U.S. Nat. Herb. 23: 245. 1922.

This species is quickly and easily recognized by the persistent pubescence on the lower leaf surface. Most of the leaves show a tendency toward an undulate or wavy margin to the blade, while in some specimens this tendency is so exaggerated that the marginal folds overlap in the dried specimens. The fruit is globose and the perianth lobes are imbricate in fruit. The achene is not coronate.

Standley distinguished his new species, *Coccoloba lapathifolia*, from *C. liebmanni* on the basis of a "glabrous or very minutely puberulent" inflorescence rachis, in contrast to one densely short-pilose. Examination of the material cited below, however, including both types, indicates quite clearly that *C. lapathifolia* is the same as *C. liebmanni* and should be placed in synonymy.

México. COLIMA: Manzanillo, *Ferris 6061* (A, DS, F), *Palmer 965* (GH, NY); between Galera and Pochutla, *Liebmann s.n.* (c-holotype of *C. liebmanni*; B). GUERRERO: Acapulco, *Palmer 206* (US-holotype of *C. lapathifolia*; GH); Placeres, *Hinton 9101* (NY). OAXACA: Distrito de Tamiltepec, *Conzatti 4406½* (GH); Llano Grande & Pinotepa, *Nelson 2341* (GH); Cerro de Picacho, *Purpus 7735* (GH, NY); Tequisistlán, *Seler 1719* (B).

Coccoloba lehmannii Lindau, Bot. Jahrb. 20 (Beibl. 49): 7. 1895.

Uvifera lehmanni Lindau, in footnote, l.c.

Coccoloba lehmanni Lindau, Repert. Sp. Nov. 1: 156. 1905.

Coccoloba changuinolana Standley, Publ. Field Mus. Bot. 8: 9. 1930.

Coccoloba williamsii Standley, Publ. Field Mus. Bot. 11: 148-149. 1936.

Coccoloba allenii Lundell, Contr. Univ. Mich. Herb. 6: 8. 1941.

Lindau described this species in two papers. In the earlier publication the specific name is spelled "*lehmannii*" and in the later one, "*lehmanni*." Two collections (*Lehmann 6109* and *7560*) were cited in the first publication, but in the second description only *Lehmann 7560* was cited. In both

descriptions this new species is compared with *Coccoloba gracilis* of the section *Campderia*. Lindau's two descriptions of *Lehmann* 7560 are comparable; thus one may assume that Lindau overlooked the first publication which described both of these collections. It seems desirable to select *Lehmann* 7560 in the Berlin Botanic Garden Herbarium as the lectotype.

Coccoloba changuinolana was based on three collections from Panama with *Dunlap* 499 being selected as the type. An examination of these specimens shows Standley's original description to be in error on the important character of "perianthii tubo accrescente inclusus." The perianth lobes, not the perianth tube, increase in size to surround the mature achene, and the species as represented by the collections cited by Standley belongs to the section *Campderia*. Although Standley stated that the new species was related to *C. schiedeana*, I can find no basis for comparison between the two. However, *C. changuinolana* is comparable in all characteristics with *C. lehmannii*, from Columbia, and is assigned in synonymy to that species.

I have seen only the type collection, *Llewellyn Williams* 4803, of the several specimens that Standley cited in his original description of *C. williamsii*. This Peruvian species must also be placed in the synonymy of *C. lehmannii*. *Williams* 4803 is in fruiting condition and the longer fruiting pedicels are in contrast to the shorter pedicels found on the flowering specimens of the Lehmann collection which is the type of the species. Additional collections which I have seen are intermediate. Standley indicated a relationship of *C. williamsii* with *C. caracasana*, both species being assigned to the section *Campderia*, but these are clearly distinct in the leaf shape and nature as well as in the abundant pubescence.

Still a third species, *Coccoloba allenii* Lundell is assigned to synonymy here. Lundell correctly noted the alliance of *C. allenii* with *C. williamsii*, but distinguished *C. allenii* on the basis of a furfuraceous-lepidote indument and large apiculate spathaceous ochreolae. Additional specimens collected by Allen in Panama show many intermediate conditions in both characteristics.

Coccoloba lehmannii is currently known to occur in Columbia (type), Panamá, Peru, Costa Rica and Venezuela.

Costa Rica. La Palma, Suxaola Valley, *Dunlap* 467 (F, Y). **Panamá.** BOCAS DEL TORO: Daytonia farm, Region of Almirante, *Proctor Cooper* 421 (F, Y); Changuinola Valley, *Dunlap* 499 (F-type of *C. changuinolana*; B, Y). COCLÉ: El Valle, *Allen* 2181 (MICH-type of *C. allenii*; A, F), *Allen & Alston* 1857 (F, GH, MO).

Coccoloba lindaviana, sp. nov.

Frutex, 8 m., ramulis teretibus, leviter striatis, glabris; ocreis coriaceis, dense strigosis vel glabratis, 9–12 mm. longis; petiolis supra basem ocrearum gerentibus, 8–11 mm. longis, glabris; laminis oblongis, anguste oblongis vel oblongi-ellipticis, apice acutis vel breviter acuminatis, basi rotundatis, vel truncatis, 15×4.5 vel 22×8.5 cm. longislatisque, cori-

aceis, glabris, nerviis primariis 11–15, adscendentibus; inflorescentiis terminalibus, racemosis 12–15 cm. longis, rachis glabris, bracteis triangularibus, minutis, minusque 0.5 mm. longis, glabris, ocreolis membranaceis, glabris vel ciliatis ad marginem, bracteis aequaliter; floribus ignotis; pedicellis fructiferis 1.5–2 mm. longis, glabris; fructu ovato, 8 mm. longo, 6 mm. diametro, ad apicem obtuse coronato; acheniis castaneis, levibus, nitidis.

Honduras. YORO: Aguan river valley, vicinity of Coyoles, *Yuncker, Koepper & Wagner 8032* (GH-holotype; F); Cortés, canyon of Rio Piedras, 3 km. from San Pedro Sula, *Molina 3430* (F); El Encanto in Montana La Cumbre, *Molina 3577* (F); Montana de Rio Piedras, *Molina 3555* (F).

The Molina collections bear an unpublished name attributed to Standley and L. Williams. I agree with them that a new taxon is represented here, even though this species is currently known only from old and fruiting specimens. *Coccoloba lindaviana* is, therefore, distinct on the basis of the leaf shape, the position of the leaves, which are borne above the base of the ocreae, and by the oval fruit which is slightly coronate at the apex. It is also similar to *C. hondurensis*, differing in the venation of the leaves and the position of the petiole base. All of the fruits I have examined had fully-formed seeds. Nevertheless, there is a possibility of a hybrid origin of this species.

The species is named in honor of Gustav Lindau who published a monograph of the genus *Coccoloba* in 1890.

Coccoloba lindeniana (Bentham) Lindau, Bot. Jahrb. 13: 82. 1890.

Campteria lindeniana Bentham, in Benth. & Hook. Gen. Pl. 3: 103. 1880.

This species is known only from the type collection made by J. Linden (1602) in Tabasco, near Teapa, Mexico, in May, 1840. An altitude of 300 m. is given on the collector's label. Specimens have been seen in the herbaria at Geneva, Leningrad and Paris, as well as a fragment in the Berlin herbarium.

Coccoloba lindeniana seems distinctive among Mexican and Central American species in the very pubescent leaves and inflorescence axis and the pubescence of the bracts and ocreolae. It may prove to be nothing more than the pubescent form of *C. acuminata* which Lindau described as *C. acuminata* var. *pubescens*. *Coccoloba acuminata* is widely distributed through Central America and adequately represented in herbaria, although only a few collections are available from Guatemala. The pubescent phase, which I do not recognize as a distinct taxon, is found throughout the range of the species. The abundance and persistence of the pubescence varies.

The inflorescence of *Coccoloba acuminata* is characteristically interrupted, with the axis swollen below each flower cluster. The clusters therefore appear at an acute angle to the inflorescence axis. In *C. lindeniana*



Howard, Richard A. 1959. "Studies in the genus *Coccoloba*. VII A synopsis and key to the species in Mexico and Central America." *Journal of the Arnold Arboretum* 40(2), 176–203. <https://doi.org/10.5962/p.36685>.

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