

Flora of Panama. Part IV. Fascicle III

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Annals of the Missouri Botanical Garden, Vol. 47, No. 4 (Nov., 1960), 263-359.

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FLORA OF PANAMA

Part IV. Fascicle 3*

LORANTHACEAE

By CARLOS TOLEDO RIZZINI

Vines, undershrubs, shrubs or rarely trees, always parasitic on roots or stems; the vines, less commonly the shrubs, bearing adventitious roots united with their hosts. Leaves usually opposite, sometimes alternate, entire, seldom reduced to scales, more or less coriaceous and inconspicuously nerved, the nervation either palmate or pinnate; without stipules. Flowers very large to minute, frequently showy because of the bright colors, androgynous or unisexual, spicate, clustered, strobilate or arranged in ternations, these in racemes, spikes, corymbs, umbels and so on, rarely solitary, subtended by bractlets either free or coalescent, or bractless; perianth simple or double; calyculus present or absent; tepals (perianth segments) 3-6 or none; stamens as many as the tepals, reduced to staminodia in the pistillate flowers, the filaments joined to the tepals; pollen grains variable, globose or triangular, the exine either smooth or granulose (in some small genera it is reticulate or aculeate); ovary formed by the receptacle or blossom axis (thus the above mentioned calyculus is the edge of the receptacle), 1-(rarely several)-celled, sterile and poorly developed in the staminate flowers; stigma capitate, wanting in the male flowers which, however, have a slightly reduced style. Fruit (indeed a pseudofruit since it is developed from the receptacle), so far as American species are concerned, a berry (a drupe in certain Old World forms), frequently showing a milky layer containing rubber and persistent perianth parts; seed solitary, naked, the endosperm obviously developed and fleshy, rarely lacking; embryo small, with 2 rather large cotyledons.

The plants of this family are either completely (when they are leafless and without chlorophyll) or partly (when they bear normal foliage leaves) parasitic on other woody plants. The roots applied to the host become haustoria and through these part or all the food supply is secured from the latter. The few erect, terrestrial, tree-like forms live upon roots and their haustoria are underground.

The family comprises about 38 genera and 1,400 species, mainly tropical and subtropical but occasionally found in temperate regions. It is very homogeneous,

* Assisted by a grant from The National Science Foundation.

yet the morphological types are well marked so that the New World forms are readily distinguishable from the Old World ones. The Central American species are more closely related to the South American than to the North American or West Indian ones.

The following artificial key to genera serves only for the Panamanian entities so far known, since it has been prepared with the purpose of making the generic identification easy.

- a. Flowers small to very large, at least 2 mm. long, not immersed in the rachis of the inflorescence.
 - b. Plants terrestrial. Bractlets large, foliaceous, free..... 1. GAIADENDRON
 - bb. Plants growing upon others. Bractlets minute, mostly coalescent.
 - c. Flowers very small, hidden inside short, long-bracted spikes, the male flowers naked. Pollen grains spherical, prominently aculeate. 2. ANTIDAPHNE
 - cc. Flowers perianthed, freely inserted, conspicuous. Pollen grains neither round nor aculeate.
 - d. Flowers several cm. long, showy, each subtended by a cupula or cup. Endosperm wanting..... 3. PSITTACANTHUS
 - dd. Flowers up to 1 cm. long, usually shorter, without a cup below the calyculus. Endosperm present.
 - e. Flower perfect, each subtended by one bract plus two bractlets, all closely united..... 4. PHRYGILANTHUS
 - ee. Flowers unisexual (the vestigial pistil remains in the staminate flowers as the pollenless anthers do in the pistillate ones), each set of bract and bractlets subtending three flowers (ternation).
 - f. Filaments of the stamens slender and thin. Pollen grains dimorphous: the fertile triangular and tricolpate mixed with sterile, globose and smooth ones..... 5. STRUTHANTHUS
 - ff. Filaments of the longer stamens scalloped at each side. Pollen grains belonging to one type, triangular..... 6. PHTHIRUSA
 - aa. Flowers very small, no longer than 2 mm., sunken in depressions in the rachis of the spike.
 - b. Calyculus distinct though poorly developed. Tepals 6. Pollen grains reticulate..... 7. ORYCTANTHUS
 - bb. Calyculus lacking. Tepals 3. Pollen grains smooth.
 - c. Anther 1-celled, dehiscing transversely..... 8. DENDROPHTHORA
 - cc. Anther 2-celled, opening by 2 longitudinal slits..... 9. PHORADENDRON

1. GAIADENDRON G. Don

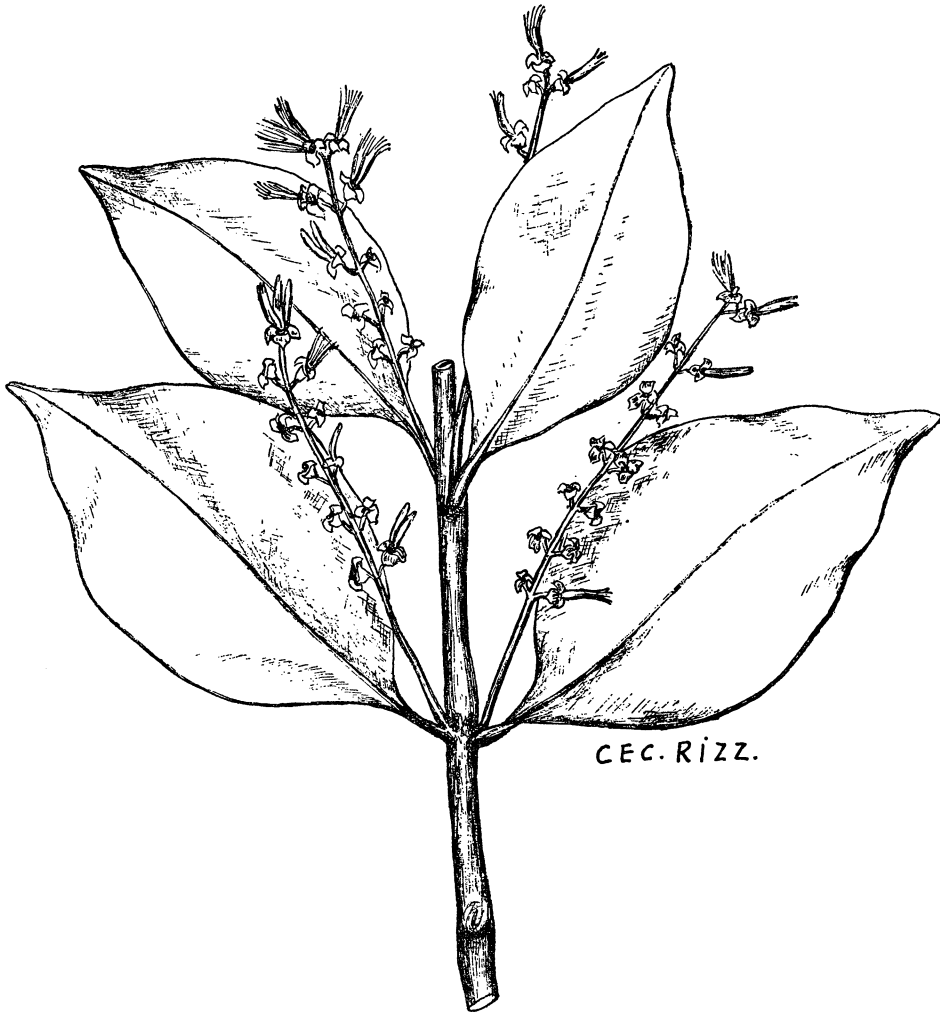
GAIADENDRON G. Don, Gen. Hist. 3:431. 1843; Eichler, in Mart. Fl. Bras. 5, pt. 2: 47. 1868 (as a subgenus of *Phrygilanthus*).

Tall shrubs or small trees living upon earth, but parasitizing roots of other plants. Leaves opposite, more or less coriaceous, almost always minutely, but evidently, punctate beneath. Flowers conspicuous, colored, 4–8-merous, perfect, in ternations, these in racemes or corymbs; bractlets conspicuously developed, free, persistent; pedicels often unequal. Pollen grains 3-angled, the exine granulose. Ovary said to be 2–6-celled, but this scarcely convincing. Fruit baccate, the seeds albuminous.

A chiefly Andean genus of about 6 species. The following is the only known from Central America, where it is endemic. A careful re-examination of the ovary, living or fixed, will probably show that the genus does not essentially differ from *Phrygilanthus* and that it must be retained, as by Eichler, under the last mentioned name.

1. *GAIADENDRON POAENSE* Donn. Sm. in Bot. Gaz. 56:61. 1913.

Parasitic shrubs or short trees reported to reach a height of 3-6 m., growing on the ground, with erect, terete branches. Leaf blades slightly ovate or oblong, acutish at the base, attenuate to the blunt apex, minutely punctate beneath, fleshy-coriaceous, often drying revolute at the margins, nerveless, to 8 cm. long and 4.5 cm. wide; petioles 5-10 mm. long. Racemes axillary, solitary, 7-10 cm. long. Bractlets ovate, persistent, foliaceous, 5-12 mm. long. Flowers in ternations, the

Fig. 72. *Gaiadendron poasense*

lateral short-pedicelled, androgynous, about 15 mm. long; tepals 6-7 in number, 13 mm. in length. Ternations pedicellate, the pedicels about 4-6 mm. long. Fruit not found yet.

Costa Rica, Panama.

CHIRIQUÍ: Volcán de Chiriquí, *Terry 1311*; *Davidson 995*; vicinity of Cerro Punta, *Allen 1518*; Boquete, Bajo Chorro, *Davidson 44*.

2. ANTIDAPHNE Poepp. et Endl.

ANTIDAPHNE Poepp. et Endl. *Nova Gen. ac Spec.* 2:70. 1838.

Stachyphyllum Van Tieghem, in *Bull. Soc. Bot. France* 42:565. 1895.

Medium-sized, erect shrubs, without adventitious roots in the shoots. Leaves alternate, thickly coriaceous. Flowers minute, spicate, dioecious; spikes short (up to 10 mm. in length), sessile in the leaf axils, more or less strobiliform; bractlets scale-like, broadly imbricate, either caducous or persistent in anthesis. Staminate flowers reduced to 3-6 stamens inserted at the base of the bractlets on a small disk, the filaments elongated, unequal; anthers erect, 2-4-celled, longitudinally dehiscent; pollen grains globose, with 3 pori, the exine conspicuously aculeate. Pistillate flowers sessile, in groups of 2-5 at the bractlet axils, bearing a perigonium; tepals well or poorly developed, adnate to the ovary; style none, but the stigma capitate. Fruit a round berry, the pericarp fleshy and possessing an evident milky layer.

A distinctive genus amongst South American Loranthaceae, recognized at first glance by the minute, bracteate, compact and dioecious spikes bearing naked male flowers; moreover, another striking feature lies in the aculeate (echinate) round pollen grains, since no other genus in the family shows such a character.

Most peculiar too is the geographical distribution of the 4 known species. *A. viscoidea* Poepp. et Endl., the commonest of all, is Andean; *A. fendleri* (V. Tiegh.) Engler occurs in Venezuela not rarely; *A. amazonensis* Rizz. and *A. paranaensis* Rizz., both more recently detected and described, are from the Amazonian forest. Thus the 4 species behave as being vicarious, coming down from the high Andean mountains to the low Amazonian basin, the habitats never intergrading with one another.

Keeping in mind the aforesaid statement, it is somewhat surprising to find *A. viscoidea* in Central America (Costa Rica, Guatemala and Panama) but—it must be stressed—at high altitudes (from 1,400 m. upwards).

1. ANTIDAPHNE VISCOIDEA Poepp. et Endl. *Nova Gen. ac Spec.* 2:70. 1838.

A densely branched shrub, glabrous, the branches generally to 50 cm. long, terete or nearly so. Leaves almost sessile, or the petioles very short and thick, obovate to suborbicular, cuneate at the base, the nerves very prominent and openly reticulate, coriaceous, 3-7 cm. long, 2-3 cm. wide. Flowers cream-colored, the Perianth segments slightly dentate. The bractlets fall when the flowers open. Fruit oval.

This species differs from the others mainly in having shorter spikes covered with bractlets which are deciduous by the time of anthesis. The whole genus is worked out in *Rodriguesia* 18-19:221-225, *pl.* 26-28. 1956.

Steyermark mentions a collection (*Fieldiana, Bot.*, 24. pt. 4:63. 1946) in Panama; it certainly is very rare there; no specimens were seen.

3. PSITTACANTHUS Mart.

PSITTACANTHUS Mart. in *Flora* 13:106. 1830; Eichler, in *Mart. Fl. Bras.* 5 pt. 2:23. 1868.

Always stout and erect shrubs, lacking aerial roots. Leaves usually opposite, coriaceous. Flowers large, showy, brilliantly colored, hexamerous, androgynous, in ternations or binations; these in racemes, corymbs or umbels; bractlets united in a cup which subtends the flowers. Tepals either free or connate, sometimes ligulate at the base. Stamens unequal, alternately shorter and longer, the filaments slender; pollen grains 3-angled, flattened, the exine granulose. Stigma capitate. Fruit baccate, large for the group, the seeds without endosperm but bearing big, and often more than 2, cotyledons.

About 80 species are known, especially in tropical America, 5 of them reported from Panama. The genus is easy of recognition because of the cups subtending the flowers, which are the largest among *Loranthaceae*, at least the New World ones.

- a. Branches terete. Leaves not falcate. Flowers 2-4 cm. long.
 - b. Leaves very broadly ovate, approaching orbicular, up to 9.5 cm. in width..... 1. *P. SCHERYI*
 - bb. Leaves not ovate, to 3 cm. broad.
 - c. Leaves oblong. Perianth 2-3 cm. long, the tepals lacking a typical ligule..... 2. *P. LATERIFLORUS*
 - cc. Leaves obovate-elliptic. Perianth 3-3.5 cm. long, the tepals conspicuously ligulate at the base..... 3. *P. ALLENI*
- aa. Branches 4-angled. Leaves oblique. Flowers 3-9 cm. long.
 - b. Leaves lance-elliptic or oblong, obtuse. Flowers 3-5 cm. long..... 4. *P. CHRISMARII*
 - bb. Leaves mostly ovate, acute. Flowers 5-9 cm. long..... 5. *P. SCHIEDEANUS*

Another species that may well be expected is *P. calyculatus* (DC.) Don, from Mexico and found in Costa Rica, which is closely allied to *P. chrismarii* Urban but distinguishable by the longer, acute and not oblique leaves.

1. PSITTACANTHUS SCHERYI Woods. in *Ann. Missouri Bot. Gard.* 28:426. 1941.

A very stout shrub up to 1.8 m. tall. Branches terete, glabrous, very thick. Leaves widely ovate or suborbicular, the rounded base scarcely contracted to the petiole, fleshy-coriaceous, the nerves poorly developed, 9-11 cm. long, 6-9.5 cm. broad; petioles about 8 mm. long. Flowers orange below, deep yellow toward the tips, 2.5-3.2 cm. long; the 2-flowered peduncles fasciculately disposed, 3-6 mm. long; pedicels about 5 mm. long; calyculus with entire margin, 2.5 mm. deep; cup about as long as the calyculus; perianth segments slightly enlarged at the base, the filaments attached above the middle.

Endemic.

CHIRIQUÍ: vicinity of Bajo Mona and Quebrada Chiquero, *Woodson & Schery 581* (type).

2. *PSITTACANTHUS LATERIFLORUS* Woods. & Schery, in Ann. Missouri Bot. Gard. 27:309. 1940.

A slender and handsome shrub, drying olivaceous. Branches terete, glabrous. Leaves oblong or elliptic, attenuate both to the blunt apex and acute base, in youth more or less spatulate, firmly coriaceous, nerveless or nearly so, 4–7 cm. long, 1.5–2.5 cm. wide; petioles 2–5 mm. long. Flowers geminate 2–6 in each axil, corymbosely disposed, scarlet, 2–3 cm. long; common peduncle about 8 mm. long, the pedicels twice as short; calyculus and cup with entire margins, 2 mm. long; perianth segments lightly dilated at the base, the filaments medially inserted. Fruit green, ellipsoid, 6 to 12 mm. long.

Endemic.

CANAL ZONE: road to San Carlos, *Harvey 5173*. COCLÉ: vicinity of El Valle de Antón, *Allen 1979* (type); in the same place, *Allen 3702* and *2233*; marshes along R. Antón, *Hunter & Allen 371*.

3. *PSITTACANTHUS ALLENII* Woods. & Schery, in Ann. Missouri Bot. Gard. 27:309. 1940.

In habit and color very similar to *P. lateriflorus* Woods. & Schery, but the flowers are usually longer and broader and the tepals bear well developed ligules. Branches terete, toward the tips somewhat compressed. Leaves elliptic-obovate, rounded at the apex, cuneate to the base, coriaceous, almost nerveless, 4–7 cm. long, 2–3 cm. broad; petioles 2–3 mm. long. Flowers 2–6 corymbosely arranged, orange, 3–3.5 cm. long; common peduncle about 5–8 mm. long; pedicels 5 mm. long; calyculus and cup with entire margins, 1–2 mm. long; perianth segments or tepals dilated at the base, showing conspicuous ligules; filaments about medially attached. Fruit not seen.

Endemic.

COCLÉ: vicinity of El Valle de Antón, *Allen 1223* (type); Penonomé, *Williams 526*.

P. lateriflorus and *P. allenii* are easily confused, and difficult to separate, at first glance. The ligule, which the latter bears, is to be seen as a basal outgrowth of the perianth segments; one must seek for it at the inner portion of the tepal base, which is dilated about 2 mm. upwards. Moreover, the leaves of *P. allenii* show a well-marked tendency to be broader toward the apex.

Davidson's bad specimen no. 568 (Boquete, Chiriquí) differs from *P. allenii* in no wise but the leaf shape, which is lanceolate.

4. *PSITTACANTHUS CHRISMARII* Urban, in Engl. Bot. Jahrb. 24:331. 1897.

Psittacanthus americanus (L.) Mart. in Flora 13:108. 1830, as to the Mexican and Central American specimens, not the West Indian ones.

Plants erect, the branches quadrate and glabrous. Leaves sessile (petioles 0–3 mm. long), obliquely lance-elliptic or oblong, rarely ovate, narrowed both to the blunt apex and acute base, thick and hard, faintly 3–6-nerved, 7–12 cm. long, 2–4 cm. wide. Inflorescences densely flowered, both axillary and terminally

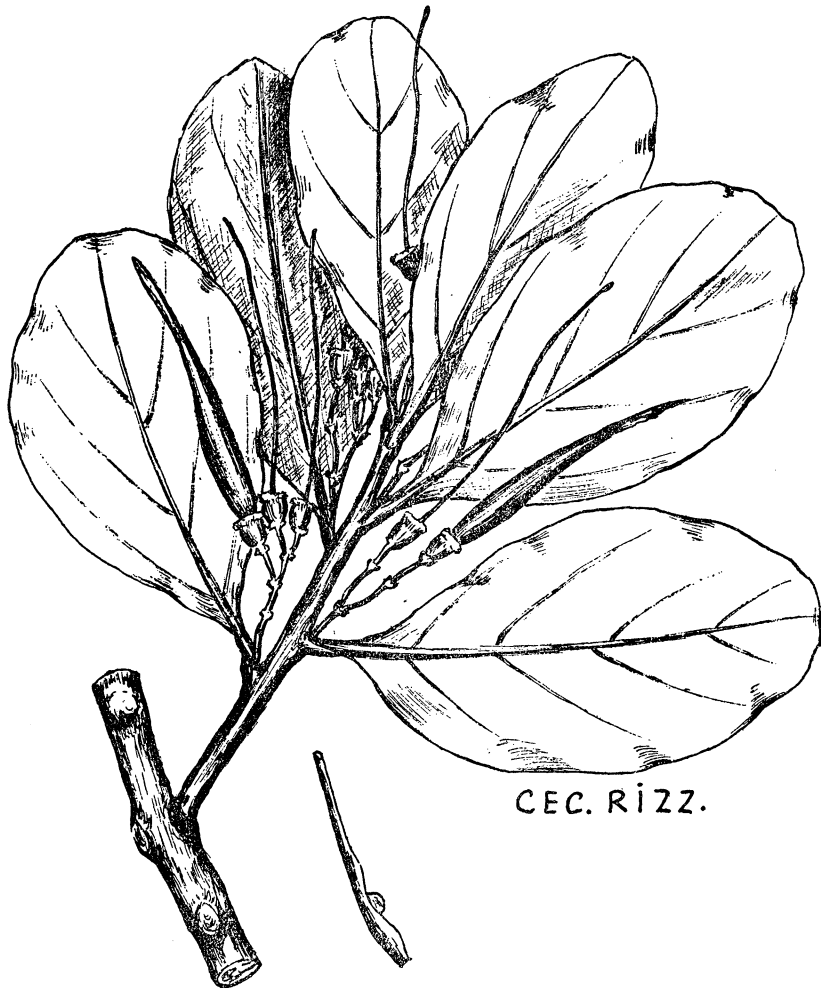


Fig. 73. *Psittacanthus allenii*; below: base of tepal in profile, showing ligule.

racemose or paniculate, 8–15 cm. long; common peduncle to 2.5 cm. long; pedicels about 1.5 cm. long; cups 1–2 mm. deep. Buds conspicuously clavate-apiculate, to 4 cm. long. Flowers red, 3–5 cm. long, in ternations; calyculus denticulate at the margin, 3–4 mm. long; perianth segments enlarged at the base, the filaments about medially adnate.

CHIRIQUÍ: El Boquete, Maxon 538. COCLÉ: vicinity of Las Uvas, Allen 2796; Aguadulce, Pittier 4836. HERRERA: Pesé, Allen 806. PANAMÁ: vicinity of San Carlos, Allen, 1130, Harvey 5172.

P. chrismarii Urban has always been confused with *P. americanus* (L.) Mart., from the West Indies; nevertheless, as Urban pointed out, it is easily distinguished by the obviously 4-angled branches.

5. *PSITTACANTHUS SCHIEDEANUS* (Cham. & Schl.) Bl. in R. & S. Syst. 7, pt. 2: 1730. 1830.

Loranthus schiedeanus Cham. & Schl. in *Linnaea* 5:172. 1830.

Stout plants with thick, 4-angled, compressed branches, the branchlets often wing-margined. Leaves falcately ovate, rarely oblong, acute, rounded at the base, coriaceous, the nerves slightly impressed, to 13 cm. long, about 3–5 cm. wide; petioles 1–1.5 cm. long. Inflorescences corymbose, terminal, very densely flowered, up to 20 cm. long; common peduncle to 4 cm. long; pedicels about 2 cm. long; bracts well developed, 5–12 mm. long; cups mostly 2 mm. deep. Buds slightly clavate, briefly apiculate. Flowers yellowish-orange, 5–9 cm. long, in ternations; calyculus irregularly denticulate, 5 mm. long; perianth segments not enlarged at the base, the filaments medially attached.

Mexico and Central America.

CHIRIQUÍ: Finca Lérída to Peña Blanca, *Woodson & Schery 308*; R. Chiriquí Viejo, *G. White 76* and *P. White 331, 42*; Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 915*; vicinity of Bajo Mona and Quebrada Chiquero, *Woodson & Schery 596*; trail from Cerro Punta to headwaters of Río Caldera, *Allen 1444*.

4. PHRYGILANTHUS Eichl.

PHRYGILANTHUS Eichl. in *Mart. Fl. Bras.* 5, pt. 2:45. 1868.

Shrubs or small trees living both on earth, as root parasites, and upon other woody plants. Leaves generally leathery, opposite, rarely reduced to scales. Flowers typically hermaphrodite, hexamerous, seldom 4–8-merous, showy, either solitary or arranged in ternations, these in racemes, corymbs or umbels; bracts and bractlets moderately developed, both persistent and caducous according to the species group. Stamens unequal. Pollen grains 3-lobate, the exine granulose. Ovary surrounded by a well-developed, fleshy disk. Fruit a juicy berry, the seeds albuminous.

The genus embraces about 30 species thriving primarily in South American highlands. Only a few have been gathered in Mexico, Central America and Australia. As said before, this genus is poorly distinct from *Gaiadendron* (see both figures) and they possibly will later be joined into one.

1. PHRYGILANTHUS panamensis Rizz., n. sp.

Secunda stirps ad Sect. *Martiella* (v. Tiegh.) Engl. attribuenda. A prima species usque adhuc cognita, *Ph. palmeri* (Wats.) Engl. in Mexico vigente, primo vultu floribus racemosis atque foliis caudatis discernitur, neglecta florum magnitudine.

Frutex parasiticus ramis elongatis teretibusque, ad nodos modice incrassatis, internodiis 2–4 cm. longis. Folia ovato-caudata, basi subrotundata, e medio apicem versus gradatim attenuata, extremo apice valde angustata, coriacea, nervis supra tantum subtiliter impressis, 5–9 cm. longa, 3–5 cm. lata; petiolis 1–2 cm. longis. Racemi vulgo 2 ad singulas axillas, longitudine ad 4 cm. usque, laxi, rachidi



Fig. 74. *Phrygilanthus panamensis*

quadrangula; floribus oppositis, neque in ternationibus aggregatis et androgynis. Pedicelli circa 1–2 mm. longi, teretes. Bractea triangulari-acuta, 2 mm. longa; bracteolae duae pro flore, liberae a bractea et hac duplo minores, conformes. Alabastra cylindrica, apice optime apiculata, siccitate nigrescentia. Calyculus ad marginem membranaceum 0.5 mm. altum tantum reductus. Perigonium hexamerum, ad summum 1 cm. longum, caeterum ut in aliis generis speciebus. Fructus latent.

CHIRIQUÍ: Bajo Chorro, Boquete, alt. 1800 m., M. E. Davidson 431 (US, HOLOTYPE; F, ISOTYPE).

On vegetative characters alone this remarkable plant resembles *Struthanthus marginatus*, with which it has been confused; however, it suffices to observe the pointed buds as well as the solitary flowers at each pedicel of *Pb. panamensis* to make ready distinction.

The only other species of the Section *Martiella* is *Pb. palmeri* (Wats.) Engl., whose leaves rounded at the apex together with its red flowers, to 4 cm. long—not to mention the inflorescence (see Latin diagnosis)—place it far from the above.

5. STRUTHANTHUS Mart.

STRUTHANTHUS Mart. in Flora 13:102. 1830; Rizzini, in Rev. Brasil. Biol. 10 (4): 393. 1950.

Shrubs, either erect and rootless or scandent and supplied with adventitious roots, rarely vines. Leaves usually coriaceous. Flowers small, pedicelled or sessile, 5–6-merous, in ternations; these in racemes, panicles, corymbs or spikes, sometimes umbellate; bractlets coalescent or free, persistent or deciduous. Stamens unequal, the filaments slender. Pollen grains of two types: fertile 3-lobate, the exine granulose; sterile globose, the exine smooth. Pistillate flowers with staminodia; staminate ones with reduced style, this lacking stigma. Buds of the staminate flowers clavate. Stigma capitate. Fruit a berry, the seeds with endosperm.

The genus consists of about 60 species, mostly South American. Only a few have been recorded in Mexico and Central America.

- a. Leaves acuminate.
 - b. Spikes showing numerous imbricate scales at the base. Ternations sessile without bractlets (they are promptly caducous)..... 1. *S. POLYSTACHYUS*
 - bb. Spikes naked at the base. Ternations pedicellate with persistent and connate bractlets..... 2. *S. MARGINATUS*
- aa. Leaves rounded at the apex.
 - b. Ternations without bractlets (they are soon deciduous). Flowers short-pedicelled..... 3. *S. ORBICULARIS*
 - bb. Ternations bearing connate bractlets. Flowers sessile, the ternations stalked..... 4. *S. ROTUNDATUS*

1. STRUTHANTHUS POLYSTACHYUS (R. & Pav.) Bl. in R. & S. Syst. 7, pt. 2:1731. 1830.

Loranthus polystachyus R. & P. Fl. Peruv. 3:50. 1802.

An erect shrub lacking adventitious roots, as much as 2 m. high (usually shorter). Branches terete, the branchlets rather compressed. Leaves broadly ovate or almost oblong, acuminate, rounded at the base, veined on both sides, more or less coriaceous, cartilaginous-margined, to 15 cm. long, 7 cm. broad; petioles 1–2 cm. long. Ternations completely sessile. Spikes solitary or 2–3 together, 3–5 cm. long. Inside the foliar axils there are many imbricate scales (prophylls) enclosing the base of the spikes. Bractlets soon caducous and so not detectable. Flowers yellow, 3–4 mm. long. Fruit oval, blue, 5–6 mm. thick; fruiting spikes rather longer and thicker than the flowering ones, to 7 cm. long.

South and Central America (however, not yet found in Brazil). An easily recognizable species.

BOCAS DEL TORO: von Wedel 480; Río Cricamola, Woodson, Allen & Seibert 1911. COCLÉ: north of El Valle de Antón, Allen 3721; mountains beyond La Pintada, Hunter & Allen 624; Almirante, Cooper 205; Bismarck, Williams 561. COLÓN: along Río Fató, Pittier 4192. VERAGUAS: vicinity of Sta. Fé, Allen 4391.

2. *STRUTHANTHUS MARGINATUS* (Desr.) Bl. in R. & S. Syst. 7, pt. 2:1731. 1830.

Loranthus marginatus Desr. in Lam. Encycl. 3:596. 1789.

A scandent shrub provided with aerial roots. Branches somewhat compressed and lenticellate-dotted. Leaves narrowly ovate or lance-ovate, conspicuously acuminate, rounded-obtuse at the base, firmly leathery, finely nervose on both surfaces, cartilaginous-margined, 7–12 cm. long, 3–5 cm. wide; petioles 5–10 mm. long. Ternations pedicelled. Racemes 1–3 in each axil, 3–8 cm. long. Bractlets persistent, connate. Flowers yellowish green, 3–4 mm. long. Fruit yellow or orange, 8–10 mm. long.

Widespread in Brazil. Costa Rica, Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 1287*. CHIRIQUÍ: Callejón Seco, Volcán de Chiriquí, *Woodson & Schery 486* and *504*; vicinity of Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 808* and *932*; Río Chiriquí Viejo valley, Cerro Punta, *G. White 34*; Finca Lérida to Peña Blanca, *Woodson & Schery 292*; Boquete, *Davidson 859*; Bajo Chorro, Boquete, *Davidson 392, 908*.

3. *STRUTHANTHUS ORBICULARIS* (H. B. K.) Bl. in R. & S. Syst. 7, pt. 2:1731. 1830.

Loranthus orbicularis H.B.K. Nov. Gen. & Sp. 3:434. 1820.

Vines bearing adventitious roots, with long and flexuous branches, the branchlets twining, quadrate; the young leaves seem to serve as prehensile organs (they show petioles fully developed while the blades remain much smaller than the normal ones). Leaves broadly obovate to rounded, sometimes perfectly orbicular, coriaceous, rarely veiny, to 5 cm. long, 4 cm. wide; petioles 1–1.5 cm. long. Bractlets free, soon caducous. Ternations sessile. Flowers pedicelled, yellow or greenish yellow, 5–7 mm. long. Spikes solitary, rather stout (especially when fruiting), the rachis sharply angled, 7–15 cm. long. Fruit elliptic, purple to red-brown, about 1 cm. long.

Peru, Ecuador, Colombia. Rare in Brazil. Central America, where it is more widely dispersed.

BOCAS DEL TORO: Río Cricamola, *Woodson, Allen & Seibert 1908*; Chiriquí Lagoon, *von Wedel 2663, 1065*. CANAL ZONE: *White 121*; vicinity of Ancón, *Piper 6019*; Balboa, *Standley 29327*; Bellavista, *Macbride 2754*. COCLÉ: vicinity of El Valle, *Allen 1803*; *Seibert 417*; vicinity of Sta. Clara beach, *Woodson, Allen & Seibert 1700*. PANAMÁ: *Woodson, Allen & Seibert 1513*; Las Sabanas, *Standley 25936*; San José Island, *Johnston 518*; *Erlanson 73*; Saboga Island, *Miller 1938*. PROVINCE UNKNOWN: Quebrada de Oro, *Wheeler & Zetek 12-III-1923*.

4. *STRUTHANTHUS ROTUNDATUS* Rizz. in Rev. Brasil. Biol. 10 (4): 401. 1950.

Resembling *S. orbicularis* in habit. Branches terete, the branchlets compressed. Leaves perfectly elliptic or nearly rounded, slightly attenuate at the base, the apex emarginate and mucronate, moderately coriaceous, almost nerveless, 4–6 cm. long, 3–4.5 cm. wide; petioles 5–15 mm. long. Ternations pedicelled. Bractlets connate, persistent. Racemes solitary, 5–10 cm. long, the rachis compressed. Flowers deep yellow, about 7 mm. long. Fruit unknown.

Brazil, Panama.

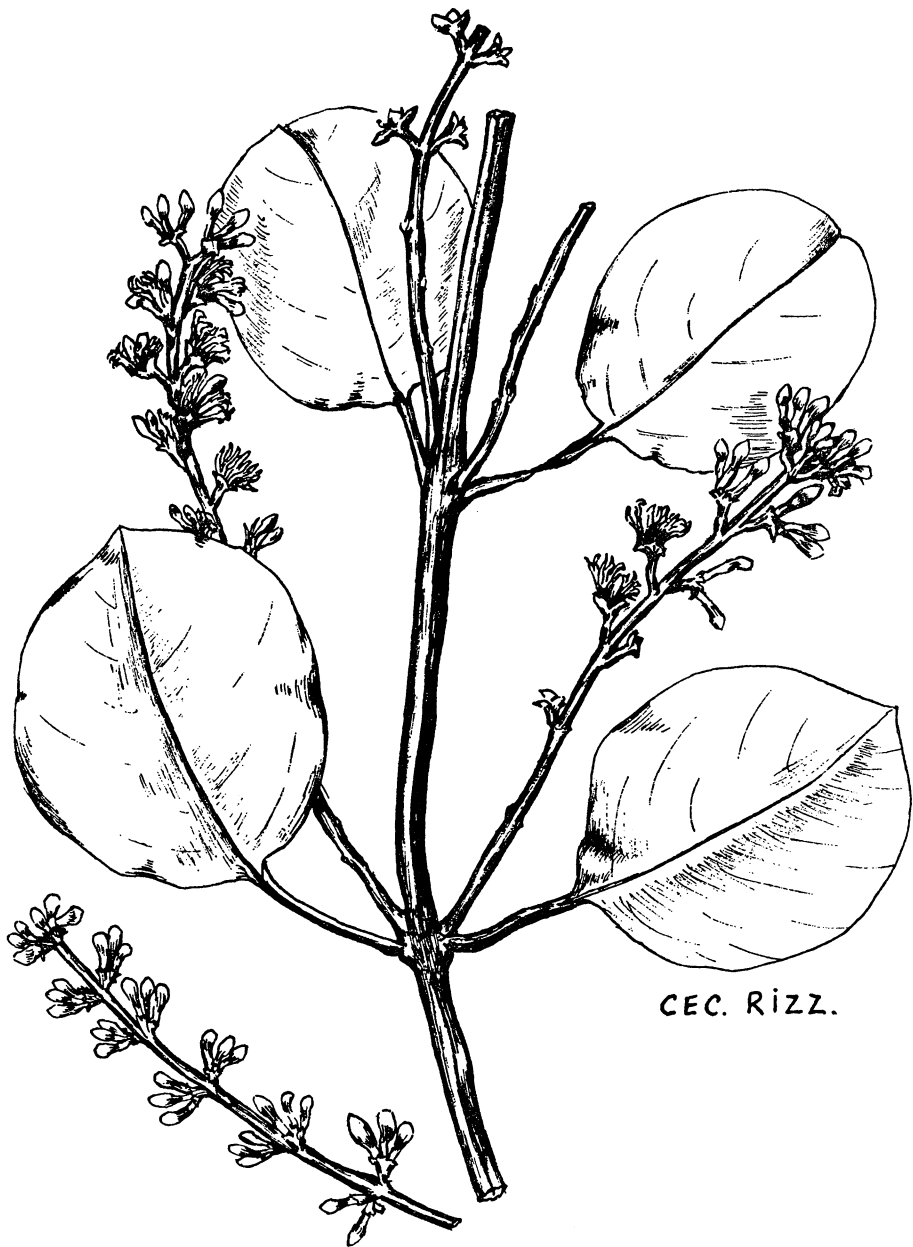


Fig. 75. *Struthanthus rotundatus*; below: spike of *S. orbicularis*.

CHIRIQUÍ: Finca Lérída to Boquete, Woodson, Allen & Seibert 1141; vicinity of Cerro Punta, Allen 1571; pastures around El Boquete, Pittier 2882.

In general appearance, especially by its leaves, this species is very similar to *S. polyrbizus* Mart. too, but differs as follows: the former has racemes as long as the leaves or longer; the latter shows corymbs half as short as the leaves. So it may be understood why they have sometimes been confused.

The type (see figure in Rodriguesia, 18-19, tab. 8, 1956) conserved at the British Museum leaves no doubt as to the identity of Brazilian and Panamanian material.

6. PHTHIRUSA Mart.

PHTHIRUSA Mart. in Flora 13:110. 1830; Rizzini, in Dusenía 3 (6): 451. 1952.

Erect or scandent shrubs, the latter developing aerial roots. Leaves mostly leathery. Flowers often very tiny, tetra-hexamorous, in ternations; these in racemes, spikes, panicles or rarely subsolitary; bractlets connate. Stamens unequal, the filaments of the longer scalloped at both sides by pressure of the anthers of the shorter ones. Pollen grains of one type; triangular in shape, the exine finely granulose, showing three pores. Pistillate flowers with staminodia; staminate ones with vestigial style, this lacking stigma; androgynous flowers sometimes occur. Buds of the male flowers terete. Fruit baccate as in *Struthanthus*.

A genus of about 55 species, widely distributed throughout South America and the West Indies. It differs from the preceding by the combination of scalloped filaments, pollen grains of one type and terete male buds; thus, despite the opinion of Baehni and Macbride (Candollea 7:287-290. 1936-1938), it seems best to maintain it as a genus (see also Rodriguesia 18-19:87-234. 1956). The following are the only Central American species.

- | | |
|--|-----------------|
| a. Leaves acute or acuminate. Inflorescence several together or branched.
Flowers 4-6 mm. long. | |
| b. Flower clusters pedicellate, paniced..... | 1. P. ADUNCA |
| bb. Flower clusters borne in spikes, sessile..... | 2. P. PITTIERI |
| aa. Leaves obtuse or nearly so. Inflorescences mostly solitary, unbranched.
Flowers 1-2 mm. long..... | 3. P. PYRIFOLIA |

1. PHTHIRUSA ADUNCA (Meyer) Maguire, in Bull. Torrey Bot. Club 75:301. 1948.

Loranthus aduncus Meyer, Prim. Fl. Esseq. 149. 1818.

Loranthus paniculatus H.B.K. Nov. Gen. & Sp. 3:422. 1820.

Loranthus conduplicatus H.B.K. loc. cit. 1820.

Loranthus magdalenae Cham. & Schl. in Linnaea 3:219. 1828.

Loranthus theobromae Willd. ex R. & S. Syst. 7:132. 1829.

Struthanthus aduncus (Meyer) G. Don, Gen. Syst. 3:414. 1834.

Phthirusa theobromae (Willd. ex R. & S.) Eichl. in Mart. Fl. Bras. 5, part 2:56. 1868.

Phthirusa paniculata (H.B.K.) Macbr. in Field Mus. Publ. Bot. 11:17. 1931.

Scandent shrubs bearing adventitious roots. Branches terete, the branchlets more or less compressed. Leaves ovate or oblong, rounded at the base, gradually acuminate, distinctly nervose, leathery, 4-7 cm. long, 2.5-4.5 cm. broad; petioles

1–2 cm. long. Flowers pale yellow, 4–6 cm. long, paniculate, the ternations pedicelled (pedicels 1–3 mm. long, rarely none); filaments provided with many glandules at the angles. Fruit oblong, pedicellate, orange, to 1 cm. long.

Brazil, where it is widely distributed, Peru, Venezuela (also very common there), Guianas, Paraguay, Panama. South American specimens are not different from Central American ones even in the least detail.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 2414*. CANAL ZONE: vicinity of Miraflores Lake, *G. White 158*; Bellavista, *Salvoza 1005*. CHIRIQUÍ: vicinity of Callejón Seco, Volcán de Chiriquí, *Woodson & Schery 500*. VERAGUAS: vicinity of Santiago, *Allen 1012*.

Ph. theobromae and *Ph. magdalenae* are not at all clearly distinct; as a matter of fact, examining the extremely rich South American material, numerous transitions are seen to occur from one to another. The other names above quoted are merely synonyms dealing with the priority question and deserve no more attention.

2. *PHTHIRUSA PITTIERI* Krause, in Fedde, Repert. Sp. Nov. 15 (1–3): 441. 1917.

Known only from original description which is, however, very complete. Branches terete. Leaves narrowly ovate or ovate-oblong, long-acuminate, rounded-obtuse at the base, 12–18 cm. long, 5–9 cm. broad. Ternations in axillary spikes, these numerous in each axil. Flowers 5 mm. long.

Endemic.

COLÓN: in the margins of Río Fató, *Pittier 3911*.

3. *PHTHIRUSA PYRIFOLIA* (H. B. K.) Eichl. in Mart. Fl. Bras. 5, pt. 2:36. 1868.

Loranthus pyrifolius H.B.K. Nov. Gen. & Sp. 3:441. 1820.

An erect shrub without aerial roots. Branches greatly flattened, the tips reddish-scurfy. Leaves ovate or elliptic, nearly rounded at the base, obtuse toward the apex, now and then mucronate or even caudate, distinctly veiny on both sides, to 10 cm. long, 5 cm. wide; petioles about 1 cm. long. Ternations perfectly sessile. Flowers very minute, 1–2 mm. long. Spikes axillary, solitary or 2 in each axil, unbranched, reddish-furfuraceous, 5–10 cm. long. Fruit oblong, 4–6 mm. long.

Panamanian specimens available agree exactly with Brazilian ones. Venezuela, Guianas, Colombia, Costa Rica, West Indies, etc.

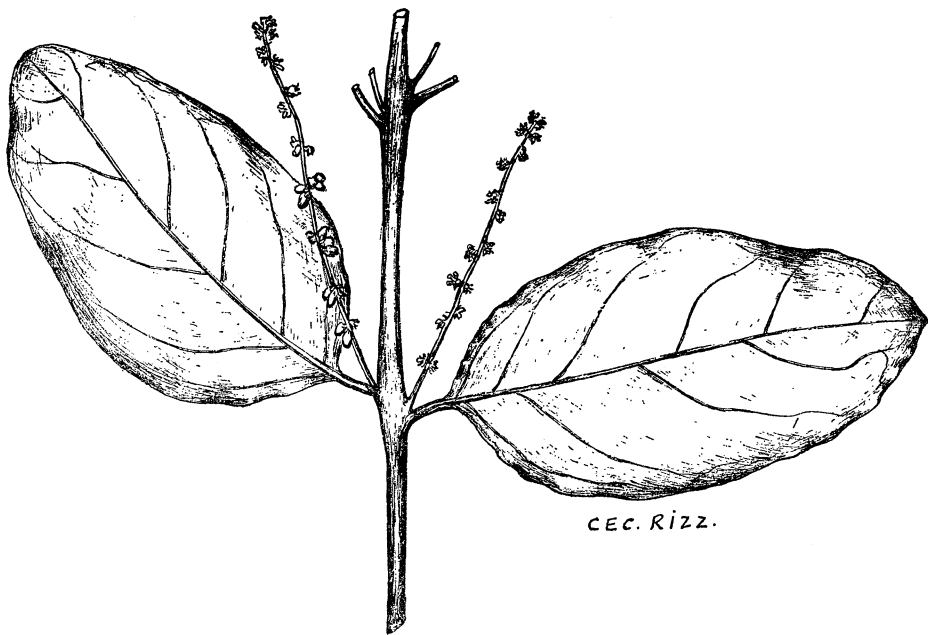
CANAL ZONE: near Vigía and San Juan on Río Pequeni, *Dodge, Steyermark & Allen 16571*; around Las Cruces, *Pittier 2623*; *Sutton Hayes 1022*; without locality, *Woodworth & Vestal 493*; Gatún Lake, *Bangham 441*; Changuinola Valley, *Dunlap 321*.

7. *ORYCTANTHUS* (Griseb.) Eichl.

ORYCTANTHUS Eichl. in Mart. Fl. Bras. 5, pt. 2:87. 1868.

Loranthus sect. *Oryctanthus* Griseb. Fl. Brit. West Ind. Isl. 311. 1860.

Erect shrubs, almost always with aerial roots starting from the base of the stem. Leaves opposite, coriaceous. Flowers minute, perfect, 6-merous, more or

Fig. 76. *Phthirusa pyrifolia*

less immersed in the rachis of the spikes; bractlets poorly developed or absent. Pollen grains strongly reticulate. Stigma capitate. Fruit baccate, the seeds albuminous.

About 18 species, uniformly distributed throughout the American tropics. The genus is noteworthy for its double-perianthed flowers sunk in the axis of the inflorescence.

- | | |
|--|--------------------|
| a. Leaves sessile, cordate at the base..... | 1. O. CORDIFOLIUS |
| aa. Leaves petiolate, either rounded or acute at the base but not cordate. | |
| b. Rachis glabrous, black. Bractlets with free margins. Flowers (buds and fruits) perpendicular to the rachis..... | 2. O. OCCIDENTALIS |
| bb. Rachis furfuraceous, more or less brown-reddish. Bractlets with the margins united with the rachis. Flowers (buds and fruits) oblique to the rachis..... | 3. O. SPICATUS |

1. *ORYCTANTHUS CORDIFOLIUS* (Presl) Urban, in Engl. Bot. Jahrb. 24:348. 1897.

Viscum cordifolium Presl, Epim. Bot. 253. 1849.

A stout shrub with terete branches, the branchlets compressed, scarcely rusty-furfuraceous, becoming glabrate. Leaf blades sessile, broadly ovate, cordate at the rounded base, attenuate to the blunt apex, firmly coriaceous, nerves distinct but faint, about 7–12 cm. long, 4–8 cm. wide. Spikes axillary, solitary, to 8 cm. long, the peduncle 5–15 mm. long. Bractlets with free margins. Flowers or buds

deep red, 2 mm. long, inserted obliquely on the glabrous rachis. Fruit ovate, 5 mm. long.

Central America.

BOCAS DEL TORO: Isla Colón, *von Wedel 512*; vicinity of Nievécita, *Woodson, Allen & Seibert 1830*. CANAL ZONE: Quebrada Tranquila, *Dodge & Allen 17332*. COCLÉ: Penonomé, *Williams 196*. PANAMÁ: near Matías Hernández, *Standley 28923*.

2. *ORYCTANTHUS OCCIDENTALIS* (L.) Eichl. in Mart. Fl. Bras. 5, pt. 2:89. 1868.

Loranthus occidentalis L. Syst. ed. 10. 988. 1774.

Erect shrubs. Branches, terete, the branchlets slightly compressed, petioles (to 5 mm. long) and peduncles (5–10 mm. long) rusty-furfuraceous, later subglabrate. Leaf blades very broadly ovate, almost orbicular at the base, scarcely constricted to the apex, this obtuse, thick and hard, nervation distinct or veinless, 3–10 cm. long, 2–8 cm. wide. Spikes solitary, to 3 cm. long; rachis glabrous. Bractlets with distinct margins. Flowers or buds becoming brown, 1–1.5 mm. long, perpendicular to the rachis. Fruit ovate, 4–5 mm. long, the apex not exceeded by the margin of the persistent calyculus.

West Indies, Costa Rica, Panama.

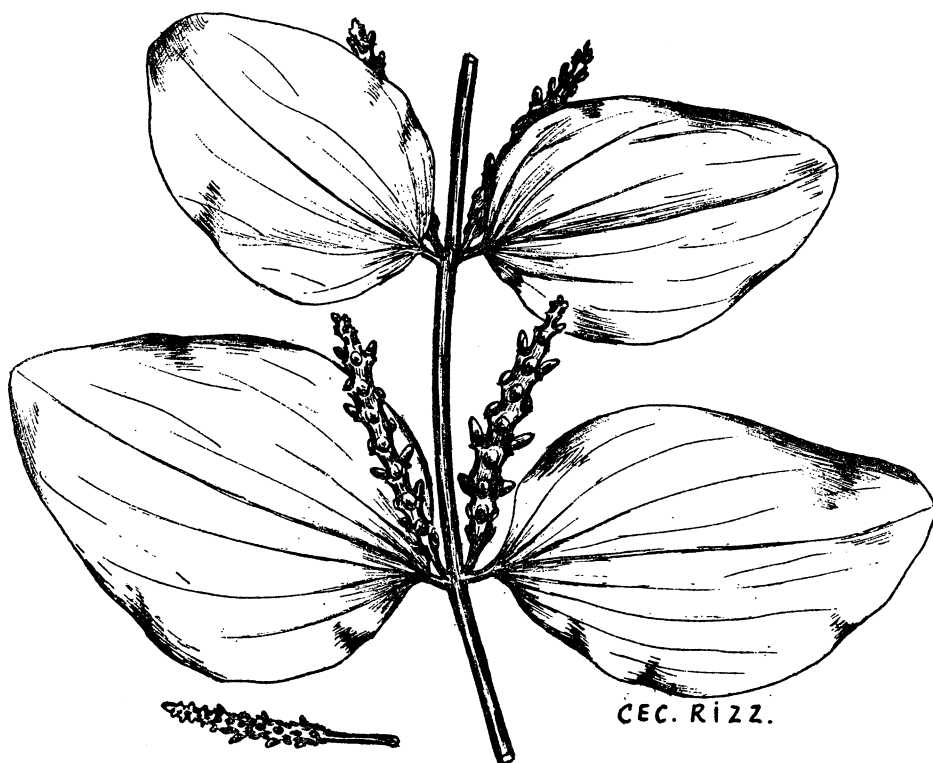


Fig. 77... *Oryctanthus spicatus*; below: spike of *O. occidentalis*.

CANAL ZONE: Juan Mina, *Piper* 5703; around Las Cruces, *Pittier* 2622; Las Cascadas Plantation, *Standley* 25679; Santa Rita Trail, *Cowell* 74; without locality, *Woodworth & Vestal* 492; Chagres, *Fendler* 135; Barro Colorado Island, *Shattuck* 700.

3. *ORYCTANTHUS SPICATUS* (Jacq.) Eichl. in Mart. Fl. Bras. 5, pt. 2:89. 1868.

Loranthus spicatus Jacq. Enum. Pl. Carib. 18. 1760.

An erect shrub 50–70 cm. tall. Branches terete, the slightly compressed tips, with petioles (1–5 mm. long) and rachis, reddish-scurfy but becoming more or less glabrous. Leaf blades ovate, sometimes orbicular-ovate, rounded at the base, moderately attenuate to the blunt apex, thickly leathery, lightly nerved (rarely nerveless), to 9 cm. long, 5 cm. broad. Spikes solitary, to 2 cm. long, stouter than in the preceding; peduncles to 5 mm. long. Bractlets not distinct from the rachis. Flowers or buds 1 mm. long, oblique to the rachis. Fruit ovate-oblong, about 5 mm. long, the apex evidently exceeded by the margin of the persistent calyculus.

West Indies, South and Central America.

CANAL ZONE: near Vigia and San Juan on Río Pequení, *Dodge, Steyermark & Allen* 16577; Ancón Hill, vicinity of Balboa, *Seibert* 380, 410; Barro Colorado Island, *Shattuck* 590 and *Wilson* 151; Gatún Lake, *Wetmore & Abbe* 148; *Woodworth & Vestal* 494. CHIRIQUÍ: Gualaca, *Allen* 5025. COCLÉ: Penonomé, *Williams* 195. PANAMÁ: Tumba Muerto Road, *Standley* 29831; near Punta Paitilla, *Standley* 26249.

The morphological facts by which *O. occidentalis* differs from *O. spicatus* are minute and tedious ones. Notwithstanding, and worth noting, additional characters may be found in the spikes: in the first species these are slender, blackish and supported by a peduncle longer than 5 mm.; in the second, the spikes are stouter, reddish-brown and short-peduncled or even sessile.

8. *DENDROPTHORA* Eichl.

DENDROPTHORA Eichl. in Mart. Fl. Bras. 5, pt. 2:102. 1868; Urban, in Engl. Bot. Jahrb. 24:370. 1897.

Erect shrubs, more or less yellow, lacking adventitious roots. Leaves opposite, small or wanting. Cataphylls poorly developed. Flowers trimerous, very minute, dioecious, deeply immersed in depressions in the rachis of the spikes. Anther cells confluent, dehiscing transversely; pollen grains globose, the exine smooth. Pistillate flowers without staminodia. Staminate flowers showing no style. Fruit a berry, the seeds with endosperm.

A genus of about 32 species, thriving better in high-altitudinal places, chiefly in South America and the West Indies. It is very similar in appearance to *Phora-dendron*, from which may be distinguished as indicated in the above key, except that its species are less robust with leaves small or reduced to scales.

- a. Developing normal leaves..... 1. *D. COSTARICENSIS*
 aa. Leaves wanting or reduced to scales..... 2. *D. BISERRULA*

1. *DENDROPTHORA COSTARICENSIS* Urban, in Ber. Deutsch. Bot. Gesell. 14:285. 1896.

An erect shrub. Branches terete, the branchlets somewhat compressed, striate-rugose. Leaves obovate-spatulate, long-attenuate to the base, the apex rounded and emarginate, veinless, moderately coriaceous, 2–3 cm. long, 1–1.5 cm. broad; petioles about 5 mm. long. Spikes solitary, axillary, 1–2-jointed, 5–15 mm. long, the peduncles 0–3 mm. long. Flowers 6-seriate, 18–40 in each joint. Fruit white, globose.

Costa Rica, Panama.

CHIRIQUÍ: Bajo Chorro, Boquete, *Davidson 369*; upper belt of Chiriquí Volcán, *Pittier 3100*.

2. *DENDROPTHORA BISERRULA* Eichl. in Mart. Fl. Bras. 5, pt. 2:104. 1868.

An upright, densely branched under-shrub attaining 25 cm. in height, the branches terete. Leafless. Scales about 1 mm. long. Spikes very numerous, axillary, solitary, 1-articulate, to 2.5 cm. long with 4–24 flowers, these 2-seriate; the peduncles 5–8 mm. long; the rachis quadrate. Fruit globose, white.

Central America.

CHIRIQUÍ: Volcán de Chiriquí, Boquete, *Terry 1333*, *Maxon 5374a*; around El Potrero, *Pittier 3073*.

This species is remarkable by supporting usually a vigorous growth of filamentous as well as foliaceous lichens, which give it a peculiar appearance.



Fig. 78. *Dendrophthora biserrula*

9. PHORADENDRON Nutt.

PHORADENDRON Nutt. in Journ. Acad. Philadelphia ser. 2. 1:185. 1847; Trelease, The Genus Phoradendron (Urbana, Ills.: The University of Illinois, 1916).

Erect and rootless shrubs. Leaves opposite, rarely reduced to scales. Flowers as in *Dendrophthora*, except that they are arranged in definite rows on the spike

joints (2 or 3 series over each side of the joints). Anthers 2-celled, dehiscent by longitudinal slits; pollen grains globose, the exine smooth. Fruit as in the preceding genus.

The New World mistletoe includes about 300 species. In the Old World it is replaced by *Viscum*.

- a. Cataphylls present on all internodes of the branches.
 - b. Branches cymosely or dichotomously forking at every node.
 - c. Shoots obviously swollen below the nodes. Leaves rounded at the apex. Fruit globose, with erect tepals..... 1. *P. PERGRANULATUM*
 - cc. Shoots not enlarged below the nodes. Leaves, at least the upper of them, acute. Fruit elongated, with connivent tepals..... 2. *P. ROBALOENSE*
 - bb. Branches not forking at all nodes.
 - c. Basal scales of the spikes forming a large and deep funnel-shaped tube enclosing the peduncle..... 3. *P. SUPRAVENULOSUM*
 - cc. Scales not forming a tube, thus the peduncle free.
 - d. Leaves to 3 cm. broad, basined. Cataphylls 2-4 pairs on all joints..... 4. *P. WOODSONII*
 - dd. Leaves mostly broader, nerveless or obscurely pinnately nerved. Cataphylls a single pair on all joints, usually 2-5 pairs on the lowermost..... 5. *P. PIPEROIDES*
 - aa. Cataphylls present only on the lowest internode of each branch.
 - b. Branches terete. Spikes typically 2-jointed.
 - c. Spike joints slender, up to 20-flowered in 4 series..... 6. *P. CRISPUM*
 - cc. Spike joints rather stout, the more numerous flowers in 6 series..... 7. *P. ALLENII*
 - bb. Branches 4-angled or flattened. Spikes mostly 3-(or more) articulate.
 - c. Shoots prevailingly flattened or 2-edged.
 - d. Branchlets subquadrangulate toward the tip..... 8. *P. SEIBERTII*
 - dd. Branchlets of the same shape as the branches.
 - e. Leaves up to 1.5 cm. wide. Spike joints clavate or turbinate, stout.
 - f. Cataphylls two pairs above the base. Joints clavate, 4-8-flowered. Leaves to 7 cm. long..... 9. *P. CORYNARTHON*
 - ff. Cataphylls one pair, strictly basal. Joints turbinate, 16-24-flowered when pistillate (staminate ones to 70-flowered). Leaves 8-15 cm. long.
 - g. Flowers 6-ranked, 30-70 in each joint when staminate..... 10. *P. NOVAE-HELVETIAE*
 - gg. Flowers 4-ranked, about 30 in each joint when staminate. 11. *P. TONDUZII*
 - ee. Leaves 1.5-4 cm. wide. Spike joints terete.
 - f. Spikes with 7-10 slender joints. Leaves 2.5-4 cm. broad..... 12. *P. GRACILISPICUM*
 - ff. Spikes with 5-7 rather stout joints. Leaves up to 3 cm. broad.
 - g. Leaves typically undulate or even crisped..... 13. *P. UNDULATUM*
 - gg. Leaves entire..... 14. *P. COOPERI*
 - cc. Branches typically 4-sided or 4-lined.
 - d. Leaves obovate, most of them emarginate. Spike joints 4-6-flowered. Fruit tuberculate..... 15. *P. MUCRONATUM*
 - dd. Leaves oblong, oblong-lanceolate or oblong-obovate. Spike joints 8-20-flowered. Fruit smooth.
 - e. Leaves obovate-oblong. Fruit with upright tepals. Joints 6-8-flowered..... 16. *P. TRINERVIUM*
 - ee. Leaves lance-oblong or oblong. Fruit tepals closely connivent. Joints 14-20-flowered..... 17. *P. VENEZUELENSE*

1. *PHORADENDRON PERGRANULATUM* Trel. in Ann. Missouri Bot. Gard. 27:308. 1940.

A stout shrub cymosely branching at every node; shoots terete, much dilated and somewhat compressed below the nodes. Cataphylls a single basal pair on all joints, the margin almost fimbriate. Leaves falcately oblong, attenuate to both ends, rounded at the apex, acute at the base, nerveless, coriaceous, drying somewhat

crisped marginally, 5–9 cm. long, 1.5–3 cm. wide; petioles scarcely 2–4 mm. long. Spikes solitary, mostly 4-articulate, about 3 cm. long; peduncle 3–5 mm. long; joints slender, 5–8 mm. long, 4–8-flowered in 4 series. Fruit rounded, varnished, the tepals erect, about 3 mm. in diameter.

Endemic.

COCLÉ: vicinity of El Valle, *Allen 777*.

2. *PHORADENDRON robaloense* Woods., n. sp. Nomen tantum in sched.

Inter affines (praesertim *P. benslovii* Robs.) haec species distinctissima et statim discernenda vaginis cataphyllaribus in tubum amplum 3–10 mm. longum connatis, foliis spicisque neglectis.

Fruticulus dioicus circa 2.5 m. altus, ramis dichotomis teretibus; internodiis 4–8 cm. longis. Vagina cataphyllaris 3–10 mm. longa, tubulosa, in dentes 2 latos rotundatos divisa. Folia obliqua, ovato-lanceolata, basi vel obtusa vel cuneata, apicem versus longe attenuata, imo apice ex indole cuta, crasse coriacea, siccitate marginibus undulata, obsolete palmatinervia aut avenia, 8–12 cm. longa, 2–4.5 cm. lata; petiolis crassis, circa 1 cm. longis. Spicae 2–3-nae in axillis, graciles, 3–4-articulae, 3–5 cm. longae; pedunculis 8 mm. longis; articulis plus minusve 1 cm. longis, 4-seriatim 6–14-floris; floribus femineis. Baccae elongatae, perigonio clauso coronatae, 5–6 mm. longae.

CHIRIQUÍ: Bajo Mona, Robalo Trail, alt. 1500–2100 m. s. m., *Paul H. Allen 4838* (MO, HOLOTYPE).

Pb. robaloense Woods. ex Rizz. is a very striking species and is easily distinguished from its allies (*Aequatoriales Cymosae*) by the tubular cataphylls, the few-flowered spike joints and the elongated fruits.

3. *PHORADENDRON SUPRAVENULOSUM* Trel. Genus *Phoradendron*. 154. 1916.

Branches inconspicuously angled, compressed and enlarged below the nodes; internodes rather long (4–7 cm.). Cataphylls a single pair at each joint, 1–2 cm. above the base, parted, 2 mm. high. Leaves oblong, moderately falcate, very acuminate pointed, cuneate to the base, moderately coriaceous, obscurely 5-nerved, to 13 cm. long, 6 cm. broad; petioles about 1 cm. long. Spikes solitary, 3–5-articulate, 4–7 cm. long; peduncle 5–7 mm. long, enclosed within a large, funnel-shaped tube formed by the basal scales; joints rather stout, to 2 cm. long, 30–50-flowered, the flowers in 6 series. Fruit apparently elongated, with connivent tepals.

Previously known from Guatemala, Nicaragua and Costa Rica.

DARIÉN: Crist, Cana-Cuasi Trail, *Terry 1571*.

This specimen, insufficient for a complete study, differs from *Pb. supra-venulosum*, as described by Trelease, in some small details and approaches *Pb. membranaceum* in certain others. Future studies may perhaps determine segregation as a proper species.



CEC. RIZZ.

Fig. 79. *Phoradendron robaloense*

(265)

4. PHORADENDRON WOODSONII Trel. in Ann. Missouri Bot. Gard. 27:308. 1940.

Branches slender, terete, regularly forked. Cataphylls a basal pair followed by 2 or 3 others, bifid at all internodes. Leaves ovate-oblong, scarcely cuneate to the rounded base, more or less abruptly acuminate, moderately leathery, obscurely 3-5-nerved, thickly cartilaginous-margined, 5-7 cm. long, 2-3 cm. wide; petioles nearly lacking. Spikes solitary, 5-6-articulate, 3-5 cm. long; peduncle 3-5 mm. long; joints lightly clavate, 5-8 mm. long, with about 10 flowers in 4 ranks. Fruits subglobose, 4 mm. long, the tepals inflexed.

Endemic.

COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1302* (type).

5. PHORADENDRON PIPEROIDES (H. B. K.) Nutt. in Journ. Acad. Nat. Sc. Philadelphia, ser. 2, 1:185. 1847.

Viscum latifolium Sw. Fl. Ind. Occ. 1:268. 1797, non Lam.

Loranthus piperoides H.B.K. Nov. Gen. & Sp. 3:443. 1820.

Phoradendron latifolium (Sw.) Griseb., Fl. Brit. West Ind. Isl. 314. 1860.

A very variable shrub, abundantly branched. Shoots slender, slightly compressed above, soon becoming terete. Cataphylls a single pair on every joint, 2-5 pairs on the lowest one, pointed. Leaves, at least most of them, obliquely broadly ovate, angustate both toward the base and apex, acuminate, coriaceous, marginally crisped and brown to black in drying, nerveless or obscurely pinnately veined beneath, 5-12 cm. long, 2.5-4.5 cm. broad; petioles about 5 mm. long. Spikes clustered, slender, mostly 6-jointed, 4 cm. long; peduncle nearly suppressed; joints terete, 5 mm. long, 6-20-flowered, the flowers 4-ranked. Fruits subglobose, yellow, 4 mm. in diameter, with connivent tepals.

Widely distributed through the New World.

BOCAS DEL TORO: vicinity of Nievécita, *Woodson, Allen & Seibert 1843*; Río Cricamola, between Finca St. Louis and Konkintoe, *Woodson, Allen & Seibert 1900, 1904*; Almirante, *Cooper 93, 193*. CANAL ZONE: Chagres, *Fendler 136*; Barro Colorado Island, *Shattuck 1138*; Fuertes House, *Woodworth & Vestal 663*; Mindí, *Sutton Hayes 616*. CHIRIQUÍ: El Boquete, *Pittier 3345*; around Caldera, *Pittier 3357*; Bajo Mona, *Davidson 522*. COCLÉ: above Penonomé, *Williams 258*. DARIÉN: Chepigana, Cana-Cuasi Trail, *Davidson & Terry 1572*. PANAMÁ: Sabanas Road, *Gillespie P-40*.

6. PHORADENDRON CRISPUM Trel. Genus Phoradendron 77. 1916.

A moderately branched undershrub 30-60 cm. tall, the branches terete. Cataphylls a single basal pair, short. Leaves obovate to round-obovate, a little attenuate to the base, firmly membranaceous, veinless or very obscurely 3-nerved, drying crisped, 3.5-5 cm. long, 1.5-3 cm. wide; petioles 4-6 mm. long. Spikes solitary, with 2-3 short articles, 5-15 mm. long; peduncle almost suppressed; joints 10-20-flowered in 4 series. Fruits white, translucent.

Panama and Costa Rica.

CHIRIQUÍ: Boquete, Volcán de Chiriquí, *Davidson 992*.

7. PHORADENDRON ALLENII Trel. in Ann. Missouri Bot. Gard. 27:307. 1940.

Very similar to *Pb. crispum* Trel., but the flowers are constantly more numerous and 6-ranked. Branches terete. Cataphylls only a basal pair on the lowermost internode of the shoots. Leaves obovate, to 6 cm. long, 2.5 cm. broad, finely 3-nerved; petioles about 5 mm. long. Spikes solitary, stout, 2-3-articulate, to 2 cm. long; peduncle about 4 mm. long; joints 5-8 mm. long, 20-40-flowered irregularly arranged in 6 rows. Fruits globose, 4-5 mm. in diameter, the tepals more or less erect.

Endemic.

CHIRIQUÍ: vicinity of Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 792* (type).

8. PHORADENDRON seibertii (Trel.) Rizz., nov. stat.

Phoradendron corynarthron Eichl. var. *seibertii* Trel. in Ann. Missouri Bot. Gard. 24:187. 1937.

Branches 2-edged, the branchlets more or less 4-angled. Cataphylls a single basal pair, tubular, the margin parted. Leaves narrowly oblong, some of them almost spatulate, rounded at the apex, attenuate to the base, nerveless, coriaceous, 4-7 cm. long, 1-1.5 cm. wide; petioles to 4 mm. long. Spikes solitary, slender, 4-6-articulate, to 2 cm. long; peduncle about 2 mm. long; joints short, terete, 10-18-flowered, the flowers in 4 rows.

Endemic.

COCLÉ: El Valle de Antón, *Seibert 411* (type).

Pb. corynarthron Eichl. always shows clavate spike joints with 4 to 8 flowers, flattened branchlets and subacute leaves, thus being clearly different from *Pb. seibertii* (Trel.) Rizz.

9. PHORADENDRON CORYNARTHRON Eichl. in Mart. Fl. Bras. 5, pt. 2:115. 1868.

Phoradendron davidsoniae Standl., Field Mus. Publ. Bot. 22:17. 1940.

A handsome yellow (drying yellowish-brown) undershrub with flattened branches, the branchlets somewhat enlarged below the nodes. Cataphylls usually two pairs, one about 0.5-1 cm. above the node and the other 1.5-2 cm. above the first, pointed. Leaves lanceolate to narrowly oblong, rarely falcate, attenuate to both ends, subacute at the apex, cuneate to the base, moderately coriaceous, more or less revolute along the margins in drying, nearly nerveless to finely 3-nerved, 4-7 cm. long, 0.8-1.5 cm. wide; petioles about 5 mm. long. Spikes solitary, typically 3-articulate, 1-1.5 cm. long (becoming 2-3.5 cm. when fruiting); peduncle 1-5 mm. long; joints clavately 4-8-flowered in 4 series, 2-10 mm. long. Fruit round, white, 3 mm. in diameter, the tepals closely connivent.

Central America, widely dispersed in Panama.

CHIRIQUÍ: vicinity of Finca Lérída, *Woodson & Schery 220*; Bajo Mona, mouth of Quebrada Chiquero along Río Caldera, *Woodson & Schery 294*; Loma Sardina, *Allen 4769*; vicinity of Casita Alta, Volcán de Chiriquí, *Woodson, Allen & Seibert 929*; Boquete, *Davidson 740* (type of *Phoradendron davidsoniae* Standl.) and *923*. COCLÉ: Aguadulce, in savannas, *Pittier 4955*.

Pb. corynarthron must not be confused with *Pb. rigidum* Urban, from Venezuela. This shows shorter spikes bearing 2-3 joints, which are 10-flowered, and broader leaves.

10. PHORADENDRON NOVAE-HELVETIAE Trel. in Ann. Missouri Bot. Gard. 27:307. 1940.

A dioecious, very bushy shrub up to 4.5 m. tall. Branches rather stout, 2-edged, the branchlets highly compressed. Cataphylls a single pair, strictly basal, large, up to 3 mm. long. Leaves obliquely lanceolate, very acute, cuneately long-attenuate to the base, thus almost sessile or subpetioled for about 1 cm., finely 3-5-nerved, somewhat coriaceous, to 15 cm. long, 1.5 cm. broad. Spikes both solitary and clustered, 3-4-articulate, turbinate, the flowers 6-ranked; pistillate ones much stouter, to 4 cm. long, the joints 1 cm. long, 16-24-flowered; staminate spikes slender, to 6 cm. long, the joints 6-12 mm. long, 30-70-flowered; peduncle in any case 2-3 mm. long. Fruits globose, the tepals closely inflexed.

Endemic.

CHIRIQUÍ: vicinity of Finca Lérida, *Allen 4752*; vicinity of New Switzerland, *Allen 1399* (type); Cerro Vaca, *Pittier 5376*.

Pb. novae-helvetiae, a pretty species, is very similar to *Pb. tonduzii* Trel., reported to occur in Panama (see below); it may be distinguished by the 6-seriate flowers and 30-70-flowered male joints (instead of 4-ranked as Trelease says).

11. PHORADENDRON TONDUZII Trel. Genus Phoradendron 67. 1916.

Authoritatively (see Standley's Flora of Costa Rica, p. 406) but not unquestionably Panamanian; however, it may be expected.

In habit of foliage and inflorescence it is closely related to *Pb. novae-helvetiae* Trel., above described. They are readily distinguishable by the flower disposition and by the number of male flowers.

12. PHORADENDRON GRACILISPICUM Trel. Genus Phoradendron 130. 1916.

Trelease mentions a collection from Chiriquí. The following description is taken from the original (*ibidem*):

Branches ancipital and rather persistently 2-keeled, the internodes 4-6 cm. long. Cataphylls only basal or followed by a second pair some 2 cm. higher. Leaves lanceolate or oblong-acute, the base cuneate, devoid of nerves, 10-16 cm. long, 2.5-4 cm. broad; petioles about 1 cm. long. Spikes often clustered, markedly slender, very long (to 7 cm.), reddish, showing about 10 thin joints some 12-flowered in 4 (6) series; peduncle 2 mm. long, often followed by 1 or 2 partly or wholly sterile joints, the scales ciliolate. Young fruit elongated, the tepals connivent.

13. PHORADENDRON UNDULATUM (Pohl) Eichl. in Mart. Fl. Bras. 5, pt. 2:122. 1868.

Viscum undulatum Pohl, in DC. Prodr. 4:282. 1830.

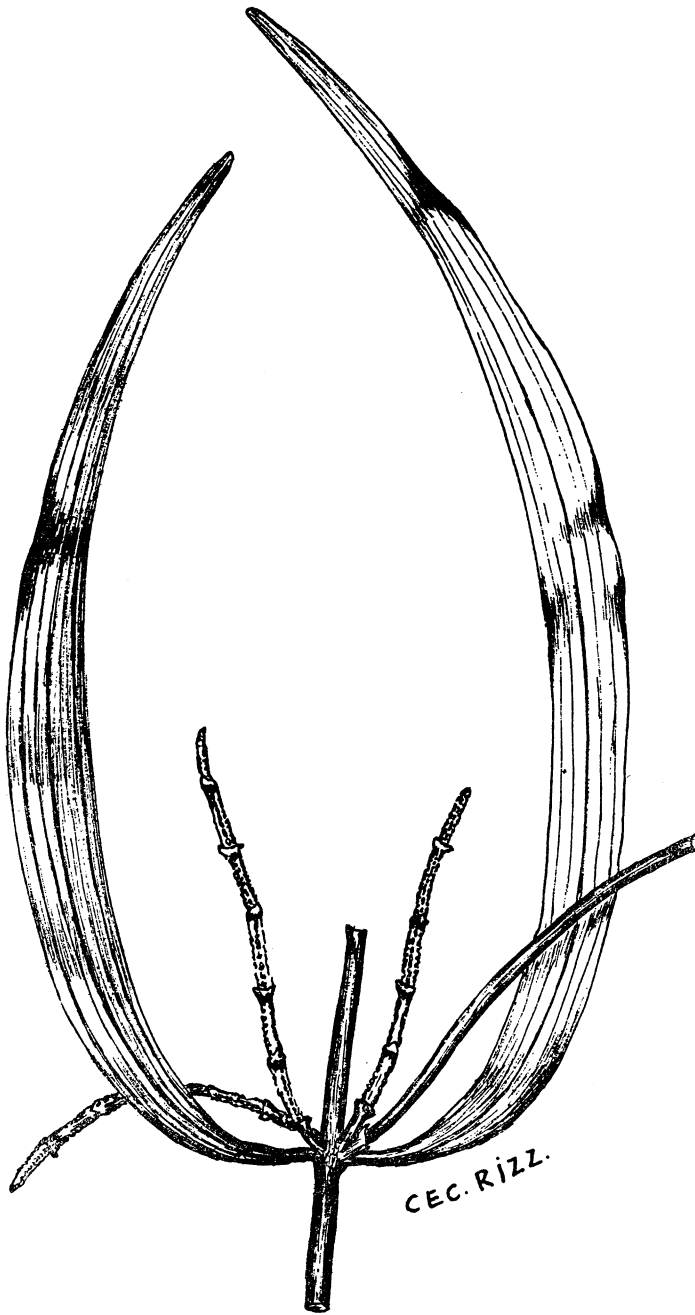


Fig. 80. *Phoradendron novae-helvetiae*

(269)

Yellow, with a brownish tint, moderately tall shrub hanging from trees. Branches ancipital and 2-keeled, especially toward the tips. Cataphylls a nearly basal pair followed by 2-3 additional ones, rather pointed. Leaves lanceolate, not rarely somewhat ovate, acuminate, under lens rugose, the nerves wanting, the margins callose-thickened and conspicuously undulate, 7-12 cm. long, 2-4 cm. wide; petioles 3-8 mm. in length, canaliculate above. Spikes many times clustered, 2-5 cm. long, with 5-9 moderate joints; peduncle none or up to 8 mm. long; joints mostly 10-flowered in 2 ranks, 2-5 mm. long. Fruits round-ovoid, smooth, 3 mm. in diameter, the tepals slightly parted.

Another interesting finding of a plant, previously known only from Brazil, in Panama. The excellent specimen, mentioned below, minutely examined and compared with several Brazilian ones, agrees even in the smallest details as, for instance, in the callose-margined and finely verrucose leaves.

Brazil, Panama.

CHIRIQUÍ: pastures around El Boquete, *Pittier 2932*.

Ph. gracilispicum Trel. is to be distinguished from the above by it longer, slender and many-jointed spikes.

14. PHORADENDRON COOPERI Trel. Genus Phoradendron 67. 1916.

Branches rather stout, 2-sided or ancipital. Cataphylls a single, strictly basal pair, pointed. Leaves falcately lanceolate to oblong-lanceolate, long-attenuate to the somewhat obtuse apex, thin, finely 5-nerved, cuneately subpetioled for 1-1.5 cm., to 20 cm. long, 2.5 cm. broad. Spikes solitary, 3-4-articulate, about 3-4 cm. long; peduncle nearly suppressed; joints 16-25-flowered in 4 ranks, 8-10 mm. long. Fruits round, 3 mm. in diameter, the tepals closely meeting.

Central America.

CHIRIQUÍ: Boquete, *Davidson 580*.

15. PHORADENDRON MUCRONATUM (DC.) Kr. et Urb. in Engl. Bot. Jahrb. 24: 352.

Viscum mucronatum DC. Prodr. 4:282. 1830.

Phoradendron emarginatum Mart. ex Eichl., in Mart. Fl. Bras. 5, pt. 2:118. 1868.

Phoradendron emarginatum var. *minor* Eichl. loc. cit. 119. 1868.

Phoradendron minor (Eichl.) Trel., The Genus Phoradendron 117. 1916.

Branches somewhat nodose, the branchlets sharply 4-angled. Cataphylls a single basal pair, 2 mm. long. Leaves obovate, often emarginate, cuneate to the base, coriaceous, distinctly 3-5-nerved, to 3.5 cm. long, 2 cm. broad; petioles about 2-4 mm. long. Spikes solitary, sessile, 3-4-jointed, 5 mm. long, when fruiting to 1.5 cm. long; joints 4-6-flowered in 4 series. Fruits ovoid, tuberculate, 3-4 mm. long, the tepals nearly erect.

South and Central America, West Indies.

PANAMÁ: swamp between El Jagua Hunting Club on Río Jagua and El Congor Hill, *Hunter & Allen 474*. COCLÉ: Aguadulce, *Pittier 4956*.

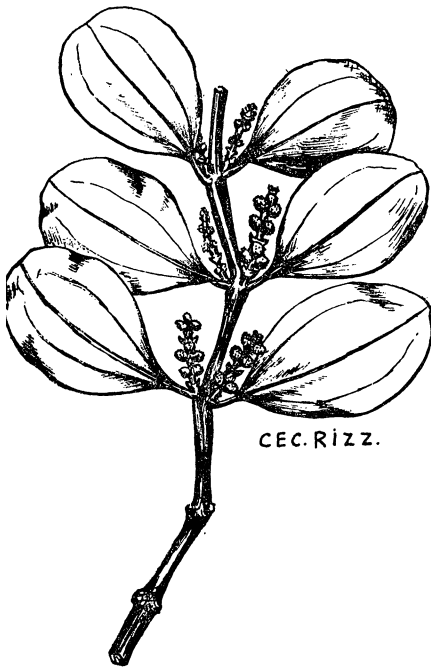


Fig. 81. *Phoradendron mucronatum*

As shown by Urban, *Ph. emarginatum* (Brazil) only differs from *Ph. mucronatum* (West Indies) by the larger leaves and longer spikes. The var. *minor* of the former species, with smaller leaves and shorter spikes, is intermediate between the two. Actually, there are no clear-cut differences.

Southern Brazilian specimens are constantly stouter than Central American and West Indian ones; but the northeastern Brazilian material is smaller than the former and approaches the latter.

In short: *Ph. mucronatum* is a South and Central American and West Indian rather variable entity, well characterized and easily recognizable by the obovate-emarginate leaves, 4-angled branches, 4-6-flowered spike joints and verrucose fruit—as it is evident from the examination of exceedingly abundant herbarium material.

16. PHORADENDRON TRINERVIUM Griseb. Fl. Brit. West Ind. Isl. 314. 1860.

Phoradendron rubrum var. *brevispica* Eichl. and var. *latifolia* Eichl. in Mart. Fl. Bras. 5, pt. 2:121. 1868.

Branches toward the tips rhombically quadrangulate, the branchlets somewhat compressed and swollen below the nodes. Cataphylls a single basal pair, short. Leaves narrowly obovate or elliptical-obovate, angustate to the base, very obtuse, almost nerveless despite the specific name, coriaceous, 2-5 cm. long, 1-1.5 cm. wide; petioles 2-4 mm. long. Spikes solitary or clustered, 3-4-articulate, up to 3 cm. long; peduncle 1-2 mm. long; joints slender, 10-18-flowered in 4 series, 4-7 mm. long. Fruit yellow, ovate, 3-5 mm. long, the tepals erect, parted.

West Indies, Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, von Wedel 2763.

17. PHORADENDRON VENEZUELENSE Trel. Genus *Philodendron* 111. 1916.

Phoradendron herrerense Trel. in Ann. Missouri Bot. Gard. 27:307. 1940.
Phoradendron sonanum Trel. loc. cit. 308. 1940.

A rather variable, androgynous shrub. Branches 4-lined, the branchlets quadrangulate, slightly compressed and somewhat enlarged below the nodes. Cataphylls a single basal pair, parted. Leaves lance-oblong, more or less falcate, obtuse or subacute, sometimes shortly mucronate, attenuate to the base, leathery, indistinctly



Fig. 82. *Phoradendron venezuelense*

3-5-nerved or nearly nerveless, cartilaginous-margined, 3-6 cm. long, rarely up to 8 cm., 7-15 mm. broad; petioles 2-5 mm. long. Spikes mostly clustered, slender, often 3-articulate (seldom to 5-jointed), about 1.5 cm. long, but attaining to 5 cm. when fully developed; peduncle 3-10 mm. long; joints 10-24-flowered, the flowers 4-seriate, to 1 cm. long. Fruit globose, yellow, 3 mm. in diameter, the tepals closely connivent.

Widely distributed both in Venezuela and Panama. Also in Colombia and the West Indies, where it is rare.

BOCAS DEL TORO: Water Valley, *von Wedel* 936; Chiriquí Lagoon, *von Wedel* 1578, 2518, 2599, 2648. CANAL ZONE: Ancón Hill, vicinity of Balboa, *Seibert* 408; around Gamboa, *Pittier* 2604; Barro Colorado Island, near Barbour Point, *Wilson* 146. HERRERA: Pesé, *Allen* 798 (type of *Ph. herrerense* Trel.). PANAMÁ: Sabanas near Chepo, *Hunter & Allen* 78; on Sabanas, road to Chepo, *Hunter & Steyermark* s. n.; Río Tecumen, *Standley* 26552; along Corozal Road, *Standley* 26869; Llanos de Panamá Viejo, *Heriberto* 288. VERAGUAS: hills of Soná, *Allen* 1033 (type of *Ph. sonanum* Trel.). PROVINCE UNKNOWN: *Sutton Hayes* 829.

Ph. herrerense Trel. only differs from *Ph. venezuelense* in the more regularly branched stem; *Ph. sonanum* Trel. is distinguished from the latter by some longer, 3-5-jointed spikes; in both cases the differences are too poorly developed to be taken into account.

OPILIACEAE

BY LORIN I. NEVLING, JR.

1. AGONANDRA Miers

AGONANDRA Miers, in *Ann. Nat. Hist.* ser. 2. 8:172. 1851, nomen; Benth. & Hook. f. *Gen.* 1:349. 1862.

Dioecious trees, the bark generally corky. Leaves alternate, simple, thin, usually small, ovate to elliptic, petiolate. Inflorescences axillary, racemose, bracteate. Flowers small, green, pedicellate. Calyx small, usually crateriform, (5- or) 4-lobed or undulate. Petals 4 (or 5), free, valvate, especially caducous in pistillate flowers. Stamens 4 (or 5), antipetalous, the filaments filiform, the anthers ovoid; absent in pistillate flowers. Disc annular or cupuliform, irregularly lobed, more or less connate at the base, generally erect. Pistil 1, superior, the ovary 1-loculate, the style generally obsolete, the stigma 4-lobed. Fruit a berry.

In the past pistillate flowers of this genus have been characterized by the absence of petals. Examination of the single collection from Panama clearly shows the presence of petals and also reveals their caducous nature.

Approximately a dozen species distributed from Mexico to Argentina. Known from a single species in Panama.



Fig. 83. *Agonandra brasiliensis*

1. *AGONANDRA BRASILIENSIS* Benth. & Hook. f. Gen. 1:349. 1862.

Trees to 8 m. tall, the bark rough, brown, the branchlets slender, terete, glabrous, olive-green. Leaves ovate, 2.5–5.5 cm. long, 2–3 cm. broad, abruptly and briefly acuminate at the apex, obtuse and attenuate at the base, glabrous, the costa plane to immersed above, emersed below, the primary lateral veins prominulous; petiole 3–9 mm. long. Staminate inflorescence 30- to 75-flowered, farinose, the rhachis 3–7 cm. long. Staminate flowers (immature): pedicel about 0.5 mm. long; calyx crateriform, about 0.5 mm. long, farinose, undulate; petals 5, ovate, about 1.5 mm. long, 0.75 mm. broad, farinose without, glabrous within; stamens 5, the filaments 1–2 mm. long, glabrous, the anthers about 0.5 mm. long and broad; disc 5-lobed, the lobes very nearly free, about 0.5 mm. long, fleshy, truncate, obscurely and irregularly lobed at the apex, glabrous; pistillode conical, about 0.75 mm. long, glabrous. Pistillate inflorescences 10- to 15-flowered, farinose, the rhachis 0.5–4.5 cm. long. Pistillate flowers: pedicel 0.5–0.75 mm. long; calyx crateriform, about 0.25 mm. long, farinose without, the margin undulate; petals 4, ovate-trigonal, about 1 mm. long, 0.5 mm. broad at the base, farinose without, indefinitely papillate to glabrous within; disc annular, about 0.25 mm. tall, irregularly lobed to the middle, glabrous; ovary doleiform, 0.5–0.75 mm. long, glabrous, the style obsolete, the stigma 4-lobed. Berry ovoid, 12–15 mm. long, 10–12 mm. in diameter, glabrous; pedicel 5–8 mm. long.

Central and South America. The single collection examined was flowering and fruiting in February–March and was collected at an altitude of 50–1000 ft.

COCLÉ: Penonomé and vicinity, R. S. *Williams* 368.

OLACACEAE

BY LORIN I. NEVLING, JR.

Armed or unarmed trees, shrubs or perhaps vines, autotrophic or reportedly hemiparasitic. Leaves alternate, sometimes opposite, simple, generally entire, pinnately veined, petiolate; estipulate. Inflorescences axillary, panicles, racemes, cymes or umbels, often fasciculate. Flowers dichlamydeous, bisexual or rarely polygamodioecious, sometimes polymorphic, actinomorphic, generally small and inconspicuous. Calyx small, gamosepalous, crateriform to campanulate, usually with a 3- to 6-toothed margin, free or basally adnate to the ovary or to the disc, sometimes accrescent. Petals 3-6, usually the same number as calyx lobes, free or connate, valvate or imbricate in bud. Disc sometimes present, simple or cupuliform. Stamens generally the same number as, or twice the number of, petals, the anthers dehiscent longitudinally or by valves. Pistil 1, the ovary superior or rarely half-inferior, sessile, generally 2- to 5-loculate, the ovules the same number as locules, pendulous, integuments 0, 1 or 2, the style simple, sometimes heteromorphic, terminal, elongate to obsolete, the stigma often 3-parted. Fruit mostly a drupe, sometimes accompanied by a colorful accrescent calyx.

A pantropic family of about 25 genera and 300 species. Four genera are known from Panama. A fifth genus, *Chaunochiton*, is known from Costa Rica, Guiana and northern Brazil. Whether this disjunction is real or is an artifact of collection is not known at this time.

- | | |
|---|---------------|
| a. Calyx crateriform or cupuliform, free from the ovary, with 3 to 6 lobes or teeth; ovary superior; ovules with 1 or 2 integuments; fruit a drupe; plants root parasites (<i>Ximenia</i>) or autotrophes. | |
| b. Petals 5-6, free or connate, glabrous to more or less villous within; stamens 5-6 or 10-12; stigma 3- to 5-lobed; unarmed autotrophic shrubs or trees; leaves and bark with either resin canals or laticiferous ducts or both. | |
| c. Leaves and bark with resin canals and laticiferous ducts; pubescence branched; calyx with 5-6 teeth, not accrescent; petals connate; ovary 3- or 4-loculate (by abortion from 5)..... | 1. MINQUARTIA |
| cc. Leaves and bark with laticiferous ducts but lacking resin canals; pubescence unbranched; calyx with 5-6 teeth or lobes, accrescent; petals free; ovary with 3 locules..... | 2. HEISTERIA |
| bb. Petals 4-5, free, densely set with barbed hairs within; stamens 8-10; stigma minutely capitate; parasitic shrubs or trees, armed with axillary spines; leaves and bark lacking laticiferous ducts and resin canals..... | 3. XIMENIA |
| aa. Calyx reduced, adnate to the ovary; ovary half-inferior; ovules lacking integument; spurious fruit drupaceous (eccentrically annulate at the apex); plants unarmed root parasites..... | 4. SCHOEPFIA |

1. MINQUARTIA Aubl.

MINQUARTIA Aubl. Hist. Pl. Guyan. Franç. Suppl. 4. t. 370. 1775.

Secretania Mull.-Arg. in DC. Prod. 15²:227. 1866.

Minguartia Miers, in Journ. Linn. Soc. 17:338. 1879.

Unarmed autotrophic trees, the young branches generally densely rusty-tomentulose, the hairs branched, the older stems often perforated. Leaves alternate,

elliptic, acuminate at the apex, glabrous above, glabrescent below, with resin canals and laticiferous ducts. Inflorescences spicate, bracteate. Flowers bisexual, hypogynous, small. Calyx cupuliform to crateriform, small, (6-) 5-toothed, persistent but not accrescent. Petals 5 (or 6), connate into a campanulate corolla tube, puberulent to villous within, the lobes valvate in bud. Stamens 10 (or 12), in two whorls, the anthers dehiscing longitudinally, the filaments filiform, adnate to the corolla tube, antipetalous generally longer. Ovary 5-merous but often reduced to 3 or 4 locules by abortion, the stigma 3- to 5-lobed. Fruit a small ovoid or round drupe.

Three or four species distributed in Panama, Ecuador, Guiana and Brazil. A single species is known from Panama.

1. *MINQUARTIA GUIANENSIS* Aubl. Hist. Pl. Guyan. Franç. Suppl. 4. t. 370. 1775.
Secretania loranthacea Mull.-Arg. in DC. Prod. 15²:227. 1866.

Trees to 30 m. tall, the young branches angular, glabrous. Leaves elliptic, 8-16 cm. long, 3.0-7.5 cm. broad, abruptly and briefly acuminate at the apex, rounded or obtuse at the base, chartaceous, glabrous, the costa emersed above and below, the primary lateral nerves numerous, conspicuous; petiole 5-23 mm. long, broadly canaliculate. Inflorescence spicate, rusty-tomentulose, the rhachis elongating to 5 cm. long, the flowers sessile, subtended by small ovate bracts. Calyx cupuliform, about 1 mm. long, 1.5-2.0 mm. in diameter, 5-toothed, rusty-tomentulose without; petals 5, connate into a campanulate corolla tube, the tube 1.0-1.5 mm. long, tomentulose without, black-punctate within, the lobes 1.0-1.5 mm. long, 1 mm. broad, villous within; stamens 10, inserted just below the orifice, the alternipetalous inserted slightly lower than the antipetalous, the anthers broader than long, minute, the filaments about 0.5 mm. long, glabrous; ovary globose, about 1.5 mm. in diameter, densely rusty-tomentulose, the style short. Immature drupe ellipsoid, about 7 mm. long, 4 mm. in diameter.

The Panamanian specimens are sterile, for all practical purposes, and the incomplete floral description is based upon fragmentary collections from South America.

Known as *manwood* and *nispero negro* in Panama. The wood is heavy and extremely durable.

BOCAS DEL TORO: region of Almirante, *Cooper 497*. CANAL ZONE: Gamboa, *Standley 28380*. CHIRIQUÍ: Progreso, *Cooper & Slater 312*.

The cited specimens are, with the exception of some very immature inflorescences, glabrous throughout. In this respect they are unlike their South American counterparts, which are usually rusty-tomentulose throughout.

2. HEISTERIA Jacq.

HEISTERIA Jacq. Enum. Pl. Carib. 4. 1760.

Rbaptostylum Humb. & Bonpl. Fl. Aequin. 2:139, t. 125. 1809.

Hesiodia Vell. Fl. Flum. 4. t. 140. 1825, (as *Hesioda*).

Acrolobus Klotzsch, in Verhandl. Akad. Wiss. Berlin 236, t. 3. 1856.

Raptostylus Post & O. Kuntze, Lex. Gen. Phaner. 477. 1904.

Phanerocalyx Spencer Le Moore, in Journ. Bot. 59:244. 1921.

Unarmed autotrophic shrubs or trees. Leaves alternate, oval, elliptic or oblanceolate, glabrous, with laticiferous ducts. Inflorescences in compact axillary fascicles, multi-flowered although only 1 or 2 per axil develop into mature fruit. Flowers bisexual, hypogynous, small. Calyx small, generally crateriform, free, 5-6 toothed or lobed, accrescent, becoming coriaceous. Petals 5-6, somewhat connate at the very base, glabrous or puberulent to villous within, valvate in bud. Stamens 10 or 12 in two whorls (in Panamanian species) or 5-6 in one whorl, the anthers globose, dehiscent longitudinally, the filament filiform or liguliform, antipetalous often somewhat shorter than the antisealous. Ovary superior, conical, 3-merous to the middle, the ovules 3, pendulous, with 2 integuments, the style short to obsolete, the stigma 3-lobed. Fruiting calyx more or less reflexed, often brilliantly colored; drupe globose, oblate spheroid or ellipsoid; embryo embedded in the top of the endosperm, small.

About 65 species, West Africa, Central and South America. Five species are known from Panama.

The genus is generally divided into two sections on the basis of the number of stamens. The five Panamanian species have either 10 or 12 stamens and are therefore placed in section *Eubeisteria* Engl. (in Engl. & Prantl Aufl. 2. Nachtr. 19. 1900).

Heisteria is marked by a paucity of flowering specimens which is only partially overcome by a particularly abundant supply of fruiting specimens. Unfortunately, the fruiting structures are rather variable and thus specific delimitation is sometimes obscure.

- a. Fruiting calyx much shorter than the drupe; petals puberulent to villous within; filaments puberulent.
- b. Fruiting calyx inconspicuously 5-lobed, about 1 cm. in diameter; drupe oblate spheroid, 7-9 mm. long; fruiting pedicel 13-20 mm. long; petals puberulent within; pistil conical..... 1. *H. FATOENSIS*
- bb. Fruiting calyx conspicuously 5-lobed, 1.5-2.5 cm. in diameter; drupe broadly ellipsoid, 10-15 mm. long; fruiting pedicel 8-10 mm. long; petals puberulent to villous within; pistil lageniform..... 2. *H. CONCINNA*
- aa. Fruiting calyx as long as or longer than the drupe; petals glabrous within; filaments indefinitely papillate or glabrous.
- c. Leaves linear-lanceolate, 1.5-5.0 cm. broad, gradually tapering to apex, the costa immersed above, emersed below; filaments about 0.25 mm. broad; drupe ovoid, 6-8 mm. long; fruiting pedicel 6-9 mm. long..... 3. *H. COSTARICENSIS*
- cc. Leaves ovate, elliptic or oblanceolate, 3-8 cm. broad, acute or acuminate at the apex, the costa emersed above and below; filaments about 0.5 mm. broad; drupe ovoid, ellipsoid or obovoid, 5-12 mm. long; fruiting pedicel 8-23 mm. long.
- d. Leaves oblanceolate to broadly elliptic, 10-27 cm. long, long-acuminate at the apex; anthers 0.5 mm. long and broad; fruiting calyx longer than the drupe, 2-3 cm. in diameter, shallowly 5-lobed; drupe ovoid or ellipsoid; fruiting pedicel 8-12 mm. long. 4. *H. MACROPHYLLA*
- dd. Leaves ovate to elliptic or rarely oblanceolate or obovate, 5-15 cm. long, abruptly and briefly acuminate at the apex; anthers about 0.25 mm. long and broad; fruiting calyx about as long as the drupe, 1-2 (-2.5) cm. in diameter, very shallowly 5-lobed or undulate; drupe ellipsoid or obovoid; fruiting pedicel 10-23 mm. long..... 5. *H. LONGIPES*

1. *HEISTERIA FATOENSIS* Standl. in Field Mus. Nat. Hist. 8:137. 1930.

Shrubs or trees to 3.5 m. tall, the young branches generally angular, sometimes strikingly flexuose, glabrous, brownish-red. Leaves ovate, 5–13 cm. long, 3–6 cm. broad, abruptly and briefly acuminate at the apex, rotund at the base, chartaceous, the costa plane above, emersed below, the primary lateral veins 5–6 pairs; petiole 7–12 mm. long, slightly canaliculate. Calyx crateriform, 5-toothed, glabrous, the teeth 0.5 mm. long and broad; petals 5, deltoid, 1.75–2.0 mm. long, about 1 mm. broad at the base, glabrous without, puberulent within; stamens 10, free, the anthers to 0.25 mm. long and broad, the filaments liguliform, 1.0–1.5 mm. long, about 0.25 mm. broad, puberulent; pistil conical, 0.75–1.0 mm. long, about 0.75 mm. in diameter, glabrous; pedicel 4.5–6.0 mm. long. Fruiting calyx much shorter than the drupe, obscurely lobed, strongly reflexed, about 1 cm. in diameter; drupe oblate spheroid, 7–9 mm. long, 9–11 mm. in diameter, cherry to yellowish-red; pedicel 13–20 mm. long.

Known only from Panama. Flowering and fruiting from July to October.

BOCAS DEL TORO: Water Valley, *Von Wedel 1401*. COLÓN: Loma de Gloria, near Fató (Nombre de Dios), *Pittier 4244*.

Pittier reports the type collection as being "a woody vine". He may have been mistaken as vines are little known in this genus. In addition, the specimens do not have a vine-like aspect.

2. *HEISTERIA CONCINNA* Standl. in Field Mus. Nat. Hist. Bot. 8:137. 1930.

Trees to 9 m. tall, the young branches terete, glabrous, olive-green to brownish-red. Leaves ovate, 6–13 cm. long, 3–6 cm. broad, abruptly and briefly acuminate at the apex, acute to obtuse at the base, coriaceous, the costa plane to immersed above, emersed below, the primary lateral veins generally prominulous; petiole 7–18 mm. long, canaliculate. Calyx crateriform, 5-toothed to the middle, about 1 mm. long, glabrous, the teeth 0.75 mm. long, 0.5 mm. broad; petals 5, elliptic, 2.0–2.5 mm. long, 1.25 mm. broad, glabrous without, the lower half puberulent to villous within; stamens 10, free, the anthers 0.25 mm. long and broad, the filaments filiform, about 1.5 mm. long, puberulent; pistil lageniform, the ovary oblate spheroid, 0.5 mm. long, 0.75 mm. in diameter, the style about 0.75 mm. long; pedicel about 5 mm. long. Fruiting calyx shorter than the drupe, 1.5–2.5 cm. in diameter, reflexed, distinctly 5-lobed, red; drupe broadly ellipsoid, 10–15 mm. long, 8–10 mm. in diameter; pedicel 8–10 mm. long.

Costa Rica and Panama. Flowering and fruiting from December to February at altitudes to 120 meters.

CANAL ZONE: Barro Colorado Island, *Woodworth & Vestal 484*. CHIRIQUÍ: vicinity of San Félix, *Pittier 5197*. VERAGUAS: San Francisco, *Powell s. n.*

3. *HEISTERIA COSTARICENSIS* Donn. Sm. in Bot. Gaz. 19:254. 1894.

Shrubs to 3 m. tall, the young branches angular, glabrous, olive-green. Leaves linear-lanceolate, 16–25 cm. long, 1.5–5.0 cm. broad, gradually tapering to the apex, acute to obtuse at the base, chartaceous, the costa immersed above, emersed

below, the primary lateral veins numerous; petiole 3–13 mm. long, scarcely canaliculate. Calyx crateriform, deeply 5-toothed, glabrous, the teeth about 0.5 mm. long, 0.5 mm. broad; petals 5, deltoid, about 2 mm. long, 1 mm. broad, glabrous; stamens 10, free, the anthers to 0.5 mm. long and broad, the filaments liguliform, about 1 mm. long, 0.25 mm. broad, glabrous; pistil conical, about 1 mm. long, 1 mm. in diameter; pedicel about 1.5 mm. long. Fruiting calyx longer than the drupe, 1.5–2.5 cm. in diameter, shallowly 5-lobed, somewhat enclosing the drupe or reflexed, red; drupe ovoid, 6–8 mm. long, about 7 mm. in diameter, vertically ribbed, blue; pedicel 6–9 mm. long.

Costa Rica and Panama. In Panama fruiting from October to February.

CANAL ZONE: Quebrada Lopez, *Allen 2128*; along Caño Quebrado, *Pittier 6825*; Barro Colorado Island, *Hunnewell 16422*, *Standley 40898*, *41168*.

4. *HEISTERIA MACROPHYLLA* Oerst. in Vid. Medd. Kjoebn. 1856:40. 1857.

Heisteria latifolia Standl. in Journ. Wash. Acad. Sci. 17:8. 1927.

Shrubs to 2 m. tall, the young stems terete to somewhat angular, glabrous, olive-green. Leaves elliptic or broadly elliptic to oblanceolate, (5–) 10–37 cm. long, 3–8 cm. broad, acuminate at the apex, acumen to 8 cm. long, cuneate to obtuse at the base, chartaceous to subcoriaceous, the costa emersed above and below, the primary lateral veins numerous, arcuate-ascending; petiole 6–30 mm. long, canaliculate. Calyx crateriform, 5- or 6-toothed, glabrous; petals (4 or) 5, deltoid, about 1.75–2.0 mm. long, 1–2 mm. broad at the base, glabrous; stamens 10, the anthers 0.5 mm. long and broad, the filaments liguliform, 0.75–1.5 mm. long, 0.5 mm. broad, glabrous; pistil conical, 1 mm. long and broad, glabrous; pedicel 1.25–2.0 mm. long. Fruiting calyx as long as or longer than the drupe, 2–3 cm. in diameter, inconspicuously and shallowly 5-lobed, more or less reflexed, red; drupe ovoid or ellipsoid, 8–12 mm. long, 6–9 mm. in diameter, vertically ribbed, black; pedicel 8–12 mm. long.

A common forest species of Central America. Known in Panama as *ajicillo* and fruiting from April to November.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1082*, *1278*; Fish Creek Mts., *Von Wedel 2269*; Water Valley, *Von Wedel 846*, *913*, *1538*, *1720*. CANAL ZONE: between France Field and Catival, *Standley 30366*; Barro Colorado Island, *Standley 40877*. COLÓN: along Río Culebra, above Santa Isabel, *Pittier 4156*.

Heisteria latifolia was proposed by Standley as a new species primarily on the basis of the very broad leaves with conspicuously elongate petioles. A continuous series between the leaves of *H. macrophylla* and *H. latifolia* can be demonstrated in Panamanian material and therefore it does not seem reasonable to maintain *H. latifolia* as a distinct species.

The flowers appear to be rather variable, even in number of parts. A flower from *Von Wedel 1538* (MO) was found to have 6 calyx lobes, 4 petals and 10 stamens.

Standley reported this species as attaining 10 meters in height (Field Mus. Bot. Ser. 18¹⁻²:409. 1937).

5. *HEISTERIA LONGIPES* Standl. in Journ. Wash. Acad. Sci. 17:8. 1927.

Shrubs or trees to 20 m. tall, the young branches somewhat angular, glabrous, olive-green. Leaves ovate to elliptic or rarely oblanceolate or obovate, 5–15 cm. long, 3–8 cm. broad, acute to abruptly and briefly acuminate at the apex, acute at the base, chartaceous, the costa emersed above and below, the primary lateral veins numerous; petiole 5–15 mm. long, deeply canaliculate. Calyx crateriform, 5-lobed to one-third from the base, glabrous; petals 5, deltoid, 2.25–2.75 mm. long, 1.25–1.5 mm. broad, glabrous; stamens 10, free, the anthers about 0.25 mm. long and broad, the filaments liguliform, about 1.5 mm. long, 0.5 mm. broad, glabrous or indefinitely papillate; pistil conical, 1 mm. tall, 1.25 mm. in diameter; pedicel 3.5–4.0 mm. long. Fruiting calyx about as long as the drupe, 1.0–2.0 (–2.5) cm. in diameter, shallowly 5-lobed or undulate, generally somewhat reflexed, red; drupe ellipsoid or obovoid, 5–10 (–12) mm. long, 5–7 mm. in diameter; pedicel 10–23 mm. long.

Fruiting from January to September to 2000 meters. Known as *naranjillo colorado* in Panama.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 444, 567, Cooper & Slater 127*; region of Almirante, *Cooper 569*; Old Bank Island, *Von Wedel 2123*; Isla de Colón, *Woodson, Allen & Seibert 1945*. CANAL ZONE: along the Trinidad River, *Pittier 4006*; Tortuguilla cove (area west of Limón Bay, Gatún Locks and Gatún Lake), *Johnston 1523*; Barro Colorado

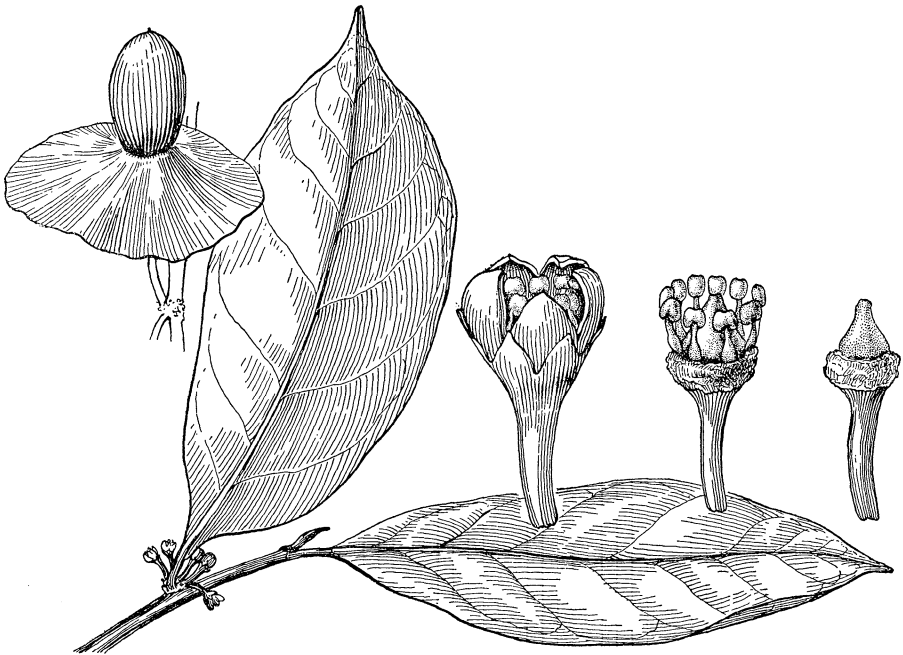


Fig. 84. *Heisteria longipes*

Island, Bailey & Bailey 81, Bangham 534, Kenoyer 341, Salvoza 923, 958, Wetmore & Abbe 20, 99, Wilson 153, Woodworth & Vestal 436. CHIRIQUÍ: vicinity of Puerto Armuelles, Woodson & Schery 856, Stern & Chambers 126; trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, Allen 1589; Progreso, Cooper & Slater 166. COCLÉ: El Valle de Antón, along Río Indio trail, Hunter & Allen 328. DARIÉN: near the mouth of Río Yapé, Allen 339. PANAMÁ: Cerro Campana, trail from Campana to Chica, Allen 2657. SAN BLAS: high hills back of Puerto Obaldía, Pittier 4289.

The type specimen, *Pittier 4006* (US), is an unusual specimen for two reasons: the petals and stamens which are ordinarily caducous have persisted into young fruit formation; secondly, Standley reported 6 petals and 12 stamens for it. Examination of the immature fruit of this specimen revealed only 5 petals and 10 stamens although there appeared to be some peculiarities in the androecial whorl, namely, basal cohesion between some of the filaments. Such floral variability upon a single specimen is entirely possible and has been demonstrated in at least one other species from Panama, *H. macrophylla* Oerst.

3. XIMENIA L.

XIMENIA L. Sp. Pl. 1193. 1753.

Heymassoli Aubl. Hist. Pl. Guyan. Franç. 1:324, t. 125. 1775.

Rottboelia Scop. Introd. 233, n. 1060. 1777.

Pimecaria Raf. Alsog. Am. 64. 1838.

Armed root parasitic shrubs or trees, the spines axillary, the young branches glabrous. Leaves alternate, ovate or elliptic, mucronate or acuminate at the apex, obtuse to cuneate at the base. Inflorescence umbellate, simple or compound, sometimes fasciculate, bracteate. Flowers bisexual, hypogynous, medium-sized. Calyx small, 3- to 5-toothed, not accrescent. Petals 4 or 5, free, thickly covered with red-brown barbed hairs within, valvate in bud. Stamens 8-10, in two whorls, the anthers oblong or linear, dehiscent longitudinally, the filaments filiform. Ovary long-conical, 4-loculate above the middle, the ovules pendulous, with 1 integument, the style filiform, about as long as the ovary, the stigma minutely capitate. Drupe ovoid to ellipsoid, from yellow to purple; seed with a small embryo at the apex of the fleshy endosperm.

Approximately 15 species, circumtropical; Florida, Central and South America, Antilles, Africa, East Indies, Asia, and Australia. Only one species known from Panama.

1. XIMENIA AMERICANA L. Sp. Pl. 1193. 1753.

Ximenia multiflora Jacq. Enum. Pl. Carib. 19. 1762.

Ximenia inermis L. Sp. Pl. ed. 2. 497. 1762.

Ximenia aculeata Crantz, Inst. 2:381. 1766.

Heymassoli spinosa Aubl. Pl. Guayan. Franç. 1:324, t. 125. 1775.

Ximenia elliptica Forst. f. Prod. 27. 1786.

Ximenia spinosa Salisb. Prod. 276. 1796.

Ximenia montana Macfad. Fl. Jamaica 1:121. 1837.

Ximenia loranthifolia Span. in *Linnaea* 15:177. 1841.

Ximenia arborescens Tussac, ex Walp. *Rep.* 1:377. 1842.

Ximenia laurina Delile, in *Ann. Sci. Nat. ser. 2.* 20:89. 1843.

Ximenia fluminensis M. Roem. *Syn. Hesper.* 22. 1846.

Ximenia oblonga Lam. ex Hemsl. in *Biol. Centr. Am. Bot.* 1:185. 1879.

Trees to 7 m. tall, the spines axillary branches, often leafy, usually stout. Leaves ovate, 3–11 cm. long, 2.0–4.5 cm. broad, retuse and mucronulate at the apex, obtuse to cuneate at the base, subcoriaceous, glabrous or bullate, the costa immersed above, emersed below, the primary lateral veins 3–6 pairs, most conspicuous towards the base of the lamina; petiole 5–7 mm. long, canaliculate. Inflorescence umbellate, simple or compound, often fasciculate, multi-flowered, the bracts small, ciliate, caducous. Calyx crateriform, to 0.75 mm. long, about 1.5 mm. in diameter, 3- or 4-toothed, ciliate; petals 4, liguliform, 7–11 mm. long, 1.5–2.0 mm. broad, greatly reflexed, coriaceous, glabrous without, densely covered with red-brown barbed hairs within, white and often purple tipped; stamens 8, subexserted, the anthers linear, 3.0–4.5 mm. long, 0.5–0.75 mm. broad, the filaments 3.0–4.5 mm. long, glabrous; ovary long-conical, 3–4 mm. long, 1.0–1.5 mm. in diameter, glabrous, the style 3.0–4.5 mm. long; pedicel 5–6 mm. long. Drupe ellipsoid, 2–3 cm. long, 1.5–2.5 cm. in diameter, pale yellow.

A circumtropical species.



Fig. 85. *Ximenia americana*

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *Von Wedel 1402*; Water Valley, *Von Wedel 1620*. CANAL ZONE: vicinity of Fort Sherman, *Standley 31145*; Victoria Fill, *Allen 1750*. CHIRIQUÍ: Isla Parida, *Pittier 2819*. DARIÉN: Patiño, on cliffs along beach, *Pittier 5703*; vicinity of La Palma, *Pittier 5498*. PANAMÁ: San Jose Island, *Erlanson 149, Johnston 719, 774*; Bella Vista, *Killip 39943*; Nuevo San Francisco, *Standley 30780*. PROVINCE UNKNOWN: Bahia Honda, *Elmore H39*; La Venta, *Hunnewell 16417*.

4. SCHOEPFIA Schreb.

SCHOEPFIA Schreb. Gen. 129. 1789.

Codonium Rohr, ex Vahl, in Skrivt. Natur. Selsk. Kjoeb. 2:206, t. 6. 1792.

Haenkea Ruiz & Pavon, Fl. Per. 3:8, t. 231. 1802.

Diplocalyx A. Rich. in Sagra, Hist. Cuba 11:81. 1850.

Ribeira F. Allemão, Trab. Comm. Sc. Expl. Bot. Rio de Janeiro 29, 38. 1864.

Schoepfiopsis Miers, in Journ. Linn. Soc. 17:75. 1878.

Unarmed glabrous shrubs or trees, reportedly root parasites. Leaves alternate, entire, coriaceous. Inflorescences few-flowered racemes generally fasciculate in the leaf axils, with or without basal perular bracts and the flowers subtended by a cupule composed of 2 bracteoles and 1 bract or subtended by a single bract.



Fig. 86. *Schoepfia schreberi*

Flowers bisexual, small. Calyx extremely small, cyathiform or crateriform, margin subentire. Petals 3–6, united into a tubular-campanulate corolla, often pubescent within, the lobes valvate, reflexed, white, yellow or red. Stamens 3–6, in one whorl, as many as the petals, antipetalous, adnate to the corolla, the anthers oval, dehiscing longitudinally, sessile or short-filamented. Ovary half-immersed, the ovules pendulous, lacking integument, the style thin, the stigma 2- or 3-lobed. Spurious fruit with the drupe enclosed in the adnate, accrescent calyx, eccentrically annulate at the apex; seed with the small embryo at the tip of the endosperm.

About 38 species of the Old and New World. Only one species is definitely known from Panama. A second species, *S. vacciniiflora*, has been reported by Standley (in *Field Mus. Nat. Hist. Bot.* 18²:409. 1937 and in *Fieldiana Bot.* 24⁴:90. 1946) in Panama. The *S. vacciniiflora* name is in itself a confusing matter. *Schoepfia vacciniiflora* Planch. ex Hemsl. (*Diag. Pl. Mex.* 5. 1878) is reported from Guatemala whereas *S. vacciniiflora* Planch. ex Planch. & Triana (*Ann. Sci. Nat. ser. 5.* 15:382. 1872) is reported from Colombia. Whether or not these epithets are based upon a common species is difficult to determine.

1. *SCHOEPFIA SCHREBERI* J. F. Gmel. *Syst. Veg.* 2:376. 1791.

Schoepfia americana Willd. *Sp. Pl.* 1:996. 1798.

Schoepfia arborescens Roem. & Schult. *Syst.* 5:160. 1819.

Shrubs or trees to 8 m. tall, the young branches slender, angular, olive-green to white. Leaves ovate to lanceolate, 4–8 cm. long, 1.5–3.5 cm. broad, acute-acuminate to acuminate at the apex, cuneate-attenuate or obtuse at the base, the costa emersed above and below, the primary lateral veins 5–6 pairs, rather conspicuous; petiole to 5 mm. long. Inflorescences 1- to few-flowered, fasciculate, the peduncle to 5 mm. long, the flowers subtended by a cupule composed of 2 bracteoles and 1 bract, the cupule 1–3 mm. in diameter, 3-toothed, ciliate. Calyx cyathiform, about 1 mm. long, subentire, glabrous; corolla tube 2.0–2.5 mm. long, 1.5–2.5 mm. broad at the orifice, glabrous, red, the lobes 4 or 5, deltoid, 1.0–1.5 mm. long and broad, glabrous without and minutely puberulent within except for a cluster of villous hairs at the point of staminal insertion; stamens 4 or 5, inserted at the orifice of the corolla tube, the anthers 0.5–0.75 mm. long and broad, exerted, subsessile; ovary half-inferior, globose, densely papillate, the style 0.5 mm. long, the stigma bifid, included. Spurious fruit ellipsoid, 10–13 mm. long, 7–8 mm. in diameter, glabrous.

Florida, Central America, Antilles and South America.

CHIRIQUÍ: vicinity of El Boquete, *Maxon 5040*. COCLÉ: Penonomé and vicinity, *Williams 333*. PANAMÁ: Bejuco, *Allen 978*.

BALANOPHORACEAE

BY LORIN I. NEVLING, JR.

Fleshy root parasites, rhizomatous, lacking chlorophyll, the rhizome tuberous, digitiform, cylindrical or filiform, sometimes branched, naked or sometimes with scale-leaves, yellow to dark red in color. Inflorescence monoecious or dioecious, highly modified, of endogenous origin, above ground at anthesis, more or less erect, sessile or pedunculate (in our species), the peduncle terete, with or without an encircling, often basal sheath, scaly or naked above the sheath, the head with or without protective peltate scales, sometimes with paraphysoid trichomes or reduced pistillate flowers surrounding or subtending the flowers. Flowers unisexual, monochlamydeous, small. Perianth absent or more often present, of 2-4 (-8) tepals, free or connate into a tube of varying size and shape, in pistillate flowers sometimes reduced to an epigynous collar or absent. Stamens generally as many as perianth segments and opposite them, the filaments free or connate into a staminal column of varying length, sometimes very short, the anthers free or connate into a syandrium, introrse or extrorse; absent in pistillate flowers. Pistil composed of 1, 2 (or 3) carpels, the ovules usually 1 per carpel, lacking integument, often fused to the wall of the ovary, the styles 1 or 2, terminal, the stigma usually simple, rarely sessile; in staminate flowers absent or reduced to a pistillode. Fruit nut-like or drupaceous, the endocarp usually hard; seed sometimes fused to the wall of the fruit, the embryo apical in the fleshy oil-rich endosperm, with or without suspensor.

Approximately 18 genera, pantropic but primarily distributed in the Southern Hemisphere. Three genera are represented in Panama.

- a. Inflorescence monoecious or rarely dioecious, the peduncle with or without an encircling sheath, otherwise naked, the head when immature covered with deciduous, 6-sided, peltate scales, the staminate and pistillate flowers surrounded by claviform, paraphysoid trichomes; staminate flowers with the perianth segments connate at least in the lower half, the anthers completely connate, a small pistillode sometimes present; pistillate flowers with the pistil 2-carpellate, the styles 2, spreading; fruit ovoid, ellipsoid or obovoid, compressed.
- b. Staminate flowers with perianth of 3 (-6) tepals, connate in the lower half into a tube, the lobes becoming widely reflexed, the filaments adnate to the perianth below, free or connate below into a staminal column, usually free above, the anthers each with two posterior pollen sacs and one anterior pollen sac..... 1. HELOSIS
- bb. Staminate flowers with the perianth segments completely connate, the margin crenate, the filaments free from the perianth, completely connate, the anthers each with 2 large lateral pollen sacs..... 2. CORYNAEA
- aa. Inflorescence dioecious or rarely monoecious, the peduncle with an encircling basal sheath, scaly, the head when immature covered by the imbricate peduncle scales, the staminate flowers subtended by reduced pistillate flowers, the pistillate flowers agglutinate into a dense mat, ebracteate; staminate flowers with the perianth segments free, the anthers connate below, free above, pistillode absent; pistillate flowers with the pistil 1-carpellate, the style 1, erect; fruit ellipsoid, never compressed..... 3. LANGSDORFFIA

1. HELOSIS Rich.

HELOSIS Rich. in Mém. Mus. Par. 8:416, *t.* 20. 1822, nom conserv.

Caldasia Mutis, ex Caldas, in Seeman. Nuev. Gran. 2:26. 1810, nom. rejic.

Latraeophila Leandr. Sacram. ex St. Hil. in Ann. Sci. Nat. ser. 2. 7:32. 1837.

Lathraeophila Hook. f. in Trans. Linn. Soc. 22:55. 1856.

Rhizome filiform to digitiform, often intertwined, rich in starch, yellowish to brownish. Inflorescence monoecious, claviform, the peduncle thick, generally encircled at the base or at the middle with a glabrous, toothed to lobed, oblique sheath (rarely absent), the head globose, ovoid or ellipsoid, when immature covered with 6-sided, peltate, umbonate scales beneath which occurs a dense mat of paraphysoid trichomes and young developing flowers, the scales spirally arranged, deciduous, about the axis of each scale are oriented two whorls containing many pistillate flowers surrounded by a single whorl of 6 flowers which are situated at the angles of the covering scale and are either rudimentary or functionally staminate. Perianth in the staminate flowers composed of 3 (or 6) tepals connate in the lower half into a tube, the lobes becoming widely reflexed; in the pistillate flowers reduced to a low bilabiate epigynous collar or, according to some authors, absent. Stamens as many as the perianth lobes and opposite them, exerted, the filaments adnate to the perianth tube below, free or connate into a staminal column, generally free above, the anthers united into a synandrium, each with two posterior and a single anterior pollen sac, introrse; absent in the pistillate flowers. Pistil 2-carpellate, the ovary compressed, the ovules 2, fused to the ovary wall, generally only one maturing, the styles 2, filiform, spreading, deciduous, the stigmas globose or capitate; pistillode sometimes present in the staminate flowers, often very reduced. Fruit nut-like, compressed, with crusty epicarp and hard endocarp.

Howard (in *Rhodora* 61:79–81. 1959) reports that in alcohol-preserved specimens of *Helosis* from the West Indies the filaments are free throughout their length whereas in herbarium specimens the filaments appear to be tightly adherent. In contrast, in herbarium specimens from Central America the filaments appear to be adnate at least at the base; this same basal adnation also is found in alcohol-preserved specimens.

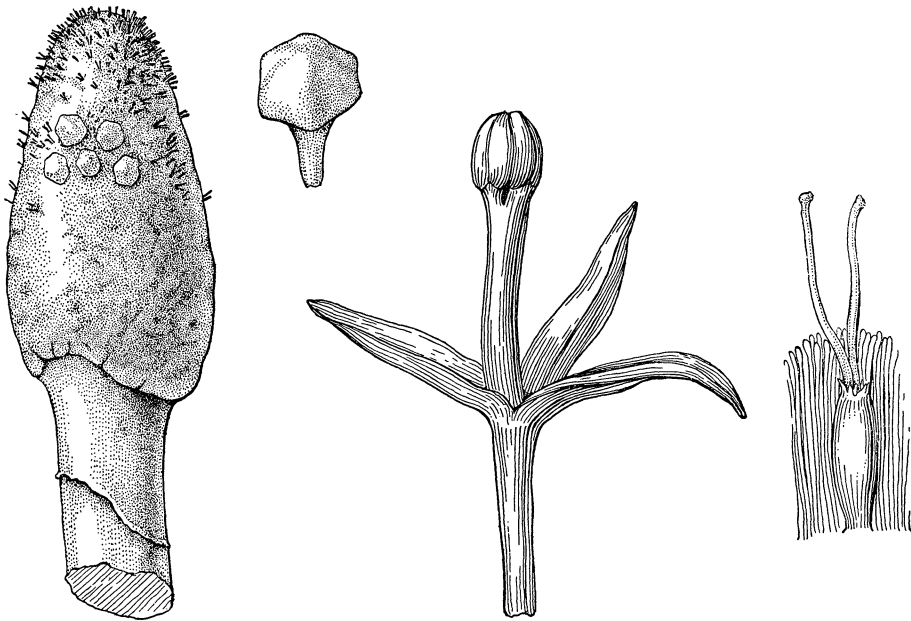
Three species from the Antilles and tropical America. A single species from Panama.

1. HELOSIS MEXICANA Liebm. in Forh. Vidensk. Skand. Nat. 4:181. 1844.

Helosis aquatica Mutis, ex Hook f. in Trans. Linn. Soc. 22:59. 1856.

Caldasia mexicana (Liebm.) O. Kuntze, Rev. Gen. 2:590. 1891.

Rhizome and inflorescence more or less ferruginous on drying. Inflorescence with the peduncle 8–16 cm. long, with or without an encircling sheath, the head ovoid or more often ellipsoid, 3–5 cm. long, 1.5–3.0 cm. in diameter, the scales about 3 mm. in diameter, stalk about 2 mm. long, the paraphysoid trichomes claviform, 1.0–2.5 mm. long. Staminate flowers: perianth tube tubular, 2–3 mm. long, glabrous, the lobes 3, ovate, 1–3 mm. long, 0.75–1.0 mm. broad; filaments connate, free at the apex at maturity, 0.25–0.75 mm. long, the synandrium 0.5–1.0 mm.

Fig. 87. *Helosis mexicana*

long, 0.5–0.75 mm. in diameter. Pistillate flowers based on Mexican specimens: perianth obscurely bilabiate and becoming fimbriate, minute; ovary tubular to somewhat ellipsoid, 1.0–1.25 mm. long, glabrous, the styles 1.25–1.75 mm. long, deciduous, the stigmas minutely capitate. Fruit 1.25–2.25 mm. long, about 0.5 mm. broad.

CANAL ZONE: Matachín, *Kuntze 74*. COCLÉ: El Valle de Antón, *Seibert 469*.

2. CORYNAEA Hook. f.

CORYNAEA Hook. f. in *Trans. Linn. Soc.* 22:31, *t. 13, 14*. 1856.

Itoasia O. Kuntze, *Rev. Gen.* 2:590. 1891.

Rhizomes nodular or rarely elongate, often lobed, lacking scales, sometimes with root-like processes. Inflorescence mostly monoecious and proterogynous or rarely dioecious, claviform, the peduncle encircled at the base with a glabrous annular to cupuliform sheath which is sometimes very obscure, naked above the sheath, the head globose or ellipsoid, when immature covered with 6-sided, peltate, umbonate scales underneath which occurs a dense mat of paraphysoid trichomes and young developing flowers, the scales deciduous prior to anthesis. Perianth of the staminate flowers tubular, conical or subcampanulate, completely connate, crenate; in the pistillate flowers reduced to a low epigynous collar or, according to some authors, absent. Stamens 3, exserted, the filaments completely fused into a

staminal column free from the perianth tube, the anthers united into a synandrium, each with two large lateral pollen sacs, introrse; absent in the pistillate flowers. Pistil 2-carpellate, the ovary compressed, the ovules 2, fused to the ovary wall, generally only one maturing, the styles 2, filiform, spreading, deciduous, the stigmas globose or capitate; pistillode present in the staminate flowers. Fruit nut-like, compressed, with crusty epicarp and hard endocarp.

A poorly known genus consisting of perhaps 4 species of Central and South America. Only 1 species is represented in Panama.

1. *CORYNAEA CRASSA* Hook. f. in Trans. Linn. Soc. 22:31, *t.* 13, 14. 1856.

Itoasia crassa (Hook. f.) O. Kuntze, Rev. Gen. 2:590. 1891.

Rhizome an irregularly multi-lobed mass, becoming ferruginous upon drying. Inflorescence pink, the peduncle with an irregularly short-lobed, basal sheath, 1.5–2.5 cm. long, vertically ribbed, glabrous, the head globose and becoming fusiform, 2–4 cm. long, 1.5–2.0 cm. in diameter, the scales 3–4 mm. in diameter, stalk 2–3 mm. long, the paraphysoid trichomes claviform, 1.5–2.0 mm. long. Staminate flowers not seen. Pistillate flowers: perianth a low epigynous collar or absent (?); ovary obovoid, 1 mm. long, 0.5–0.75 mm. broad, the styles 1.0–1.5 mm. long, the stigmas minutely capitate; pedicel to 0.5 mm. long. Fruit obovoid, about 1.5 mm. long, 1 mm. broad.

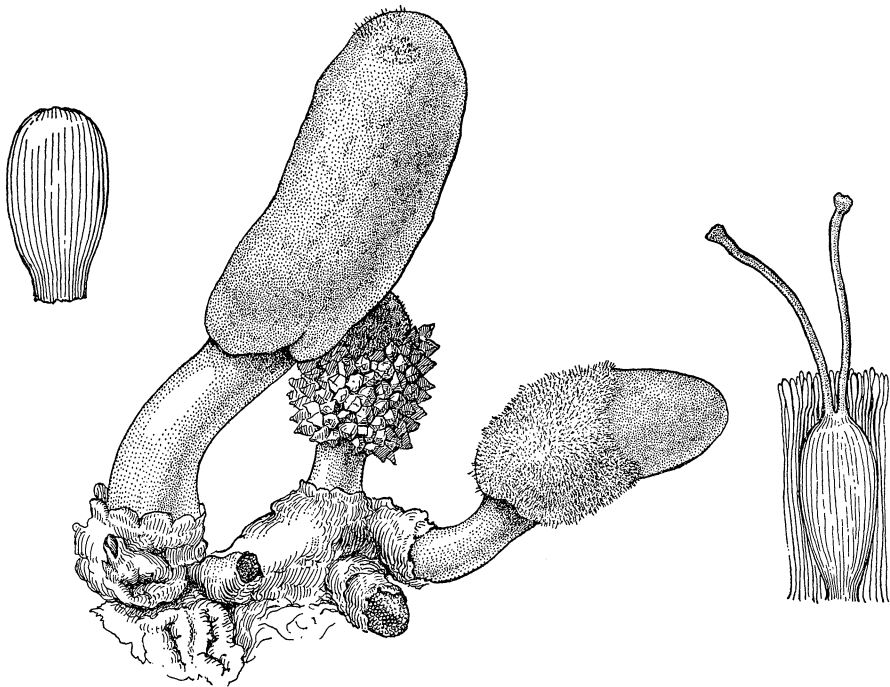


Fig. 88. *Corynaea crassa*

Collected flowering in July between 3500 and 4000 meters. According to Woodson and Schery these plants are parasitic on bamboo roots.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, Woodson & Schery 470.

3. LANGSDORFFIA Mart.

LANGSDORFFIA Mart. in Eschweg. Journ. Bras. 2:178. 1818.

Langsdorfia C. A. Agardh, Aphor. 203. 1825.

Senftenbergia Klotzsch & Karst. ex Klotzsch, in Linnaea 20:460. 1847, nom. nud. in synonym.

Rhizome lobed, creeping or upright, often dichotomously branched, tomentose and sometimes glabrescent. Inflorescence dioecious or rarely monoecious, capitate to clavate, the peduncle terete, thick, enclosed at the base by a short, lobed or toothed sheath, above the sheath vested with many imbricate scales, the scales in the basal portion ovate to oval-lanceolate, gradually becoming progressively lanceolate towards the flower-head, the head globose, ovoid or ellipsoid, staminate generally larger than the pistillate, yellow, yellowish-red or red, the staminate flowers subtended by reduced pistillate flowers, the pistillate flowers agglutinate into a dense mat, ebracteate. Perianth in the staminate flowers composed of 3 or rarely 2 concave tepals, valvate; in the pistillate flowers reduced to an epigynous collar, obscurely 2- or 4-lobed. Stamens as many as the tepals and opposite them, exerted, the filaments short, connate into a staminal column, the anthers connate below and free above, each with 4 pollen sacs at the base and 2 at the apex, extrorse; absent in the pistillate flowers. Pistil 1, the ovules 1, fused to the ovary wall, the style 1, erect, filiform, deciduous, the stigma minutely papillate; pistillode absent in the staminate flowers. Fruit drupaceous, with fleshy epicarp and hard endocarp.

Apparently only a single species from Mexico to southern Brazil.

1. LANGSDORFFIA HYPOGAEA Mart. in Eschweg. Journ. Bras. 2:178, *t.* 5. 1818.

Langsdorfia janeirensis Rich. in Mém. Mus. Par. 8:412, *t.* 19. 1822.

Langsdorfia moritziana Klotzsch & Karst. in Linnaea 20:461. 1847.

Thonningia janeirensis (Rich.) Liebm. in Forh. Skand. Naturf. Christ. 180. 1847.

Thonningia mexicana Liebm. loc. cit. 1847.

Langsdorfia rubiginosa Wedd. in Ann. Sci. Nat. ser. 3. 14:187. 1850.

Senftenbergia moritziana (Klotzsch & Karst.) Eichl. in Mart. Fl. Bras. 4²:10. 1869, nom. nud. in synonym.

Rhizome digitiform, canescent-tomentose. Staminate inflorescence clavate, the peduncle 2–5 cm. long, scaly, surrounded at the base by a lobed sheath, the lobes deltoid, 0.5–1.0 cm. long and broad, canescent-tomentose, the scales stiff, ciliate, enclosing the head when immature, lower scales ovate, about 1 cm. long, 5–7 mm. broad, upper scales lanceolate, to 3.5 cm. long, 1 cm. broad, the head ellipsoid, 5–7 cm. long, about 3 cm. in diameter. Staminate flowers based on Brazilian specimens: pedicel 6–10 mm. long; tepals 3 (or 2), free, ovoid, about 3 mm. long, 1.5–2.0 mm. broad, becoming widely reflexed, glabrous; stamens 3, the filaments about 0.5 mm. long, completely connate, the anthers connate below, free above. Pistillate inflorescence generally capitate to clavate, the peduncle and vesture as in the staminate inflorescence, the head subglobose, 2–4 cm. long, 4.5 cm. in diameter. Pistillate flowers: free but tightly agglutinated with one another above due to a

waxy secretion; perianth epigynous, connate into a curious tubular or obovoid structure, 1.5–2.5 mm. long, 0.5–0.75 mm. in diameter, surrounding the style and in intimate contact with it, the perianth lobes 2, short; ovary ellipsoid, about 1 mm. long, 0.5 mm. in diameter, the style 1, 0.5–1.5 mm. long, slender, spirally twisted, the stigma minutely capitate. Fruit ellipsoid, about 1 mm. long, 0.5 mm. in diameter.

The only specimen examined was collected flowering and fruiting in July at an altitude of 2000–2500 meters.

CHIRIQUÍ: forested ridges south of Finca Lérica, *Allen 4773*.

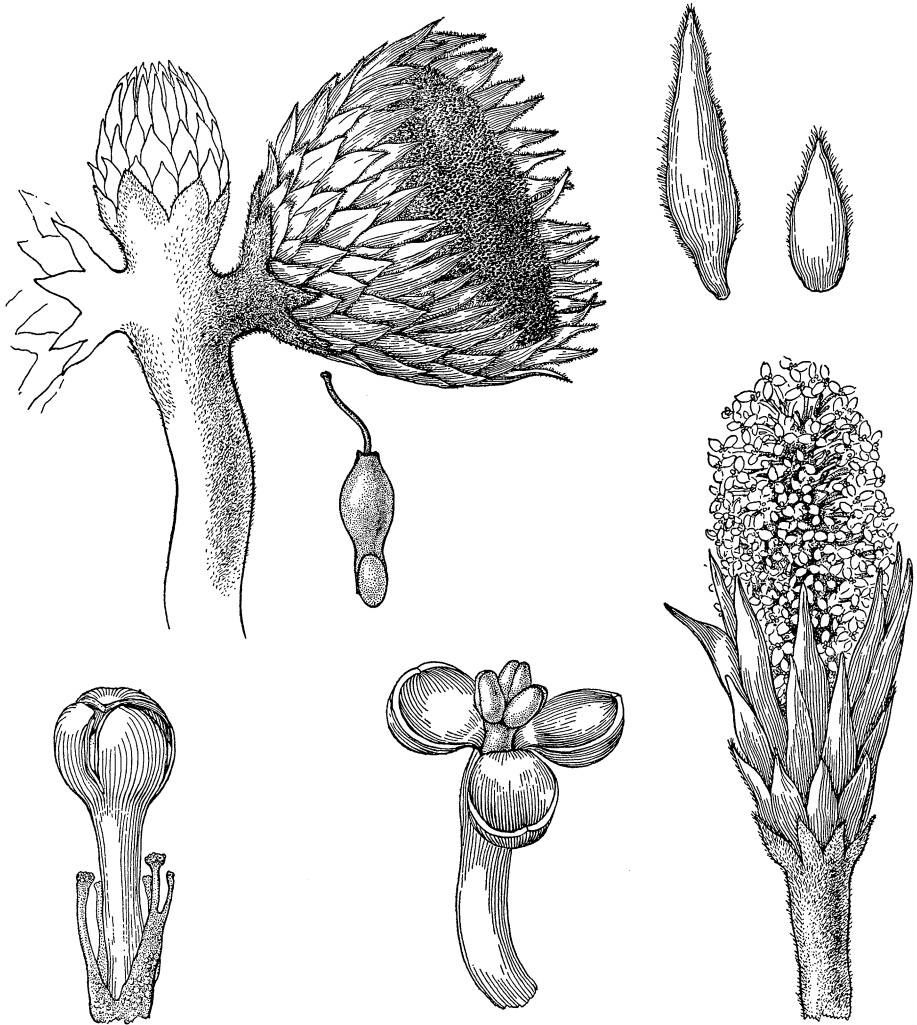


Fig. 89. *Langsdorffia hypogaea*

ARISTOLOCHIACEAE

By HOWARD WM. PFEIFFER

Scandent lianas, herbs, or rarely trees, the wood often having broad inter-fascicular rays. Leaves alternate, spiral, estipulate, simple, palmately veined, usually entire. Flowers mostly axillary, perfect, actinomorphic or zygomorphic, hypogynous to epigynous, in racemes, cymes, solitary or in clusters and cauliflorous, rarely terminal, large and showy or small, often with fetid or resinous odor. Calyx gamosepalous, often petaloid and elaborately contorted and lobed. Corolla of 3 reniform petals in *Saruma*, rudimentary in some species of *Asarum*, absent in all other members of the family. Stamens 6 to 12 or occasionally many, in one or two whorls, free, connate or adnate to the short, fleshy, united styles. Ovary apocarpous to syncarpous, 6- to 4-carpellate and -loculate, with marginal to axile placentation; ovules many to few, anatropous. Pollen monosulcate to nonaperturate, spherical. Fruit follicular or capsular with septicidal, rarely septifragal or irregular dehiscence, often dehiscing acropetally; seeds numerous to few, with a small basal embryo in abundant endosperm.

The Aristolochiaceae, or Birthworts, are distributed throughout the tropic and temperate regions of the world. The genera are poorly defined and are in need of competent revision. The largest genus, *Aristolochia*, is the sole representative of the family in Panama. It is a large genus with about 300 species in tropic and temperate areas throughout the world. Eleven species are reported from Panama, but further collections will probably double this number.

The leaves of *Aristolochia* are remarkably variable. For example, on a single shoot about 2 dm. long of *Aristolochia panamensis* leaves may be seen which are narrowly linear-lanceolate, broadly ovate, and broadly obtriangulate with a deeply emarginate apex. As a consequence, leaf characteristics have been used as infrequently as possible in the keys. An exception to this general rule may be noted in that group which bears pseudostipules. The Aristolochiaceae, it will be recalled, are estipulate; however, in these species, an axillary bud produces a single, small leaf which is amplexicaul and nearly sessile. It frequently is ruffled, not having the shape of the ordinary leaves on the shoot, and looks strikingly like a pair of connate, auriculate stipules.

The description of a flower as complex as that of *Aristolochia* is always a problem. The species differences of greatest importance lie in the elaborate inflations and expansions of the calyx tube. In an attempt to standardize the descriptions, therefore, it has seemed convenient to subdivide the calyx tube into several morphological portions and to treat each of these separately. It should be emphasized here that not necessarily all of these subdivisions are present in any given species.

An explanation of these arbitrary designations follows. As the calyx arises from the apex of the ovary, it expands into a large, inflated, usually gibbous portion called the *utricle*. The utricle narrows into the cylindrical portion known as the *tube*. This expands and usually imperceptibly merges with the expanded *limb*. In

the larger flowers the tube has a peculiar venation at its distal end which subdivides the tube into two portions, conveniently described as the *tube proper*, and the *throat*. The throat is usually funnelliform and as a result tends to lend greater width and expansion to the limb.

One constantly finds reference in the literature to the fetid odor of *Aristolochia* flowers. While many of them are truly fetid and evil smelling, many are odorless and a few have been described as having either a sweet or a resinous odor. The flowers ostensibly are pollinated by various species of Diptera. In herbarium specimens, dissection of the utricle often reveals insects which have burrowed or forced their way between the lobes of the styles. The flowers are equipped with rigid, inward-pointing hairs throughout the length of the tube. The Diptera, doubtless attracted by the color and odor of the blooms, are trapped within the utricle since they are able to pass only inward over the hairs. The flowers are protogynous. With pollination, the anthers dehisce and the rigid hairs in the tube wilt, allowing the flies to escape and carry pollen to another bloom.

Several species of *Aristolochia* furnish the serpentaria of medicine which is used as a tonic and as a febrifuge. Many of the plants are utilized as a native remedy for snakebite and bear the common name Snakeroot.

The remarkable shapes of the calyx tubes lead to various names such as Dutchman's Pipe, Pelican Flower and Goose Flower. The name *Aristolochia*, which is derived from the Greek *aristos*, best, and *lochia*, delivery, refers to its supposed medicinal properties in connection with the alleviation of the pains of childbirth; the curved flower, with summit and base together suggesting, by the doctrine of signatures, the human fetus in the womb.

Standley, writing about the aristolochias of El Salvador, reports that the roots of *guaco* or *A. anguicida* are used by the natives to wash clothes, to scour out dirt, and also as a remedy for stomach ache. He further states that infusions of *A. arborescens* are used as a remedy for venereal diseases in the female and for dysentery in children.

1. ARISTOLOCHIA L.

ARISTOLOCHIA L. Sp. Pl. ed. 1. 960. 1753.

- Isotrema* Raf. in Amer. Monthly Mag. & Crit. Rev. 4:195. 1819.
Hocquartia Dum. Comm. Bot. 30. 1822.
Dasyphnonion Raf. First Cat. Bot. Gard. Transylv. Univ. 13. 1824.
Cardiolochia Raf. ex Rchb. Consp. 85. 1828.
Einomeia Raf. Medic. Fl. 1:62. 1828.
Endodeca Raf. loc. cit. 62. 1828, sphalm.
Pistolochia Raf. loc. cit. 62. 1828.
Siphisia Raf. loc. cit. 62. 1828.
Isiphia Raf. Medic. Fl. 2:232. 1830.
Dictyanthes Raf. in Loudon, Gard. Mag. 8:247. 1832.
Niphus Raf. loc. cit. 247. 1832.
Siphidia Raf. loc. cit. 247. 1832.
Ambuya Raf. Fl. Tellur. 4:98. 1836.
Diglosselis Raf. loc. cit. 98. 1836.
Endothea Raf. loc. cit. 98. 1836, corr. *Endodeca* (1828).

Hexaplectris Raf. loc. cit. 97. 1836.

Plagistra Raf. loc. cit. 98. 1836.

Psophiza Raf. loc. cit. 99. 1836.

Pteriphis Raf. loc. cit. 99. 1836.

Tropexa Raf. loc. cit. 98. 1836.

Guaco Liebm. in Forhandl. Skandin. Naturf. 1844:203. 1847.

Howardia Klotzsch, in Monatsb. Acad. Berl. 1859:607. 1859.

Lianas, rarely upright perennial herbs, shrubs or trees. Leaves alternate, petiolate, estipulate but an axillary bud often producing a clasping, broadly reniform leaf (pseudostipule); blade entire or 3 to 7-lobed, often cordate, palmately or pinnately veined, variable. Flowers axillary, solitary, perfect, epigynous, zygomorphic. Calyx gamosepalous, variously inflated, thence more or less contracted, expanding into a 1- to 3-lobed limb. Corolla absent. Stamens typically 6, the anthers sessile and adnate to the style, 2-celled, dehiscing longitudinally. Ovary inferior, 6-loculate; placentation axile, the ovules numerous, anatropous. Styles 6, marginally connate, fleshy, with coroniform stigmatic lobes, or essentially capitate. Fruit a capsule, septicidally or septifragally 6-valved, often dehiscing acropetally. Seeds numerous, horizontally compressed in vertical rows, the embryo rudimentary in abundant endosperm.

In the treatment of *Aristolochia* presented here, it has seemed the wisest choice to include, in addition to the species collected in Panama, accounts of those reasonably certain to be found there. Accordingly, these species will be found incorporated into the key to species and described with the presently known groups in the formal treatment.

Perhaps a word of caution might be of some help when attempting to key flowering material in this genus. Many of the collections of the large-flowered species are collections of buds, and dimensions derived from them must be regarded as approximate. For example, the flowers of *Aristolochia grandiflora* become fourteen feet long but few collections reflect this great dimension. The buds undoubtedly develop for weeks before anthesis and few collectors are willing to return to the same location repeatedly for the sake of a single bloom; hence the measured length of the calyx tube as collected may be considerably less than the mature size.

- a. Shrubs or low perennial herbs; pseudostipules absent.
 - b. Stems glabrous; flowers axillary near the apices of young vegetative shoots; leaves cordate-reniform; perennial herbs with swollen roots. 1. *A. NUMMULARIFOLIA*
 - bb. Stems woolly; flowers borne in clusters near the ground, cauliflorous; leaves extremely variable in size and shape; shrubs; capsules dehiscing apically..... 2. *A. PANAMENSIS*
- aa. Lianas; stems hirsute to glabrous; flowers axillary or racemose on young shoots or if on old wood not produced near the ground; capsules dehiscing acropetally.
 - c. Pseudostipules present.
 - d. Leaves (other than pseudostipules) trilobate, the base truncate; calyx limb bilobate, the lower lobe ending in a filiform extension 8 to 20 cm. long..... 3. *A. TRILOBATA*
 - dd. Leaves unlobed, the base cordate to subhastate.
 - e. Flowers solitary, axillary, more than 8 cm. long, the axis of the calyx tube abruptly bent at the union of the utricle and the tube; ovary with a sharp bend at the distal end, thus bearing the flower to one side; leaves irregular, but with a tendency toward a cordate-hastate base, the lobes broad and circular in outline..... 4. *A. ODORATISSIMA*

- ee. Flowers in axillary racemes, less than 6 cm. long, rectilinear; ovary without an apical bend; leaves simply cordate at the base.
- f. Calyx limb strongly monolobate becoming broadly expanded with a plicature along its median nerve; utricle ovoid, gibbous, narrowing abruptly to the 5 mm.-long tube..... 5. *A. INFLATA*
- ff. Calyx limb unequally bilobate, the upper short and barely extended beyond the throat, the lower long, spatulate and non-plicate; utricle cylindrical to spheroid, gradually and slightly narrowing to the 15 mm.-long tube..... 6. *A. ANGUICIDA*
- cc. Pseudostipules absent.
- g. Ovary immediately subtended by a foliaceous bracteole.
- h. Calyx tube glabrate, ca. 3 dm. long, yellow blotched with purple; bracteole orbicular..... 7. *A. ARBORESCENS*
- hh. Calyx tube densely pubescent at maturity, at anthesis ca. 3 m. long, white and pink blotched with purple; bracteole acuminate. 8. *A. GRANDIFLORA*
- gg. Ovary not subtended by a foliaceous bracteole, the pedicels naked.
- i. Calyx limb with numerous fimbriae on the inner surface..... 9. *A. COSTARICENSIS*
- ii. Calyx limb without fimbriae.
- j. Leaves cordate-ovate, nearly as wide as long; stems glabrous.
- k. Flowers borne in short racemes or clusters on old wood, cauliflorous.
- l. Veins in leaves conspicuously marked with white borders; leaves long-acuminate; flowers small, 3 to 4 cm. long..... 10. *A. VERAGUENSIS*
- ll. Veins in leaves green; leaves short-acuminate; flowers longer than 20 cm., showy..... 11. *A. SYLVICOLA*
- kk. Flowers borne in many flowered racemes in axils of leaves of young shoots..... 6. *A. ANGUICIDA*
- jj. Leaves oblong, more than three times longer than wide.
- m. Flowers rectilinear, more than 10 cm. long; leaves deeply cordate..... 12. *A. CHAPMANIANA*
- mm. Flowers with tube and limb reflexed on the utricle, ca. 5 cm. long; leaves truncate to subcordate at the base..... 13. *A. MAXIMA*
1. *ARISTOLOCHIA NUMMULARIFOLIA* HBK. Nov. Gen. & Spec. 2:115. *t. 110*. 1817.

Aristolochia clauseni Duch. in Ann. Sc. Nat. ser. 4. 2:57. 1854.

Aristolochia emarginata Willd. ex Duch. in DC. Prod. 15-1:466. 1864.

Aristolochia pusilla Pohl, ex Duch. loc. cit. 1864.

Aristolochia tenera Pohl, ex Duch. loc. cit. 1864.

Aristolochia subclausa Wats. in Proc. Amer. Acad. 20:372. 1882.

Aristolochia pyrina Taub. in Engl. Bot. Jahrb. 21:426. 1896.

Aristolochia exigua Lindm. in Bull. Herb. Boiss. ser. 2. 1:525. 1901.

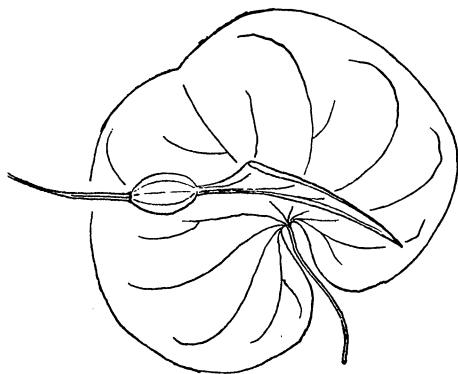


Fig. 90. *Aristolochia nummularifolia*

Herbs, 3 to 6 dm. tall, perennial, with thickened fusiform roots. Leaves alternate, somewhat distichous, reniform to acute and cordate, ca. 3 cm. broad, 2 to 3 cm. long, glabrous. Pseudostipules absent. Flowers small, axillary, rectilinear, the utricle, tube and monolobate limb nearly indistinguishable as such, ca. 2 to 4 cm. long, greenish yellow. Fruit cylindrical, ca. 2 cm. long, 1 cm. wide, dehiscing acropetally. Seeds numerous, horizontally compressed, 2 mm. wide, 0.2 mm. thick.

Columbia and Venezuela. To be sought in Panama.

2. *ARISTOLOCHIA PANAMENSIS* Standley, in Journ. Wash. Acad. Sci. 15:5. 1925.

Decumbent subshrubs, to 6 dm. tall. Leaves alternate, spiral, very variable in shape, narrowly lanceolate to broadly obovate, villous-tomentose, 5 to 15 cm. long, 3 to 10 cm. wide. Pseudostipules absent. Flowers cauliflorous, borne near the soil in inconspicuous short racemes, ca. 5 cm. long along the curved axis, brownish marked with purple, the utricle narrow, thence widening into a gibbous sac, the limb sharply reflexed on the utricle, the tube reduced to a constriction of the utricle. Gynostemium of 6 closely connate styles, capitate. Fruit cylindrical, ca. 3 cm. long, 1 cm. wide, dehiscent apically. Seeds several, pyramidal, grooved, ca. 4 mm. wide.

Known only from Panama.

CANAL ZONE: Cocoa Plantation, *Lindsay 488*; Las Cascadas Plantation, near Summit, *Standley 29515, 25740*; Rio Paraíso, above East Paraíso, *Standley 29906* (type); Rio Pedro Miguel, near East Paraíso, *Standley 29950*.

CHIRIQUÍ: Pastures and forested river banks east of Gualaca, alt. 500 ft., *Allen 5040*; vicinity of San Félix, eastern Chiriquí, alt. 0-120 m., *Pittier 5463*; San Félix, eastern Chiriquí, *Pittier 5750*.

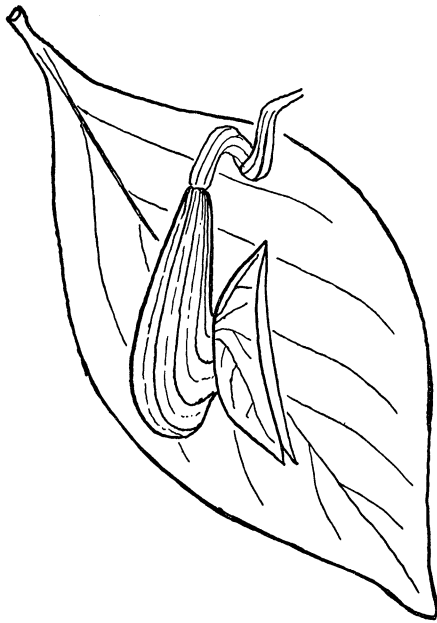


Fig. 91. *Aristolochia panamensis*

3. *ARISTOLOCHIA TRILOBATA* L. Sp. Pl. ed. 1. 2:960. 1753.

Aristolochia trifida Lamk. Encyc. 1:251. 1783.

Aristolochia triloba Salisb. Prod. 214. 1796.

Aristolochia macroura Gomez, in Mem. Ac. Lisboa 3:77. 1812.

Aristolochia caracasana Spreng. Syst. 3:753. 1826.

Aristolochia appendiculata Vell. Fl. Flum. 9: t. 98. 1827.

Aristolochia caudata Booth, ex Lindl. in Bot. Reg. t. 1453. 1831.

Aristolochia tapetotricha Lem. Illustr. Hort. 3:misc. 22. 1856.

Howardia trifida Klotzsch, in Monatsb. Acad. Berl. 1859:617. 1859.

Howardia trilobata Klotzsch, loc. cit. 1859.

Howardia macroura Klotzsch, loc. cit. 1859.

Twining, glabrous lianas. Leaves alternate, spiral, subpalmate, 3-lobate, truncate at the base, glabrous, ca. 6 cm. wide, 6 cm. long. Pseudostipules present. Flowers axillary, ca. 15 to 20 cm. long, red-brown with purple stripes, the utricle elliptic, ca. 5 cm. long, 3 cm. wide, curving abruptly at the apex with slight narrowing into the tube, ca. 5 cm. long, 2 to 3 cm. wide, ending in the bialate limb which terminates in a long filiform extension. Seeds numerous, horizontally compressed, 6 mm. diameter, 0.75 mm. thick.

Throughout tropic Central and South America.



Fig. 92. *Aristolochia trilobata*

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, *von Wedel 1404, 1812*. CANAL ZONE: Chagres, Isthmus of Panama, *Fendler 445, 440*.

4. *ARISTOLOCHIA ODORATISSIMA* L. Sp. Pl. ed. 2. 2:1362. 1763. non Benth., nec Vell.

Aristolochia moschata Wedd. ex Duch. in DC. Prod. 15-1:475. 1864.

Aristolochia odoratissima β *grandiflora* Duch. loc. cit. 1864.

Aristolochia martiniana Standl. in Publ. Field Mus. Bot. 17:238. 1937.

Lianas, twining, scandent, glabrous. Leaves alternate, variable cordate-hastate to sub-trilobate, membranous, ca. 15 cm. long, 12 cm. wide. Pseudostipules present. Flowers axillary, the calyx borne at an abrupt angle at the apex of the ovary, dark red, mottled and striped with lighter shades of red and yellow, the utricle ovate, 2 to 3.5 cm. long, the tube arising at a right angle from the side of the utricle, 15 to 20 mm. long, the limb thick, delicate, crenate, suborbiculate, 6 to 12 cm. diameter. Fruit cylindrical to subfusiform, abruptly bent in a right angle at the apex, slightly curved, 1.5 cm. diameter, 4 cm. long, dehiscent acropetally. Seeds numerous, horizontally compressed, 5 mm. diameter, 0.5 mm. thick.

Southern Central America, northwestern South America, Amazonia.

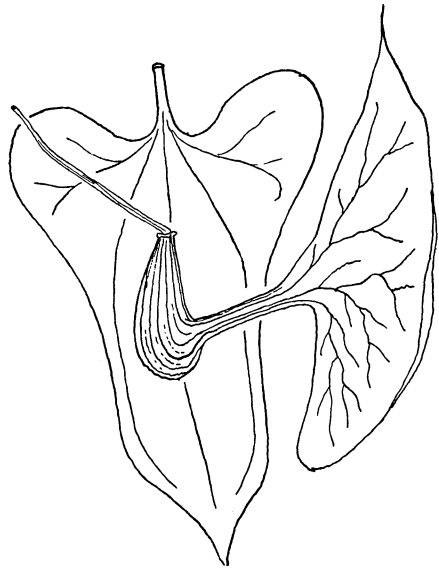


Fig. 93. *Aristolochia odoratissima*

BOCAS DEL TORO: Changuinola Valley, *Dunlap 556*; vicinity of Chiriquí Lagoon, Bastimentos, Mariano Creek, *von Wedel 2903*; vicinity of Chiriquí, Old Bank Island, *von Wedel 2046*; vicinity of Chiriquí Lagoon, Water Valley, *von Wedel 1556*; vicinity of Chiriquí Lagoon, *von Wedel 1200*; Water Valley, *von Wedel 791*.

5. *ARISTOLOCHIA INFLATA* HBK. *Nov. Gen. & Spec.* 2:145. 1817.

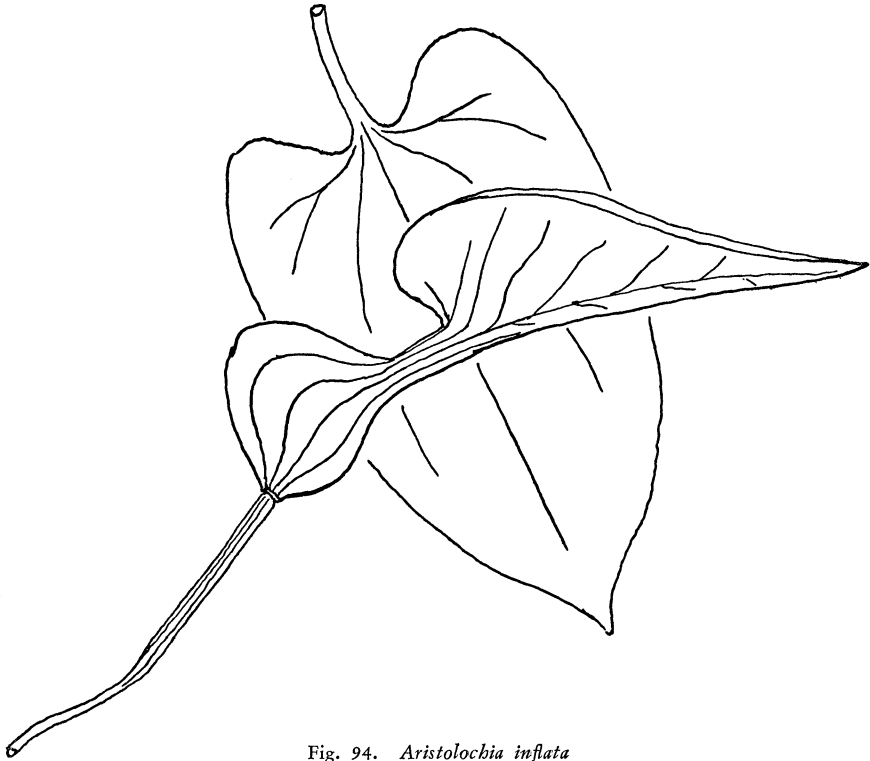
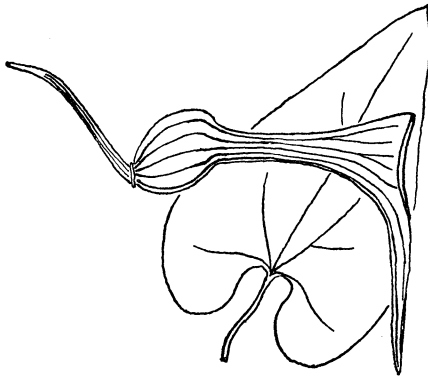
Aristolochia gibbosa Duch. in *Ann. Sc. Nat. Ser.* 4-2:53. 1854.

Howardia benthamii Klotzsch, in *Monatsb. Acad. Berl.* 1859:620. 1859.

Slender, scandent lianas. Leaves alternate, ovate, acute, cordate, 3 to 5 nerved, membranous, ca. 10 cm. long, 8 cm. wide, glabrous. Pseudostipules present. Flowers solitary, axillary, rectilinear, borne on young leafy shoots, 4 to 6 cm. long, yellow spotted purple, the utricle ovoid, 1 to 1.5 cm. long, narrowing obliquely to a short tube 7.5 mm. long, acuminate. Fruit cylindrical, ca. 3.5 cm. long, 1 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 2 mm. diameter, 0.5 mm. thick.

Central America.

CANAL ZONE: Camino de Corozal, *Bro. Heriberto 247*. COCLÉ: between Aguadulce and the Chico R., alt. 20 m., *Pittier 5008*; Penonomé and vicinity, alt. 50-1000 ft., *Williams 204*. HERRERA: vicinity of Chitré, alt. 20 m., *Allen 1101*. PANAMÁ: vicinity of Pacora, alt. 35 m., *Allen 2032*; Agricultural Experiment Station at Matías Hernández, *Pittier 6872*; along the Corozal Road, near Panamá, *Standley 26770*; vicinity of Juan Franco Race Track, near Panamá, *Standley 27796*; near Punta Paitilla, *Standley 26246*; Taboga Island, *Standley 27029, 27063*; Tumba Muerto Road, near Panamá, *Standley 29796*; sabanas, north of Panamá City. *Bro. Paul 587*; Panamá, *Hayes 781, 294, 146*.

Fig. 94. *Aristolochia inflata*6. *ARISTOLOCHIA ANGUICIDA* L. Sp. Pl. ed. 2. 2:1362. 1763.*Aristolochia loriflora* Mast. in Engl. Bot. Jahrb. 8:220. 1887.*Howardia anguicida* Klotzsch, in Monatsb. Acad. Berl. 1859:611. 1859.Fig. 95. *Aristolochia anguicida*

Lianas, with slender stems. Leaves alternate, spiral, oblong-ovate, cordate, 7 to 10 cm. broad, 10 to 15 cm. long, glabrous. Pseudostipules usually present. Flowers axillary, rectilinear, ca. 2.0 to 2.5 cm. long, mottled purple, the utricle gibbous, 0.9 cm. long, narrowing abruptly into the tube, ca. 1.0 cm. long, which widens gradually into a funnelform, unequally monolobate limb. Fruit cylindrical, 3 cm. long, 1.5 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 0.4 cm. diameter, 1 mm. thick.

Honduras, Guatemala and south to Venezuela and Colombia. To be sought in Panama.

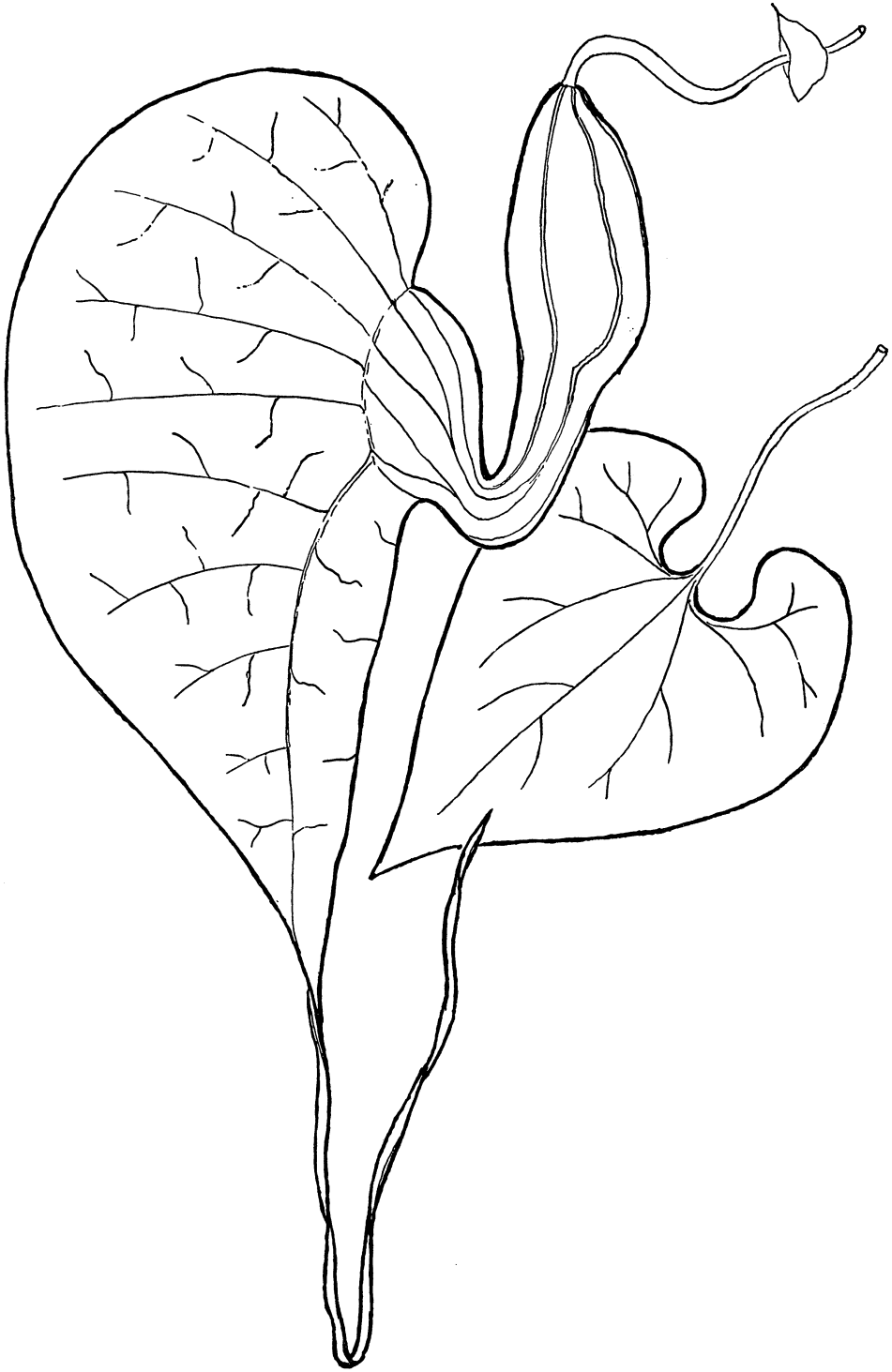


Fig. 96. *Aristolochia arborescens*

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7. *ARISTOLOCHIA ARBORESCENS* Linn. Sp. Pl. 960. 1753.

Aristolochia foetens Lindl. Bot. Reg. t. 1824. 1836.

Howardia foetens Klotzsch, in Monatsb. Acad. Berl. 1859:610. 1859.

Lianas, with twining stems. Leaves alternate, cordate, apex acute to acuminate, membranous, 5 to 20 cm. broad, 8 to 30 cm. long, glabriusculus at maturity. Pseudostipules absent. Flowers immediately subtended by an orbiculate, perfoliate bracteole, axillary, solitary but occasionally in pairs, glabrescent, yellow, blotched with purple, the utricle broadly gibbous-clavate, ca. 30 cm. long, the tube sharply reflexed on the utricle, ca. 35 cm. long, widening into a throat distinguished by peculiar annular venation and constriction, ca. 5 cm. long, the limb obliquely funnellform, terminating in a struppate extension ca. 20 cm. long; the odor putrid. Fruit ovate-cylindric, ca. 10 cm. long, 6 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 1 cm. diameter, 2 mm. thick.

Mexico south to Colombia.

COLÓN: Fató (Nombre de Dios), sea level, *Pittier 4145*. DARIÉN: vicinity Pinogana, alt. 20 m., *Allen 4292*; trail between Pinogana and Yavisa, alt. 15 m., *Allen 291*.

8. *ARISTOLOCHIA GRANDIFLORA* Sw. Prod. Veg. Ind. Occ. 3:1566. 1806, non Gomez, nec Arruda, nec Vahl.

Aristolochia gigas Lindl. Bot. Reg. t. 60. 1842.

Howardia grandiflora Klotzsch, in Monatsb. Acad. Berl. 1859:610. 1859.

Aristolochia grandiflora β *hookeri* Duch. in DC. Prod. 15-1:473. 1864.

Twining lianas, older stems ridged with cork. Leaves alternate, cordate, apex acute to acuminate, membranous, 5 to 20 cm. broad, 7 to 30 cm. long, densely pilose to velutinous becoming nearly glabrous on upper surface. Pseudostipules absent. Flowers immediately subtended by an acuminate foliaceous bracteole, borne on young stems, axillary, solitary, ca. 3 m. long, the color white blotched with purple, pilose, the utricle broadly gibbous-clavate, ca. 45 cm. long, the tube sharply reflexed on the utricle, ca. 40 cm. long, the limb obliquely salverform, terminating in a filiform extension from the medial lower edge, the odor of "old tobacco". Fruit ovate-cylindric, 10 cm. long, 4 to 6 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 1 cm. diameter, 3 mm. thick.

Panama, south throughout Amazonia.

DARIÉN: vicinity of Yape, alt. 30 m., *Allen 647*.

This species rarely is collected. It appears that practically all of the large-flowered *Aristolochia* collections have been named *grandiflora*, but are properly *A. arborescens*. There is a relatively sharp distinction between the two species. *A. grandiflora* has truly a huge flower, perhaps the largest in American tropics, a total reported axial length in excess of 4.5 meters, while *A. arborescens* is about one-fourth as large. The flowers of the former are velutinous without and differ in color and odor from the latter. *A. arborescens* has a well-differentiated throat, while *A. grandiflora* is not markedly endowed with this feature.

9. *ARISTOLOCHIA COSTARICENSIS* (Klotzsch) Duch. in DC. Prod. 15-1:450. 1864.

Howardia costaricensis Klotzsch in Monatsb. Acad. Berl. 1859:614. 1859.

Aristolochia ferruginea T. S. Brandeg. in Univ. Calif. Publ. Bot. 6:51. 1914.

Aristolochia baughtiana Hoehne, in Arquiv. Bot. Estad. S. Paulo 2:99. 1947.

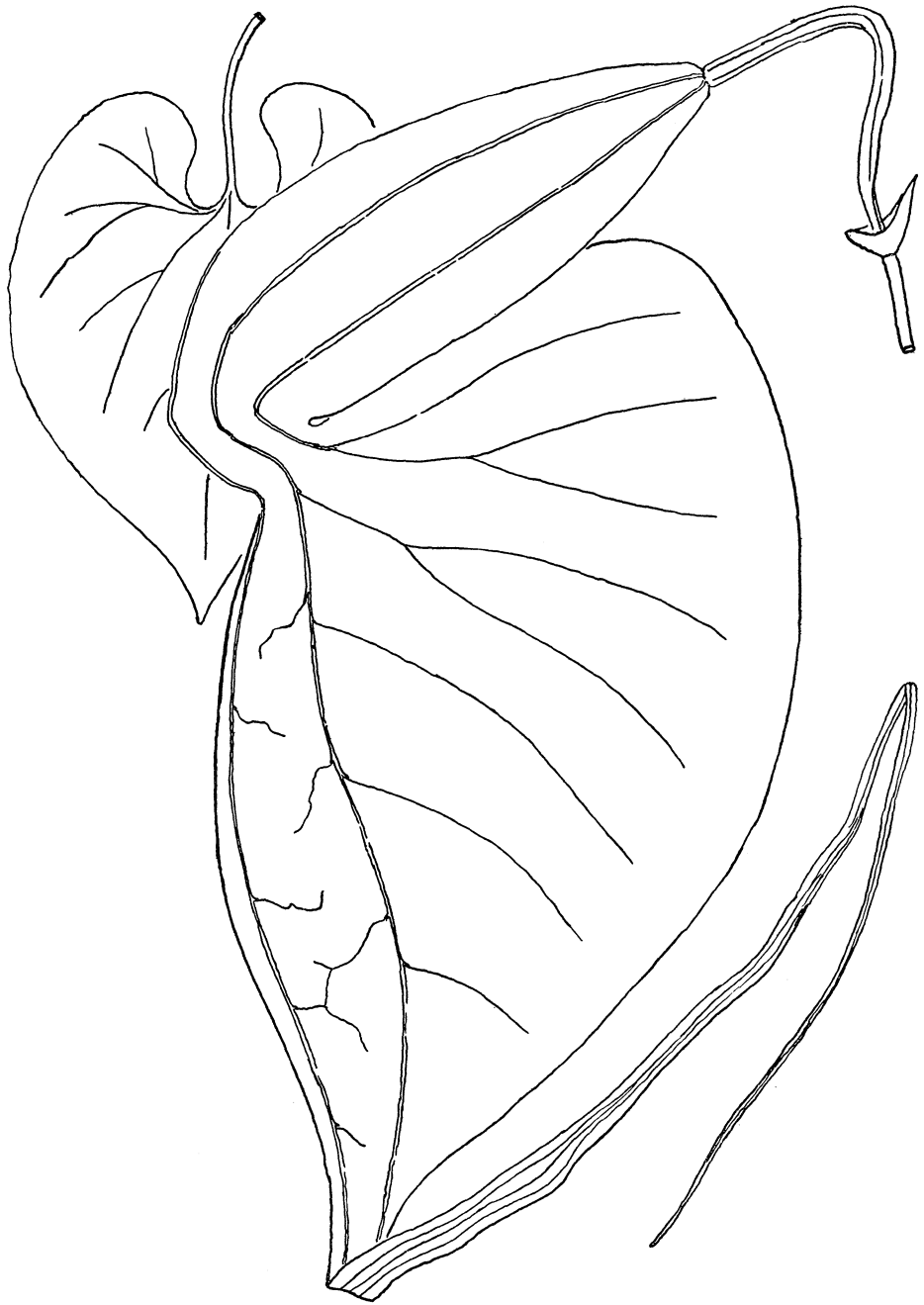
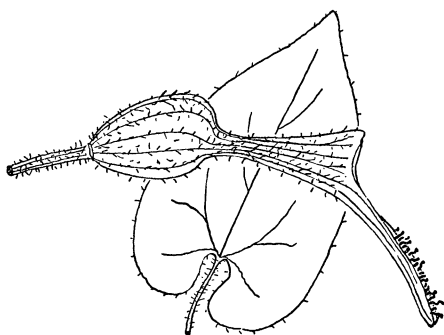


Fig. 97. *Aristolochia grandiflora*

(301)

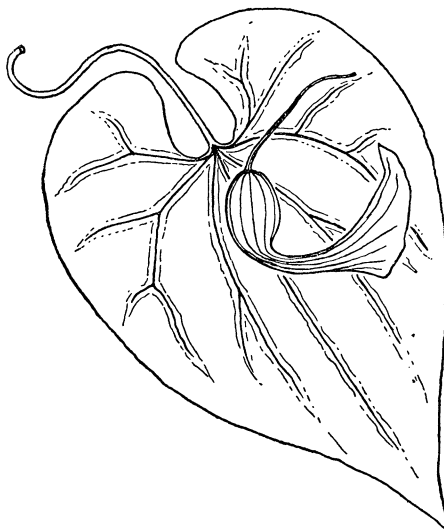
Fig. 98. *Aristolochia costaricensis*

Twining, scandent lianas, hispid-pilose throughout. Leaves alternate, spiral, cordate, apex acute, 9 to 15 cm. broad, 10 to 25 cm. long, upper surface glabrescent, lower pilose. Pseudostipules absent. Flowers axillary, solitary, ca. 7 cm. long, the color brownish-purple marbled with white, densely pilose-hispid, the utricle ellipsoid, 3 cm. long, the tube arising obliquely and abruptly from the side of the utricle near the distal end, 2 cm. long, gradually enlarging into the obliquely funnellform limb which bears a linguiform lobe variously spotted and mottled and covered on the inner side with many fleshy excrescences or fimbriae. Fruit ovoid, ca. 6 cm. long, 4 cm. wide, dehiscing acropetally. Seeds numerous, horizontally compressed, 1 cm. diameter, 2 mm. thick.

Tropic Central and northern South America.

CANAL ZONE: Barro Colorado Island, *Aviles* 70; Gatún, *Hayes* 620; around Gamboa, alt. 40–80 m., *Pittier* 4431; Barro Colorado Island, *Shattuck* 164, 726. BOCAS DEL TORO: Bank of Changuinola R., *Dunlap* 420; Changuinola Valley, *Dunlap* 18; vicinity of Chiriquí Lagoon, *von Wedel* 1228, 1267. DARIÉN: vicinity of Yape, alt. 30 m., *Allen* 864. PANAMÁ: Alhajuela, Chagres Valley, alt. 30–100 m., *Pittier* 2326; Mamoni R., above Chepo, alt. 23–25 m., *Pittier* 4732; north of Panamá City, *Bro. Paul* 374. PROVINCE UNKNOWN: western Panama, *Stork* 18.

10. *ARISTOLOCHIA VERAGUENSIS* Duch. in DC. Prod. 15–1:458. 1864.

Fig. 99. *Aristolochia veraguensis*

Howardia veraguensis Klotzsch, ex Duch. loc. cit. 1864.

Twining lianas. Leaves alternate, spiral, ovate, apex long acuminate, base deeply cordate, 12 to 20 cm. broad, 15 to 30 cm. long, veins and adjacent tissues white, glabrous. Pseudostipules absent. Flowers cauliflorous in short racemose clusters, small, purple, red-reticulate, the utricle subspheric, ca. 1 cm. long, narrowing into the 1.5 cm. long tube which unequally enlarges to form the 2 cm. long mucronate limb, which is arcuately reflexed upon the utricle. Fruit not seen.

East Panama, south to Brazilian Amazonia.

DARIÉN: El Real, *Allen* 2210.

11. *ARISTOLOCHIA SYLVICOLA* Standl. Journ. Wash. Acad. Sci. 15:5-6. 1925.

Slender, scandent lianas. Leaves broadly rounded-deltoid, acuminate or acute, the base very shallowly cordate to truncate, 8 to 12 cm. broad, 10 to 20 cm. long, dark green and glabrous above, beneath light green to white, subarachnoid-velutinous to thinly puberulent. Pseudostipules absent. Flowers cauliflorous in short, few-flowered racemes, maroon finely marbled with white and pink, the utricle ellipsoid, 6 cm. long, the tube short and reflexed, thence opening into the showy limb which is notched at the upper medial edge, ca. 20 cm. wide. Fruit long-cylindric, 12.5 cm. long, 3 cm. wide, dehiscent acropetally. Seeds numerous, revolute, 3 mm. diameter, 8 mm. long, 2 mm. thick.

Known only from Panama.

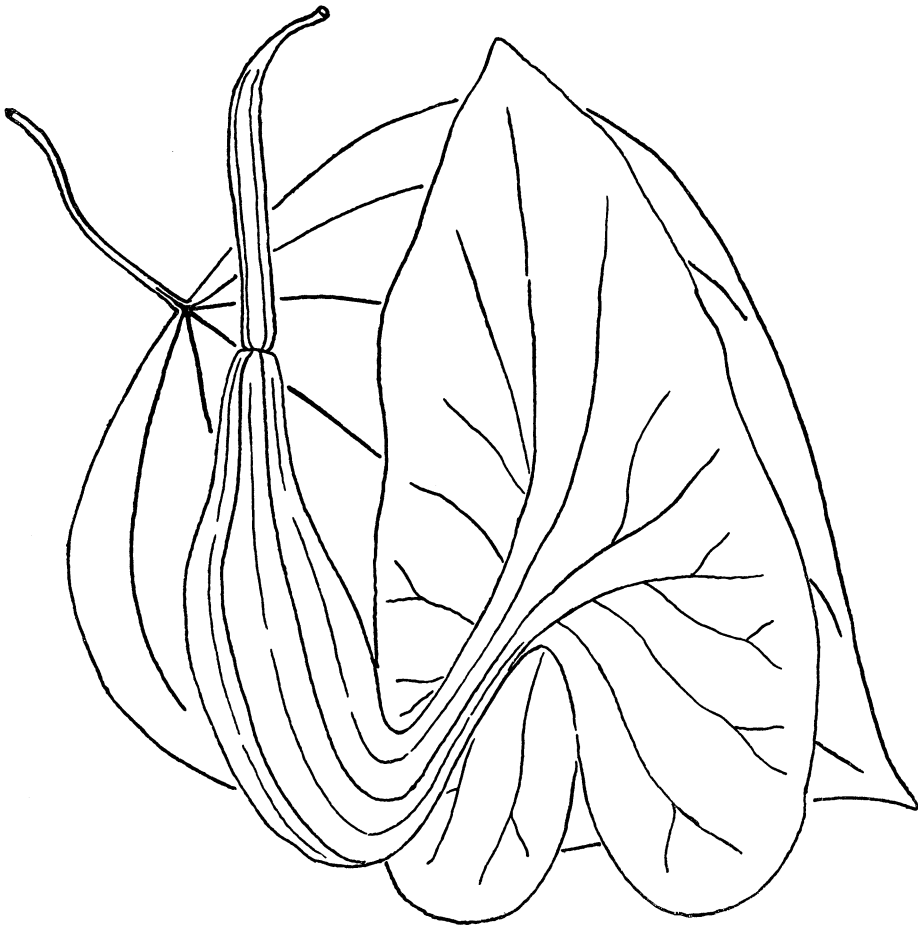


Fig. 100. *Aristolochia sylvicola*

BOCAS DEL TORO: Changuinola Valley, *Dunlap 247*. CANAL ZONE: Summit, *Allen 2250*; Barro Colorado Island, *Shattuck 640*; Barro Colorado Island, alt. 120 m. or less, *Standley 40866*; hills north of Frijoles, *Standley 27469* (type); Barro Colorado Island, alt. 900 m., *Wetmore & Abbe 1*. DARIÉN: Trail between Paya and Palo de las Letras, *Stern et al. 204*.

12. *ARISTOLOCHIA CHAPMANIANA* Standl. in *Contrib. Arn. Arb.* 5:60. 1933.



Aristolochia maxima var. *cordata* Standl. in *Field Mus. Publ. Bot.* 8:136. 1930.

Twining, scandent lianas, sparsely hispidulous-pubescent. Leaves alternate, subdistichous, oblong-spatulate, apex acute to obtuse, base typically deeply cordate, 3 to 6 cm. broad, 10 to 20 cm. long, glabrescent. Pseudostipules absent. Flowers solitary, axillary, rectilinear or slightly arched, dark purple-brown, the utricle long-ellipsoid, ca. 5 cm. long, the tube 3 cm. long, splitting monolaterally into the oblong-lanceolate limb, ca. 7 cm. long. Fruit ovate-cylindric, ca. 12 cm. long, 5 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 1 cm. diameter, 2 mm. thick.

Central America and northern South America.

Fig. 101. *Aristolochia chapmaniana*

CANAL ZONE: Barro Colorado Island, *Bangham 455*; Cerro Gordo, near Culebra, alt. 50–290 m., *Pittier 2304*; Barro Colorado Island, *Shattuck 413* (type); Barro Colorado Island, *Shattuck 1076*; Barbour-Lathrop Trail, alt. 900 m., *Wetmore & Woodworth 77*; Barro Colorado Island, *Zetek 3618*. COCLÉ: between Las Margaritas and El Valle, *Woodson et al. 1739*; above Penonomé, alt. 2000–3000 ft., *Williams 548*. PANAMÁ: San José Island, *Erlanson 424*; San José Island, *Johnston 726, 1253, 1316*.

13. *ARISTOLOCHIA MAXIMA* L. *Spec. Pl. ed. 2.* 2:1361. 1763.

Aristolochia geminiflora HBK. *Nov. Gen. & Spec.* 2:118. *t. 117.* 1817.

Aristolochia reticulata Seem. *Bot. Voy. Herald*, 193. 1854.

Howardia geminiflora Klotzsch, in *Monatsb. Acad. Berl.* 1859:619. 1859.

Howardia gollmerii Klotzsch, loc. cit. 1859.

Howardia hoffmanni Klotzsch, loc. cit. 621. 1859.

Howardia maxima Klotzsch, loc. cit. 615. 1859.

Aristolochia biflora Willd. ex Duch. in *DC. Prod.* 15–1:457. 1864.

Aristolochia mathewsii Duch. loc. cit. 497. 1864.

Aristolochia maxima α *maxima* Duch. loc. cit. 456. 1864.

Aristolochia maxima β *geminiflora* Duch. loc. cit. 457. 1864.

Aristolochia maxima γ *angustifolia* Duch. loc. cit. 1864.

Aristolochia reticulata J. F. Holton, ex Duch. loc. cit. 1864.

Aristolochia sprucei Mast. in *Mart. Fl. Bras.* 4–2:88. 1875.

Aristolochia asperifolia Ule, in *Verh. Bot. Ver. Prov. Brandenb.* 47:121. 1905.

Twining, scandent lianas. Leaves alternate, spiral, oblong-spatulate, apex acute to obtuse, sometimes minutely mucronate, base truncate to shallowly subcordate, 4 to 8 cm. broad, 10 to 20 cm. long, glabrous. Pseudostipules absent. Flowers in clustered racemes with reduced leaves, purple-brown, the utricle ovoid, ca. 3 cm. long, narrowing abruptly into the recurved tube, ca. 1 cm. long, which gradually widens into the strongly reflexed limb, ca. 3 cm. long. Fruit ovate-cylindric, ca. 15 cm. long, 7 cm. wide, dehiscent acropetally. Seeds numerous, horizontally compressed, 1.2 cm. diameter, 3 mm. thick.

Central America and tropic South America.

PANAMÁ: between Las Sabanas and Matías Hernández, *Standley* 31839; Taboga Island, *Standley* 27090, 27856; Tumba Muerto Rd., near Panamá, *Standley* 29804; sabanas, north of Panamá City, *Bro Paul* 517; Belleviota, *Macbride* 2763.

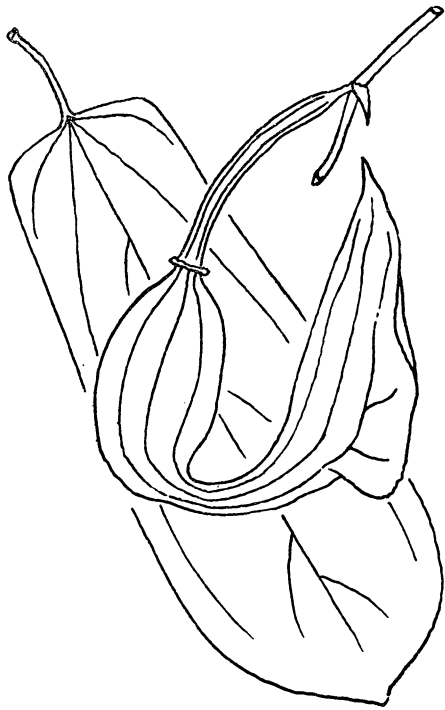


Fig. 102. *Aristolochia maxima*

POLYGONACEAE

By JAMES A. DUKE

Flowers perfect or unisexual, monoecious or dioecious, trimerous or dimerous, on short usually articulate pedicels, solitary or fasciculate within scarious ochreolae. Calyx uniseriate or biseriate, hypogynous, of 3-6 free or partially connate tepals, greenish to red or white. Stamens usually 6-9, rarely more or less, the filaments filiform or flattened, occasionally partially adnate to the calyx; anthers 2- or 4-locular, usually versatile and introrse. Ovary superior, triquetrous or lenticular, unilocular, containing a single erect orthotropous ovule, the stigmata filiform or capitate and entire or variously fringed. Achene trigonous or lenticular, usually with a crustaceous pericarp, the embryo usually excentric in a mealy endosperm. Herbs, shrubs, trees or vines with alternate usually entire simple leaves with ochreate stipules, the stems often sulcate, hollow and geniculate. Flowers in terminal racemes or panicles, often spicate, rarely cymose, or solitary or fasciculate in the axils, usually subtended by scarious ochreolae.

This predominantly north temperate family of about 30 genera and 700 species is represented in Panama by six genera. It is economically a rather unimportant family. *Fagopyrum*, the buckwheat, and *Rheum*, the rhubarb, are crops of limited importance. *Antigonon* spp., *Polygonum* spp. and *Muehlenbeckia* spp. are often cultivated in Central America as ornamentals. Some species of *Rumex* are troublesome lawn weeds.

- a. Plants herbaceous or suffruticose (spp. of *Polygonum* § TINARIA twin-
ing); calyx of 3-6 tepals, the inner slightly larger; stamens 5-9.
 - b. Calyx of 6 tepals, the outer reflexed or spreading, the inner usually
larger and longitudinally folded, often tuberculate; flowers perfect
or dioecious, verticillate; filaments shorter than the anthers..... 1. RUMEX
 - bb. Calyx of 3-5 subequal tepals, not reflexed, closely conforming to the
achene, not plicate or tuberculate; flowers perfect, not verticillate;
filaments longer than the anthers..... 2. POLYGONUM
- aa. Plants shrubby, arboreal or lianoid; calyx of 5-6 tepals, the outer
slightly or greatly larger than the inner; stamens mostly 8-9.
 - c. Achenes scarcely if at all exceeded by the tepals; tepals discrete and
scarious or showing tendencies to form a fleshy calyx tube fused with
the achene; tepals 5, the outer only slightly larger than the inner;
stamens 8.
 - d. Flowers perfect; tepals cordate, discrete, becoming scarious,
loosely investing the achene; vines with tendrils..... 3. ANTIGONON
 - dd. Flowers dioecious or polygamo-dioecious (perfect in *Muehlen-
beckia* spp.); tepals not cordate, bony to fleshy but not scarious,
closely investing the achene; trees, shrubs or scramblers without
tendrils.
 - e. Inflorescences both axillary and terminal, dioecious or perfect;
tepals discrete nearly to their base; scramblers (in Panama), the
twigs terete to quadrangulate, not lenticular..... 4. MUEHLENBECKIA
 - ee. Inflorescences terminal on primary or short lateral branches,
dioecious with staminodes or pistillodes developed; tepals forming
a dry to fleshy tube, at least at their bases; trees in Panama
(except one scrambler with bilateral wood and lenticular twigs). 5. COCCOLOBA
 - cc. Achenes conspicuously exceeded by 3 wing-like outer tepals; outer
tepals of the pistillate flowers basally fused to form a tube free of
the achene; tepals 6, the outer much longer and broader than the
inner in pistillate flowers; stamens 9..... 6. TRIPLARIS

1. RUMEX L.

RUMEX L. Sp. Pl. 333. 1753.

Flowers perfect or unisexual, pedicellate, few to many in verticillate ochreolate fascicles. Perianth of 6 tepals, the outer 3 usually smaller and spreading or reflexed, the inner 3 cordate, entire or lacerate, frequently with an abaxial tubercle, usually accrescent and closely investing the achene. Stamens 6, discrete, the filaments usually shorter than the anthers, the anthers mostly 2-locular and loculicidal. Ovary trigonous with 3 spreading to reflexed filiform styles capped by fimbriate peltate stigmata. Achene triquetrous, smooth and lustrous or rough and dull, usually included. Glabrous usually perennial herbs, occasionally becoming quite tall and shrubby. Leaves alternate, entire or rarely dentate, occasionally tending to form rosettes, the ochreae hyaline and rather tardily deciduous.

Of this large predominantly temperate genus, only two species, both probably naturalized from Europe, are thus far represented in the flora of Panama. Here they tend to be weeds in lawns and pastures at higher elevations. *R. costaricensis*

Fig. 103. *Rumex crispus*

Rechinger, a strikingly large species, is apparently endemic to the high mountains of Costa Rica. Three other species are reported in Guatemala by Standley & Steyermark (in *Field Mus. Bot.* 24⁴:131. 1946).

- a. Flowers perfect, the inner tepals tuberculate, 3.5–5 mm. long; achenes smooth, about 3 mm. long; leaves cordate to acute basally; plants non-clonal, with yellowish taproots..... 1. *R. CRISPUS*
- aa. Flowers dioecious, the inner tepals not tuberculate, about 1 mm. long; achenes rough, about 1 mm. long; leaves hastate; plants clonal, with creeping rootstocks..... 2. *R. ACETOSELLA*

1. RUMEX CRISPUS L. Sp. Pl. 335. 1753.

Mostly unbranched coarse glabrous perennials with yellowish taproots. Leaves glabrous, lanceolate to oblong, apically acute, basally acute to cordate, the cauline blades mostly 10–12 cm. long by 0.5–3 cm. broad; petioles 1–5 cm. long; ochreae up to 2.5 cm. long, tardily deciduous. Inflorescences of crowded many-flowered ochreate verticils in racemes or panicles. Flowers perfect, on pedicels mostly 5–12 mm. long; outer tepals oblong, 1–2 mm. long, scarcely accrescent; inner tepals broadly ovate to cordate, accrescent becoming 3.5–5 mm. long, 2–3.5 mm. broad, with a prominent exterior tubercule developing on 1 or 3 of them; stamens 6, discrete, the filaments mostly less than 0.5 mm. long, the anthers 1–1.5 mm. long, basifixed; ovary trigonous, the 3 styles usually reflexed, with 3 peltate fimbriate stigmata. Achenes triquetrous, brown, lustrous, included, often capped by the persistent styles and stigmata, 2.5–3 mm. long, 2–2.5 mm. broad.

CHIRIQUÍ: Alto Lino, wayside roadside, 4200 ft., *Bro. Maurice 883*.

A native of Eurasia, this is a widespread weed, and common in temperate portions of the Americas. In Guatemala it is called *lengua de vaca* and *lengua de caballo*. The leaves are occasionally cooked as a potherb.

2. RUMEX ACETOSELLA L. Sp. Pl. 538. 1753.

Acetosella acetosella (L.) Small, Man. SE. Fl. 446. 1933.

Low delicate glabrous perennials with slender creeping rootstocks. Leaves glabrous, lanceolate-hastate, apically acute to rounded, 1–3 cm. long, 3–8 mm. broad; petioles 1–5 cm. long; ochreae mostly 0.5–1 cm. long, tardily deciduous. Inflorescences of panicles of remote few-flowered verticils. Flowers dioecious, on pedicels mostly less than 3 mm. long; outer tepals oblong to narrowly ovate, about 0.5 mm. long, scarcely accrescent; inner tepals broadly ovate, about 1 mm. long, scarcely accrescent, not tuberculate; stamens 6 discrete, the filaments less than 0.3 mm. long, the anthers 0.5–1 mm. long, bilocular and loculicidal; ovary trigonous, the 3 styles spreading, with 3 peltate fimbriate stigmata. Achene triquetrous, brown, dull and rough, often slightly exerted, about 1 mm. long.

CHIRIQUÍ: Cerro Punta, ca. 6025 ft., *P. White 196*; Valley of the upper Río Chiriquí Viejo, *P. White 60*.

This species, like the former, is a native of Eurasia now widespread in temperate regions of the Americas. In Costa Rica it is called *ruibarbillo*. Due to its persistent rootstocks, this is often an obnoxious weed of lawns and pastures. It is believed to have been imported into Central America as a contaminant in grass seed.

2. POLYGONUM L.

POLYGONUM L. Sp. Pl. 359. 1753.

Flowers perfect, occasionally with tendencies toward suppression of one sex, with pedicels distally articulated, usually in ochreate fascicles. Perianth of 4–5

subequal partially connate tepals, white, green, red or pink. Stamens 5-8 (-9), the filaments discrete, often unequal in length, occasionally adnate to the tepals, the anthers small, versatile, introrse, often isodiametric and appearing peltate. Ovary lenticular or trigonous; styles 2 or 3, terminated by capitate stigmata. Achene usually included, lenticular or trigonous, often beaked, the facies ovate or orbicular. Annual or perennial herbs, sometimes clambering or twining, occasionally shrubby. Leaves alternate, mostly linear to ovate, occasionally sagittate, cordate or hastate, the blades mostly exceeding the petioles; ochreae usually conspicuous, often fringed with strigose cilia. Inflorescences of terminal spicate panicles, racemes or cymes, in some species the flowers solitary or fasciculate in the axils; rachises glabrous to sericeous, occasionally glandular.

This largely temperate genus contains about 150 species, about half of which occur in North America. Many of the herbaceous species are aquatic or bog plants; some are rather obnoxious weeds. Shrubby species are often cultivated as ornamentals. The sections of the genus have often been elevated to generic status, but they are here maintained at the subgeneric level. Heterostyly, tendencies toward the suppression of one sex in the flowers, environmental modifications, and hybridization have all contributed to the difficult taxonomy of the section *PERSICARIA*, to which belong five of the six Panama species. Fourteen species are known from Guatemala and four from Costa Rica.

- a. Plants not twining; leaf bases acute; inflorescences of terminal subspicate racemes or panicles; achenes lenticular or triquetrous; styles 2-3, partially discrete.....§ *PERSICARIA*.
- b. Ochreae with reflexed or spreading herbaceous flanges; leaves mostly over 4 cm. wide; achenes lenticular..... 1. *P. HISPIDUM*
- bb. Ochreae unflanged, but often strigose-ciliate at the summit; leaves mostly less than 4 cm. wide; achenes lenticular or triquetrous.....
- c. Achenes triquetrous; styles 3; spikes filiform, lax, interrupted, with only the uppermost ochreolae imbricate.
- d. Tepals, leaves and ochreae conspicuously dark-punctate; midribs of the leaves subglabrous..... 2. *P. PUNCTATUM*
- dd. Tepals, leaves and ochreae inconspicuously pellucid-punctate; midribs of the leaves strigose or strigillose..... 3. *P. HYDROPIPEROIDES*
- cc. Achenes lenticular; styles 2; spikes cylindrical, rigid, continuous, with all but the lowermost ochreolae imbricate.
- e. Facies of the achenes ovate; ochreae 2-3 cm. long, with apical strigose cilia to 1.5 cm. long; peduncles glandless; calyx white; leaves often conspicuously pubescent..... 4. *P. ACUMINATUM*
- ee. Facies of the achenes orbicular; ochreae 0.5-1.5 cm. long, eciliate at the summit; peduncles glandular; calyx pink; leaves, except for the veins, glabrous..... 5. *P. MEXICANUM*
- aa. Plants twining; leaf bases cordate; inflorescences of lax axillary, frequently leafy, racemes or panicles; achenes triquetrous. Styles 3, united and capped by a 3-lobed capitate stigma.....§ *TINARIA*. 6. *P. CONVULVULUS*

1. *POLYGONUM HISPIDUM* HBK. Nov. Gen. & Sp. 2:178. 1817.

Robust glutinous-hispid perennials. Leaves punctate, hispid especially on the veins, entire but ciliate on the margins, apically attenuate, the bases decurrent on the petioles; blades broadly lanceolate to ovate, 10-30 cm. long, 5-9 cm. broad; ochreae 1-3.5 cm. long, hispid, the summits capped by herbaceous recurving flanges. Inflorescences of terminal continuous ochreolate subspicate racemes or

panicles, the peduncles strigose, the floriferous portions mostly 3–10 cm. long and 0.5–1 cm. broad, the flowers fascicled in ochreolae 2–4 mm. long. Flowers white to dark rose, the pedicels apically articulated and about equaling the ochreolae, 3–4 mm. long; tepals 5, subequal, the outer 4–5 mm. long, the inner somewhat shorter; stamens 5, discrete, affixed just above the base of the tepals; filaments 1.5–2 mm. long, the anthers about 0.5 mm. in diameter, subrotund, versatile, thus appearing peltate; ovary lenticular; styles 2, about 2 mm. long, connate for about 1 mm., the stigmata at anthesis about equaling the anthers. Achenes lenticular, orbicular, often with a concavity on one or both facies, black, lustrous, 3–4 mm. long, the persistent styles slightly over 1 mm. long.

CANAL ZONE: vicinity of Gatuncillo, *Piper* 5624. PANAMÁ: in swamps on edge of jungle; along road between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen* 16672.

This paludal or aquatic species, occurring chiefly at low elevations, is probably indigenous to South and Central America and the West Indies.

2. *Polygonum punctatum* Ell. Bot. S. C. & Ga. 1:445. 1817.

- Polygonum hydroppiper* Michx. Fl. Bor. Am. 1:238. 1803. not L. 1753.
Polygonum hydroppiperoides Pursh, Fl. Am. Sept. 270. 1814. not Michx. 1803.
Polygonum acre HBK. Nov. Gen. & Sp. 2:179. 1817.
Polygonum maritimum Vell. Fl. Flum. 4. t. 39. 1827.
Polygonum antibaemorrhoidale f. *riparium* Mart. Reise. 550. 1828.
Polygonum antibaemorrhoidale f. *aquatile* Mart. Reise. 550. 1828.
Polygonum antibaemorrhoidale a *riparium* Mart. in *Linnaea* 5: litt. 41. 1830.
Polygonum antibaemorrhoidale β *aquatile* Mart. loc. cit. 1830.
Polygonum acre a *aquatile* Meissn. in Mart. Fl. Bras. 5¹:18. 1855.
Polygonum acre β *riparium* Meissn. loc. cit. 18. 1855.
Polygonum acre a *confertiflorum* Meissn. in DC. Prodr. 14:108. 1856.
Polygonum acre β *leptostachyum* Meissn. loc. cit. 108. 1856.
Polygonum acre γ *brachystachyum* Meissn. loc. cit. 108. 1856.
Polygonum acre δ *majus* Meissn. loc. cit. 108. 1856.
Polygonum acre ε *riparium* Meissn. loc. cit. 108. 1856.
Polygonum punctatum eciliatum Small, in Bull. Torr. Club 20:214. 1893.
Polygonum punctatum robustior Small, in Bull. Torr. Club 21:477. 1894.
Persicaria punctata eciliata Small, Fl. SE. U. S. 379. 1903.
Persicaria punctata robustior Small, loc. cit. 379. 1903.
Persicaria robustior Bickn. in Bull. Torr. Club 36:455. 1909.
Persicaria punctata var. *tacubayana* Nieuwl. in Am. Midl. Nat. 3:131. 1913.
Polygonum punctatum var. *robustius* Fernald, in *Rhodora* 25:147. 1921.
Polygonum punctatum var. *parvum* Vict. & Rousseau, in Contr. Inst. Bot. Univ. Montr. 36:13. 1940.
Polygonum punctatum var. *aquatile* (Mart.) Fassett, in *Caldasia* 4:221. 1946.
Polygonum punctatum var. *aquatile* f. *stipitatum* Fassett, loc. cit. 223. 1946.
Polygonum punctatum var. *typicum* Fassett, in *Brittonia* 6:371. 1949.
Polygonum punctatum var. *tacubayanum* (Nieuwl.) Fassett, loc. cit. 374. 1949.
Polygonum punctatum var. *majus* (Meissn.) Fassett, loc. cit. 372. 1949.
Polygonum punctatum var. *ellipticum* Fassett, loc. cit. 375. 1949.
Polygonum punctatum var. *confertiflorum* (Meissn.) Fassett, loc. cit. 377. 1949.
Polygonum punctatum var. *confertiflorum* f. *longicollum* Fassett, loc. cit. 379. 1949.
Polygonum punctatum var. *littorale* Fassett, loc. cit. 379. 1949.
Polygonum punctatum var. *parviflorum* Fassett, loc. cit. 381. 1949.
Polygonum punctatum var. *mexicanum* Fassett, loc. cit. 381. 1949.
Polygonum punctatum var. *riparium* (Meissn.) Fassett, loc. cit. 382. 1949.

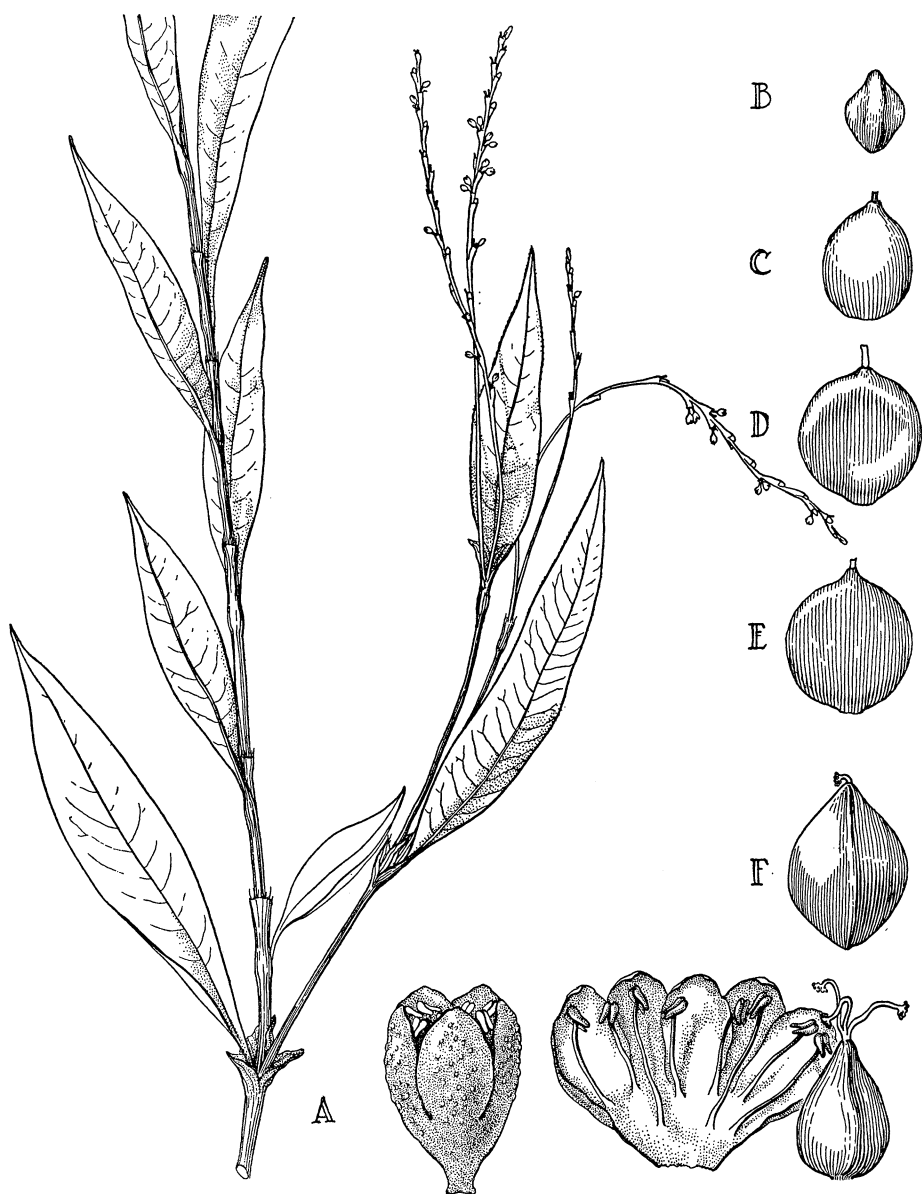


Fig. 104. A. Habit and details of *Polygonum punctatum*; seeds: B. *P. hydropteroides*; C. *P. acuminatum*; D. *P. hispidum*; E. *P. mexicanum*; F. *P. convolvulus*.

Slender glabrous annuals or perennials, sometimes creeping and forming colonies. Leaves punctate with dark glands, subglabrous, entire but minutely ciliate on the margins, apically attenuate, the bases decurrent on the petioles; blades

lanceolate to narrowly ovate, 2–10 cm. long, 0.5–2 cm. broad; ochreae 0.5–1.5 cm. long, strigose-ciliate only apically. Inflorescences of terminal interrupted, often drooping, spicate racemes or panicles, the peduncles glabrous, the floriferous portions 5–15 cm. long, about 0.5 cm. broad, the flowers fascicled in ciliate ochreolae 2–3 mm. long. Flowers mostly white to greenish, the pedicels apically articulated and exceeding the ochreolae by 1–2 mm.; tepals 5, subequal, the outer 3–4 mm. long, the inner somewhat shorter, strongly punctate, ovate; stamens typically 8, discrete, affixed just above the base of the tepals; filaments 1–1.5 mm. long, the anthers less than 0.5 mm. in diameter, subrotund, versatile, thus appearing peltate; ovary trigonous; styles 3, about 1 mm. long, connate for about 0.5 mm.; stigmata capitate. Achenes triquetrous (in Panama), with ovate facies and inconspicuous beaks, brown to black, 2.5–4 mm. long.

CANAL ZONE: Gamboa, *Bro. Heriberto 37*; shore, end of Barro Colorado Island, *Bangham 571*; Joan Mina, *Piper 5694*; in water, Darién Station, *Standley 31578*. CHIRIQUÍ: vicinity of El Valle de Antón, ca. 600 m., *Allen 1986*; valle of the Upper Río Chiriquí Viejo, *P. White 38*; vicinity of Boquete, ca. 1300–1700 m., *Woodson, Allen & Seibert 1165*. COCLÉ: lower portion of valley and marshes along R. Antón, El Valle de Antón, ca. 500 m., *Hunter & Allen 354*; Penonomé and vicinity, 50–1000 ft., along stream, *Williams 60*; El Valle, valley floor and lower slopes along highway, *Miller 1834*. COLÓN: Ahorca Lagarto to Culebra, *Cowell 391*. PANAMÁ: Chepo, 100 ft., *Bro. Maurice 763*. PROVINCE UNKNOWN: western Panamá, *Stark 44*; *Sutton Hayes 968*.

This, the most commonly collected and perhaps most abundant species in Panama, ranges from southern Canada to Argentina. Some local Central American names are *chilillo*, *chilillo de perro* and *canilla de pava*. Decoctions of the acrid leaves are reported to be used in treating dogs suffering from mange. Those interested in infraspecific delineations are referred to the monograph of Fassett (in *Rhodora* 6:369. 1949.), in which twelve varieties, four to be expected in Panama, are treated. Fassett cites Panama specimens of vars. *aquatile* and *ellipticum*; vars. *confertiflorum* and *majus*, judging from their distributions, are to be expected in Panama. Closely allied *P. portoricense* Bert., with eciliate ochreae and ochreolae, is widespread in tropical America and might be expected in Panama.

3. POLYGONUM HYDROPIPEROIDES Michx. Fl. Bor. 1:239. 1803.

- Polygonum barbatum* Walt. Fl. Car. 131. 1788. not L.
Polygonum mite Persoon, Syn. Pl. 1:440. 1805.
Polygonum virgatum Cham. & Schlecht. in *Linnaea* 3:45. 1828.
Polygonum hydropiperoides β *virgatum* Meissn. in *Mart. Fl. Bras.* 5¹:17. 1855.
Polygonum hydropiperoides var. *strigosum* Small, in *Bull. Torr. Club* 9:355. 1892.
Polygonum hydropiperoides *macouni* Small, in *Mem. Dept. Bot. Col. Coll.* 1:81. 1895.
Persicaria hydropiperoides (Michx.) Small, *Fl. SE. U. S.* 378. 1903.
Polygonum hydropiperoides f. *leucochranthum* Moore, in *Rhodora* 16:129. 1914.
Polygonum hydropiperoides var. *digitatum* Fernald, in *Rhodora* 23:260. 1922.
Polygonum hydropiperoides f. *strigosum* (Small) Stanford, in *Rhodora* 28:26. 1926.
Polygonum hydropiperoides var. *macerum* Stanford, loc. cit. 26. 1926.
Polygonum hydropiperoides var. *sanebelense* Stanford, loc. cit. 27. 1926.
Polygonum hydropiperoides var. *bushmanum* Stanford, loc. cit. 27. 1926.
Polygonum hydropiperoides var. *asperifolium* Stanford, loc. cit. 27. 1926.

Slender subglabrous perennials, occasionally creeping and rooting at the lower

nodes. Leaves punctate with inconspicuous pellucid glands, usually strigillose on the veins below, entire but minutely ciliate on the margins, apically long-attenuate, the bases decurrent on the petioles; blades narrowly lanceolate, slightly falcate, 4–15 cm. long, 0.5–1.5 cm. broad; ochreae 1–3 cm. long, with apical cilia up to 8 mm. long. Inflorescences of terminal, lax, often drooping, subspicate racemes or panicles, the peduncles glabrous; floriferous portions interrupted, 5–15 cm. long, about 0.5 cm. broad, the flowers fasciculate in ciliate ochreolae 2–3 mm. long. Flowers mauve to greenish, the pedicels apically articulated and ultimately exceeding the ochreolae by about 1 mm.; tepals usually 5, subequal, ovate, becoming 2–3 mm. long; stamens usually 8, discrete, affixed just above the base of the tepals; filaments about 1 mm. long; anthers less than 0.5 mm. in diameter, subrotund, versatile, thus appearing peltate; ovary trigonous; styles 3, about 1 mm. long, connate for about 0.5 mm.; stigmata capitate. Achenes triquetrous (in Panama), with ovate facies and inconspicuous beaks, brown to black, 2–3 mm. long.

CANAL ZONE: Gigante Bay, Barro Colorado Island, *Sbattuck 840*; Barro Colorado Island, *Kenoyer 347*.

Usually inhabiting meadows and stream banks, this species ranges from Canada to Central and South America, where it is supposed to merge with *P. persicarioides* HBK. In regions of Guatemala it is called *flor de chajutal* (fide Standley & Steyermark, in *Field Mus. Bot.* 24⁴:126. 1946.). Intergradation, south of the continental borders of the United States, prompted Stanford (in *Rhodora* 28:25. 1926.) to reduce *P. persicarioides* HBK. to varietal status under *P. hydropiiperoides*. In the Central American material however, *P. persicarioides* seems more distinct from *P. hydropiiperoides* than does *P. punctatum*. Recent workers have probably rightly upheld *P. persicarioides* as a distinct species. It occurs at moderate elevations in Guatemala, Costa Rica and South America and is perhaps to be expected in Panama.

4. POLYGONUM ACUMINATUM HBK. *Nov. Gen. & Sp.* 2:178. 1817.

- Polygonum cuspidatum* Willd. in *Spreng. Syst.* 2:256. 1825.
Polygonum erectum Vell. *Fl. Flum.* 4: *t.* 42. 1827.
Polygonum setigerum Wedd. in *Ann. Sci. Nat.* 3¹³:253. 1849.
Polygonum floribundum Wedd. loc. cit. 253. 1849.
Polygonum acuminatum α *bumboldtii* Meissn. in *DC. Prodr.* 14:114. 1856.
Polygonum acuminatum β *glabrescens* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum γ *subcordatum* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum δ *setigerum* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum ϵ *brachystemon* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum ζ *microstemon* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum η *weddellii* Meissn. loc. cit. 114. 1856.
Polygonum acuminatum θ *capense* Meissn. loc. cit. 114. 1856.
Persicaria acuminata (HBK.) Maza, in *Per. Cub.* 278. 1896.
Polygonum guatemalense Gandoger, in *Bull. Bot. Soc. France* 66:225. 1919.

Rather robust perennials, often conspicuously strigose or cinereous. Leaves punctate with inconspicuous pellucid glands, usually strigose or cinereous, strigose on the margins, apically long-attenuate, the bases abruptly decurrent on the

petioles; blades sessile or subsessile, lanceolate, falcate, 10–30 cm. long, 2–3.5 cm. broad; ochreae 2–3 cm. long, with apical strigose cilia up to 1.5 cm. long, strigose on the veins. Inflorescences of terminal rather rigid subspicate racemes or panicles, the peduncles strigose; floriferous portions continuous, 3–13 cm. long, almost 1 cm. broad, the flowers fasciculate in ciliate imbricate ochreolae 2–3.5 mm. long. Flowers whitish, the pedicels apically articulated and ultimately exceeding the ochreolae by 1–2 mm.; tepals 4 (–5), subequal, ovate, becoming 2.5–3.5 mm. long; stamens commonly 6, discrete, affixed just above the base of the tepals; filaments to 3 mm. long, with versatile anthers about 0.5 mm. long; ovary lenticular; styles 2, 2–3 mm. long, connate for about 0.5 mm.; stigmata capitate. Achenes lenticular, with ovate facies and a clearly delineated beak about 0.5 mm. long, brown to black, lustrous, 2–2.5 mm. long, 1.5–2 mm. broad.

CANAL ZONE: vicinity of Miraflores Lock, G. White 187; south end of island, P. White 142; Río Chagres, Fairchild 2095; vicinity of Gamboa, Allen 1969; Mindi, Cowell 168.

Inhabiting marshes and streams of low elevations, this species ranges from Mexico through Central America and South America to Argentina. In Guatemala it is called *chilillo* and *chilillo de clucho*. The typical varieties of *P. punctatum* and *P. hydrophiperoides*, essentially North American varieties, grade into atypical varieties in the Caribbean countries, and here tend to approach the more southern species, *P. acuminatum* and *P. persicarioides*. This gradation is responsible for a serial relationship between these four species. Data suggesting this seriation are included in the following chart:

<i>P. punctatum</i> var. <i>punctatum</i>	<i>P. hydrophiperoides</i> var. <i>hydrophiperoides</i>	<i>P. persicarioides</i>	<i>P. acuminatum</i>
with dark punctation	with pellucid punctation	with pellucid punctation	with pellucid punctation
achenes strictly triquetrous	achenes strictly triquetrous	achenes lenticular and triquetrous	achenes strictly lenticular
spikes filiform and interrupted	spikes filiform and interrupted	spikes cylindric and continuous	spikes cylindric and continuous
leaves subglabrous	leaves subglabrous to strigillose below	leaves strigillose below	leaves strigose to sericeous

5. *POLYGONUM MEXICANUM* Small, in Bull. Torr. Bot. Club 19:256. 1892.

Polygonum pennsylvanicum Torr. Bot. Mex. Bound. Surv. 178. 1859. not L. 1753.

Persicaria mexicana Small, Fl. SE. U. S. 377. 1903.

Rather robust annuals, glabrous below, upwardly becoming glandular-hairy, sometimes decumbent and rooting at the lowermost nodes. Leaves conspicuously punctate, essentially glabrous except for the strigillose margins, apically long-attenuate, the bases gradually decurrent on petioles up to 1 cm. long; blades linear to lanceolate, falcate, 6–15 cm. long, 0.5–2.0 cm. broad; ochreae 0.5–1.5 cm. long, eciliate, glabrous. Inflorescences of terminal subspicate racemes or panicles, the peduncles glandular and strigose; floriferous portions continuous, 1–6 cm. long,

5–8 mm. broad, the flowers fasciculate in eciliate imbricate ochreolae 2–3 mm. long. Flowers pink, the pedicels distally articulated and mostly included in the ochreolae; tepals 4–5, subequal, ovate, becoming 2–3 mm. long; stamens 6–8, discrete, difficultly separable from the tepals; filaments filiform or flattened, 1–2.5 mm. long; anthers less than 0.5 mm. in diameter, subrotund, versatile, thus appearing peltate; ovary lenticular; styles 2, about 2 mm. long, connate for about 1 mm.; stigmata capitate. Achenes lenticular, orbiculate, the beak not prominent, brown to black, dull, 2–3 mm. long, 2–3 mm. broad.

PROVINCE UNKNOWN: Panamá, *Sutton Hayes 970*.

This aquatic or paludal species has a spotty distribution in Mexico and Central America and possibly in the southern United States. Colloquial names in Guatemala are *lechuga de agua* and *chilillo*. Small, in describing this species, emphasized its relationship to *P. pennsylvanicum* L. and did not compare it with *P. segetum* HBK., another very closely related species. Recent authors in their keys separate *P. segetum* from *P. mexicanum* by the former's ciliate ochreae, but this is an inconstant character; both were originally described as having eciliate ochreae. From the descriptions of Small (Fl. SE. U. S. 337. 1903.) and Stanford (in *Rhodora* 27:186. 1925.) it is concluded that the Panama specimen is *P. mexicanum* because of the orbicular achenes with short acute beaks, the achenes of *P. segetum* being ovoid with attenuate spinose beaks. These two species are separated by weak characters indeed and a concentrated study might demonstrate that they are conspecific.

6. POLYGONUM CONVULVULUS L. Sp. Pl. 364. 1753.

Clambering or twining glabrous or scurfy annuals. Leaves inconspicuously punctate, often scurfy on the veins below, entire but strigillose on the margins, apically acute or attenuate, the bases not decurrent on the petioles; blades cordate, 1–6 cm. long, 0.5–5 cm. broad; ochreae 2–4 mm. long, fragile, usually eciliate. Inflorescences of axillary lax leafy racemes or panicles, the peduncles and rhachises scurfy, the flowers loosely fasciculate in mostly eciliate ochreolae 1–2 mm. long. Flowers greenish, the pedicels distally articulated and ultimately exceeding the ochreolae by 1–2 mm.; tepals 5, subequal, connate for about half their length, 3–4 mm. long; stamens 8, discrete, adnate for half their length to the tepals; filaments about 1.5 mm. long; anthers less than 0.5 mm. in diameter, subrotund; ovary trigonous; styles 3, connate, capped by a 3-lobate stigma, about 0.5 mm. long. Achenes triquetrous, with ovate facies, scarcely beaked, dull, black, granular, 3–4 mm. long.

CHIRIQUÍ: Cerro Punta, ca. 6025 ft., *P. White 198*.

This weedy species, naturalized from Europe, is quite common in temperate North America, but seems to be rather rare in Central and South America. The cited specimen is the only *P. convolvulus* from Central and South America in the herbarium of the Missouri Botanical Garden.

The section ECHINOCAULON Small is represented in Central America by *P. meissnerianum* Cham. & Schlecht., which differs from all the aforementioned in having clambering armed stems and glandular dichotomous few-flowered cymes and triquetrous achenes. In the Caribbean region it is found in Mexico, Guatemala, Salvador, Costa Rica and the West Indies but has not yet been collected in Panama. It ranges from the southeastern United States to Brazil. *Joinsson 167* from Paraná in Brazil, labeled as *P. meissnerianum*, is *P. arifolium* L., probably not previously reported from Brazil or even from South America.

3. ANTIGONON Endl.

ANTIGONON Endl. Gen. Pl. 310. 1836-40.

Corculum (Endl.) Stuntz, in U. S. D. A., Bur. Pl. Ind., Bull. 282:86. 1913.

Flowers perfect, with articulated pedicels, in ochreolate fascicles of 1-many. Perianth of 5 discrete unequal tepals, the outer 3 broader than the inner 2; tepals red or greenish white, slightly accrescent in fruit. Stamens 8, 2-3 mm. long, at first exceeding the stigmata; filaments united below into an occasionally appendiculate tube essentially free from the tepals; anthers 4-locular, introrse, versatile, about 0.5 mm. long. Ovary trigonous; styles 3, arcuate, terminated by peltate stigmata. Achenes mostly concealed by the tepals, bluntly 3-angled, usually brown and slightly lustrous. Capreolate vines scandent by tendrils terminating the inflorescences, the stems sulcate, herbaceous or suffrutescent, pubescent or glabrate. Leaves alternate, cordate to deltoid, acute to acuminate apically, the blades exceeding the alate or terete petioles; ochreae obsolete. Inflorescences of axillary and terminal racemes or panicles, the rachises usually pubescent and terminated by tendrils.

This genus, indigenous to Mexico and Central America and cultivated elsewhere because of its handsome flowers and reputedly edible tubers, is here considered to consist of only three species. Due to the rapid migrations of cultivants, all three species are treated here, although *A. leptopus* is the only species so far collected in Panama. Stuntz (in U. S. D. A., Bur. Pl. Ind., Bull. 282:86. 1913.), in his widely overlooked paper, points out the similarity of the name *Antigonon* with *Antigona*, now reduced to synonymy with *Casearia* in the Flacourtiaceae. He concluded that *Antigonon* was homonymous with *Antigona* and proposed the generic name *Corculum*. International rules of nomenclature allow the existence of *Peponia* and *Peponium* so apparently different singular genders are not regarded as homonyms or orthographic variants. Consequently the generic name *Antigonon* should be maintained.

- | | |
|--|--------------------|
| a. Outer tepals at anthesis longer than broad, cordate, minutely pubescent without, rarely stipitate-glandular within; petioles alate or terete, pubescent or glabrous, longer than the sinus of the cordate to truncate leaf base, mostly more than 1 cm. long. | |
| b. Tepals reddish, in fruit less than 1.5 times as long as broad; achene included; petioles terete or alate..... | 1. A. LEPTOPUS |
| bb. Tepals greenish white, in fruit mostly more than 1.5 times as long as broad; achene slightly exserted; petioles alate..... | 2. A. FLAVESCENS |
| aa. Outer tepals at anthesis at least as broad as long, rounded at both ends, closely tomentose without, stipitate-glandular within; petioles mostly terete, shorter than the sinus of the cordate leaf base, mostly less than 1 cm. long..... | 3. A. GUATEMALENSE |

1. *ANTIGONON LEPTOPUS* Hook. & Arn. Bot. Beech. Voy. 308. 1840.

Antigonon platypus Hook. & Arn. loc. cit. 309. 1840.

Antigonon cordatum Mart. & Gal. in Bull. Acad. Brux. 10¹:354. 1843.

Antigonon cinerascens Mart. & Gal. loc. cit. 355. 1843.

Corculum leptopus (Hook. & Arn.) Stuntz, in U. S. D. A., Bur. Pl. Ind., Bull. 282:86. 1913.

Glabrous to densely cinereous- or rufous-pubescent tuberous vines. Leaves broadly cordate to narrowly deltoid, acute to acuminate, often mucronate; blades mostly 3–14 cm. long, 2–12 cm. broad, glabrate to closely pubescent below; petioles mostly 1–2.5 cm. long, glabrous to pubescent, the leaf bases occasionally decurrent



Fig. 105. *Antigonon leptopus*

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on the petioles forming flanges up to 5 mm. wide. Inflorescences of axillary and terminal capreolate racemes or panicles, the rhachises glabrate to densely pubescent. Flowers pedicellate, the glabrous to densely pubescent pedicels mostly articulated below the middle; tepals pink to purplish, cordate, in fruit 8–25 mm. long, 4–20 mm. broad, glabrous to closely pubescent without, rarely stipitate-glandular within; stamens 8, connate about half their length to form a filament tube, often with 1 tooth intercalated between the free portions of adjacent filaments; ovary trigonous; styles 3, arcuate; stigmata peltate. Achenes bluntly triquetrous, usually included, about 1 cm. long.

CANAL ZONE: Balboa, *Standley 25533*; Balboa, *Standley 28551*; Chiva-chiva trail 2 mi. above Red Tank, *Maxon & Harvey 6612*; Matachín to Las Cascadas, *Cowell 357*. PANAMÁ: O. U. Experiment Station, 3 mi. e. of Panamá City, *Maxon, Harvey & Valentine 7088*.

This species is widely cultivated and escaped and determination of its natural range would be difficult. It is cultivated in Florida where it is called "confederate vine". In the West Indies it is called *corallina* and *corallillo*. In Mexico, where it is supposed to have originated, it is called *coronilla* and *chaclomacal*. Other Central American names are *confite*, *flor de san miguel*, *san diego*, *bellisima*, *colación* and *confite rojo*. In the Canal Zone it is called "coralvine", *coralito*, *enredadera* and *cadena de amor*. In Panamá and the Canal Zone, *A. leptopus* seems to be fairly well established. A variant commonly called *A. cinerascens*,* which seems to differ regularly only in its dilated petioles, might also be cultivated here. Comparison of specimens with and without the dilated petioles has revealed no correlated differences. Hence it is concluded that *A. platypus* (*A. cinerascens*) is conspecific with *A. leptopus*.

2. ANTIGONON FLAVESCENS Watson, in Proc. Am. Acad. 22:446. 1887.

Finely pubescent tuberous vines. Leaves narrowly cordate to deltoid, acute, mucronate, the blades mostly about 8 cm. long by 6 cm. broad, pubescent on the veins below; petioles 1–2 cm. long, sparsely pubescent, the leaf bases decurrent on the petioles forming flanges up to 4 mm. broad. Inflorescences of axillary and terminal capreolate racemes or panicles, the rhachises rufous-pubescent. Flowers pedicellate, the minutely pubescent pedicels articulated 2–3 mm. from the rhachis, 7–10 mm. long; tepals greenish white, cordate, acute, in fruit about 10 mm. long by 4 mm. broad, glabrate; stamens 8, connate slightly less than half their length, about 2 mm. long; ovary trigonous; styles 3, arcuate; stigmata peltate. Achenes bluntly triquetrous, about 11 mm. long, slightly exserted.

* The epithet *cinerascens* Mart. & Gal. is antedated three years by the epithet *platypus* Hook. & Arn., published in a footnote. The type of *A. platypus* is *Andrieux 117* and a paratype is *Andrieux 116*. Meissner (in DC. Prodr. 14:184. 1856.) applied the name *A. cordatum* Mart. & Gal. to the type and *A. cinerascens* to the paratype, apparently using the epithets and scarcely diagnostic descriptions of Martens & Galeotti and overlooking the epithet *platypus*. Thus plants with dilated petioles have been passing as *A. cinerascens* rather than *A. platypus*, the earlier name. Recent workers have attributed darker tepals to *A. cinerascens* than to *A. leptopus* but Martens & Galeotti make no such distinction but compare them as "également rose". I feel, just as Hooker & Arnott suggested (Bot. Beech. Voy. 309. 1840.), that there is only one species involved.

This lochmophilous species is known only from Mexico and Guatemala. Due to the inferior color of its tepals, it is less likely to be cultivated than other species. In characters other than color this species is very similar to some of the narrow-tepaled forms of *A. leptopus*. Although the flowers of a specimen labeled *A. flavescens*, Pringle 4570, collected in Jalisco, are annotated by C. H. Thompson (Oct. 10, 1898) as "all right for *A. flavescens*", the fruiting tepals are broadly ovate. If this annotation is correct, there is little doubt that *A. flavescens* is but a color form of *A. leptopus*. Watson (in Proc. Am. Acad. 22:446. 1887.) offered no supporting character for color save the narrower tepals. I strongly suspect that *A. flavescens* is merely a color form of *A. leptopus*. On the contrary, Standley & Steyermark (in Field Mus. Bot. 24⁴:106. 1946.) believe it to be a good species.

3. ANTIGONON GUATEMALENSE Meissn. in DC. Prodr. 14:184. 1856.

Polygonum grandiflorum Bertol. Fl. Guat. 412. 1840. not Willd. 1799.

Antigonon grandiflorum (Bertol.) Robinson, in Proc. Am. Acad. 44:613. 1909.

Antigonon macrocarpum Britton & Small, in Britton & Wilson, in N. Y. Acad. Sci. 5²:266. 1924:

Cinereous tuberous vines. Leaves broadly cordate, abruptly acuminate, mucronate, the blades 3–9 cm. long, 2.5–7 cm. broad, closely cinereous-pubescent below; petioles mostly less than 1 cm. long, cinereous-pubescent, terete, the leaf bases not decurrent. Inflorescences of axillary and terminal capreolate racemes or panicles, the rhachises cinereous-pubescent. Flowers pedicellate, the pedicels medially articulated, with a change in degree of pubescence at the point of articulation, becoming 10–15 mm. long; tepals pink, at anthesis as broad as long, about 1 cm. long, closely cinereous-pubescent without, stipitate-glandular within; stamens 8, connate about one fourth their length, about 2 mm. long; ovary trigonous; styles 3, arcuate; stigmata peltate. Mature achenes not seen.

This species, an inhabitant of thickets, is often cultivated. No specimens have been seen from Panama. It has been collected in Mexico, Guatemala, Salvador, Nicaragua, Costa Rica and the West Indies. Colloquial names reported to be applied in Salvador are *colación*, *confite* and *san andrés*.

4. MUEHLENBECKIA Meissn.

MUEHLENBECKIA Meissn. Gen. Pl. 2:227. 1840. nom. conserv.

Calacinum Raf. Fl. Tellur. 2:33. 1836.

Karkinetron Raf. Fl. Tellur. 5:11. 1836.

Sarcogonum G. Don. in Sweet, Hort. Brit. 3:577. 1839.

Conobaea Bert. in Steud. Nom. Bot. 2¹:404. 1840.

Flowers polygamo-subdioecious (perfect in some spp. outside Panama), with short pedicels articulated at the base of the tepals, 1–5 (–many) in fascicles subtended by telescoped ochreolae. Tepals 5 (6, 4), subequal, greenish white, slightly accrescent and becoming more or less fused with the achene basally. Stamens 8 (–10), 1–3 mm. long, inserted on the base of the tepals, discrete or forming an inconspicuous annular disc, reduced or absent in pistillate flowers; anthers 4-locular,

introrse, versatile. Ovary trigonous, reduced or absent in staminate flowers; styles 3, short, arcuate; stigmata capitate, lobate, or fimbriate. Achenes mostly included, bluntly to acutely triquetrous, dark, lustrous, often punctulate. Scramblers or low matted shrubs with usually glabrous, often sulcate stems. Leaves alternate, entire, apically acuminate to acute, basally hastate, cordate or acute, the blades usually exceeding the petioles; ochreae hyaline and conspicuous, deciduous. Inflorescences of axillary panicles, racemes or glomerules, occasionally leafy.

This genus of some twenty species occurs chiefly in tropical American and Australian areas, often in alpine regions. In Central America are two indigens, *M. tamnifolia* and *M. volcanica*. Only *M. tamnifolia* has been collected in Panama. *M. volcanica*, a low mat-forming alpine shrub with the flowers solitary or fasciculate in the axils of the small elliptic leaves, inhabits the high mountains of Guatemala and western South America from Bolivia to Ecuador. *M. platyclada*, with the stem conspicuously flattened, is often cultivated in the Americas as a bizarre ornamental. It is a native of the Solomon Islands.

1. MUEHLENBECKIA TAMNIFOLIA (HBK.) Meissn. Gen. Pl. 2:227. 1840.

Polygonum tamnifolium HBK. Nov. Gen. & Sp. 2:180. 1817.

Polygonum flexuosum Benth. Pl. Hartw. 80. 1839.

Polygonum quadrangulatum Mart. & Gal. in Bull. Acad. Brux. 10¹:353. 1843.

Muehlenbeckia Benthamii Endl. Gen. Suppl. 4:51. 1847.

Muehlenbeckia quadrangulata Endl. loc. cit. 51. 1847.

Muehlenbeckia tamnifolia α *Humboldtii* Meissn. in DC. Prodr. 14. 149. 1856.

Muehlenbeckia tamnifolia β *quadrangulata* Meissn. loc. cit. 149. 1856.

Muehlenbeckia tamnifolia γ *Hartwegii* Meissn. loc. cit. 149. 1856.

Muehlenbeckia tamnifolia δ *laxiflora* Meissn. loc. cit. 149. 1856.

Muehlenbeckia leptobotrys Meissn. loc. cit. 149. 1856.

Muehlenbeckia Stuebelii Lindau, in Hieron. in Bot. Jahrb. 21:307. 1895.

Sarcogonum tamnifolium Rusby, in Mem. Torr. Club 6:111. 1896.

Calacium tamnifolium (HBK.) Macbr. in Field Mus. Bot. 4:116. 1927.

Calacium leptobotrys (Meissn.) Macbr. loc. cit. 116. 1927.

Clambering glabrous lianas, the branches smooth and sulcate, often angulate. Leaves glabrous, ovate, apically usually abruptly acuminate, basally hastate or cordate to acute, the blades mostly 3–8 cm. long, 1.5–4 cm. broad; petioles mostly 8–20 mm. long, glabrous, terete or canaliculate. Inflorescences chiefly of axillary racemes or panicles, the rhachises glabrous, rarely with reduced leaves. Flowers short-pedicellate, the pedicels apically articulated, 0.5–3 mm. long; tepals mostly five, greenish white, ovate, apically subacute to rounded, slightly connate basally, 1.5–3 mm. long, 1–2 mm. broad, glabrous; staminate flowers with 8 (–10) mostly separate stamens about 1 mm. long attached to the lower half of the tepals, the anthers introrse and versatile, about 0.5 mm. long, the ovary a short 3-styled rudiment or absent; pistillate flowers with trigonous superior ovaries with ovate facies; styles 3, strongly arcuate; stigmata fimbriate-flabellate; stamens reduced to sessile staminodia. Achenes bluntly trigonous, usually included by the tepals and hardly separable from their bases, often capped by an amorphous mass of stylar

tissue, smooth or slightly verrucose, dark, lustrous, 2–3 mm. long, nearly or quite as broad.

CHIRIQUÍ: R. Chiriquí Viejo, near Monte Lirio, G. White 65; Bajo Chorro, Boquete Dist., Davidson 177; vicinity of Casita Alta, Volcán de Chiriquí, Woodson, Allen & Seibert 921; trail from Paso Ancho to Monte Lirio, Allen 1507; Bajo Mono-Robalo trail, western slope of Cerro Horqueta, Allen 4812. PROVINCE UNKNOWN: Sutton Hayes 486, 983.

Often forming tangles in thickets or forests, this species ranges from southern Mexico through Central America and western South America to Argentina. In Costa Rica it is called *bejuco colorado*. A decoction of the leaves was once considered anti-hemorrhagic (fide HBK. Nov. Gen. & Sp. 2:180. 1817.). It is perhaps just coincidental that most specimens from Costa Rica and Panama have rounded to acute leaf bases and in other respects match the description of *M. stuebelii* Lind., a Colombian variant differing chiefly by its attenuate leaf bases and smaller inflorescences exceeded by the leaves. Allen 4812 with both acute and subcordate leaf bases clearly shows that the leaf base is of little taxonomic significance in *M. tamnifolia*. Since many specimens with acute leaf bases have inflorescences clearly exceeding the leaves, it is concluded that *M. stuebelii* is conspecific with *M. tamnifolia*.



Fig. 106. *Muehlenbeckia tamnifolia*

5. COCCOLOBA P. Br. ex L.

By RICHARD A. HOWARD

COCCOLOBA P. Br. ex L. Syst. Nat. ed. 10. 1007, 1367. 1759. Taxon 3:114, 156, 233. 1954, nom. conserv. Howard, Jour. Arnold Arb. 40:176-220. 1959.

Guaibara Miller, Gard. Dict. ed. 4. 2. 1754.

Coccolobis P. Br. Civ. & Nat. Hist. Jam. 209. pl. 14, f. 3. 1756.

Shrubs or trees, trees with scrambling branches, or lianas; branches terete or stout, commonly strongly striate, short shoots commonly developed laterally, or the terminal shoots of limited growth becoming long shoots, pith solid or the stem hollow except at the nodes; nodes commonly swollen; ocreae characteristically developed, sheathing at first, becoming split along one or two sides, the basal portion commonly coriaceous and persistent, the apical portion commonly membranaceous and deciduous or entirely membranaceous and deciduous, glabrous, puberulent or silky pubescent; leaves alternate, persistent or deciduous, membranaceous, chartaceous or coriaceous, on deciduous trees the young leaves usually turning black on drying, varying considerably in size on the same shoots, the leaves of adventitious or juvenile shoots commonly much larger and frequently of different shape from those of normal shoots; the petiole borne at the base of, or well above the base of, the ocrea, petioles slender to stout, commonly canaliculate above, glabrous to puberulent or pubescent; leaf blades with margins flat to slightly recurved, straight or undulate, midrib commonly keeled above and often below, primary veins straight to the margin or branched near the margin becoming reticulate, or arcuate and anastomosing, or arcuate and bifurcate-anastomosing, the secondary venation parallel or reticulate, conspicuous to obscure, leaf surface glabrous, puberulent or pilose becoming glabrate, pubescence often mixed with glandular-like bodies which are either hair bases or resinous excretions from the stomata or rarely multicellular glands; inflorescence terminal or terminal on lateral shoots, paniculate, racemose or spicate, the peduncle usually short; basal ocrea present, flowers functionally unisexual, the staminate flowers borne in clusters of 2-7, the pistillate flowers usually borne singly at each nodule on the rachis, rachis swollen at each flower cluster or terete, flowering clusters distinct or confluent, subtended by a small bract and one or more membranaceous ocreolae, ocreolae usually covering the flower bud and splitting regularly or irregularly forming a membranaceous collar or sheath, or one, two or more appendages, pedicels short or well developed, equaling or exceeding the ocreolae, hypanthium well developed or slight, perianth lobes usually 5, rarely to 7 in number, imbricate in bud, often reflexed at maturity, stamens usually 8, functional stamens exerted, non-functional stamens included, filaments commonly flared at the base and more or less united, functional pistil exerted, the non-functional pistil included, ovary strongly trigonous, glabrous, functional styles 3, or if 2 or 1 the non-functional styles filamentous, stigmatic surface often expanded; hypanthium and perianth lobes expanding in fruit, or only the perianth lobes expanding to cover the achene, fruiting hypanthium when fresh commonly brightly colored and fleshy, usually

astringent to taste, occasionally strongly fibrous; the achene trigonous in outline, black, brown or tan in color, shiny or dull, the outer wall hard, the inner layer papery, seed with ruminant endosperm, the major lobes 3, the minor lobes and involutions numerous, the embryo centrally located, the cotyledons orbicular, flat, rarely folded or contorted, the radicle small and terete.

Type: *Coccoloba uvifera* (L.) L. (*Polygonum uvifera* L.), probably from Jamaica.

- a. Petioles arising from well above the base of ocrea, the diameter of the leaf-scar smaller than the distance to the base of the ocrea.
 - b. Inflorescence paniculate.
 - c. Inflorescence few branched; leaf base rounded or cordate; fruit spherical, rounded at the base..... 1. *C. LASSERI*
 - cc. Inflorescence many branched; leaf blade acute at the base, decurrent on the petiole; fruit oval, stalked at the base..... 2. *C. TUERCKHEIMII*
 - bb. Inflorescence racemose or spicate.
 - d. Inflorescence racemose; the fruits clearly stalked..... 3. *C. CORONATA*
 - dd. Inflorescence spicate; the fruits essentially sessile..... 4. *C. OBOVATA*
- aa. Petioles arising from the base of the ocrea, the diameter of the leaf-scar greater than the distance from the base of the ocrea.
 - f. Inflorescence racemose.
 - g. Lianas; leaves usually oblong-elliptic and bullate between the veins. 5. *C. PARIMENSIS*
 - gg. Trees or shrubs; the branches not climbing.
 - h. Leaves as broad as or broader than long, orbicular to broadly oblong, apex rounded to emarginate; fruit obpyriform, obtuse and rounded at the apex, the perianth lobes imbricate..... 6. *C. UVIFERA*
 - hh. Leaves longer than broad.
 - i. Foliar ocrea 3-5 cm. long, membranaceous or chartaceous, silky pubescent; fruit coronate at the apex, the crown surrounded by the distinct perianth lobes..... 7. *C. MANZANILLENSIS*
 - ii. Foliar ocrea 1-2 cm. long, coriaceous or if chartaceous not silky pubescent; fruit not coronate, the perianth lobes imbricate, covering at least the upper half of the achene.
 - j. Inflorescence strongly sulcate or striate, the flower clusters closely associated and not appearing interrupted, rachis and bracts, ocreolae and perianth densely puberulent; mature fruit with perianth lobes distinct to the base..... 8. *C. DARIENENSIS*
 - jj. Inflorescence terete, not noticeably sulcate or striate, the flower clusters clearly distinct and separate on the axis, rachis and flowers scarcely puberulent or glabrous.
 - k. Leaves narrowly oblong, thick coriaceous, drying pale green or tan, the ultimate venation indistinct; fruit spherical, the perianth lobes surrounding the upper half of the achene..... 9. *C. PADIFORMIS*
 - kk. Leaves elliptic to elliptic-oblong, thin coriaceous, drying dark green or black, the ultimate venation clearly distinct and reticulate; fruit ovoid, the apex obtuse or acute, the perianth lobes distinct to the base, hypanthium scarcely evident..... 10. *C. LEHMANNII*
 - ff. Inflorescence spicate, the pedicels shorter than the ocreolae and the bracts in flower and fruit or if protruding beyond the ocreolae the visible portion less than the diameter of the inflorescence axis; perianth lobes expanding and covering at least the upper half of the mature achene.
 - l. Leaves lanceolate to ovate-lanceolate, the apex acuminate; inflorescence axis swollen at the flower clusters and tapering below each cluster..... 11. *C. ACUMINATA*
 - ll. Leaves oval to orbicular, the apex rounded or emarginate; the inflorescence axis of uniform thickness not expanded at each flower cluster..... 12. *C. CARACASANA*

1. *COCCOLOBA LASSERI* Lundell, Contr. Univ. Mich. Herb. 6:10. 1941.

Tree to 12 m. tall; branchlets thick, striate, puberulent; ocreae cylindrical and flaring at the top, to 1.5 cm. long, subtruncate, membranaceous above the petiole, densely puberulent when young, the petiole inserted at or above the middle; petioles minutely puberulent, stout, striate, 3–8 mm. long; blades obovate or oblanceolate-obovate, 12×5 , 15×8 , 19×10.5 cm. long and broad on fertile branches, chartaceous, glabrous above, puberulent below on the midrib and primary veins, apex rounded to obtusely-acute, attenuate from above the middle to the base, the base emarginate or rounded, primary veins 8–12 on each side; adventitious shoots and their leaves unknown; inflorescences terminating short lateral branches, rarely terminal, paniculate, the panicles sessile, composed of 3 or 4 racemes, the racemes to 30 cm. long, peduncles of racemes to 1.5 cm. long, the rachis densely puberulent, striate; staminate flowers borne in clusters of 3–6, pistillate flowers borne singly, bracts and ocreolae minute, less than 0.5 mm. long, the ocreolae multiple, membranaceous, pedicels 1–1.3 mm. long, puberulent, hypanthium about 1 mm. long, contracted into a short stipe, perianth lobes suborbicular, about 1 mm. in diameter, fertile stamens slightly exceeding the perianth lobes, functional pistil 2–3 mm. long, the styles 2 or 3, fruiting pedicels 1–1.3 mm. long, the mature fruit nearly spherical, the perianth lobes imbricate, about $\frac{1}{3}$ the length of the fruit; the achene light brown, not coronate at the apex.

Common name: "uvero".

Collected in flower in May, June, September and November. Collected in fruit in August and December.

Recorded altitude, the tidal belt to 20 m.

COCLÉ: Aguadulce, Pittier 4089; Penonomé, Williams 357; Stern, Chambers, Dwyer & Ebinger 989. HERRERA: Chitré, Allen IIII; Mangle Dejunco, Steyermark, Allen & Dodge s. n. PANAMÁ: Bejuco, Allen 2542; Panamá Nat. Highway, Las Lajas Bridge, Bartlett & Lasser 16638; Río Pacora, Bartlett & Lasser 16946 (Holotype, MICH.); Balboa to Chamé, Dodge, Hunter, Steyermark & Allen 16732; Punta Paitilla, Standley 26265. PROVINCE UNKNOWN: Duchassaing s. n. (collected 1851).

Here regarded as endemic to Panama. *Coccoloba lasseri* is very similar to *C. tuerckheimii*, differing in its smaller leaves, smaller inflorescence and nearly spherical fruits. A study of young plants, vigorous shoot growth or adventitious growth may well prove this species to be the same as *C. tuerckheimii*.

2. *COCCOLOBA TUERCKHEIMII* Donnell Smith, Bot. Gaz. 37:213. 1904.

Large tree to 15 m. tall; branches stout, striate, the internodes frequently shortened and compacted, forming areas of short shoot growth, lateral shoots, particularly flowering branches, distinct as short shoots; ocreae to 3 cm. long, large and conspicuous, coriaceous, strongly striate and persistent at the base, membranaceous and deciduous at the apex, puberulent becoming glabrate; petioles borne 6–15 mm. above the base of the ocreae, 1.5–3.5 cm. long, usually striate and slender, puberulent when young; blades oblong-ovate, abruptly short acuminate at the apex, the base acute and decurrent on the petiole, 13×7 , 25×12 to 45×25 cm. long and wide, thinly coriaceous, glabrous above, puberulent below



Fig. 107. *Coccoloba lasseri*

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when young, remaining so on the midrib and veins, primary veins 7–10 on each side, occasionally nearly barbate in the axils of the midrib and the veins on each side; inflorescence generally terminal on lateral short shoots, paniculate, the ocreae coriaceous, flaring, striate, 1 cm. long, the panicle almost sessile, peduncle short, 1–3 cm. long, racemes numerous, 10–19, each 10–35 cm. long, rachis and all parts puberulent, staminate flowers in clusters of 4–7, pistillate flowers borne singly at each nodule, bracts small, broadly triangular, less than 0.5 mm. long, ocreolae shorter than to scarcely exceeding the bracts, pedicels 2–3 mm. long, hypanthium conical 0.75 mm. long, perianth lobes oblong, 1–1.5 mm. long, 1 mm. wide, fertile stamens on filaments 3 mm. long, fertile pistil 3 mm. long; fruiting pedicels 2–3 mm. long, fruit oval, 11–14 mm. long, 6–9 mm. in diameter, the apex obtuse and slightly coronate, the perianth lobes surrounding the apex of the achene, the base of the fruit constricted to a stalk 1–2 mm. long; achene dark brown, obtusely trigonous in outline.

Type: *von Tuerckheim 8493*, Cubilquütz, Dept. Alta Verapaz, Guatemala.

Collected in flower in August. Collected in fruit in July.

Guatemala, Honduras, Nicaragua, Costa Rica, Panama.

BOCAS DEL TORO: Changuinola valley, Island of Potrero, *Dunlap 181*. COLON: Dos Bocas, Río Fató valley, *Pittier 4197*.

3. *COCCOLOBA CORONATA* Jacquin, Enum. Pl. Carib. 19. 1760, Select, Stirp. Am. Hist. 114, t. 77. 1763; Dugand, *Caldasia* 4:427. 1947; Howard, Jour. Arnold Arb. 41:40, 226, 227. 1960.

Coccoloba novogranatensis Lindau, Engl. Bot. Jahrb. 13:192. 1890.

Coccoloba caribaea Urban, Symb. Ant. 5:377. 1907.

Coccoloba waitii Johnston, Sargentia 8:122. 1949.

Shrub, 3 m., or tree, 15m.; trunk commonly muscular, bark red; branchlets terete, glabrous, gray, the nodes slightly swollen; ocreae cylindrical, the upper portion membranaceous and deciduous, the lower portion coriaceous and persistent; leaves of normal shoots with petioles 8–11 mm. long, puberulent when young, with age glabrous except in the groove, attached above the base of the ocreae; blades ovate to oblong-ovate to ovate-elliptic, 6 × 4, 9 × 4, 10.5 × 5.5 cm. long and broad, thin-coriaceous, glabrous above, glabrate below except for long hairs along the midrib at the base of the blade, the apex attenuate, the base narrowly cordate, the margin entire, midrib and primary veins inconspicuous above, prominent below, the primary veins 5 or 6 pairs, the ultimate venation finely reticulate; leaves of adventitious shoots generally similar but occasionally obovate and narrowed at the base to ovate-lanceolate or lanceolate-elliptic, the blades 11 × 7 to 18 × 15 cm. long and broad, the basal lobes of leaves of adventitious shoots often overlapping; inflorescence terminal on short lateral shoots, 3–9 cm. long, the basal ocreae 5–10 mm. long, bilobed at the apex, the rachis glabrous, flowers commonly borne singly at each node, but occasionally two together in staminate plants, the bracts oblong, 2 mm. long, 0.5–0.75 mm. broad, the ocreolae 3 mm. long, bilobed at the apex, membranaceous and persistent, the pedicels 2.5–4 mm. long, the hypanthium 0.75 mm. long, the perianth lobes ovate, 1.5 mm. long and broad, the

functional stamens 2.5 mm. long, the functional pistil 2 mm. long; fruit generally spherical with coronate lobes, occasionally narrowed at the base, 1 cm. long, 5–9 mm. in diameter; the achene brown, shining.

Collected in flower in May. Collected in fruit in July, September and November.

St. Vincent, Grenada, Trinidad, Tobago, Margarita, Venezuela, Colombia, Peru, Guatemala, Panama.

DARIÉN: Cana, *Williams 945*. HERRERA: Pesé, *Allen 802*. PANAMÁ: Perlas Islands, Pedro Gonzalez, *Allen 2602*; San José Islands, *Erlanson 377, 550, 216*; *Harlow 41*; *Johnston 213, 230* (GH-type of *C. waitii*) *957, 1306*.

Although most of the specimens cited have been collected in coastal areas or at low elevations, the specimens by *R. S. Williams 945* were collected at 2800 ft. altitude. This collection is young material but appears to be safely referred here.

There appears to be no specimen preserved that was collected by Jacquin. However, the description and illustration are sufficiently specific and can serve as the nomenclatural type.

4. *COCCOLOBA OBOVATA* HBK. Nov. Gen. 2:176. 1817.

Coccoloba Goudotiana Wedd. Ann. Sci. Nat. III, 13:260. 1850.

Coccoloba riparia Lundell, Contr. Univ. Mich. Herb. 6:11. 1941.

Shrub of 3 m. to tree 15 m. tall; branches terete, glabrous; ocreae oblique, truncate, 7–10 mm. long, glabrous, membranaceous, striate, appressed; leaves of normal shoots with petioles 12–15 mm. long, pilose or glabrous, inserted above the base of the ocreae, blades obovate to subround-obovate, rarely ovate-lanceolate to elliptic obovate, 9×6 , 10×4 , 16×8 to 24×9.5 cm. long and wide, apex obtusely acuminate, base slightly cordate, coriaceous, turning dark brown or black on drying, tomentulose on the midrib and veins, persistent, short pilose in the axils of the veins and midrib, commonly densely covered with globose or peltate excretions associated with the stomata; leaves of adventitious shoots with petioles 3.5–6 cm. long, blades broadly elliptic-ovate to elliptic-oblong, 28×14 to 37×26 cm. long and wide; inflorescence terminal, solitary, densely flowered, staminate to 25 cm. long, pistillate to 17 cm. long, the flowers borne singly in the pistillate and in clusters of 4 in the staminate, peduncle, rachis, bracts and ocreolae short pilose, bracts semi-orbicular, 0.75 mm. long, ocreolae bilobed 1.5 mm. long, membranaceous, usually in multiples, pedicels included in the ocreolae in flower, exserted and to 1.5 mm. long in fruit, hypanthium 0.75 mm. long, the lobes ovate or nearly orbicular, to 1 mm. long, functional stamens exserted, sterile stamens included, ovary triangular, styles 3; fruit globose, obtusely-trigonous, strongly striate, the base rounded, the apex obtusely coronate, 6 mm. long, 5.5 mm. in diameter; achene tan to dark brown, trigonous.

Type: Colombia, prov. Tolima, Honda, *Humboldt s. n.* June 1805 (Herb. Willd. 7704), isotype Paris.

Common name: "Papaterra blanca", "Peña blanca".

Collected in flower in March, June, July, September and December. Collected in fruit in August and December.

Altitude range: 50 to 800 m.
Costa Rica, Panama, Colombia.

CANAL ZONE: Barro Colorado Island, *Aviles* 998, *Salvoza* 984, *Shattuck* 1063, *Starry* 298; F. L. Island, *Bangham* 593; Salamanca Hydrographic Station, *Dodge*, *Steyermark* & *Allen* 16983, 16983a, *Woodson*, *Allen & Seibert* 1572; northwestern part of Canal Zone, *Johnston* 1519; between Tumba Vieja and Salamanca, *Steyermark* & *Allen* 16758. CHIRIQUÍ: Cerro Galera Chorchá, *Gualaca*, *Allen* 5020; San Félix, *Allen* 3655; between San Félix and Cerro Flor, *Allen* 1917; Progreso, *Cooper & Slater* 270; San Bertolomé, *Woodson* & *Schery* 947; between Río Chiriquí and Remedios, *Woodson*, *Allen & Seibert* 1182. COCLÉ: El Valle, *Allen* 2229 (MICH—holotype of *C. riparia*). VERAGUAS: between Santiago and David, *Stern*, *Chambers*, *Dwyer* and *Ebinger* 999.

5. *COCOLOBIA PARIMENSIS* Bentham, Hook. Lond. Jour. Bot. 4:626. 1845.

Coccoloba bracteolosa Lundell, Contr. Univ. Mich. Herb. 6:9. 1941, not Meisner.
Coccoloba leptostachya Standley, Contr. Arn. Arb. 5:62. 1933, not Bentham.

Tree to 8 m. with scrambling branches or a liana reaching 44 m.; stems slender, striate, minutely puberulent becoming glabrous, sparsely glandular; ocreae membranaceous, split and flaring at the apex, 2–2.5 cm. long, puberulent, usually deciduous to the petiole; petioles arising from the base of the ocrea, slender, 1.5–2 cm. long on fertile shoots, puberulent; blades oblong-elliptic to elliptic-ovate, 8.5 × 4.5, 13.5 × 7 to 21 × 15 cm. long and broad, membranaceous when young becoming thin-coriaceous when mature, flat to noticeably bullate between the veins, puberulent to short pilose on the midrib and veins, puberulent to glabrate, usually sparsely glandular between the veins, apex short acuminate to obtuse, the base rounded, primary veins 6–9 on each side; leaves of sterile shoots larger, on petioles 5–6 cm. long, the blades to 27 × 16 cm. long and broad, the apex rounded and apiculate, the base truncate to cordate; inflorescence terminal on short lateral branches, usually solitary, all parts puberulent, staminate inflorescence 15 cm. long, the flowers 2–7 at each nodule, the pistillate inflorescences rarely exceeding 10 cm. in length, the flowers borne singly at each nodule, bracts minute, 0.5 mm., ovate, acute, puberulent, ocreolae large, 3–4 mm. long, membranaceous, bilobed, each lobe apiculate to acute, pedicels equaling or slightly exceeding the ocreolae, hypanthium 0.8 mm. long, narrowed to a stipe 0.5–1 mm. at the base, perianth lobes oblong-elliptic, 2 mm. long, fertile stamens longer than the lobes and exerted, fertile pistil 2 mm. long, styles 3, non-functional parts rudimentary; fruiting pedicels 3–4 mm. long, the fruit ovate, 1 cm. long, 8 mm. in diameter, the base rounded, short stalk evident, the apex obtusely acute, not coronate, the lobes imbricate and about ¼ the length of the fruit, smooth and not striate; achene chestnut brown, smooth, not trigonous.

Type: *Schomburgk s. n.* Rio Parimé, Brazil (Kew).

Collected in flower in June. Collected in fruit in June and August.

Panama, Colombia, Peru, Brazil. Altitude to 120 m.

CANAL ZONE: Barro Colorado Island, *Aviles* 15; L. H. & E. Z. *Bailey* 219, 654; *Bangham* 447; *Salvoza* 904; *Shattuck* 1123; *Standley* 41099; *Wetmore* & *Woodworth* 859. PANAMÁ: Juan Díaz region near Tapia river, *Maxon* & *Harvey* 6700.

6. *COCCOLOBA UVIFERA* (L.) L. Syst. Nat. ed. 10. 1007. 1759.*Polygonum uvifera* L. Sp. Pl. 365. 1753.*Guaibara uvifera* House, Amer. Midl. Nat. 8:64. 1922.

Tree of strand areas, 2–15 m. tall; branches stout, papillose to pilose; ocreae rigid, coriaceous at the base, membranaceous at the apex, 3–8 mm. long, papillose to pilose; leaves of normal shoots with stout petioles, 7–10 mm. long, puberulent to pilose, the blades orbicular to reniform, 10×10 , 11×14 , 13×18 , 20×27 cm. long and broad, thick and fleshy when fresh, coriaceous when dry, glabrous and minutely punctate on both surfaces, the apex rounded, truncate or emarginate, the base rounded to broadly cordate, one lobe extending around the petiole, the primary veins 3–5 pairs usually straight, bifurcate and weakly anastomosing near the margin, commonly barbate in the axils of the basal veins, the secondary venation minutely reticulate or obscure; inflorescence stout, 15–30 cm. long, racemose, occasionally branched at the base, the rachis puberulent, staminate flowers in clusters of 1–7, the pistillate flowers solitary at each locus, the bracts ovate, 1–1.5 mm. long, 2 mm. broad, puberulent, the ocreolae membranaceous, 1 mm. long, puberulent, the flowering pedicels 1–2 mm. long, the hypanthium 2–3 mm. long, the perianth lobes 4 mm. long, 3–4 mm. wide, the fertile stamens to 4 mm. long; fruiting pedicels 3–4 mm. long, fruit obpyriform, 1.2–2 cm. long, 8–10 mm. in diameter, narrowed at the base, rounded-truncate at the apex, the perianth rose-purple when mature; achene black.

Type: Linnaean Herbarium—(terminal leaf of young plant.) Jamaica (?)

Local name: "sea grape".

Collected in flower in January, February and October. Collected in fruit in March.

General in the West Indies, Mexico, Central and northern South America along beaches and strand locations.

BOCAS DEL TORO: Almirante, *G. Proctor Cooper 558*; Changuinola valley, *Cooper & Slater 82*; Chiriquí Lagoon, *von Wedel 2826*. PROVINCE UNKNOWN: Isthmus of Chagres, *Fendler 287*.7. *COCCOLOBA MANZANILLENSIS* Beurling, Prim. Fl. Portobello in Kongl. Vetensk. Akad. Handl. Stockh. 142. 1854 (1856). (as *C. manzinellensis*); Lindau, Engl. Bot. Jahrb. 12:209. 1890.*Campdera nematostachya* Griseb., Bonplandia 6:4. 1858.*Coccoloba nematostachya* Lindau, Engl. Bot. Jahrb. 13:208. 1890.

Tree; branches striate, canescent, branchlets striate, silky pubescent; ocreae membranaceous to thinly coriaceous, divided to the middle, protracted in a long obtuse apex, to 4.5 cm. long, golden or tawny pubescent; petioles inserted at the base of the ocreae, 1–2 cm. long, canescent on the adaxial surface, short pilose elsewhere becoming glabrate; leaf blades oblong-elliptic, obovate or obovate-elliptic, apex short acuminate to rarely rounded, narrowed below the middle to a cordate or nearly rounded base, 11×6 , 15×8 , to 25×15 cm. long and wide, thin, coriaceous and flat when young, conspicuously undulate or bullate between the veins

when mature, margin reflexed, primary veins 14–17 on each side, generally glabrous but long pilose on the midrib; inflorescence terminal, the staminate 15–34 cm. long, the pistillate 20 cm. long, loosely flowered, all parts pilose, peduncle 1 cm. long, staminate flowers in clusters of 3 or 4, pistillate flowers borne singly at each nodule, bracts and ocreolae minute, to 0.5 cm. long, pilose, pedicels thin, about 1 mm. long, hypanthium campanulate, slightly stalked, 1 mm. long, the perianth lobes ovate, about 1 mm. long, fertile filaments 1.5 mm. long, exerted, fertile pistil 1.5 mm. long, styles 3, fruiting pedicels 1–1.5 mm. long, fruit ovoid, slightly stalked at the base, coronate at the apex, strongly striate when dry, 7 mm. long, 4 mm. thickest diameter; achene dark brown, strongly trigonous.

Local name: "Hueso" (ex Standley).

Collected in flower in January. Collected in fruit in June.

Endemic to Panama. Known altitude 10–20 m.

CANAL ZONE: Barro Colorado Island, L. H. & E. Z. Bailey 42; *Sbattuck* 425; between Gatún and Lion Hill, *Pittier* 2570. COLÓN: Porto Bello, *Billberg* 230, 234 (Holotype). DARIÉN: La Palma, *Pittier* 6599. PANAMÁ: Pacora, *Allen* 3450. PROVINCE UNKNOWN: *Andersson* s. n. (Type of *C. nematostachya* Griseb., GOET.)

The appearance of specimens assigned to this species vary considerably and depend on the period of collection. The leaves are apparently deciduous and young foliage appears with the flowers. Thus flowering specimens have smaller leaves of soft texture which turn black on drying. This is the condition of the type specimens of both species considered here. A few leaves of the Andersson collection, which is the type of *C. nematostachya*, are more mature and show the bullate characteristic also found in the fully mature leaves of the collection by Liberty Hyde and Ethel Zoe Bailey (number 42) which is the only collection known in fruit. The long ocreae and copious silky pubescence clearly mark this species.

The original spelling of *C. manzinellensis* by Beurling has been changed to *C. manzanillensis* by Lindau. While the island where Billberg collected the type specimen can not be located on modern maps, Beurling's intentions were obvious. Manzanillo, or "little apple" in Spanish, is commonly applied to the widespread and infamous strand plant *Hippomane manchineel*. Although Lindau failed to comment on his correction of an orthographic error or to cite the original spelling, it seems desirable to allow this correction to stand.

8. COCCOLOBA DARIENENSIS Howard, Jour. Arnold Arb. 40:195. 1959.

Tree, to 33 m. tall, d.b.h. 30 cm.; branches terete, glabrous; ocreae chartaceous, obliquely truncate, 1 cm. long, glandular (?) resinous, tightly appressed; petioles arising from the base of the ocreae, 7–11 mm. long, terete or canaliculate above, glabrous; blades narrowly oblong to lanceolate-oblong, acute to short acuminate at the apex, cuneate at the base, 10.5×3.5 to 14.5×5.0 cm. long and wide, thinly coriaceous, glabrous, primary veins 9 or 10 pairs, arcuate-ascending; inflorescence racemose, 8–14 cm. long, ocreolae membranaceous, bracts and ocreolae rarely puberulent and ciliate at the apex and margins; staminate flowers 3–4 per nodule, pedicels shorter than the ocreolae, perianth lobes oblong, 1–1.5 mm. long, glabrous, functional stamens 3 mm. long, sterile pistil rudimentary, 1 mm. long; pistillate

flower not known; fruiting pedicels 1–2 mm. long, exceeding the ocreolae, glabrous; fruit ovoid, 5–7 mm. long, 5 mm. in diameter, rounded at the base, obtusely trigonous at the apex, hypanthium scarcely evident, perianth lobes distinct to the base, imbricate, achene chestnut brown or black, dull or shiny.

Collected in flower in June. Collected in fruit in July and October.

DARIÉN: vicinity of Campamento Buena Vista, Río Chacunaque above confluence with Río Tuquesa, *Stern, Chambers, Dwyer & Ebinger 813, 813A*; trail between Cana and Boca de Cupe, vicinity of El Real, along road to Río Pirré, *Stern, Chambers, Dwyer & Ebinger 603*; Pinogana, *Allen 934* (Holotype GH).

The recent collections by Stern et al. have increased our knowledge of this species, previously known only from the type collection. These specimens substantiate the previously suggested differences from *Coccoloba acuminata*.

The common *Coccoloba venosa* of the West Indies, Central America (Mexico to Costa Rica) and South America (Venezuela and Colombia) is to be expected in Panama. It will be distinguished from the present species by the larger leaves, broadest above the middle and borne on shorter and thicker petioles, by the longer bracts of the inflorescence and the smaller and more pointed fruit with characteristically brilliantly colored fruiting perianth.

9. *COCCOLOBA PADIFORMIS* Meisner in DC Prodr. 14:166. 1856.

Tree to 13 m. tall; branches terete, glabrous; ocreae membranaceous, obliquely truncate, 1 cm. long; petiole arising from the base of the ocreae, canaliculate above, glabrous, 10–18 mm. long; leaf blades oblong to oblong-obovate, apex short acuminate, base narrowed or rounded, 9.5×3.5 , 13×6 to 18×8 cm. long and wide on normal shoots, to 26×12 cm. on vigorous shoots, glabrous, coriaceous when mature, margins slightly recurved, lateral veins 9–11 on each side, arcuate, leaves deciduous, the young leaves bright red to clear yellow, not turning black on drying; inflorescence solitary or to three in a cluster, racemose, 3–6 cm. long, basal ocreae one to several, coriaceous, slightly apiculate, glabrous, rachis terete, crispose puberulent, bracts minute to 1 mm. long, glabrous or puberulent, ocreolae membranaceous, conical or flaring, 1 mm. long, staminate flowers 1 or 2 at each nodule, pistillate flowers solitary at each nodule, pedicels horizontally divergent, 2 mm. long, puberulent or glabrous, hypanthium short, 0.5–0.75 mm. long, perianth lobes ovate-oblong, 1 mm. long, fertile stamens with subulate filaments 2 mm. long, fertile pistil 2 mm. long; fruiting pedicels 3–5 mm. long, fruit globose, 8–9 mm. in diameter when dry, perianth lobes imbricate and distinct for $\frac{1}{4}$ to $\frac{1}{3}$ the length of the fruit; achene pale green to tan, smooth and often shining, not coronate, hypanthium moderately veined when dry.

Type: *Moritz 377* along river Catuche near Caracas, Venezuela.

Costa Rica, Panama, Colombia, Venezuela.

CANAL ZONE: south of Fort Sherman, *Johnston 1737, 1814*; Quebrada Ancha, *Steyermark & Allen 17101*; vicinity of Río Cocoli, Road K-9, *Stern, Chambers, Dwyer & Ebinger 27, 28*; Gatún, *Pittier 2785*.

10. *COCCOLOBA LEHMANNII* Lindau, Engl. Bot. Jahrb., Beibl. 49:6-7. 1895.

Coccoloba lehmannii Lindau, Repert. Nov. Spec. Reg. Veg. 1:156. 1905.
Coccoloba changuinolana Standley, Pub. Field Mus. Nat. Hist. 8, 1:9. 1930.
Coccoloba williamsii Standley, Publ. Field Mus. Nat. Hist. 11, 5:148. 1936.
Coccoloba allenii Lundell, Contr. Univ. Mich. Herb. 6:8. 1941.

Small tree to 10 m. tall; branches sulcate, glabrate; ocreae 1-2 cm. long, membranaceous, mostly deciduous, minutely puberulent with or without resinous excretions, these often becoming numerous and appearing as lepidote scales; petioles arising from the base of the ocreae, 1-2 cm. long, canaliculate above puberulent and/or with resinous scales; leaf blades elliptic, elliptic-oblong, rarely oval-elliptic or obovate-elliptic, the apex short acuminate to acute or obtuse, the base rounded or shortly attenuate to the petiole, 9×4.5 , 15×8 , 17×10 to 20×12 cm. long and wide, thinly coriaceous, glabrous above except puberulent on the midrib, glabrous below or puberulent on the veins or occasionally with resinous excretion evident on the blade and veins, primary veins 10-17 on each side; inflorescence terminal or lateral, racemose, 10, 24, or to 35 cm. long, the peduncle 1-3 cm. long, the ocreae frequently flaring, membranaceous and conspicuous, to 5 cm. long, all parts puberulent or with resinous excretions, staminate flowers borne in clusters of 2-4, pistillate flowers borne singly at each nodule, flower clusters clearly distinct to nearly confluent, bracts triangular-ovate, the apex acute, 1-1.5 mm. long, the ocreolae membranaceous, split along one side and sheathing or equally divided into two flaring or erect lobes, usually membranaceous and conspicuous, 2-3 mm. long, flowering pedicels equaling or slightly shorter than the ocreolae, puberulent, hypanthium 1 mm. long, narrowly campanulate, perianth lobes round to oblong, about 2 mm. long and nearly as wide, functional stamens exerted on filaments, 2 mm. long, functional pistil 1.5 mm. long, styles 3; fruiting pedicels to 6 mm. long, exceeding the ocreolae, fruit ovoid, to 7 mm. long and 5 mm. in diameter, apex obtuse, base rounded, perianth lobes surrounding the achene, hypanthium not evident in fruit; achene light tan, strongly trigonous.

Type: Colombia, Dept. Antioquía, Cauca, *Lehmann 7560*. (lectotype Berlin).

Collected in flower in June and December. Collected in fruit in March and July.

Costa Rica, Panama, Colombia, Venezuela.

BOCAS DEL TORO: Changuinola valley, *Dunlap 499* (type of *C. changuinolana*); Daytonia farm, region of Almirante, *G. Proctor Cooper 421*. COCLÉ: El Valle, *Allen 2181* (type of *C. allenii*), *Allen & Alston 1857*. DARIÉN: Ensenada Guayabo, *Stern & Chambers 181*.

11. *COCCOLOBA ACUMINATA* HBK., Nov. Gen. 2:176. 1817.

Coccoloba strobulifera Meisner, Fl. Bras. V, 1:14, tab. 25. 1855.
Coccoloba acuminata var. *pubescens* Lindau, Engl. Bot. Jahrb. 13:193. 1890.
Coccoloba acuminata var. *glabra* Lindau, Engl. Bot. Jahrb. 13:194. 1890.

Shrub 1-2 m. or tree to 8 m. tall; stems smooth, puberulent to glabrate; ocreae membranaceous, 1 cm. long, truncate, puberulent to ferruginous pilose or with glandular excretions; petioles arising from the base of the ocreae, 1-1.5 cm. long,

ferruginous pilose, puberulent or glabrate; blades lanceolate, ovate-lanceolate or oblong lanceolate, acuminate at the apex, cuneate or almost rounded at the base, 11×4 , 13×3.5 , 17×6 to 24×7 cm. long and wide, subcoriaceous, dark green above and pale gray-green below when fresh, drying black and shiny above and dull opaque below, flat, pilose, puberulent to glabrate below, primary veins 13 to 20 on each side, crispose-pilose in the axils of the veins below, on the midrib or glabrate; inflorescence 15–29 cm. long, nodules distinct and separate, peduncle 2–4 cm. long, rachis pilose, puberulent or glabrate, angular, striate, expanding below each flower cluster, staminate flowers borne singly but subtended by a series of imbricate ocreolae or in clusters of 2–5 flowers each with a single ocreola, pistillate flowers generally borne singly, bracts ovate, acute to acuminate, puberulent, ocreolae membranaceous, puberulent, or pilose-ciliate on the margin, pedicels shorter than the ocreolae, to 1 mm. long, hypanthium campanulate to 1 mm. long, perianth lobes ovate, 1 mm. long, puberulent or glabrous, or with glandular excretions appearing as scales, fertile filaments to 1.5 mm. long, exserted, fertile pistil 1 mm. long, styles 2 or 3; fruit subglobose, strongly trigonous, attenuate at both ends, 6–8 mm. wide at the middle, perianth lobes surrounding $\frac{1}{2}$ to $\frac{2}{3}$ of the fruit, fruiting perianth fleshy, bright or dull red often white when fresh, black when dry; achene chestnut brown to pale tan, shiny, strongly trigonous.

Type: *Humboldt s. n.* near Mompox along Río Magdalena, Colombia.

Collected in flower in February and April. Collected in fruit in February, April, June, July, August and October.

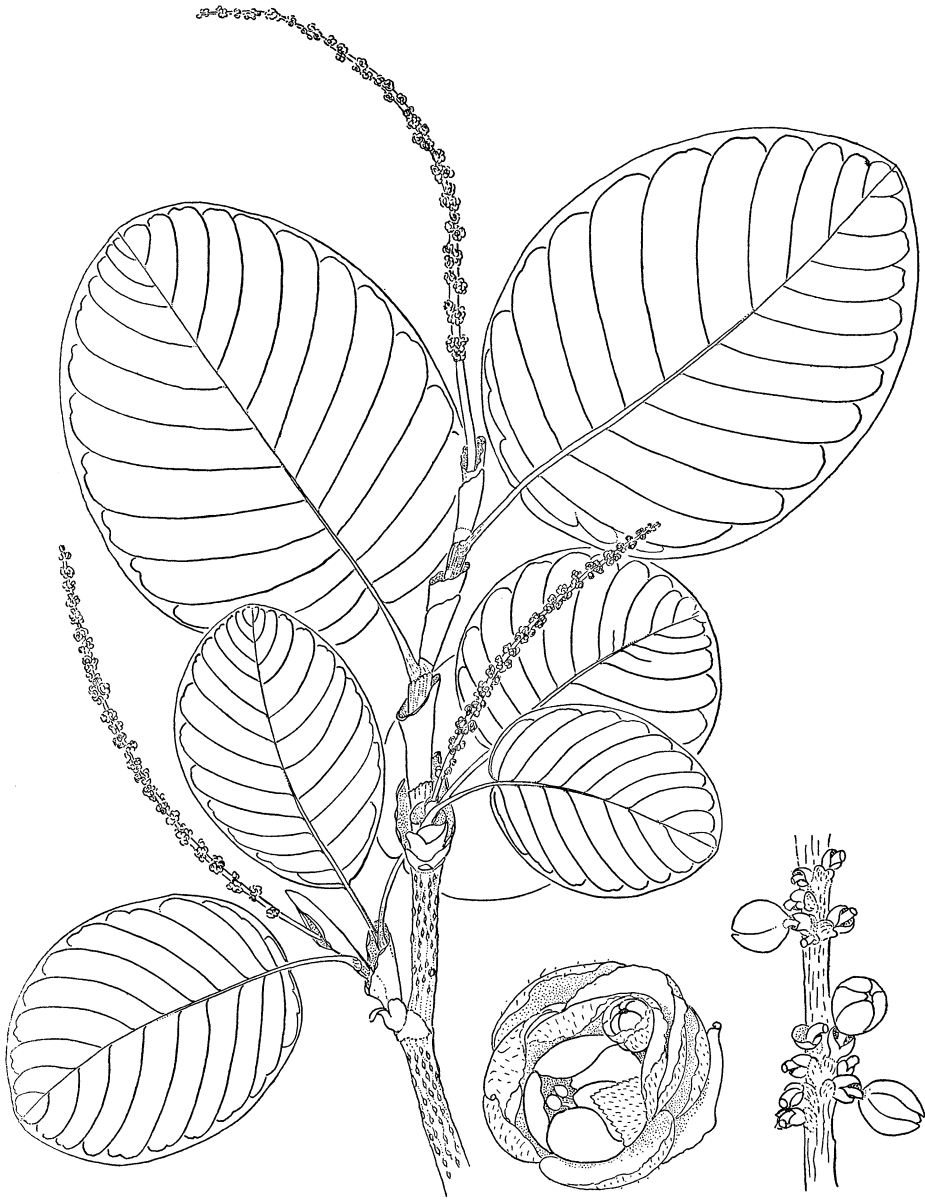
Colombia, Ecuador, Peru, Venezuela, British Guiana, Brazil. Altitude 20–100 m. above sea level.

CANAL ZONE: Barro Colorado Island, *Aviles 74, 976, L. H. & E. Z. Bailey 616, Bangham 378, Starry 223, Wilson 22, 140, Woodworth & Vestal 397*; Juan Mina along Chagres River, *Bartlett & Lasser 16321*; Gamboa Beach, *Maggs II 39*; Frijoles, *Maxon 4707*; Gamboa, *Pittier 2608*; upper Chilibre River, *Seibert 1510*; Quebrada Bonita, *Steyermark & Allen 17194*. DARIÉN: vicinity of Campamento Buena Vista, Río Chucunaque above confluence with Río Tuquesa, *Stern, Chambers, Dwyer & Ebinger 938*; Yape, *Allen 850*; Tucuti, Chepigana, *M. E. & R. A. Terry 1381*; without location, *MacBride 2676*; without province, Maune & Gorgone, *Wagner s. n.*; Marragantí, *Williams s. n.*; without location, *Weddell s. n.*

12. COCCOLOBA CARACASANA Meisner, DC Prodr. 14:157. 1856-57.

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

Tree 2.5–12 m. tall; branches sulcate, hispid pubescent to puberulent or glabrous; ocreae 1–2.5 cm. long, membranaceous, often spreading pubescent, puberulent, glabrous or covered with resinous excretions; petioles borne at the base of the ocreae, 1–2 cm. long, pilose to puberulent or glabrous; leaf blades oval, ovate or orbicular, rarely oblong or elliptic, the apex obtuse, rounded or emarginate, the base usually rounded and slightly cordate, rarely narrowed and acute, 6×6 , 8.5×9 , 12×14 , 14×12 to 15×10.5 cm. long and wide, coriaceous, glabrous above, pilose or hispid below to puberulent or glabrous, the pubescence most commonly persistent in the axils of the veins or on or along the midrib, veins 10 or 11 on each side; leaves of adventitious shoots borne at the base of the ocreae

Fig. 108. *Coccoloba caracasana*

3.5 cm. long petioles to 4 cm. long with blades 37×25 cm. long and wide; inflorescence terminal, to 25 cm. long, the flowering nodes usually distinct, peduncle 2 cm. long, rachis pilose to puberulent, rarely glabrous, sulcate, bracts triangular, acute, 1 mm. long, pilose, ocreolae membranaceous and transparent, pilose to puberulent, spreading, staminate flowers in clusters of 3–4, pistillate flowers borne singly at each nodule, the rachis not swollen or directed below each flower cluster, hypanthium conical, pilose, 0.5 mm. long, the perianth lobes ovate, 1–1.5 mm. long and broad, the outer ones usually densely pilose, fertile stamens 1.5 mm. long, exserted, fertile pistil with exserted styles; fruit nearly globose, 5–6.5 mm. long, 5 mm. in diameter, the base rounded or narrowed to a short stalk when dry, the apex obtuse, the perianth lobes covering $\frac{2}{3}$ of the achene or more, white when fresh, brown or black when dry; achene strongly trigonous, reddish-brown or black when fresh, dull dark brown when dry.

Type: Meisner did not select a type in describing this species. Only one (*Vargas 30**) of the many specimens he did cite is currently in the Prod. Herb. and this must be considered the lectotype.

Local names: "ubero", "papaturre blanco".

Collected in flower in February, March and April. Collected in fruit in April.

Mexico, Guatemala, El Salvador, Costa Rica, Nicaragua, Panama, Colombia, Venezuela.

CANAL ZONE: Ancón, *Pittier 2730*; Gorgas Memorial Lab., *White 106*; below Miraflores Dam, *Stern, Chambers, Dwyer & Ebinger 4*; Río Agua Salud near Frijoles, *Piper 5848*; Victoria Fill near Miraflores Locks, *Allen 1701*. CHIRIQUÍ: Progreso, *Cooper & Slater 270*. PANAMÁ: Sabanas Road, *Gillespie P-34, 34a*; Chepo, *Klug 25*. LOS SANTOS: La Jagua, *Bartlett & Lasser 16382*.

Collectors have noted this species to be infested with biting, stinging ants. None of the specimens seen has a hollow pith or sufficient pith for ant quarters, and I suspect that the ants may be in the ocreae sheaths. This is the only species in Panama reported to have a sweet and edible fruit. Most species of *Coccoloba* have astringent fruit.

6. TRIPLARIS Loefl.

TRIPLARIS Loefl. It. Hisp. 256. 1758.

Blochmannia Reichb. Consp. 163. 1828.

Velasquezia Bertol. Fl. Guat. 39. 1840.

Flowers dioecious, solitary or fasciculate in the ocreolae, short-pedicellate to subsessile, the pedicels, rhachises and dorsal surfaces of the ocreolae usually densely pubescent. Staminate flowers in fascicles of 1–5 subsessile pairs; tepals 6, subequal, linear to ovate, uniseriate, pubescent; stamens 9, exceeding the more or less campanulate tepals, the filaments discretely attached to the bases of the free portions of the tepals, not forming a distinct annular ring; anthers versatile, introrse, 4-locular; pistillodes absent. Pistillate flowers pedicellate and mostly solitary in the ochreolae; tepals in 2 strongly dissimilar series; outer 3 (sepals) connate at the bases forming a rhomboidal to campanulate tube, the distal portions

developing into oblanceolate wings; inner 3 (petals) much smaller, linear to ovate, free or partially adnate to the tube; staminodia absent or occasionally forming an annular disc from which apparently functional stamens arise; ovary trigonous; styles 3, with verrucose stigmatic tissue extending down their inner surfaces to about half their length. Achenes included, triquetrous or rarely terete, with a small beak formed of the persistent style bases, brown, lustrous or dull, occasionally verrucose or punctate. Trees with glabrous to densely tomentose or strigose hollow branches. Leaves alternate, entire, glabrous to densely tomentose or strigose, oblong to ovate, often slightly inequilateral, often with conspicuous longitudinal striae representing the plications of the leaf in the bud, the veins immersed above, but prominent below; ochreae deciduous. Inflorescences of predominantly terminal subspicate panicles or racemes.

Of this largely South American genus of some twenty species and fifty names, three species reach Panama, with only one reaching as far north as Mexico. Many species with bright red inflorescences are cultivated as ornamentals. Some have weedy tendencies and constitute important elements in secondary successions. Much to the collector's consternation, the hollow internodes are almost invariably inhabited by vicious ants. Recent workers have pointed out the urgent need for a monograph of the genus. No monographic work, except on a regional basis, has appeared since Meissner's monograph of the Polygonaceae (in DC. Prodr. 14:1-186. 1856.). The genus, like so many dioecious amentiferous groups, is badly complicated by specific intergradations.

A closely related largely South American genus *Ruprechtia*, which differs in having solid internodes and terete achenes, has been reported from Panama, but the report was based on vegetative material (Standley, in Contr. U. S. Nat. Herb. 27: 170. 1928.). I have seen no specimens of *Ruprechtia* from Panama.

- | | |
|---|----------------------|
| a. Pistillate petals adnate to the calyx tube for 3 mm. or more, often auriculate or tubular near the peak of adnation, longer than the achene, mostly linear to spatulate; achene facies not sulcate; pedicels equaling or exceeding the ochreolae; hairs on the rhachis mostly less than 1 mm. long; staminate spikes more than 6 mm. broad, the tepals connate for at least half their length. | |
| b. Leaves broadly ovate, about twice as long as broad, with about 15 pairs of lateral veins; pistillate petals adnate to the calyx tube for at least 6 mm., conspicuously exceeding the tube and distally dilated. | 1. T. MELAENODENDRON |
| bb. Leaves oblong, 2-4 times as long as broad, with 17-30 pairs of lateral veins; pistillate petals adnate to the calyx tube for 2-5 mm., equaling or slightly exceeding the tube, not conspicuously dilated distally..... | 2. T. CUMINGIANA |
| aa. Pistillate petals scarcely if at all adnate to the calyx tube, exauriculate, shorter than the achene, narrowly obovate; achene facies sulcate; pedicels mostly shorter than the ochreolae, hairs on the rhachises 2.5 mm. long; staminate spikes 5-6 mm. broad, the tepals connate less than half their length..... | 3. T. AMERICANA |

1. *TRIPLARIS MELAENODENDRON* (Bertol.) Standl. & Steyerl. in Field Mus. Bot. 23:5. 1943.

Velasquezia melaenodendron Bertol. Fl. Guat. 40. 1840.

Triplaris auriculata Meissn. in DC. Prodr. 14:174. 1856.

Triplaris Macombii Donn. Sm. in Bot. Gaz. 19:257. 1894.

Triplaris Macombii var. *rufescens* Donn. Sm. loc. cit. 20:293. 1895.

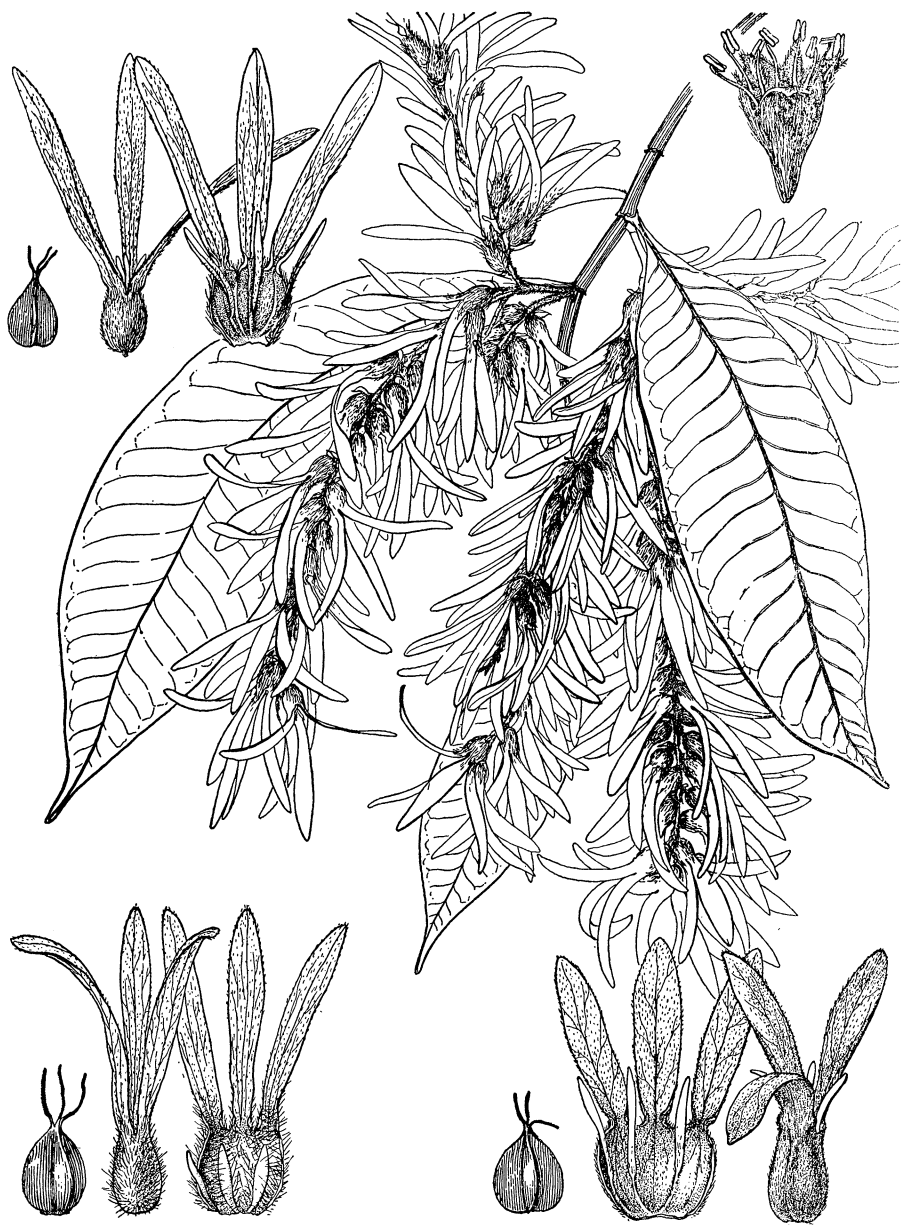


Fig. 109. Above: *Triplaris cumingiana*, habit and details; Lower right: *T. melaenodendron*; Lower left: *T. americana*.

Small trees up to 12 m. high, the upper branches geniculate, glabrous or appressed-pubescent, reddish to grayish brown. Leaves subsessile to petiolate, the petioles canaliculate and up to 2 cm. long; blades ovate, usually 1.5–2 times as long as broad, 15–30 cm. long, 8–18 cm. broad, apically acute to acuminate, basally rounded, densely appressed-pubescent or glabrous, with mostly less than 18 pairs of lateral veins. Staminate inflorescences of fascicles closely approximated along the rachises forming compact spikes up to 1 cm. broad, the spikes simply or racemously disposed; perianth in one series of 3 linear and 3 narrowly deltoid tepals, 4–4.5 mm. long, connate for over half their length; filaments about 7 mm. long, adnate to the tepals for 2–3 mm.; anthers 1–1.5 mm. long. Pistillate flowers with pedicels 3–9 mm. long, the sepals becoming 35–50 mm. long, the wings commonly only twice as long as the tubes; wings oblanceolate with rounded or subacute apices, with 1 conspicuous central vein from which several laterals arise, plicate just above the tubes; tubes more pubescent without than within; petals 15–30 (–40) mm. long, distally up to 3 mm. wide, usually adnate to the tubes for at least 6 mm., often auriculate or tubular near the peak of adnation; ovary trigonous; styles 3, 2–5 mm. long, their inner surfaces stigmatic. Achenes 9–12 mm. long, 5–8 mm. broad, dark yellowish brown; facies ovate, not sulcate.

This, the most common species north of Panama, is an inhabitant of low altitude thickets and forests. Ranging from Mexico to Colombia, it seems to grade into the more southern species *T. cumingiana*. *T. colombiana* Meissn., of northern Colombia, appears to differ only in having narrower leaves and asperulous-punctate achenes. *T. melaenodendron* has been reported from Panama and is to be expected there, but I have yet to see a specimen from Panama. Some common names applied to the tree in Central America are *hormigo*, *mulato*, *tabaco*, *tabacón*, *gallito*, *canilla de mula*, *palo mulato* and *tabaco de monte*. It is one of the most conspicuous elements of the flora of the Pacific Coast of Central America (fide Standl. & Steyererm. in *Field Mus. Bot.* 24⁴:137. 1946).

2. *TRIPLARIS CUMINGIANA* Fischer & Meyer, in *Mem. Acad. St. Petersb.* 6⁶:149. 1840.

? *Triplaris lindeniana* Wedd. in *Ann. Sci. Nat.* 3¹³:266. 1849.

Small trees up to 15 m. high, the upper branches geniculate, usually glabrous, reddish to grayish brown. Leaves subsessile to petiolate, the petioles canaliculate and up to 2 cm. long; blades oblong, mostly 2.5–4 times as long as broad, 15–25 (–30) cm. long, 4–9 cm. wide, apically acute to acuminate, basally rounded to acute, glabrous except for the strigose midribs and occasionally the lateral veins below, with 18–30 pairs of lateral veins. Staminate inflorescences of fascicles closely approximated to the rachises forming compact spikes up to 1 cm. broad, the spikes simply or racemously disposed; perianth in one series of 3 linear and 3 narrowly deltoid tepals 3–4 mm. long, connate for about half their length; filaments 4–6 mm. long, adnate to the tepals for 1.5–2 mm.; anthers 1–1.5 mm. long. Pistillate flowers with pedicels 2.5–9 mm. long, the sepals becoming 30–50 mm. long, the free wings 2–3 times as long as the tubes; wings oblanceolate with

blunt to acute apices, 3-nerved, plicate just above the tube, the tubes more pubescent without than within; petals 12–18 mm. long, adnate to the tube for 2–5 mm., occasionally auriculate or tubular near the peak of adnation; ovary trigonous; styles 3, 2–5 mm. long, their inner surfaces stigmatic. Achenes 8–12 mm. long, 4–5 mm. broad, yellowish-brown; facies ovate, not sulcate, often strongly veined or verrucose.

CANAL ZONE: Between Mt. Hope and Santa Rita Trail, *Cowell 63*; Victoria Fill, near Miraflores Lock, *Allen 1700*; vicinity of former town Empire, Culebra Cut and vicinity, *Hunter & Allen 777*; Ft. Clayton, *Piper 6011*; Ft. Clayton, *Wbeeler & Zetek in 1023*; Pa. Rr. Sta., *Sutton Hayes 971*; no spec. loc., *Christopherson 141*. DARIÉN: trail between Pinogana and Yaviza, *Allen 293*; R. Chucunaque, *Leopold 146*; along Interamerican Hwy. between Pinogana and Yaviza, 1 km. from Tuirá, *Stern, Chambers et al. 126*; vicinity of Campamento Buena Vista, R. Chucunaque, above confluence with R. Tuquesa, *Stern, Chambers et al. 858*. PANAMÁ: Chiva-chiva Rd., 100 m., *Allen 4269*; Chepo, *Kluge 38*. SAN BLAS: Perme, *Cooper 644 & 647*. PROVINCE UNKNOWN: *Sutton Hayes 386*.

This, the commonly collected species in Panama, ranges from Costa Rica to Ecuador. In the West Indies and elsewhere it is cultivated as an ornamental. *Palo santo* and *guayabo hormiguero* are Panamanian names for the tree, the light-grained wood of which is occasionally used in construction.

Stern, Chambers et al. 858 is a particularly edifying collection. Although the tree was in fruit, the leaves were newly unfolding. The very young leaves are quite membranaceous and have 5–6 lines paralleling the midrib on either side. These lines represent folds incurred in the vernation in the strigose, fusiform terminal bud. Juvenile leaves are often unusually broad and may have fewer secondary veins, thus resulting perhaps in confusion with *T. melaenodendron*.

In Colombia *T. cumingiana* grades into closely related *T. surinamensis* Cham., which ranges from Colombia to Brazil, chiefly on the eastern half of the continent. *T. surinamensis* differs in having subglabrous rhachises, petals almost free of the calyx tube, and non-strigose foliar midribs, these often with a down tufted in the axils formed with the secondary veins. Intermediates between *T. cumingiana* and *T. surinamensis* are encountered and may possibly account for the obscure names *T. vabliana* Fischer & Meyer and *T. purdei* Meissner. In Ecuador *T. cumingiana* appears to grade into the larger-fruited *T. guayaquilensis* Wedd. (incl. *T. arnottiana* Meissner). *T. lindeniana* Wedd., with slightly narrower outer tepals, will probably prove, in a more concentrated study, to be conspecific with *T. cumingiana*.

3. *TRIPLARIS AMERICANA* L. Syst. 10:881. 1758-9.

Triplaris pyramidalis Jacq. Select. Stirp. Amer. Hist. 113. 1763.

Triplaris noli-tangere Wedd. in Ann. Sci. Nat. 3¹³:264. 1850.

Triplaris felipensis Wedd. loc. cit. 3¹³:263. 1850.

Triplaris pavonii Meissner, in DC. Prodr. 14:172. 1856.

Triplaris eurypythya Blake, in Contr. U. S. Nat. Herb. 20:239. 1919.

Triplaris laxa Blake, loc. cit. 20:240. 1919.

Small trees up to 20 m. high, the upper branches geniculate, glabrous to pubescent, mostly grayish-brown. Leaves mostly tapering to a petiole 1–4 cm. long and canaliculate; blades ovate, about twice as long as broad (in Panama),

15–30 cm. long, 7–15 cm. broad, apically abruptly acuminate, basally tapered, glabrous to hirsute on the veins below, with mostly 20–25 pairs of lateral veins. Staminate inflorescences of scattered fascicles forming lax spikes mostly less than 6 mm. broad, the spikes simply or racemously disposed; perianth in 1 series of 6 narrowly ovate tepals 2 mm. long, 1 mm. broad, connate for about 0.5 mm.; filaments about 2 mm. long, adnate to the tepals for about 0.5 mm.; anthers about 0.5 mm. long. Pistillate flowers with pedicels 2–5 mm. long, sepals becoming 30–45 mm. long; wings mostly about 3 times as long as the tubes, oblanceolate with rounded apices, with 1 conspicuous vein from which several laterals arise, plicate just above the tubes; tubes as pilose within as without; petals 4–7 mm. long, 1–2 mm. broad, essentially free of the tubes, narrowly ovate to obovate; ovary trigonous; styles 3, 3–4 mm. long, their inner surfaces stigmatic. Achenes 7–8 mm. long, 3–5 mm. broad, yellowish brown, with a medial sulcation in which the petals fit.

DARIÉN: Marraganti and vicinity, 10–200 ft., *Williams 988*; vicinity Pinogana, 20 m., *Allen 4276*.

This variable species ranges from Panama to Brazil mostly at elevations below 900 meters and seems to be an important element in rain forests and in secondary successions. In Panama it is probably called *palo santo*; in Colombia it is called *vara santa*; in Peru, *tangarana* and *tangarana blanca*; in Brazil, *formigueira*.

Comparison of the achenes of the Panama material with those of the types of *T. felipensis*, *T. pavonii*, *T. williamsii* (in herb. N. Y. Bot. Gard.), and *T. euryphylla* and *T. laxa* (in U. S. Nat. Herb.) reveals that they possess in common the sulcate achenes as they are so clearly illustrated in the original description of *T. pyramidalis* Jacq. (Select. Stirp. Amer. Hist. pl. 173, fig. 5. 1763.). Dugand (in *Mutisia* 10:4. 1952) has correctly associated Colombian specimens with *T. pyramidalis*, and he indicates the close applicability of this name to the descriptions of *T. euryphylla* and *T. felipensis*. *T. williamsii* Rusby and *T. laxa* Blake are narrow-leaved variants perhaps worthy of specific designation. *Klug 2162* from Peru and *Krukoff 8330* from Brazil probably represent *T. bonplandiana* Wedd., which differs in having slightly sulcate, terete achenes and the petals occasionally lacking. *Ruprechtia martii* Meissner is very similar to and probably conspecific with *T. bonplandiana*. *T. brasiliiana* Cham. (incl. *T. formicosa* Moore) represents a small-fruited departure from *T. americana*. *T. guanaensis* Rusby* (incl. *T.*

**T. guanaensis* is involved in a species complex centering about *T. setosa* Rusby, a species with stiff pustulate hairs up to 1 cm. long. Britton (ex Rusby, in Bull. Torr. Bot. Club 27:130. 1900) described *T. hispida* from Bolivia. I believe this to be a hybrid between *T. guanaensis* and *T. setosa*. In the same year Huber (in Bol. Mus. Goeldi 4:559. 1900) described *T. longifolia* from sterile material which had the distinctive hairs of *T. setosa* and might or might not be a hybrid. Then Rusby (in Mem. N. Y. Bot. Gard. 7:237. 1927) described *T. setosa* noting its affinity to *T. hispida*. Plants fitting *T. setosa* have long been passing as *T. poeppigiana* Wedd., but the type of *T. poeppigiana* has rhomboidal tubes with strongly plicate wings; furthermore it was described as having glabrous branches. The type of *T. setosa* contrasts sharply with its campanulate tubes with non-plicate wings and broad, round sinuses, and with pustulate hairs up to 1 cm. long. None of the Meissner types (in herb. N. Y. Bot. Gard.) and none of the Meissner descriptions (in DC. Prodr. 14:171. 1856) seems to resemble *T. setosa*. Standley (in Field Mus. Bot. 13²:467. 1937) erroneously listed *T. setosa* as a synonym for *T. poeppigiana*. He also there described *T. punctata*, which seems to differ from *T. setosa* only in lacking the pustulate hairs.

boliviana Britton) differs slightly from *T. americana* in having lanceolate petals exceeding and masking the achene.

The name *T. americana* L. has long remained a mystery since the Linnaean description divulges no diagnostic secrets. A mysterious sheet, bearing only a fragment of a fruiting inflorescence, from the Bernhardt herbarium, which houses the type of *T. surinamensis*, is inscribed simply "Triplaris americana". This could very possibly be a fragment of the Linnaean type or a comparable specimen; the fruits are the same size as those in a microfiche of the Linnaean type. The leaves, as evidenced by the microfiche, are also identical with those of the specimens that I am treating as *T. americana*. A more firm substantiation of my claim, that *T. americana* and *T. pyramidalis* are conspecific, may be desired, but this would require a dissection of the Linnaean type. I sense no discomfort, however, in predicting* that such an operation would unclot an achene with a groove in each of its three facies, and that in the groove or closely appressed to it will be a narrowly ovate or obovate petal, so characteristic of the extant Panamanian collections of what I here call *T. Americana* L.

* The prediction has already been fulfilled. In a letter dated Oct. 4, 1960, Prof. Dugand informs me that he has sent "nearly topotypical" *T. pyramidalis* to Sandwith for comparison with the type of *T. americana*. Dr. Sandwith confirmed Dugand's view that *T. americana* and *T. pyramidalis* are conspecific.