



**Flora of Panama. Part IX. Family 171. Scrophulariaceae**

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# FLORA OF PANAMA<sup>1</sup>

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY  
AND COLLABORATORS

## Part IX

### FAMILY 171. SCROPHULARIACEAE

W. G. D'ARCY<sup>2</sup>

Mostly *herbs* or *shrubs*, rarely *trees* or *lianas*, sometimes paludal or aquatic, sometimes parasitic or saprophytic, glabrous or pubescent with simple or branched, glandular or eglandular hairs, often gland dotted, often drying black. *Leaves* opposite or alternate, occasionally verticillate, simple or compound, mostly serrate to denticulate, sometimes deeply incised; exstipulate. *Inflorescences* cymose, racemose or spicate, often with flowers solitary or in pairs, mostly axillary; pedicels mostly subtended by 1–2 bracts, the bractlets sometimes present, the bracts sometimes colorful. *Flowers* mostly perfect, zygomorphic, the calyx mostly of 5 similar or dissimilar, united or deeply divided lobes; corolla 5 or fewer lobed, mostly 2-lipped, the upper (posterior) lip of 3 lobes, often elaborated into saccate or other irregular forms; stamens (5)4 or 2, staminodes sometimes present, inserted in the corolla tube, mostly didynamous or 2, the anthers 1–2 thecate, the thecae sometimes separated on variously elaborated connective arms, sometimes confluent; disc sometimes present; ovary 2 locular at least basally, sometimes 1 locular apically, each locule with many(–few–1) anatropous or amphitropous ovules on elaborated placentas; styles mostly united, the stigmas 2 or 1. *Fruit* mostly a septicidal or also loculicidal capsule, sometimes a berry or nutlike, the placenta often persistent as a tuberculate peg, sometimes winged; seeds small, the embryo straight or slightly bent, the endosperm fleshy.

#### Literature:

- Pennell, F. W. 1935. The Scrophulariaceae of Eastern Temperate North America. Acad. Nat. Sci. Philadelphia Monogr. 1: 1–650.  
Standley, P. C. & L. O. Williams. 1973. Scrophulariaceae in Flora of Guatemala, Fieldiana, Bot. 24 (IX 3–4): 319–418.  
Thieret, J. W. 1954. The tribes and genera of Central American Scrophulariaceae. Ceiba 4: 164–184.  
———. 1967. Supraspecific classification in Scrophulariaceae: a review. Sida 3: 87–106.

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1. Leaves deeply lobed, dissected or compound.

2. Plants submersed aquatics; leaves lax, the segments filiform ..... 5. *Benjaminia*

- 2'. Plants terrestrial; leaves turgid or stiff, the segments linear to broad.
3. Corollas bright yellow, sometimes drying orange; calyces green, not showy; leaves membranaceous, the segments mostly more than 5 mm wide; corolla exerted, the lower lip inflated, entire ..... 7. *Calceolaria*
- 3'. Corollas green, red or yellowish; calyces or bracts red, often showy; leaves stiff, the segments mostly less than 3 mm wide; corolla included, the tube elongate, the lower lip 3-toothed ..... 9. *Castilleja*
- 1'. Leaves simple, toothed, crenate or entire, rarely lobed or dissected.
4. Fruit a globose capsule packed with hairs; corollas tubular, red or pink, glabrous outside, the flowers in clusters or pairs ..... 18. *Russelia*
- 4'. Fruit a capsule lacking internal hairs, or a berry; corollas various, if red and tubular then pubescent outside, flowers variously disposed.
5. Flowers more than 1.3 cm long.
6. Corollas bright yellow, sometimes drying orange; leaves lanceolate, petiolate ..... 7. *Calceolaria*
- 6'. Corollas red, white, greenish, sometimes fading yellowish; leaves various, if lanceolate, then sessile.
7. Flowers narrowly tubular or salverform.
8. Leaves mostly linear, mostly less than 4 mm wide; plants drying dark ..... 6. *Buchnera*
- 8'. Leaves more than 4 mm wide, ovate; plants drying green or brown.
9. Corolla salverform, the limb flaring, more than 3 cm wide; pedicels stout and elongate, bibracteate partway up ..... 11. *Escobedia*
- 9'. Corolla tubular, the limb mostly erect, less than 2 cm wide; pedicels either slender or short, lacking bracts.
10. Leaves entire; corolla glabrous outside, white or purplish ..... 12. *Gibsoniothamnus*
- 10'. Leaves dentate or serrate; corolla pubescent outside, red or orange ..... 13. *Lamourouxia*
- 7'. Flowers campanulate or irregular (saccate).
11. Leaves linear, less than 4 mm wide; plants drying dark ..... 1. *Agalinis*
- 11'. Leaves linear to ovate, more than 4 mm wide; plants mostly drying green or brown.
12. Leaves more than 2 cm wide; flowers white or pinkish.
13. Leaves opposite.
14. Leaves lanceolate; coarse herb mostly over 40 cm tall; fruit a rotund white berry ..... 14. *Leucocarpus*
- 14'. Leaves ovate; forest herb less than 30 cm tall; fruit a narrow capsule ..... 21. *Tetranema*
- 13'. Leaves alternate ..... 10. *Digitalis*
- 12'. Leaves less than 2 cm wide; flowers blue or purplish.
15. Capsule enclosed in the winged calyx cup; leaves ovate ..... 22. *Torenia*
- 15'. Capsule exerted from the short calyx cup; leaves linear ..... 3. *Angelonia*
- 5'. Flowers less than 1.3 cm long.
16. Leaves lanceolate, mostly over 2 cm wide, 10 cm long; large herbs mostly over 40 cm tall; fruit a white berry ..... 14. *Leucocarpus*
- 16'. Leaves various, if lanceolate then less than 2 cm wide, 10 cm long; herbs mostly less than 40 cm tall, or shrubs; fruit a capsule.
17. Capsule apically divided into 2 rounded lobes (Fig. 23.) ..... 23. *Veronica*
- 17'. Capsule unlobed, obtuse or globose.
18. Leaves linear, less than 5 mm wide and several times longer than wide, mostly entire, sometimes minutely and sparingly toothed.
19. Flowering calyx tubular; plants drying dark.
20. Corolla pink, purplish or white, the limb of spreading, subequal lobes; calyx green or dark, not showy; anthers 1-thecate ..... 6. *Buchnera*
- 20'. Corolla green or yellowish, the limb of unlike erect and recurved lobes; calyx showy red or orange; anthers 2-thecate ..... 9. *Castilleja*

- 19'. Flowering calyx either cup shaped, tubular, or leaflike; plants mostly not drying dark.
21. Calyx lobes of different size and shape, mostly ovate ..... 4. *Bacopa*
- 21'. Calyx lobes all alike, mostly narrow.
22. Flowers sessile or nearly so ..... 20. *Stemodia*
- 22'. Flowers distinctly pedicellate.
23. Fruiting pedicels less than 10 mm long; flowers white ..... 19. *Scoparia*
- 23'. Fruiting pedicels more than 10 mm long; flowers pink ..... 1. *Agalinis*
- 18'. Leaves deltoid, ovate, rotund or elliptic, mostly less than twice as long as broad (sometimes less than 5 mm wide), entire or toothed.
24. Leaves alternate; shrubs; corolla white, campanulate ..... 8. *Capraria*
- 24'. Leaves opposite; herbs; corolla white, yellow or blue, shapes various.
25. Leaves scabrous; flowers yellow, inconspicuous in spike-like terminal racemes ..... 2. *Alectra*
- 25'. Leaves smooth; flowers variously colored, pedunculate or sessile, solitary or in clusters.
26. Plants erect or ascending, mostly over 6 cm tall.
27. Placenta conspicuously winged by the septum after seeds have fallen; flowers blue or purple.
28. Capsule enclosed in the calyx cup ..... 22. *Torenia*
- 28'. Capsule exerted from the calyx cup ..... 15. *Lindernia*
- 27'. Placenta peglike, globose or rudimentary, un-winged; flowers white or bluish.
29. Calyx lobes of different size and shape, mostly ovate or cordate.
30. Flowers yellow; anther cells separated on arms (Fig. 15.) ..... 16. *Mecardonia*
- 30'. Flowers white; anther cells contiguous, at least in part ..... 4. *Bacopa*
- 29'. Calyx lobes all alike, mostly narrow.
31. Capsules globose; flowers white ..... 19. *Scoparia*
- 31'. Capsules ovoid or ellipsoid; flowers blue ..... 20. *Stemodia*
- 26'. Plants prostrate, creeping, or ascending, less than 6 cm tall.
32. Fruits globose ..... 17. *Micranthemum*
- 32'. Fruits ovoid or ellipsoid.
33. Calyx lobes of different size and shape, mostly ovate or cordate.
34. Flowers yellow; anther cells separated on arms (Fig. 15.) ..... 16. *Mecardonia*
- 34'. Flowers white; anther cells contiguous, at least in part ..... 4. *Bacopa*
- 33'. Calyx lobes all alike, mostly narrow ..... 20. *Stemodia*

The Scrophulariaceae includes over 250 genera with over 5,000 species distributed worldwide, but with the greatest number of species in temperate regions. Many of the species are wide ranging.

The family can usually be recognized by the 2-lipped flowers with paired stamens and the conical or globose capsules which contain many small seeds

and a peglike placenta. There are many exceptions to these features, but the Scrophulariaceae has every appearance of being a natural group. However, some genera usually placed in the family may belong to other families. Thus Niezgodá and Tomb (1975) report that the pollen of *Capraria* is more like that in the Myoporaceae than in the Scrophulariaceae, and *Gibsoniothamnus* has characters strongly suggesting placement in the Bignoniaceae or Gesneriaceae rather than in the Scrophulariaceae. *Tetranema* is quite unlike other members of the Scrophulariaceae and is strongly suggestive of the Gesneriaceae. At the same time, *Nautilocalyx*, which is usually considered to belong to the Gesneriaceae, may actually belong to the Scrophulariaceae. At one time the Scrophulariaceae was considered to be closely related to the Solanaceae and some elements, e.g., *Verbascum* (not in Panama) were thought to be transitional between the two families. Several seemingly fundamental features, e.g., absence of internal phloem, presence of iridioid compounds, and regular rather than asymmetrical ovary placement argue against close affinity between these two large but somewhat similar families. The same features just noted support affinity of the Scrophulariaceae with the Bignoniaceae and Gesneriaceae.

Classification of the family tends to recognize two major groups, subfamily Scrophularioideae (Antirrhinoideae) in which the posterior (upper) lip of the corolla is external in bud, and subfamily Rhinanthoideae in which it is internal. The Rhinanthoideae are frequently parasitic and they have a greater tendency to dry dark. The greatest Panamanian development in the family is in tribe Gratioleae subfamily Scrophularioideae, which includes many paludal or aquatic herbs of both New and Old Worlds—in Panama: *Bacopa*, *Benjaminia*, *Capraria*, *Leucocarpus*, *Lindernia*, *Mecardonia*, *Micranthemum*, and *Stemodia*.

Many species of Scrophulariaceae are valuable horticultural items, especially in temperate gardens, and a few, e.g. *Digitalis*, yield drugs, but the family is of little economic importance.

## 1. AGALINIS

**Agalinis** Raf., New Fl. & Bot. N. Amer. 2: 61. 1837. (nomen cons. contra *Chyrta* Gaertn.). TYPE: *A. plustris* Raf. = *A. purpurea* (L.) Pennell (type cons.).

*Chyrta* Gaertn., Fruct. Sem. Pl. 3: 184. 1807. TYPE: *C. anomala* Gaertn. = *A. tenuifolia* (Vahl) Raf.

*Virgularia* Ruiz & Pavón, Fl. Peruv. Chile Prodr. 92, tab. 19. 1794. (nomen rejic. proposita). LECTOTYPE: *V. lanceolata* Ruiz & Pavón.

*Tomanthera* Raf., New Fl. Bot. N. Amer. 2: 65, tab. 836. 1837. TYPE: *T. lanceolata* Raf. = *Agalinis auriculata* (Michx.) Blake.

*Otophylla* Benth. in DC., Prodr. 10: 512. 1846. LECTOTYPE: *O. michauxii* Benth. = *Agalinis auriculata* (Michx.) Blake.

*Anisantherina* Pennell, Mem. Torrey Bot. Club 16: 106. 1920. Based on *Gerardia hispidula* Mart. = *Agalinis hispidula* (Mart.) D'Arcy.

*Gerardia* sensu auct., non L., Gen. Pl. ed. 5. 266. 1754. (nomen rejic. vs. *Stenandrium* Nees, Acanthaceae).

*Herbs* or *shrubs*, annual or perennial, usually erect, branched, virgate, glabrous hirsute or scabrous, eglandular; parasitic on the roots of other plants. *Leaves* opposite or alternate, often reduced upwards, mostly narrow, entire, glabrous

beneath, glabrous or scabrous above, lacking defined petioles. *Inflorescences* terminal racemes or panicles, mostly open; peduncles slender, often bracteate; pedicels bibracteolate or obsolete. *Flowers* mostly showy, pink, purple or sometimes white, the calyx tubular or campanulate, 5-lobed or toothed, the lobes sometimes denticulate; corolla campanulate, the tube straight or slightly curved, slightly inflated upwards, the limb spreading with 5 rounded lobes, sometimes somewhat 2-lipped; sometimes puberulent inside or out; stamens 4, didynamous, the filaments inserted halfway up the corolla tube, mostly pilose, the anther thecae equal or somewhat unequal but all similar in shape, mostly parallel, sometimes basally spurred, dehiscent longitudinally; ovary glabrous, 2-locular, the style slender, straight, deciduous, the stigma solitary, terminal. *Capsule* woody, chartaceous or sometimes leathery, mucronulate, loculicidally and sometimes septicidally dehiscent; seeds many, reticulate, oblong to prismatic.

*Agalinis* is usually easily recognized by its showy, distinct pink flowers and linear leaves on wiry stems. The name is used here in the hopes that the prior name, *Virgularia*, will be rejected by international committee. *Agalinis* includes about 40 species of the New World with the largest number of species (20) occurring in the eastern United States. *Agalinis* is closely related to *Sopubia*, a large Old World genus distinguished by having one anther sac reduced to a linear, fingerlike downward directed process. The name *Sopubia* Don. (1825) antedates *Agalinis*.

#### Literature:

- D'Arcy, W. G. 1979. Proposal to conserve the name *Agalinis* Raf. (1837) against *Virgularia* Ruiz & Pavon (1794) Scrophulariaceae. *Taxon* 28: 419-422.  
 Hansen, O. J. 1975. The East African species of *Sopubia* (Scrophulariaceae). *Kew Bull.* 30: 543-558.  
 Pennell, F. W. 1928-29. 1929-30. *Agalinis* and allies in North America. *Proc. Acad. Nat. Sci. Philadelphia* 80: 339-449; 81: 111-247.

#### 1. *Agalinis hispidula* (Mart.) D'Arcy, *Ann. Missouri Bot. Gard.* 65: 4. 1978. [1979]—FIG. 1.

*Gerardia hispidula* Mart., *Nov. Gen. Sp. Pl.* 3: 13. 1929. TYPE: not seen.

*Anisantherina hispidula* (Mart.) Pennell, *Mem. Torrey Bot. Club* 16: 106. 1920.

Erect, wiry annual *herbs* to 50 cm tall, often drying black; stems branching, slender, hispidulous with straight, multicellular hairs. *Leaves* opposite below, sometimes alternate above, to 8 cm long, linear, costate, the margins sparingly denticulate, scabrous above, glabrate beneath. *Inflorescences* open terminal racemes or panicles; pedicels 10-20 mm long, stiff, slender, glabrous, subtended by a leaf or bract, bearing two scalelike bracts about ½ way along the length. *Flowers* with the calyx campanulate cyathiform, ca. 6 mm long, the 5 deltoid teeth apically acuminate to subulate, glabrous, slightly accrescent in fruit; corolla pink, campanulate, 10-12 mm long, the limb ca. 6 mm long, the lobes ca. 3 mm long; stamens 4, the filaments inserted at the bottom of the limb (top of constriction in the tube), long pilose upwards, the anther thecae unequal, divergent, included. *Capsule* exserted 3-5 mm (¼ of the length), dehiscent septicidally

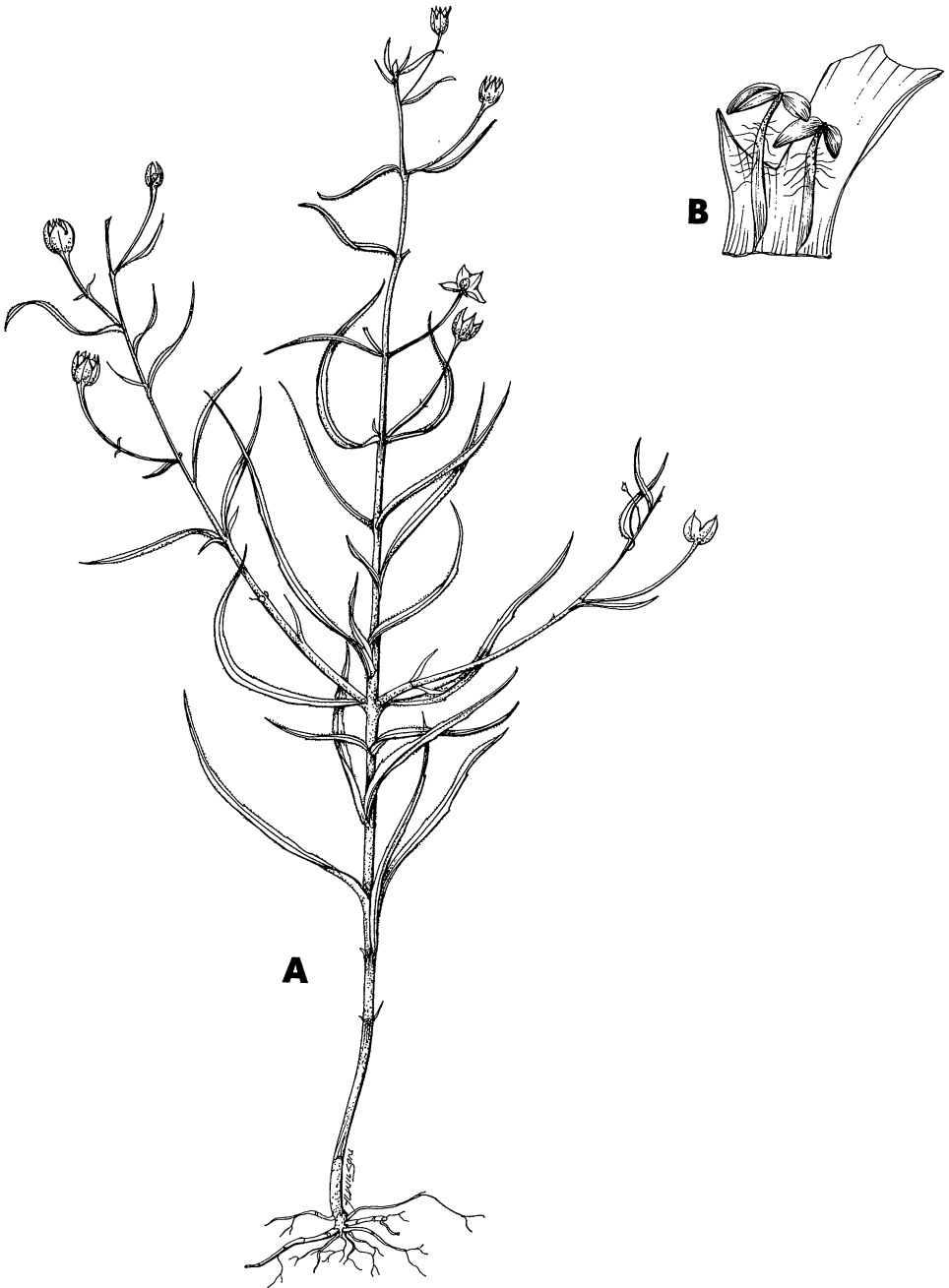


FIGURE 1. *Agalinis hispidula* (Mart.) D'Arcy.—A. Habit ( $\times\frac{1}{2}$ ).—B. Stamens. Note one reduced theca in each anther ( $\times 5\frac{1}{2}$ ). [After Allen 821 (MO).]

and also sometimes loculicidally, the septum remaining with the capsule, the placenta dark, shiny, pitted.

This species may be recognized by its wiry, linear leaves and showy, bell-like pink flowers. In Panama it grows on open savannahs. *Agalinis hispidula* ranges from Guatemala to Brasil, occurring in similar open habitats. In Belize it occurs in pineland savannahs.

Because the anther thecae are slightly unequal, Pennell segregated this species as the genus *Anisantherina*. The Old World genus *Sopubia* is very much like *Gerardia* but is distinct in its singular anther thecae (Hansen, 1975). One cell of the anther is reduced to a fingerlike process which is directed downwards from the other. The reduction of anther cell in *Agalinis hispidula* is much less advanced and the shape of the two cells is similar. Pennell commented on possible affinity of this species with Old World stocks and drew attention to the condition in *Sopubia*, but he thought that *Agalinis hispidula* is more closely related to *Buchnera* and *Harveya* of the Old World than to other species of *Agalinis* in the Americas. His hypothesis does not evoke confidence.

COCLÉ: Natá, 50 m, *Allen 821* (MO, US). Hills W of Soná, *Allen 1070* (MO). Sabana de Dormisolo near Chepo, *Pittier 4664* (US). Aguadulce, *Pittier 4857* (US).

## 2. ALECTRA

*Alectra*<sup>3</sup> Thunberg, Nov. Gen. Pl. 81. 1784. TYPE: *A. capensis* Thunb.

Erect, wiry *herbs* parasitizing the roots of other plants. *Leaves* opposite or alternate, crenate to toothed, often scabrous, subsessile or petiolate, often appearing 3-nerved. *Inflorescences* solitary flowers in the upper leaf axils, sometimes appearing racemose; pedicels with a narrow bract near the apex. *Flowers* with the calyx campanulate, the 5 short lobes alike; corolla campanulate, variously exserted; stamens 4, the filaments glabrous or bearded, the anthers sometimes mucronate. *Fruiting calyx* sometimes accrescent.

*Alectra* is a primarily African genus with about 40 species in all. Two species occur in the New World. The plants are parasites on the roots of other plants but have normally developed leaves. The leaves may be opposite or alternate. Most collections dry without evident flowers, and the latest revision of the genus (Melchior, 1941) did not provide full descriptions of floral details, hence the brief description above.

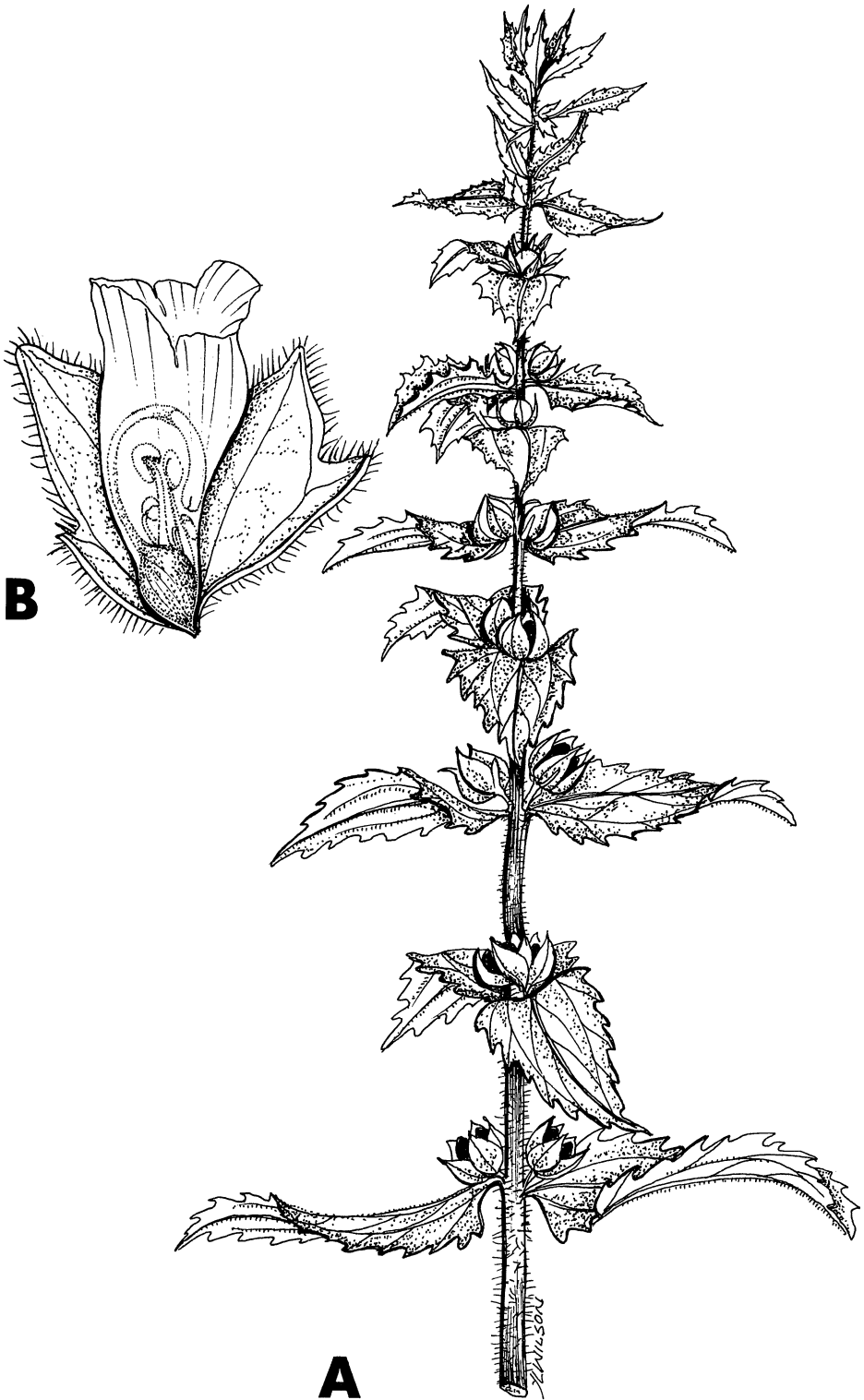
### Literature:

Melchior, H. 1941. Die Gattung *Alectra* Thunb., Notizbl. Bot. Gart. Berlin-Dahlem 15: 423-447.

1. *Alectra aspera* (Cham. & Schlecht.) L. O. Williams, Fieldiana, Bot. 34: 118. 1972.—FIG. 2.

<sup>3</sup> For a list of synonyms see Melchior (1941). Only this name has been used for Central American material.





*Pedicularis melampyroides* L. Cl. Rich., Actes Soc. Hist. Nat. Paris 1: 111. 1792. TYPE: not seen.

*Glossostylis aspera* Cham. & Schlecht., Linnaea 3: 22. 1828. TYPE: Brazil, *Beyrich* (PMO).

*Alectra brasiliensis* Benth. in DC., Prodr. 10: 339. 1846. Authentic specimens: Brazil, *Gardner 567*, *Salzmann* (both MO).

*Alectra melampyroides* (L. Cl. Rich.) Kuntze, Rev. Gen. Pl. 2: 458. 1891, not *Alectra melampyroides* Benth. in DC., Prodr. 10: 339. 1846.

*Melasma melampyroides* (L. Cl. Rich.) Pennell in Britton & Wilson, Sci. Surv. P. R. & V. I. 6: 188. 1925.

Strict, erect *herbs* to 60 cm tall, stems wiry, hirsute with brownish, weak, several-celled hairs. *Leaves* opposite to alternate, subsessile, lanceolate, ovate or deltoid, apically acute, basally cuneate or truncate, the margins crenate to dentate, the teeth often salient, mostly 2–4 cm long, 8–16 cm wide, the midvein prominent on both sides and a pair of flanking longitudinal veins conspicuous beneath, the minor pinnate venation evident beneath, obscure above, scabrous above, scabridulous beneath with short, acicular hairs on multicellular bases, shiny above; petioles flat, broadly cuneate, 1–2 mm long. *Inflorescences* solitary flowers in the upper leaf axils, sometimes aggregated to appear racemose, the pedicels stout, glabrate, ca. 2 mm long, a linear to narrowly obovate hirsute bract arising from just below the apex. *Flowers* with the calyx broadly campanulate, hirsute, ca. 8 mm long, lobed about  $\frac{1}{3}$  way down, the lobes somewhat unequal, deltoid with subulate tips; corolla yellow, only slightly exserted, 1.0–1.3 cm long; stamens 4, didynamous, the anther theca forming an inverted U, 1.5 mm long over the filament apex; style circinnate in bud, 2-lobed. *Capsule* depressed globose, mostly included in the calyx which ruptures irregularly with age.

Although a number of collections were available from Central America, none had well preserved flowers, hence the omission of floral details above.

All Panamanian collections of *Alectra aspera* are from the Canal Zone and most are from the Pipeline Road just north of Gamboa, an area of slight disturbance in premontane wet forest. It grows in the open. The species ranges from Brazil to Guatemala and it occurs in the Antilles.

CANAL ZONE: En Gamboa en la Navy Pipeline, *Correa et al. 1704* (MO). Pipeline Road N of Gamboa Gate, *D'Arcy 9294* (MO); *Gentry 2652* (MO, PMA), *6675* (MO); *Maas & Dressler 714* (MO); *Nee 8431* (MO). Río Pedro Miguel near East Paraiso, *Standley 3004* (US). Pipeline Road N of Gamboa Gate, *Wilbur & Teeri 13411* (DUKE).

### 3. ANGELONIA

*Angelonia* Humboldt & Bonpland, Pl. Aequin. 2: 92. 1809. TYPE: *A. salicariaefolia* H. & B.

Erect or prostrate *herbs* or *shrubs*, pubescent with multicellular, often glandular hairs. *Leaves* subopposite, opposite below, mostly toothed, subentire, pinnately nerved, mostly without a defined petiole. *Inflorescences* solitary flowers

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FIGURE 2. *Alectra aspera* (Cham. & Schlecht.) L. O. Williams.—A. Habit ( $\times 1$ ).—B. Flower bud showing stamens and style. Part of calyx removed ( $\times 4$ ). [After *Wilbur & Teeri 13411* (DUKE).]

in the leaf axils but sometimes aggregated into showy racemes or spikes, the pedicels sometimes with minute basal bracts. *Flowers* strongly zygomorphic, the calyx 5-lobed to the base, the lobes ovate, alike, appearing imbricate; corolla cupular campanulate with 2 widely flaring lips, the upper lip 2-lobed, the lower lip 3-lobed with 2 pollen-collecting sacs, the lobes all similar; anthers 4, the filaments short, inserted near the base of the corolla tube, the anthers alike, the 2 thecae strongly divaricate and basally connate, situated at the throat against the upper side of the corolla; the stigma capitate, situated near the anthers. *Capsule* globose, dehiscent into 2 valves, the placentas honeycomblike.

*Angelonia* includes about 25 species in South America and two other species in Central America. The species treated here also occurs in the Antilles. At least two species are widely cultivated.

1. *Angelonia angustifolia* Benth. in DC., Prodr. 10: 254. 1846. TYPE: Mexico, not seen.

Erect perennial *herbs* to 60 cm tall, rarely scapose, the stems sparingly pilose with peak, multicellular gland-tipped hairs, drying sulcate. *Leaves* subopposite, oblanceolate, apically acuminate or acute, basally acute, minutely and distantly serrate in the distal half, the midvein prominent, the 2–3 lateral veins often indistinct, glabrous; petiole not defined, the leaf base concaulescent forming a pair of ridges on the stem. *Inflorescences* solitary flowers in the leaf axils, aggregated to form terminal racemes with reduced leaves; pedicels slender, 10–15 mm long, sparingly pilose, basally flanked by two minute, glabrous, acicular, scalelike bracts. *Flowers* showy, zygomorphic, the calyx 3–4 mm long, 5-lobed to the base, the lobes ovate, apically acuminate, glabrous; corolla blue or violet with a green throat, 15–20 mm long, 2-lipped, the lips wide spreading, the upper lip 2-lobed with a shallow sinus, the lower lip with 3 spatulate lobes 6–10 mm long, the lobes all subequal, punctate dorsally, punctate and puberulent inside, sometimes ciliolate, the tube campanulate, apically 2-saccate on the lower side and with a short appendage (staminode?); stamens 4, alike, the filaments inserted near the base of the tube, the anthers 2-locular with divaricate, basally connate thecas situated against the top of the tube, not exerted; ovary narrowly ellipsoidal, the style short, the stigma situated among the anthers. *Capsule* subglobose, half exerted from the persistent calyx lobes, 4–8 mm across, dehiscent to the base into 2 valves, the placentas becoming honeycomblike.

This species is recognizable with its narrow glabrous leaves, showy, unusual shaped flowers, and small, globose capsules. It ranges from Mexico to Panama and is most common along the Caribbean lowlands. In Panama, most collections are from Bocas del Toro. This species is also cultivated as an ornamental, and the collections cited from the Canal Zone are all cultivated plants. "Porto Bello" (Nicaragua); "Boca de la Vieja" (Guatemala); "Angelon" (Colombia).

BOCAS DEL TORO: Almirante, *Blum 1369* (MO). Isla Colón, *Wedel 62* (MO). Old Bank Island, *Wedel 1961* (MO, US). Careening Cay, *Wedel 2811* (MO, NY, US). Bastimientos, *Wedel 2914* (MO, NY). COCLÉ: Natá, *Allen 821* (MO, NY, US). Boca del Toabré at confluence of Río Coclé del Norte, *Lewis et al. 5572* (DS, MO). Aguadulce, *Pittier 4857* (US). PANAMÁ: Cultivated, Cañasas, 100 m, *Duke 145002* (MO). Without other locality, *Heriberto*

294 (US). Garden in Panama City, *Maurice* 755 (US). Sabana de Dormisolo near Chepo, *Pittier* 4664 (US). Juan Díaz, *Standley* 30525 (US).

#### 4. BACOPA

**Bacopa** Aubl., Hist. Pl. Guiane 128, *tab.* 48. 1775. nomen cons. TYPE: *B. aquatica* Aubl.

*Moniera* Juss. ex P. Br., Civ. Nat. Hist. Jam. 269. 1756. nomen rejic. TYPE: *Gratiola monnieri* L. = *Bacopa monnieri* (L.) Pennell.

*Monniera*, mult. auct., orth. mut.

*Brami* Adans., Fam. Pl. 2: 208. 1763. nomen rejic. TYPE: Based on *Brami*, Rheede, Hort. Malabar. 10: 27, *tab.* 14. 1689.

*Bramia* Lam., Encycl. Méth. Bot. 1: 459. 1785. TYPE: *B. indica* Lam. = *Bacopa monnieri* (L.) Pennell.

*Mella* Vandelli, Fl. Lusit. Bras. Sp. 43. 1788. TYPE: Pub. without species.

*Septas* Loureiro, Fl. Cochinch. 392. 1790. non *Septas* L. 1760 (Crassulaceae). TYPE: *S. repens* Lour. = *Bacopa monnieri* (L.) Pennell.

*Calytriplex* Ruiz & Pavón, Fl. Peruv. Chil. Prodr. 96. 1794. TYPE: *C. obovata* R. & P.

*Herpestis* C. F. Gaertner, Fruct. Sem. Pl. 3: 186. 1807. TYPE: *H. rotundifolia* C. F. Gaertner = *Bacopa innominaia* (Maza) Alain.

*Herpestes* Kunth, Syn. Pl. 2: 124. 1823. = *Herpestis* Gaertn. orth. mut.

*Habershamia* Raf., Neogenyton 2. 1825. LECTOTYPE: *Monniera cuneifolia* (Michx.) Raf. = *Bacopa monnieri* (L.) Pennell.

*Hydranthelium* H.B.K., Nov. Gen. Sp. 7. ed. fol. 156. 1825. TYPE: *H. callitrichoides* H.B.K.

*Macuillamia* Raf., Neogenyton 2. 1825. TYPE: *M. rotundifolia* (Michx.) Raf. = *Bacopa rotundifolia* (Michx.) Wettst.

*Geochorda* Cham. & Schlecht., Linnaea 3: 11. 1828. TYPE: *G. cuneata* Cham. & Schlecht.

*Caconapea* Cham., Linnaea 8: 28. 1833. TYPE: *C. gratioles* Cham.

*Ranaria* Cham., Linnaea 8: 30. 1833. TYPE: *R. monnierioides* Cham. = *Bacopa monnierioides* (Cham.) Robinson.

*Septilia* Raf., Fl. Tell. 4: 68. 1836. TYPE: *S. repens* Raf. = *Bacopa monnieri* (L.) Pennell.

*Amphianthus* Torr., Ann. Lyceum Nat. Hist. New York 4: 82. 1837. TYPE: *A. pusillus* Torr.

*Heinzelmannia* Neck. ex Endl., Genera Pl. 682. 1839. nomen nudum in syn.

*Hydrotrida* Willd. ex Steud., Nom. Bot. ed. 2. 1: 783. 1840. nomen nudum. TYPE: *H. beccabunga* Steud.

*Heptas* Meisn., Pl. Vasc. Gen. 293. 1842–43? TYPE: *H. repens* Meisn. = *Bacopa monnieri* (L.) Pennell.

*Ildefonsia* Gardner, London J. Bot. 1: 184. 1842. non Schott ex Steudel, Nom. Bot. 427. 1821. nomen nudum. TYPE: *I. bibracteata* Gardner.

*Anisocalyx* Hance ex Walp., Ann. Bot. Syst. 3: 195. 1853. TYPE: *A. limanthiflorus* Hance = *Bacopa monnieri* (L.) Pennell.

*Cardiolphus* Griff., Not. Pl. Asiat. 4: 105. 1854. TYPE: *C. decussata* Griff.

*Ranapalus* Kellogg, Proc. Calif. Acad. Sci. 7: 113. 1877. TYPE: *R. eisenii* Kellogg = *Bacopa eisenii* (Kellogg) Pennell.

*Hydrotrida* Small, Fl. Miami 165. 1913. LECTOTYPE: *H. caroliniana* (Walt.) Small = *Bacopa caroliniana* (Walt.) Robinson.

*Monocardia* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 155. 1920. TYPE: *M. violacea* Pennell = *Bacopa salzmännii* (Benth.) Edwall.

*Herbs*, often paludal, erect or sprawling, often glandular punctate. *Leaves* opposite, entire or rarely dissected, pinnately or digitately veined, often sessile and somewhat clasping. *Inflorescences* paniculate or solitary flowers in the axils, sometimes geminate, the pedicels sometimes bracteate. *Flowers* with the calyx 5-lobed to the base, the outer 3 larger and enclosing the inner 2; corolla 2-lipped, the upper lip entire or 2-lobed, the lower lip 2-lobed, sometimes pubescent; stamens 4, didynamous, inserted in the upper ½ of the tube, the anthers mostly alike, the thecae separate but proximal; ovary 2-carpellate, the ovules numerous, the style mostly straight, the stigma minutely 2-lobed. *Capsule* conical or obtuse,

apically dehiscent into 4 valves, the placenta persistent; seeds oblong, longitudinally reticulate.

This genus is defined by the unequal sepals, the outer three larger and enclosing the narrower inner two. Stamens are usually 4 but may be 2 in some species or even in some plants with usually 4 stamens. The leaves are mostly glabrate and often glandular punctate; stems are glabrate or pilose. The genus is found in a number of habitats but many species are paludal or aquatic. A few species are tolerant of brackish waters. Species range from southern Canada to warm temperate South America and in the Old World.

- a. Flowers sessile, fruiting pedicels less than 2 mm long; leaves 1 costate or pinnately veined. Plants erect.
  - b. Stems pilose; fruiting calyces more than 3 mm long ..... 1. *B. axillaris*
  - bb. Stems puberulent or glabrate; fruiting calyces less than 3 mm long.
    - c. Capsules copiously glandular, long; stems glabrous, sparingly glandular; leaves basally narrowed and often appearing petiolate ..... 8. *B. sessiliflora*
    - cc. Capsules eglandular; stems pubescent with whitish hairs; leaves basally broad and somewhat clasping ..... 5. *B. monnierioides*
- aa. Flowers conspicuously pedunculate, fruiting pedicels more than 3 mm long, mostly longer than the leaves; leaves palmately nerved or 1 costate; plants erect, creeping or floating.
  - d. Outer fruiting sepals basally cordate, covering the capsule.
    - e. Fruiting sepals about as long as the pedicels, puberulent; stems puberulent ..... 2. *B. bacopoides*
    - ee. Fruiting sepals much shorter than the peduncles, long ciliate; stems pilose ..... 7. *B. salzmännii*
  - dd. Outer fruiting sepals basally narrowed, mostly not completely covering the capsule.
    - f. Leaves basally auriculate or hastate; leaves apically obtuse or acute; plants erect ..... 3. *B. laxiflora*
    - ff. Leaves basally narrowed; apically bluntly obtuse or rounded; plants creeping or floating.
      - g. Leaves narrowly obovate or oblong, 1-nerved, less than 4 mm wide ..... 4. *B. monnieri*
      - gg. Leaves rotund, sometimes broadly obovate, conspicuously palmately many nerved, mostly more than 5 mm wide ..... 6. *B. repens*

1. ***Bacopa axillaris*** (Benth.) Standl., J. Wash. Acad. Sci. 15: 460. 1925.

*Herpestis axillaris* Benth. in DC., Prodr. 10: 396. 1846. TYPE: Colombia, *Purdie* (K, not seen).  
*Caconapea axillaris* (Benth.) Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 152. 1920.  
*Monniera axillaris* (Benth.) Kuntze, Rev. Gen. Pl. 463. 1891.

Erect, sometimes branched *herbs*, the stems stout, soft, villous with stout, white, weak, uniseriate hairs mostly ca. 0.5 mm long, also with inconspicuous white, sessile glands; roots stout and fibrous. *Leaves* opposite, oblong or oblanceolate, apically acute, bluntly serrate in the upper ½, basally acuminate or cuneate to the slightly clasping insertion; to 5 cm long, 10 mm wide, the mid-vein prominent, the minor veins 3–5 on each side, obscure, strongly ascending, somewhat discolored, dark green and inconspicuously punctate above, pale beneath and conspicuously glandular punctate with brown sessile discoid glands, usually glabrous on both sides except sometimes on the costa beneath. *Inflorescences* geminate fascicles of 3–6 flowers in the leaf axils; pedicels 1–2 mm long, glabrous, sometimes with a few sessile glands, conspicuously broadening upwards;

bracts 2, scalelike, narrowly ovate, 0.5 mm long at the pedicel apex. *Flowers* with the sepals distinct, the outer 3 broadly ovate, ca. 3 mm long, 2 mm wide, apically rounded or emarginate, entire or denticulate, the teeth sometimes with short, stout-based white hairs, otherwise glabrous, mostly with a few scattered white or brown sessile glands, palmately 5-nerved, the inner 2 sepals narrow, acute, prominently costate and reticulate, punctate with white and brown sessile glands, slightly shorter than the outer bracts; corolla white, ca. 3 mm long, slightly exerted from the calyx, tubular, contracted towards the middle, glabrous outside, pubescent at the contracted level inside, 4-lobed, the lobes short; stamens 4, the filaments glabrous, ca. 0.75 mm long, inserted at about the same level in the upper  $\frac{1}{2}$  of the tube, the anthers yellow, 0.5 mm long, the thecae separate; style 1.5 mm long, terete, the stigma horseshoe shaped, erose, peltate on the style. *Capsule* narrowly conical, 3 mm long, 4-valved, the valves 3-nerved; placentas flat, obtuse; seeds with a brownish, longitudinal reticulum, faboid rectangular, 0.5 mm long.

This species is distinguished by its villous stems and narrow, often discolored leaves. The species occurs in swamps and other wet places in lowland central Panama. It is also reported from Colombia and Guatemala.

CANAL ZONE: Madden Dam, *Ebinger 864* (MO, US). Camino de la Granja, *Heriberto 159* (US). Cerro Gordo near Culebra, *Standley 26035* (PH, US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29055* (US). PANAMÁ: Sabanas N of Panama City, *Paul 559* (US). Las Sabanas, *Standley 25948* (PH, US). Near Juan Franco Race Track near Panama, *Standley 27829* (US). Near Matías Hernández, *Standley 28998* (US).

## 2. *Bacopa bacopoides* (Benth.) Pulle, Enum. Pl. Surinam. 415. 1906.

*Herpestis bacopoides* Benth. in DC., Prodr. 10: 399. 1846. TYPE: Brasil, *Gardner 1090* (MO). *B. bracteolata* Pennell ex Standley, Contr. U.S. Natl. Herb. 27: 336. 1927. LECTOTYPE: Panama, *Pittier 6877* (US—"Caconapea bracteolata Pennell 1919") NY.

*Herbs* to 40 cm tall, branched, the stems drying angled, glabrate, apically with a few sessile globose tawny glands. *Leaves* opposite, ovate, obovate or broadly elliptical, ca. 2.5 mm long, 1.5–2.0 mm wide, apically obtuse, basally cuneate, the margins serrulate in the upper  $\frac{2}{3}$ , glabrate, scabridulous above and along the midvein beneath, inconspicuously punctate with dark brown, subglobose glands, the midvein evident, with ca. 2 ascending veins on each side; petiole not defined. *Inflorescences* 1 or 2 flowers per leaf axil, sometimes paired, the pedicels slender, shorter than the leaves, about as long as the fruiting calyx, pilose with short white hairs or appearing pulverulent, angled, with a pair of small, cucullate, puberulent subopposite bracts near the top of the pedicel. *Flowers* with the calyx divided into 5 free sepals, the outer 3 sepals cordate, ca. 5 mm long, 4 mm wide, apically obtuse, puberulent, nervose, somewhat accrescent, the inner sepals narrow, acute, costate, ciliolate, shorter than the outer bracts; corolla white, 4–5 mm long; stamens 4, didynamous, the filaments 1.0–1.5 mm long, curved, inserted near the middle of the corolla tube, the anthers alike, ellipsoidal, the thecae 0.6 mm long, proximal, versatile, the connective short; ovary smooth, glabrous, sometimes glandular, the style distinct, terete, ca. 2 mm long, the stigmas bifurcate near the base, 0.7 mm long, the branches

terete. *Capsule* globose, sometimes apically glandular, the valves indurate, ca. 3 mm long, the outer sepals becoming winglike, to 15 mm long, coriaceous; seeds oblong, longitudinally reticulate, 0.5 mm long, tan or reddish brown.

This species may be recognized by its relatively large, cordate fruiting calyces which are often minutely puberulent. The leaves are sometimes basally contracted and thus petiolate.

*Bacopa bacopoides* occurs in Brasil, Surinam, Panama, Nicaragua, Guatemala and Belize. Some of the material treated by Williams (1973) as *B. lacertosa* Standley is actually this species. This species is quite similar to Philippine material going under the name *Herpestis floribunda* R. Br. In Panama *B. bacopoides* occurs in marshes and wet places at lower elevations.

CANAL ZONE: Navy Reservation N of Gamboa, *Dressler 3217* (MO, PMA). COCLÉ: Near Olá, *Pittier 5086* (US). COLÓN: 6 mi SW of Portobelo, *Luteyn 1421* (DUKE). LOS SANTOS: 3 mi W of Carreta, ca. 5 mi S of Las Tablas, *Burch et al. 1251* (MO). PANAMÁ: Agricultural Experiment Station at Matías Hernández, *Pittier 6877* (NY). Big swamp E of Río Tocumen, *Standley 2659* (US). Matías Hernández, *Standley 28999* (US—center specimen). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29054* (PH, US), *29219* (US). Río Tocumen, *Standley 29425* (US). Between Matías Hernandez and Juan Díaz, *Standley 32012, 32085* (both US).

3. ***Bacopa laxiflora*** (Benth.) Edwall, Bol. Commiss. Geogr. Estado São Paulo 13: 180. 1897.

*Herpestis laxiflora* Benth. in DC., Prodr. 10: 396. 1846. TYPE: Brasil, *Gardner 2702* (?K, not seen).

*Herpestis auriculata* Robinson, Proc. Amer. Acad. Arts 26: 172. 1891. TYPE: Mexico, *Pringle 2937* (GH, not seen).

*Bacopa auriculata* (Rob.) Greenm., Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 262. 1907.

*Caconapea auriculata* (Rob.) Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 150. 1920.

*Mella laxiflora* (Benth.) Pennell, Notul. Nat. Acad. Nat. Sci. Philadelphia 46: 1. 1940.

Erect *herbs* to 45 cm tall, stems drying angled, apically slender, glabrate, sometimes with a few short gland-tipped hairs near the apex, much branched; roots fibrous, sometimes rooting at the lower nodes, the stems basally stout. *Leaves* opposite, oblong or ovate, to ca. 30 mm long and 10 mm wide, apically acute, serrate in the upper  $\frac{2}{3}$ , basally short auriculate, the auricles sometimes denticulate, clasping and appearing perfoliate, the midvein prominent, the lateral veins ca. 5 on each side, drying obscure above and scabridulous with minute acropetal trichomes, glabrate and lighter beneath; petiole wanting. *Inflorescences* numerous, solitary or paired in the leaf axils, the pedicels slender, scabridulous, mostly exceeding the leaves with a pair of linear or narrowly ovate scalelike bractlets to 1 mm long immediately below each flower, the subtending leaves sometimes reduced to small bracts. *Flowers* small, the calyx with the outer 3 sepals ovate, apically acute, basally narrowed, costate, ca. 4 mm long, 2.5 mm wide, apically scabridulous, sometimes mucronulate, the 2 inner bracts narrow, costate, hyaline, ciliolate, shorter than the outer bracts; corolla purplish, pubescent within below the filament insertion; stamens 4, didynamous, the filaments inserted in the upper  $\frac{1}{2}$  of the corolla tube, glabrous, ca. 2 mm long, the anthers ellipsoid, ca. 0.7 mm long, versatile, the ventral 2 reduced; ovary glabrous, ovoid, the style distinct, terete, ca. 2.5 mm long, the stigmas distinct, ca. 1 mm long, bifurcate

for  $\frac{2}{3}$  of the length, inserted in a short, annular disc. *Capsule* subglobose, 3–4 mm long, indurate, eglandular, the placenta cuneiform; seeds longitudinally reticulate, reddish brown, 0.5 mm long.

*Bacopa laxiflora* is an erect herb, the leaves and flowers mostly numerous, but the leaves are often reduced and the hastate or auriculate nature of the leaf bases is not always conspicuous. The species is reported from Panama and from Brasil and one may presume it occurs in other neotropical countries.

COCLÉ: Aguadulce, *Pittier 4907* (NY, US). PANAMÁ: Road between Panama and Chepo, *Dodge et al. 16676* (MO). Las Sabanas, *Heriberto 150* (US). 1 mi W of Juan Díaz, *Killip 3079* (US). Las Sabanas, *Standley 25945* (US). Near big swamp E of Río Tocumen, *Standley 26721* (PH, US). Near Matías Hernández, *Standley 28999* (MO—part, PH).

4. ***Bacopa monnieri***<sup>4</sup> (L.) Pennell, Proc. Acad. Nat. Sci. Philadelphia 98: 98. 1946. Based on *Lysimachia monnieri* L.

*Lysimachia monnieri* L., Cent. 2. Pl. 9. 1756. TYPE: South America, *Hallman* (not seen). *Gratiola monnieri* L., Amoen. Acad. 4: 306. 1759. TYPE: Jamaica, *P. Browne* (not seen). *Bacopa monnieri* (L.) Edwall, Bol. Commiss. Geogr. Estad. São Paulo 13: 180. 1897. Based on *Gratiola monnieri* L.

Glabrous paludal *herbs*, the stems procumbent, mostly eglandular. *Leaves* opposite, somewhat succulent, narrowly obovate to spatulate, entire, apically rounded, basally cuneate, glandular punctate, the midvein apparent, palmately 3-nerved, the midvein evident but the 2–4 lateral veins obscure; petioles undifferentiated, the cuneate blades appearing slightly clasping perfoliate. *Inflorescence* a solitary flower in a leaf axil, the pedicels slender but broadening upwards, becoming 1–2 cm long in fruit, with 2 sepal-like, narrow, opposite apical bracts subtending the flower. *Flower* 7–9 mm long, the calyx imbricate, the 2 outer bracts equal, broadly ovate deltoid, 5 mm long, 2–3 mm wide, conspicuously 1-nerved, keeled, the 3 unequal inner sepals narrow, ranging from slightly shorter to slightly longer than the outer bracts; corolla tubular, ca. 8 mm long, glabrous, 5-lobed  $\frac{1}{4}$ – $\frac{1}{3}$  way down, the lobes subequal, white, pale purple or blue; stamens 4, the filaments glabrous, inserted unequally near the top of the tube, compressed, the anthers black, linear or curved, the thecae versatile, affixed near the middle, elongate, ca. 1.5 mm long and proximally connate for most of their length, little exerted; ovary narrowly oblong, ca. 4 mm long and 1 mm wide, the style discrete, ca. 4 mm long, terete, apically curved downwards, the stigma flat, slightly 2-lobed. *Capsule* loculicidal and septicidal to the base, the valves separating at the base, ca. 2 mm long, the placenta narrow, peglike, foveate, the septum translucent, hyaline, extending ca. 0.75 mm beyond the placenta on each side; seeds numerous, ca. 0.5 mm long, longitudinally reticulate, the reticulum reddish brown.

This is one of the most widespread species of *Bacopa*, and unlike some of the other species of *Bacopa* in Panama, it is usually found creeping in mud at the edges of standing water. It can tolerate somewhat brackish water and is often

<sup>4</sup> Many synonyms have been used for this species. Only the names given here relate directly to Panamanian plants.



found near the sea. The narrowly oblong or oblanceolate leaves and downward curving fruiting pedicels help to identify it.

BOCAS DEL TORO: Around air strip, *D'Arcy 11233* (MO). SW of Bocas at Maccaw Hills, Isla Colon, *Wedel 532* (MO). CANAL ZONE: Chagres, *Fendler 217* (MO). CHIRIQUÍ: El Pedregal de David, *Pittier 3377* (NY, US). COLÓN: Manzanillo Island, *Hayes 694* (NY). PANAMÁ: Panamá la Vieja, *Maurice 809* (US). SAN BLAS: Through cultivation on mainland in front of Ustupo, *D'Arcy 9514* (MO). Mulatuppa, *Duke 8504* (MO). Mainland near Isla Mosquito, *Duke 8880* (MO, OS). Mainland opposite Ailigandí, *Lewis et al. 214* (MO). Island village of Mamitupo, *Warner 212* (MO).

5. ***Bacopa monnierioides*** (Cham.) Robinson, Proc. Amer. Acad. Arts 44: 614. 1909.

*Ranaria monnierioides* Cham., Linnaea 8: 31. 1833. TYPE: Brasil, *Sello* (not seen).

*Herpestis ranaria* (Cham.) Benth., Hook. Companion Bot. Mag. 2: 57. 1836. Based on *Ranaria monnierioides* Cham.

*Bacopa ranaria* (Cham.) Chod. & Hassl., Bull. Herb. Boissier sér. 2, 4: 288. 1904.

*Caconapea appressa* Penn., Proc. Acad. Nat. Sci. Philadelphia 72: 152. 1920. TYPE: Colombia, *Pennell 1460* (MO, NY).

*Bacopa parviflora* Penn. ex Standley, Contr. U.S. Natl. Herb. 27: 336. 1928. LECTOTYPE: Panama, *Pittier 2462* (US).

*Bacopa parviflora* Standl. ex Williams, Fieldiana, Bot. 34: 118. 1972. TYPE: Panama, *Killip 3240* (F, not seen, MO). Redundant name.

*Caconapea parviflora* Pennell, ined. TYPE: Panama, *Pittier 2462* (US).

Erect herbs to 45 cm tall, sometimes rooting at the lower nodes; lower stems stout, soft, the upper stems slender, puberulent with weak, curled whitish hairs, drying angled; roots short and fibrous. *Leaves* opposite, narrowly oblong, to 3 cm long and 8 mm wide, apically obtuse or acute, basally clasping, not narrowed into a petiole, the margins entire or minutely denticulate, sometimes slightly inrolled, the midvein prominent, the lateral venation palmate, strongly ascending, obscure, glabrous, both sides punctate with numerous sessile annular glands. *Inflorescences* geminate fascicles of 1–5 flowers in the leaf axils, the subtending leaves sometimes reduced to small bracts; pedicels to 1 mm long, ebracteate, drying angled. *Flowers* minute, calyx ca. 1.5 mm long, lobed to the base, the outer lobes ovate, to 0.7 mm wide, prominently costate, conspicuously punctate with sessile, annular glands, the inner 2 lobes narrow, acute, minutely ciliate; corolla white or bluish white, tubular, 4-lobed, exerted ca. 0.5 mm from the calyx, white drying orange; stamens 4, the filaments glabrous, unequal, inserted high on the corolla tube, the anthers yellow, dorsifixed, the thecae proximal, the upper  $\frac{1}{2}$  connate; ovary ellipsoid, reddish, smooth but sometimes drying longitudinally nervate, ca. 0.7 mm long, the style discrete, positioned on a minute pedicel, compressed, the stigma convolute, crestlike. *Capsule* ca. 1.5 mm long, splitting to the base, the valves indurate, eglandular; seeds numerous.

*Bacopa monnierioides* is similar to *B. sessiliflora* but has puberulent stems, especially on emerging, the locules of the anthers are divergent, and the capsule is eglandular or nearly so. The leaves subtending flowers (bracts) tend to remain basally broad even when much reduced, while in *B. sessiliflora* they tend to become narrow as well as smaller.

This species is widespread, ranging from Paraguay to Guatemala, and if *B.*

*beccabunga* (Griseb.) Pennell is considered synonymous, it also occurs in Cuba. In Panama it grows erect in swamps and wet savannahs.

CANAL ZONE: Beneath old Miraflores Bridge, *Dwyer 54* (MO). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29223* (US). COLÓN: Forests around Portobelo, *Pittier 2462* (US). PANAMÁ: Savannahs near Chepo, *Duke 6035* (MO). Las Sabanas, *Heriberto 158* (US). Between the Tapia and Tocumen Rivers, *Killip 3240* (MO, US). Sabanas N of Panama City, *Paul 574* (US). Sabana de Juan Corso near Chepo, *Pittier 4676* (US). Las Sabanas, *Standley 25946* (PH, US). Near big swamp E of Río Tocumen, *Standley 26717* (PH, US). Juan Franco Race Track, *Standley 27828* (PH, US). Near Matías Hernández, *Standley 29002* (PH, US). Nuevo San Francisco, *Standley 30771* (US). Between Pacora and Chepo, *Woodson et al. 1649* (MO). SAN BLAS: Weeds of Mandinga Airport, *Duke 14826* (OS).

6. ***Bacopa repens*** (Sw.) Wettst. in Engl. & Prantl., Nat. Pflanzenfam. IV 3b: 76. 1895.

*Gratiola repens* Sw., Prodr. Veg. Ind. Occ. 14. 1788. TYPE: Jamaica, Swartz (not seen).

*Herpestis repens* (Sw.) Schlecht. & Cham., Linnaea 5: 107. 1830.

*Macuillamia limosa* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 158. 1920. TYPE: Colombia, Pennell 2927 (NY, US).

*Bacopa limosa* (Penn.) Standley, Contr. U.S. Natl. Herb. 27: 336. 1928.

*Macuillamia repens* (Sw.) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 60. 1935.

Aquatic or paludal *herbs*, stems stout but weak and prostrate, fistulose, drying flat, pubescent with spreading white hairs, glabrescent; roots fibrous, sometimes rooting at the nodes. *Leaves* obovate, elliptical or orbicular, apically obtuse or round, basally cuneate or slightly clasping, to 20 mm long, 15 mm wide, palmately many nerved, glabrous or pubescent, the margins entire or somewhat sinuate. *Inflorescences* 1(-3) flowers in the leaf axils, the peduncles slender, pilose, ca. 8 mm long, slightly longer in fruit, terete or drying angled, ebracteate. *Flowers* with 4-5 free sepals, the outer 2 sepals 2.5 mm long, 1.5 mm wide, entire, oblong, apically blunt acute, basally narrowed, nervose, glabrate or pilose, sometimes ciliate, the inner 2 sepals narrower, thin costate, ciliolate, shorter than the outer sepals; corolla white, the throat yellow, 3 mm long; stamens 4, the filaments glabrous, inserted at the top of the corolla tube, the anthers dark, broadly ellipsoidal, ca. 0.7 mm long, the thecae proximal; ovary glabrous, the style apically furcate, the stigmas 2-lobed, peltate, the style basally tapering gradually into the ovary, the style 1 mm long. *Capsule* globose, ca. 2 mm long, partly enclosed by the accrescent sepals, the sepals becoming 3-4 mm long.

This species may be recognized by its glabrescent stems, rotund leaves and small flowers and fruits. The only other Panamanian species of *Bacopa* with rotund leaves, *B. salzmannii*, has conspicuously pilose stems and much larger fruits.

*Bacopa repens* is found in swamps and other wet places in lowland Panama. It ranges from southern Mexico into South America and the Antilles. It closely resembles *B. rotundifolia* (Michx.) Wettst. which has slightly larger flowers, pedicels, and capsules, and sepals shaped slightly differently. *Bacopa rotundifolia* is a species of the southeastern United States.

COCLÉ: Between Las Margaritas and El Valle, *Woodson et al. 1754* (MO). DARIÉN: El Real, Río Tuira, *Stern et al. 451* (MO, US). Edge of road on Othon's farm, El Real, *Stern*

*et al.* 810 (MO, US). PANAMÁ: 5–6 mi E of Chepo on Panamerican Highway, Duke 4019 (MO). Las Sabanas in swamp, Heriberto 148 (US).

7. ***Bacopa salzmännii*** (Benth.) Edwall, Bol. Commiss. Geogr. Estado São Paulo 13: 176, 181. 1897.—FIG. 3.

*Herpestis salzmännii* Benth. in Hook., Companion Bot. Mag. 2: 58. 1836. TYPE: Brazil, Salzmänn 400 (MO).

*Bacopa salzmännii* (Benth.) Chod. & Hassl., Bull. Herb. Boissier sér. 2. 4: 290. 1904. Redundant combination.

*Monocardia humilis* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 157. 1920. TYPE: Colombia, Rusby & Pennell 1065 (NY, US).

?*M. lilacina* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 156. 1920. TYPE: Colombia, Pennell 1476 (NY, US).

*M. violacea* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 156. 1920. TYPE: Colombia, Pennell 1480 (NY, US).

*Bacopa humilis* (Pennell) Standley, J. Wash. Acad. Sci. 15: 460. 1925.

*B. violacea* (Pennell) Standley, J. Wash. Acad. Sci. 15: 460. 1925.

*Herpestis ciliata* Pennell, Notul. Nat. Acad. Nat. Sci. Philadelphia 46: 2. 1940. TYPE: Guyana, Smith 2281 (NY).

Aquatic *herbs*, floating or prostrate on mud, sometimes ascending, sparingly branched, the stems stout, soft, hirsute with slender, sturdy uniseriate hairs, the basal cell enlarged, and with scattered globose sessile glands, sometimes rooting at the nodes, the roots fibrous. *Leaves* opposite, often subtended by tufts of white hairs, rotund or broadly ovate, apically obtuse or round, to 1.5 cm long and 1.2 cm wide but often much smaller, basally truncate or subcordate with auricles clasping the stem, the margins entire, often ciliate, the surfaces glabrous or with long hairs, palmately many nerved; petioles obsolete, punctate with brownish orange glands. *Inflorescences* of solitary flowers in the axils of the leaves, often geminate, the pedicels slender, hirsute, exceeding the leaves; ebracteate. *Flowers* with the sepals free to the base, the outer 3 broad, ca. 6 mm long and 5 mm wide, apically obtuse or emarginate, basally truncate or subcordate, the costa and the margins ciliate, many nerved, the inner 2 sepals narrowly deltoid, costate, glandular, slightly shorter than the outer sepals, hirsute outside, glabrous within; corolla blue or white, slightly exserted, ca. 7 mm long, 4-lobed, the upper lobe emarginate; stamens 4, the filaments glabrous, ca. 1 mm long, inserted near the top of the tube, the anthers linear, ca. 1.5 mm long, the thecae versatile, medifixed, connate along  $\frac{1}{2}$ , free but proximal along the other  $\frac{1}{2}$ ; the ovary narrow, 1 mm long, glabrous, sulcate, the style terete, distinct, 3 mm long, apically curved, the stigma capitate, convoluted and slightly 2-lobed. *Capsule* ca. 3 mm long; seeds numerous, oblong, ca. 0.5 mm long, longitudinally reticulate, reddish brown.

*Bacopa salzmännii* may be recognized by its stout pilose stems and rotund leaves. It is generally prostrate.

The species occurs in lowland Panama in bogs, marshes, and other wet places. It ranges from southern Mexico to Brasil and it occurs in the Antilles.

BOCAS DEL TORO: Chiriquicito to 5 mi S along Río Guarumo, Lewis *et al.* 2008 (MO, US). CANAL ZONE: Chagres, Fendler 212 (MO). Gatún Lake, Seibert 636 (MO, PH). Barro Colorado Island, Shattuck 15 July 1934 (MO). Juan Franco Race Track near Panama, Standley 27827 (US). Old Las Cruces Trail between Fort Clayton and Corozal, Standley

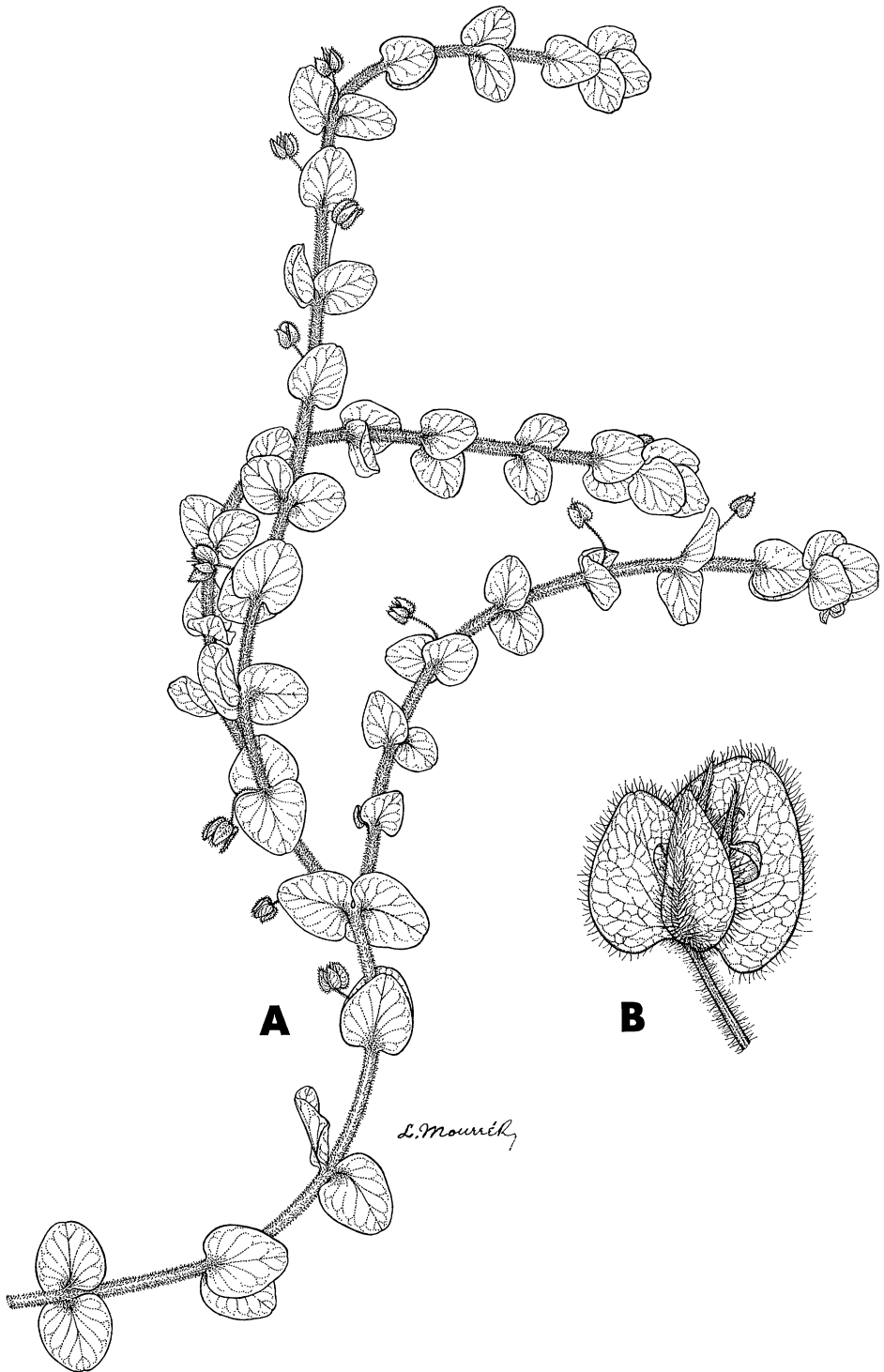


FIGURE 3. *Bacopa salzmannii* (Benth.) Edwall.—A. Habit ( $\times \frac{7}{10}$ ).—B. Fruiting calyx ( $\times 4\frac{1}{5}$ ). [After Seibert 636 (MO).]

29218 (PH, US). Río Pedro Miguel near East Paraiso, *Standley 30044* (MO). CHIRIQUÍ: Marsh ca. 12 km W of El Hato, *D'Arcy 10882* (MO). Boqueté, 3800 ft, *Davidson 573* (MO, US). Francés Arriba School ca. 14 mi N of David, 1200 ft, *Lewis et al. 659* (MO, US). Marsh 1.6 mi NW of El Hato del Volcán towards Costa Rica border, *Luteyn 820* (DUKE). Las Lagunas W of El Hato del Volcán, 1400 m, *Wilbur et al. 10992* (DUKE). Boqueté, 1200–1500 m, *Woodson & Schery 707* (MO). Finca Lérída to Boquete, 1300–1500 m, *Woodson et al. 1150* (MO, NY). COCLÉ: El Valle de Antón, 600 m, *Allen 1996* (MO, NY, US). La Yeguada, 500–1000 m, *D'Arcy 11285* (MO). Km 21 on road to El Valle, *Gentry 5618* (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al. 2504, 2572* (both DS, MO). Boca del Toabré at confluence of Río Coclé del Norte, *Lewis et al. 5553* (DS, MO). El Valle de Antón 500–700 m, *Seibert 487* (MO, NY, PH). La Mesa 3 km N of El Valle, 850 m, *Wilbur et al. 15627* (DUKE). Penonomé, *Williams 199* (NY, US). Between Las Margaritas and El Valle, *Woodson et al. 1721* (MO, PH, NY). COLÓN: Miguel de la Borda, *Croat 10070* (MO). Around Portobelo, 5–100 m, *Pittier 2456* (NY, US). PANAMÁ: Road between Panamá and Chepo, *Dodge et al. 16678* (MO). Las Sabanas, *Heriberto 148* (US); *Paul 567* (US). Laguna de Portala near Chepo, *Pittier 4608* (US). Las Sabanas, *Standley 25947* (US). Big swamp E of Río Tocumen, *Standley 26540* (US), *26661* (PH, US). Near Matías Hernández, *Standley 29001* (PH, US). VERAGUAS: Hills W of Soná, *Allen 1067* (MO, PH, US).

### 8. *Bacopa sessiliflora* (Benth.) Pulle, Enum. Pl. Surinam 415. 1906.

*Herpestis sessiliflora* Benth., Companion Bot. Mag. 2: 58. 1836. TYPE: Guyana, *Leprieur* (K, not seen).

*Bacopa sessiliflora* (Benth.) Edwall, Bol. Commiss. Geogr. Estado São Paulo 13: 176, 181. 1897. incomplete combination.

*Caconapea conferta* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 153. 1920. TYPE: Colombia, *Pennell 1435* (MO, NY).

*C. sessiliflora* (Benth.) Pennell, Proc. Acad. Nat. Sci. Philadelphia 75: 11. 1923.

Erect *herbs* to 45 cm tall, glabrous, the stems mostly terete; roots fibrous. *Leaves* opposite, oblanceolate, mostly ca. 3 cm long, 4 mm wide, apically acute, the base narrowed but without a distinct petiole, serrate in the upper ½, copiously but inconspicuously punctate with brownish, annular glands on each side. *Inflorescences* solitary or fasciculate flowers in the leaf axils; pedicels glabrous, eglandular, to 1 mm long or obsolete, drying angled, bracts narrowly deltoid or linear, 1.0–1.5 mm long, costate, thin, located at the top of the pedicel. *Flowers* small, the calyx 5-lobed to the base, the outer 3 sepals 2–3 mm long, entire, apically obtuse, costate and nervose, with copious, globose, shiny tawny glands, the 2 inner sepals narrow, slightly shorter than the outer sepals, costate, sparingly glandular; corolla blue or white, ca. 4 mm long, exserted ca. 1 mm from the calyx, 5-lobed, compressed and somewhat 2-lipped, the lobes rotund, 0.5 mm long, the tube pilose within in the lower ½; stamens 4, the filaments terete, curved, inserted about the middle of the corolla tube, the anthers yellow, rotund, the thecae connate, dorsifixed, versatile; ovary ca. 1.25 mm long, densely glandular, the style ca. 1 mm long, mostly eglandular, distinct from the ovary, stigma slightly 2-lobed. *Capsule* 2–3 mm long, indurate, glandular, at least near the base and the apex, splitting apically, the placenta yellow, cuneiform; seeds numerous, ca. 0.25 mm long, dark brown, reticulate.

*Bacopa sessiliflora* is similar to *B. monnieroides* which also has nearly sessile small flowers and narrow leaves, but it has conspicuously glandular capsules and somewhat different leaves. The leaves of *B. monnieroides* have a greater tendency

to clasp the stem and thus have less contracted petiolar regions, and the leaves of *B. monnierioides* are usually entire while those of *B. sessiliflora* are usually serrate.

*Bacopa sessiliflora* is found in wet marshes and other wet places in Panama. It has some tolerance for brackish water and is found behind beaches. The species ranges from Guatemala to Colombia and Surinam.

CANAL ZONE: Just E of Gatún Lock, *Duke 4309* (MO). Chagres, *Fendler 211* (MO, US). Cerro Gorda near Culebra, *Standley 26036* (US). Juan Franco Race Track near Panama, *Standley 37830* (PH, US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29217* (PH, US). Summit, *Standley 30055* (US). COCLÉ: Aguadulce, *Pittier 4897* (NY, US). COLÓN: Miguel de la Borda, *Croat 10069* (MO). Mouth of Río Piedras, *Lewis et al. 3188* (DS). LOS SANTOS: Monagre Beach 5 mi SE of Chitre, *Tyson et al. 3051* (MO). PANAMÁ: Las Sabanas, *Standley 25949* (US). Río Tapia, *Standley 28223* (US). Nuevo San Francisco, *Standley 30769* (US). Between Matias Hernández and Juan Diaz, *Standley 32024* (PH, US). Near Las Sabanas, *Standley 40773* (US).

## 5. BENJAMINIA

**Benjaminia** Mart., Fl. Bras. 10: 255. 1 June 1847. TYPE: *B. utriculariaeformis* Benj. ex Mart. = *B. reflexa* (Benth.) D'Arcy.

*Quinquelobus* Benj., Linnaea 20: 316; (before 1 June) 1847; Berichtigung 1. (1 August 1847). nomen nudum. LECTOTYPE: *Q. utriculariaeoides* Benj. = *Benjaminia reflexa* (Benth.) D'Arcy.

*Naiadothrix* Pennell, Mem. Torrey Bot. Club 16: 105. 1920. TYPE: *N. longipes* Pennell = *Benjaminia reflexa* (Benth.) D'Arcy.

*Bacopa* sect. *Chaetodiscus* subsect. *Naiadothrix* Pennell, Proc. Acad. Nat. Sci. Philadelphia 98: 98. 1946.

Submerged aquatic *herbs*, sometimes rooting at the nodes, glabrate or pubescent, glandular punctate. *Leaves* verticillate, pinnately dissected, flat, the segments filiform. *Inflorescences* solitary flowers in the leaf axils, the pedicels elongating in fruit, ebracteate. *Flowers* with the calyx divided to near the base into 5 subequal narrow lobes; corolla 2-lipped, the lobes rounded; stamens 4, didynamous, the anthers equal, the thecae equal and proximal; ovary obtuse, 2-locular, the stigma flat and curved. *Capsule* ovoid, membranaceous, the seeds oblong, longitudinally reticulate, numerous.

This genus has long been considered congeneric with *Bacopa* but it differs notably in its dissected leaves and 5 subequal calyx lobes which are connate to slightly higher above the base. The pedicels lack bracts and the ovary is surrounded by sterile filaments or tufts, features present in some species of *Bacopa* but not in others. *Benjaminia* has also been considered closely allied to *Conobea* Aublet, but in that genus the leaves are serrate, not dissected, the calyx lobes are of 2 different sizes and the pedicels are apically bibracteolate. *Leucospora* Nutt. a monotypic genus of eastern North America, agrees superficially with *Benjaminia* in many details including the form of the leaves, flowers and fruit and in the pedicels lacking bracts, but the sepals are more deeply divided, there are no filaments around the ovary, and the lower anthers are separated on minute arms. In its leaf morphology *Benjaminia* is quite similar to the Asiatic *Limnophila* R. Br., but species of that genus always bear some entire or serrate leaves near

the inflorescence, quite different from the submerged, dissected leaves. *Benjaminia* is apparently monotypic, although a case can be made for separating plants from Belize from the type species. It is restricted to the neotropics.

The contorted formalities of nomenclature and status of *Benjaminia* and its type species were reviewed by Smith & Pires (1956). Benjamin first noted the genus in *Linnaea* 20: 316, listing *Quinquelobus* with four species, but because no generic description was provided, none of these names is validly published. One of his species, *Q. utriculariaeoides*, was without description but referred to his unpublished treatment in Martius' *Flora Brasiliensis*. Soon after, the *Flora Brasiliensis* treatment appeared, and Martius had altered the *Lentibulariaceae* manuscript of Benjamin, substituting the name *Benjaminia* for *Quinquelobus* and altering the name of the single species appearing therein from *utriculariaeoides* to *utriculariformis*. The type, *Gardner 4347*, was indicated. The date given in the front of the volume for the *Lentibulariaceae* is 1 June 1847. In corrections page (*Berichtigung*) dated 1 August 1847 appearing at the end of *Linnaea* vol. 20, Benjamin made transfers of his names in *Quinquelobus* into *Benjaminia*. He stated that the *Flora Brasiliensis* treatment had appeared after his paper listing *Quinquelobus* and referred to the whole sequence as an error on his part.

A year earlier, Bentham had published *Herpestis reflexa* based on the same collection, *Gardner 4347*. Bentham (1848) later noted that *Benjaminia utricularioides* (sic.) and his own *Herpestis reflexa* were based on the same type and belonged to the *Scrophulariaceae* and not to the *Lentibulariaceae* where Benjamin had placed his species. Benjamin (1849) protested Bentham's statements arguing that the material before him was indeed *lentibulariaceous*, suggesting that Bentham may have been working with different plants. In his *Genera Plantarum*, Bentham (1873) noted Benjamin's rejoinder but did not accept it, and he regarded *Quinquelobus* and *Benjaminia* as spurious. The figure presented by Benjamin in the *Flora Brasiliensis* agrees with the *scrophulariaceous* collection of *Gardner 4347* at MO in all respects, and his diagnosis notes "semina plurima minima ellipticâ," so it is assumed that Benjamin erred and that his plant was the same as the other parts of the collection at MO and K.

#### Literature:

Smith, L. B. & J. M. Pires. 1956. An evaluation of *Benjaminia* Martius ex Benjamin. *J. Wash. Acad. Sci.* 46: 86.

#### ***Benjaminia reflexa* (Benth.) D'Arcy, comb. nov.—FIG. 4.**

*Herpestis reflexa* Benth. in DC., *Prodr.* 10: 399. 1846. LECTOTYPE: Brasil, *Gardner 4347* (dupla MO).

*Benjaminia utriculariaeformis* Mart., *Fl. Bras.* 10: 256. 1847. TYPE: Brasil, Goyas, *Gardner 4347* (B, not seen; isotype MO).

*Quinquelobus utriculariaeoides* Benj., *Linnaea* 20: 316. 1847. = *Benjaminia utriculariformis* Benj. orth. mut. cf. Benjamin, *Linnaea* 20: Bericht. 1. 1847.

*Monniera reflexa* (Benth.) Kuntze, *Rev. Gen. Pl.* 2: 463. 1891.

*Bacopa reflexa* (Benth.) Edwall, *Bol. Commiss. Geogr. Estado São Paulo* 13: 176. 1897.

*Naiadothrix longipes* Pennell, *Mem. Torrey Bot. Club* 16: 105. 1920.

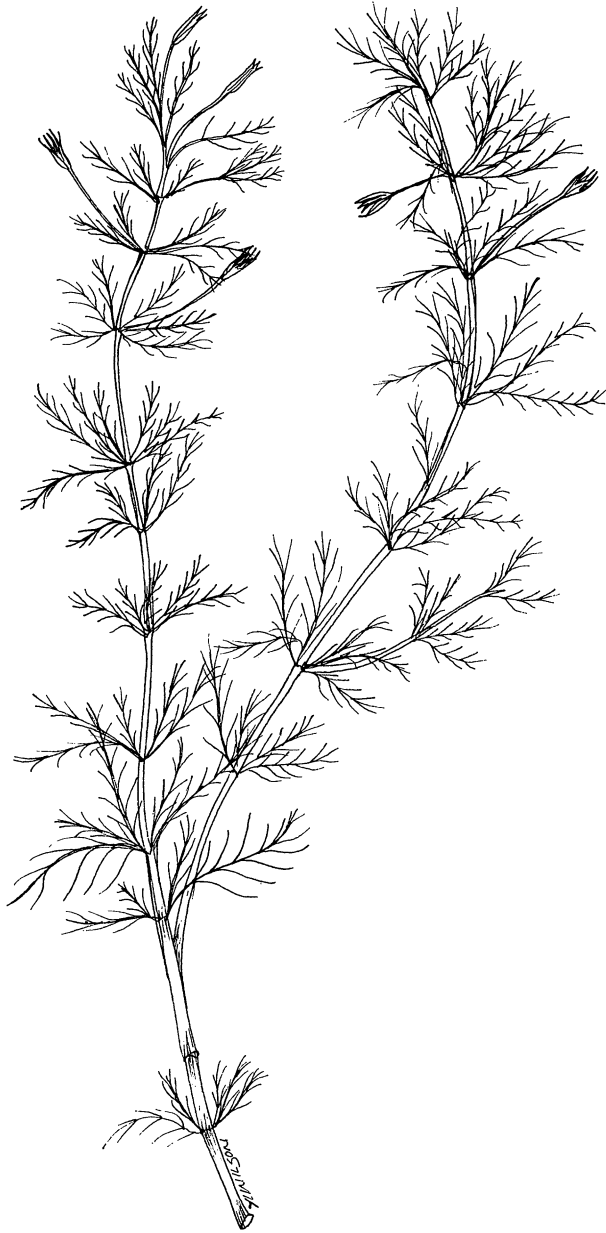


FIGURE 4. *Benjaminia reflexa* (Benth.) D'Arcy. Habit ( $\times 1$ ). [After Hunter & Steyermark 16718 (NY).]

*N. reflexa* (Benth.) Pennell, Mem. Torrey Bot. Club 16: 106. 1920.

*Bacopa longipes* (Pennell) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 141. 1932.

*B. naitas*, Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 141. 1932. TYPE: Belize, Schipp 610 (F, holotype, not seen; isotype MO).



Rooted, submerged aquatic *herbs*; stems often branching, sometimes ridged, the nodes sometimes slightly jointed, glabrate or pubescent with weak, white, several-celled hairs, glandular punctate. *Leaves* 6–8 verticillate, 2–35 mm long, imparipinnately dissected, the 5–20 segments on each side flat, filiform, 0.5–12.0 mm long; petiole wanting or short, the leaf bases sometimes united into a rudimentary column. *Inflorescence* of solitary flowers in the leaf axils, usually only 1 per node, pedicels 0.5–18.0 mm long, becoming 10–25 mm long and stouter in fruit, holding flower and fruit above the water surface, ebracteate. *Flowers* 2–5 mm long in bud, the calyx mostly 2–5 mm long, 5-lobed to near the base, the lobes narrow, costate and cucullate, apically ciliolate, punctate, becoming more strongly angled and longer in fruit; corolla bluish or mauve with a yellow eye, lined, exerted ca. 5 mm from the calyx, 2-lipped, the lobes rounded, entire; stamens 4, the anthers versatile, all alike, and the thecae all alike, the filament apically narrowed and the connective not evidently enlarged; style straight, the stigma flattened and curved. *Capsule* ovoid, ca. 2.5 mm long, slightly shorter than the calyx, the pericarp membranous, perhaps not regularly dehiscent, the style persistent; seeds numerous, 0.6 mm long, tan or yellowish, longitudinally reticulate.

This species is conspicuously distinct from all other Panamanian Scrophulariaceae in its finely dissected leaves which closely resemble those of *Cabomba* (Nymphaeaceae). In *Cabomba*, the leaves are doubly compound, the pinnate leaflets arising from stalked verticels while in *Benjaminia reflexa* the verticels are sessile on the stems or nearly so. *Benjaminia reflexa* is superficially similar to *Bacopa myriophylloides* (Benth.) Pennell of South America. In that species, the leaves are not pinnate but digitate, and features of the flower are quite different, notably lacking sterile tufts of filaments around the ovary.

Little material of *Benjaminia* has accumulated in herbaria and the above synonymy is proposed with hesitation. The plants from Belize are much more robust and have more distinctly angled stems than other material seen, and Panamanian plants are more pubescent than those from elsewhere. Capsules of Cuban plants are apically flat or emarginate while those from Brasil are subacute. The capsules of the Cuban plants are also glandular while on Brazilian plants the glands are not evident. In spite of this variation, it is here assumed that all material seen is of one species, wide-ranging geographically and differing greatly in age and perhaps growing conditions. Contrary to Pennell, none of the plants is glabrous. The above description was prepared from a range of material at hand and not from Panamanian specimens only.

PANAMÁ: Aquatic pool in savanna, road to Chepo, *Hunter & Steyermark 16715* (PH), *16718* (NY, PH). Laguna de Portala near Chepo, 50 m, *Pittier 4604* (US).

## 6. BUCHNERA

**Buchnera** L., Sp. Pl. 630. 1753; Gen. Pl., ed. 5. 278. 1754. TYPE: *B. americana* L.

*Piriþea* Aubl., Hist. Pl. Guiane 2: 628. 1775. TYPE: *P. palustris* Aubl. = *Buchnera palustris* (Aubl.) Spreng.

*Bonnetia* Neck., Elem. Bot. 1: 368. 1790, non *Bonnetia* Schreb. (1789—Theaceae), nec

*Bonmetia* Mart. (1826—Theaceae). nomen illegit., cited *Piripea* Aubl. TYPE: not designated.

*Buechnera* auct. = *Buchnera* orth. mut.

Annual or perennial *herbs*, mostly drying black, perhaps parasitic; stems sparingly branched, mostly wiry, slightly compressed or terete, mostly pubescent, often strigose, the hairs often stout based. *Leaves* narrow, the basal leaves opposite, sometimes small and broad, the cauline leaves often alternate, entire or remotely denticulate, pointed at both ends, (1-)3-5-nerved; petiole mostly obsolete. *Inflorescences* terminal spikes, the flowers subsessile, subtended by scalelike foliaceous bracts and by 2 ovate, usually ciliate bracts, the outermost usually larger. *Flowers* with the calyx tubular, sometimes broader above, 5-lobate, the lobes equal or conspicuously unequal, the tube 10-nerved, enervate between or conspicuously nervate between the major nerves, slightly accrescent in fruit; corolla salverform, the tube exerted, glabrous or pubescent outside, the limb with 5 subequal rotund lobes, the throat densely tufted with stout, moniliform hairs, the tube mostly pubescent below and pubescent with simple or few celled hairs below the point of stamen insertion; stamens 4, inserted in the bottom  $\frac{1}{2}$  of the tube, didynamous, the anthers ovoid or ovate, pointed apically, versatile, situated about  $\frac{2}{3}$  way up the tube; ovary ovoid, glabrous, the style simple, the stigma a linear extension of the style, perhaps inconspicuously 2-lobed, included. *Capsule* enveloped by the indurate fruiting calyx, sometimes slightly exerted, splitting loculicidally to the base into 2 elliptical valves, the dissepiment remaining with the valves as broad median ridges, the placenta narrowly cylindrical; seeds numerous, oblong, slightly angled, longitudinally ridged.

*Buchnera* includes about 100 species, about 16 occurring in the New World and ranging from eastern Canada to Argentina. The genus is relatively uniform in general appearance, sparingly branched wiry herbs with small, salverform white, blue or purplish corollas. In some species variously colored corollas occur in the same population. The calyx is shaped much like that of *Escobedeia* with which *Buchnera* is usually allied. Species of *Buchnera* occupy open habitats and are tolerant of paludal conditions as well as extreme drought. In Panama, species of *Buchnera* bloom on dry savannahs when no other plants are in flower.

#### Literature:

Philcox, D. 1965. Revision of the New World species of *Buchnera* L. (*Scrophulariaceae*). Kew Bull. 18: 275-315.

- a. Calyx with the areas between the 10 principal nerves enervate; corolla mostly white, the lobes entire, glabrous; inflorescence mostly open ..... 1. *B. pusilla*
- aa. Calyx with evident nerves between the 10 principal nerves and hence appearing many nerved; corolla mostly pink or purplish, the lobes often crenulate, sometimes ciliate; inflorescence mostly crowded.
  - b. Corolla tube externally glabrous; leaves linear, appearing 1-nerved, glabrous except at the ciliate base; bracts glabrous except for the ciliate margin; calyx glabrous, the lobes acuminate; annual plants ..... 3. *B. weberbaueri*
  - bb. Corolla tube externally pilose; leaves lanceolate or oblong, mostly evidently 3-nerved, pubescent overall; bracts dorsally pubescent, especially apically; calyx pubescent, at least on the nerves, the lobes short-deltoid; perennial plants ..... 2. *B. rosea*

1. ***Buchnera pusilla*** H.B.K., Nov. Gen. Sp. Pl. 2: 340. 1818. TYPE: Colombia, *Humboldt & Bonpland* (B, not seen, destroyed fide Philcox 1965; photo MO). —FIG. 5.

*B. tinctoria* Bertol., Fl. Guatimal. 26. 1840. TYPE: Guatemala, *Bertoloni* (?BOLO, not seen).

*B. major* Polak., Linnaea 41: 588. 1877. TYPE: Costa Rica, *Polakowsky 519*, not seen.

*B. mexicana* Hemsl., Biol. Centr. Amer. Bot. 2: 457. 1881. TYPE: Mexico, *Seemann 2095* (K).

*B. mexicana* var. *minor* Hemsl., Biol. Centr. Amer., Bot. 2: 457. 1881. TYPE: Mexico, *Seemann 1506* (K).

*B. minor* (Hemsl.) Riley, Kew Bull. 1923: 117. 1923.

*B. elongata* sensu auct., non Sw.

*B. elongata pilosa* Benth., Bot. Voy. Sulphur 144. 1845. nomen nudum. TYPE: Mexico, *Schlechtendal 113*, not seen.

*B. lithospermifolia* sensu auct., non H.B.K.

*B. pilosa* Benth., Bot. Voy. Sulphur 144. 1845. nomen nudum.

Slender annual *herbs*, sparingly branched, to 30 cm tall, the stems wiry, scabrid with white, stout based mostly ascending short hairs and also with finer hairs, mostly somewhat compressed, inconspicuously ridged. Basal *leaves* obovate, to 10 mm long, glabrate but ciliate on the margin and the costa, the cauline leaves narrowly oblanceolate or linear, to 3 mm wide and 40 mm long, entire or with a few ill-spaced salient teeth, scabrid with stout based short acicular whitish or dirty colored hairs, in age the stout bases remaining as callose punctations, 3-nerved but usually appearing 1-nerved, the petiole not differentiated. *Inflorescence* mostly open, a terminal spike to 15 cm long, the outermost bracts ovate, shorter than the calyx except those towards the base of the inflorescence, the inner bract narrower, shorter, both bracts ciliate and scabrid with short, firm, acicular hairs, these often stout based. *Flowers* mostly white, sometimes blue, pink or purple, the calyx 5–7 mm long, tubular, 10-ribbed, the ribs prominent and conspicuously scabrid, the intermediate areas with obscure venation, mostly glabrous, the 5 teeth often quite unequal, narrowly acuminate, mostly 1–2 mm long, somewhat outcurving; corolla salverform, to 8 mm long, the tube exerted, mostly glabrous outside, the limb 5-lobed, the lobes 2–5 mm long, entire, glabrous, but sometimes minutely papillose ventrally, the throat slightly elevated above the patent lobes, tufted with sturdy hairs, sparingly pilose within with long weak hairs; stamens 4, the filaments inserted about  $\frac{1}{2}$  way up the tube, subequal, the anthers narrowly ovoid or oblong, pointed apically, 2-locular, situated in the top  $\frac{1}{2}$  of the corolla tube; ovary glabrous, 2-locular, narrowly conical, the style straight, glabrous, the stigma elongate, slightly expanded, sometimes compressed. *Capsule* included in the indurated, slightly accrescent calyx, mostly exceeding the calyx tube but not the lobes, the valves elliptical; seeds ca. 1 mm long, yellowish, oblong, longitudinally ridged.

This species is distinguished from other Panamanian species of *Buchnera* by its roughly scabrid flowering calyces which lack venation between the 10 ribs.

→

FIGURE 5. *Buchnera*.—A, B. *Buchnera pusilla* H.B.K.—A. Habit ( $\times\frac{7}{10}$ ).—B. Calyx and bracts, corolla removed ( $\times 3\frac{1}{2}$ ). [After *Pittier 5069* (US).]—C. *Buchnera weberbaueri* Diels. Calyx and bracts, corolla removed ( $\times 3\frac{1}{2}$ ). [After *Piper 5542* (US).]



In fruit, this species may develop nerves between the calyx ribs. The usually glabrous corolla and entire, eciliate corolla lobes are also distinctive. One collection, *Ebinger 1077*, from the Azuero Peninsula, has corolla tubes with a few hairs at the apex, a condition quite unusual in the species. This collection seems in no other way different from other collections from throughout the range.

*Buchnera pusilla* is sometimes difficult to separate from *B. longifolia* H.B.K. (*B. elongata* Sw.) from the Antilles. Philcox (1965) noted that Antillean collections tend to have less sturdy hairs on the calyces and these hairs usually lack expanded bases. Material examined in this study did not evoke confidence in the separation. Both *B. pusilla* and *B. longifolia* were published at the same time, so that if the two names do apply to the same species, *B. longifolia* becomes a synonym of *B. pusilla*.

*Buchnera pusilla* ranges from Mexico to Ecuador and Brasil, and if the synonymy of *B. longifolia* is accepted, in the Antilles and south to Argentina.

CANAL ZONE: Chiva-Chiva, *Killip 3133* (PH, US). Alhajueta, Chagres River, *Killip 3217* (US). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5745* (PH, US). Sosa Hill, Balboa, *Standley 25296* (PH, US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29035* (US). Cocoli Island, Miraflores Lake, *White 289* (MO). CHIRIQUÍ: Lava flow between El Hato and Bambito, *D'Arcy 1011* (MO). Ca. 3 km NE of El Hato del Volcan at base of Volcán de Chiriquí, 1–3 km E of highway, 1500–1800 m, *Davidse & D'Arcy 10381* (MO). Cerro Vaca, 900–1136 m, *Pittier* (US). COCLÉ: E of Río Teta and Inter-American Highway, *Blum 1878* (MO). Near Santa Clara Beach, *Croat 9605* (MO). Picacho de Olá, *Pittier 5069* (US—right hand plants only). Penonomé, 50–1000 ft, *Williams 184* (NY). COLÓN: Savannas along drowned Río Azote Caballo, 66–70 m, *Dodge et al. 16838* (MO). HERRERA: Ocú, *Ebinger 1077* (MO, US). PANAMÁ: Pacora, 35 m, *Allen 1001* (MO). Between Panama and Chepo, *Dodge et al. 16659* (MO). Near beach at Nueva Gorgona, *Duke 4542a* (MO). Toward top of Cerro Campana, *Duke 6010* (DS, MO). Savannas near Chepo, *Duke 6055* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5104* (MO). South Beach, San Jose Island, *Erlanson 529* (US), 569 (NY, US). Air strip and East Harbor, San Jose Island, *Harlow 77* (US). Llanos de Panamá Vieja, *Heriberto 289* (US). Savannas near Chepo, *Hunter & Allen 33* (MO). East Bay, San Jose Island, *Johnston 180* (MO, US). Savannas, *McBride 2659* (US). 7 mi S of Campana, *McDaniel 8316* (DUKE, MO). Savannas N of Panama City, *Paul 391* (US). Laguna de Portala near Chepo, *Pittier 4597* (US). Chepo, 60 m, *Pittier* (US). Sosa Hill, *Standley 26409* (US). Big swamp E of Río Tocumen, *Standley 26616* (US). Toboga Island, *Standley 28024* (US). Río Tapia, *Standley 28189* (US). Between Las Sabanas and Mátias Hernández, *Standley 31852* (PH, US). VERAGUAS: Near La Mesa, *Tyson 6056* (MO).

2. *Buchnera rosea* H.B.K., Nov. Gen. Sp. Pl. 2: 342. 1818. TYPE: Colombia, *Humboldt & Bonpland* (P, not seen; photo, MO).

*B. lithospermifolia* sensu auct., non H.B.K.

Perennial wiry herb to 1 m tall, sparingly branched, the stems terete or somewhat compressed, sometimes drying somewhat angled or grooved, puberulent but seldom strigulose, the 2–3 celled hairs microscopically tuberculate, the bases sometimes expanded. Leaves lanceolate, to 6 cm long, 10 mm wide, acute at both ends, entire or remotely denticulate, prominently 3(–5) nerved, the veins elevated beneath, scabrous to glabrate, the leaves smaller upwards, becoming scalelike and apparently 1-nerved at the inflorescence, pubescent on both sides with acicular hairs, more so beneath, glabrescent beneath except on the costa, the petiole obsolete. Inflorescence an elongate terminal spike, the flowers mostly aggregated and sometimes congested near the apex, the lower portion of the

rachis with greatly reduced leaves (bracts), the flowers subtended by 2 small bracts, the outermost larger, conspicuously ciliate and dorsally appressed pubescent. *Flowers* mostly pink or purplish, the calyx tubular, 5–6 mm long, the 5 deltoid lobes subequal, the tube 10-nerved with evident intermediate longitudinal nerves and thus appearing many nerved, mostly pubescent all over with short hairs, the bases sometimes expanded and callose, but not greatly so; corolla salverform, 6–9 mm long, the tube overall pubescent outside with short, weak hairs; the limb 5-lobed, 6–7 mm across, the lobes entire or crenulate-erose margined,  $\bar{p}$ emarginate ciliate, the throat tufted with stout hairs; stamens inserted in the lower  $\frac{1}{2}$  of the tube, the 2 pairs at nearly the same level, 1 pair of the filaments twice as long as the other, the anthers ovate, apiculate, versatile, becoming quite flat, situated in the upper  $\frac{1}{2}$  of the tube; ovary glabrous, the style simple, the stigma an elongate continuation of the style, not or hardly exceeding the anthers. *Fruiting calyx* 5–7 mm long, 20–30 nerved or reticulate between the 10 ribs, indurate, apically strigose with short, subappressed stout based hairs, the capsule about as long as the calyx lobes; seeds yellowish, longitudinally ridged, oblong, ca. 0.5 mm long.

*Buchnera rosea* is distinguished from *B. pusilla* by its pubescent corolla tube and by the nervate areas between the calyx ribs. It is distinguished from *B. weberbaueri* by its usually 3–5 nerved and pubescent leaves. *Buchnera rosea* ranges from Peru to Panama. Panamanian collections are much less robust than those seen from South America.

CANAL ZONE: Ancón Hill, Killip 12076 (PH, US); Piper 5542, 5546, 5577 (all US); Standley 26346 (US). PANAMÁ: Isla Taboga, Allen 1281 (MO, PH, US). Hills NE of Hacienda La Joya, Dodge et al. 16881 (MO). Taboga Island, Killip 3171 (US); Macbride 2819 (PH, US); Miller 2032 (US); Pittier 3594 (US); Standley 28024 (US); Woodson et al. 1466 (MO).

3. ***Buchnera weberbaueri*** Diels, Bot. Jahrb. Syst. 37: 430. 1906. HOLOTYPE: Peru, Weberbauer 4595 (B, destroyed, not seen; photo MO); NEOTYPES: Panama, Terry 1273 (F, not seen, MO).—FIG. 5.

*B. leiantha* Standley, Field Mus. Nat. Hist., Bot. Ser. 22: 105. 1940. TYPE: Panama, Terry 1273 (F, holotype; isotype, MO).

Wiry herb to 60 cm tall, mostly unbranched; stems terete or somewhat compressed, scabrous with stout acicular white hairs and finer shorter hairs, glabrescent. *Leaves* linear, to 3 cm long, to ca. 2 mm wide but mostly narrower, 3-nerved on wider leaves, mostly seemingly 1-nerved, the nerves indurate callose, glabrous except ciliate near the base. *Inflorescences* elongate terminal spikes, only the apical 10–25 mm floriferous, the basal portion with scalelike bracts, the flowers congested, subtended by 2–3 ovate bracts slightly more than  $\frac{1}{2}$  as long as the calyx, the innermost bracts much smaller, glabrous except for the ciliate margins. *Flowers* lavender, the calyx narrowly funnelform, 7–10 mm long, many nerved, glabrous, the lobes equal, acuminate, ca. 2 mm long; corolla tube to ca. 10 mm long, glabrous outside, the lobes rotund, ca. 3 mm long, sometimes sparingly ciliate and crenulate, the throat bearded. *Capsule* ovoid, glabrous, 6–8 mm long, included in the indurate calyx.

*Buchnera weberbaueri* ranges from Peru to Trinidad and west to Panama and Belize. In Panama it occurs at middle elevations in Chiriqui as well as at lower elevations in Cocle Province. Philcox described this species as an annual, but in Diel's original description the roots are referred to as napiform incrassate, suggesting a perennial habit.

CHIRIQUÍ: Pastures around Boquete, 100–1300 m, *Pittier* 3364 (NY, US). Cerro Vaca, eastern Chiriquí, 900–1136 m, *Pittier* 5359 (US). Jarmillo, Boquete District, 4500 ft, *Terry* 1273 (MO). COCLÉ: Hills N of El Valle, 800 m, *Allen* 2238 (MO). Picacho de Olá, 350–600 m, *Pittier* 5069 (US—left hand specimen only).

## 7. CALCEOLARIA

ULF MOLAU\*

*Calceolaria* L., Kongl. Vetensk. Akad. Handl. 31: 288, 1770. TYPE: *C. pinnata* L. *Fagelia* Schwenke, Verh. Bataafsch Genootsch. Rotterdam 1: 147. 1774. TYPE: *F. flavicans* J. F. Gmel.

Annual or perennial *herbs* or *shrubs*. *Leaves* simple, opposite (ternate in some Peruvian species), petiolate or sessile. *Inflorescence* terminal or axillary, usually consisting of pairs of cymes, sometimes reduced to axillary pairs of pedicels. *Flowers* with the calyx 4-parted, the sepals valvate, the corolla bilabiate, yellow or reddish (Peru and Chile); upper lip usually smaller than the lower lip, hooded; lower lip saccate, inflated, globose; stamens 2, the filaments short, the anther cells deflexed or divaricate; ovary 2-loculed; the style short, often recurved, the stigma simple. *Capsule* dry; seeds minute, numerous.

*Calceolaria* includes about 300 species and is one of the largest genera of the Andes, ranging from Mexico to Cape Horn. In Central America, Venezuela, Colombia, Ecuador, Peru and Bolivia, the genus is restricted to mountain regions, occurring at elevations of 1000–4000 m. In Argentina and Chile, however, many lowland species occur, frequently with an acaulescent habit.

Four species are known to occur in Panama. *Calceolaria irazuensis* and *C. perfoliata* belong to the subgenus *Cheiloncos* (Wettst.) Pennell, comprising species with entire leaves and anthers with contiguous cells. Both anther cells are fertile and the connective is reduced. This subgenus consists of annual or perennial, mesophytic or xerophytic herbs and shrubs, and reaches its highest species diversity in Ecuador and Peru. *Calceolaria mexicana* and *C. tripartita* belong to the other subgenus, *Calceolaria*, which comprises usually widespread, hydrophytic annual herbs, characterized by pinnatifid-lobed leaves and peculiar anthers. The anther cells are separated by the elongated connective, and the lower one is often sterile and modified.

### Literature:

Pennell, F. W. 1945. The genus *Calceolaria* in Southeastern Peru. Proc. Acad. Nat. Sci. Philadelphia 97: 174.

- a. Leaves entire, the margin serrate; anther cells contiguous, both fertile, (subgenus *Cheiloncos*)
- b. Leaves sagittate or narrowly triangular; petioles broadly winged and connate at the base ..... 3. *C. perfoliata*

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- bb. Leaves broadly lanceolate; petioles not dilated ..... 1. *C. irazuensis*  
 aa. Leaves usually deeply pinnatifid-lobed; anther cells separated by the elongated connective, the lower one fertile or sterile (subgenus *Calceolaria*)  
 c. Lower anther cell fertile ..... 2. *C. mexicana*  
 cc. Lower anther cell sterile ..... 4. *C. tripartita*

1. ***Calceolaria irazuensis*** Donnell Smith, Bot. Gaz. (Crawfordsville) 20: 292. 1895. TYPE: Costa Rica, *Donnell Smith 4904* (K).—FIG. 6.

*C. costaricensis* Kränzl., Ann. K. K. Naturhist. Hofmus. 22: 192. 1907. TYPE: *Endres* (B, not seen, destroyed).

Erect or scandent *herb* to 2 m tall; stems puberulent, distally tomentous with short brown or purplish hairs. *Leaves* 4.8–12 cm long, 1.7–4.3 cm broad, broadly lanceolate, apically acuminate, basally truncate or attenuate, sometimes narrowed almost to the base of the petiole, the margin irregularly serrate or serrulate, above dark green, glandular dotted and often short pilose, beneath paler, reticulate venose, the primary and the secondary veins tomentous with brownish hairs, the lamina glabrous, dotted with sessile yellowish glands; petiole 5–15 mm long, tomentous or villous. *Inflorescence* of 1–2 pairs of 2–10-flowered cymes; primary peduncles (3.5–)5–12 cm long, in vestiture resembling the stems; pedicels 0.8–4.0 cm, tomentous; bracts resembling the main leaves but smaller, subordinate bracts lacking. *Flowers* with the sepals 4.5–9.0 mm long, 3.5–7.0 mm broad, ovate, brownish green, both sides with yellowish hyaline glands, ciliate; corolla externally glandular papillose or glandular pilose at least around the mouth, the upper lip light yellow, 6–8 mm long, 10–13 mm broad, hooded, flattened in the lateral view, the lower lip deep yellow, 15–25 mm long, 10–17 mm broad, projecting, saccate about  $\frac{2}{3}$  of its length, internally with a tuft of white hairs below the base and between the stamens; anthers 3.5–4.0 mm long, dark brown, dehiscing throughout, the cells divaricate, equal, their distal parts bent somewhat downward, the filaments 1.5 mm long, glabrous; ovary glandular, style 4–5 mm long, distally decurved. *Capsule* 5–8 mm long, globose, with small glands and a slightly pointed apex.

*Calceolaria irazuensis* is readily distinguished from other Central American species of the genus by shape of leaves and corolla. It belongs to the section *Dermatophylla* Pennell, which ranges from Costa Rica to Peru. It is an upland species, restricted in its distribution to the higher mountains of Panama and Costa Rica.

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White 115* (MO). E slope of Volcán de Chiriquí (Barú) above Boquete, 3100 m, *Davidse & D'Arcy 10280* (MO). Loma Larga to summit, Volcán de Chiriquí, 2500–3380 m, *Woodson et al. 1061* (MO). Potrero Muleto to summit of El Barú, *D'Arcy 10161* (MO). Alto Respinga and above, 2800 m, *D'Arcy 9995* (MO).

2. ***Calceolaria mexicana*** Benth., Pl. Hartw. 47, 1840. TYPE: Mexico, *Hartweg 356* (K).—FIG. 6.

*C. glutinosa* Heer & Regel, Linnaea 24: 196. 1851. TYPE: Guatemala, *Warscewicz* (not seen).

*C. urticina* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 1: 82. 1905. TYPE: Mexico, *Uhde 1203* (not seen).



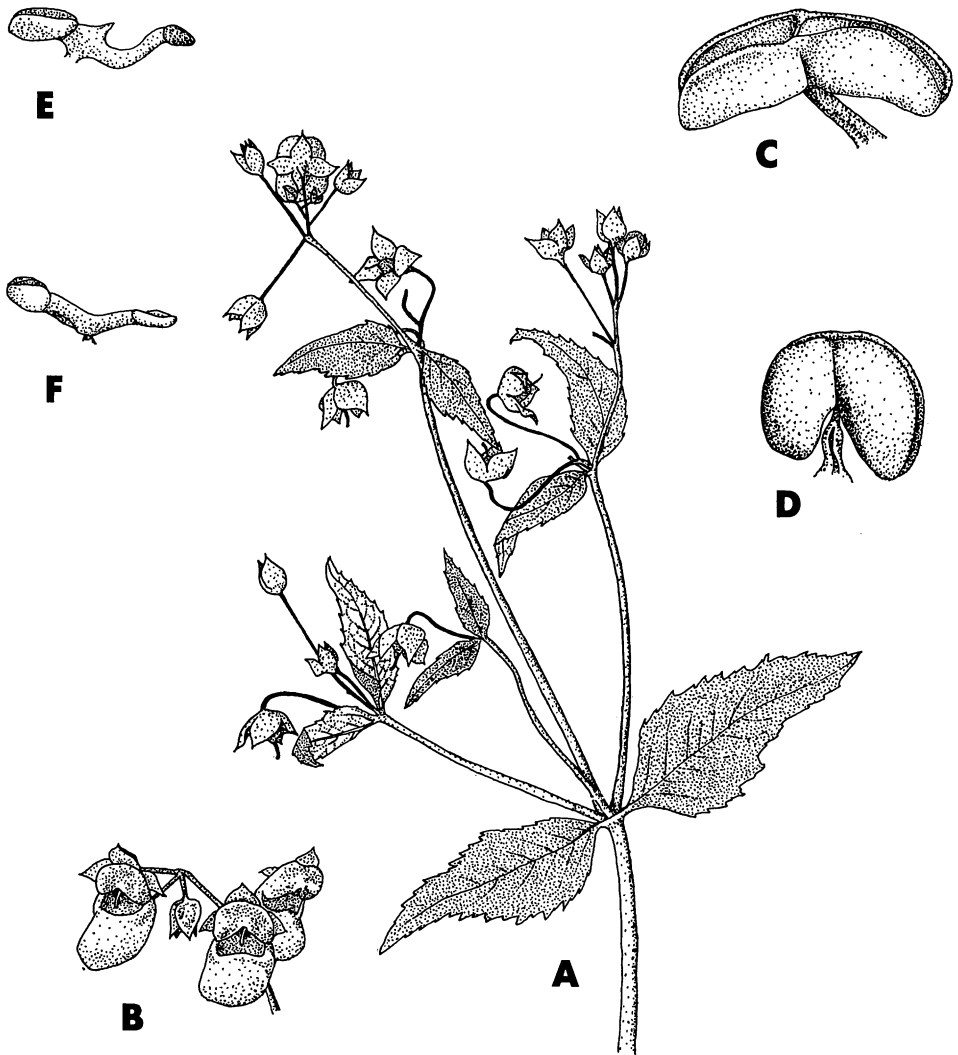


FIGURE 6. *Calceolaria*.—A–C. *Calceolaria irazuensis* Donnell Smith.—A. Flowering branch ( $\times 7/10$ ).—B. Flowers ( $\times 7/10$ ).—C. Stamen ( $\times 10\frac{1}{2}$ ). [A & C after Davidse & D'Arcy 10280 (MO); B after photo of D'Arcy 9995 (MO).]—D. *Calceolaria perfoliata* L.f. Stamen ( $\times 10\frac{1}{2}$ ). [After D'Arcy (MO-2338343).]—E. *Calceolaria tripartita* Ruiz & Pavón ( $\times 10\frac{1}{2}$ ). [After Woodson & Schery 701 (MO).]—F. *Calceolaria mexicana* Benth. ( $\times 10\frac{1}{2}$ ). [After D'Arcy 6421 (MO).]

- C. palustris* Sodiro ex Kränzl., Pflanzenreich 4 (257c): 27. 1907. TYPE: Ecuador, Sodiro 115/1 bis (B, not seen, destroyed; photo PH).
- C. prostrata* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 1: 31. 1907. TYPE: Venezuela, Ernst (BM).
- Fagelia crenatiloba* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 182. 1920. TYPE: Colombia, Pennell 3119 (NY).
- F. micrantha* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 180. 1920. TYPE: Colombia, Pennell 3145 (NY).
- F. radiculoides* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 181. 1920. TYPE: Colombia, Pennell 1942 (NY; isotype PH).

*C. laciniata* Kränzl., Repert. Spec. Nov. Regni Veg. 27: 3. 1929. TYPE: Colombia, *Schultze* (B, not seen, destroyed).

*C. radiculoides* (Pennell) Kränzl., Repert. Spec. Nov. Regni Veg. 27: 4. 1929.

*C. flosparva* Edwin, Phytologia 19: 380. 1970. TYPE: Peru, *Pennell 15633* (PH, holotype; F, US isotypes).

Annual *herb*, 0.1–0.5(–1.0) m tall; stems procumbent or ascending, fleshy, pilose with fine, often glandular hairs. *Leaves* 2–6(–11) cm long, 1.5–5(–6.5) cm broad, very variable, usually pinnatisect and ovate, occasionally almost entire and then lanceolate and incised, serrate, basally truncate or attenuate, lateral lobes in 1–2(–3) pairs, usually lingulate, acute or obtuse, the margin doubly serrate, occasionally lacinate, above green, pilose, beneath pale, glabrous or pilose on the midrib; petioles 1–6 cm long, often slightly winged distally, connate by a swollen ridge across node. *Inflorescence* varying from axillary pairs of pedicels to terminal, repeatedly dichotomous 5–30-flowered cymes; primary peduncles 1.5–9 cm long; pedicels 1–3 cm long, pilose or villose, often with gland-tipped hairs; bracts petiolate, entire, lanceolate, acute, the margin serrate; subordinate bracts frequently present. *Flowers* with the sepals 3–7 mm long, 1.5–3 mm broad, green, lance ovate, acute or acuminate, glabrous or puberulous, the margin denticulate; corolla small, sulphur yellow, glabrous, the upper lip 1–2 mm long, 2–3 mm wide, hooded, concealing the anthers, the lower lip 5–11 mm long, 3–6 mm wide, projecting, saccate most of its length, the proximal part appressed against the upper lip and closing the mouth; anthers 2.0–3.5 mm long, both cells fertile, much shorter than the elongated, linear connective; style 0.5–1.5 mm long, slightly curved. *Capsule* 3–9 mm long, broadly ovoid, glandular-pilose.

This species is best recognized by its anthers, which have both cells fertile and separated by the elongated connective. *Calceolaria mexicana* is a common upland species of moist and wet places, ranging from Mexico to Bolivia.

BOCAS DEL TORO: Robalo Trail, N slope of Cerro Horqueta, (6–7000 ft), *Allen 4909* (MO, P). CHIRIQUÍ: Río Chiriquí Viejo just above Guadalupe, *Croat & Porter 16038* (MO). Las Nubes 2.7 mi NW of Río Chiriquí Viejo W of Cerro Punta, 2200 m, *Croat 22389* (MO). La Popa above Boquete, 5200 ft, *D'Arcy 6421* (C, MO). Gravel bar in Río Chiriquí Viejo across from town of Cerro Punta, 1830 m 6000 ft, *D'Arcy 6592* (C, MO). Alto Respinga and above, 2800 m, *D'Arcy 9974* (MO). Bajo Chorro, Boquete District, 6000 ft; clearing in rain forest, *Davidson 139* (MO). Boquete trail, Cerro Respinga, E of town of Cerro Punta, 2000–2500 m, *Gentry 5902* (MO). Valley of upper Río Chiriquí Viejo, Monte Lirio, 1300–1900 m, *Seibert 168* (MO). Trail between Cerro Punta and Quebrada Bajo Grande, 2000–2100 m, *Wilbur et al. 11886* (MO). 2 km W of La Garita 3 km WNW of Cerro Punta, 2000 m, *Wilbur et al. 15254* (MO). Bajo Chorro, 1900 m, *Woodson & Schery 622, 636, 642* (all MO).

3. *Calceolaria perfoliata* L. f., Suppl. 86, 1781. TYPE: Colombia, *Mutis 121* (LINN, holotype, isotypes PH, S, US).—FIG. 6.

*Fagelia perfoliata* (L.f.) Kuntze, Rev. Gen. Pl. 2: 460. 1891.

*F. tolimensis* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 177. 1920. TYPE: Colombia, *Pennell 2979* (NY).

*Calceolaria homoiclada* Kränzl., Repert. Spec. Nov. Regni Veg. 27: 10. 1929. TYPE: Colombia, *Schultze* (B, destroyed, not seen).

Scandent *herb* 1–4 m long; stems usually purplish, pilose, with long internodes. *Leaves* joined by the connate petioles; leaf-blades sagittate or narrowly triangular, 6–11 cm long, 3.5–7 cm broad, acute or somewhat acuminate, basally truncate or

slightly cordate, the margin irregularly doubly dentate or serrate, above green, pilose, beneath pale green or grayish green, reticulate venose, the nerves villous with whitish hairs, the lamina glabrous or pilose; petiole 2–5 cm long, winged, the margin entire or denticulate, at the connate base 2–4 cm broad, distally 0.5–1.5 cm broad. *Inflorescence* of 2–4 pairs of 10–20-flowered axillary cymes; peduncles 6–15 cm long; pedicels 1.5–4.5 cm long, villous with spreading whitish hairs; bracts oblique ovate, sessile, acuminate, dimidiate, irregularly dentate, 3–7 cm long, 2–4 cm broad, subordinate bracts lacking. *Flowers* with the sepals 9–12 mm long, 6–8 mm broad, somewhat enlarged during ripening of the capsule, yellowish, ovate, caudate acuminate, puberulent on both the surfaces, ciliate; corolla sulphur yellow, the upper lip paler, externally slightly pilose, the upper lip globose, arched over the anthers, 4–6 mm long, 6–9 mm broad, the lower lip inflated, projecting, finally pendent, 15–20 mm long, 8–15 mm broad, saccate to about  $\frac{1}{2}$  of its length; anthers dark brown, horseshoe shaped, the cells decurved laterally, each 2–3 mm long; filament glabrous, 1–2 mm; ovary covered with a villous tomentum; style almost straight, 5–7 mm long. *Capsule* 6–7 mm long, ovoid conic, puberulent.

*Calceolaria perfoliata* is recognized by its peculiar leaves and shape of the anthers. A related species, *C. trilobata* Hemsl., native of Colombia and Ecuador, has been introduced to Guatemala, but it has not been reported from Panama. It is distinguished from *C. perfoliata* by deltoid leaf-blades, green sepals and divaricate anther cells. Both species belong to the section *Zygophylla* Pennell, comprising herbs with perfoliate leaves, and ranging from Central America to Bolivia.

*Calceolaria perfoliata* is an upland species, ranging from Costa Rica to Ecuador and it is abundant in Colombia. In Panama it is restricted to the mountains of Chiriquí.

CHIRIQUÍ: Alto Respinga and above, 2800 m, *D'Arcy* (MO-2338343). Bajo Chorro, Boquete District, 1830 m, *Davidson* 159 (MO). W slope of El Barú, 2130–2440 m, *Tyson & Loftin* 5981 (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery* 445 (MO).

4. *Calceolaria tripartita* Ruiz & Pavón, Fl. Peruv. Chil. 1: 14, tab. 22. 1798.

TYPE: Peru, *Pavon* (not seen).—FIG. 6.

*C. pinnata* Ruiz & Pavón, Fl. Peruv. Chil. 1: 14, tab. 19. 1798. non L. TYPE: Peru, *Pavon* (MA).

*C. heterophylla* Willd., Enum. Pl. Hort. Berol. 29. 1809. non R. & P. TYPE: Ecuador, *Bonpland* (B-Willd.).

*C. chelidionoides* H.B.K. Nov. Gen. Sp. Pl. 2: 378. 1818. TYPE: Ecuador, *Bonpland* 2214.

*C. scabiosaefolia* R. & S. in L., Syst. Veg. 1: 187. 1817. TYPE: Ecuador, *Bonpland* (B-Willd.). (B-Willd.; isotype P).

*C. gracilis* H.B.K., Nov. Gen. Sp. Pl. 2: 379. 1818. TYPE: Ecuador, *Bonpland* 3109 (B-Willd.; photo F, PH).

*C. chelidonioides flaccida* Benth. in DC., Prodr. 10: 204. 1846. TYPE: Ecuador, *Hall* 3 (K).

*C. chelidonioides parvifolia* Benth. in DC., Prodr. 10: 204. 1846. TYPE: Ecuador, *Hartweg* 1271 (K).

*Fagelia chelidonioides* (H.B.K.) Kuntze, Rev. Gen. Pl. 2: 459. 1891.

*F. scabiosaefolia* (R. & S.) Kuntze, Rev. Gen. Pl. 2: 460. 1891.

- Calceolaria ranunculoides* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 1: 97. 1905. TYPE: Peru, *Weberbauer 2708* (not seen).
- C. rivularis* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 1: 83. 1905. TYPE: Bolivia, *Fiebrig 3394* (BM).
- C. sarmentosa* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 1: 97. 1905. TYPE: Peru, *Weberbauer 3121* (not seen).
- C. mandoniana* Kränzl., Pflanzenreich. 4(257c): 30. 1907. TYPE: Bolivia, *Mandon 460* (BM).
- Fagelia diversifolia* Pennell, Addisonia 4: 73, pl. 157. 1919. TYPE: Colombia, *Pennell 1320* (NY).
- F. pinnatisecta* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 185. 1920. TYPE: Colombia, *Rusby & Pennell 721* (NY).
- F. scalaris* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 184. 1920. TYPE: Colombia, *Rusby & Pennell 710* (NY).
- Calceolaria puru-puru* Kränzl., Feddes Repert. Spec. Nov. Regni Veg. 27: 2. 1929. TYPE: Peru, *Herrera 748* (B, destroyed; photos F, PH).
- C. gracilis stenoptera* Diels, Biblioth. Bot. 116: 140. 1937. TYPE: Ecuador, *Diels 848* (not seen).
- C. obscura* Pennell, Proc. Acad. Nat. Sci. Philadelphia 97: 176, fig 16a. 1945. TYPE: Peru, *Pennell 14043* (PH, holotype; isotypes BM, F, GH, NY, US).
- C. tripartita mandoniana* Pennell, Proc. Acad. Nat. Sci. Philadelphia 97: 175. 1945.
- C. cartensis* Guillen, Raymondiana 1: 37. 1968. TYPE: Peru, *Guillen 3306* (SMF).
- C. soukupii* Guillen, Raymondiana 1: 34. 1968. TYPE: Peru, *Guillen 3528* (SMF).
- C. velardei* Guillen, Raymondiana 1: 41. 1968. TYPE: Peru, *Infantes 1273* (SMF).
- C. celendinensis* Guillen, Raymondiana 2: 16. 1969. TYPE: Peru, *Riccio 6279* (SMF).
- C. grandepinnata* Edwin, Phytologia 19: 380. 1970. TYPE: Peru, *Pennell 14891* (US, holotype; isotypes GH, NY, PH, US).

Annual herb, 0.1–0.7 m tall; stems procumbent or ascending, fleshy, often reddish below, pilose with fine, often glandular hairs. Leaves (1.5–)3–8(–20) cm long, (1.2–)3–7.5(–15) cm broad, very variable, pinnatisect, ovate with 1–3 pairs of elliptic or lanceolate, acute lateral lobes, the apical lobe ovate or lanceolate, usually somewhat larger than the others, doubly serrate, occasionally incised lacinate, above green and pilose, often with gland-tipped hairs, beneath pale green, pilose or almost glabrous; petioles (0.6–(2–5)–6) cm long, at the lower nodes connate by a swollen ridge across the node. Inflorescence usually of several pairs of axillary pedicels, sometimes a terminal pair of 6–12 flowered cymes; primary peduncles 3–8 cm long; pedicels 1–3 cm long, glandular pilose; bracts, when present, petiolate, entire or nearly so, lanceolate, acute, the margin serrate or lacinate; sepals 4–7 mm long, 2.5–4.0 mm broad in anthesis, later somewhat enlarged, green, ovate, acuminate, denticulate, ciliate with gland-tipped hairs; corolla yellow, sometimes with an orange tinge, glabrous, the upper lip 2–3 mm long, 3–4 mm wide, hooded, concealing the fertile parts of the anthers, the lower lip 10–20 mm long, 6–15 mm wide, projecting, saccate most of its length, the proximal part appressed against the upper lip, closing the mouth; anthers 2.0–3.5 mm long, the posterior (upper) cell fertile, the anterior (lower) cell sterile, reduced to a knob, projecting down in the orifice as a blunt club, by leverage bringing the posterior fertile cell from under the hood of the corolla, the connective elongated, slender and sigmoid, occasionally flattened, 1.2–2.0 mm long, the filament 0.5 mm long; style 1.5–2.0 mm long, curved. Capsule widely conic, 5–9 mm long, glandular pilose.

This species is superficially like *Calceolaria mexicana* but differs in having leaf lobes more deeply cut and the lower anther cell sterile. *Calceolaria tripartita*

shows a striking local variation, especially concerning shapes of leaves and lower anther cell. This is probably due to self-pollination, which occurs regularly in late anthesis, even though the flowers have an elaborate mechanism of cross-pollination, resembling that of *Salvia*.

The type collection of *Calceolaria tripartita* has evidently disappeared from Madrid (MA). The applicability of this name has been carefully considered by Pennell (1945). *Calceolaria tripartita* is an upland species, occurring on moist or wet soil and gravel. It ranges from Mexico to Chile and is one of the most common species of the genus in the northern Andes.

CHIRIQUÍ: Río Chiriquí Viejo just above Guadalupe, *Croat & Porter 16024* (MO). Top of peak between Baru and Respinga, 3000 m, *D'Arcy 10112* (MO). NW of Boquete, Cerro Horqueta, trail to lower edge of cloud forest, 5000–5800 ft, *Dwyer et al. 464* (MO). Río Caldera beyond Bajo Mono near Boquete, 1700 m, *Wilbur et al. 11049* (MO). Río Caldera beyond Bajo Mono about 4 mi NW of Boquete, 4200 ft, *Wilbur et al. 13497* (MO). Finca Lérica, 1750 m, *Woodson & Schery 234* (MO). Vicinity of Bajo Chorro, 1900 m, *Woodson & Schery 701* (MO). Bajo Mono, mouth of Quebrada Chiquero, along Río Caldera, 1500–2000 m, *Woodson et al. 997* (MO).

## 8. CAPRARIA

*Capraria* L., Sp. Pl. 628; Gen. Pl., ed. 5. 276. 1754. TYPE: *C. biflora* L.

Slender branched *shrubs* or *herbs*, the branching alternate. *Leaves* alternate, rotund or linear, mostly toothed in the apical  $\frac{1}{2}$ , cuneate below, inconspicuously glandular punctate, the midvein prominent with about 3 ascending lateral veins on each side; petioles not distinct. *Inflorescences* 1–several flowers in the axils of a leaf; pedicels slender. *Flowers* with the calyx lobes 5, equal, narrow, separate to near the base, the corolla white, rotate or tubular campanulate, glabrous outside, sometimes bearded at the throat within, the stamens 4 or 5, subequal or not, the filaments glabrous, inserted low or high on the corolla tube, alternate with the corolla lobes, the anthers introrse, versatile, basifixed, the basal portions of the thecae divaricate; ovary ovate conical, the style slender, apically compressed, the stigma a pair of lateral areas on the style apex. *Capsule* elliptical, ovoid or conical, glandular punctate, dehiscent septicidally and loculicidally, the placenta remaining as a conspicuous, reticulate-pitted peg; seeds numerous, minute, yellow, with a thick crystalline reticulum.

*Capraria* is a genus of about 4 species of tropical and subtropical America, one species adventive in the Old World. On the basis of pollen morphology, Niezgodá & Tomb (1970) transferred this genus to the Myoporaceae.

### Literature:

Niezgodá, C. J. & A. S. Tomb. 1975. Systematic palynology of tribe Leucophylleae (Scrophulariaceae) and selected Myoporaceae. *Pollen et Spores* 17: 497–516.

Sprague, T. A. 1921. A revision of the genus *Scoparia*. *Kew Bull.* 1921: 205–212.

- a. Style 2 mm long; corolla rotate; calyx only about  $\frac{1}{2}$  as long as the capsule, narrowly deltoid ..... 2. *C. peruviana*

- aa. Style 5 mm long; corolla campanulate or tubular; calyx about as long as the capsule, linear, narrow throughout ..... 1. *C. biflora*

1. **Capraria biflora** L., Sp. Pl. 628. 1753. TYPE: Cultivated, Uppsala (LINN 785.1, not seen; microfiche MO).—FIG. 7.

Slender branched *shrub* to 2 m tall, the twigs tomentulose to glabrate, often drying whitish, slender, the branching alternate. *Leaves* alternate, obovate to oblanceolate, apically obtuse, basally cuneate, toothed in the apical  $\frac{1}{2}$ , the teeth mucronulate, not callose, the midvein prominent, with ca. 3 strongly ascending veins on each side, to 7 cm long, 1.5 cm wide; petiole obscure. *Inflorescence* of 1 or 2 flowers in the leaf axils, numerous; pedicels slender, mostly 1.0–1.5 cm long, glabrate to tomentose. *Flowers* inconspicuous, the calyx of 5 equal, linear lobes ca. 6 mm long, glabrate or hirsute, sometimes ciliate; corolla white, tubular campanulate, ca. 6–9 mm long, 5-lobed about  $\frac{1}{2}$  way down, the lobes rounded, subequal within, glabrous outside, 3 lobes bearded at the throat, sometimes glabrous; stamens 4 or 5, alternate with the corolla lobes, the filaments slender, glabrous, ca. 3 mm long, inserted at the base of the corolla tube, 2 slightly longer and basally geniculate, the anthers ca. 1 mm long; ovary obtuse conical, 2-sulcate, glabrous, the style ca. 5 mm long, slightly compressed apically, the stigma a linear region along the narrow sides of the style. *Capsule* ovoid, glabrous, glandular punctate, septicidally and loculicidally dehiscent, ca. 5 mm long; placenta persistent, conspicuously rugose punctate; seeds yellow, rugose, with a thick, crystalline reticulum, ca. 0.5 mm long.

Nearly all Panamanian collections of this species are from near beaches. It ranges from Florida to Argentina, and is adventive in the Old World. It is a frequent element of the Antillean flora. Several infraspecific taxa have been recognized in this species based on degree of pubescence. Most Panamanian plants are glabrate, but a few collections are tomentulose and might be distinguished as forma *hirta* Loes.

This species is used to make a tea, used sometimes as a beverage and sometimes for reputed medical properties. In large doses it may be a dangerous depressant. "Goatweed," "Te del Pais," "Hierba Te," "Cola de Gallo."

BOCAS DEL TORO: Bocas runway area, *Lazor et al.* 2305, 2387 (both SCZ). Isla Colón, *Wedel* 509 (MO), 2977 (MO, US). Water Valley, *Wedel* 1910 (US). CANAL ZONE: Fort San Lorenzo, *Burch et al.* 1027 (UC). Farfan Beach, *Godfrey* 1677 (SCZ). Gatún, *Heriberto* 106 (US). Edge of mangrove swamp near Fort Randolph, *Standley* 28594 (US). Fort Sherman near beach, *Standley* 31209 (US). PANAMÁ: Taboga Island near beach, *Dwyer* 2818A, 2819 (both MO). Main beach, San Jose Island, *Harlow* 60 (US). Low woods E of Bella Vista, *Maxon & Valentine* 6951 (US). Taboga Island, *Pittier* 3533 (US). Bella Vista, *Standley* 25323 (US). Punta Paitilla, *Standley* 30798 (US). Taboga Island, *Woodson et al.* 1492 (MO). SAN BLAS: Beach E of Puerto Obaldía, *Croat* 16897 (MO).

2. **Capraria peruviana** Benth. in DC., Prodr. 10: 430. 1846. Based on *Capraria peruviana*, *Agerati foliis absque pediculis*, *Feuillee*, Obs. 2: 764, *tab.* 123, *fig.* 48. 1714.

*Shrub* to 2 m tall, the branches slender, puberulent, ridged below the nodes with concaulescent leaf tissue. *Leaves* alternate, lanceolate, apically acute, basally

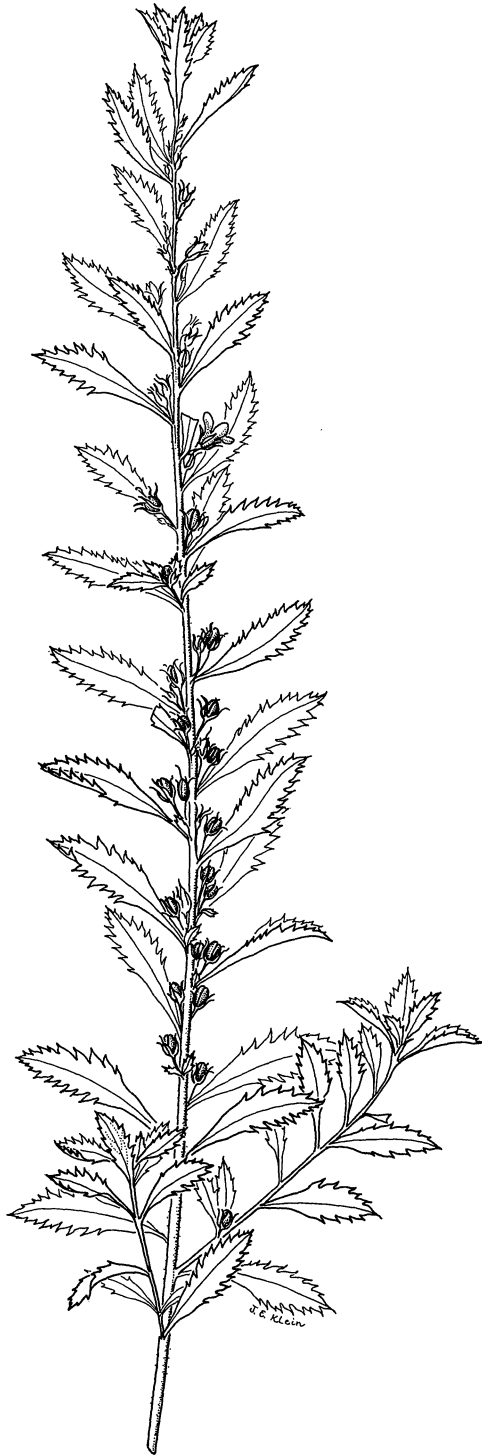


FIGURE 7. *Capraria biflora* L. Habit ( $\times\frac{3}{8}$ ). [After Harlow 60 (US).]

narrowed, denticulate in the upper  $\frac{1}{2}$ , to 7 cm long, 10 mm wide; midvein prominent, the lateral venation obscure; petiole not evident. *Inflorescence* of 1–4 flowers in the axils of the leaves, numerous, the pedicels slender, puberulent, ca. 10 mm long. *Flowers* with the calyx of 5 equal lobes free nearly to the base, narrowly deltoid, ca. 3 mm long, glabrate; corolla white, rotate, ca. 4 mm long, the lobes acute, exceeding the tube, the tube shorter than the calyx lobes, glabrous outside, glabrate within; stamens 5, the filaments glabrous, unequal, 2 short, ca. 1 mm long, inserted near the top of the tube, 2 ca. 2 mm long inserted at the base of the tube; anthers versatile, 1 mm long, the thecae basally divaricate; ovary obtuse conical, the style 2 mm long, apically compressed, the stigma linear, following the style margins, ca. 1 mm long. *Capsule* 4–5 mm long, broadly ellipsoidal, glandular punctate, much exceeding the calyx lobes, the seeds yellow, ca. 0.4 mm long, reticulate.

This species is known from Peru and Ecuador, and it is sparingly found in Colombia and Panama. Close attention to detail is necessary to separate it from the more frequent and widespread *C. biflora*. The above description was made from a series of Ecuadorian collections at MO.

PANAMÁ: On old walls, Panama, *Hayes* 395 (K, not seen, cited by Sprague 1921).

### 9. CASTILLEJA

NOEL H. HOLMGREN<sup>5</sup>

*Castilleja* Mutis ex L.f., Suppl. Pl. 47, 293. 1781. TYPE: *C. fissifolia* L.f.

Perennial or annual *herb*, often becoming shrubby in warm regions, hemiparasitic. *Leaves* alternate, sessile, entire or pinnately lobed, cauline. *Inflorescence* a short or elongate spike or raceme; bracts often leaflike at the base of the inflorescence, gradually differentiating upward, often more conspicuously colored than the flowers. *Flowers* conspicuous to inconspicuous, mostly concealed behind the bracts; calyx tubular, equally or unequally cleft into 4 segments, usually partially united into 2 lateral primary lobes or the primary lobes entire by complete fusion of the lateral clefts, somewhat accrescent in fruit; corolla greenish or the exerted parts often colored, tubular, elongate and narrow, bilabiate, the upper lip galeate (hooded), beaklike, the lobes united to the tip and enclosing the anthers, the lower lip somewhat 3-saccate with 3 more or less rudimentary teeth or sometimes 3 petaloid lobes nearly equalling the galea in length, external to the upper lip in bud; stamens 4, didynamous, attached near or above the middle of the corolla tube, the 2 anther-sacs unequally placed, the outer longer and attached by its middle, the inner smaller and suspended from its apex; stigma united and capitate, or sometimes slightly 2-lobed. *Fruit* a loculicidal capsule, more or less asymmetrical, ovate to globose; seeds numerous, the loose testa alveolately reticulate.  $x = 12$ .

*Castilleja* includes about 200 species. They occur chiefly in western North America, but are represented in eastern North America with 3 species, northern Asia with about 5, Central America with about 8, and Andean South America

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with about 5. The major taxonomic distinctions are in the flowers. Named in honor of Domingo Castillejo, a botanist of Cadiz, Spain.

Literature:

Pennell, F. W. 1940. Scrophulariaceae in R. E. Woodson, Jr. & R. W. Schery, Contributions toward a flora of Panama. *Ann. Missouri Bot. Gard.* 27: 338-341.

- a. Inflorescence spicate with small, crowded flowers; calyx subequally cleft both front and rear; plants annuals ..... 1. *C. arvensis*  
 aa. Inflorescence racemose and secund with conspicuous flowers; calyx much more deeply cleft in front than in back; plants perennials ..... 2. *C. quirosii*

1. **Castilleja arvensis** Schlecht. & Cham. *Linnaea* 5: 103. 1830. TYPE: Mexico, near Jalapa, *Schiede & Deppe* (not seen).

*C. communis* Benth. in DC., *Prodr.* 10: 529. 1846. LECTOTYPE: Mexico, Vera Cruz, Jalapa, *Linden 212* (not seen, photo NY), designated by Pennell.

*C. communis* fo. *johnstoniae* Standley, *Publ. Field Mus. Nat. Hist., Bot. Ser.* 23: 86. 1944. TYPE: Guatemala, Santa Lucía Cotz, *Standley 63500* (F).

*C. agrestis* Pennell, *Fieldiana, Bot.* 28(3): 519. 1953. TYPE: Mexico, Michoacán, Pátzcuaro, *Pringle 3349* (PH).

Annual *herb*; stems 1-8 dm tall, usually simple, sometimes sparingly branched above, often with fleshy leaf scales (tubercles) at the base; herbage villous to hirsute, usually with viscid and gland-tipped hairs. *Leaves* 3-6(-10) cm long, 5-15(-22) mm broad, entire, oblanceolate or narrow lanceolate to elliptic or obovate, usually tapering to a petiolar base, the midvein and usually 2 lateral veins prominent, the larger leaves irregularly pinnately veined. *Inflorescence* a dense, many flowered spike, glandular villous; bracts lanceolate to oblanceolate, tipped with red to orange or occasionally yellow. *Flowers* small; calyx 9-12 mm long, the median cleft subequal, 3-5 mm deep, the primary lobes entire, truncate or rounded, viscid villous below, densely glandular puberulent on the rigid lobes, distally colored as on the bracts; corolla included in the calyx, usually about 1 mm shorter to as long as the calyx, the galea 2.5-5 mm long, the lower lip much reduced with 3 lanceolate lobes, the tube longer than the galea, 6-8.5 mm long. *Fruit* a capsule, 5-7 mm long, round, obovoid spherical, often blackish brown; seeds numerous, elongate, truncate at the summit.

*Castilleja arvensis* is the most widespread species of *Castilleja*, ranging from central and northeastern Mexico south through Central America to nearly throughout South America, and it has been introduced to Hispaniola and Hawaii. It most commonly occurs in disturbed areas such as pastures, cornfields, roadsides and open forests from near sea level to about 2500 m elevation, and it flowers year-round.

CHIRIQUÍ: Cerro Punta, 2000 m, *Allen 1557* (MO, NY, US). Burica Peninsula, Rabo de Puerco, 8 km W of Puerto Armuelles, 150 m, *Busey 451* (MO). Camino entre Bambito y La Amenaza, 6000 ft, *Correa 1297* (PMA). Methodist Camp near Nueva Swissa, *Croat 13523* (MO). 1 mi E of Cañas Gordas, near Costa Rican border, *Croat 22317* (MO). Las Cumbres, N of Quebroad Iglesia, near town of Cerro Punta, *Croat & Porter 16100* (MO). Slope of La Popa above Boquete, 5400 ft, *D'Arcy & D'Arcy 6407* (MO). Across Río Chiriquí Viejo from town of Cerro Punta, *D'Arcy & D'Arcy 6524* (MO). Bajo Mono, Boquete District, 4500 ft,

*Davidson 502* (MO). Cerro Respinga, E of town of Cerro Punta, 2000–2500 m, *Gentry 5922* (MO). El Boquete, 1300 m, *Killip 3509* (US); *Maurice 700* (US). 2.5 km SE of town of Cerro Punta, *Mori & Kallunki 5642* (MO). Bajo Grande, 1–3 km E of town of Cerro Punta, 2000–2200 m, *Nee 9985* (MO). Around Boquete, 1000–1300 m, *Pittier 2851* (US). Cerro Punta, 6800 ft, *Ridgway & Solís 2410* (MO). 2 mi W of Cerro Punta, across the river, 6000 ft, *Tyson 7176* (PMA). Valley of the upper Río Chiriquí Viejo, 1300–1900 m, *White & White 32* (MO). Finca Lérída to Peña Blanca, 1750–2000 m, *Woodson & Schery 291* (MO). Vicinity of Bajo Mona and Quebrada Chiquero, 1500 m, *Woodson & Schery 527* (MO). Boquete, 1200–1500 m, *Woodson & Schery 801* (MO).

2. **Castilleja quirosii** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1104. 1938. TYPE: Alrededores del cráter del Volcán de Irazú, *Quiros 329* (F).—FIG. 8.

*C. aurantiaca* Pennell, Ann. Missouri Bot. Gard. 27: 338. 1940. TYPE: Panama, *Woodson et al. 926* (MO, NY, PH).

*C. chiriquiensis* Pennell, Ann. Missouri Bot. Gard. 27: 338. 1940. TYPE: Panama, *Maxon 5307* (NY, US).

*C. seibertii* Pennell, Ann. Missouri Bot. Gard. 27: 339. 1940. TYPE: Panama, *Woodson et al. 1085* (MO, NY).

*C. bicolor* Pennell, Ann. Missouri Bot. Gard. 27: 340. 1940. TYPE: Panama, *Woodson et al. 1035* (NY, PH).

Perennial *herb* or *shrub*; stems 1.5–10 dm tall, simple or usually much branched and woody below, hirsute with spreading or reflexed hairs, rarely nearly glabrous, obscurely lined or ribbed by decurrent leaf bases. *Leaves* 1–3(–4) cm long, divided into 1–2(–4) pairs of lateral lobes in the upper ½ or rarely entire, the midblade linear, the lateral lobes filiform, usually 3-veined, densely and finely cinereous puberulent, sometimes nearly glabrous with scabrid margins and nerves. *Inflorescence* a secund raceme; bracts entire or the lower lobed, the pubescence as on the leaves, distally or nearly wholly colored red to orange; pedicels ascending, 2–6(–11) mm long in flower, 6–8(–18) mm long in fruit. *Flowers* conspicuous; calyx 15–20(–23) mm long, the posterior cleft shallow, 1–3 mm deep, the anterior cleft 11–16 mm deep, the primary lobes entire or emarginate, if lobed the posterior lobes longer, rounded, hispidulous, red to orange, sometimes yellowish orange at the tip; corolla (18–)22–28(–32) mm long, decurved, the galea more than twice as long as the tube, 16–20(–23) mm long, slender, densely white puberulent dorsally, yellow to yellowish green with reddish margins, the lower lip much reduced with 3 narrow teeth about 1 mm long, dark green or reddish green, the tube 7–8(–10) mm long. *Fruit* a capsule, 8–12 mm long, ovoid, dark brown.

*Castilleja quirosii* is frequent to rare in the upland of the Volcán de Chiriquí on open rocky ridges and in elfin forests from 2,000 to 3,600 m elevation, flowering year-round. It is also found on the slopes of Volcán de Irazú and Cerro de Escazú in Costa Rica, from 1,500 to 3,300 m elevation.

Pennell (1940), who described four new species from the slopes of Volcán Chiriquí, had only six collections from which to draw his conclusions. With 13 new collections from the Chiriquí Province for comparison the four Pennell entities merge into one variable species. The different growth forms Pennell distinguished appear to be phenotypic products of differing exposures to sun and wind, elevations and moisture. Pennell also distinguished the four on color

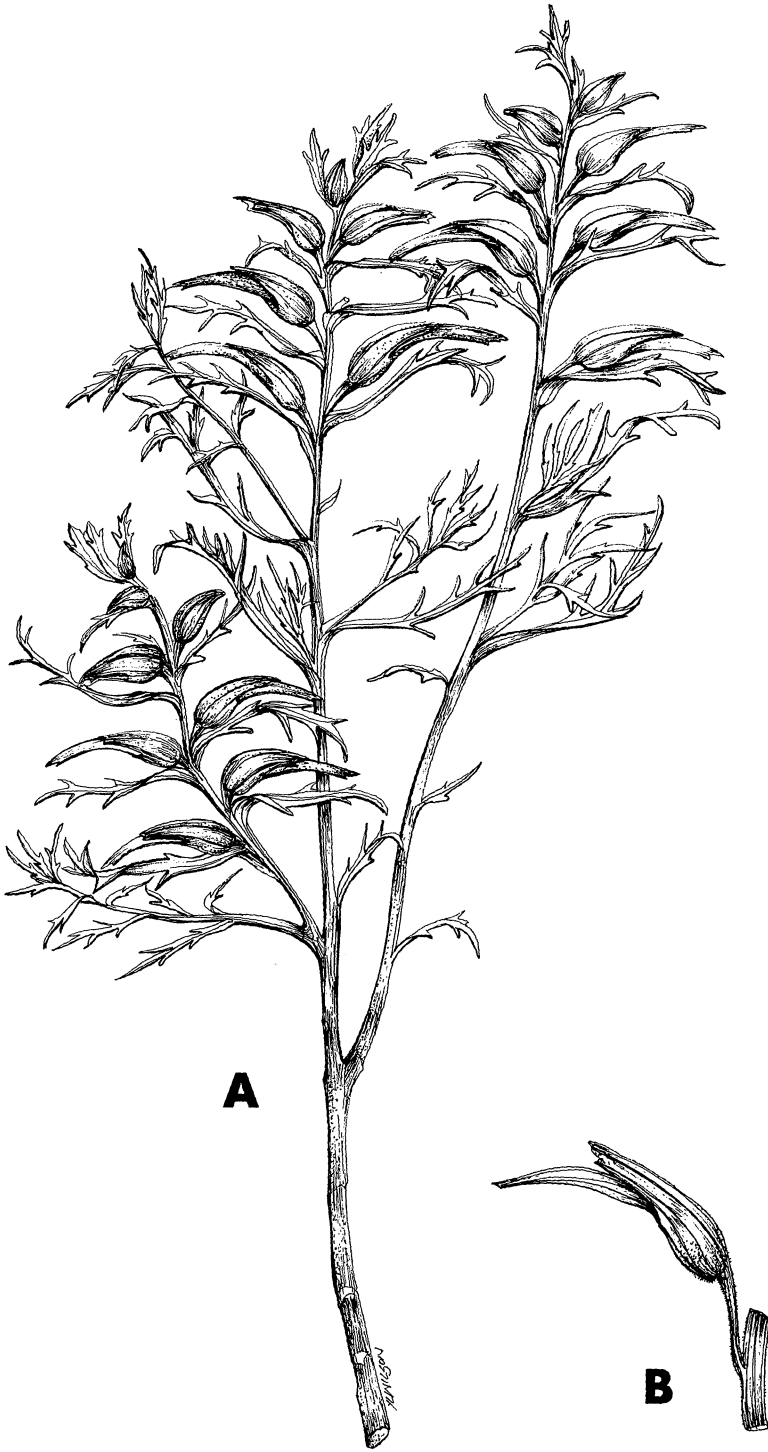


FIGURE 8. *Castilleja quirosii* Standley.—A. Habit ( $\times \frac{1}{6}$ ).—B. Flower ( $\times 1\frac{1}{2}$ ). [After Davidse & D'Arcy 10247 (MO).]

differences, but color variability is common in species of *Castilleja*. Standley based his *C. quirosii* on a collection from a disjunct population of the species in the Cordillera Central of Costa Rica.

*Castilleja quirosii* belongs to section *Castilleja*, a highly derived group that reaches its best development in the mountains of southern Mexico, Central America and northern Andean South America. The closest relatives to *C. quirosii* are in Costa Rica, *C. talamancensis* N. Holmgren of the northern half of the Cordillera de Talamanca and *C. irasuensis* Oerst. of Volcán Irazú and Volcán Turrialba in the Cordillera Central. These two kindred species differ from our species in having prominently ribbed stems and glabrate to glabrous herbage as opposed to obscurely ribbed, hispid stems. The calyx of *C. talamancensis* is red with yellow lobe tips while both *C. quirosii* and *C. irasuensis* are red or orange to the tips.

CHIRIQUÍ: Summit and SW face of Cerro Copete, 9000 ft, *Allen 4886* (MO). Top of peak between Barú and Respinga, 3000 m, *D'Arcy 10084* (MO). 11 km WNW of Boquete, 3000 m, *Davidse & D'Arcy 10247* (MO). Volcán de Chiriquí, Boquete District, 7000 ft, *Davidson 869* (MO). Potrero Muleto, Volcán de Chiriquí, Boquete District, 10400 ft, *Davidson 1032* (US). Summit of Chiriquí Volcano, 3600 m, *Killip 3600* (US). Cuesta Grande, E slope of Chiriquí Volcano, 2600–2990 m, *Maxon 5307* (NY, US). Upper belt of Chiriquí Volcano, N slope, 3000–3374 m, *Pittier 3088* (US). Volcán de Chiriquí, *Sapper* (US). Volcán de Chiriquí, Boquete District, 11,000 ft, *Terry 1353* (MO). 8 mi NE of El Volcán, 8100–8400 ft, *Tyson 834* (MO). Top of El Barú above 11,000 ft, *Tyson & Loftin 6162* (MO). Valley of the upper Río Chiriquí Viejo, *White 50* (MO). Finca Lérída to Peña Blanca, 1750–2000 m, *Woodson & Schery 332* (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 396* (MO), *431* (MO). Casita Alta, Volcán de Chiriquí, ca. 1500–2000 m, *Woodson, Allen & Seibert 926* (MO, NY). Loma Larga to summit, Volcán de Chiriquí 2500–3380 m, *Woodson et al. 1035* (MO, NY), *1085* (MO, NY).

## 10. DIGITALIS

**Digitalis** L.<sup>6</sup>, Sp. Pl. 621. 1753; Gen. Pl., ed. 5. 272. 1754. TYPE: *D. purpurea* L.

Perennial *herbs* or rarely *shrubs*, sometimes scapose. *Leaves* alternate, simple, mostly crenate or dentate, apparently petiolate. *Inflorescences* terminal racemes, sometimes secund; pedicels basally bracteate. *Flowers* showy, calyx divided to the base, the 5 lobes alike; corolla yellowish, purplish, often spotted, conspicuously exserted, zygomorphic, campanulate, mostly pubescent; stamens 4, alike, the anthers with 2 similar thecae; style slender, elongate, the stigma 2-lobed. *Capsule* ovoid to conical, septicidal.

*Digitalis* is a genus of about 30 species of Europe and Asia. Several species are cultivated in other countries for ornament, and the species treated here is naturalized in many countries of the New World. "Foxgloves."

### Literature:

Heywood, V. H. 1972. *Digitalis* in T. G. Tutin et al., eds. Flora Europaea 3: 239–241.

<sup>6</sup> A number of generic synonyms are given by Werner, 1960. Only the above name has been used for Panamanian plants.

Werner, K. 1960. Zur Nomenklatur und Taxonomie von *Digitalis* L., Bot. Jahrb. Syst. 79: 218–254.

1. *Digitalis purpurea* L.<sup>7</sup>, Sp. Pl. 621. 1753. TYPE: Herb. Linn. (LINN 775.1, not seen, microfiche MO).—FIG. 9.

Perennial *herbs* to 1.5 m tall, stems sometimes stout, glabrate or scurfy pubescent with greyish arachnoid hairs, drying sulcate. *Leaves* alternate, 8–15 cm long (lower leaves sometimes much larger), elliptical or obovate, apically acute, obtuse or rounded, basally obtuse, narrowed into the winged petiolar area, the margins crenate serrate with numerous blunt teeth, pinnately veined with ca. 4 veins on each side, glabrate above, pilose beneath with whitish hairs, especially on the veins; petiole winged, 5–15 mm wide, 3–8 cm long, often exceeding the blades, basally clasping and concaulescent on the stem. *Inflorescence* a secund raceme to 30 cm long, the numerous flowers evenly spaced, the peduncle pilose or glabrate, the pedicels pilose, ca. 1 cm long, subtended by an ovate, pubescent bract. *Flowers* showy, fragrant, the calyx 5-lobed to the base, the lobes oblong, elliptical or ovate, apiculate, 12–18 mm long, glabrous to pubescent; corolla broadly campanulate, 3–5 cm long, somewhat zygomorphic with 4 short lobes, the lowermost slightly longer and deltoid, purple with brownish flecks on the lower side, glabrous outside, ciliolate, sparingly long pilose at the mouth within; stamens 4, straight, stout, the anthers alike, the thecae subequal, divaricate, basally connate, ovate, ca. 2 mm long; style slender, the stigma 2-lobed. *Capsule* ovoid conical, 12 mm long, 10 mm broad at the base, dehiscent septically, subtended by the wide-spreading calyx.

*Digitalis purpurea* is an Old World species widely planted for ornament. It is naturalized in Central America and has been collected in upland Chiriqui Province. Two variants are present in Panama, one with glabrate stems and calyces and acute leaves, the other (*Tyson 7211*) with short-pilose stems, calyces and rounded or obtuse leaves. The leaves and sap of this species are toxic and have caused deaths in humans and livestock. The drug digitalis is employed in medicine for the treatment of heart irregularities. "Foxglove"; "Dedalera."

CHIRIQUÍ: Alto Respinga, above Cerro Punta, around 3000 m, *D'Arcy 10680* (MO). Slopes of Cerro Punta, 2000 m, *Gentry 5891* (MO). Boquete trail 6 mi E of Cerro Punta, 7000 ft, *Tyson 7211* (PMA).

## 11. ESCOBEDIA

*Escobedia* Ruiz & Pavón, Fl. Peruv. Chil. Prodr. 91, tab. 18. 1794. TYPE: *E. scabrifolia* R. & P. = *E. grandiflora* (L.f.) Kuntze.

*Silva* Vell., Fl. Flum. 55. 1825. TYPE: *S. curialis* Vell. = *Escobedia grandiflora* (L.f.) Kuntze. *Micalia grandiflora* Raf., Fl. Tell. 2: 104. 1836 [1837]. TYPE: *M. grandiflora* L.(f.) Raf.

Tall *herbs*, the stems relatively slender, drying sulcate, glabrous or scabridulous pubescent; roots orange. *Leaves* opposite, ovate to linear, coriaceous, scabrous,

<sup>7</sup> A number of synonyms are given by Werner, 1960. Only the above name has been used for Panamanian material. Werner also presented a number of infraspecific taxa.



FIGURE 9. *Digitalis purpurea* L. Habit ( $\times\frac{1}{2}$ ). [After Tyson 7211 (MO).]

at least above, digitately nerved. *Inflorescences* of solitary or geminate flowers in the axils of upper leaves, sometimes aggregated into racemes or panicles; peduncles stout, bibracteate in the upper  $\frac{1}{2}$ . *Flowers* showy, the calyx tubular, 5 or 10 nerved, apically 3–6 lobate, the lobes sometimes irregular, corolla tubular salverform, the tube long and slender, the limb spreading with 5 rounded lobes; stamens 4, the filaments inserted  $\frac{1}{2}$  way up the tube, ciliate, the anthers long

sagittate, included; style bent apically, the stigma running along one side or the style apex. *Capsule* included, the seeds relatively large.

The showy tubular flowers of this genus resemble those of *Brunfelsia undulata* (Solanaceae) or *Posequeria latifolia* (Rubiaceae) which are also fragrant night bloomers adapted to hawk moth pollination. The roots of *Escobedia* are used by local peoples as a food coloring agent which resembles saffron. "Color"; "Azafran."

Although Pennell recognized 15 species in the genus, there are fewer than six. In upper Central America, *Escobedia laevis* Cham. & Schlecht., a species with linear leaves and narrow calyces, occurs in marshes, but it has not been found as far south as Panama. Species with broader leaves often occur in drier habitats from Mexico to Paraguay and Brazil. The genus is closely related to the African genus *Cycnium* Mey. ex Benth. (1846) from which it may not be distinct. *Cycnium* has been distinguished by the anthers having one theca reduced.

#### Literature:

Pennell, F. W. 1931. *Escobedia*—A neotropical genus of the Scrophulariaceae. Proc. Acad. Nat. Sci. Philadelphia 83: 411–426.

Thieret, J. W. 1960. The Scrophulariaceae-Buchnereae of Central America. Ceiba 8: 92–101.

#### 1. *Escobedia grandiflora* (L.f.) Kuntze, Rev. Gen. Pl. 3(2): 231. 1893.—FIG. 10.

*Buchnera grandiflora* L.f., Suppl. Pl. 287. 1781. LECTOTYPE: Colombia, Mutis (LINN 790.2, not seen; microfiche MO).

*Escobedia scabrifolia* Ruiz & Pavón. Syst. Veg. Fl. Peruv. Chil. 159. 1798. TYPE: Peru, Pavón, not seen.

*Silva curialis* Vell., Fl. Flum. 55; 1: tab. 149. 1825. TYPE: not seen.

*Micalia grandiflora* (L.f.) Raf., Fl. Tell. 2: 104. 1837.

*Escobedia curialis* (Vell.) Pennell, Proc. Acad. Nat. Sci. Philadelphia 83: 417. 1931.

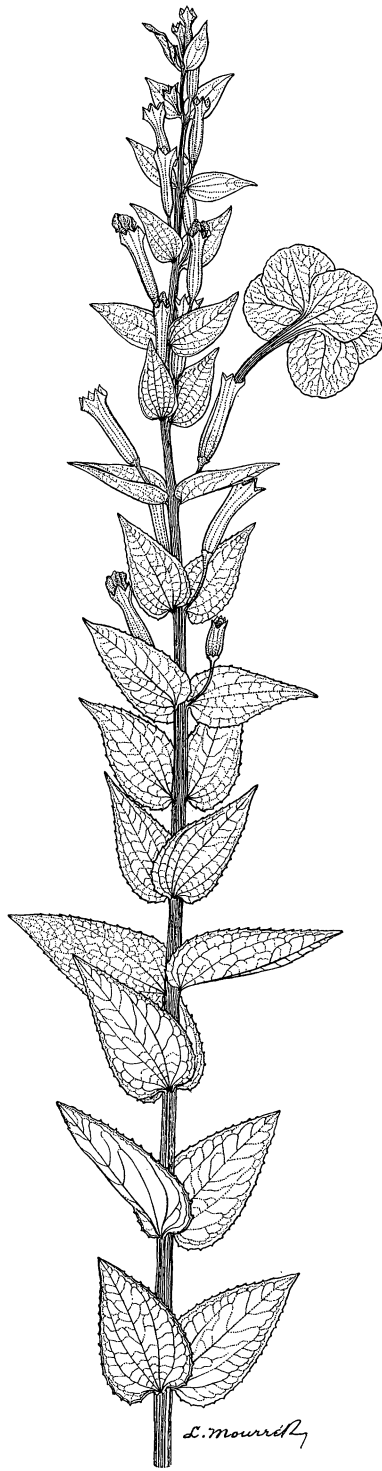
*Escobedia longiflora* Pennell, Proc. Acad. Nat. Sci. Philadelphia 83: 423. 1931. TYPE: Mexico, Pringle 6665 (MO).

*E. reticulata* Pennell, Proc. Acad. Nat. Sci. Philadelphia 83: 420. 1931. TYPE: Costa Rica, Pittier 11118 (US).

Tall, perennial *herbs*; stems relatively slender, drying many sulcate, retrorsely scabridulous; roots conspicuously orange. *Leaves* opposite, ovate to narrowly deltoid, apically acute or obtuse, basally obtuse, truncate or slightly auriculate, the margins serrate with low, callose teeth, veins 5–7-digitate, impressed above, prominent beneath, the minor venation prominent beneath, stiffly coriaceous, scabrous with short, sturdy hairs on multicellular bases, the bases sometimes giving a pustulate appearance; petioles to 1 mm long or wanting. *Inflorescences* solitary, often geminate flowers in the upper leaf axils, sometimes aggregated

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FIGURE 10. *Escobedia grandiflora* (L.f.) Kuntze. Habit ( $\times \frac{1}{6}$ ). [After Woodson & Schery 727 (MO).]





into a raceme; peduncles stout, curved, scabrous, 1.5–3.0 mm long bearing 2 opposite ovate to linear bracts to ca. 7 mm long on the upper  $\frac{1}{2}$ . *Flowers* with the calyx tubular, 3–5 cm long, with 3–6 irregular deltoid lobes 5–8 mm long, conspicuously 10-nerved in the lower  $\frac{1}{2}$ , 5 or 10 nerved apically, glabrous to scabrous, sometimes pubescent only on the veins, sometimes appearing pustulate with hair bases; corolla white, tubular salverform, the tube slightly curved, 8–10 cm long, 8–15 mm wide near the apex, the limb spreading 3–6 cm across with 5 rounded lobes, puberulent outside and on the limb with short gland-tipped hairs, glabrous within the tube; stamens 4, the filaments slender, compressed, inserted about  $\frac{1}{2}$  way up the tube, ca. 1.5 mm free, ciliate apically, the anthers alike, narrow, long sagittate with slender tails, 1.5 cm long, situated ca.  $\frac{3}{8}$  way up the tube, dehiscing by long, introrse slits, minutely apiculate; ovary narrow, glabrous, the style bent apically, pubescent at the stigmatic level, the stigma ca. 1.5 mm long, running along 1 side of the style, the final 5–7 mm sharply curved, enlarged, situated just above the anther tips. *Capsule* ca. 2 cm long; seeds 4.0–4.5 mm long.

*Escobedia grandiflora* is distinctive in its large, white, tubular salverform flowers and scabrous, coriaceous leaves. It has been collected only twice in Panama, perhaps because it blooms at an inconvenient collecting hour. Both collections are from Boquete, one of these noted as being a swampy meadow. In other countries it often occurs on drier sites such as cliff faces and wooded slopes.

Pennell and Thieret both applied the name *E. reticulata* to material from Panama and Costa Rica, which they distinguished by the pustulate calyces and the position and size of the bracts. While these characters may mark a local variant in a wide ranging species, they are not of significance at the species level. Pennell applied the name *E. curialis* to plants with wider leaves than is usual in northwestern South America. Although this may represent a distinct species, the plant illustrated by Vellozo, which is taken to be the type, has narrower leaves quite like those of plants from Panama. *Escobedia longiflora* was separated by Pennell and Thieret on the basis of the 10-ribbed calyx. In all species of *Escobedia* the calyces are 10-ribbed basally, and in *E. grandiflora* whether the intermediate set of ribs continues to the top of the calyx seems to vary within populations.

Although roots of this species are used for culinary purposes in other countries, no such use is known for Panama.

CHIRIQUÍ: Boquete, 1200–1500 m, Woodson & Schery 727 (MO). Finca Lerida to Boquete, 1300–1700 m, Woodson *et al.* 1163 (MO, NY).

## 12. GIBSONIOTHAMNUS

**Gibsoniothamnus** L. O. Williams, Fieldiana, Bot. 32: 211. 1970. TYPE: *G. pithecobius* (Standley & Steyerl.) L. O. Wms. = *G. cornutus* (D. Sm.) A. Gentry.

*Shrubs*, epiphytic, ?hemiepiphytic, or free standing, stems often angled, glabrate to pubescent with iniseriate multicellular sometimes gland-tipped hairs,

sometimes tuberculate. *Leaves* opposite, sometimes unequal, simple, entire, often coriaceous, pinnately 3–4 nerved on each side, the nerves well spaced, arcuate; petioles mostly short, not forming stipular ridges. *Inflorescences* terminal cymose racemes or panicles, often condensed and fasciculate, sometimes reduced to a few flowers, the peduncles mostly elongate, bracteate. *Flowers* showy, the calyx brightly colored, merging into the pedicel, cupular, 5-dentate, the teeth sometimes ventrally conduplicate, the sinuses then appearing truncate and membranaceous; corolla tubular, 5-lobed, the lobes short, rotund, quincuncial, bearded within near the point of the stamen insertion; stamens 4 in 2 pairs, the filaments bearded at the point of insertion, the anthers basally divaricate, with a broad, differentiated connective, dehiscing longitudinally, situated below the corolla mouth; disc apparently wanting; ovary 2-locular, the placenta median, many ovulate, the style glabrous, the stigma a terminal annulus, not bilobate. *Fruit* a juicy or mucilaginous berry; seeds numerous, prismatic, minutely ciliate with a gelatinous slimy covering, the endosperm extremely scant or wanting; embryo straight, cylindrical, the appressed cotyledons forming about  $\frac{1}{2}$  its length.

*Gibsoniothamnus* is a genus of 3 or 4 species of southern Mexico and Central America. The flowers are showy, presumably hummingbird pollinated, and the fruit is a berry. The plants are epiphytic, perhaps hemiepiphytic, or free-standing shrubs. Although numerous collections have been made in recent years, species limits are poorly drawn and the following treatment is highly tentative. The only element described in the genus which is not accounted for below is *Gibsoniothamnus moldenkianus* (Stand.) L. O. Wms. from Mexico, known only from the type which has not been studied.

Two collections at MO from Costa Rica (Alajuela) with small leaves and small white flowers may represent still another species.

Family placement of this genus is uncertain, and it is here treated in the Scrophulariaceae mainly for editorial considerations. Species of *Gibsoniothamnus* have been described in the Verbenaceae, Scrophulariaceae, and Bignoniaceae, and routine herbarium determinations have frequently placed specimens in the Solanaceae, Gentianaceae, or Ericaceae. From the Verbenaceae it may be excluded by its many ovulate ovary, from Gentianaceae by its imbricate corolla and lack of endosperm, from Ericaceae by its 2-loculed ovary, and from the Solanaceae by its opposite leaves, lack of internal phloem and the orthodirectional placement of the ovary. *Gibsoniothamnus* is believed by Gentry (1971, 1974, and pers. comm.) and Williams (1970) to be closely related to *Schlegelia* Miq., another genus of uncertain placement. *Schlegelia* was treated in the Flora of Panama as a member of the Bignoniaceae and in Flora of Guatemala under the Scrophulariaceae. Leinfellner (1973) stated that the U-shaped placenta of the *Schlegelia* species he studied is more suggestive of the Scrophulariaceae than of the Bignoniaceae. Gentry's 1974 report that the ovary of *Gibsoniothamnus* is 2-locular to the top was verified by microtome sections, so this ovary differs conspicuously from the U-shaped placental situation of typical *Schlegelia*. While this completely 2-locular ovary bespeaks a greater evolutionary distance between the two genera than assumed by earlier workers, it does not offer much guidance

as to the correct family placement of *Gibsoniothamnus*. Leinfellner (1972, 1973), Weber (1972), and Hartl (1956), who studied ovary structure in the Bignoniaceae, Gesneriaceae, and Scrophulariaceae, failed to report any characters which absolutely separate these families. Sunken peltate glands as in *Gibsoniothamnus* are more common in both Bignoniaceae and Gesneriaceae than in the Scrophulariaceae, and the entire leaves are uncommon but not unique in the Scrophulariaceae. The absence or extreme paucity of endosperm is more in harmony with the Bignoniaceae than either Scrophulariaceae or Gesneriaceae. Pubescence of the seeds is unusual in all three families although it does occur in the Gesneriaceae and a few Bignoniaceae, and the wings on typical seeds of the Bignoniaceae may derive from hairlike trichomes.

Literature:

- Gentry, A. H. 1971. Note on *Gibsoniothamnus*. Fieldiana, Bot. 34: 55.  
 ———. 1974. *Gibsoniothamnus* (Scrophulariaceae) in Panama. Ann. Missouri Bot. Gard. 61: 533–537.
- Leinfellner, W. 1972–3. Das Gynözeum der Bignoniaceen. Österr. Bot. Z. 120: 269–277; 121: 13–22; 122: 59–73.
- Weber, A. 1971. Zur Morphologie des Gynoeciums der Gesneriaceen. Österr. Bot. Z. 119: 234–305.
- Williams, L. O. 1970. An overlooked genus of the Scrophulariaceae. Fieldiana, Bot. 32: 211–214.
- a. Calyces, pedicels and stems copiously pilose with white or tawny hairs, 1–2 mm long; calyx more than 20 mm long ..... 3. *G. mirificus*
- aa. Calyces, pedicels and stems glabrous or soon glabrescent; calyx less than 20 mm long.
- b. Corolla white; flowers mostly solitary; calyx basally conspicuously cucullate, winged, or broadly deltoid, the teeth usually broad in fruit ..... 1. *G. alatus*
- bb. Corolla pinkish to purplish; flowers mostly in subsessile fascicles; calyx basally flat, narrowly winged, or narrowly deltoid, the teeth usually apically narrow in fruit ..... 2. *G. cornutus*
- c. Calyx sinuses truncate, calyces mostly less than 20 mm long .....  
 ..... 2a. *G. cornutus* var. *cornutus*
- cc. Calyx sinuses usually acute, calyces mostly more than 10 mm long .....  
 ..... 2b. *G. cornutus* var. *latidentatus*

1. ***Gibsoniothamnus alatus*** A. Gentry, Ann. Missouri Bot. Gard. 64: 133. 1977 [1978]. TYPE: Panama, *Mori & Kallunki 5449* (MO).

*Shrub*, ?hemiepiphytic or epiphytic, to 1.3 m tall; stems subterete or angled, slender, the nodes sometimes crowded. *Leaves* ovate, elliptical or obovate, apically obtuse or acuminate, basally narrowed, acuminate, the margins sometimes somewhat revolute, the major veins impressed above, slightly elevated beneath, mostly with 3 strongly ascending somewhat arcuate pinnate veins on each side of the costa, glabrate, sometimes with ciliate margined pores (domatia) in the vein axils beneath, sometimes minutely pubescent at the tip beneath, minutely glandular punctate beneath; petioles mostly drying dark, slightly channeled above, minutely pubescent beneath. *Inflorescences* reduced terminal racemes, few flowered, the flowers sometimes solitary, pedicels to 18 mm long,

slender but broadening upwards, glabrate, articulating at or just above the base, the bract deltoid, minute, often appressed to the pedicel. *Flowers* purple, the calyx ca. 1.8 mm long, the teeth ventrally conduplicate, the dorsal surface enated to form narrow wings which run from the base of the cup to the tips, the sinuses acute in flower, nonmembranaceous, running down to 6–8 mm from the calyx base, in fruit forming a membranous sleeve, the cup not distinct from the wings; corolla white, tubular, ca. 18 mm long, ca. 3 mm thick, the lobes rotund, short, with a short, spreading limb; stamens not seen; style (Gentry) 18 mm long, the ovary globose. *Fruit* mostly enveloped by the calyx sleeve, the tip perhaps exerted.

This species ranges from Bocas del Toro to Darien, occurring from 300 m to perhaps 2,000 m. The four collections seen are far from homogeneous, the type and *Duke 15657*, both from Darien, have relatively large leaves to 8 cm long with well defined acuminate tips, whereas the other three more westerly collections have leaves not exceeding 3.5 cm, with blunt and scarcely acuminate tips. It is possible that these western collections represent a different species.

*Gibsoniothamnus alatus* is distinct in its calyx, the teeth of which form winging enations from the base of the calyx cup to the tips of the teeth. In fruit, there is also a well defined membranaceous sleeve truncating the calyx cup and running continuously and discretely abaxially to the teeth. This species is also distinct in its flower color which is reportedly a purple calyx with a white corolla. Mori & Kallunki note the fruit is pink.

COSTA RICA: Prov. Alajuela. Road between Cañas and Upala 8 km N of Bijagua, 300 m, *Croat 36050* (MO). 8 km N of Río Naranjo on Cañas-Upala road, 400–500 m, *Utley & Utley 3161* (MO). PANAMÁ: BOCAS DEL TORO: Chiriquí Trail cloud forest between Quebrada Higuera and Gutierrez, *Kirkbride & Duke 754* (MO). CHIRIQUÍ: Cerro Colorado, road to copper mine 33.1 km beyond bridge over Río San Félix, 13.1 km beyond turnoff to Escopeta, 1400 m, *Croat 37200* (MO). DARIÉN: Elfin forest, Cerro Campamento, S of Cerro Pirre, *Duke 15657* (MO). N slopes of Cerro Pirre, *Mori & Kallunki 5449* (MO).

2. ***Gibsoniothamnus cornutus*** (Donnell Smith) A. Gentry, *Fieldiana*, Bot. 34: 55. 1971.

*Schlegelia cornuta* Donnell Smith, *Bot. Gaz.* (Crawfordsville) 16: 6. 1893. TYPE: Guatemala, *Heyde & Lux* ex pl. cit. 3004 (F, not seen; photo MO).

*Clerodendron epiphyticum* Standley, *Publ. Field Mus. Nat. Hist., Bot. Ser.* 22: 168. 1940. TYPE: Costa Rica, *Lankester 1296* (F, not seen; photo MO).

*C. pithecobius* Standley & Steyer., *Publ. Field Mus. Nat. Hist., Bot. Ser.* 22: 373. 1940. TYPE: Guatemala, *Standley 67887* (F, not seen).

*C. mimicum* Standley & Steyer., *Fieldiana*, Bot. 23: 227. 1947. TYPE: Guatemala, *Steyermark 43267* (F, not seen).

*Gibsoniothamnus mimicus* (Standley & Steyer.) L. O. Williams, *Fieldiana*, Bot. 32: 214. 1970.

*G. pithecobius* (Standley & Steyer.) L. O. Williams, *Fieldiana*, Bot. 32: 214. 1970.

*G. epiphyticus* (Standley) L. O. Williams, *Fieldiana*, Bot. 34: 120. 1972.

*G. allenii* A. Gentry, *Ann. Missouri Bot. Gard.* 61: 534. 1974 [1975]. TYPE: Panama, *Gentry 758* (MO).

*G. pterocalyx* A. Gentry, *Ann. Missouri Bot. Gard.* 61: 535. 1974 [1975]. TYPE: Panama, *Kirkbride & Duke 1020* (MO).

2a. ***Gibsoniothamnus cornutus*** (Donnell Smith) A. Gentry var. ***cornutus***.

*Shrub*, ?hemiepiphytic or epiphytic; twigs strongly angled or winged, glabrous;

stems strongly 2–4 angled or sharply narrow winged at the nodes, angled into the petioles, the internodes mostly short; bark drying gray. *Leaves* opposite, simple, entire, obovate, 3–9 cm long, 12–25 mm wide, apically indistinctly short acuminate or obtuse, basally obtuse or acute, mostly drying slightly revolute, slaty above, ochraceous beneath, the major venation impressed above, elevated and contrasting beneath, the usually 3 pinnate veins on each side arcuate and ascending, the proximal pair near the margin and often giving the leaf a plinerved appearance, minor venation obscure, ciliate at least apically and along the costa beneath, glabrescent or sparingly pubescent at maturity, some populations barbulate and pitted in the vein axils beneath, minutely punctate on both sides with submerged peltate trichomes; petiole 7–14 mm long, channeled above, glabrate or sparingly hispid. *Inflorescence* terminal, cymose, congested, sometimes subumbellate and many flowered; peduncle short to obsolete, strongly angled; pedicels glabrate to 3.5 cm long, subtended by small bracts, flat and deltoid or linear and to 6 mm long, pubescent with nearly straight white tuberculate hairs. *Flowers* showy, the pedicels, the calyx and the corolla magenta; calyx merging with the apically expanded pedicel, cupular or campanulate, 2–5 mm long (excluding teeth), somewhat succulent, the 5 triangular costa conspicuous or not, running into the teeth, the teeth deltoid to subulate, 3–5 mm long, becoming 6–9 mm long in fruit, sometimes laterally compressed and appearing cucullate, glabrate or sparingly pilose with gland tipped hairs, the sinuses obtuse, rounded or truncate, sometimes thin, especially in fruit; corolla tubular, to 3 cm long, 3 mm wide, sometimes slightly curved, the 5 short, rotund lobes quincuncial in bud, thinning at the margins, ciliolate, the throat pulverulent, the tube bearded just below the point of the stamen insertion; stamens 4, the filaments densely bearded at the point of insertion, narrowed at the tip, glabrous, the anthers situated in 2 proximal pairs just below the corolla mouth, 2-locular, the locules proximal, dehiscing longitudinally, the connective differentiated, somewhat discolorous; ovary obovoid, apically flat or depressed, glabrous, the stigma flat, terminally annular, slightly broader than the style. *Fruit* a berry, nearly included in the calyx cup, 2-locular, many-seeded; seeds numerous, 3–4 mm long, wedge shaped with 1 end acute, strongly angled, minutely pubescent, mucilaginous and slimy.

This species ranges from Guatemala to Panama, and the typical variety has a calyx with truncate sinuses and somewhat enated or winging costas. The flowers are reported as purplish. The type collection of *G. pterocalyx* has slightly different leaf texture from other collections seen.

CHIRIQUÍ: Between Pinola and Quebrada Seco on Chiriquicito-Caldera Trail, *Kirkbride & Duke 1020* (MO). COCLÉ: El Valle de Antón, 1000 m, *Allen 1824, 2385, 3414* (all MO). Cerro Pajita, N of El Valle de Antón, 3500 ft, *Allen 4496* (MO). Cerro Pilón, to 2900 ft, *Dwyer 8676* (MO). Cerro Pilón near El Valle, *Duke 12149, 13189* (both MO). Top of Cerro Pilón, *Gentry 758* (MO, NY). Trail from La Mesa towards los llanos, *Luteyn 4110* (DUKE). Trail to La Mesa ca. 4.5 mi beyond El Valle de Antón, *Wilbur & Luteyn 11670* (DUKE). DARIÉN: Upper Tyler Kittredge gold mining camp, headwaters of Río Tuquesa, *Croat 27281* (MO).

2b. ***Gibsoniothamnus cornutus* var. *latidentatus*** (A. Gentry) D'Arcy, comb. nov.—FIG. 11.

*G. latidentatus* A. Gentry, Ann. Missouri Bot. Gard. 61: 536. 1974 [1975]. TYPE: Panama, Gentry 759 (MO).

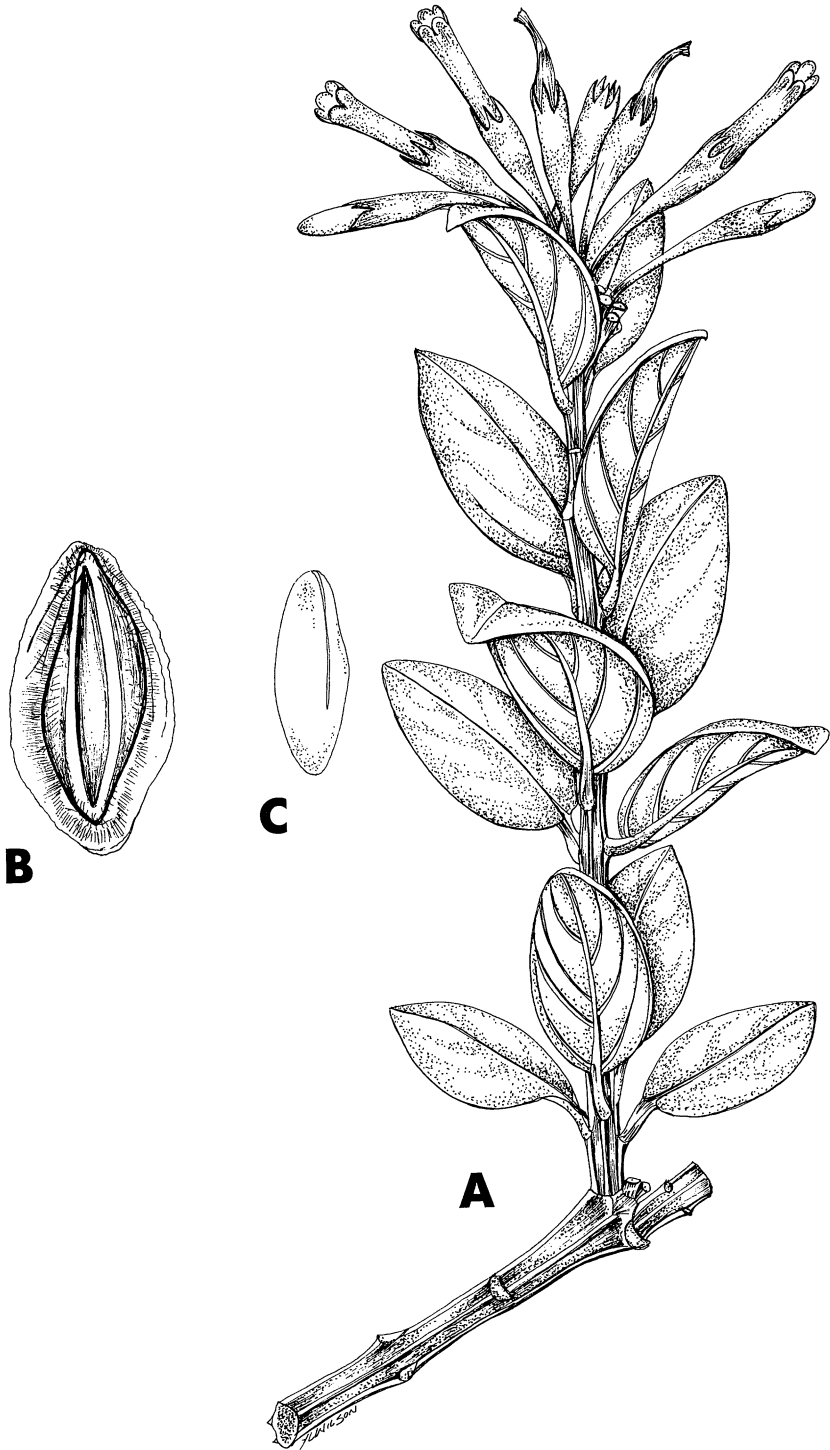
*Shrub* resembling the typical variety. *Leaves* glabrate and lacking domatia or barbulate vein axils beneath. *Flowers* with the calyx teeth basally broad and connate, tangentially flattened, the sinuses acute, nonmembranaceous.

This variety is much like the typical variety but differs in lacking domatia on the leaf undersides and in the form of the calyx. In addition to having basally broad, flat teeth, the calyx remains succulent in fruit. It is known only from Cerro Jefe in Central Panama, 500–950 m elevation.

PANAMÁ: Camino de Llano a Cartí, *Correa et al.* 1888 (MO). Cerro Jefe, *Croat* 17343 (MO). El Llano-Cartí Road, 7–12 km from Interamerican Highway, *Croat* 25138 (MO). Cerro Jefe, *D'Arcy* 11385 (K, MO, PMA, US); *Dressler* 3448 (MO); *Duke* 8175 (MO); *Dwyer et al.* 7293 (MO); *Dwyer & Gauger* 7351 (MO); *Gentry* 759 (MO). El Llano-Cartí Road, 340 m, *Gentry* 1181 (DUKE, MO), 1321 (MO); *Gentry & Mori* 14203 (MO, PMA), 14216 (MO). Cerro Jefe, *Kirkbride & Crebbs* 27 (MO); *Luteyn* 3201 (DUKE). Cerro Campana, *Luteyn & Kennedy* 1789 (DUKE). Cerro Jefe, *Luteyn & Kennedy* 3947 (DUKE). El Llano-Cartí Road, *Mori & Kallunki* 5104 (MO). 5–10 km NE of Altos de Pacora, 700–800 m, *Mori & Kallunki* 6064 (MO). Cerro Jefe, *Mori & Kallunki* 6076 (MO). El Llano-Cartí Road, *Nee & Tyson* 10991 (MO). Cerro Jefe, *Skog et al.* 4220 (MO); *Tyson* 3529 (DUKE). VERAGUAS: Descent to Río Caloveborita ca. 16 km NW of Santa Fé, 650 m, *Dressler* 5142 (MO). Shoulder of Cerro Tuti, *Folsom & Edwards* 3345 (MO).

3. ***Gibsoniothamnus mirificus*** A. Gentry, Ann. Missouri Bot. Gard. 64: 133. 1977 [1978]. TYPE: Panama, *Croat* 34298 (MO, holotype; PMA, isotype).

Epiphytic *shrub*, the twigs stout, angled, drying yellow, hispid pilose with stout, curved or straight tawny many-celled hairs on scarcely elevated, many-celled bases, branches gray, scabridulous but soon glabrescent and becoming subterete. *Leaves* ovate, elliptical or obovate, often broadly so, apically short acuminate, blunt, basally obtuse or rounded, to 8 cm long, 4 cm wide, the veins impressed above, elevated and contrasting beneath, ca. 3 pinnate veins on each side, strongly ascending and arcuate, the basal pair close to the margin, the loop connected near the margin, some short intermediate veins sometimes present, pilose with long, weak, slender, multicellular hairs overall, sometimes glabrescent except beneath on the major veins, inconspicuously glandular punctate above, more noticeably so beneath; petiole 7–9 mm long, flat or slightly channeled above, hispid pilose with tawny hairs, pinkish (Whieler), usually drying dark. *Inflorescence* terminal, fasciculate or umbellate, sometimes reduced to a solitary flower, the peduncles 3–5 mm long, glabrous or pubescent, persistent, subtended by minute linear to deltoid pubescent bracts; pedicels reddish (Whieler), articulating at the base, 10–15 mm long, slender but broadening upwards, hispid pilose with tawny hairs 1–2 mm long. *Flower* with the calyx merging into the pedicel, pinkish, ca. 3 cm long (including teeth), the teeth narrowly deltoid, ca. 2 mm wide at the base, 2.0–2.5 cm long, continuous with the ribs of the cup, the sinuses obtuse or acute, much broader and subtruncate in fruit, pilose overall with weak whitish hairs 2–3 mm long; corolla tubular, red or pink, 3–4 cm long, slightly curved and slightly contracted in the upper half, the lobes short, rotund, 3 mm long, subequal but forming a definite lip, ciliate but otherwise glabrous outside; androecium and gynoecium not examined. *Fruit* not seen.



*Gibsoniothamnus mirificus* is distinct from other members of the genus in its overall hairiness and in its long slender calyx teeth which extend over  $\frac{1}{2}$  the length of the corolla. It is known from Santa Rita Ridge just southeast of Colon, and from the Continental Divide near El Cope in Cocle Province.

COCLÉ: Lumber camp 7 km N of El Copé, 900 m, *Folsom 1286* (MO). COLON: Santa Rita Ridge road, 380 m, *Croat 34298* (MO); *Folsom 3705* (MO); (grown to maturity and pressed in cultivation), *Whieler 77103* (MO).

### 13. LAMOUREUXIA

**Lamourouxia** H.B.K., Nov. Gen. Sp. Pl. 2, ed. folio 269; ed. quarto 335. 1817 [1818]. nomen cons. vs. *Lamourouxia* C.A. Agardh. 1817. (Algae).

LECTOTYPE: *L. multifida* H.B.K.,<sup>8</sup> type cons.

Erect perennial *herbs* or slender *shrubs*; roots fibrous or arising from a stout caudex, perhaps parasitic on other plants. *Leaves* opposite, often reduced upwards, dentate, serrate or narrowly pinnatisect and appearing compound, mostly pubescent with simple, glandular or branched hairs, sometimes scabrous, short petiolate or sessile. *Inflorescences* terminal racemes, the pedicels short, subtended by foliose bracts. *Flowers* with the calyx cupular or campanulate, 10-nerved, 4(5) lobed to about  $\frac{1}{2}$  way down, the lobes obtuse, deltoid or linear; corolla showy red, orange, yellow or white, tubular, tomentose outside, and sometimes within, 2-lipped, the lobes short, mostly recurved; stamens 4 or 2 and 2 staminodes, the filaments inserted low on the tube, the lower (dorsal) anthers situated against the upper corolla lip, barely exerted, the upper two anthers situated lower in the tube against the lower side, sometimes reduced to tufts of hairs, the anthers U-shaped, sometimes auriculate or pointed, mostly pilose; ovary 2-locular, narrow, the style slender, the stigma punctiform. *Capsule* ovoid or elliptical, exerted from the calyx which tardily ruptures, loculicidally dehiscent, the valves sometimes beaked; seeds numerous, ellipsoidal or oblong, the testa light colored, honeycomblike.

*Lamourouxia* is a genus of about 26 species ranging from Mexico to Peru. The plants are usually recognizable by their slender, often wandlike stems with numerous small leaves, and tubular, pubescent, red or orange flowers. Ernst (1972) divided the genus into three sections based primarily on the degree of reduction of the upper (shorter) pair of stamens. The two Panamanian species are members of sect. *Hemispadon* which has only two fully developed anthers, the other two rudimentary. *Lamourouxia lanceolata* Benth., also of sect. *Hemi-*

<sup>8</sup> For discussion of lectotypification of this genus see Taxon 18: 479. 1969. The International Code of Botanical Nomenclature 1972 incorrectly noted *L. virgata* Kunth as the type species.

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FIGURE 11. *Gibsoniothamnus cornutus* var. *latidentatus* (A. Gentry) Kuntze.—A. Habit ( $\times\frac{3}{4}$ ).—B. Embryo ( $\times 34\frac{1}{2}$ ).—C. Seed ( $\times 34\frac{1}{2}$ ) note fine radial pubescence and fine hairs from the end. The pubescence supports a mucilaginous covering. [After *Mori-Kallunki 6149* (MO).]



*spadon* which has only two fully developed anthers, the other two rudimentary. *Lamourouxia lanceolata* Benth., also of sect. *Hemispadon*, occurs from Costa Rica to Mexico and may be expected in Panama. *Lamourouxia lanceolata* differs from the two species now known from Panama in having narrow leaves which are glabrous above and calyces which are glabrous to scurfy pulverulent with indiscernible hairs. *Lamourouxia virgata* H.B.K. occurs in the mountains of Colombia but does not reach Panama or Central America. It is a member of sect. *Adelphidion* which has reduced but still functional upper (ventral) anthers situated against the lower side of the corolla.

#### Literature:

Ernst, W. R. 1972. Floral morphology and systematics of *Lamourouxia* (Scrophulariaceae: Rhinanthoideae). Smithsonian Contr. Bot. 6: 1-63.

- a. Leaves scabrous above, basally obtuse; calyx mostly lacking glandular hairs ..... 1. *L. gutierrezii*  
 aa. Leaves softly pubescent above, basally truncate to auriculate; calyx with copious, glandular hairs ..... 2. *L. viscosa*

1. ***Lamourouxia gutierrezii*** Oerst. in Benth. & Oerst., Vidensk Meddel Dansk Naturhist. Foren. Kjøbenhavn 1853: 29. TYPE: Costa Rica, *Oersted* 9398 (C, not seen).

*L. scabra* Benth. ex Seemann, Bot. Voy. Herald 177, pl. 33. 1854. SYNTYPES: Panama: *Seemann* (BM, not seen; photo MO); Boquete, *Seemann* (K, not seen).

Erect perennial *herbs* or *shrubs*, perhaps hemiparasitic on the roots of other plants, to 2 m tall, the stems slender, often woody below, drying dark, puberulent with short, weak, blackish, multicellular, rarely branched hairs; branching characterized by long wandlike stems and short lateral branches 5-15 cm long. *Leaves* opposite or verticillate, ovate, mostly 10-15 mm long, ca. 5 mm wide, elliptical or obovate, apically acute, basally cuneate, the margin dentate with ca. 5 rounded, callose and revolute margined teeth on each side, scabrous and shiny above, tomentose beneath with longer, stouter hairs on the veins, the venation pinnate with ca. 5 lateral veins on each side, impressed above, elevated beneath; petiole to 2 mm long, canaliculate, pilose beneath. *Inflorescences* terminal racemes, the flowers congested or well spaced; pedicels tomentose, ca. 5 mm long, subtended by a small foliaceous bract. *Flowers* with the calyx cupular, 7-9 mm long, 4-lobed, the lobes obtuse or deltoid, ca. 3 mm long, tomentulose outside, glabrate within, 10-nerved; corolla red or orange, 2.5-4 cm long, tubular, tomentulose outside with branched hairs, more so upwards, 2-lipped, the lips ca. 12 mm long, apically recurved, the upper lip glabrate within except at the apex, the lower lip long pilose in the upper  $\frac{2}{3}$ , bearded at the level of stamen insertion, stamens 2, the filaments inserted low on the lower side of the tube, bearded at point of insertion, otherwise glabrous, the anthers connivent, positioned against the upper lip and barely exerted, U-shaped with pointed auricles, long pilose, 2-thecate, 3-4 mm long; staminodes 2, inserted low on the upper side, the

filaments slender, terminating in tufts of hair or rarely in rudimentary anthers, situated about  $\frac{1}{2}$  way up the corolla; ovary and the style glabrous, the stigma punctate, slightly immersed in styler tissue. *Capsule* ovoid, black, ca. 10 mm long, 7–8 mm wide, loculicidally dehiscent, the valves short beaked; seeds stramineous, oblong, 1.5 mm long, pitted reticulate, numerous.

This species is known only from the uplands of Panama and Costa Rica. Its leaves are generally smaller and more numerous than those of the other Panamanian species, *L. viscosa*.

CHIRIQUÍ: Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m, *Allen 1496* (MO, NY). W slopes of S flank of Cerro Horqueta, 1640 m, *Cochrane et al. 6255* (MO). El Barú above Boquete, 1200–1800 m, *D'Arcy 9233, 9935* (both MO). 3 km NE of El Hato del Volcán, 1800 m, *Davidse & D'Arcy 10414* (MO). Bajo Mono, 4500 ft, *Davidson 475* (MO). Valley of Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9028* (MO, OS). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 398* (MO). Río Caldera beyond Bajo Mono ca. 4 mi NW of Boquete, 4200 ft, *Wilbur et al. 13526* (DUKE, MO, PMA). Bajo Quiel ca. 4 mi NW of Boquete, 1350 m, *Wilbur et al. 15506* (DUKE, MO, PMA). Río Caldera ca. 3 km beyond Bajo Mono, ca. 4 mi NW of Boquete, 1500 m, *Wilbur & Luteyn 19199* (DUKE).

2. *Lamourouxia viscosa* Kunth, Nov. Gen. 2, ed. folio 272. 1817. TYPE: Mexico, Humboldt & Bonpland (P-H.B.K. & P, fide Ernst 1972, neither seen).—FIG. 12.

Erect *herbs* or *shrubs* to 2(3) m tall; sometimes unbranched, the branches and stems slender, scurfy tomentulose with greyish indumentum, the hairs weak, blackish, several celled, sometimes branched; stems mostly terete. *Leaves* opposite, reduced in size upwards, sessile, ovate, apically obtuse, basally truncate to auriculate, the margins with numerous, sharp, sometimes callose teeth, mostly 2–4 cm long, 1–2 cm wide, somewhat coriaceous, both sides velutinous above with short whitish hairs, the venation obscure above, prominent beneath, the midvein and 2–4 strongly ascending lateral veins on each side conspicuously elevated. *Inflorescences* terminal racemes, at first congested, elongating with maturity, the pedicels tomentose, 3–4 mm long. *Flowers* with the calyx ca. 7 mm long, cupular, glandular tomentose, 10-ribbed, 4–5 lobed, the lobes deltoid, 2–3 mm long, sometimes somewhat acuminate; corolla red, tubular, 3–4 cm long, 5–7 mm wide, pulverulent tomentose with dark hairs, 2-lipped; stamens 2, the lower pair of anthers held against the upper lip, tomentose, the 2 staminodes reduced to tufts of hairs; stigma punctiform. *Capsule* ovoid, black, apiculate, ca. 2 cm long, ca. 8 mm wide; seeds oblong, ca. 1.5 mm long, with a stramineous, deeply reticulate testa.

This species is the most variable and widespread in the genus (Ernst, 1972), ranging from northern Mexico to central Panama. In Panama it occurs at slightly lower elevations than the other species, *L. gutierrezii*.

CHIRIQUÍ: El Barú above Boquete, 1200–1800 m, *D'Arcy 9915* (MO). 1.5 mi from Boquete on road to David, *Dwyer & Hayden 7630* (MO). COCLÉ: El Valle, 600–1000 m, *Allen 1154* (MO). Hills N of El Valle, 800 m, *Allen 2235* (MO, NY). VERAGUAS: Hueco de Calobré camino hacia La Yeguada, *Carrasquilla et al. 287* (MO). La Yeguada a orillas del Río San Juan, *Correa & Dressler 1970* (MO). Between Laguna La Yeguada and Calobré, *Luteyn 1473* (DUKE).

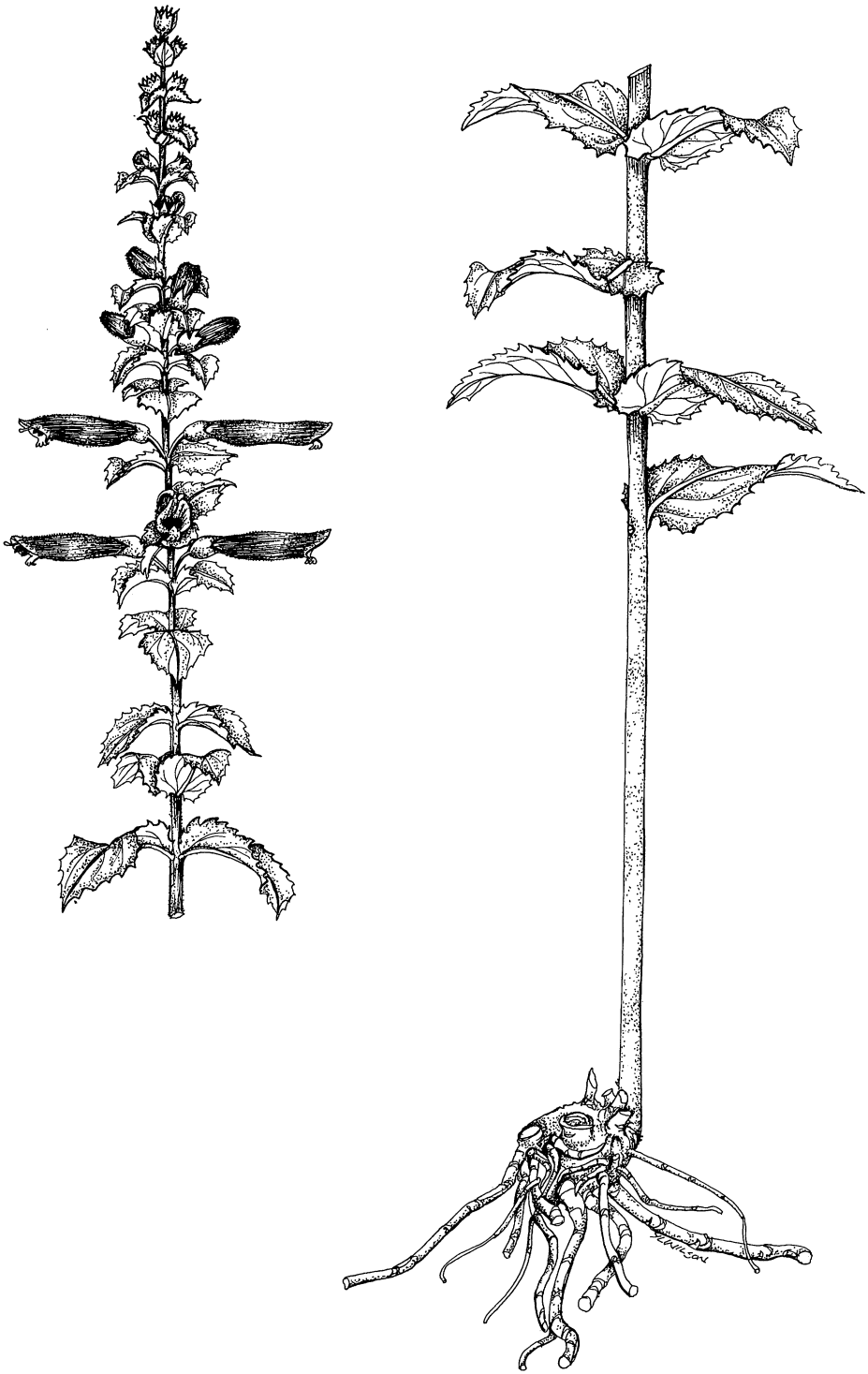


FIGURE 12. *Lamourouxia viscosa* H.B.K. Habit ( $\times 7/10$ ). [After Allen 2235 (MO).]

## 14. LEUCOCARPUS

**Leucocarpus** D. Don in Sweet, Brit. Fl. Gard. 11, *tab. 124*. 1830. TYPE: *L. alatus* D. Don = *L. perfoliatus* (H.B.K.) Benth.

Robust *herbs*, glabrate, stems stout, strongly 4-angled or winged. *Leaves* opposite, lanceolate, denticulate, basally auriculate and appearing connate perfoliate, sessile but the basal part of the lamina contracted to appear petiolar. *Inflorescences* short pedunculate axillary cymes, the peduncle short, the flowers in several many-flowered clusters, the bracts small, narrow, subtending the pedicels and the inflorescence branches. *Flowers* with the calyx narrowly campanulate, 5-dentate, costate; corolla tubular campanulate, the 4 crenate lobes similar, glabrous outside, pubescent at the mouth within; stamens 4, alike, the 2 thecae basally divergent, staminode wanting; stigma 2-lamellate, situated just below the anthers. *Fruit* a white fleshy berry, 10 cm across, faintly bisulcate, the style persistent or leaving a beak; seeds numerous, minute, subglobose, reticulate.

*Leucocarpus* is a monotypic genus of mainland tropical America. It is distinctive in its robust stature, pedunculate cymose inflorescences, and baccate fruits.

1. **Leucocarpus perfoliatus** (H.B.K.) Benth. in DC., Prodr. 10: 335. 1846.—  
FIG. 13.

*Mimulus perfoliatus* H.B.K., Nov. Gen. Sp. Pl. 2: 371. 1817. TYPE: Colombia, H. & B., not seen.

*Conobea alata* Graham, Edinburgh New Philos. J. 10: 168. 1830. TYPE: Cultivated, Scotland, not seen.

*Leucocarpus alatus* (Graham) D. Don in Sweet, Brit. Fl. Gard. II, 2; *tab. 124*. 1833.

*Hemichaena fruticosa* Benth., Pl. Hartw. 78. 1841. TYPE: Guatemala, *Hartweg 549* (?K, not seen).

*Leucocarpus fruticosus* (Benth.) Benth. in DC., Prodr. 10: 336. 1846.

Coarse, erect *herbs* or *shrubs* to 2.5 m tall, glabrate; stems stout, drying strongly angled, hollow, if puberulent soon glabrescent. *Leaves* opposite, appearing connate perfoliate but actually not so, lanceolate, to 20 cm long, ca. 3 cm wide, apically acute, basally narrowed and auriculate with an indistinct petiolar region, the margin serrate with numerous prominent but fine teeth, sometimes ciliolate, the midvein prominent, plane or impressed above, elevated beneath, lateral veins numerous, arcuate ascending, drying reticulate beneath, glabrate or with some short scattered hairs, copiously glandular dotted beneath on emerging; petiolar area broadly winged, mostly edentate. *Inflorescences* numerous short, several flowered contracted cymes to 4 cm long and 4 cm broad, the peduncles mostly 1–2 cm long, drying compressed, ciliolate, the bracts narrowly deltoid or lanceolate, costate, ca. 4 mm long, situated at the base of the pedicels and the peduncle branches. *Flowers* with the calyx 7–8 mm long, tubular campanulate, 5-lobed, the lobes 3–4 mm long, acute to linear, outcurving, extending downwards as prominent calyx costas, glabrous, the calyx tube enervate; corolla white, drying yellow, tubular to campanulate, ca. 1.5 mm long, glabrous outside or with minute glandular trichomes near the top of the tube, exerted ca. 10 mm from



FIGURE 13. *Leucocarpus perfoliatus* (H.B.K.) Benth.—A. Habit ( $\times\frac{1}{2}$ ).—B. Flower ( $\times 2$ ). [After Seibert 163 (MO).]

the calyx, 4-lobed, the lobes rotund, subentire, subequal, 3–4 mm long, the sinuses conspicuously infolded, the infolded portion densely bearded with white hairs; stamens 4, alike, the anthers free, alike, the 2 thecae divaricate and downcurved in a U over the filament apex, the filaments glabrous, slender, not apically expanded except as a pedicel-like connective; style shorter than the anthers, glabrous, terete; stigmas compressed, elliptical, apically acute, the ovary smooth, glabrous, eglandular, drying sulcate. *Fruit* a conspicuous, white, fleshy berry, ellipsoidal or ovoid, 10–18 mm long, septally sulcate, loosely enveloped by the slightly accrescent calyx until maturity, the calyx then dehiscing longitudinally to the base at one or more points, the style sometimes persistent, 4–5 mm long; seeds reddish brown, ca. 0.5 mm long, ellipsoidal, sometimes somewhat compressed, weakly pitted reticulate in indistinct longitudinal lines; placenta drying dark, massive, the septum drying light, indurate.

This species is a conspicuous element of natural disturbance at upper elevations in the Chiriquí Mountains. It ranges from Mexico (Jalisco) to Bolivia and Venezuela, but it is not known from the Antilles.

*Leucocarpus perfoliatus* blooms and fruits the year round.

BOCAS DEL TORO: Robalo Trail, N slope of Cerro Horqueta, 6000–7000 ft, *Allen 4806* (MO). CHIRIQUÍ: New Switzerland, valley of Río Chiriquí Viejo, 1800–2000 m, *Allen 1407* (MO, US). Cerro Punta, 7000 ft, *Blum et al. 2413* (MO, SCZ). Las Nubes, 5.5 km NW of Río Chiriquí Viejo W of Cerro Punta, 2000 m, *Busey 271* (MO). Camino entre Bambito y La Amenaza, 6000 ft, *Correa 1283* (MO). Hill above FSU cabin between Nueva Swissa and Cerro Punta, 1650 m, *Croat 26292* (MO). Las Nubes, 2000 m, *Croat 26421* (MO). Cerro Colorado copper mine development, 28 mi above San Félix, *Croat 33215* (MO). Bajo Chorro, Boquete District, 6000 ft, *Davidson 226* (MO). Road to Bajo Grande from Cerro Punta, *Folsom 4015* (MO). Slopes of Cerro Horqueta, 3500 ft, *Maurice 892* (US). Cerro Colorado, 50 km N of San Félix, 1200–1500 m, *Mori & Dressler 7880* (MO). Cerro Punta, 2½ km SW of town, *Mori & Kallunki 5663* (MO). Pastures around Boquete, 1000–1300 m, *Pittier 2914* (US). Cerro Punta, 6800 ft, *Ridgway & Solis 2406* (MO, SCZ). Monte Lirio, upper valley of upper Río Chiriquí Viejo, 1300–1900 m, *Seibert 163* (MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson 5633* (MO, SCZ). Volcán, *Urriola 22* (MO). Thickets between Cerro Punta and Guadalupe, 1980 m, *Wilbur et al. 13040* (MO). Trail from Bajo Grande along Quebrada Grande to top of Paso de Respinga, 2100–2400 m, *Wilbur et al. 15128* (MO). Bajo Mona and Quebrada Chiquero, 1500 m, *Woodson & Schery 558* (MO).

## 15. LINDERNIA

**Lindernia** All., *Mélanges Philos. Math. Soc. Roy. Turin* 3: 178, *tab. 5, fig. 1.*

1766. TYPE: *L. pyxidaria* All. = *L. procumbens* (Krock.) Philc.

*Vandellia* P. Br. ex L., *Syst. Nat.*, ed. 12, 2: 384, 422. 1767; *Mant. Pl.* 1: 89. 1767. TYPE: *V. diffusa* L. = *Lindernia diffusa* (L.) Dur. & Jacks.

?*Ilysanthes* Raf., *Ann. Nat.* 1: 13. 1820. TYPE: *I. riparia* Raf., based on *Lindernia attenuata* All.

*Bonnaya* Link & Otto, *Icones Pl. Sel.* 23. 1820. TYPE: *B. brachiata* Link & Otto.

*Bazina* Raf., *Aut. Bot.* 44. 1844. TYPE: *B. nudiflora* Raf., based on *Lindernia grandiflora* Nutt.

*Pyxidaria* Hall ex Kuntze, *Rev. Gen. Pl.* 2: 464. 1891. TYPE: *Lindernia pyxidaria* All.

Small paludal *herbs*, copiously branching, erect or ascending, sometimes rooting at the nodes, the roots fibrous, the stems mostly slender, drying angled, glabrate. *Leaves* opposite, small, entire or denticulate, sometimes punctate, 1–3-veined from near the base, basally cordate or truncate and clasping, or petiolate. *Inflorescences* of 1(–3?) flowers in the leaf axils, the pedicels slender,

drying angled, shorter or longer than the leaves, ebracteate. *Flowers* with the calyx 5-lobed, the lobes short or free to the base, costate and 1-3(-5) veined, the corolla prominently exserted from the calyx but sometimes cleistogamous and then the corolla little or not exceeding the calyx, campanulate, 2-lipped, the upper lip emarginate, the lower lip 3-denticulate, blue, white or purplish; stamens 4 or 2, the filaments inserted high on the corolla tube, the anthers connate in pairs, the thecae narrow, widely divergent and forming a cross, the filament sometimes conspicuously expanded just below the anther; ovary glabrous, eglandular, the style exserted or not, the stigmas compressed, ovate or discoid. *Capsule* elliptical or ovoid, sometimes slightly oblique, sometimes globose, dehiscent septically to the base, the placenta narrow, winged by the light colored septum; seeds numerous, mostly oblong, rarely curved, reticulate in transverse or longitudinal lines, these lines sometimes assuming the magnitude of small wings.

*Lindernia* is widespread in both temperate and tropical regions of the world, and some of the same species occurring in northern parts of the temperate zone, e.g., New Hampshire or Germany, also occur in lowland tropical Panama. The plants grow in wet, boggy areas, often in full sun. Some species are especially frequent weeds.

At one time, species with 2 anthers were separated from those with 4 anthers as the genus *Ilysanthes*, but several botanists have argued that this is not of generic importance. The distinctions of the South American sections were outlined by Miranda (1977). In addition to the three sections present in Panama, the New World hosts sect. *Bazina*, and the typical Old World section *Lindernia* has been doubtfully reported from the Guianas. Section *Bazina* is characterized by winged seeds (Pennell, 1935). Its sole species, *L. grandiflora*, has strongly angled, bent seeds, and the angles form only rudimentary wings. Two Panamanian collections, identified by asterisks under *L. anagallidea*, resemble the Florida species in overall leaf appearance and in having bent seeds with prominent angles. Thus the distinction of the Florida species and the section based on it is less than one might conclude from the literature.

#### Literature:

Miranda, D. O. 1977. Flavonoid and morphological studies of *Lindernia* Allioni (Scrophulariaceae) in South America. *Bot. J. Linn. Soc.* 75: 47-67.

Mukerjee, S. K. 1945. A revision of the Indo-Burmese species of *Lindernia* Allioni. *Jour. Indian Bot. Soc.* 24: 127-134.

Philcox, D. 1968. Revision of the Malesian species of *Lindernia* All. (Scrophulariaceae). *Kew Bull.* 22: 1-72.

- a. Calyx lobed less than  $\frac{1}{2}$  way down; outline of placenta and septum broadly elliptical; leaves (bracts) subtending terminal flowers conspicuously reduced (sect. *Torenioides*) ..... 2. *L. crustacea*
- aa. Calyx lobed to near the base; outline of placenta and septum narrowly elliptical or conical; leaves (bracts) subtending flowers like the others (undifferentiated).
  - b. Flowers all subsessile, pedicels less than 2 mm long; leaves all shortly but distinctly petiolate; capsules often more than 5 mm long; leaves crenate dentate with numerous fine teeth (sect. *Numularia*) ..... 3. *L. diffusa*

- bb. Many or all flowers on distinct pedicels more than 2 mm long; upper (or all) leaves rounded or cordate clasping, the petioles obsolete; capsules less than 5 mm long; leaves entire or with few teeth (sect. *Brachycarpae*).
- c. Leaves mostly less than 8 mm long, all leaves rounded or cordate clasping; capsule mostly shorter or as long as the calyx ..... 1. *L. anagallidea*
- cc. Plants with many leaves more than 8 mm long; lower leaves narrowed and appearing petiolate; capsule mostly longer than the calyx ..... 4. *L. dubia*

1. ***Lindernia anagallidea*** (Michx.) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 152. 1935.

*Gratiola inaequalis* sensu auct., an Walt., Fl. Carol. 61. 1788. TYPE: not known.

*G. anagallidea* Michx., Fl. Bor. Amer. 1: 6. 1803. TYPE: Carolina, *Michaux* (P, not seen).

*Lindernia dilatata anagallidea* Muhl., Cat. Pl. Amer. Sept. 59. 1813. TYPE: ?Carolina, ?Pennsylvania, *Muhlenberg* (?PH, not seen).

*Ilysanthes anagallidea* (Michx.) Raf., Aut. Bot. 46. 1840.

*I. inaequalis* (Walt.) Pennell, Torreya 19: 149. 1919.

Delicate, paludal *herbs*, usually copiously branched, sometimes rooting at the nodes, prostrate or ascending, the branches slender, drying angled, glabrate. *Leaves* elliptic or ovate, sometimes rotund, mostly less than 8 mm long (Panama), pairs of leaves (bracts) subtending flowers often reduced, apically obtuse, sometimes acute, basally cordate or truncate and somewhat clasping, the margins usually thick, dentate or entire, the veins few, sometimes conspicuous, 1–3, palmate, glabrate; petioles wanting. *Inflorescences* solitary flowers in the leaf axils, the pedicels slender, drying angled, glabrate, exceeding the leaves, often greatly so, ebracteate. *Flowers* with the calyx 5-parted to the base, the lobes oblong, 3-nerved, apically acute, ca. 2.5 mm long, hardly accrescent. *Corolla* white, blue or mauve, ca. 7 mm long, campanulate; stamens 2, the filaments inserted ca. 3 mm from the base of the corolla, free ca. 1 mm, glabrous, compressed, the anthers connate, the thecae divaricate, narrow; style ca. 3 mm long, glabrous, apically short curved and flattened, the styles compressed, discoid. *Capsule* ellipsoidal, rotund, ca. 3 mm long, dehiscing septicidally, the placenta narrow, pitted, with narrow wings forming an elliptical outline; seeds numerous, yellow, ca. 0.5 mm long, reticulate laterally and longitudinally.

This diminutive species occurs from the northern United States south through the tropics into southern temperate areas. In Panama it occurs in wet weedy places at lower elevations.

*Lindernia anagallidea* is often difficult to separate from *L. dubia*. In Panama it is more delicate with smaller leaves, but in other countries, *L. anagallidea* is sometimes more robust.

For arguments in favor of the name used here and rejection of the name *L. inaequalis* see Pennell (1935).

CHIRIQUÍ: Marsh 12 km W of El Hato, *D'Arcy 10886* (MO). COCLÉ: In wet sand, valley floor and lower slopes along highway, El Valle, *Miller 1823* (US). In bogs, El Valle, 500–700 m, *Seibert 486* (MO). PANAMÁ: Sabana de Juan Corso near Chepo, 60–80 m, *Pittier 4743* (US). Near big swamp E of Río Tocumen, *Standley 26720* (US). In marsh, Juan Franco Race Track near Panama, *Standley 27826* (US). Near Matías Hernández, *Standley 28997* (US). Between Pacora and Chepo, *Woodson et al. 1646, 1648* (both MO).



2. *Lindernia crustacea* (L.) F. Muell., Syst. Census Austral. Pl. 1: 97. 1882.<sup>9</sup>

*Capraria crustacea* L., Mant. Pl. 87. 1767. LECTOTYPE: China (LINN 785.3, not seen) designated by Philcox, 1968.

*Torenia crustacea* (L.) Cham. & Schlecht., Linnaea 2: 570. 1827.

*Pysidaria crustacea* (L.) Kuntze, Rev. Gen. Pl. 2: 464. 1891.

Prostrate or ascending paludal *herbs*, profusely branching, the stems drying angled, the angles ciliate, often purplish, slender, sometimes rooting at the nodes, the roots fibrous. *Leaves* opposite, rotund, apically obtuse or rounded, basally obtuse or truncate, crenate or serrate, to 15 mm across, punctate on both sides, glabrate above, beneath glabrate but sometimes pubescent on the veins; lower leaves distinctly petiolate, the petiole shorter than the leaves, thin winged, the costa pubescent beneath. *Inflorescence* a solitary flower in a leaf axil, or by suppression of the shoot, appearing terminal and 1–3 flowered, ebracteate, the pedicels slender, angled, ciliate, mostly exceeding the leaves, often purplish. *Flowers* with the calyx narrow, oblong or obconical, ca. 2 mm long, becoming 4 mm long in fruit, angled, glabrate or ciliate on the angles, with 5 subequal short lobes, the lobes often purplish; corolla blue or purple, exserted, ca. 4 mm long, 2-lipped, the upper lip longer, slightly 2-lobed or erose, the lower lip 3-lobed; stamens 4, didynamous, the upper pair inserted near the base of the corolla lip sinuses, the filaments glabrous, apically thickened, the thecae alike, divaricate and forming a nearly straight line, the lower pair inserted on the lower lip, the filaments slightly shorter, slenderer, not apically thickened, the thecae slightly unequal, the 2 anthers connivent, and the 4 thecae forming a cross; ovary glabrous, eglandular, the style slightly exceeding the anthers, the stigmas compressed, rotund discoid, papillose, drying elliptical. *Fruit* ovoid, included in the somewhat accrescent calyx, 4–5 mm long, the calyx costae prominent, the intercostal areas becoming hyaline, often splitting to the base, the style sometimes persistent, ca. 3 mm long; dehiscing septicidally to the base leaving the narrow pitted placenta winged by the thick, indurate, elliptical septum; seeds oblong, yellow, tuberculate in lines, ca. 0.5 mm long.

This weedy species is widely distributed in both New and Old Worlds.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2745 (DS). Almirante, *Blum* 1323 (MO, SCZ). Railroad tracks near Milla 7.5, *Croat & Porter* 16454 (MO). Railroad tracks near Milla 5, *Croat & Porter* 16481 (MO). Changuinola, *D'Arcy* 11162 (MO). Changuinola to 5 mi S at junction of Río Terebé, 100–200 ft, *Lewis et al.* 788 (MO, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al.* 1965 (MO, US). CANAL ZONE: Near mouth of Río Chagres, *Allen* 894 (MO). Frijoles, *Croat* 6269 (MO). Los Ríos, *Croat* 11460 (MO). Between Frijoles and Monte Lirio, 30 m, *Killip* 12119 (US). Pipeline Road ca. 16 mi N of Gamboa, *Lewis et al.* 5441 (MO). Edge of lake near Madden Dam, *Mori & Kallunki* 1991 (MO). 6 km E of Gamboa, *Nee* 9036 (MO). Frijoles, *Standley* 27409, 31495 (both US). 6 mi N of Gamboa near Río Frijol, *Tyson* 1463 (MO, SCZ). Howard Air Force Base near Red Devil drop zone, *Tyson* 1848 (SCZ). Miraflores Lake, *White* 182 (MO). BARRO COLORADO ISLAND: *Croat* 5991, 6579 (both MO); *Ebinger* 545 (MO); *Foster* 2290 (PMA); *Kenoyer* 521 (US); *Shattuck* 219 (MO); *Standley* 40947 (US). CHIRIQUÍ: San Bartolo Arriba W of Puerto Armuelles, 125 m, *Croat* 26729 (MO). Puerto Armuelles in bananas, *D'Arcy* 10078

<sup>9</sup> More synonyms are provided by Chamisso & Schlechtendal, Linnaea 2: 570–572. 1827, Philcox (1968), and Miranda (1977), but only the names presented here relate directly to the Panamanian flora.

(MO). David airport, 25 ft, *Lewis et al.* 752 (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, 0–150 m, *Liesner* 455 (MO). San Bartolomé, Burica Peninsula, 0–50 m, *Woodson & Schery* 924 (MO). COCLÉ: Boca del Toabré at confluence with Río Coclé del Norte, *Lewis et al.* 5518, 5567 (both MO). COLÓN: From sea to top of ridge behind Garotte, *D'Arcy* 9335 (MO). Mouth of Río Piedras, *Lewis et al.* 3198 (DS). Portobelo, *Wilbur & Luteyn* 11647 (DUKE). Roadside 5–7 mi SW of Portobelo towards Maria Chiquita, *Wilbur & Weaver* 11206 (DUKE). DARIÉN: Boca de Cupe, 40 m, *Allen* 901 (MO). Boca Quebrada Venado, Río Tuqueza, *Bristan* 1097 (MO, OS). Road to Pinogana near El Real, *Croat & Porter* 15476 (MO). Río Pirre, *Duke* 4977 (MO, US). El Real, Río Tuirá, *Stern et al.* 806 (MO). Río Sabana, *Tyson et al.* 4780 (MO, SCZ). LOS SANTOS: Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al.* 2940 (DS). PANAMÁ: Road to Cerro Azul 5 mi above Interamerican Highway, *Croat* 11524 (MO). Top of ridge N of El Llano, *D'Arcy & D'Arcy* 6047 (MO). 5–6 mi E of Chepo on Panamerican Highway, *Duke* 4042 (MO). Agronomy School Farm, Tocumen, *Dwyer* 4109 (US). Cerro Jefe, 1000 m, *Gentry* 6754 (PMA). Sabana de Juan Corso, near Chepo, 60–80 m, *Pittier* 4529 (US). SAN BLAS: Permé, *Cooper* 219 (US). Puerto Obaldía, *Croat* 1700A (MO). Mandinga Airport, *Duke* 14830 (OS). Outskirts of Puerto Obaldía, *Gentry* 1577 (MO, SCZ). VERAGUAS: Mouth of Río Concepción, *Lewis et al.* 2787 (MO).

3. *Lindernia diffusa* (L.) Wettst. in Engl. & Prantl. (editors), *Natürlichen Pflanzenfamilien* IV, 3b: 79. 1891.—FIG. 14.

*Vandellia diffusa* L., *Mant. Pl.* 1: 89. 1767. TYPE: Virgin Islands, *Brown* (PLINN 795–3). *Lindernia diffusa* (L.) Wettst. ex Durand & Jackson, *Index Kewensis* suppl. 1: 248. 1906. *Pyxidaria diffusa* (L.) Kuntze, *Rev. Gen. Pl.* 2: 464. 1891.

Paludal *herbs*, branching at the base or above, sometimes rooting at the nodes, the stems slender, angled, pilose in lines with weak, white hairs. *Leaves* opposite, rotund, ovate to rhombic, apically obtuse or rounded, basally cuneate to truncate, to 2 mm across, the margin crenulate, ciliate, minutely punctate, more noticeably so when young, glabrate or pubescent above, the veins somewhat pubescent beneath, the undersides sometimes purple, the midvein prominent with 2–3 lateral, ascending veins on each side; petiole winged, ca. 1 mm long. *Inflorescences* solitary or paired flowers in the leaf axils, the pedicel ebracteate, angled, broadening upwards indistinctly into the calyx, ca. 1 mm long. *Flowers* small, the calyx narrowly obconical, ca. 6 mm long, often pinkish or purplish, basally strongly angled, the angles ciliate, glabrous otherwise or pubescent, divided almost  $\frac{1}{2}$  way down into 5, narrowly acute, subequal lobes, sometimes tardily splitting to the base at the sinuses; corolla white and yellow, clavate in bud, ca. 8 mm long, glabrous outside, bearded within, 2-lipped, the upper lip emarginate, often purplish, the lower lip slightly shorter, 3-lobed; stamens 4, with 2 filaments inserted well below the top of the tube, glabrous, slender, broadening into a thick, deltoid connective, the anthers 2-thecae, the thecae divaricate in the lower  $\frac{1}{2}$ , coherent in the upper  $\frac{1}{2}$ , linear or ovate, yellowish, ca. 0.5 mm long, the lower 2 with the filaments inserted above the level of the 2 major sinuses, the free portion geniculate, glabrous, terete, ovary oblong, the style terete, ca. 3 mm long, the stigmas broadly ovate, somewhat reflexed, ca. 0.5 mm long. *Capsule* narrowly conical, sulcate, mostly prominently exserted from the calyx, to 9 mm long, scabridulous near the top, apiculate, greenish, sometimes septicidally dehiscent to the base, the placenta somewhat compressed, narrowly acute, the septum forming narrow hyaline wings; seeds yellowish or brownish, oblong, tuberculate, pitted in lines, angled, ca. 0.5 mm long.



FIGURE 14. *Lindernia diffusa* (L.) Wettst. Habit ( $\times \frac{1}{4}$ ). [After Croat 6938 (MO).]

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 386 (US). Changuinola to 5 mi S at junction of Ríos Changuinola and Terebe, 100–120 ft, *Lewis et al.* 921 (MO, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al.* 1968 (MO, US). Chiriquí Lagoon, *Wedel* 1157 (MO). Río Cricamola between Finca St. Louis and Konkintoë, *Woodson et al.* 1877 (MO). CANAL ZONE: Near mouth of Río Chagres, *Allen* 895 (MO). Barro Colorado Island, *Croat* 6938 (MO, SCZ), 11845 (MO). Frijoles, *Croat* 10372 (MO). Ft. Kobbe, *Duke* 3911 (MO). Chagres, *Fendler* 218 (MO). Pipeline Road, *Gentry & Dressler* 1984 (MO). Between Frijoles and Monte Lirio, *Killip* 12189 (US). Mount Hope Cemetery, *Standley* 28800 (US). Las Cruces Trail between Fort Clayton and Corozal, *Standley* 29041 (US). PANAMÁ: Bella Vista, *Standley* 25390 (US). Las Cascadas Plantation near Summit, *Standley* 29590 (US). Near Fort Sherman, *Standley* 31125 (US). COCLÉ: 12 mi NE of Penonomé, 1200 ft, *Lewis et al.* 1530 (DS). El Valle de Anton, 100–2000 ft, *Lewis et al.* 2502 (DS). 2 mi N of El Valle, 620–660 m, *McDaniel* 8293 (MO). COLÓN: Río Chagres 1 mi above Madden Lake, *Duke* 4484 (MO, DS). Confluence of Río Pacora and Río Corso, 450 m, *Duke* 11958 (MO, OS). Cerro Campana, *Lewis et al.* 3088, 4894 (both MO). Around Portobelo, *Pittier* 2442 (US). Near big swamp E of Río Tocumen, *Standley* 26592 (US). Between France Field and Catival, *Standley* 30380 (US). SAN BLAS: Mainland opposite Ailigandí, *Lewis et al.* 70 (MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al.* 2798 (DS). Just S of Santa Fé, *Nee* 8075 (MO).

4. *Lindernia dubia* (L.) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 152. 1935.

*Gratiola dubia* L., Sp. Pl. 17. 1753. TYPE: Virginia, not seen.

*Capraria gratioloides* L., Syst. Veg., ed. 10. 1117. 1759. Based on *Gratiola dubia* L.

?*Ilysanthes riparia* Raf., Ann. Nat. 1: 13. 1820. TYPE: not seen. Perhaps based on *Lindernia attenuata* Muhl. cf. Aut. Bot. 45. 1840.

*I. gratioloides* (L.) Benth. in DC., Prodr. 10: 419. 1846.

*I. dubia* (L.) Barnhart, Bull. Torr. Bot. Club 26: 376. 1899.

*Lindernia gratioloides* (L.) Lloyd & Fouc., Fl. Ouest Fr. ed. 4. 246. 1886. (not seen, fide Pennell, Torreya 19: 149. 1919).

Paludal *herbs*, often branched, sometimes rooting at the nodes, the branches slender or stout, drying angled, glabrate. *Leaves* opposite, elliptical or ovate, to 30 mm long, apically rounded, obtuse or occasionally acute, the upper leaves rounded, truncate or cordate and clasping the stem, the lower leaves narrowed into a distinct, petiole-like region, the margins entire or denticulate, the margins not thickened, glabrate, scarcely punctate, the veins ca. 3 from near the base, 1 or more lateral veins often inserted higher on the costa. *Inflorescence* solitary or paired flowers in the leaf axils, the pedicels variable in length, those near the apex much exceeding the leaves, those near the base of the stems much shorter than the leaves, slender, drying angled, glabrate, thickening near the flower. *Flowers* with the calyx divided nearly to the base, the lobes subequal, oblong, acute, ca. 3 mm long, corolla white with a blue or purplish throat, 5–10 mm long, sometimes cleistogamous and hardly exceeding the calyx lobes; stamens 2, inserted in the throat, the anther thecae divaricate, narrow, connate; style slender, ca. 3 mm long, the stigmas compressed, rotund. *Capsule* about equaling the calyx lobes, broadly ellipsoidal, ca. 4 mm long, dehiscing septicidally.

This species is closely related to *L. anagallidea*, and the scant Panamanian material at hand is extremely difficult to separate from that species. In North America, plants are more robust and the characters noted in the key are much more apparent. This species occurs in the eastern United States and in Central America.

CANAL ZONE: Old Las Cruces Trail between Fort Clayton and Corozal, Standley 29056, 29225a (both US).

## 16. MECARDONIA

**Mecardonia** Ruiz & Pavón, Fl. Peruv. & Chil. Prodr. 95. 1794; Syst. Veg. 164. 1798. TYPE: *M. ovata* R. & P.

*Pagesia* Raf., Fl. Ludov. 48. 1817. TYPE: *P. leucantha* Raf. = *Mecardonia acuminata* (Walt.) Small.

Erect or creeping *herbs*, annual or perennial, much branched, mostly glabrous, sometimes blackening on drying, gland dotted, stems angled. *Leaves* opposite, mostly serrate, basally narrowed, the costa prominent; petiole indistinct. *Inflorescence* solitary axillary flowers, the pedicels elongate, subtended by 2 basal bracts, the bracts often leaflike. *Flowers* yellow or white, the calyx 5-lobed, mostly to the base, the lobes often equal in length, quite unequal in width, the outer sepals much wider; corolla yellow or white, campanulate and somewhat bilabiate, glabrous outside, bearded at the mouth within; stamens 4, didynamous, inserted on the corolla throat, the anthers with the 2 thecae held apart on short arms; stigma 2-lobed, lamelliform, the ovary 2-locular, many ovulate. *Seeds* numerous, oblong, reticulate.

*Mecardonia* is a New World genus. North of Colombia it includes two well-marked species, while south of the Amazon there may be other species. It may be recognized by its gland-dotted foliage, by the pedicels basally bibracteate, and by the anthers separated by an armlike connective.

1. *Mecardonia procumbens*<sup>10</sup> (Miller) Small, Fl. S.E. U.S. 1065, 1338. 1903.  
—FIG. 15.

- Erinus procumbens* Miller, Gard. Dict. ed. 8. 1768. TYPE: ?Mexico, *Houston* (?BM, not seen).  
*Lindernia dianthera* Swartz. Prodr. Veg. Ind. Occ. 92. 1788. TYPE: Hispaniola, *Swartz* (not seen).  
*Herpestis caprarioides* H.B.K., Nov. Gen. Sp. Pl. 2: 368. 1818. TYPE: Colombia, *Humboldt* (B. Willd. 11541, not seen, microfiche MO).  
*H. chamaedryoides* H.B.K., Nov. Gen. Sp. Pl. 2: 369. 1818. nomen illegit. cites *Lindernia dianthera* Sw. TYPE: Ecuador (B. Willd. 11540, not seen, microfiche MO).  
*H. colubrina* H.B.K., Nov. Gen. Sp. Pl. 2: 368. 1818. TYPE: Peru, *Humboldt* (B. Willd. 11545, not seen, microfiche MO).  
*H. montevidensis* Spreng., Syst. Veg. 2: 802. 1818. TYPE: Uruguay, *Sello* (not seen).  
? *H. vandellioides* H.B.K., Nov. Gen. Sp. Pl. 2: 367. 1818. TYPE: Mexico (B. Willd. 11534, not seen, microfiche, obscure, MO).  
? *H. flagellaris* Cham. & Schlecht., Linnaea 2: 575. 1827. TYPE: Brasil (not seen).  
*H. peduncularis* Benth., Bot. Mag. 2: 56. 1836. LECTOTYPE: Texas, *Drummond* 75 (K, not seen).  
*H. chamaedryoides* var. *peduncularis* (Benth.) A. Gray, Synop. Fl. N. Amer. 2: 280. 1878.  
*Monniera procumbens* (Miller) Kuntze, Rev. Gen. Pl. 2: 463. 1891.  
*M. montevidensis* (Spreng.) Kuntze, Rev. Gen. Pl. 3(2): 236. 1898.  
*M. procumbens*  $\delta$  *flagellaris* (Cham. & Schlecht.) Kuntze, Rev. Gen. Pl. 3(2): 236. 1898.  
*M. procumbens*  $\gamma$  *montevidensis* (Spreng.) Kuntze, Rev. Gen. Pl. 3(2): 236. 1898.  
*M. chamaedryoides* var. *peduncularis* (Benth.) Mohr, Contr. U.S. Natl. Herb. 6: 721. 1900.  
*M. dianthera* (Sw.) Millsp., Field Mus. Nat. Hist., Bot. Ser. 2: 98. 1900.  
*Mecardonia peduncularis* (Benth.) Small, Fl. S.E. U.S. 1065, 1338. 1903.  
*M. tenuis* Small, Fl. S.E. U.S. 1065, 1338. 1903. TYPE: Florida, *Blodgett* (NY, not seen).  
*M. viridis* Small, Fl. S.E. U.S. 1065, 1338. 1903. TYPE: Texas, *Heller* 1460 (NY, not seen).  
*Bacopa procumbens* (Miller) Greenm., Field Mus. Nat. Hist., Bot. Ser. 2: 261. 1907.  
*Herpestis procumbens* Urb., Symb. Antil. 4: 558. 1911.  
*Bacopa chamaedryoides peduncularis* (Benth.) M. C. Metz, Catholic Univ. Amer., Biol. Ser. 16: 173. 1934.  
*Pagesia dianthera* (Sw.) Penn., Acad. Nat. Sci. Philadelphia Monogr. 1: 69. 1935.  
*P. peduncularis* (Benth.) Penn., Acad. Nat. Sci. Philadelphia Monogr. 1: 65. 1935.  
*P. procumbens* (Miller) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 68. 1935.  
*Bacopa procumbens* var. *peduncularis* (Benth.) Fern., Rhodora 37: 442. 1935.  
*B. peduncularis* (Benth.) Standl., Field Mus. Nat. Hist., Bot. Ser. 11: 174. 1936.  
*B. montevidensis* (Spreng.) Hert. & Melch., Rev. Sudamer. Bot. 4: 191. 1937.  
? *Pagesia vandellioides* (H.B.K.) Penn., Notul. Nat. Acad. Sci. Philadelphia 43: 2. 1940.  
*Mecardonia montevidensis* (Spreng.) Penn., Proc. Acad. Nat. Sci. Philadelphia 98: 87. 1946.  
? *M. vandellioides* (H.B.K.) Penn., Proc. Acad. Nat. Sci. Philadelphia 98: 87. 1946.

Creeping or ascending glabrous ephemeral *herbs*, mostly branching at the base, sometimes rooting at the lower nodes, the branches to 15 cm long, slender, flexuous; roots mostly short and fibrous, the stems sometimes strongly angled, sometimes with dark brown, multicellular, peltate glands. *Leaves* opposite, ovate, mostly 10–15 mm long, 8–10 mm wide, with about 7 even, ascending teeth on the upper  $\frac{2}{3}$  of the margin, apically obtuse, basally cuneate, mostly conspicuously (under a lens) glandular punctate with multicellular, sessile glands; petiole very short or indistinct. *Inflorescence* at first terminal, soon axillary, a solitary flower

<sup>10</sup> Other synonyms exist for this plant, but they do not relate directly to the Panama flora.

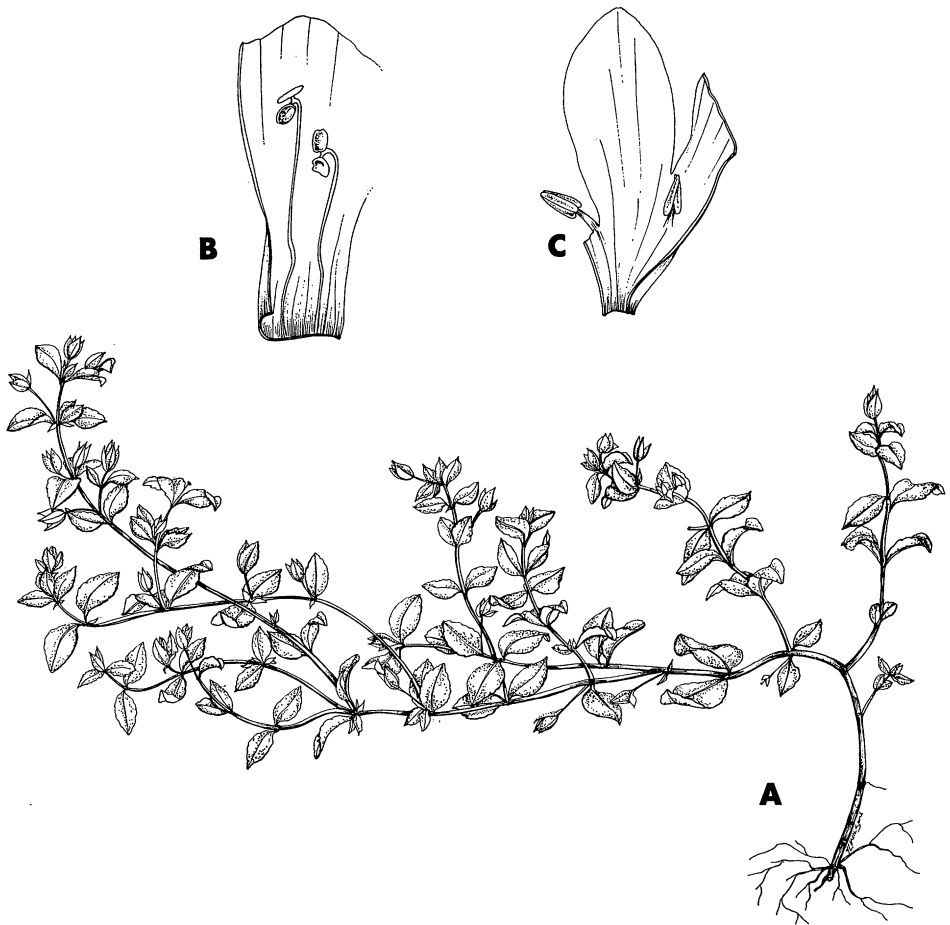


FIGURE 15. *Mecardonia* and *Bacopa*.—A-B. *Mecardonia procumbens* (Miller) Small.—A. Habit ( $\times\frac{1}{2}$ ).—B. Stamens ( $\times 7\frac{1}{2}$ ). [After Tyson 5356 (MO).]—C. *Bacopa salzmannii* (Benth.) Edwall. Stamens ( $\times 5$ ). [After Woodson *et al.* 1721 (MO).]

in a leaf axil, seldom geminate; pedicels slender, ca. 3 mm long, longer in fruit, bracts 2–4 mm long, linear, mostly entire, located at the base of the pedicel. *Flowers* ca. 8 mm long, the sepals free, the outer 3 sepals ovate, 7 mm long, 2–3 mm wide, larger in fruit, apically acute, basally obtuse or rounded, mostly lacking glands, inner 2 sepals linear, slightly shorter than the outer sepals; corolla tubular, exserted, yellow with purple lines, ca. 8 mm long, 5-lobed, the lobes recurved, rounded, sometimes irregularly crenulate, or emarginate, alike but the posterior pair with a short sinus, bearded in the throat; stamens 4, a rudimentary staminode sometimes present, the filaments glabrous, inserted at unequal heights in the lower  $\frac{1}{2}$  of the tube, free ca. 2 mm, the anther 2-thecate, the thecae oblong, held apart on expanded connectives, the connectives consisting of a discoid or ellipsoidal expansion at the filament apex and one slender arm to each theca; ovary narrowly ovoid, longitudinally sulcate, the styles 1.5 mm long, connate, apically

flattened, the stigma a linear crest on the slightly curved, flattened styles. *Capsule* narrowly ovoid, ca. 4 mm long, the walls stramineous, dehiscent loculicidally and septicidally from the apex; calyx accrescent, the outer sepals becoming 9 mm long and 5 mm wide; enlarged, linear placenta persistent on the withered capsule; seeds numerous, ovoid, 0.3 mm long, longitudinally ridged with a reddish brown reticulum.

BOCAS DEL TORO: Changuinola, 0–100 m, *D'Arcy 11153, 11179* (both MO). Runway at Almirante, *Lazor et al. 2319* (MO). Changuinola to 5 mi S at junction Río Terebé, *Lewis et al. 805A* (MO), *817, 1962* (both MO, US). Nievécita, 0–50 m, *Woodson et al. 1863* (MO, NY). CANAL ZONE: Chagres River near Juan Mina, *Bartlett & Lasser 16361* (MO). Colon to Empire, *Crawford 412, 583* (both PH). Pipeline Road 2½–5 mi from Gamboa gate, *Croat 9373, 33678* (both MO). Railroad track in front of Summit Garden, *D'Arcy 9303* (MO). Pipeline road to 18 km N of Gamboa, *D'Arcy 10636* (MO). Ft. Kobbe, *Duke 3954* (MO). Toro Point, Ft. Sherman, *Duke 4341* (MO). Madden Dam, *Ebinger 866* (MO, US). Chagres, *Fendler 213* (US). Road K-10 2 mi on Panamerican Highway toward Nuevo Emperador, *Lewis et al. 5218* (MO). Madden Forest, *Lewis et al. 5330* (DS, MO). Summit Gardens, *Mori & Kallunki 1891* (MO). SE side of Madden Lake near the Puente Natural, 90 m, *Nee & Hansen 14075* (MO). Railroad 3 mi W of Gamboa, *Nee & Mori 3609* (MO, PMA). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5736* (US). Sosa Hill, *Standley 26491* (PH, US). Near Fort Randolph, *Standley 28760* (US). Fort Sherman, *Standley 30986* (US). Chiva-Chiva Trail near Miraflores Lake, *Tyson 1382, 1387* (both MO). Gatún railroad station, *Tyson 3506* (MO). 5 mi N of Cocoli, *Tyson 3871* (MO). George Green Forest Preserve behind Cerro Tigre, *Tyson et al. 2508* (MO, PMA). Barro Colorado Island, *White 149* (MO). Miraflores Lake, *White 169* (MO), *266* (MO, PH). Pipeline Road N of Gamboa, *Wilbur & Weaver 11225* (DUKE). CHIRIQUÍ: Quebrada Tuco 9 mi S of Puerto Armuelles, *Croat 22093* (MO). Boquete, 3800 ft, *Davidson 575* (MO, US). Quebrada Melliza 6 mi S of Puerto Armuelles, *Liesner 486* (MO). Boquete, *Maxon 4965* (NY, US). COCLÉ: El Valle de Antón, 1000–2000 ft, *Lewis et al. 2604* (DS, MO). Above Penonomé, *Williams 528* (NY). COLÓN: Portobelo, *Wilbur & Luteyn 11651* (DUKE). DARIÉN: Boca de Cupe, ca. 40 m, *Allen 900* (MO). Airstrip at Caná gold mine, 480 m, *Croat 38011* (MO). Río Sambú upstream from Puerto Indio, *Dressler* (MO). Río Tuquesa at lower mining camp Charco Chiva, *Mori 6954* (MO). Caná, *Williams 734* (NY, US). HERRERA: 12.5 mi S of Ocú, 1200 ft, *Lewis et al. 1658* (MO, US). LOS SANTOS: 3 mi S of Carrete, ca. 5 mi S of Las Tablas, *Burch et al. 1245* (MO, US). Río Tonosí near Tonosí, *Lewis et al. 1574* (MO, US). Punta Mala, *Tyson 2706* (MO). PANAMÁ: Bayano Dam, *D'Arcy 9416* (MO). Without other locality, *Hayes 709, 823* (both NY). Punta Paitilla, *Heriberto 12b* (PH, US), *12* (US). Savanas N of Panama City, *Paul 621* (US). Near Matías Hernández, *Standley 28933* (US). Nuevo San Francisco, *Standley 30723* (US). Chepo, *Wilbur & Luteyn 11819* (DUKE). SAN BLAS: Puerto Obaldía, *Croat 17000* (MO). Soskatupu, *Duke 10187* (MO); *Elias 1667* (MO). Puerto Obaldía, *Gentry 1578* (MO).

## 17. MICRANTHEMUM

*Micranthemum* Michaux, Fl. Bor. Amer. 1: 10, tab. 2. 1803. nomen cons. TYPE: *M. orbiculatum* Michx. = *M. umbrosum* (Walt. ex Gmel.) Blake.—FIG. 16.

*Globifera* J. F. Gmelin, Syst. Nat. 2: 32. 1791. nomen rejic. TYPE: *G. umbrosa* Gmel., based on "*Anonymos*" *umbrosa* Walt.

[*Anonymos* Walt., Fl. Carol. 62. 1788. Name not intended as a generic name, cf. International Code of Botanical Nomenclature 1972 Article 20, note. TYPE: "A." *umbrosa* Walt.]

Diminutive creeping or floating *herbs*, glabrate, branching and rooting at the nodes. *Leaves* opposite, entire, mostly rotund, sometimes succulent; sessile or nearly so. *Inflorescences* solitary flowers in the leaf axils; pedicels short. *Flowers* minute, the calyx 4-parted to the base; corolla campanulate, 4-lobed, the lobes imbricate; stamens 2 inserted at the top of the corolla tube, the filaments genicu-

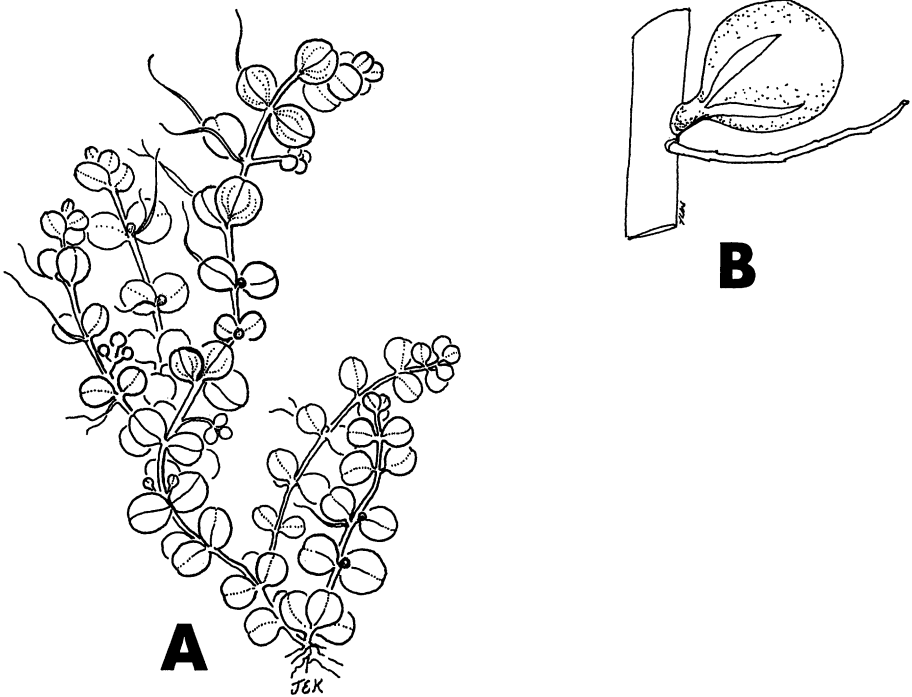


FIGURE 16. *Micranthemum umbrosum* (Gmel.) Blake.—A. Habit ( $\times 1$ ).—B. Fruit subtended by adventitious root ( $\times 25$ ). [After McDaniel 8033 (MO).]

late, the 2 anther thecae separated by the slightly enlarged connective; style short, apically flattened and bent, the ovary globose, somewhat oblique, 2-locular, many ovulate. *Fruit* a slightly irregular, subglobose capsule, septicidally dehiscent, the septum remaining with the valves or evanescent; placenta ovoid, pitted; seeds yellowish, longitudinally ridged reticulate, numerous.

*Micranthemum* includes several species of temperate and tropical America. The type species, *M. umbrosum* (Walt. ex Gmelin) Blake, occurs in temperate eastern North America and in Brasil and Argentina. Several other species have been described from the New World tropics. The plants in this genus grow in moist shady habitats. Some botanists include *Hemianthus* Nutt. (1817) in *Micranthemum*. *Hemianthus* includes a number of superficially similar species which grow in the Antilles or in brackish ponds and flats in eastern North America. The type species of *Hemianthus*, *H. micranthemoides* Nutt., differs from *Micranthemum* in such important floral details as divided styles, elongate corolla tubes, fused calyx lobes, etc., which do not argue for unity of the two genera.

1. *Micranthemum pilosum* Ernst, *Flora* 57: 215. 1874. TYPE: Caracas, Venezuela, *Ernst* Nov. 1873 (B, if extant, not seen; photo US).

?*M. standleyi* L. O. Williams, *Fieldiana, Bot.* 34: 124. 1972. TYPE: Guatemala, *Standley* 68810 (F, US, neither seen).



Diminutive floating or prostrate *herbs*; stems branching, glabrate, the nodes mostly shorter than the leaves; roots often arising from leaf- or flower-bearing nodes. *Leaves* opposite entire, orbiculate, ovate or elliptical, apically obtuse or rounded, basally cuneate obtuse; digitately 5-nerved, membranaceous or ?succulent; petioles mostly wanting. *Inflorescences* solitary flowers in the leaf axils; pedicels ca. 0.3 mm long, somewhat longer in fruit, broadening upwards. *Flower* 0.5–1.5 mm long, 4 parted to near the base, the lobes lanceolate, 0.5–1.0 mm long, pubescent; corolla 4-lobed, the lobes round, imbricate, exerted from the calyx; stamens 2, inserted at the top of the corolla tube, the filaments geniculate, curved, short, the thecae lenticular, separated by the somewhat enlarged and compressed connective; style short, included, apically compressed and curved, the stigma U-shaped; ovary subglobose, glabrous. *Fruit* a globose capsule ca. 1 mm across, chartaceous, septicidally dehiscent to the base, the placenta ovoid, pitted; seeds yellow, longitudinally reticulate, 0.3 mm long, oblong.

*Micranthemum pilosum* occurs on forest floors and in wet shady places in lowland Panama. It differs from *M. umbrosum* of the southeastern United States and parts of South America in its smaller flowers and fruits, and in the pubescent calyx which is shorter than the corolla.

Some plants from Texas and Louisiana now known as *M. umbrosum* also have these features and may be taxonomically distinct from plants of the eastern United States. The name *M. pilosum* is used with some hesitation as the photograph of the type does not reveal the floral details just noted. A study of *Micranthemum* material from the vicinity of Caracas is desirable.

CANAL ZONE: Old Las Cruces trail between Fort Clayton and Corozal, *Standley* 29121 (PH, US). Fort Sherman, *Standley* 30927 (PH). COCLÉ: Natá, *McDaniel & Tyson* 14741 (MO). HERRERA: Ciénaga Juncalillo near Correa, *McDaniel* 8033 (MO). PANAMÁ: Río Pacora E of Panama City on Panamerican Highway, *Bartlett & Lasser* 16961 (MO). Hills NE of Hacienda La Joya, *Dodge et al.* 16923 (MO). Majecito, camino del Campo el Ranchon, *Rivera* 3 (PMA). Big swamp E of Río Tocumen, *Standley* 26683 (US). Between Matías Hernández and Juan Díaz, *Standley* 31949 (PH, US).

## 18. RUSSELIA

**Russelia** Jacq., Enum. Pl. Carib. 6. 1760. TYPE: *R. sarmentosa* Jacq.

Small, wiry *shrubs*, sometimes appearing herbaceous, the stems mostly ridged or angled, glabrate or pubescent. *Leaves* opposite or verticillate, membranaceous to coriaceous, ovate to lanceolate, sometimes reduced and caducous, entire, serrate or deeply incised, venation pinnate, sometimes glandular dotted; petioles present or wanting, mostly short; stipules wanting. *Inflorescences* axillary cymose clusters, mostly pedunculate; bracts foliaceous, reduced upwards on the flowering stems; bractlets narrow, sessile, mostly pubescent; pedicels slender. *Flowers* showy red or pink, rarely white; calyx 5-lobed to near the base, the lobes apically narrow, mostly with hyaline margins; corollas tubular, slightly bilabiate, the mouth mostly not spreading, mostly glabrous outside, mostly pubescent near the mouth and at the point of the stamen insertion within; stamens 4, didynamous, included, the filaments inserted just above the base of the tube, often pubescent

basally, the anthers ovoid, the cells divaricate, a short staminode mostly present; stigma entire, included, the ovary 2-locular, the ovules numerous on an expanded placenta. *Fruit* a rotund capsule, glabrous, septicidal, the style persistent or forming a beak, packed with long hairs derived from the placentas; seeds numerous, small, oblong, or elliptical, longitudinally striate or sometimes reticulate.

*Russelia* includes about 50 species, mostly Mexican, with one weedy species widespread in the neotropics and one species widely cultivated and escaping in the tropics. In Panama only the weedy *R. sarmentosa* and the cultivated *R. equisetiformis* are recorded. Species of this genus are usually easily recognized by the red or pink clusters of tubular flowers, glabrous outside, and by the angled stems.

#### Literature:

Carlson, M. C. 1957. Monograph of the genus *Russelia* (Scrophulariaceae). *Fieldiana, Bot.* 29: 231-292.

- a. Plants nearly leafless; branches numerous and verticillate, slender; inflorescences 2-flowered; corolla glabrous inside; cultivated plant ..... 1. *R. equisetiformis*
- aa. Plants with abundant ovate leaves; branches mostly opposite or ternate; inflorescences several-many flowered; corollas pubescent inside; common weed ..... 2. *R. sarmentosa*

1. ***Russelia equisetiformis*** Schlecht. & Cham., *Linnaea* 6: 377. 1831. TYPE: Mexico, *Schiede & Deppe 1187* (GH, not seen).

*R. juncea* Zucc., *Flora* 15 Beibl. 2: 99. 1832. TYPE: Cult. Munich, seed from Mexico, *Zuccarini* (?M, not seen).

Erect, branched, semileafless *herbs* to 1 m tall, the stems conspicuously 4-8 angled, the angles stramineous, glabrate, the branching often verticillate, each branch subtended by a leaf or adnate petiole. *Leaves* opposite or verticillate, subtending branches, oblong, elliptical or ovate, mostly less than 1 cm long, 6 mm wide, entire or serrate, the lateral veins 2-3 on each side, glabrate with a few scattered glands and minutely tomentose at the base of the costa above; petiole short, minutely tomentose above, the lower  $\frac{1}{2}$  tightly connivent with the axillary branch, medially callose and with thickened margins. *Inflorescences* paired, solitary or dichasial flowers scattered through the upper part of the plant, or condensed into open cymes or panicles, the peduncles to 15 mm long, the pedicels slender, sometimes purplish, 6-8 mm long, each subtended by a scalelike glabrate bract. *Flowers* small but showy, the calyx 2-3 mm long, the 5 deltoid lobes free to near the base, imbricate, glabrous, mostly eglandular; corolla tubular, scarlet, 15-30 mm long, glabrous but glandular in the throat, the lobes short, obtuse, similar; stamens 4, inserted at the base of the corolla tube, the anther thecae ovoid or elliptical, strongly divaricate, obliquely connivent at the base, 0.6-1.0 mm long, all situated on the lower side at the corolla mouth; style apically curved. *Capsule* not seen.

This species is perhaps native to Mexico but is widely cultivated and is now naturalized in many tropical and subtropical countries. In Panama it is known

only in cultivation but may be expected to persist from time to time. The broom-like, usually leafless stems and small showy red flowers are good features for recognition. Young plants, especially those grown in shelter from sun and wind, tend to have more leaves.

CANAL ZONE: Cultivated, Summit Gardens, *D'Arcy 10640A* (MO). PANAMÁ: Cultivated, Panama la Vieja, *Paul 782* (US).

2. ***Russelia sarmentosa*** Jacq., Enum. Pl. Carib. 6. 1760; Sel. Stirp. Amer. 178. 1763. TYPE: Cuba, *Jacquin*, not seen.—FIG. 17.

*R. colombiana* Pennell, Proc. Acad. Nat. Sci. Philadelphia 72: 186. 1920. TYPE: Colombia, *Smith 1361* (NY, holotype; isotype, MO).

*R. flavoviridis* Blake, Contr. U.S. Natl. Herb. 24: 22. 1922. TYPE: Guatemala, *Blake 7790* (US, not seen).

*R. tabacensis* Lundell, Contr. Univ. Michigan Herb. 6: 59. 1941. TYPE: Mexico, *Matuda 3524* (MICH).

*R. oxyphylla* Lundell, Contr. Univ. Michigan Herb. 7: 51. 1942. TYPE: Panama, *Bartlett & Lasser 16349* (MICH).

Erect, branching *herbs* to 2 m tall; stems conspicuously slender, stiff, glabrate, sometimes tufted at the nodes, 4–8 angled, the angles drying stramineous. *Leaves* opposite or ternate, ovate, mostly 2–4 cm long, 1.5–3 cm wide, apically obtuse, acute, or acuminate, basally rounded, obtuse or truncate, rarely cuneate, the margins sharply serrate to serrate crenate, the venation pinnate, with 3–5 conspicuous arcuate veins on each side, a minor vein extending to the tip of each tooth, ciliate, sparingly pubescent on each side with short, weak, whitish multicellular hairs, the hairs beneath fewer and confined mainly to the veins, scattered peltate glands abundant beneath and occasionally above; petioles short, 1–3 mm long, with thickened, basally tufted margins and with a medial callose thickening at the base. Inflorescences axillary fascicles of 1–3 short cymes; peduncles to 1.5 cm long, slender, angled, glandular, glabrate to pubescent, the nodes tufted and subtended with linear, pubescent bracts, the pedicels filiform, 1–3 mm long, slightly longer and stouter in fruit, sparingly glandular, glabrous, drying angled. *Flowers* small but showy, the calyx 5-lobed nearly to the base, ca. 4 mm long, the lobes long acuminate, basally broad and somewhat inflated to appear imbricate when pressed, glandular, the costa pubescent; corolla showy scarlet, tubular, 6–15 mm long, sparingly villous near the base, 4–5 lobed, the lobes mostly subequal, short, oblong, the lower lobe bearded near the throat within with stout, unicellular hairs, pilose near the point of filament insertion; stamens 4, the filaments inserted near the base of the corolla tube, glabrous, the anthers ellipsoidal, divaricate, the connective minute, the lower pair situated unequally about  $\frac{2}{3}$  way up the tube, the upper pair barely exerted; staminode short bearing a sterile knob; ovary smooth, glabrous, narrowly conical ellipsoidal, the stigma linear, situated near the lower anthers. *Capsule* globose turbinoid, ca. 4 mm across, dehiscent loculicidally and septocidally, the valves venose, beaked, not separating widely, the placentas dark, turbinoid, sometimes somewhat convoluted, the septum remaining with the valves, the locules filled with short, stout, tawny hairs arising from the placentas; seeds dark reddish brown, ca. 0.6 mm long,



FIGURE 17. *Russelia sarmentosa* Jacq.—A. Habit ( $\times\frac{1}{2}$ ).—B. Fruit ( $\times 3$ ). [After Allen 2770 (US).]

oblong, evenly pitted and reticulate, the pits with glandular material resembling that of the leaf undersides.

This species shows considerable variability, especially with respect to degree of pubescence and frequency of glands, but these differences do not warrant

taxonomic distinction. Carlson (1957) recognized several variants from Panama<sup>11</sup> but they represent unusual individuals rather than taxonomic populations.

*Russelia sarmentosa* is the most widespread species in the genus, ranging from Mexico to Colombia with representation in the Greater Antilles. It ranges from sea level to at least 1,500 m, occurring at forest edges, in pastures and along roadsides. It has considerable resistance to grazing. The erect, wiry stems and verticels of small, bright red flowers are distinctive.

CANAL ZONE: Between Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16349* (MICH). Madden Forest, *Croat 8943* (DUKE, MO). Salamanca Hydrographic Station on gorge of Río Pequeni, *Dodge et al. 16967* (MO). Drowned forest of Quebrada Tranquilla and branches, *Dodge & Allen 17324* (DS, MICH, MO). Balboa Heights, *Greenman & Greenman 5024* (MO). Cerro Ancón, *Heriberto 130* (US). Collin d'Ancón, Balboa, *Hladik 117* (MO). Ancón, *Paul 149* (US); *Piper 6021* (US). Río Grande near Culebra, *Pittier 2125* (US). Ancón Hill, *Standley 26325* (US). Sosa Hill, Balboa, *Standley 26478* (US). Balboa, *Standley 27000* (MO, US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29141* (US). Balboa, *Standley 29313* (US). Pueblo Nuevo, *White 297* (MO). CHIRIQUÍ: Paso Ancho to Monte Lirio, *Allen 1582* (MO, US). 5 mi S of Boquete, *Allen 4701* (MO). Ridge above Brazo Seco near Costa Rican Border, 100–200 m, *Croat 22552* (MO). 3 mi NE of El Hato del Volcán at base of Volcán Chiriquí, 1500–1800 m, *Davidse & D'Arcy 10363* (MO). Bajo Mono, Boquete District, 4700 ft, *Davidson 472* (MO, US). Lava fields near town of Volcán, 4600 ft, *Duke 9134, 9144* (both MO). Between Boquete and Cerro Horqueta, *Duke A13730* (DUKE, MO). Boquete, Llanos Francia, 4 mi toward Dolega, 4500 ft, *Dwyer & Hayden 7595* (MO). Llanos between Boquete and David, *Ebinger 748* (MO). Monchuila-Santo Domingo, *Gonzalez 30* (MO). 4.1 mi from Boquete on road to David, *Kirkbride 99* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 358* (MO, US). 12.4 mi N of David, *Lewis et al. 708* (MO). 2.2 mi E of El Hato del Volcán, *Luteyn 808* (DUKE, MO). Between Cerro Vaca and Hato del Loro, 850–1100 m, *Pittier 5384* (US). Llanos Francia near Boquete, 3300 ft, *Stern et al. 1205* (MO). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5724* (MO). Río Chiriquí Viejo valley, *White 77* (MO). 2 mi S of Puerto Armuelles, *Wilbur et al. 13587* (DUKE). COCLÉ: El Valle, 800–1000 m, *Allen 92, 1156* (both MO), 2770 (US). Between Cerro Pilón and El Valle de Antón, 700–900 m, *Duke & Dwyer 13907* (MO). W of Río Guías, *Gentry 5843* (MO). Ridge S of El Valle, 600 m, *Gentry 6795* (MO). Río Indio trail, El Valle de Antón, 500–700 m, *Hunter & Allen 335* (MO). 5 mi N of El Valle de Antón, *Luteyn 1182* (DUKE, MO). Crater around El Valle de Antón, *Luteyn 1259* (DUKE, MO). 2 mi N of El Valle, 620–660 m, *McDaniel 8259* (DUKE). Chigore de Penonomé, *Puga 4* (PMA). La Mesa, *Weaver & Foster 1656* (DUKE). W slopes of Cerro Pajita, headwaters of Río Guaybo, *Webster 16821* (MO). SE of El Valle de Antón, *Wilbur & Luteyn 11171* (DUKE). W slopes of Cerro Pajita in crater of El Valle de Antón, 650 m, *Wilbur et al. 15610* (DUKE, MO). Penonomé, 50–100 ft, *Williams 185* (US). COLÓN: Santa Rita Ridge 4–5.5 mi E of Transisthmian Highway, *Lewis et al. 5274* (DS, MO). DARIÉN: Chepigana, *Duke & Bristan 266* (MO, OS). HERRERA: Ocú, 100 m, *Allen 4047* (MO). 12.5 mi S of Ocú, 1200 ft, *Burch 1657* (MO). La Avena to Pesé, 22 ft, *Burch et al. 1298* (MO, US). Between El Potrero and Las Minas, *D'Arcy & Croat 4152* (MO). Between Las Minas and Pesé, *Duke 12342* (MO). 2½ mi N of Ocú, *Graham 227* (MICH). 10 mi S of Ocú, *Tyson et al. 2806* (MO). 1 mi N of Las Minas, *Wilbur 12072* (DUKE). PANAMÁ: Alcade Díaz, *Blandon 11* (PMA). Taboga Island, *Celestino 53* (US). Sabanas 3 mi E of Juan Díaz, *Cornman 2025* (US). Goofy Lake to Cerro Jefe, *Correa & Dressler 457* (DUKE, MO, PMA). 3 mi from Interamerican Highway on road to Cerro Campana, *Croat 12062* (MO). Cerro Campana, *Croat 12098* (MO). Near Calzada Larga, *Croat 12387* (MO). Cerro Jefe, *Croat 13041* (MO). Cerro Campana, *D'Arcy 9561* (MO). Río Chagres 1 mi above Madden Lake, *Duke 4458* (MO). Near top of Cerro Campana, *Duke 6004* (MO). Río Pasiga near first sharp bend above the sea, *Gentry 2249* (MO). Río Tocumen N of Chepo road, *Hunter & Allen 232* (MO). Cerro Azul, *Jaen 35* (MO). Cerro Campana on road to Su Lin, 650 m, *Kennedy et al. 2038* (MO). Taboga Island, 300 m, *Killip 3192* (US).

<sup>11</sup> a. Stems glabrate.

b. Plants eglandular ..... *R. sarmentosa* fo. *eglandulata* Carlson

bb. Plants with glands ..... *R. sarmentosa* Jacq. fo. *sarmentosa*

aa. Stems pubescent ..... *R. sarmentosa* var. *nicaraguensis* Carlson

SE slope of Cerro Campana, *Lewis et al.* 3110 (MO). Cerro Campana, *Luteyn* 1060 (DUKE). Taboga Island, *Macbride* 2771 (US). Cerro Campana, *Porter et al.* 4319 (MO). El Espino de La Chorrera, *Rodriguez* 34 (DUKE, PMA). Chivo-Chivo, *Solanilla* 6 (MO, PMA). Taboga Island, *Standley* 27904 (US). W slope of Cerro Campana, 2500 ft, *Tyson et al.* 2381 (PMA). 9 km SE of El Valle de Antón, *Wilbur et al.* 11165 (DUKE). Isla Taboga, 0–186 m, *Woodson et al.* 1477 (MICH, MO). VERAGUAS: Santiago, 50 m, *Allen* 1081 (MO, US). Ca. 5 mi NE of La Mesa, *Blum & Tyson* 663 (MO). Carretera a San Francisco, *Cisneros* 13 (MO, PMA). Santiago near San Francisco, *Dwyer* 1240 (MO, US). N tip of Coiba Island, *Foster* 1640 (DUKE). Between San Francisco and Santa Fé, *Stern et al.* 1913 (US). Near Santiago, *Tyson* 5175 (MO). Puerto Mutis, 12 mi S of Santiago, *Tyson* 6021 (MO). PROVINCE UNKNOWN: *Duke* 6191 (MO); *Weston* 5709 (MO).

## 19. SCOPARIA

*Scoparia* L., Sp. Pl. 116. 1753. Gen. Pl., ed. 5. 52. 1754. TYPE: *S. dulcis* L.

*Herbs* or weak *shrubs*, much branched, glandular punctate, the branches slender, alternate. *Leaves* opposite, mostly small and narrow, apically dentate or entire, sometimes dissected, basally cuneate; petioles indistinct. *Inflorescence* 1–several flowered in the leaf axils, the pedicels filiform. *Flowers* small, the corolla white, blue or reddish, 4-lobed nearly to the base, 1 (posterior) lobe emarginate, glabrous outside, densely bearded inside with long hairs; stamens 4, alike, the filaments glabrous, inserted in the corolla tube, the anthers ovoid, versatile, exserted; ovary ellipsoidal or hemispheric, glabrous, the style glabrous, mostly short, the stigma punctiform, exserted. *Capsule* globose, dehiscent septically and loculicidally from the apex; seeds numerous, minute, reticulate.

*Scoparia* includes about 20 species, most of these in South America or Mexico. The species treated here is a pantropical weed. Some species are used for medicinal teas.

### Literature:

- Chodat, R. 1908. Étude critique des genres *Scoparia* L. et *Hasslerella* Chod. Bull. Herb. Boissier sér. 2, 8: 1–16; 85–89.  
 Fries, R. E. 1906. Systematische Übersicht der Gattung *Scoparia*. Ark. Bot. 6(9): 1–31, tab. 8.  
 ———. 1908, 1909. Einige weitere Bemerkungen über die Gattung *Scoparia*. Bull. Herb. Boissier sér. 2, 8: 934–940.

1. *Scoparia dulcis* L., Sp. Pl. 116. 1753. TYPE: Jamaica, *Sloane*, not seen.—  
 FIG. 18.

Perennial *herbs* or weak *shrubs* to 1.5 m tall, conspicuously glandular punctate (under a lens), the branches slender, angled by the concaulescent leaf bases, mostly glabrous, sometimes ciliate at the nodes. *Leaves* opposite, sometimes obovate, saliently dentate and to 4 cm long and 1.8 cm wide, mostly much narrower and smaller, the teeth often inconspicuous, apically obtuse, basally cuneate, sometimes with a distinct petiolar region, the midvein prominent with ca. 3 ascending lateral veins on each side, the venation often obscure above. *Inflorescence* of 1–several flowers from the leaf axils, often paired; pedicels

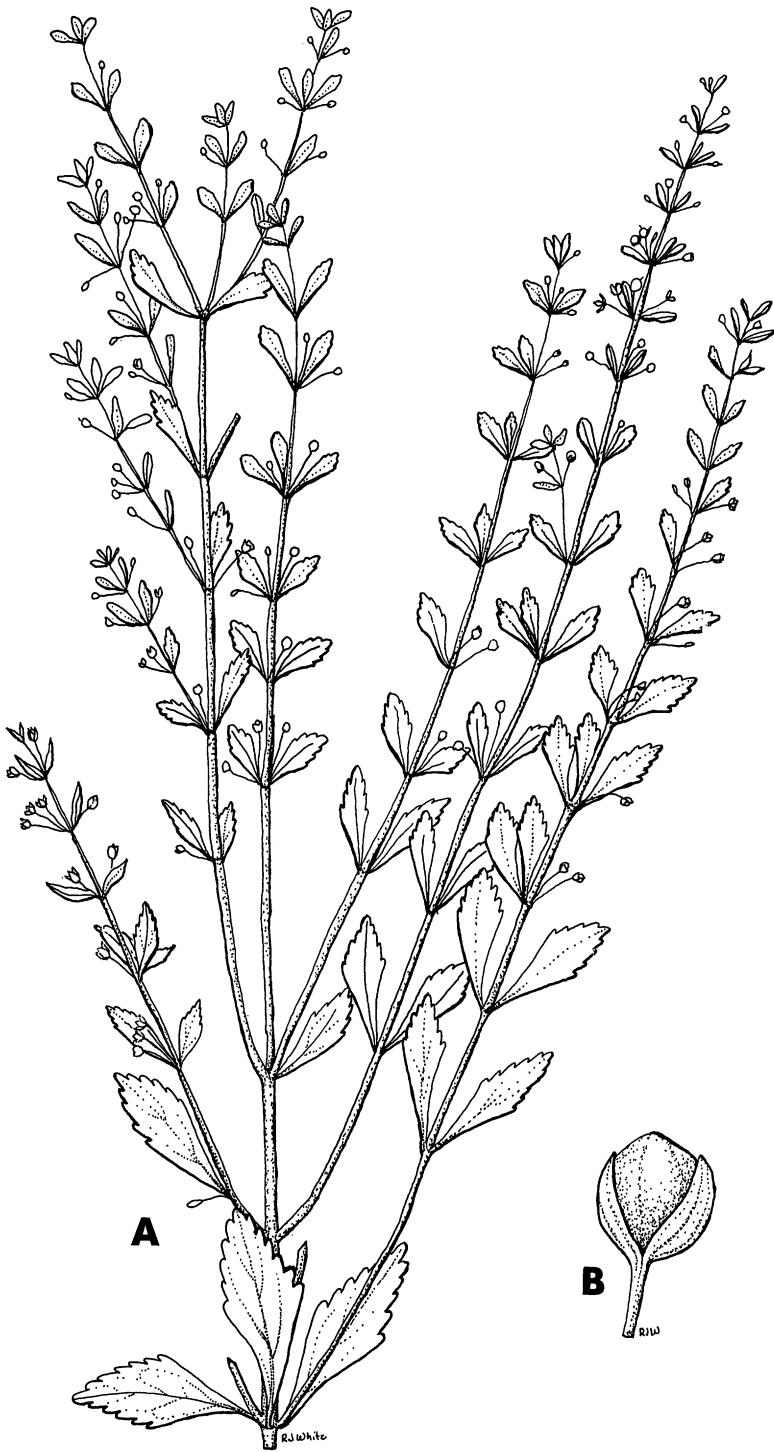


FIGURE 18. *Scoparia dulcis* L.—A. Habit ( $\times\frac{3}{8}$ ).—B. Fruit ( $\times\frac{3}{8}$ ). [After White 116 (MO).]

filiform, mostly ca. 5 mm long. *Flowers* small, the calyx 4-parted nearly to the base, the lobes oblong, obtuse or rounded apically, mostly glabrous, sometimes ciliate, apically rounded, 3 nerved; corolla white, rotate, 4-lobed nearly to the base, the lobes 2½ mm long, only slightly exceeding the calyx, ovate, glabrous above but densely bearded with long white hairs in the lower ¼ within; stamens 4, the filaments glabrous, slender, inserted on the corolla tube, 1 mm long; anthers yellow, 1 mm long, ellipsoidal, exserted; ovary ellipsoidal, the style 1.5 mm long, only slightly exceeding the anthers, the stigma punctiform, exserted. *Capsule* globose, 1.5–2.0 mm across, exceeding the calyx, 4-sulcate, yellowish brown, glabrous, dehiscent apically, sometimes beaked by remnants of the style; seeds numerous, ca. 0.5 mm long, somewhat prismatic, coarsely reticulate.

*Scoparia dulcis* is a widespread weed of tropical lowlands. The leaves are used for a tea, used in some countries as a beverage and in others as a medicinal. It is reputed to purify or cool stagnant water. "Sweet Broom," "Escobilla amarga," "Escoba amarga."

BOCAS DEL TORO: Almirante-Changuinola Canal, *Blum* 1405 (MO). Without other locality, *Carleton* 95, 149 (both US). Laguna de Chiriquí, *Hart* 175 (US). Runway, Bocas del Toro, *Lazor et al.* 2351 (MO, PMA). Changuinola to 5 mi S at junction of Río Terebé, 100–200 ft, *Lewis et al.* 791 (DUKE, MO, PMA, US). Chiriquí Lagoon, *Wedel* 1243, 1337 (both MO), 2830 (MO, US). CANAL ZONE: Pipeline Road near Gamboa, *Clewell & Tyson* 3273 (PMA). Boyd-Roosevelt Highway near Babanita, *Croat* 9274 (MO, SCZ). Lowland side of Ft. Kobbe, *Duke & Mussell* 6589 (MO). Frijoles, *Ebinger* 631 (MO). Chagres, *Fendler* 5 (MO, US). Ancón Hill, *Greenman & Greenman* 5123 (MO). Between Frijoles and Monte Lírio, 30 m, *Killip* 12123 (US). Río Chagres bridge near Gamboa, *Lasseigne* 4273 (MO). 2 mi N of Gatún Locks on road to Fort San Lorenzo, *Lazor & Blum* 5421 (MO). Pipeline Road 16 mi N of Gamboa, *Lewis et al.* 5444 (MO). Ancón, *Macbride & Featherstone* 18 (US); *Piper* 5537 (US). Gatuncillo, *Piper* 5657 (US). Balboa, *Standley* 25460 (US). Frijoles, *Standley* 27637 (US); Río Pedro Miguel near East Paraiso, *Standley* 30041 (US). Río Cocolí, Road K-9, *Stearn et al.* 336 (MO). Near survival school, Curundu, *Tyson* 1061 (PMA). Miraflores, *White* 116 (MO). BARRO COLORADO ISLAND: *Croat* 4160 (MO); *Ebinger* 593 (MO); *Shattuck* 49 (MO). CHIRIQUÍ: Llanos W of Gualaca, 500 ft, *Allen* 5046 (MO). Quebrada Guanabanito 1 km W of dam at La Represa, Burica Peninsula, *Busey* 485 (MO). Pozos de Salud, outskirts of Tolé Town, 330 m, *Correa* 128 (DUKE, SCZ). La Represa 2 mi SW of Puerto Armuelles, 0–200 m, *Croat* 22064 (MO). David airport, 25 ft, *Lewis et al.* 758 (MO). Quebrada Mellize 6 mi S of Puerto Armuelles, 0–150 m, *Liesner* 420 (MO). Towards El Hato del Volcán ca. 8 km N of La Concepción, *Wilbur & Luteyn* 19450 (DUKE). San Bartolomé, 0–50 m, *Woodson & Schery* 926 (MO). COCLÉ: Natá, 50 m, *Allen* 841 (MO, US). 12 mi NE of Penonomé, 1200 ft, *Lewis et al.* 1526 (MO, US). Boca del Toabré at confluence of Río Coclé del Norte, *Lewis et al.* 5492 (DS). 2 mi N of El Valle, 620–660 m, *McDaniel* 8290 (DUKE). Mountains above El Valle, *Stimson* 5021 (SCZ). 10 mi E of Natá at Río Grande, *Tyson* 5302 (MO). El Valle on road to La Mesa, *Tyson* 6920 (PMA). El Valle de Antón, *Wilbur et al.* 11709 (DS, DUKE, MO). COLÓN: Road to Portobelo ¼ mi N of Maria Chiquita, *Croat* 11358 (MO). Santa Rita Ridge, *Dwyer & Gentry* 9356 (MO, PMA). Maria Chiquita E of Río Piedras toward Portobelo, *Dwyer & Kirkbride* 7790 (MO). Under bridge crossing Chagres River 1 mi N of Colon-Panama line, *Lazor & Tyson* 2960 (MO). Santa Rita Ridge 5.5–6 mi E of Transisthmian Highway, *Lewis et al.* 5388 (DS, MO). Santa Rita Ridge road, *Mori & Kallunki* 1822 (MO). 5–7 mi SW of Portobelo towards Maria Chiquita, *Wilbur & Weaver* 11173 (DUKE). DARIÉN: Boca Quebrada Venado, Río Tuquesa, *Bristan* 1100 (MO). Mannene, *Kirkbride & Bristan* 1611 (MO). Town weed, Yaviza, *Lazor & Correa* 3385 (PMA). Río Tuquesa at lower mining camp Charco Chiva, *Mori* 6964 (MO). HERRERA: Roadside between El Potrero and Las Minas, *Croat* 9656 (MO). Ocú, *Diaz* 6A (DUKE, MO, PMA). 1 mi N of Las Minas, *Wilbur et al.* 12113 (DUKE). LOS SANTOS: Santa Ana, *Duke* 12475 (MO). Río Tonosí, near Tonosí, *Lewis et al.* 1572 (MO). Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al.* 2239 (MO). Headwaters of Río Pedregal 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al.* 2923 (DUKE, MO). Between Tonosí and Macaracas, *Oliver et al.* 3563 (DUKE, MO). Monagre Beach 5 mi SE of



Chitré, *Tyson et al.* 3043, 3049 (both MO). Pedasí, *Wilbur et al.* 12035 (DUKE). PANAMÁ: Pedro Gonzales, Pearl Islands, *Allen* 2592 (MO). 7 mi N of Cerro Azul on road to Cerro Jefe, 2600 ft, *Blum* 1804 (SCZ). Río Majé 4–5 mi above waterfall near Bayano Lake, *Croat* 34686 (MO). 5–6 mi E of Chepo on Panamerican Highway, *Duke* 4015 (MO). Savannas near Chepo, *Duke* 6050 (DS, MO). Río Pacora just below Río Corso, *Duke* 12017 (MO). Río Mar, *Dwyer* 1802 (MO). Without other locality, *Grisebach* 1857 (MO). Road to Cerro Azul, *Lazor* 5545 (SCZ). SW slope of Cerro Campana, *Lewis et al.* 3135 (DUKE, MO). Chimán, *Lewis et al.* 3305 (MO). Tributary of Río Chagres 5 mi SW of Cerro Brewster, 1000 ft, *Lewis et al.* 3404 (DUKE, MO). Road to Cerro Campana 2–4 mi above Panamerican Highway, 800 m, *Luteyn* 3999 (DUKE). Near Tapía River, Juan Díaz region, *Maxon & Harvey* 6672, 6755 (both US). E of Bella Vista, *Maxon & Valentine* 6952 (US). Saboga Island, *Miller* 1974 (MO, US). El Llano-Cartí Road, 916 km from Panamerican Highway, *Mori & Kallunki* 1865 (MO). Sabanas, *Paul* 43 (US). Chepo, *Pittier* 4455 (US). Taboga Island, *Standley* 27109 (US). Río Tapía, *Standley* 28076 (US). Cerro Azul, 2000 ft, *Tyson* 2100, 2126 (both MO). W slope of Cerro Campana, 2300 ft, *Tyson* 4026 (MO). Chepo, *Tyson* 6785 (MO, PMA). Carretera Cermeno a Monte Oscuro, *Varela* 5 (MO). Veracruz, *Wendehake* 12 (MO). Near Chepo, *Wilbur & Luteyn* 11798 (DUKE). Cartí road ca. 5 km from Panamerican Highway, *Wilbur & Luteyn* 19484 (DUKE); *Witherspoon & Witherspoon* 8722 (MO). Isla Taboga, 0–186 m, *Woodson et al.* 1431 (MO). SAN BLAS: E of Puerto Obaldía, *Croat* 16937 (MO). Mulatuppa, Río Ibedi, *Duke* 8506 (MO). Soskatupu, *Elias* 1695 (MO). Caladonia Harbor, Mt. Vernon, *Elmore* L14 (DS, US). Mainland opposite Achituppu, *Lewis et al.* 107 (MO, US). Forests around Puerto Obaldía, 0–50 m, *Pittier* 4365 (US). VERAGUAS: Stream feeding Laguna La Yeguada, 15 mi N of Calobre, 644 m, *Luteyn* 1442 (DUKE, MO). Panamerican Highway ½ km W of turnoff to Ocu, *Nee* 7999 (MO). 5 mi SE of Calobre, *Wilbur et al.* 12126 (DUKE). Outskirts of Santiago, *Wilbur & Teeri* 13009 (DUKE).

## 20. STEMODIA

*Stemodia* L., *Syst. Nat.*, ed. 10: 1118, 1374. 1759. nomen cons. TYPE: *S. maritima* L.

*Stemodiaca* P. Browne, *Civ. Nat. Hist. Jam.* 261. 1756. nomen rejic. Based on *Scordium maritimum* Sloane (1707) = *Stemodia maritima* L.

*Phaelypea* P. Browne, *Civ. Nat. Hist. Jam.* 269. 1756. nomen rejic. prop. TYPE: *P. erecta; foliis sessilibus* . . . P. Browne = *Stemodia durantifolia* (L.) Sw.

?*Matourea* Aubl., *Hist. Pl. Guiane* 2: 641, 259, obs. p. 48. 1775. TYPE: *M. pratensis* Aubl. See Minod (1918: p. 202 in note).

?*Dickia* Scopoli, *Intr. Hist. Nat.* 199. 1777. Based on *Matourea* Aubl.

?*Angervillea* Necker, *Elem. Bot.* 1: 351. 1790. Based on *Matourea* Aubl.

*Unanuea* Ruiz & Pavón,  *Ic. Fl. Peru. ined. ex Benth. in DC., Prodr.* 10: 380. 1846. in syn.

*Unannea* Steud., *Nom. Bot.* ed. 2. 2: 729. *Unanuea* Ruiz & Pavón, orth. but. TYPE: *U. febrifuga* Steud.

?*Chodatophyton*<sup>12</sup> Minod, *Bull. Soc. Bot. Genève sér. 2.* 10: 235. 1918. TYPE: *C. ericifolium* (Kuntze) Minod.

*Lendneria*<sup>12</sup> Minod, *Bull. Soc. Bot. Genève sér. 2.* 10: 240. 1918. TYPE: *L. humilis* (Solander) Minod = *Stemodia verticillata* (Mill.) Hassl.

?*Verena*<sup>12</sup> Minod, *Bull. Soc. Bot. Genève sér. 2.* 10: 250. 1918. TYPE: *V. hassleriana* (Chodat.) Minod.

?*Valeria*<sup>12</sup> Minod, *Bull. Soc. Bot. Genève sér. 2.* 10: 251. 1918. TYPE: *V. trifoliata* (Link) Minod.

Erect or sprawling *herbs*, the stems mostly pubescent, drying angled, branching freely. *Leaves* opposite or ternate, ovate or elliptical, mostly serrate, pubescent, often glandular punctate, petiolate, or subsessile. *Inflorescences* 1–3 flowers in the leaf axil, often geminate or ternate, the peduncles slender, ebracteate.

<sup>12</sup> Minod based these genera on species formerly considered to belong to *Stemodia*. Only *Lendneria* was critically examined in this study, and it is properly considered a synonym of *Stemodia*. See discussion under *S. verticillata* below.

*Flowers* with the calyx 5-lobed to near the base, the lobes narrow, sometimes slightly unequal; corolla white, blue, or purplish, often drying dull orange, tubular to narrowly campanulate, 2-lipped, the upper lip entire, emarginate or 2-lobed, bearded in the throat, the lower lip 3-lobed, the tube often pubescent inside; stamens 4, the filaments mostly inserted in pairs at somewhat different levels, glabrous, 1 pair of anthers sometimes with thecae differing from the others, the thecae held apart by an enlarged globose or armlike connective, parallel or divaricate, sometimes pubescent, a staminode sometimes present; ovary smooth, conical, mostly compressed, the style terete, glabrous, the stigma ligulate, often with 2 minute but distinct lateral appendages; placentas drying to form a narrow peg which does not run to the top of the ovary, the septum, in the apical portion at least, remaining with the capsule walls, in the lower portion sometimes remaining with the placenta; dehiscing loculicidally and septicidally  $\frac{1}{2}$  way or all the way down; seeds small, numerous, oblong pyriform, often longitudinally 6–10 sulcate, the surface minutely rugose.

*Stemodia* includes about 35 species in the New World tropics. Several of these are of widespread distribution as ruderal or paludal weeds. The small pedicellate blue or white flowers, narrow corolla tube and deeply divided calyx are useful characters for recognition. The sulcate seeds are useful in recognizing at least two of the Panamanian species. The fact that the upper portion of the placental septum remains with the capsule walls and is not apparent after dehiscence separates it from *Lindernia* and some other genera.

#### Literature:

Minod, M. 1918. Contribution à l'étude du genre *Stemodia* et du groupe des Stémodiées en Amérique. Bull. Soc. Bot. Genève sér. 2. 10: 155–252.

- a. Flowers subsessile, the pedicels less than 1 mm long; leaves not noticeably punctate.
  - b. Leaves subsessile, basally auriculate and seeming to clasp the stem; stigmas recurved and flattened; plants often more than 15 cm tall; basal leaves mostly more than 10 mm long ..... 1. *S. durantifolia*
  - bb. Leaves conspicuously petiolate, basally cuneate; stigmas erect or slightly bent; plants mostly less than 15 cm tall; leaves mostly less than 10 mm long ..... 5. *S. verticillata*
- aa. Flowers long petiolate, the pedicels more than 5 mm long; leaves copiously glandular punctate beneath (under a lens).
  - c. Stems soon glabrescent, leaves glabrous; flowers in open racemes; anthers pubescent ..... 4. *S. reliquiarum*
  - cc. Stems and leaves pubescent; flowers solitary or paired in the leaf axils; anthers glabrous.
    - d. Corolla more than 9 mm long; leaves mostly more than 15 mm long ..... 3. *S. peduncularis*
    - dd. Corolla less than 9 mm long; leaves mostly less than 15 mm long ..... 2. *S. jorullensis*

1. *Stemodia durantifolia* (L.) Swartz, Obs. Bot. 240. 1791. Based on *Capraria durantifolia* L.

*Veronica caule hexandra* . . . Sloane, Cat. Plant. Jamaic. 81. 1696; Voy. Isl. Madera . . . 196, tab. 124, fig. 2. 1707. TYPE: not seen.

- Lysimachia coerulea galericulata* . . . Sloane, Cat. Pl. Jamaica. 66. 1696; Voy. Isl. Madera . . . 174. 1707.
- Phaelypea erecta; foliis sessilibus* . . . P. Br., Civ. Nat. Hist. Jam. 269. 1756. Based on *Veronica caule hexandra* . . . Sloane. Cites also *Lysimachia coerulea galericulata* . . . Sloane.
- Capraria durantifolia* L., Syst. Nat. ed. 10: 1116. 1758 (May–June 1759). Based on *Lysimachia coerulea galericulata* . . . Sloane; *Capraria durantifolia* L., Pl. Jamaica. Pug. (Amoen. Acad. 97) 399. 28 Nov. 1759. Based on *Phaelypea erecta; foliis sessilibus* . . . P. Br.; *Capraria durantifolia* L., Syst. Veg. ed. Murray (ed. 13) 475. 1774; ed. Murray (ed. 14) 567. 1784.
- C. oppositifolia* L., Fl. Jamaica. (Amoen. Acad. 96) 380. 13 Dec. 1759. ?based on *Phaelypea erecta; foliis sessilibus* . . . P. Br.
- Conobea verticillaris* Spreng., Novi Prov. Hort. Acad. Hal. 13. 1818. TYPE: Cult. Berlin, from Brasil, not seen. fide Minod (1918).
- Stemodia verticillaris* (Spreng.) Link, Enum. Pl. Hort. Berol. 2: 144. 1822.
- Conobea viscosa* Schrank in Hornschuch, Syll. Pl. Nov. 2: 61. 1828. TYPE: not seen.
- Stemodia chilensis* Benth., Bot. Reg. 1470. 1831. TYPE: not seen.
- Lobelia verticillata* Kunze in Poepp., Coll. Pl. Chilense Exsiccate ex Presl., Prodr. Mongr. Lobel. 52. 1836. nomen nudum. TYPE: Chile, Poeppig 170 (MO). Not *Stemodia verticillata* (Mill.) Hassl.
- ?*Stemodia berteriana* Benth. in DC., Prodr. 10: 384. 1846. TYPE: Hispaniola, Bertero (?G, not seen; not G-DC.).
- Stemodiaca durantifolia* (L.) Morong, Pl. coll. Paraguay 183. 1880–1891, not seen, fide Minod (1918).
- S. chilensis* (Benth.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.
- ?*S. berteriana* (Benth.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.
- S. durantifolia* (Benth.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.
- Stemodia erecta* (P. Br.) Minod, Bull. Soc. Bot. Genève sér. 2. 10: 212. 1918.

Erect, viscid-pubescent *herbs* to 1 m tall, branching freely, the stems compressed on emerging, somewhat woody below, slender above, drying angled, hispid with short, whitish, gland-tipped hairs. *Leaves* opposite, lanceolate, varying greatly in size on the same plant, the lower leaves often 4(–6) cm long, 10(–15) mm wide, the upper leaves mostly less than 2.5 cm long, 5 mm wide, apically acute, basally auriculate and clasping the stem, appearing perfoliate, serrate, the teeth sharply ascending, callose tipped, viscid with scattered erect, gland-tipped, slender hairs and sessile glands, the hairs somewhat longer beneath, the midvein prominent, the ca. 5 lateral pinnate veins on each side often obscure. *Inflorescence* solitary in the leaf axils, often geminate, sometimes aggregated to appear long spicate; pedicels short, to 0.5 mm long, drying angled, viscid pilose; 2 linear, opposed, pubescent, ca. 2 mm long bracts near the top of the pedicels. *Flowers* with the calyx 5-lobed nearly to the base, the lobes narrow, acute, costate, ca. 2 mm long, viscid pilose, somewhat accrescent in fruit; corolla blue or purplish, drying dark apically, 5–6 mm long, outside minutely puberulent and glandular upwards, 2-lipped, the upper lip ca. 2 mm long, truncate or slightly emarginate, bearded in the throat with sturdy clavate hairs, the lower lip 3-lobed, the lobes ca. 1.5 mm long, the stamens 4, the filaments glabrous, terete, inserted at about the same level just below the sinuses in the corolla tube, the lowermost pair somewhat longer, the anthers alike, the connective globose, separating the 2 parallel, basifixed, oblong thecae, the thecae ca. 0.6 mm long, broadly elliptical after dehiscence, light (?yellow) colored; ovary narrowly conical, septally sulcate, somewhat compressed, glabrous, eglandular, the style stout, terete, glabrous, the stigma compressed, fanlike, slightly downcurved, the stigmatic area terminal, linear. *Fruit* a conical or ovoid capsule ca. 3 mm long, at first dark (?purplish), ultimately stramineous, the placenta dark, narrowly compressed conical, 2–3 mm

long, loculicidally and septicidally dehiscent to the base; seeds ca. 0.3 mm long, ellipsoidal, blackish brown, tuberculate in lines.

This is the most widespread species in the genus, ranging from Arizona and California through the Antilles and Central America to Uruguay and Chile. In Panama it occurs as a ruderal or street weed in lowlands, especially in the Pacific drainage. It may be recognized by its auriculate-based, lanceolate leaves and clusters of small, subsessile flowers, thus somewhat resembling some species of *Hyptis*, e.g., *H. verticillata*.

CANAL ZONE: Near Boy Scout Camp, *Croat 12917* (MO). Mangrove swamp between Gatún and Fort Sherman, *Croat 15396* (MO). Curatella savanna W of Ft. Kobbe, *Duke & Mussell 6582* (MO). SE side of Madden Lake near the Puente Natural, *Nee & Hansen 14070* (MO). Between Miraflores and Pedro Miguel, 30–50 m, *Pittier 2504* (US). Balboa, *Standley 25618, 30903* (both US). Miraflores Lake, *White & White 197* (MO). Pipeline Road N of Gamboa, *Wilbur & Weaver 11223* (DUKE). COCLÉ: Between Porto Posada and Penonomé, *Williams 166* (NY, US). COLÓN: Mouth of Río Piedras, *Lewis et al. 3188* (MO). LOS SANTOS: Near Tonosí, *Duke 12492* (MO, OS). Río Tonosí near Tonosí, *Lewis et al. 1555* (MO, US). PANAMÁ: Without other locality, *Duchassaing* (P). By airstrip near beach in Panama City, *Duke 4005* (MO). Isla del Rey, *Duke 9572* (MO, OS). Between Río Pacora and Chepo, *Dwyer et al. 5116* (MO). Sabanas, *Heriberto 76* (US). Near Tapia River, Juan Díaz region, *Maxon & Harvey 6756* (US). La Jagua vicinity of Pacora River, 25–60 m, *McDaniel 10322* (MO). Sabanas N of Panama City, *Paul 581* (US). Sabana de Dormisoló near Chepo, 60–80 m, *Pittier 4665* (US). Agricultural Experiment Station at Matías Hernández, *Pittier 6880* (NY, US). Río Tapia, *Standley 28225* (US). Near Matías Hernández, *Standley 28898* (US). Between Las Sabanas and Matías Hernández, *Standley 31913* (US).

2. *Stemodia jorullensis* H.B.K., Nov. Gen. Sp. Pl. 2: 358. 1817. TYPE: Mexico, ?*Humboldt* (?P, not seen).

*S. xorullensis* Spreng., Syst. Veg. 2: 466. 1825. (1824) *S. jorullensis*, orth. mut.

*S. angulata* Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 22. 1854. TYPE: Costa Rica, *Oersted* (?C, not seen).

*S. ageratifolia* Wright in Sauv., Fl. Cubana 99. 1873. TYPE: Cuba, *Wright 2993*, not seen.

*Stemodiaca jorullensis* (H.B.K.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.

*S. angulata* (Oerst.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.

Small annual *herbs*, erect, prostrate or ascending, to 30 cm tall, the stems slender, drying angled, sparingly pilose with weak, whitish hairs; roots short. *Leaves* opposite, broadly ovate, mostly 8–12 mm long, apically obtuse or rounded, basally truncate or cuneate, the margins serrate with ca. 8 blunt teeth on each side, some of the teeth double, venation pinnate with 4–5 veins on each side, above sparingly pilose with weak white hairs, beneath with a few similar hairs and punctate with sessile or plane glands; petiole narrow, broadening upwards, about ½ as long as the blade. *Inflorescences* 1–3 flowers in the leaf axils, the pedicels slender, pilose, much exceeding the leaves, ebracteate. *Flowers* with the calyx pilose, 5-lobed to near the base, 4 lobes alike and equal, narrowly acute, the fifth slightly longer, broader, apically differentiated; corolla white, perhaps with some pink, drying dull yellow or orange, 6–9 mm long, tubular, 2-lipped, glabrate outside, sometimes ciliate on the angles, the upper lip 2-lobed, the lobes broadly rotund, ca. 1.7 mm long, apically sinuate, bearded at the throat with stout, clavate hairs, the lower lip 3-lobed, the middle lobe obtuse, ultimately acute, the 2 lateral lobes rotund, the tube generally pilose within, sometimes with

a few scattered sessile glands; stamens 4, the anterior filaments basally geniculate, glabrous, inserted near the base of the tube, 5–6 mm free, the anthers alike or dissimilar, the thecae ca. 0.7 mm long, oblong, parallel, separated by the globose connective, the posterior filaments glabrous, ca. 1 mm free, inserted in the upper half of the corolla tube, the anthers similar to the anterior pair but slightly larger, a minute staminode inserted between the posterior filaments at the same level; ovary glabrous, smooth, eglandular, compressed, septally sulcate, the style straight, the stigma situated at the level of the lower (posterior) anthers, bent at an obtuse angle to the style, minutely appendaged on the sides. *Capsule* ovoid or ellipsoidal, about as long as the calyx, apically acute or obtuse, dehiscing septicidally and loculicidally from the apex, the valves apically recurving; placenta narrowly conical, dark, winged only at the base; seeds numerous, reddish brown, oblong, longitudinally ca. 6-sulcate, ca. 0.5 mm long.

This species grows in wet roadsides and marshes. It ranges from Mexico to northern South America, and it also occurs in the Greater Antilles. In most features it is similar to *S. peduncularis* but its stature, leaves, flowers and fruits are smaller. The glands on the leaf undersides are nearly plane whereas those of *S. peduncularis* are usually globular and distinctly raised from the leaf surface. The level of insertion of the stamens also differs markedly.

One collection examined, *Tyson & Smith 4145*, differs from the others in having narrowly elliptical leaves reaching ca. 1.2 cm in length. Details of the corolla and androecium do not differ from the other collections.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 2576* (MO, US). CANAL ZONE: Chagres, *Fendler 215* (MO). Balboa, *Standley 29275* (US). CHIRIQUÍ: David, *Roy 2* (US). COCLÉ: Boca del Toabré at confluence with Río Coclé del Norte, *Lewis et al. 5554* (DS, MO). COLÓN: Portobelo, La Cruzio Trail, *Ebinger 102* (MO). Meadows around Portobelo, *Pittier 2442A* (US). DARIÉN: Boca de Cupe, 40 m, *Allen 899* (MO). Río Mortí ca. 6 mi upstream from Mortí Abajo, 100 m, *Duke 10160* (DUKE, MO, OS). Manene, *Kirkbride & Bristan 1569* (MO). Río Tuquesa at mining camp Charco Chiva, *Mori 6953* (MO). PANAMÁ: Cañita, *Tyson & Smith 4145* (MO).

3. *Stemodia peduncularis* Benth. in DC., Prodr. 10: 382. 1846. SYNTYPES: Mexico, *Linden 1098*, *Galeotti 1024* (both K, neither seen).—FIG. 19.

*Stemodiocra peduncularis* (Benth.) Kuntze, Rev. Gen. Pl. 2: 466. 1891.

Erect, sprawling or scrambling herb or subshrub to 1.5 m long, the stems slender, prominently angled, pubescent with weak short whitish hairs, the angles ciliate, ultimately stramineous near the base, spreading by stolons and sometimes rooting at the lower nodes. *Leaves* opposite, frequently with a short axillary shoot bearing 1–2 pairs of juvenile leaves to  $\frac{1}{2}$  as long as the expanded leaves, ovate, mostly 2–4 cm long, 1.5–2.5 cm wide, apically obtuse, basally truncate or cuneate, the margins conspicuously serrate with numerous blunt teeth, the venation pinnate with ca. 4 lateral veins on each side, these furcating near the margin and running into the teeth, the minor venation obscure above, drying reticulate beneath, pubescent above with numerous scattered short whitish weak, slightly appressed hairs, beneath with fewer but slightly longer hairs and numerous globular or depressed globular, amber, yellow or black glands; petioles slender



FIGURE 19. *Stemodia peduncularis* Benth. Habit ( $\times \frac{3}{5}$ ). [After Davidson 482 (MO).]

but slightly winged upwards,  $\frac{1}{4}$ – $\frac{1}{2}$  as long as the leaves, mostly copiously pubescent. *Inflorescences* 1–3 flowers fasciculate in the leaf axils, sometimes geminate, the peduncle slender, puberulent to tomentose, becoming glandular upwards, ebracteate, the pedicels to 20 mm long,  $\frac{1}{2}$  to as long as the subtending leaf. *Flowers* with the calyx 5-lobed to near the base, the lobes narrowly deltoid to subulate, subequal, ca. 5 mm long, pubescent and glandular dorsally, basally cucullate, the tips slightly differentiated; corolla 12–18 mm long, tubular, white, sometimes pinkish in part, red veined, drying dull orange, conspicuously nervate, 2-lipped, the upper lip 2-lobed, the lobes rotund, densely bearded just above the throat with stout hairs, and sometimes with a few glands outside, the lower lip 3-lobed, the lobes ca. 2 mm long, narrowly obtuse, the middle lobe narrower, the tube pilose outside especially near the top, the inside bearded on the upper side about  $\frac{1}{2}$  way up the tube and long pilose at the base; stamens 4 in 2 pairs, the anterior pair alike, the filaments inserted about  $\frac{1}{3}$  way up the tube, glabrous, ca. 2 mm free, the anther thecae oblong, ca. 0.7 mm long parallel, separated by the enlarged, discoid connective, the posterior pair of filaments subequal, inserted ca. 2 mm from the bottom of the tube, glabrous, 5–6 mm free, the anthers situated at the throat, the thecae unlike, unequal, smaller than those of the anterior pair, separated by a smaller enlarged connective; ovary smooth, glabrous, eglandular, narrowly conical, compressed, septally sulcate, the style straight, smooth, glabrous, the stigma obtuse, compressed, flanked by 2 small lateral projections, the stigmatic area terminal. *Fruit* ovoid, ca. 7 mm long, dehiscent septicidally and loculicidally part way down, at first dark purple, ultimately stramineous; seeds not seen.

*Stemodia peduncularis* ranges from Panama to Mexico (Vera Cruz). It is distinguished by its long pedicellate flowers, ovate leaves, and relatively long flowers. In Panama it occurs at middle and upper elevations in the Chiriqui Mountains.

CHIRIQUÍ: NE side of Cerro Pando, 7.8 air km NW of El Hato del Volcán, *Cochrane et al.* 6308 (MO). E side of Cerro Pando, 6000 ft, *D'Arcy & D'Arcy* 6648 (MO). Bajo Mono, Boquete District, 4500 ft, *Davidson* 482 (MO, US). Slopes NE of Cerro Pando NW of Nueva California, 1500 m, *Wilbur et al.* 11017 (MO).

4. ***Stemodia reliquiarum*** D'Arcy.<sup>13</sup> TYPE: Panama, *D'Arcy* 10893 (MO, holotype; isotypes G, PMA).—FIG. 20.

Sparingly branched, sprawling *herbs*, the stems weak, drying dark brown, sulcate, angled below, sparingly pilose with weak, erect, 5-celled hairs, soon glabrescent; roots slender, weak, drying sulcate or compressed. *Leaves* opposite, ovate, mostly 3–5 cm long, 15–25 mm wide, apically acute or obtuse, basally obtuse or truncate, serrate with 10–15 teeth on each side, some of the teeth often double or irregular, the main venation 3–5 digitate, plane or prominulous above, elevated beneath, the central vein with 3–5 arcuate lateral veins, the venation

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<sup>13</sup> *Stemodia reliquiarum* D'Arcy, spec. nov. *Herba* pusilla inconspicua; foliis ovatis, serratis, venis 3–5-digitatis; *inflorescentibus* terminalibus racemosis; floribus minutis, calycis 5-partitis, pilosis, corollis coeruleis salverformibus, staminibus binatis, pari supra fertili, antheris barbatis, infra rudimentali; seminibus stemodiis alis similibus.

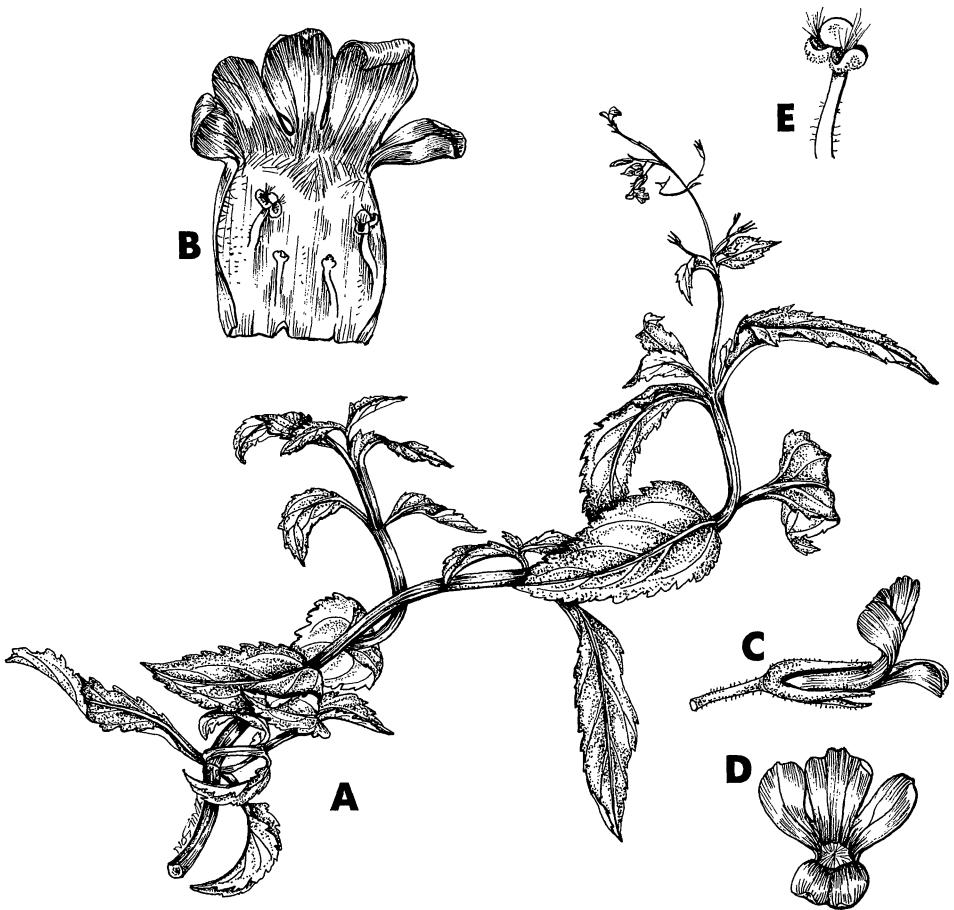


FIGURE 20. *Stemodia reliquiarum* D'Arcy.—A. Habit ( $\times\frac{3}{5}$ ).—B. Corolla opened showing stamens ( $\times 8\frac{2}{5}$ ).—C-D. Flower showing lateral and frontal views ( $\times 5\frac{2}{5}$ ).—E. Stamen showing pubescent anther ( $\times 15$ ). [After D'Arcy 10893 (MO).]

anastomosing near the margin to form a continuous but sinuous submarginal vein, minor venation reticulate, prominulous on both sides but often obscure, glabrous, both sides punctate with minute pustules (?glands); petiole slender, narrowly margined, mostly 5–8 mm long, the bases forming decurrent angles on the stem just below the nodes; stipules wanting. *Inflorescence* a terminal, open raceme; pedicels slender, sparingly pilose, ca. 5 mm long, becoming 10–15 mm long in fruit, broadening slightly in the upper  $\frac{1}{2}$ ; bracts 2, basal, minutely foliaceous to scalelike, narrow, ciliate. *Flowers* small, the calyx 5-parted to the base, the segments narrow, 2–3 mm long, becoming 4 mm long in fruit, drying dark brown, sparingly pilose dorsally or ciliate, glabrous ventrally except at the very base, minutely callose apically, the 3 longitudinal veins evident ventrally; corolla blue, salverform, the tube 3–4 mm long, slightly exceeding the calyx, nervate, outside glabrous or with a few small hairs at the top, within apically densely tufted with



large hairs, pubescent below along 1 side with smaller hairs, the lobes porrect, slightly oblique, subequal, oblong, apically sinuate, 2–3 cm long, enervate, minutely pulverulent near the base ventrally; stamens 4, the lower pair of filaments ca. 0.5 mm long, inserted equally ca. 1 mm from the corolla base, the anthers much reduced, the thecae unequal, separated by the subcapitate connective but not by arms, opening laterally longitudinally by a large porelike slit, perhaps sometimes sparingly polleniferous, the upper pair of filaments 0.7–1.0 mm long, drying slightly compressed, inserted 1.0–1.2 mm from the corolla base, apically sharply down curved and expanded into an armlike connective, 1 anther theca sessile on the connective, and the other terminal on the stipelike connective arm, both thecae pulverulent outside, conspicuously tufted along the apical edge of the insertion on the connective, opening longitudinally into portlike slits; ovary conical, sulcate, the style short, stout, 0.5 mm long, the stigma clublike, perhaps down curved, about twice as wide as the style. *Fruit* a conical-obtuse capsule slightly exceeding the calyx, dehiscing apically into 4 valves, the placenta broad, unwinged; seeds numerous, prismatic, dark brown, longitudinally reticulate with narrow walls, ca. 0.6 mm long.

This species is diagnostically distinct from other members of *Stemodia* by its pubescent anthers. It is also amply distinct in superficial appearance; the ovate leaves, sprawling habit, terminal, open racemes and digitately nerved leaves are all good distinguishing features, and might warrant recognition at the generic level. *Stemodia reliquiarum* does not conform to any of the genera or infrageneric groups recognized by Minod in his study of the *Stemodia* alliance.

Although herbarium specimens reveal plants several decimeters long, in the field plants appear much smaller, as only the minute flowers of the open inflorescence are evident amongst the mass of other greenery which obscures the full size of this plant. Known only from grazed pastures in forest remnants on the Chiriqui mountains at about 2,000 m elevation, this species may be expected in other parts of Central America and perhaps northern South America.

CHIRIQUÍ: Disturbed cloud forest at Monte Rey above Boquete, *Croat & Porter 15678* (MO). Weedy pasture at Monte Rey, above Boquete, 1500–2500 m, *D'Arcy & D'Arcy 6391* (MO); *D'Arcy 10893* (MO). Wet soil on edge of forest, foot of Sierra del Boquete, 1200 m, *Maurice 702* (MO). COSTA RICA: CARTAGO: Tapanti Hydroelectric Reserve Trail along Río Dos Amigos, 1600–1700 m, *Croat 36214* (MO).

5. *Stemodia verticillata* (Miller) Hassl., Contr. Fl. Chaco (Trab. Mus. Farmac. Fac. Ciencias Méd. Buenos Aires 21): 110. 1909.

*Erinus verticillatus* Miller, Gard. Dict. ed. 8. 1768. TYPE: America, *Houston*, not seen.

*Stemodia parviflora* Aiton W. T., Hortus Kew. ed. 2. 4: 52. 1812. Based on *Erinus verticillatus* Mill.

*Lindernia verticillata* Britton in Britton & Wilson, Bot. Porto Rico 6: 184. 1925.

*Lendneria humilis* (Solander) Minod, Bull. Soc. Bot. Genève sér. 2. 10: 241. 1918.

*Capraria humilis* Solander, in Aiton W. T., Hortus Kew. ed. 1. 2: 354. 1789. TYPE: not seen. fide Sprague, Kew Bull. 1921: 211. 1921.

*Stemodia humilis* (Solander) Dawson, Revista Mus. La. Plata, Secc. Bot. 8: 14. 1956. not *S. humilis* Minod (1918).

*Stemodiocris verticillata* (Miller) Kuntze, Rev. Gen. Pl. 2: 466. 1891.

*Stemodia arenaria* H.B.K., Nov. Gen. Pl. 2: 357, tab. 175. 1817. TYPE: Colombia, *Bonpland* (?P, not seen).

?*Conobea pumila* Spreng., Novi Prov. Hort. Acad. Hal. 13. 1819. TYPE: Cult. Berlin, from Brasil, not seen. fide Minod (1918); Sprague 1921: 211. 1921.

*Stemodia verticillata* (Miller) Sprague, Kew Bull. 1921: 211. 1921. redundant combination.

?*Poarium veronicoides* Desv. ex Hamilton, Prodr. Pl. Ind. Occ. 46. 1825. TYPE: Hispaniola, Desvaux, not seen.

*Herpestis diffusa* Willd. ex Cham. & Schlecht., Linnaea 3: 6. 1828. TYPE: herb. Willd. 11444 (B, not seen; microfiche MO), in syn.

*Stemodia pauciflora* Rusby, Mem. Torrey Bot. Club 6: 93. 1896. *S. parviflora* Ait., orth. mut.

Erect or sprawling diminutive *herbs* to 15 cm tall, the stems slender, freely branching, drying angled, pilose with weak translucent hairs. *Leaves* opposite or ternate, broadly ovate, mostly 10–15 mm long, 8–12 mm wide, apically rounded or obtuse, basally cuneate to truncate, the margins conspicuously serrate with 7–9 teeth on each side, the teeth often double, the venation pinnate with ca. 4 lateral veins on each side, sparingly pilose on both sides, soon glabrescent above, not noticeably punctate or glandular; petioles about  $\frac{1}{2}$  as long as the leaves, slender but broadening upwards, pilose above, pubescent beneath. *Inflorescences* solitary in the leaf axils, often geminate or ternate, the pedicels short, ca. 1 mm long, drying angled, ebracteate. *Flowers* with the calyx 5-lobed to near the base, the lobes alike, linear, separate, costate, hyaline margined, 3 mm long, glandular pilose, corolla blue or purplish with a white eye, tubular, 5 mm long, 2-lipped, the upper lip truncate, apically sinuate or emarginate, saccate, puberulent outside, the inside bearded at the throat with stout, whitish clavate, unicellular hairs, the lower lip 3-lobed, the lobes truncate, glabrate, the tube white with dark lines, ciliate on the angles, slightly curved, otherwise glabrate outside, the inside generally pubescent on the dorsal side and near the bottom with long slender unicellular hairs; stamens 4 in 2 pairs, the ventral pair inserted ca. 1 mm above the bottom of the corolla tube, free ca. 2 mm, glabrous, the thecae reduced, ca. 0.15 mm long, parallel, separated by the somewhat enlarged connective, the dorsal pair inserted slightly unequally slightly above the ventral pair, 1 mm free, the thecae strongly divaricate, separated by the enlarged connective, 0.3 mm long, a short staminode inserted at the base of the tube between the 2 dorsal anthers; ovary glabrous, smooth, narrowly ovoid conical, compressed, the style stout, short, 1.0–1.5 mm long, basally expanded, the stigma compressed obtuse with conspicuous lateral appendages, ultimately recurving. *Fruit* a globose capsule ca. 1.25 mm across, dehiscent loculicidally and septicidally as far down as the septum (ca.  $\frac{1}{2}$  way down), the style persistent on 1 valve, the placenta ellipsoidal, ca. 1 mm long, extending little more than  $\frac{1}{2}$  the length of the capsule, punctate, the septum thickening, indurate below, the lower  $\frac{1}{2}$  persistent with the placenta and the lower  $\frac{1}{2}$  of the capsule, above narrow, and not persisting after dehiscence; seeds oblong to pyriform, 0.5 mm long, brownish yellow, longitudinally ca. 8 sulcate, the surface minutely rugose.

Minod (1918) segregated this species from *Stemodia* as the monotypic genus *Lendneria*, calling attention to a slightly different corolla shape, and a capsule dehiscent only  $\frac{1}{2}$  way down. These differences appear to be elaborations of trends evident in other species of *Stemodia* and do not suggest a differentiation of generic magnitude. The general configuration of the style, structure and insertion of the androecium, and longitudinal furrowing and minutely textured

surface of the seeds are all consistent with the variability of taxons recognized within *Stemodia*.

This species ranges from Mexico to Argentina, and it is present in the Antilles. It occurs as a weed of cultivation and other disturbance. It is reputed to have medicinal uses. "Hierba santa" (Costa Rica); "Corrimiento" (Salvador).

BOCAS DEL TORO: Nievécita, *Woodson et al.* 1858 (MO, NY). CANAL ZONE: Pipeline Road to 18 km N of Gamboa, *D'Arcy* 10636A (MO). Chagres, *Fendler* 216 (MO). SE side of Madden Lake near Puente Natural, *Nee & Hansen* 14077 (MO). Cerro Gordo near Culebra, *Standley* 26037 (US). Sosa Hill, Balboa, *Standley* 26490 (US). Río Paraíso above East Paraíso, *Standley* 29886 (US). Summit, *Standley* 30137 (US). Fort Sherman, *Standley* 30945 (US). Barro Colorado Island, *Standley* 41004 (US). DARIÉN: Boca de Cupe, 40 m, *Allen* 897 (MO, US). LOS SANTOS: Río Tonosí near Tonosí, *Lewis et al.* 1580 (MO). PANAMÁ: Sabanas N of Panama City, *Paul* 588 (US). Isla Taboga, *Woodson et al.* 1468 (MO, NY). SAN BLAS: Between Cangandí and Mandinga, *Duke* 14755 (MO, OS).

## 21. TETRANEMA

**Tetranema** Benth. ex Lindl., Bot. Reg. 29: tab. 52. 1843. nomen cons. (contra quid?). TYPE: *T. mexicana* Benth. ex Lindl. = *T. roseum* (Mart. & Gal.) L. Wms. non *Tetranema* Sweet, Hort. Brit., ed. 2. 149. 1830 (Leguminosae) nomen nudum, nec. *Tetranema* J. Areschoug, Nova Acta Regiae Soc. Sci. Upsal. ser. 2. 14: 418. 1850 (Algae).

*Allophyton* Brandege, T. S., Univ. Calif. Publ. Bot. 6: 62. 1914. TYPE: *A. megaphyllum* Brandeg. = *Tetranema megaphyllum* (Brandege, T. S.) L. O. Williams.

Suffruticose *herbs*, erect or sprawling, the stems stout, sometimes woody, puberulent or glabrous. *Leaves* opposite, subentire to dentate, the major veins pinnate, the minor venation sometimes conspicuously reticulate; petiole basally clasping, sometimes obsolete. *Inflorescence* axillary, scapose or racemose cymose, the flowers crowded, the pedicels short in flower, sometimes elongating in fruit, subtended by narrow bracts. *Flowers* with the calyx 5-lobed part way down, the lobes narrow, the limb campanulate, angled; corolla campanulate, purplish, the upper lip sinuate or retuse margined, the lower lip 3-lobed, the lobes all spreading; stamens 3-4, didynamous, the anthers 2-celled, the staminodes sometimes present; style slender or thick, the stigma capitate or rotate. *Capsule* ovoid, or globose, glabrous, loculicidal; seeds numerous, angled.

*Tetranema* includes five species of moist forests of Central America. All species are rare and few collections have been made. Only the species treated here is known to occur south of Guatemala.

### Literature:

- Pennell, F. W. 1925. The genus *Allophyton* of southern Mexico and Guatemala. Proc. Acad. Nat. Sci. Philadelphia 72: 269-272.  
Williams, L. O. 1972. Tropical American Plants XII (*Tetranema* pp. 127-132). Fieldiana, Bot. 34: 101-132.

**Tetranema bicolor** L. O. Williams, Fieldiana, Bot. 34: 127. 1972. TYPE: Nicaragua, *Bunting & Licht* 748 (F, not seen).—FIG. 21.



FIGURE 21. *Tetranema bicolor* L. O. Williams. Habit ( $\times \frac{1}{2}$ ). [After Dressler 5039 (MO).]

Perennial *herbs*, the stems sprawling or erect, stout and somewhat woody, at first strongly compressed, soon terete, drying dark brown, pulverulent, the nodes conspicuous. *Leaves* opposite, sometimes unequal, elliptical or obovate, to 19 cm long, 8 cm wide, apically short acuminate, basally acuminate, the margins subentire with faint suggestions of unevenly spaced teeth, the costa and lateral veins drying conspicuous beneath, ca. 8 on each side, at first straight and ascend-

ing, arcuate in the marginal area, anastomosing to form a loop-connected sub-marginal vein which gives rise to short continuations to the margin, membranous, dark green and glabrous above, light green with arachnoid pubescence beneath, sparse on the lamina but copious and appressed on the veins, the petiole slender, to 3 cm long, narrowly winged upwards merging into the lamina, slightly expanded and clasping basally, dark brown, pulverulent. *Inflorescences* axillary, contracted few-flowered racemes appearing umbellate or capitate, the peduncle slender, 6–60 mm long, green, slender, compressed and sulcate, minutely pulverulent puberulent, decorticate and stramineous in age, the pedicels subtended by unequal pairs of narrowly deltoid or lanceolate bracts, 12–18 mm long; pedicels short, obscured by the bracts, to 10 mm long in fruit. *Flowers* with the calyx narrow, 14–18 mm long, 5-lobed about  $\frac{1}{3}$  of the way down, the lobes narrow, acute, the tube campanulate, strongly angled, obscurely puberulent on the angles, slightly narrowed upwards, not accrescent; corolla campanulate with the posterior (upper) lip oblong, obtuse and retuse, ca. 4 mm long, the lower lip 3-lobate, the lobes oblong ovate, obtuse; stamens didynamous, the anthers 2-celled, the staminode absent; style slightly thickened, the stigma entire, rotate. Mature *capsule* unknown.

This species is known only by the type collection and those cited below. No corollas were seen and the fruit is unknown. Details of the corolla, androecium and gynoecium were taken from Williams' original description. *Tetranema bicolor* is easily mistaken for a member of the Gesneriaceae; the repent habit, membranous, discolorous leaves and stout stems are unlike other members of the Panamanian Scrophulariaceae. However, the crowded calyces, which somewhat resemble depauperate bladders of *Physalis*, are a good character for determination.

The plant figured by Williams has leaves in unequal pairs with narrowed winged bases which clasp the stem, while in the Panamanian plants seen, the leaf bases are so narrowly winged as to appear petiolate and the leaves are about equal. The position and length of the peduncle is variable within the Panamanian material.

COCLÉ: 7 km N of El Copé, 700–850 m, *Folsom et al.* 7085 (MO, PMA). La Mesa, 2 km W of Cerro Pilon, 860 m, *Sullivan* 523 (MO). VERAGUAS: 15–20 km NW of Santa Fe between Escuela Agrícola Alto Piedra and continental divide, 650–800 m, *Dressler* 4731 (MO). Lower slopes of Cerro Tute, Escuela Agrícola Alto Piedra 7–8 km NE of Santa Fe, 750–850 m, *Dressler* 5039 (MO).

## 22. TORENIA

**Torenia** L., Sp. Pl. 619. 1753; Gen. Pl., ed. 5: 270. 1754. TYPE: *T. asiatica* L. *Nortenia* Thouars, Gen. Nov. Madag. 9. 1808. LECTOTYPE: *N. thouarsii* Cham. & Schlecht. = *Torenia thouarsii* (Cham. & Schlecht.) Kuntze.

Erect or decumbent *herbs*, freely branching, the stems angled and sulcate, sometimes pubescent. *Leaves* opposite, serrate or crenate, petiolate, pinnately veined. *Inflorescences* 1–3 flowers in a leaf axil, sometimes geminate or ternate, the pedicel angled, subtended by a basal, linear bract. *Flowers* with the calyx united to near the top, wing angled, sometimes conspicuously so, somewhat

accrescent in fruit, enclosing the capsule, the corolla campanulate to tubular salverform, the upper lip erect, the lower (closed) lip with 3 rotund lobes, bearded in the throat, stamens 4 in 2 pairs, the filaments inserted near the top of the tube, the dorsal pair arching upwards and holding the anthers above the stigma and the ventral pair, the anthers alike or the dorsal pair reduced, the connectives coherent in pairs, the thecae oblong to linear, divaricate, held apart by the connectives, a staminode present; ovary smooth, the style straight, the stigmas flattened together. *Capsule* dehiscent septically to the base, the placenta linear, conspicuously winged by the stramineous septum; seeds globose, yellow, tuberculate.

*Torenia* is an Old World genus of perhaps 50 species. The species treated here are introduced. Several species other than *T. fournieri* are cultivated for ornament and may appear from time to time in Panamanian gardens.

*Torenia* is closely allied to *Lindernia* and *Stemodia*, but has been kept separate by Old World workers, e.g., Philcox (1968). It differs from *Stemodia* in its calyx shape and its placental septum, and from *Lindernia* in a number of small details. Although the seeds are pitted or tuberculate in *Torenia* and some species of *Lindernia* and *Stemodia*, the pitting does not appear to be of the same kind.

- a. Calyx becoming more than 5 mm wide (including wings); corolla showy, the limb more than 8 mm across, the tube conspicuously exerted from the calyx ..... 1. *T. fournieri*
- aa. Calyx less than 5 mm wide; corolla small, the limb less than 6 mm across; the tube scarcely exerted from the calyx ..... 2. *T. thourarii*

1. ***Torenia fournieri*** Linden in Fourn., *Illustr. Hort.* 23: 129, *tab.* 249. 1876.  
TYPE: Cochin China, not seen.—FIG. 22.

Decumbent or erect *herb*, to 30 cm tall or 60 cm long, freely branching; stem 4-angled and sulcate, often reddish, sparingly ascending pilose with white hairs. *Leaves* opposite, ovate, to 5 cm long, apically acute, basally obtuse or short cuneate, the margins serrate to crenulate, the venation pinnate with 5–6 arcuate veins on each side, sparingly pubescent on each side; petioles slender, 8–15 mm long. *Inflorescences* solitary flowers in the leaf axils, sometimes geminate, the pedicels sulcate, glabrate, sometimes broadening upwards, 10–20 mm long, each with a basal bract, sometimes linear, 1–2 mm long, sometimes foliose. *Flowers* showy, the lower lip 3-lobed, the lateral lobes deep purple, the middle lobe lighter colored with a large yellow eye, rotund, ca. 10 mm wide, sinuate or subentire, the upper (ventral) lip pale, often bluish, 1-lobed, somewhat larger than the lower lip, minutely puberulent outside, bearded in the throat; dorsal filaments arching above the style and ventral anthers, the anthers with the thecae oblong cuneate, ca. 1 mm long, strongly divaricate, subtended by the cuneate connective, the connectives coherent in pairs; style straight, the stigmas discoid ovate to deltoid, flattened together, ciliate and dorsally ascending pubescent near the margin, situated slightly above the ventral anthers.

*Torenia fournieri* is native to Southeast Asia and is occasionally cultivated for ornament. The flowers are showy and resemble pansies, trinitarias (*Viola*,

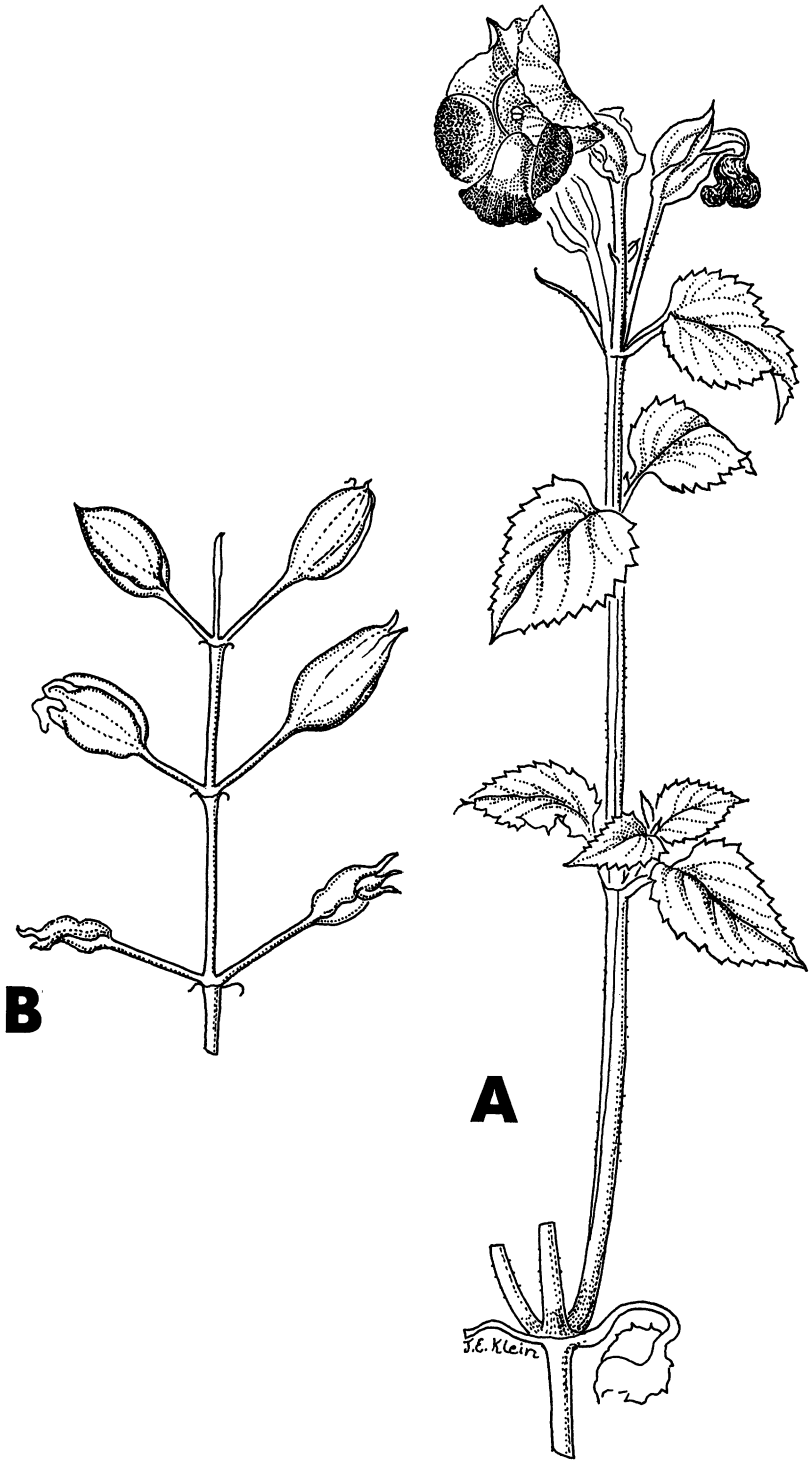


FIGURE 22. *Torenia fournieri* Linden.—A. Habit in flower ( $\times 1$ ).—B. Fructing inflorescence ( $\times 1$ ). [After Standley 28846 (US).]

sp.). The common name, Wishbone Flower, stems from the configuration of the stamens just outside the corolla throat.

Standley (1928) reported this species as naturalized in Panama. As only one collection is known from the country, it may not have persisted. However, it may be expected in gardens from time to time, grown from imported seed. Several horticultural forms are known, including several dwarf forms and one with white flowers.

CANAL ZONE: Mount Hope Cemetery, *Standley 28846* (US).

2. ***Torenia thouarsii*** (Cham. & Schlecht.) Kuntze, *Rev. Gen. Pl.* 2: 468. 1891.

*Nortenia thouarsii* Cham. & Schlecht., *Linnaea* 3: 18. 1928. Based on *Torenia pedunculata* Willd., ined. LECTOTYPE: Madagascar, *Du Petit-Thouars* (B-Willd. 11547, not seen, microfiche MO).

*Torenia parviflora* Hamilt. in Wall. *Cat. no. 3958 ex Benth.*, *Scroph. Ind.* 39. 1835, nomen illegit., notes *Nortenia thouarsii* Cham. & Schlecht., as syn.

*T. nortenia* Steud., *Nom. Bot. ed. 2.* 2: 692. 1841. Based on *Nortenia thouarsii* Cham. & Schlecht.

*Lindernia thouarsii* (Cham. & Schlecht.) Edwin, *Phytologia* 19: 361. 1970.

Ascending *herb* to 20 cm tall, the stems branching freely, slender, drying sulcate, sparingly glandular on emerging, soon glabrescent; roots short and fibrous. *Leaves* opposite, lanceolate to ovate, apically obtuse or acute, basally obtuse, rounded or truncate, the margins crenate serrate with ca. 6 teeth on each side, mostly 1.5–2.5 cm long, 8–12 mm wide, the venation pinnate with ca. 3 pairs of strongly ascending arcuate veins on each side, glabrate but ciliolate with short, white trichomes at the margins and on the main veins beneath, obscurely glandular punctate beneath; petiole 2–7 mm long, the margins ciliate, especially at the base. *Inflorescence* 1–3 flowers in the leaf axil, sometimes geminate or ternate; peduncles glabrate, sulcate, exceeding the petioles, 5–15 mm long, the bracts basal, linear, 1–2 mm long, ciliate. *Flowers* with the calyx tubular, narrowly ovoid or pyriform, with narrow, ciliolate wing angles, with 5 short lobes, somewhat accrescent in fruit; corolla slightly exserted from the calyx, bluish, purplish or whitish, tubular, ca. 10 mm long, 5-lobed, the lobes rotund, erose crenulate, ca. 2 mm across, bearded in the throat with stout whitish clavate hairs; stamens 4, the ventral pair inserted near the corolla mouth, the filaments geniculate, with a sterile, linear extension from the point of insertion, ca. 1.5 mm free, the anthers somewhat reduced, the thecae separated by the connective, rotund, the dorsal pair inserted ca. 1 mm below the ventral pair, the filaments arching above the style and not geniculate, anthers 0.8 mm free, the thecae separated, divaricate, ca. 1.7 mm long, the connectives somewhat glandular, coherent holding the 2 anthers together; staminode inserted between and slightly above the filaments bearing a small globose antheroid; ovary narrowly conical, smooth, glabrous, the style straight, terete, the stigmas discoid, erose, flattened together, ca. 0.7 mm long. *Capsule* narrowly ovoid conical, scarcely exserted from the calyx, dehiscing septicidally to the base.

*Torenia thouarsii* is native to the Indian Ocean area but is naturalized in the New World tropics, occurring in Trinidad and from Peru to Costa Rica and the



lower Oronoco in Venezuela. The elongate, tubular calyx and linear placenta are good recognition characters.

BOCAS DEL TORO: Island potrero, Changuinola Valley, *Dunlap 342* (PH, US).

### 23. VERONICA

**Veronica** L., Sp. Pl. 9. 1753. TYPE: *V. officinalis* L.

Annual or perennial *herbs*, often prostrate or ascending; stems terete or angled, often branching at the base. *Leaves* opposite, at least below, mostly pubescent with simple, multicellular hairs or glandular hairs; petioles distinct or not. *Inflorescences* either in alternate-bracted elongate racemes or solitary flowers in the axils of terminal unmodified leaves. *Flowers* mostly small, the calyx divided nearly to the base, the 4(5) lobes mostly narrow, entire, often exceeding the flowers; corolla rotate or campanulate, blue or white, rarely yellow, somewhat lobed; stamens 2, the anthers exerted; style straight, the stigma capitate. *Capsule* flattened perpendicular to the septum, the carpels discoid or lenticular, marginally connate, loculicidal or sometimes septicidal; seeds numerous, variously ornamented.

*Veronica* is a genus of over 200 species mainly of temperate parts of the Old World, but a few species are native to the Americas. They are frequently encountered in temperate regions as weeds of fields, streets or roadsides. The species in Panama are distinguishable from one another by many conspicuous characters but elsewhere species are sometimes difficult to separate.

- a. Pedicels longer than the flowers, fruits or leaves; all leaves and bracts opposite; corolla more than 3 mm across; leaves with substantial petioles ..... 3. *V. polita*
- aa. Pedicels shorter than the flowers, fruits or leaves; only lower leaves opposite; upper bracts alternate; corolla less than 3 mm across; leaves sessile.
  - b. Capsule ciliate; flowers blue; calyx pubescent, the hairs eglandular; style more than 0.5 mm long ..... 1. *V. arvensis*
  - bb. Capsule glabrous or with a few gland-tipped hairs; flowers white; bracts glabrous or with gland-tipped hairs; style less than 0.5 mm long ..... 2. *V. peregrina*

1. **Veronica arvensis** L., Sp. Pl. 13. 1753. TYPE: Herb. Linn. (LINN 26.57 or 26.58, neither seen, microfiche MO).

Ascending annual *herbs*, usually branching at the base; stems pubescent in lines with weak, whitish hairs; roots fibrous, to 25 cm long. *Leaves* opposite, obovate, apically obtuse or rounded, toothed, basally cuneate, to 1.5 cm long, pubescent on both sides with weak, multicellular hairs, petiole 0.5–1.0 mm long, flattened. *Inflorescences* long leafy appearing racemes; pedicels 0.5–1.0 mm long; bracts oblong or lanceolate, ca. 4 mm long, costate, entire or basally dentate, pubescent. *Flowers* small, the calyx divided nearly to the base, the lobes oblanceolate, entire, costate, pubescent, exceeding the corolla, ca. 4 mm long, slightly accrescent in fruit; corolla campanulate, blue with a minute white eye, ca. 2 mm long, the stamens 2, the style straight, ca. 0.6 mm long, glabrous, stigma minute, capitate. *Capsule* margins ciliate, otherwise glabrous, stramineous, the valves ultimately wide spreading; seeds reddish brown, ca. 1 mm long, ellipsoidal.

*Veronica arvensis* grows in pastures and lawns, often prostrate in part but usually with some parts ascending, the ascending portions often consisting only of "leafy" racemes. The blue flowers are minute but evident. The species is of Old World origin but is naturalized throughout most of the Americas. In Panama it has been found only in upland Chiriqui.

CHIRIQUÍ: Between Cerro Punta and Guadalupe, 1980 m, *Wilbur et al. 13046* (DUKE, MO). Town of Cerro Punta, *Wilbur et al. 15338* (DUKE).

2. *Veronica peregrina* L., Sp. Pl. 14. 1753. TYPE: Herb. Linn. (LINN 26.58 or 26.57, not seen, microfiche MO).

Erect or ascending annual *herbs*, the stems branching, glabrous or pubescent, sometimes glandular; roots fibrous. *Leaves* opposite, ovate, elliptical, oblong or lanceolate, often very variable in size and shape on the same plant, entire, costate, the strongly ascending lateral venation mostly obscure, glabrous to short pilose. *Inflorescences* long terminal leafy appearing racemes, the pedicels ca. 1 mm long, the bracts ovate or oblong, to 10 mm long, entire, much exceeding the flowers. *Flowers* with the calyx divided nearly to the base, the lobes entire, much exceeding the flowers, ovate or oblong, costate, glabrous or basally puberulent with short glandular hairs; corolla white, campanulate, stamens 2, the style short, less than 0.25 mm long, the stigma capitate. *Capsule* glabrous, stramineous, 2–3 mm long.

*Veronica peregrina* is native to the Americas but is naturalized in most parts of the Old World as well. In Panama it has been collected only in upland Chiriqui. Glabrous plants are sometimes designated as var. *peregrina*, while plants with copious glandular pubescence are referred to as var. *xalapensis* (H.B.K.) Pennell. Pennell (1935) stated that the two varieties intergrade over wide areas. The Panamanian collection are glabrate.

CHIRIQUÍ: Garden weed, Cerro Punta, *Godfrey 67328* (MO). Bambito, 5600 ft, *Tyson 7185* (PMA). Valley of upper Río Chiriquí Viejo, *White 328* (MO, PH). Between Cerro Punta and Guadalupe, 1980 m, *Wilbur et al. 13052* (DUKE). La Garita, ca. 3 km WNW of Cerro Punta, 2000 m, *Wilbur et al. 15272* (DUKE).

3. *Veronica polita* Fries, Novit. Fl. Suec. 1. 1819. TYPE: Sweden, *Fries* (?UPS, not seen).—FIG. 23.

Prostrate or occasionally ascending annual *herbs*, branching at the base, rooting at the lower nodes, the stems drying angled, sparingly pilose. *Leaves* opposite, broadly ovate or elliptical, apically obtuse, basally truncate, conspicuously dentate in the upper  $\frac{2}{3}$ , mostly 10–18 mm long, the veins ca. 5, subdigitate, strongly ascending; petiole to 8 mm long, about  $\frac{1}{2}$  as long as the leaves. *Inflorescences* solitary flowers in leaf axils near the branch apices; pedicels slender, exceeding the leaves, pilose; bracts not differentiated. *Flowers* with the calyx divided to the base, the lobes oblong to lanceolate, pubescent, ca. 4 mm long; corolla rotate campanulate, blue with a conspicuous white eye and lines to the center; stamens 2, the filaments stiff, the anthers bluish, the style stiff, the stigma punctiform. *Capsule* evenly pubescent overall, the carpels plump, ca. 3 mm long.

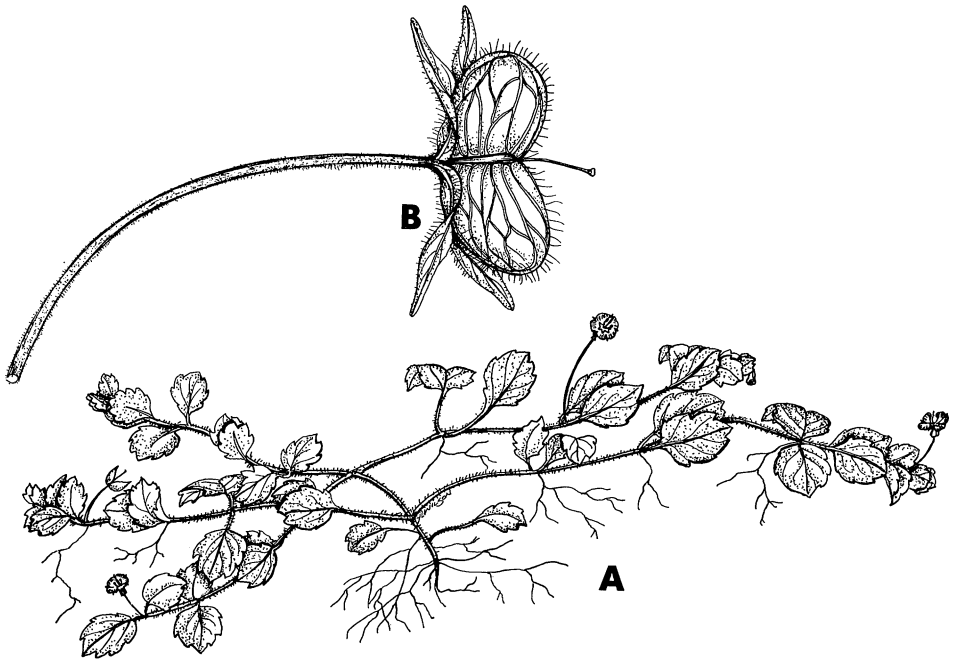


FIGURE 23. *Veronica polita* Fries.—A. Habit ( $\times\frac{1}{2}$ ).—B. Capsule ( $\times 4$ ). [After Tyson 7122 (PMA).]

*Veronica polita* is native to Europe and the mediterranean region but is now widely naturalized in the New World. It occurs in cultivated fields and lawns. In Panama it is known only from upland Chiriquí.

CHIRIQUÍ: Cerro Punta, 6000 ft, Tyson 7122 (PMA).

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