

STUDIES IN THE GENUS COCCOLOBA, X.
NEW SPECIES AND A SUMMARY OF DISTRIBUTION IN
SOUTH AMERICA

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THE GREATEST NUMBER OF SPECIES of the genus *Coccoloba* occurs in South America. In the preceding paper of this series critical notes were presented on the 159 species reported to occur in South America. These 159 species, after critical study, were reduced to 77 either worthy of recognition or so incompletely known that they could not be referred elsewhere with confidence. The unnecessarily large number of species previously described can be attributed to several factors, including a tendency on the part of many botanists to identify or concern themselves only with local or regional floras, thereby omitting consideration of species from adjacent regions; the failure to understand the morphological variation found on single plants; and the failure to recognize the complete or partial unisexuality of the flowers in the genus. The species of *Coccoloba* are mainly recognized on the appearance of the leaves. The particular identifying characteristics often seem to defy description and none has been found which lends itself to tabulation or analysis, largely due to the paucity of collections and the lack of critical field studies. A full and ample collection of a single species for complete understanding of its morphology should include detailed notes on the habit of the plant and all its branches. Specimens should be collected to show the leaves and shoot systems of adventitious growth as well as normal growth. Functionally staminate and pistillate flowering branches are needed along with fruiting branches. Specimens should be taken from several trees within a population, where possible, to show the effects of the environment. Such ideal material is gathered only by the monographer and then usually only after bitter experience with a difficult group. Recently an experienced botanical traveler returned from a motor trip across the state of Goyaz in Brazil. He asked, "What is the attractive *Coccoloba* with wand-like branches and brilliantly colored leaves, so common everywhere?" The answer could only be, "It might be a new species," for no such habit data are available for any species of the genus in South America.

The following new species are not based on the ideal material suggested above, but, as is usually the case, on the specimens on hand. After a study of many hundreds of herbarium sheets of the genus from South America it is clear that no appropriate names exist for these plants.

As I have indicated in previous papers the number of reliable characteristics useful in identification and classification of the species of this genus are few. The flowers and their parts show little variation, beyond that ex-

pected, in anthesis. The perianth segments vary in size and shape with their position in the bud. The functional stamens are always shorter than the perianth segments but appear to mature at different times and therefore increase in length at different rates, until all are approximately equal in length when the flower is fully open. The sterile stamens may equal the mature fertile stamens in length or may all be rudimentary, or one or two may be long and the remainder short, or the reverse situation may occur. The sterile pistil from the staminate flower may be as large as the fertile pistil in a flower with abortive stamens or may be very small and rudimentary. Determining the fertility of a pistil in an herbarium specimen, however, is extremely difficult; such observations really should be made by the collector. The styles and stigmas in both functional and non-functional pistils vary in size and shape, particularly so in flowers clearly staminate in function.

A description containing the words, "perianth segments ovate-oblong, 1.5–2 mm. long, 0.5–1 mm. broad, functional stamens with filaments 1.5–2 mm. long, functional pistil 1.5 mm. long, styles 2 or 3, stigmas punctate, occasionally lobed, non-functional stamens and pistils rudimentary, 0.5–1 mm. long," would apply to nearly every species described. The following descriptions therefore are limited to the most reliable characteristics which can be used to define the specimens cited.

Coccoloba colombiana, sp. nov.

Arbor, 4–6 m., ramulis teretibus, adpresse tomentosis; ocreis subcoriaceis, 2 cm. longis, tomentosis, deciduis; petiolis 1.5–2 cm. longis, supra basim ocrearum gerentibus, tomentosis; laminis obovato-oblongis vel obovato-ellipticis, 10 × 6 vel 14 × 10 cm. longis latisque, supra glabris, subtus tomentosis vel strigosis in nerviis vel axillis, apice acutis, basi cuneatis asymmetricis, nerviis primariis 8–12, arcuatis; inflorescentibus 13–17 cm. longis, rhachibus striatis, puberulentis et tomentosis, bracteis ovatis, puberulentis, ca. 0.5 mm. longis, ocreolis translucetibus, ca. 1 mm. longis, floribus masculinis 3 vel 4 per nodulum, floribus femineis 1, raro 2 per nodulum; fructu ignoto.

Colombia. Without definite location, *Vageler s.n.* (B-holotype). ATLÁNTICO: Barranquilla, Cabica, *Bro. Elias 1082* (w), *1469* (w).

The specimen selected as the holotype was collected by H. Vageler on November 29, 1923, in Colombia. The specific location in German script is "Robles," a location which cannot be found in current atlases. The specimen had been studied by Burret, who applied two unpublished names to the specimen, one of them honoring Vageler. The collection *Elias 1082* in the Vienna herbarium was identified with the same unpublished name. *Elias 1469* was identified by Standley as "*Coccoloba leptostachya*," which is neither similar nor apparently related.

Coccoloba colombiana is similar to *C. lehmannii* and *C. nitida*, differing from both in the density of the flowers on the inflorescence, the origin of

the petiole above the base of the ocrea, and the asymmetrical nature of the leaf base.

Coccoloba duckei, sp. nov.

Arbuscula subscandens ramulis teretibus, crispo-ferrugineo-tomentosis; ocreis membranaceis, 1.5–2 cm. longis, pubescentibus; petiolis supra basim ocrearum gerentibus, 3–5 mm. longis, pilosis; laminis ovato-oblongis, puberulentis vel glabratis, tenuiter coriaceis, 5 × 3.5 vel 10 × 5.5 cm. longis latisque, apice acutis vel subrotundatis, basi rotundatis vel subcordatis, nerviis primariis 8 vel 10; inflorescentibus racemosis, 10–14 cm. longis, rhachibus striatis puberulentis, bracteis ovato-oblongis, 2.5 mm. longis, nigris, puberulentis vel ad marginem ciliatis, ocreolis membranaceis, 2.5 mm. longis; floribus masculinis 3 vel 4 per nodulum; floribus femineis et fructu ignoto.

Brazil. AMAZONAS: Boa Vista, *Ducke 1358* (A-holotype, F, NY, US).

This species is named in honor of its collector, an explorer of the Amazon area, Adolpho Ducke. The species resembles *Coccoloba obovata*, from which it differs in having a densely flowered inflorescence, smaller leaves, and shorter petioles.

Coccoloba llewelynii, sp. nov.

Coccoloba bolivarana Williams, *Trop. Woods* 68: 39. 1941. nomen nudum; Howard, *Jour. Arnold Arb.* 41: 220. 1960.

Arbor 8 m., ramulis sericeo-tomentosis glabrescentibus; ocreis translucidis, 12 cm. longis, glabratis, deciduis; petiolis ad basim ocrearum gerentibus, 2–4 mm. longis, sericeo-tomentosis vel glabratis; laminis obovato-ellipticis vel oblanceolatis, 8 × 3 vel 12 × 6.5 cm. longis latisque, puberulentis, costa tomentosa glabrescente, apice acutis vel abrupte breve acuminatis, basi contracto-rotundatis vel truncato-subcordatis, nerviis primariis 6–8; inflorescentibus tenuibus 8–12 cm. longis, nodulis distinctibus, rhachibus sparse tomentosis vel glabratis, floribus masculinis 1 ad 3 per nodulum, floribus femineis singularibus, bracteis late ovatis, membranaceis, 1 mm. longis, ocreolis bifidis, erectis, membranaceis; fructu ovoideo, 6 mm. longo, 4 mm. diametro, lobis perianthii coronatis, 1 mm. longis; acheniis ferrugineis.

Venezuela. ANZOÁTEQUI: Taguatagua, *Pittier 14893* (US). BOLÍVAR: El Tigre, near Río Cuchivero, alt. 90 m., *Llewelyn Williams 13374*, June 18, 1940, (F-holotype, K). MONAGAS: Caicara, *Foster Smith 239* (US).

The collection by Williams has been referred to previously under the invalid name *Coccoloba bolivarana* (Howard *loc. cit.*). Williams described this plant as a tree of eight meters with many trunks. The Smith collection is described as a bush. The species is distinct among South American Coccolobas through the short petioled obovate-elliptic leaves and the inflorescence with distinctly separated flowering nodules. In appearance

the specimens are similar to *C. obovata* and *C. venosa*. *Coccoloba llewelynnii* differs from *C. obovata* in the type of inflorescence and in the point of attachment of the leaves. It also differs from *C. venosa* in the inflorescence and the fruit. The species is named for its distinguished collector of plants in the American tropics, Llewelyn Williams.

***Coccoloba orinocana*, sp. nov.**

Arbuscula vel arbor parva, 2–5 m.; ramis majoribus lacuniatis, hornotinis teretibus, dense ferrugineo-pubescentibus; ocreis 3 cm. longis, membranaceis, tomentosus vel pilosis, deciduis; petiolis leviter supra basim ocrearum gerentibus, 10–15 mm. longis, tomentosus; laminis oblongis, late ovatis vel oblongo-obovatis, 7×3.5 vel 12×8.5 cm. longis latisque, frequente bullatis, subtus tomentosus vel pilosis, supra pubescentis in costa nervisque, apice rotundatis vel obtusis, basi rotundis vel leviter cordatis, nerviis primariis 9–14, arcuatis; inflorescentibus 18–25 cm. longis, rhachibus puberulentis, nodulis confluentibus, floribus masculinis 3 per nodulum, floribus femineis singularibus, bracteis late ovatis, 0.5 mm. longis, puberulentis, ocreolis membranaceis, 1–2 mm. longis, puberulentis; fructu ovoideo, 4 mm. longo, 4 mm. diametro, lobis perianthii imbricatis, $1/4$ vel subaequalibus hypanthium, acheniis nitidis, cinnamomeis.

Venezuela. BARINAS: Pedroza, *Bernardi 1955* (NY). BOLÍVAR: Río Pargueni, *Wurdack & Monachino 39759* (A-holotype, NY); Río Parguaza below Raudal Maraca, *Wurdack & Monachino 40994* (A, NY); Río Parguaza, Cerro Negro Parado below El Carmen, *Wurdack & Monachino 40973* (A, NY). GUÁRICO: El Sombrero, *Pittier 12367* (A, G, US)

This species is superficially similar to *Coccoloba caracasana* but differs in the softer leaves which are commonly bullate, the arcuate ascending nervation, and the fruiting perianth which is not lobed to the base.

***Coccoloba portuguesana*, sp. nov.**

Arbor parva, ramulis teretibus, dense brunneis crisposo-tomentosis; ocreis membranaceis, 1–1.5 cm. longis, dense tomentosus, deciduis, petiolis supra basim ocrearum gerentibus, 5–12 mm. longis, tomentosus; laminis obovatis, 5.5×3 vel 16×11 cm. longis latisque, coriaceis, rugosis, inter nerviis bullatis, subtus puberulentis sed crisposo-tomentosis vel pilosis in costa axillisque, apice obtusis, subapiculatis, basim versus cuneatis, minute cordatis, nerviis primariis 8–11; inflorescentibus 6–30 cm. longis, rhachibus multo-striatis, puberulentis, bracteis ovatis, 1 mm. longis, puberulentis, ad marginem ciliatis; ocreolis translucidis, 1–2 mm. longis, puberulentis; floribus masculinis 3–5 per nodulum, floribus femineis 1–2 per nodulum; pedicellis fructiferis 0.75–1 mm. longis, fructu ovoideo, 3 mm. longo, 3 mm. diametro, hypanthio pauce manifesto, lobis perianthii basim versus distinctibus; acheniis cinnamomeis.

Colombia. Without specific location, *Goudot "31"* (P). **Venezuela.** PORTUGUESA: Ospino, *Pittier 12024* (A-holotype, G, M, NY). ZAMORA: Sabaneta de Barinas, *Mell s.n.* (NY).

Lindau (Bot. Jahrb. 13: 222. 1890) cited the Goudot collection in a list of specimens seen as "*C. spec.*" The collecting locality is uncertain but the specimen, although smaller in size than the Pittier and Mell material, is clearly referable here.

Coccoloba portuguesana resembles *C. charitostachya*, *C. warmingii* and *C. latifolia* in one or several characteristics. It differs from *C. charitostachya* in the cuneate leaf base, longer inflorescence and the fruiting perianth which is divided to the base. The species is distinct from *C. warmingii* in the ridged inflorescence axis and the pubescence and is clearly distinct in fertile material from *C. latifolia* through the racemose inflorescence and the smaller leaves.

Coccoloba steinbachii, sp. nov.

Arbor, 6 m., ramulis striatis, glabris; ocreis 1.5–2 cm. longis membranaceis, glabris; petiolis 1.5–3.5 cm. longis, supra basim ocrearum gerentibus, ad basim glabris, ad laminas pilosis; laminis ovatis vel ovato-oblongis, (5 × 3.5) 8 × 5.5 vel 14 × 9.5 cm. longis latisque, tenuiter coriaceis, inter nerviis bullatis, costa supra puberulente, subtus nerviis primariis tomentosis vel pilosis, apice abrupte acutis, basi obtusis, truncatis vel leviter cordato-truncatis, nerviis primariis 10–14, arcuato-adscendentibus; inflorescentibus 32–44 cm. longis, rhachibus, bracteis et ocreolis puberulentis, bracteis ovatis, ca. 1 mm. longis, ocreolis membranaceis, 1–1.25 mm. longis, floribus masculinis (2–)7–13 per nodulum, floribus femineis 1–2 per nodulum; fructu ignoto.

Bolivia. Junction of the Río Beni and Río Madre de Dios, *Rusby 1380* (GH, K, NY); San Carlos, Mapiri, *Buchtien 1768* (NY); Santa Cruz, Sara, Buena Vista, *Steinbach 5617* (A-holotype, G, GH, NY), Río Palometillas, *Steinbach 6604* (A).

The type was collected in flower on April 25, 1921. *Coccoloba steinbachii*, named for its collector, is superficially similar to *C. tiliacea* of Argentina. Plants of *C. tiliacea* produce both peltate and nonpeltate leaves. Specimens of *C. steinbachii* may resemble the nonpeltate leaf types of *C. tiliacea* but differ in having more numerous veins, the leaf blades bullate between the veins, a longer inflorescence, and shorter pedicels.

Britton and Rusby (Bull. Torrey Club 27: 129. 1900) referred *Rusby 1380* to "*Uvifera illhaensis*" from which *C. steinbachii* differs in having much longer inflorescences, longer petioles and more numerous veins to the leaves.

Coccoloba wurdackii, sp. nov.

Frutex adscendens, ramulis teretibus striatisque, dense ferrugineo-puberulentis; ocreis 5 mm. longis, rigidis, persistentibus, subampliatis; petiolis ad basim ocreis gerentibus, robustis 5–8 mm. longis, puberulentis; laminis late ovatis vel ovato-oblongis, 9 × 4 vel 12 × 9 cm. longis

latisque, crasse coriaceis, glabris vel rare puberulentis, in sicco dense reticulatis, costa curvata, apice late acutis, basi cordatis vel rotundis, nerviis primariis 5 vel 8; inflorescentibus 10–15 cm. longis, rhachibus, bracteis, ocreolis dense puberulentis; floribus masculinis 2–5 per nodulum, floribus femineis singularibus, bracteis late ovatis, ca. 0.5 mm. longis, 1 mm. latis, ocreolis subampliatis, bifidis, ca. 1.0 mm. longis; fructu immaturo, ovoideo basi rotundato, lobis perianthii brevibus, coronatis.

Colombia. VAUPÉS: Río Guainia opposite Maroa, *Maguire, Wurdack & Keith 41852* (A-holotype, NY). **Venezuela.** AMAZONAS: Maroa, *Maguire, Wurdack & Bunting 36443* (NY), *Maguire & Wurdack 35693* (A, NY).

This species is named in honor of Dr. John Wurdack, who along with Dr. Bassett Maguire, has contributed greatly to our botanical knowledge of northern South America. *Coccoloba wurdackii* is similar to both *C. schomburgkii* and *C. marginata*. It differs from the former in its liana habit, longer inflorescences, and larger, reticulately veined leaves. From *C. marginata* the species may be distinguished by its shorter, broader, and thicker ovate leaves and heavier inflorescence axis.

Coccoloba zuliana, sp. nov.

Ramuli teretibus; ocreis deciduis; petiolis ad basim ocrearum gerentibus, 2–3 mm. longis, glabris, laminis obovatis, 2.5 × 1.5 vel 5.5 × 2.5 mm. longis latisque, membranaceis, apice acutis, basi cuneatis, subtus in axillis sparse tomentosis, nerviis primariis 5–8; inflorescentiis 3–4 cm. longis, rhachibus striatis, bracteis ovatis, ad marginem ciliatis, ocreolis membranaceis, ca. 1 mm. longis; floribus ignotis; pedicellis fructiferis singularibus, erectis, adscendentibus, 2 mm. longis, fructu ovoideo, 4 mm. longo, 3 mm. diametro, hypanthio non-manifesto, lobis perianthii ad basim distinctibus, imbricatis, adpressis; acheniis triangularibus, ferrugineis.

Venezuela. ZULIA: Perija, *Tejera 140* (US-holotype, GH).

This species is known from a single collection but is clearly distinct from the other species of *Coccoloba* in Venezuela and in South America. The small leaves and short inflorescences with well developed peduncles mark this species. The peduncles, while only 2 mm. long, appear even longer in contrast to the thin rachis. No collector's data are available regarding the size or habit of the plant. The specimens have also lost all the ocreae. Clusters of hairs occur in the axils of the veins on the lower leaf surface. The remainder of the leaf surface, the remnants of the ocreae, and the inflorescence rachis show resinous dots which may represent hair bases or excretions of some form. *Coccoloba zuliana* appears to be related to *C. obtusifolia*, differing in the shape of the leaves, the straight peduncles and the ovate fruit. In leaf shape *C. zuliana* resembles some collections of *C. peruviana* but differs in the size of the leaves, as well as the length of the peduncles.



The distribution of the species of *Coccoloba* in South America. Numerals on the map refer to the number of species recognized in each state of Brazil and in the other countries of South America. No species have been reported from Chile. The dotted line indicates the recorded limit of distribution in northern Argentina.

DISTRIBUTION WITHIN SOUTH AMERICA

Nearly half of the species of *Coccoloba* reported from South America are inadequately known. The flowers of one sex or the other, the fruits, or the leaves from adventitious shoots may be needed for a complete understanding of the individual taxa. All attempts to produce a key to the species of the genus occurring in South America have been unsatisfactory. For the present, therefore, it appears most useful to list the species occurring in defined political and geographical areas. The largest number of species (44) occurs in Brazil, with 20 species reported from the state of Rio de Janeiro. Venezuela has 27 species. The largest number of inadequately known species also occurs in these two areas, especially the vicinities of Rio de Janeiro and Caracas. Many species from the neighborhoods of these two major cities are known only from the type collections made one hundred to two hundred years ago. Modern collectors have not located additional material. Whether the species or the habitats have been eliminated by the growth of these urban centers, or whether representatives of these species would be located by careful scrutiny of the remaining vegetation, only time will tell.

Collections representing the following species have been cited in this or the preceding paper of this series, or have been received recently from South American botanists. For ease in locating specific names the generic abbreviation has been omitted throughout.

Argentina

argentinensis, cordata, paraguariensis, tiliacea

Bolivia

cujabensis, longipes, meissneriana, mollis, persicaria, peruviana, spinescens, steinbachii, tiliacea

Brazil

ACRE: *acuminata, confusa, densifrons, duckei, lepidota, marginata, mollis, ovata, parimensis, peruviana, schomburgkii, spruceana*

ALAGOAS: *alagoensis*

AMAZONAS: *acuminata, confusa, densifrons, duckei, marginata, mollis, ovata, parimensis, peruviana, schomburgkii, spruceana*

BAHIA: *alnifolia, alagoensis, arborescens, cordata, cruegeri, ilheensis, laevis, marginata, mollis, ochreolata, ovata, pipericarpa, plantaginea, ramosissima, rosea*

CEARÁ: *latifolia, mollis*

ESPIRITO SANTO: *ochreolata*

GOYAZ: *densifrons, latifolia, marginata, mollis*

MARANHÃO: *latifolia, mollis, sparsifolia*

MATO GROSSO: *brasiliensis, cujabensis, longipes, mollis, peruviana*

MINAS GERAES: *acrostichoides, alagoensis, brasiliensis, cerifera, declinata, glaziovii, grandiflora, lanceolata, marginata, mollis, pipericarpa, sticticaulis, warmingii*

PARÁ: *acuminata, confusa, densifrons, ovata, parimensis*

PARANÁ: *glaziovii*

PERNAMBUCO: *alnifolia, laevis, mollis*

PIAUHY: *mollis*

RIO DE JANEIRO: *acrostichoides*, *alagoensis*, *alnifolia*, *arborescens*, *confusa*, *fastigiata*, *gardneri*, *glaziovii*, *grandiflora*, *laevis*, *mollis*, *ochreolata*, *peltata*, *pipericarpa*, *ramosissima*, *rigida*, *salicifolia*, *schwackeana*, *sticticaulis*, *warmingii*

RIO GRANDE: *cordata*

SANTA CATARINA: *arborescens*, *warmingii*

SÃO PAULO: *confusa*, *cordata*, *glaziovii*, *mosenii*, *warmingii*

British Guiana

acuminata, *charitostachya*, *cruegeri*, *excelsa*, *gymnorrhachis*, *latifolia*, *lucidula*, *marginata*, *ovata*, *parimensis*, *savannarum*, *schomburgkii*, *sparsifolia*, *striata*

Colombia

acuminata, *caracasana*, *colombiana*, *coronata*, *densifrons*, *dugandiana*, *filipes*, *lehmannii*, *nitida*, *obovata*, *obtusifolia*, *ovata*, *padiformis*, *portuguesana*, *trianaei*, *uvifera*, *venosa*, *wurdackii*

Dutch Guiana

conduplicata, *excelsa*, *gymnorrhachis*, *latifolia*, *marginata*, *mollis*, *uvifera*

Ecuador

acuminata, *coronata*, *densifrons*, *mollis*, *obovata*, *ruiziana*

French Guiana

excelsa, *latifolia*, *lucidula*, *marginata*, *mollis*, *parimensis*

Paraguay

cordata, *cujabensis*, *guaranitica*, *paraguariensis*, *spinescens*

Peru

acuminata, *coronata*, *densifrons*, *gracilis*, *mollis*, *nutans*, *padiformis*, *parimensis*, *peruviana*, *ruiziana*

Uruguay

argentinensis, *cujabensis*

Venezuela

acuminata, *caracasana*, *coronata*, *cruegeri*, *dugandiana*, *fagifolia*, *fallax*, *latifolia*, *laurifolia*, *lehmannii*, *lucidula*, *llewelynii*, *marginata*, *obtusifolia*, *orinocana*, *ovata*, *padiformis*, *parimensis*, *portuguesana*, *schomburgkii*, *spruceana*, *striata*, *swartzii*, *uvifera*, *venosa*, *wurdackii*, *zuliana*.