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FLORA OF PANAMA[1]

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AND COLLABORATORS

Part V, Fascicle 5[2]

FAMILY 83. LEGUMINOSAE[3]

SUBFAMILY PAPILIONOIDEAE (CONCLUSION)

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Trees, shrubs or herbs, occasionally armed. *Leaves* often alternate, pari- or imparipinnate, frequently 3-foliolate, rarely 1-foliolate; stipules usually present; stipelles mostly present. *Inflorescences* usually racemose or paniculate, often axillary. *Flowers* papilionaceous, rarely actinomorphic; hypanthium more or less

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[2] Flora of Panama pagination, found in parenthesis at the bottom of pages of early treatments, was discontinued after Part V. The contents of this and other parts of the Flora should be cited as: Ann. Missouri Bot. Gard., with volume, number, pagination and date of the Annals.

[3] Continued from Ann. Missouri Bot. Gard. 52: 54. February [March 31] 1965.

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[5] The subfamilies Mimosoideae and Caesalpinoideae of the Leguminosae were prepared by Robert W. Schery and published in the Flora of Panama, Part V, Fascicles 2 and 3; Ann. Missouri Bot. Gard. 37(2): 185–314. June 2, 1950 and 38(1): 1–94, March 22, 1951. The subfamily Papilionoideae was prepared by John D. Dwyer but for budgetary reasons, only the tribe Dalbergieae, Flora of Panama, Part V, Fascicle 4: Ann. Missouri Bot. Gard. 52(1): 1–54, March 31, 1965 was published at that time. Of the tribe Dalbergieae, the genus *Lonchocarpus* was contributed by F. J. Hermann. As more than a decade of intensive botanical study and collecting in Panama passed before it was feasible to consider resumption of publication of Dwyer's treatment, it was decided to revise the earlier treatment completely. This was done under the direction of W. G. D'Arcy working under the guidance of John D. Dwyer. This revision of the earlier manuscript enlisted the help of a number of specialists, and their contributions are identified with the groups they prepared. Except for editorial decisions agreed upon in the interest of uniformity of terminology and format, each contributor is solely responsible for his treatment. Each author is acknowledged under the genera he contributed. In addition, Michael O. Dillon, Peter S. White and James Lackey contributed largely to preparation of the key to genera and to the overall preparation of the tribes Sophoreae and Hedysareae, the Galegeae and the Phaseoleae respectively. As an aid to readers who may not have ready access to the earlier published parts of the Papilionoideae treatment, i.e., that of the Dalbergieae, the subfamily description, the relevant literature, the synoptical key to tribes are repeated here with some revision. Also,

campanulate, the teeth 5, the carinal tooth often the longest; petals 5, disposed as an upper standard or vexillum, 2 wing petals or alae, and 2 keel or carinal petals coherent apically, occasionally united in part with the wing petals and enclosing the androecium and the gynoecium, occasionally rostrate and coiled at the apex; stamens 10, rarely 9 or less, occasionally free, usually monadelphous or diadelphous, the free filaments equal or often alternating long and short, the anthers monomorphic or dimorphic; ovary 1-carpellate, often surrounded by a glandular disc, 1- to several-ovulate, the stigma capitate or lateral, often enlarged, occasionally bearded. *Fruits* mostly dehiscing along 2 sutures, often pluri-loculate by the development of septa, occasionally indehiscent and samaroid, drupaceous or lomentaceous; seeds 1–several, often arillate, exalbuminous, the radicle of the embryo curved.

Of the subfamilies of Leguminosae, the Papilionoideae, whether regarded on a world-wide basis or locally in Panama, contains the greatest number of genera and species and largest representation of plants economically important, as food, drugs, timber or dyes.

A few genera of Papilionoideae, e.g. *Clitoria, Phaseolus,* bear uncinate hairs. These minute, usually hooked trichomes usually require the aid of a lens and are best seen in silhouette by viewing the edges of surfaces.

The conspectus of the Papilionoideae presented here has been moded from the traditional concepts of older workers. Recently however, a number of innovations have been recommended. For example, Lackey (1977) recommends removal of *Pachyrhizus* from the Phaseoleae-Phaseolinae to the Diocleinae, and R. M. Polhill of Kew in a memorandum preparatory to the volume, *Advances in Legume Systematics* to be published in 1980 by the Royal Botanical Gardens Kew, recommends acceptance of several tribes not recognized here and of several shifts of genera from one tribe to another, e.g. of *Dipteryx* from the Dalbergieae to a tribe Dipteryxeae, and of *Centrolobium, Lonchocarpus, Piscidia, Muellera* from the Dalbergieae to a tribe Tephrosieae, together with *Tephrosia, Barbieria* and *Willardia* from the Galegeae; elevation of subtribe Galegeae-Indigoferinae to tribe Indigoferae; removal of *Dalea* from the Galegeae to a tribe Amorpheae; removal of *Sesbania* from the Galegeae to a tribe Sesbanieae; separation of *Desmodium* and *Alysicarpus* from the Hedysareae (Aeschynomeninae) to a tribe Desmodieae; removal of *Abrus* from the Vicieae to a monotypic tribe Abreae; removal of *Crotalaria* from tribe Genisteae to a tribe Crotalarieae, and elevation of subtribe Galegeae-Robiniinae to a tribe Robinieae but removing *Cracca* from this. Polhill does not separate *Stizolobium* from *Mucuna* but separates *Cymbosema* from *Camptosema*.

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the genera of the Dalbergieae appearing in the already published portion have been incorporated into the key to genera.

Many of the illustrations presented here were prepared in the period before 1965 and, in some cases, vouchers could not be relocated to verify determinations, localities and magnifications. Determinations for these collections were reviewed by the senior author (Dwyer) at the time the illustrations were made and it is presumed that they accord with the concepts of the various collaborating authors. All illustrations are based on material available at the time at MO.

—W. G. D'Arcy

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CONSPECTUS OF TRIBES AND SUBTRIBES[6]

a. Stamens free; leaves mostly pinnate, leaflets numerous; shrubs or trees ..... Tribe Sophoreae

2. Acosmium
5. Ateleia
21. Dussia
33. Myroxylon
34. Ormosia
40. Sophora

aa. Stamens united, at least in part; leaves and habit various.

b. Fruit articulating between the seeds ..... Tribe Hedysareae

c. Anthers all alike ..... Subtribe Desmodiinae

4. Alysicarpus
18. Desmodium

cc. Anthers dimorphic.

d. Stamens 10, the filament tube closed ..... Subtribe Stylosanthinae

42. Stylosanthes
49. Zornia

dd. Stamens 5 + 5, the filament tube open ..... Subtribe Aeschynomeninae

3. Aeschynomene
11. Chaetocalyx

bb. Fruit 2-valved or indehiscent.

e. Leaves entire or 3–5 digitate.

f. Leaflets denticulate ..... Tribe Trifolieae

45. Trifolium

ff. Leaflets entire ..... Tribe Genisteae

g. Stamens 10 with open filament tube ..... Subtribe Crotalariinae

15. Crotalaria
30. Lupinus

gg. Stamens 10 with closed filament tube ..... Subtribe Genistinae

46. Ulex

ee. Leaves pinnate.

h. Leaf terminating in a bristle ..... Tribe Vicieae

1. Abrus

hh. Leaf terminating in a leaflet.

i. Pod indehiscent ..... Tribe Dalbergieae

Published previously
(*Geoffroeae*) *Andira*
Centrolobium
Dalbergia
(*Oleicarpon*) *Dipteryx*
Fissicalyx

[6] Adapted in part from Taubert (1891), Dalla Torre and Harms (1907), and Melchior (1964).

Lonchocarpus
(Paramachaerium) Machaerium
Muellera
Piscidia
Platymiscium
Platypodium
Pterocarpus

ii. Pod mostly dehiscent.
j. Ovary surrounded by a disc ---------- Tribe Phaseoleae
k. Style glabrous (except *Clitoria*), rarely pubescent below.
l. Vexillary stamen partly united with the others.
m. Petals about equal.
n. Inflorescence rachis nodose ---------- Subtribe Diocleinae

9. Canavalia
19. Dioclea
37. Pueraria

nn. Inflorescence rachis not nodose ---------- Subtribe Glycininae

10. Centrosema
12. Clitoria
13. Cologania
44. Teramnus

mm. Either the standard or the keel much larger than the other ---------- Subtribe Erythrininae

23. Erythrina
32. Mucuna
41. Stizolobium

ll. Vexillary stamen mostly completely free.
o. Inflorescence rachis nodose; leaflets eglandular ---------- Subtribe Galactiinae

8. Calopogonium
16. Cymbosema
25. Galactia

oo. Inflorescence rachis not nodose; leaflets glandular beneath ---------- Tribe Cajaninae

7. Cajanus
22. Eriosema
24. Flemingia
38. Rhynchosia

kk. Style pubescent along the inner edge or around the stigma ---------- Subtribe Phaseolinae

28. Lablab
31. Macroptilium
35. Pachyrhizus
36. Phaseolus
47. Vigna

jj. Ovary lacking a disc ---------- Tribe Galegeae
p. Anther connective with gland, bristle or apiculum ---------- Subtribe Indigoferinae

27. Indigofera

pp. Anther connective unappendaged.
q. Ovules mostly 1–2, plants glandular punctate ---------- Subtribe Psoraleinae

17. Dalea

qq. Ovules mostly numerous; plants not punctate.

r. Inflorescence terminal or sometimes opposing a leaf ---------- Subtribe Tephrosiinae

6. Barbieria
43. Tephrosia

rr. Inflorescence always axillary ---------- Subtribe Robiniinae

14. Cracca
20. Diphysa
26. Gliricidia
29. Lennea
39. Sesbania
48. Willardia

1. Leaves all 1–2-foliolate.
   2. Trees or shrubs, leaves 1-foliolate.
      3. Inflorescences mostly equalling or surpassing the leaves; flowers included in foliaceous bracts ---- 24. Flemingia
      3′. Inflorescences much shorter than the leaves; bracts minute, the flowers exserted.
         4. Leaves more than 4 cm wide; pods more than 2 cm wide ---- *Lonchocarpus*
         4′. Leaves less than 3 cm wide; pods less than 1 cm wide ---- *Dalbergia*
   2′. Herbs, leaves 1–2-foliolate.
      5. Leaves all 2-foliolate ---- 49. Zornia
      5′. Leaves 1-foliolate or more.
         6. Leaves linear, mostly more than 8 cm long.
            7. Stems conspicuously winged by stipules; pod turgid, continuous between the seeds; flowers yellow ---- 15. Crotalaria
            7′. Stems unwinged; pod flat, the margins greatly indented between the seed segments (articles) ---- 18. Desmodium
         6′. Leaves broader, less than 7 cm long (*Indigofera lespedezioides* rarely unifoliolate).
            8. Flowers pink; pod linear, demarcated between the seeds, less than 3(4) mm wide ---- 4. Alysicarpus
            8′. Flowers yellow or blue; pod oblong, not marked between the seeds, more than 4 mm long ---- 15. Crotalaria

1′. Leaves compound, leaflets 3 or more.
   9. Plants copiously armed with spines longer than the leaves ---- 46. Ulex
   9′. Plants unarmed or with short spines.
      10. Leaves digitately 5–7 lobed ---- 30. Lupinus
      10′. Leaves 3-foliolate or pinnately 4–many foliolate.
         11. Leaves 5–many foliolate.
            12. Pod (loment) separating into articles; herbs or vines.
               13. Pod indented or crenate along one edge ---- 3. Aeschynomene
               13′. Pod nearly straight on both margins.
                  14. Leaflets 5; vines, branches twining ---- 11. Chaetocalyx
                  14′. Leaflets 7 or more; herbs, branches stiff ---- 3. Aeschynomene
            12′. Pod (loment) not separating into articles; trees, shrubs or vines.
               15. Twining vines, mostly slender; leaves odd pinnate.
                  16. Seeds red and black; leaflets less than 10 mm wide, mostly numerous; leaves terminated by a bristle ---- 1. Abrus.
                  16′. Seeds brown, not red; leaflets more than 10 mm wide, 5–7; leaves terminated by a leaflet ---- 12. Clitoria
               15′. Shrubs, trees or herbs, not twining vines.
                  17. Pods flat or winged with conspicuous flat non-seminiferous areas; seeds few (1–4); trees or shrubs.
                     18. Pods elongate, seed(s) confined to one end or side of the pod.
                        19. Seed(s) at one side of the pod.
                           20. Pod less than 25 mm long; petal; calyx subtruncate ---- 5. Atelia
                           20′. Pod more than 30 mm long; petals 5; calyx plainly toothed ---- *Pterocarpus*
                        19′. Seed(s) at one end of the pod, the remainder of the pod forming an elongate wing.
                           21. Seed at the distal end of the pod, winged proximally; flowers whitish.
                              22. Calyx subtruncate; leaflets short acuminate, pellucid punctate; stamens all free; sap clear ---- 33. Myroxylon

22′. Calyx evidently toothed; leaflets emarginate, not pellucid punctate; stamens united in fascicles; sap red ---------- *Platypodium*

21′. Seed at the proximal end of the pod, winged distally; flowers yellow, blue, pink or purple, at least in part.

23. Seminiferous area covered with spines; flowers yellow; leaflets more than 40 mm wide; wing more than 3 cm wide ---------- *Centrolobium*

23′. Seminiferous area unarmed; flowers blue, pink or purple, at least in part; leaflets less than 40 mm wide; wing more than 3 cm wide ---------- (Paramachaerium) *Machaerium*

18′. Pods elongate to discoid, seed medial in the pod (winged or with flat areas all around).

24. Pod 4-winged; flowers pinkish ---------- *Piscidia*

24′. Pod with a single wing or flat area around the seed.

25. Pods discoid.

26. Pods turning black, coriaceous to woody throughout ---------- *Dalbergia*

26′. Pods remaining green or brown, with a defined papery wing area around the seed.

27. Seed area circular, the wings inconspicuously veined; anthers dehiscing by longitudinal slits ---------- *Pterocarpus*

27′. Seed area narrow, the wings conspicuously veined; anthers dehiscing by terminal pores ---------- *Fissicalyx*

25′. Pods elongate, oblong or narrowly elliptical.

28. Leaves opposite; flowers yellow ---------- *Platymiscium*

28′. Leaves alternate; flowers variously colored.

29. Leaves with persistent subulate stipels ---------- 29. Lennea

29′. Stipels wanting or caducous.

30. Leaflets alternate.

31. Leaflets with appressed puberulence beneath, venation arcuate; stamens included; pod valves reticulate only over the seed ---------- *Dalbergia*

31′. Leaflets with spreading puberulence beneath, venation straight; stamens exserted; pod valves reticulate all over ---------- 2. Acosmium

30′. Leaflets opposite.

32. Fruiting pedicels stout, conspicuously expanded, ca. 3 mm wide just below the calyx, more than 7 mm long ---------- 26. Gliricidia

32′. Fruiting pedicels slender, scarcely expanded below the calyx, less than 6 mm long.

33. Pods tardily dehiscent, the valves with resin ducts, glabrous; style glabrous except a few minute hairs on the concave surface ---------- 48. Willardia

33′. Pods indehiscent, the valves without resin ducts, mostly pubescent; style pubescent below the tip ---------- *Lonchocarpus*

17′. Pod turgid, if compressed or flat then lacking thin areas around the seeds; seeds 1–many; trees, shrubs or herbs.

34. Leaves conspicuously glandular punctate beneath ---------- 17. Dalea

34′. Leaves eglandular, not punctate.

35. Pod thick, drupaceous, 1–2(4) seeded, ligneous; shrubs or trees.
    36. Seeds red, at least in part; stigma lateral on the ovary; stamens free; pod dehiscent ..... 34. Ormosia
    36′. Seeds brown or black, not red; stigma terminal on the ovary; stamens at least partly connate; pod mostly indehiscent.
        37. Leaflets opposite.
            38. Leaves with stiff, persistent subulate stipels ..... (Geoffroea) *Andira*
            38′. Leaves with stipels wanting or caducous ..... *Muellera*
        37′. Leaflets alternate.
            39. Leaf rachis winged; pod indehiscent, smooth, apically rounded ..... (Oleiocarpon) *Dipteryx*
            39′. Leaf rachis unwinged; pod dehiscent by conspicuous longitudinal ridges, prominently apiculate ..... 21. Dussia
35′. Pod narrow, less than 10 mm wide, few–many seeded; trees shrubs or herbs.
    40. Pod moniliform, conspicuous constrictions separating the globose seminiferous areas.
        41. Pods 5–many seeded, more than 3 cm long; leaflets more than 1.5 cm wide; hairs basifixed ..... 40. Sophora
        41′. Pods 3–5 seeded, less than 3 cm long; leaflets less than 1 cm wide; hairs medifixed ..... 27. Indigofera
    40′. Pod elongate but not conspicuously constricted between the seeds.
        42. Pod inflated and bladdery ..... 20. Diphysa
        42′. Pod valves applied, not inflated.
            43. Pod margins crenate, trees ..... *Dalbergia*
            43′. Pod margins straight, herbs or shrubs.
                44. Stipels linear, persistent.
                    45. Pods narrow, less than 4 mm wide; calyx more than 15 mm long ..... 6. Barbiera
                    45′. Pods wider, more than 4 mm wide; calyx less than 15 mm long ..... 14. Cracca
                44′. Stipels wanting or caducous.
                    46. Inflorescences lateral or axillary.
                        47. Hairs medifixed; pods less than 3 cm long ..... 27. Indigofera
                        47′. Hairs basifixed; pods more than 3 cm long ..... 39. Sesbania
                    46′. Inflorescence terminal or leaf opposed ..... 43. Tephrosia

11′. Leaves 3-foliolate.
    48. Leaflets denticulate, each lateral vein protruding into a short tooth; pod included in the calyx or petals ..... 45. Trifolium
    48′. Leaflets entire or lobed, not denticulate; pod exserted.
        49. Pod inflated, not compartmented, the seeds often becoming loose and rattling inside ..... 15. Crotalaria
        49′. Pod not inflated, often with septa, cellulose or other compartmenting, the seeds not becoming loose together inside.
            50. Fruit (loment) either breaking into articles or flat, subdiscoid, 2-articulate.
                51. Stipels present; flowers rose, violet or whitish; anthers uniform ..... 18. Desmodium
                51′. Stipels wanting; flowers yellow; anthers dimorphic ..... 42. Stylosanthes
            50′. Fruit (loment) not breaking into articles, longer than broad, mostly more than 2-seeded.
                52. Trees or shrubs more than 30 cm tall.

53. Flowers large, more than 1.5 cm long.
    54. Flowers red or orange, calyx with minute teeth or none sometimes splitting to appear lobed; style glabrous; seeds often red ..... 23. Erythrina
    54′. Flowers white or yellowish with purple marking, calyx with 5 well defined teeth; style pubescent, seeds dark, not red ..... 12. Clitoria
53′. Flowers smaller, less than 1.5 cm long.
    55. Hairs medifixed; leaves eglandular; pod thin, less than 3 mm wide; anthers spurred ..... 27. Indigofera
    55′. Hairs basifixed; leaves gland dotted beneath; pod thin, more than 5 mm wide; anthers not spurred.
        56. Pod short, less than 3 cm long; seeds 2; leaves subsessile ..... 22. Eriosema
        56′. Pod elongate, more than 3 cm long; seeds more than 2; leaves petiolate ..... 7. Cajanus
52′. Vines or herbs, if woody less than 30 cm tall.
    57. Leaflets subsessile, stipels obsolete or wanting; hairs medifixed ..... 27. Indigofera
    57′. Leaflets petiolulate, stipels developed (sometimes caducous); hairs basifixed.
        58. Standard much shorter than the keel; calyces or pods often with stinging hairs.
            59. Seeds discoid ..... 32. Mucuna
            59′. Seeds rectangular to globose ..... 41. Stizolobium
        58′. Standard about as long as the keel or longer; plants lacking stinging hairs.
            60. Pod less than 2–3 times as long as wide.
                61. Seeds large, more than 12 mm long (except *D. virgata*) ..... 19. Dioclea
                61′. Seeds smaller, less than 12 mm long.
                    62. Pod large, more than 20 mm wide; flowers elongate, more than 3 cm long ..... 16. Cymbosema
                    62′. Pod smaller, less than 20 mm wide, flowers less than 2 cm long.
                        63. Stipules persistent, conspicuous; bracts pinnate.
                            64. Leaves more than 10 mm wide ..... 36. Phaseolus
                            64′. Leaves less than 10 mm wide ..... 42. Stylosanthes
                        63′. Stipules small, caducous; bracts caducous ..... 38. Rhynchosia
            60′. Pod many times longer than wide.
                65. Standard with a notch or spur on the back near the base ..... 10. Centrosema
                65′. Standard lacking notch or spur.
                    66. Calyx lobes very unequal, the upper 2 fused into a lip or hood, the lowest 3 minute; pods large, more than 2 cm wide and often becoming woody ..... 9. Canavalia
                    66′. Calyx lobes alike or somewhat unequal through fusion, the lowest teeth about as large or larger than the upper 2; pod smaller, mostly less than 2 cm wide, mostly not woody.
                        67. Fertile stamens 5, alternating with 5 staminodes.
                            68. Flowers small, less than 1 cm long; pod linear, narrow, the apex incurved hooked; racemes short, the flowers few, distant ..... 44. Teramnus
                            68′. Flowers larger, more than 1 cm long; pod oblong, the apex not hooked; racemes long, many flowered ..... 19. Dioclea

67′. Fertile stamens 8–10, the anthers alike.
69. Calycine bracts wanting; stipels wanting; pod less than 2 cm long; seeds 2; flowers yellow ---------- 38. Rhynchosia
69′. Calycine bracts present (sometimes caducous); stipels present; pod more than 2 cm long; seeds mostly more than 2; flowers red, pink, purple, blue, mostly not yellow.
70. Style pubescent.
71. Calyx tubular, more than 5 mm long; upper bracts connate; ovary stipitate ---------- 12. Clitoria
71′. Calyx campanulate, less than 5 mm long; bracts free; ovary subsessile.
72. Pod with style persistent 8–10 mm long; hilum ⅓–½ as long as the seed perimeter, covered with a prominent, white, spongy cushion; seeds 3–6, 9–12 mm long; style flattened ---------- 28. Lablab
72′. Pod without persistent style; hilum less than ⅓ as long as the seed perimeter, cushion wanting or inconspicuous; seeds 3–27, 3–25 mm long; style terete.
73. Pod compressed with transverse constrictions outside; hilum uncovered, the hilar groove visible; style pubescence continuous from top to bottom ---------- 35. Pachyrhizus
73′. Pod without transverse constrictions; hilum usually covered with white cushion remnants; pubescence of style discrete from that of the ovary.
74. Fruiting pedicels 4–31 mm long; bracts and bracteoles persisting into flowering stage; seeds 3–10, lens heart shaped; style coiled through 2 revolutions; pubescence including uncinate hairs ---------- 36. Phaseolus
74′. Fruiting pedicels 1–17 mm long; bracts and bracteoles caducous before flowering; seeds 6–27, the lens inconspicuous; style various, if coiled then through 3–5 revolutions; uncinate hairs wanting.
75. Wings much larger than the other petals; the keel fold transverse; upper calyx teeth free; inflorescence nodes not swollen ---------- 31. Macroptilium

75′. Wings about equalling the other petals, keel fold lateral or wanting; upper calyx teeth usually partly connate; inflorescence nodes conspicuously glandular swollen ---- 47. Vigna

70′. Style glabrous.
76. Inflorescence conspicuously nodose.
77. Seed with the hilum small, circular; calyx lobes 5; leaves rhombic.
78. Pods drying black; involucral bracts lanceolate, persistent through flowering ---- 37. Pueraria
78′. Pods drying green or brown; involucral bracts linear, caducous ---- 8. Calopogonium
77′. Seed with the hilum linear, short or encircling the seed; calyx lobes 4–5; leaves elliptical or ovate.
79. Seeds large, more than 8 mm long; pod septate, woody; flowers large ---- 19. Dioclea
79′. Seeds smaller, less than 6 mm long; pod with cellulose material around the seeds; flowers tiny, less than 1 cm long ---- 25. Galactia
76′. Inflorescences not nodose.
80. Calyx tubular, more than 5 mm long; style more than 1.5 mm long; anthers 10, uniform; corolla more than 1 cm long; bracts deciduous ---- 13. Cologania
80′. Calyx campanulate, less than 5 mm long; style very short; anthers 5 alternating with 5 staminodes; corolla less than 8 mm long; bracts mostly persistent ---- 44. Teramnus

1. ABRUS

W. G. D'Arcy[7]

Abrus L., Syst. Nat., ed. 12. 2: 472. 1767. TYPE: *A. precatorius* L.

Mostly twining *vines,* seldom shrubby. *Leaves* even pinnate; leaflets mostly numerous, mucronate; rachis grooved, mucronate; stipels minute; stipules persistent. *Inflorescences* axillary or lateral pseudoracemes, terminating leafy or leafless branches, with 1–several sessile flowers at a node; bracts and bracteoles often caducous. *Flowers* with the calyx campanulate, lobed or short toothed; standard apically notched and with a short claw, the wing petals shorter than the keel petals; stamens 9, monadelphous, the staminal tube adnate to the standard; style curved, glabrate. *Legume* oblong to linear, much compressed or not, the valves pubescent, often becoming indurated, septate, the short slender beak downturned; seeds ovoid, sometimes compressed, arillate, sometimes with an annulus around the hilum.

This genus resembles members of the Phaseoleae in its many leaflets which are borne equal pinnately. The 9 stamens with united filaments are distinctive, as is the lack of a terminal leaflet.

The genus is circumtropical and, according to circumscription, includes 4–24 species. Only 2 of these species occur in the New World.

Literature:

Breteler, F. J. 1960. Revision of *Abrus* Adanson (PAP.) with special reference to Africa. Blumea 10: 607–624.

Verdcourt, B. 1970. Studies in the Leguminosae-Papilionoideae for the 'Flora of Tropical East Africa': II. Kew Bull. 24: 235–307.

1. **Abrus precatorius** L., Syst. Nat., ed. 12. 2: 472. 1767. LECTOTYPE: Ceylon, *Hermann,* Fl. Zeylan. 284 (BM, not seen), fide Breteler 1960.—FIG. 1.

Slender *vine*; stems twining, pubescent with appressed white hairs, glabrescent. *Leaves* pinnate with 5–13 pairs of leaflets; leaflets oblong to ovate, mostly 9–15 mm long, 5–7 mm wide, apically rounded or truncate and mucronulate, sometimes acute, basally obtuse, rounded or truncate; petiolules 0.5–1 mm long; petioles shorter than the width of a leaflet; rachis mostly 7–10 cm long, sparingly pubescent with ascending hairs; stipels minute, following the rachis; stipules subulate, 1–2 mm long. *Inflorescences* leafless pseudoracemes; peduncles stouter than the petioles and often stouter than the stems, 6–10 cm long, bearing ca. 4 pairs of minute bracts along the length; rachis strongly angled, somewhat congested, 3–6 cm long, the flowers 1–15 per node, pedicels 1–2 mm long, glabrous except for the apical swelling. *Flowers* white or pinkish, ca. 1 cm long, calyx cupular, ca. 2 mm long with low teeth, sparingly short pubescent; standard obovate, 8–9 mm long, the wing petals upcurved, ca. 6 mm long, stamens not exserted. *Legume* oblong, somewhat oblique, ca. 2.5 cm long, 1.5 cm wide,

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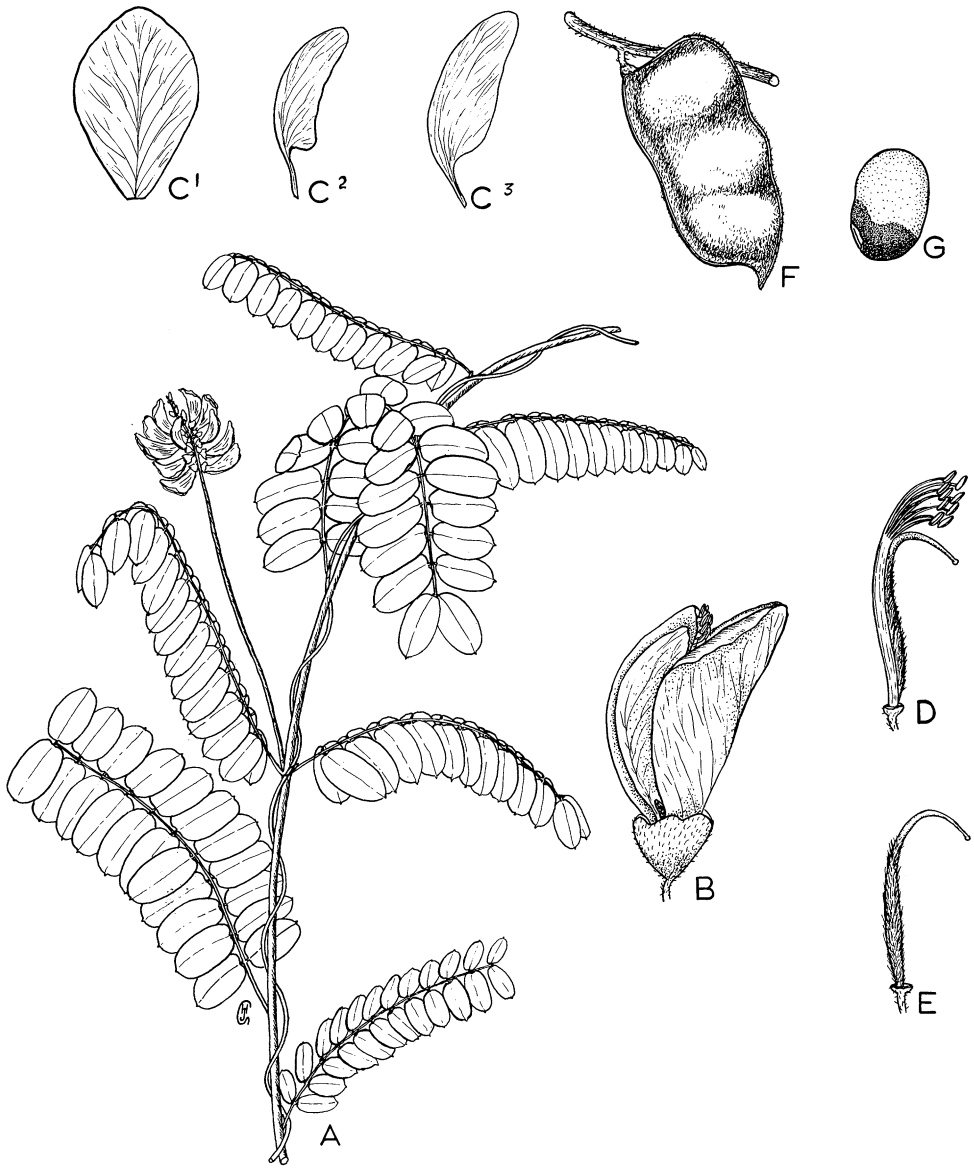

FIGURE 1. *Abrus precatorius* L.—A. Habit (×½). [After *Wedel 1731.*]—B. Flower (×3).—C. Corolla.—C^1. Standard (×2).—C^2. Wing petal (×2).—C^3. Keel petal (×2).—D. Stamens (×3).—E. Pistil (×3). [After *Wedel 1410.*]—F. Fruit (×1). [After *Gentle 1203,* Belize.]—G. Seed (×2). [After *Wedel 1308.*]

hardly stipitate, the beak slender, 3–5 cm long, downturned, dehiscent along 1 margin, the valves softly pubescent, compressed but bulging over the seeds; seeds 5–6, subglobose or slightly compressed ovoid, bright shiny scarlet with a black area near the hilum, ca. 6 mm long, the hilum depressed, ca. 1 mm long.

Abrus precatorius is usually immediately recognizable by its bright shiny red and black seeds. The vine bears leaves with many leaflets, and the congested pseudoracemes of small flowers is also distinctive, but these characteristics may lead to confusion with members of the Phaseoleae.

This species occurs in tropical and warm temperate countries on both hemispheres. In Panama it is apparently confined to the Caribbean coast.

The bright seeds of this species are much used for beads. They contain highly toxic compounds and a single seed may be lethal to a man if the hard seed coat is broken before ingestion. The toxic principle is also found in the roots although the roots are reportedly eaten as food in India. The English name is *Precatory Beads,* and in Spanish they are known as *Bejuco de Peronía* or *Bejuco de Peonía.* Nevertheless many common names have been applied to this plant.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 1304, 1308* (GH, MO). Water Valley, *Wedel 1371* (GH), *1410* (GH, MO). Isla Colón, *Wedel 2822* (GH). SAN BLAS: Mainland Point, *Duke 8981* (MO). Ailigandí, *Dwyer 6828* (MO). Mainland opposite Ailigandí, *Lewis et al. 77* (GH, MO). Playon Chico, *Stier 153* (MO).

2. ACOSMIUM

Michael O. Dillon[8]

Acosmium Schott in Spreng., L. Syst. Veg., ed. 16, 4: 406. 1827. TYPE: *Acosmium lentiscifolium* Schott.

Leptolobium Vog., Linnaea 11: 388. Apr.–Jun. 1837, non Bentham, Jun. 1837; 1838. LECTOTYPE: *Leptolobium dasycarpum* Vog. = *Acosmium dasycarpum* (Vog.) Yakovl.

Thalesia Mart. ex Pfeiffer, Nom. Bot. 2(2): 1384. 1874, nomen nudum based on *Leptolobium* Vog., non Raf. 1818, nomen nudum.

Trees or *shrubs,* to 40 m, unarmed. *Leaves* alternate, imparipinnate; leaflets alternate to subopposite, (3–)5–21, lanceolate to ovate, apically retuse or emarginate, basally obtuse to truncate, subcoriaceous or membranaceous; stipules small, caducous or inconspicuous; stipels minute or absent. *Inflorescence* of racemes or panicles, terminal, rarely completely axillary; bracts and bracteoles narrow, small, often caducous. *Flowers* small, sessile or pedicellate, calyx turbinate-campanulate, lobes usually 5, unequal, valvate or rarely narrowly imbricate, corolla yellowish white, petals 5, all similar, free, erect patent; stamens 10(5), free, subequal, exserted; filaments inflexed; anthers uniform, ellipsoid, dorsifixed; ovary sessile or short stipitate, 1–4-ovuled; style filiform; stigma small or truncate, terminal. *Fruit* oblong to broadly linear, plano-compressed or rarely turgid, indehiscent, coriaceous or woody, narrowly winged, reticulate; seeds ovate or orbicular, compressed, brown to reddish brown, the hilum apical, elliptic. Chromosomes: $n = 9$.

Acosmium sensu Yakovlev (1969) is composed of some 17 species, primarily distributed in tropical and subtropical regions of the Western Hemisphere. Its center of diversity is in Brazil, with only *Acosmium panamense* extending north into Central America to southern Mexico. While most species are rare and of

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FIGURE 2. *Acosmium panamense* (Benth.) Yakovl.—A. Habit (×½).

little economic importance, several of the more widespread species are valuable timber trees used in general construction and the manufacture of charcoal.

Literature:

Mohlenbrock, R. H. 1963. A revision of the leguminous genus *Sweetia*. Webbia 17(2): 223–263.

Rudd, V. E. 1968. Leguminosae of Mexico—Faboideae (I. Sophoreae and Podalyrieae). Rhodora 70: 492–532.

Yakovlev, G. P. 1969. A review of *Sweetia* and *Acosmium*. Notes Roy. Bot. Gard., Edinburgh 29: 347–355.

1. **Acosmium panamense** (Benth.) Yakovl., Notes Roy. Bot. Gard., Edinburgh 29: 353. 1969.—FIG. 2.

Sweetia panamensis Benth., J. Linn. Soc., Bot. 8: 263. 1865. TYPE: Panama, Canal Zone, Paraíso Station, Panama Railroad, *S. Hayes 267* (K, not seen; photo, NY 2807).
Dalbergia lavigata Standley, Trop. Woods 12: 5. 1927. TYPE: Belize, lower Belize River, *Record* (US, not seen).

Trees, to 12 m, the crown rounded. *Leaves* alternate, imparipinnate; rachis slender, canaliculate, puberulent, 6–12 cm long; leaflets 7–13, subopposite, 3–8 cm long, 2–3 cm wide, ovate to elliptic, apically obtuse, usually retuse, basally obtuse to broadly cuneate, coriaceous, nitid above, glabrous, pale beneath, glabrous, reticulate; petiolules ca. 3 mm long, terete, rugose; stipules linear, caducous. *Inflorescence* paniculate, branched, axillary to terminal leaves, puberulent, primary rachis 8–14 cm long, secondary 2–5 cm long; bracts and bracteoles linear, 1–3 mm long, caducous. *Flowers* numerous, ca. 6 mm long, pedicellate, pedicels ca. 3 mm long, puberulent; calyx turbinate-campanulate, persistent, 3–4 mm long, puberulent, 5-lobed, teeth ca. 2 mm long, acute, subvalvate; petals 5, free, white or cream colored, subequal, ca. 4 mm long, 2–3 mm wide, spatulate, emarginate, clawed; stamens 10, filaments equal to petals; anthers ca. 1 mm long, ovoid, dorsifixed, longitudinally dehiscent; ovary glabrous, stipitate, the stigma minutely capitate-penicillate, 2–3-ovulate. *Fruit* oblong or elliptic, 5–9 cm long, (1.5–)2.0–2.5 cm wide, coriaceous, compressed, ca. 5 mm thick at the seeds, reticulate, the ends acute to obtuse, mucronate; seeds 1–3, lustrous, reddish brown, subovate, ca. 8 mm long, 6 mm wide, 2–3 mm thick, the hilum ca. 1 mm long.

Acosmium panamense is widespread from southern Mexico to northern Colombia and northwestern Venezuela, usually found in moist forests up to 800 m. This species is a valuable timber tree for its wood is strong, durable, and suitable for heavy construction such as bridges, wagons, and woodworking. Its bark is said to be used as an antimalarial in El Salvador. There are many local names (cf. Rudd, 1968) for this species, known as "malvecino" in Panama.

CANAL ZONE: Ancón Hill, 20 m, *Holdridge 6535* (MO). Red Devil drop zone, Howard Air Force Base, *Tyson 1871* (MO). DARIÉN: Río Congo, *Holdridge 6296* (SCZ). Patiño, *Pittier 6609* (GH, US) (leaves only). PANAMÁ: Taboga Island, *McDaniel & Cooke 12701* (FSU, MO). Agricultural Experiment Station, Matías Hernández, *Pittier 6793* (F, GH, MO, NY).

3. AESCHYNOMENE

Michael O. Dillon[9]

Aeschynomene L., Sp. Pl. 713. 1753. TYPE: *A. aspera* L.

Gajati Rumph. ex Adans., Fam. Pl. 2: 328. 1763. TYPE: *A. aspera* L.
Macromiscus Turcz., Bull. Soc. Nat. Mosc. 19(2): 507. 1846. TYPE: *M. brasiliensis* Turcz. = *A. montevidensis* Vog.
Ctenodon Baill., Adansonia 9: 236. 1870. TYPE: *C. weddellianum* = *A. oroboides* Benth.
Climacorachis Hemsley & Rose, Contr. U.S. Natl. Herb. 8: 43. 1903. TYPE: *C. mexicana* Hemsley & Rose = *A. villosa* Poir.
Secula Small, Fl. Miami 90, 200. 1913. TYPE: *A. viscidula* Michx. = *A. oroboides* Benth.

Herbs, shrubs, or small *trees*; stems terete, finely striate, unarmed. *Leaves*

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alternate, subimparipinnate, 1–10 cm long; leaflets 5–80, alternate or subopposite, subsessile, 2–40 mm long, 1–20 mm wide, glabrous to sericeous, often minutely glandular-punctate, 1–several costate; petioles 2–40 mm long; stipules peltate, appendiculate below the point of attachment or attached at the base and not appendiculate, membranous or foliaceous, persistent or caducous. *Inflorescences* racemose, paniculate, fasciculate, or rarely solitary, axillary or terminal, bracteate, bractlets paired and subtending calyxes, pedicels glabrous to pubescent, usually glandular. *Flowers* 5–15 mm long; calyx bilabiate to campanulate, commonly persistent; corolla yellowish to red or purple, petals usually clawed; stamens 10, essentially diadelphous, 5:5, filaments united into a sheath, open on carinal side, and with splitting on vexillar side delayed or merely incipient; anthers dorsifixed, or occasionally basifixed; pollen ellipsoidal, tricolpate; ovary 2–18 ovulate, rarely 1-ovulate, sessile or short stipitate; style incurved, not bearded; stigma terminal. *Fruit* a loment, (1–)2–18-articulate, subsessile to long stipitate, laterally compressed, occasionally torulose; seeds reniform, smooth, sublustrous, light brown to black, hilum circular, embryo axile, slightly bent, endosperm present, cotyledons fleshy. Chromosomes: $n = 10$.

The genus *Aeschynomene* is composed of about 350 species distributed throughout the warmer parts of the world. In the Western Hemisphere, its presumed center of origin, some 70 species range from the mid-Atlantic states in the United States, west to Baja California, Mexico, throughout Central America, the Antilles and south to the Rio La Plata, Argentina. Two American sections, *Aeschynomene* and *Ochopodium,* are recognized by Rudd (1955), both with representative species in Panama.

Most taxa appear to be of little economic importance; however, the pith from certain South American species is used for corks and for stropping knives and razors. Various Panamanian species are commonly referred to as "pega-pega."

Literature:

Rudd, V. E. 1955. The American species of *Aeschynomene*. Contr. U.S. Natl. Herb. 32(1): 1–172.

a. Stipules peltate, appendiculate below the point of attachment; calyx bilabiate, the upper lip 2-merous, the lower lip 3-merous (section *Aeschynomene*).
  b. Leaflets with 2–several costae.
    c. Ovary glabrous to puberulent; fruit glabrous to puberulent and occasionally with scattered tuberculate based trichomes, less than 0.8 mm in length, sutures between articulations well defined, usually more than 5-articulate ---- 1. *A. americana*
    cc. Ovary villous; fruit hispid with tuberculate based trichomes, 0.8–1.4 mm long, sutures not defined between articles, 5-articulate or less ---------- 9. *A. villosa*
  bb. Leaflets with 1 central costa.
    d. Fruit blackening on drying; calyx lips entire to subentire.
      e. Stipe and basal article separated by a suture; fruits submoniliform with both margins crenate ---------- 6a. *A pratensis* var. *caribaea*
      ee. Stipe and basal article continuous, not separated by a suture; fruits with one margin entire, the other entire or crenate ---------- 8. *A. sensitiva*
    dd. Fruit and vegetative parts turning brown or straw colored on drying, or remaining green; calyx lips definitely indented.
      f. Leaflets usually denticulate or serrulate-ciliate, 10–20 mm long, 4–8 mm wide; plant generally hispid; fruit 5–7 mm wide, hispid at maturity, not muricate, both margins entire or nearly so ---------- 3. *A. ciliata*

ff. Leaflets entire, 5–7(–10) mm long, 1–2(–2.5) mm wide; plant generally glabrous or sparsely hispid; fruit 4–5 mm broad, glabrous at maturity or with scattered trichomes 0.5 mm long, muricate, upper margin straight and lower margin crenate ---------- 7. *A. rudis*

aa. Stipules not produced below the point of attachment to stem; calyx campanulate with 5 subequal lobes; articles 2–3 mm in diameter (section *Ochopodium*).

g. Fruit 2- or 3-articulate, the stipe 1–5 mm long.

h. Fruit usually biarticulate; leaves and stems canescent ------ 5. *A. histrix* var. *incana*

hh. Fruit 3-articulate; leaves pilose, stems hispid ---------- 2. *A. brasiliana*

gg. Fruit 4- to 9-articulate, stipe 8–15 mm long ---------- 4. *A. elegans*

1. **Aeschynomene americana** L.,[10] Sp. Pl. 713. 1753. TYPE: Jamaica, *Sloane* (BM, not seen).

Herbs to 2 m tall; stems erect to ascending, subglabrous to hispid. *Leaves* 2–7 cm long, 20–60 foliolate; leaflets linear-oblong, 4–15 mm long, 1–2 mm wide, subfalcate, 2–several costate, apices and margins usually serrate-ciliate; stipules appendiculate below the point of attachment, striate, glabrous to hispid, attenuate at each end. *Inflorescence* few flowered, axes flexuous, hispidulous; bracts cordate, acuminate, 2–4 mm long, 2–3 mm wide, glabrous, margins ciliate; bracteoles linear to linear-ovate, 2–4 mm long, 1.0–1.5 mm wide, acute to acuminate, glabrous, margins serrate-ciliate. *Flowers* yellow, (5–)6–8(–10) mm long, calyx 3–6 mm long, glabrous to sparsely hispid; petals 5–10 mm long, clawed, the standard suborbiculate to broadly obcordate, 5–10 mm wide, apices ciliate, wings obliquely oblong, 5–8 mm long, 2 mm wide, ciliate at the apex, keel blades 4–5 mm long, 2.5–3.5 mm wide; stamens 6–8 mm long. *Fruit* (3–)6–8(–9) articulate, articles 2.5–5.0 mm wide, 3–6 mm long, glabrous to puberulent, sometimes with glandular trichomes, verrucose at maturity, the margins thickened; seeds 2–3 mm long, 1.5–2.0 mm wide, dark brown.

Aeschynomene americana is the most widespread and abundant member of the genus in Panama, occurring in nearly every province. It is distinguished from its closest relative, *A. villosa,* in possessing loments with generally more than 4 articulations, and with these possessing well-defined lateral sutures.

Rudd (1955) recognized 2 varieties from Panamanian material based upon differences in fruit pubescence. Since no clear ecological or geographical pattern is apparent, this species is treated as being polymorphic for fruit pubescence with vegetative and floral characters remaining quite constant.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 343* (US). Water Valley, *Wedel 1531* (GH, MO, US), *1616* (GH, MO). Isla Colón, *Wedel 2973* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 12817, 12835* (both MO), *13154* (DUKE, MO, NY, SCZ). Venado Beach, *Correa & Gonzales 523* (DUKE, MO, PMA). Summit Garden, *Croat 12830* (MO, NY, SCZ). Río Indio, *Dodge & Allen 17378* (GH). Ft. Sherman site, *Dwyer 8594* (MO). Pipeline Road, 5–6 mi N of Gamboa, *Gentry 6676* (MO). Between Summit and Gamboa, *Greenman & Greenman 5260* (MO). Las Cruces Trail, *Hunter & Allen 737* (GH, MO). 0.5 mi N of Gamboa, *Lazor & Tyson 5685* (MO). Near Rio Petitpie on road to Ft. Sherman, *Mori & Kallunki 3669* (MO). 6 km E of Gamboa, *Nee 9005* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Nowicke et al. 3597* (DUKE, MO). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5190* (US). Río Grande, near Culebra, *Pittier 2112* (NY, US). Balboa, *Standley 25518, 25540* (both US). Las Cascadas Plantation, near

[10] For a list of synonyms see Rudd (1955). Only the listed names have been used for Panamanian material.

Summit, *Standley 25768, 25776* (both US). Summit, *Standley 26921* (US). Near Gatún, *Standley 27268* (US). Frijoles, *Standley 27643* (US). Gamboa, *Standley 28325* (US). Near Fort Randolph, *Standley 28735* (US). Mount Hope Cemetery, *Standley 28847* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29059, 29182* (both US). Río Pedro Miguel near East Paraíso, *Standley 30046* (US). Darién Station, *Standley 31560* (SU). Obispo, *Standley 31780* (US). 6 mi N of Gamboa, *Tyson 3500* (MO). Albrook Air Force Base, *Tyson & Lazor 6012* (FSU). 1 mi N of Summit, *Tyson et al. 2752* (MO, PMA). Cutover secondary forest, margin of the Pipeline road N to Gamboa, *Wilbur & Teeri 11245* (DUKE, GH, MO). Playa Venado, *Wilbur & Teeri 12959* (DUKE). Pipeline road, NW of Gamboa, *Wilbur & Teeri 13378* (DUKE). CHIRIQUÍ: 2 mi W of Concepción, *Baltimer* (MO). Near Veladero, *Burt & Koster 128* (MO). Rabo de Puerco, 8 mi W of Puerto Armuelles, *Liesner 33* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, *Liesner 491* (MO). Boquete, *Lewis et al. 391* (GH, MO, US). 2 mi S of Puerto Armuelles, *Wilbur et al. 13579* (DUKE). COCLÉ: El Valle, *Baltimer 1470* (MO). Olá, *Pittier 5092* (NY, US). Río Grande, *Troetsch 24* (DUKE, PMA). 10 mi E of Natá, *Tyson 5237* (FSU, SCZ). Penonomé, *Williams 359* (NY, US). COLÓN: Calzada Larga, *Gracia 48* (PMA). Quebrada Bonita, 3 km NW of Salamanca, 13 km E of Buenos Aires, *Nee 9107* (MO). 1.2 mi NE of bridge over Río Piedras on road from Portobelo to Pilón, *Nee & Mori 3669* (MO, PMA). Without definite locality, *Rose 23997* (GH, NY, US). DARIÉN: Santa Fé, *Duke 9481* (NY, US). HERRERA: Chitré, *Allen 1104* (GH, MO, US). Ocú, *Allen 4087* (MO). 4 mi S of Los Pozos, *Tyson 2679, 2695* (both FSU, MO). 10 mi S of Ocú, *Tyson 2822* (MO, US). LOS SANTOS: Punta Mala, *Tyson 2722* (SCZ). PANAMÁ: Isla Taboga, *Allen 1283, 1295* (both GH, MO, US). 1 mi E of Tocumen, *Blum & Tyson 1953* (FSU, MO, SCZ). Campo Experimental de Monte Oscuro, *Correa 1914* (PMA). Between Capira and Potrero, *Dodge & Hunter 8604* (GH, MO). Río Indio, *Dodge & Allen 17378* (MO). Tocumen Airport, *Dwyer 5603* (PMA). Chilibre, *Dwyer 11978* (MO). Urivé, *Fernandez 131* (MO, PMA). Without other Locality, *Hayes 455, 767* (both NY). El Palorin, *Heriberto 255* (NY, US). San Jose Island, *Johnston 832, 1201* (both GH, US). Icaco Island, *Johnston 937* (GH, MO, US). Alhajuela, *Killip 3226* (US). SE slope of Cerro Campana, *Lewis et al. 3153* (MO). Cerro Campana, *McDaniel 8121* (DUKE, FSU, MO). Cerro Penon, 3 km S of Alcalde Diaz, *Nee 8894* (MO). Matías Hernández, *Pittier 6871* (NY, US). Between Río Pacora and Chepo, *Porter et al. 5144* (MO). Old Panama, *Porterfield 1933* (NY). Vista del Mar, *Porterfield* (NY). Arraijan, *Porterfield* (NY). Las Cumbres, *Puga 42* (MO). 1 mi W of Bejuco, *Tyson & Blum 2543* (FSU, MO, SCZ). Bella Vista, *Standley 25405* (US). E of Río Tocumen, *Standley 26579, 29477* (both US). Corozal Road near Panama, *Standley 26787, 26865* (both US). Toboga Island, *Standley 27110* (US). Río Tapia, *Standley 28066* (US). 2 km entrada camino Cerro Azul, *Taylor 5, 78* (both PMA). VERAGUAS: 2 km NW of Atalaya, *Nee 8251* (MO). 1 mi W of Santiago, *Tyson 5171* (FSU, SCZ). Puerto Mutis 12 mi S of Santiago, *Tyson 6001* (DUKE, FSU, MO).

2. **Aeschynomene brasiliana** (Poir.) DC., Prodr. 2: 322. 1825. TYPE: Brazil, Rio de Janeiro, *Commerson* (P, holotype, not seen; F, fragment).

Prostrate or decumbent *herb*, stems to ca. 1 m long, glandular-hispidulous, crisp-pubescent. *Leaves* mostly 8–12 foliolate, less than 3 cm long; leaflets usually obovate, obtuse to rounded at each end, ciliate, mucronulate, sparsely pubescent, ca. 7 mm long, ca. 4 mm wide; stipules ovate, acuminate, 3–4 mm long, ca. 1-mm wide, glandular-hispidulous, ciliolate. *Inflorescence* racemose, axillary, 3–8 flowered; peduncles and pedicels hispid; bracts and bracteoles ovate, 1.0–2.5 mm long, 1.0–1.5 mm wide, hispidulous, ciliate. *Flowers* yellow, 5–8 mm long; calyx 1.5–3.0 mm long, ciliate, hispidulous; standard ca. 6 mm long, the claw ca. 1 mm long, the blade suborbiculate, ca. 5 mm in diameter, pubescent on the outer face, retuse, wings and keel equal to the standard, ca. 2 mm wide; stamens ca. 6 mm long. *Fruit* 2–3 articulate, the stipe 3–4 mm long, hispidulous with trichomes ca. 0.5 mm long, the articles 2–3 mm in diameter, moderately crisp-pubescent; seeds ca. 2 mm long, ca. 1.5 mm wide, dark brown. Chromosomes: $n = 10$.

This species is widespread throughout tropical America, but is represented in Panama by only a few collections. This species is distinguished from the superficially similar *Aeschynomene histrix* var. *incana* by the former's more prostrate

habit, glandular-hispidulous stems, and fruits with longer stipes. It is known locally as "pega-pega."

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5189* (F, US). Ancón Hill, *Standley 25153* (MO, US). Sosa Hill, Balboa, *Standley 25275* (US). Balboa, *Standley 25586* (US). Cerro Gordo, near Culebra, *Standley 26042* (US). Sosa Hill, Balboa, *Standley 26442* (US). Corozal, *Standley 27369* (US). Along old Las Cruces Trail, between Ft. Clayton and Corozal, *Standley 29111* (US). Balboa, *Standley 29295* (US). Summit, *Standley 30069* (US). PANAMÁ: Bald Hill, San Jose Island, *Johnston 880* (GH). Agricultural Experiment Station of Matías Hernández, *Pittier 6908* (US). Corozal Road near Panamá, *Standley 26806* (US). Juan Franco race track near Panamá, *Standley 27724* (US). Taboga Island, *Standley 28022* (US). Tumba Muerto Road near Panamá, *Standley 29747* (US). Between Las Sabanas and Matías Hernández, *Standley 31866* (US). Between Matías Hernández and Juan Díaz, *Standley 32083* (US). Río Mar, *Tyson et al. 2296* (FSU, PMA).

3. **Aeschynomene ciliata** Vog., Linnaea 12: 84. 1838. SYNTYPES: Brazil, Para: Belem, *Sieber 13736* (B, presumably destroyed; photo US, not seen). Brazil, between Rio de Janeiro and Cabo Frio, *Sello* (not located, possibly B or BM).

A. hispida sensu Standley, Flora of Panama Canal Zone, Contr. U.S. Natl. Herb. 27: 210. 1928.

Herb 1.0–2.5 m tall; stems hispid with yellow glandular trichomes. *Leaves* 10–15 cm long, 30–40 foliolate, petiole and rachis hispid; leaflets oblong with rounded to retuse apices, cordate and slightly asymmetrical basally, 10–15(–30) mm long, 3–5(–8) mm wide, glabrous, costae central, serrulate-ciliate, micropunctate adaxially; stipules appendiculate below the point of attachment, upper portion acute, lower rounded, 1–2 cm long, serrulate-ciliate, caducous. *Inflorescence* racemose, axillary, 5–many flowered; peduncles and pedicels hispid; bracts ovate-subcordate, 4–6 mm long, 2–3 mm wide; bracteoles lanceolate-ovate, acute, ciliate, 3–4 mm long, 1–2 mm wide. *Flowers* yellow, 8–10 mm long; calyx bilabiate, the upper lip trifid, the lower lip bifid, 5–7 mm long; the standard orbiculate, 5–8 mm in diameter, the claw ca. 2 mm long, serrulate-ciliate, emarginate, wings ca. 8 mm long, the claw 3 mm long, the blade ca. 5 mm long, 4 mm wide, ciliate, keel petals entire, the claws ca. 1.5 mm long, the blades 5–8 mm long, ca. 3 mm wide; stamens ca. 8 mm long. *Fruit* usually 8–10 articulate, stipe 5–10 mm long, hispid, the margins entire, articles ca. 4 mm long, 6 mm wide; seeds 3–4 mm long, ca. 2 mm wide, dark brown.

This species is distributed from southern Mexico to Ecuador, Amazonian Brazil, and Jamaica. In Panama it is known from tropical moist forest in the Canal Zone and the immediate vicinity, usually growing near water. It appears to flower and fruit principally from November to January.

CANAL ZONE: Barro Colorado Island, *Bailey & Bailey 763* (F). Mindi, *Cowell 173* (NY). Chagres, *Fendler 99* (MO, US). Barro Colorado Island, *Foster 1403* (MO, PMA, US). Without exact locality, *Hayes 184*? (NY). Between France Field and Cativa1, *Standley 30270* (US). CHIRIQUÍ: Quebrada del Medio, 2 km N of Punta de Burica, *Busey 753* (MO). COLÓN: Portobelo, *D'Arcy & D'Arcy 6691* (MO). PANAMÁ: Tocumen Airport, *Dwyer 5194* (MO, PMA). Matías Hernández, *Pittier 6946* (GH, NY, US). Juan Díaz, *Standley 30516* (US). Capitana, *Taylor 28* (PMA).

4. **Aeschynomene elegans** Schlecht. & Cham., Linnaea 5: 583. 1830. TYPE: Vera Cruz, Hacienda de la Laguna, Jalapa, Mexico, *Schiede & Deppe* (F, GH).

Herb, stems to 0.5 m, hispid with tuberculate-based, glandular trichomes, to 1 mm long, sericeous with weak, appressed trichomes, to 0.25 mm long. *Leaves*

8–12 foliolate, ca. 2 cm long; leaflets usually obovate, obtuse to truncate, mucronulate, oblique, upper surface glabrous, reticulate beneath, costae villous with appressed trichomes, ciliolate, ca. 5 mm long, ca. 2.5 mm wide; petiole hispid; rachises villous. *Inflorescence* racemose, axillary, 2–6 flowered, longer than the subtending leaves, pedicels and peduncles with indument like the stems; bracts and bracteoles ovate, acute, ca. 1 mm long, less than 1 mm wide, ciliate. *Flowers* yellow, ca. 5 mm long; calyx ca. 1 mm long, ciliolate, hispidulous; standard ca. 4 mm long, the claw ca. 1 mm long, the blade elliptic-orbiculate, entire, wings and keel equal to standard, 1.5–2.0 mm wide; stamens 4–5 mm long. *Fruit* moniliform, curved or straight, (3–)4–6 articulate, the stipe 7–10 mm long, hispid, the articles ca. 2.5 mm long, ca. 2 mm wide, crisp-pubescent, often slightly glabrate; seeds ca. 2 mm long, ca. 1 mm wide, dark brown. Chromosomes: $n = 10$.

This taxon is widespread in tropical America, but apparently rare in Panama, only being known from El Boquete, Chiriquí at ca. 1,500 m. It is called "dormidea" in Panama, and "pega-pega" in Costa Rica and Colombia.

CHIRIQUÍ: El Boquete, *Maurice 726* (US). Alta Boquete, *Terry 1263* (F, GH, MO, US).

5. **Aeschynomene histrix** Poir., Lam. Encycl. Méth. Bot. Supp. 4: 77. 1816.

5a. **A. histrix** var. **incana** (Vog.) Benth., in Mart. Fl. Bras. 15(1): 69. 1859.

Aeschynomene incana Vog., Linnaea 12: 90. 1838; non G. F. W. Mey. ex DC., 1825. TYPE: Brazil, *Sellow* (F, fragment).

Much branched *herb*, stems to 0.5 m, prostrate to suberect, canescent. *Leaves* 8–18-foliolate, to 3 cm long; leaflets oblong-elliptic, rarely obovate, obtuse to rounded, apiculate, entire, ciliate, oblique basally, pubescent, 4–8 mm long, 1.5–4.0 mm wide; stipules lanceolate, acuminate 4–10 mm long, 1–3 mm wide, hispid, serrulate-ciliate. *Inflorescence* racemose, axillary, 4–15 flowered; peduncles and pedicels hispid; bracts and bracteoles ovate, acute, 1–2 mm long, 1 mm or less wide, hispid, ciliate. *Flowers* 6–7 mm long; calyx 2–3 mm long; standard ca. 5 mm long, the claw ca. 1 mm long, blade suborbiculate, 4–6 mm in diameter, the wings and keel about as long as the standard, 1–2 mm wide; stamens 4–5 mm long. *Fruit* 2-articulate, the stipe 1–2 mm long, hispid with trichomes 2–4 mm long, mostly at the basal article, the articles 2.0–2.5 mm in diameter, glabrous to puberulent; seeds 1.5–2.0 mm long, 1.0–1.5 mm wide, black.

Aeschynomene histrix var. *incana* is readily distinguished from the typical form by its more robust habit and larger leaf size. Fruit and flower characteristics are essentially the same for the 2 varieties and there appears to be intergradation; therefore, only varietal status seems justified. Variety *incana* is found from Mexico to South America, whereas variety *histrix* is primarily South American in distribution. In Panama it is found in wet sites below 100 m in the provinces bordering the Gulf of Panama from Los Santos to Panama.

CANAL ZONE: Ancón Hill, *Greenman 5127* (MO). S side of Summit Gardens, *Nee 9549* (MO). COCLÉ: Río Hato airstrip, *Burch et al. 1150* (GH, MO, US). Aguadulce, *Pittier 4863* (GH, NY, US). Penonomé, *Williams 102* (NY, US). LOS SANTOS: Chitre/Las Tablas, *Burt & Rattray 55A* (MO). PANAMÁ: San Carlos, Río Hato, *Burt & Rattray 46* (MO). Hills NE of Hacienda La Joya, *Dodge et al. 16887* (MO). Savannas near Chepo, *Duke 6040* (MO). Without exact locality, *Seemann 216*? (NY).

6. **Aeschynomene pratensis** Small, Bull. New York Bot. Gard. 3: 423. 1905.—FIG. 3F.

6a. **Aeschynomene pratensis** var. **caribaea** Rudd, Contr. U.S. Natl. Herb. 32: 47. 1955. TYPE: Cuba, Isla de Pinos, near Nueva Gerona, *Curtiss 300* (F, GH, isotypes).

Herbs; stems 1–2 m long, becoming suffruticose, drying dark, glabrous or sparsely hispid. *Leaves* 4–7 cm long, commonly 20–25 foliolate; leaflets oblong, obtuse to subacute, obliquely rounded basally, 5–10 mm long, 1.5–2.5 mm wide, micropunctate adaxially, the costae central, petioles and rachises glabrous or with few glandular trichomes; stipules entire, acuminate above, truncate below, erose peltate, appendiculate below the point of attachment, caducous. *Inflorescence* racemose, few flowered, axillary; peduncles and pedicels glabrous to hispid; bracts stipuliform, 4–5 mm long, 1–2 mm wide, margin entire, hyaline, sometimes ciliate; bracteoles ovate, subacute, 3–4 mm long, 1.5–2.0 mm wide, hyaline margined. *Flowers* yellow, 7–10 mm long; calyx bilabiate, 4–5 mm long, vexillary lip subentire to 2-denticulate, carinal lip 3-denticulate; standard suborbiculate, 7–10 mm long, 5–9 mm wide, the claw 2–3 mm long, wings 6–10 mm long, 3–4 mm wide, the claw 1 mm long, keel falcate, 6–9 mm long, ca. 3 mm wide, the claws ca. 1 mm long; stamens 7–10 mm long. *Fruit* 5–9 articulate, stipe 8–10 mm long, glabrous, articles 5–6 mm long, 4–5 mm wide, glabrous, reticulate veined, verrucose at maturity, basal article separated from stipe by a suture, both margins crenate, or dorsally subentire; seeds 4–5 mm long, 2.5–3.0 mm wide, dark brown.

This variety is found chiefly in the Caribbean area and southward to central South America, and it has been introduced into the Old World. In Panama it has been collected from wet areas from the provinces around the Gulf of Panama. Variety *caribaea* is distinguished from variety *pratensis* by the former's smaller flowers and fruits, and also by the latter's restricted distribution in the everglades of Florida. *Aeschynomene pratensis* is distinguished from *A. sensitiva* var. *sensitiva,* its closest relative, by its slightly larger flowers and the presence of a suture between the stipe and the first article.

COCLÉ: Penonomé, *Ebinger 1016* (MO, SCZ, US); *Williams 130* (NY). Between Las Margaritas and El Valle, *Woodson et al. 1768* (A, MO, NY). HERRERA: Ocú, *Ebinger 1049* (MO, US). PANAMÁ: Road between Panama and Chepo, *Dodge et al.* (GH, MO). Without exact locality, *Seemann 203?* (GH). Nuevo San Francisco, *Standley 30753* (MO).

7. **Aeschynomene rudis** Benth., Pl. Hartw. 116. 1843. TYPE: Ecuador, Guayas, Guayaquil, *Hartweg 649* (K, not seen).

Shrubby *herb,* 1–2 m tall, sparsely hispid. *Leaves* 4–10 cm long, 30–40 foliolate, petiole and rachis hispidulous; leaflets oblong, rounded to truncate; slightly asymmetrical basally, 8–10 mm long, 2–3 mm wide, glabrous, the costae central, entire, micropunctate adaxially; stipules 7–15 mm long, 2–3 mm wide, the upper portion acute, the lower 2–3 mm long, rounded, entire. *Inflorescence* racemose, few flowered, axillary; peduncles and pedicels hispidulous; bracts subovate, acute, 3–4 mm long, 1.5–2.0 mm wide, ciliate; bracteoles ovate-oblong, acute, 2–3 mm long, ca. 1 mm wide, ciliate. *Flowers* yellow, (8–)10–15 mm long;

calyx 5–8 mm long; the standard ca. 14 mm long, the claw 2 mm long, the blade orbiculate, ca. 12 mm in diameter, retuse; the wings ca. 10 mm long, the claw ca. 1 mm long, the blade ca. 9 mm long, 5–6 mm wide; the keel petals ca. 10 mm long, 3 mm wide; stamens ca. 12 mm long. *Fruit* 6–10 articulate, the upper edge essentially entire, the lower edge crenate to subentire, the stipe glabrous, 3–6 mm long, the articles 4–6 mm in diameter, moderately hispid, usually muricate or verrucose at the center; seeds ca. 3 mm long, 2 mm wide, black.

Aeschynomene rudis is principally found in moist or wet places in tropical and warm temperate America, ranging from the United States to Argentina. It is apparently rare in Panama, with no collections known from the last 25 years. It might be confused with *A. ciliata* from which it is distinguished by several characters as indicated in the key to species.

PANAMÁ: NE of Hacienda la Joya, *Dodge et al. 16913* (MO).

8. **Aeschynomene sensitiva** Swartz,[11] Prodr. Veg. Ind. Occ. 107. 1788. TYPE: based upon Plumier's *pl. 149, fig. 2,* Icones 1693 (MO).—FIG. 3A–E.

Herbs to 4 m tall; stems glabrous to glabrate below, fruiting branches glabrous to moderately hispidulous with glandular trichomes. *Leaves* 2–10 cm long, 10–40 foliolate, petiole and rachis hispidulous; leaflets oblong, obtuse to truncate, 4–15 mm long, 1.5–3.0 mm wide, the costae central, the nerves inconspicuous, minutely punctate adaxially; stipules appendiculate below the point of attachment, caducous, 5–20 mm long, 1.5–5.0 mm wide, subentire, acute to acuminate above, truncate below, erose. *Inflorescence* racemose, axillary, 4–8 flowered; peduncles and pedicels subglabrous to densely hispidulous; bracts stipuliform, entire to ciliate-laciniate; bracteoles ovate, subacute, 1.5–5.0 mm long, 1–2 mm wide, entire to ciliate. *Flowers* yellow, 5–6 mm long; calyx 2–4 mm long, usually ciliate, vexillar lobe emarginate or subdenticulate, the cardinal lobe obscurely 3-dentate, standard 6–8 mm long, the claw 1.5–2.0 mm long, the blade suborbiculate, 4.5–6.0 mm wide, ciliate, sometimes retuse, wings and keel subequal to the standard, the claws 0.5–1.0 mm long, blades 3.5–7.0 mm long, 2.5–3.5 mm wide; stamens 5–7 mm long. *Fruit* a loment, 5–8 (rarely –10) articulate, stipe 4–8 mm long, glabrous, articles 5–7 mm long, 4–7 mm wide, glabrous to sparsely hispid, smooth to verrucose, the upper margin of loment entire, the lower crenate to subentire; seeds 3–4 mm long, 2.5–3.0 mm wide, brown. Chromosomes: $n = 10$.

Aeschynomene sensitiva is found primarily in wet sites at low elevations from the Antilles, southern Mexico, Central and South America, and has been introduced into the Old World tropics. It is distributed throughout Panama and is distinguished from its closest relative, *A. pratensis* var. *caribaea* by its smaller flowers and the absence of a suture between the stipe and the first article of the fruit.

This species was not typified in the original protologue, but the Plumier illustration is presumably an authentic representation of the species and was proposed as a lectotype by Rudd (1955).

[11] For a list of synonyms see Rudd (1955). Only the listed names have been used for Panamanian material.

FIGURE 3. *Aeschynomene*—A–E. *Aeschynomene sensitiva* Sw.—A. Habit (×1).—B. Flower (×3½).—C. Corolla.—C^1. Standard (×3).—C^2. Wing petal (×3).—C^3. Keel petal (×3).—D. Stamens (×4).—E. Pistil (×4). [After *Dwyer 2867.*]—F. *Aeschynomene pratensis* var. *caribaea* Rudd. Fruit (×2). [After *Woodson et al. 1768.*]

BOCAS DEL TORO: Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2091* (GH, MO, US). CANAL ZONE: Gamboa, *Allen 1976* (GH, MO, US). Frijoles, *Baltimer 1565, 1567* (both MO). Juan Mina, *Bartlett & Lasser 16766* (GH, MO). Gamboa, *Kennedy et al. 2324* (MO). Frijoles, *Piper 5182* (US). Between Corozal and Ancón, *Pittier 2647* (GH, NY, US). BARRO COLORADO ISLAND: *Bailey & Bailey 300* (F); *Bangham 505* (A, F); *Croat 4199* (MO, SCZ), *13232* (MO); *Kenoyer 386* (US);

Shattuck 624 (F, MO, US); *Starry 256* (F); *Wentmore & Abbe 215* (A, F, GH, MO); *Woodworth & Vestal 401* (A, F, MO). COCLÉ: Ca. 2.5 km S of Antón on old road to Puerto Obaldía, *Lasseigne 4296* (MO). Aguadulce, in savannas near sea level, *Pittier 4918* (US). Between Las Margaritas and El Valle, *Woodson et al. 1768* (US). COLÓN: Miguel de la Borda, *Croat 10019* (MO, PMA). Mouth of Río Piedras, *Lewis et al. 3180* (MO). Penonomé and vicinity, 50–100 ft, *Williams 130* (US). DARIÉN: Without other locality, *Macbride 2706* (F, MO, US). HERRERA: Ocú, *Ebinger 1049* (SCZ). PANAMÁ: Tocumen Airport, *Dwyer 5603* (MO). Chagres, *Fendler 100* (MO, US). Chilibre, *Dwyer 11976* (MO). Las Sabanas, *Heriberto 296* (US). San Jose Island, *Johnston 910* (GH). N of Panama City, *Paul 568* (US). Camino del Boticario near Chepo, *Pittier 4568* (US). Laguna de Portala near Chepo, *Pittier 4611* (US). Las Sabanas, *Standley 25938* (US). Juan Franco race track, *Standley 27818* (US). Old Las Cruces Trail between Ft. Clayton and Corozal, *Standley 29092* (US). Juan Díaz, *Standley 30514* (US). Nuevo San Francisco, *Standley 30753* (US). Between Matías Hernández and Juan Díaz, *Standley 31964* (US). Las Sabanas, *Standley 40770* (US). Capitana, *Taylor 26* (PMA).

9. **Aeschynomene villosa** Poir., Lam. Encycl. Méth. Bot. Suppl. 4: 76. 1816. TYPE: Puerto Rico, *Ledru* (P, not seen).

Herbs; stems usually decumbent, to 2–6 dm long, hispid. *Leaves* 2–7 cm long, 20–50 foliolate; leaflets linear oblong, subfalcate, mostly 3-costate, 3–6 mm long, 0.5–1.5 mm wide; stipules appendiculate below point of attachment, striate, subglabrous, (5–)10–15 mm long, 1.0–1.5 mm wide, usually somewhat hispid at the point of attachment, margins ciliate, attenuate at each end. *Inflorescence* often paniculate, few flowered, peduncles and pedicels hispid, bracts cordate, acuminate, 1.5–6.0 mm long, 1–2 mm wide, ciliate; bracteoles ovate-lanceolate, acute to acuminate, 1–4 mm long, 0.5–1.0 mm wide, ciliate. *Flowers* yellow, 3–5(–7) mm long; calyx 2–4 mm long, hispid; standard 5–7 mm long, claw 1–2 mm long, blade suborbiculate, 4–5 mm wide, entire, wings 5–7 mm long, 1–2 mm wide, keel 4–5 mm long, claws 1.0–1.5 mm long; stamens 4–5 mm long. *Fruit* 3–5(–7) articulate, articles 2.5–3.0(–4.0) mm in diameter, villous-hispid, with trichomes tuberculate based; seeds 2.0–2.5 mm long, 1.5–2.0 mm wide, blackish.

Aeschynomene villosa is distributed from southwestern United States, through Central America into northern South America. It appears to be rare in Panama, having only been collected from two localities. As with other species in this genus, it is called "pega-pega" locally.

CANAL ZONE: Madden Forest Road at entrance to Boy Scout road, *Croat 12907* (MO). Sosa Hill, Balboa, *Standley 25267* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29163* (US). PANAMÁ: Abalaba, *Killip 3367* (US). Near Matías Hernández, *Standley 28893* (US). Río Tocumen, *Standley 29399* (US). VERAGUAS: Divisa/Santiago, *Burt & Rattray 82* (MO, SCZ).

4. ALYSICARPUS

Michael O. Dillon[12]

Alysicarpus Desvaux, Journ. Bot. (Desvaux) sér. 2. 1: 120. 1813. TYPE: *A. bupleurifolius* (L.) DC. = *Hedysarum bupleurifolium* L., type cons.

Herbs; stems ascending to procumbent, terete, striate. *Leaves* alternate, 1-foliolate (rarely 3-foliolate); leaflets linear-lanceolate to oval, reticulate-venose; stipules scarious, acuminate, free or connate; bistipellate. *Inflorescence* race-

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mose, terminal or rarely axillary, bracts scarious, deciduous, pedicels paired, short. *Flowers* small; calyx 5-lobed, deeply divided, lobes unequal, the upper 2 connate nearly to the apex, glumaceous; corolla reddish purple, or rarely orange; the standard obovate to orbicular, clawed; the wings obliquely oblong; the keel slightly incurved, obtuse; stamens 10, diadelphous, upper connate only basally; anthers uniform; ovary sessile or shortly stipitate; ovules numerous; style filiform, incurved at the apex, stigma broadly capitate, terminal. *Fruit* a loment, terete to compressed, submoniliform, indehiscent; seeds suborbicular or globose, smooth, lustrous, estrophiolate. Chromosomes: $n = 8, 10$.

Alysicarpus is a genus of about 30 species, primarily of the Old World tropics, of which we have one, *A. vaginalis* (L.) DC. The genus appears to have no economic importance in the New World except as a noxious weed. However, in Africa Dalziel (1937) reports that various species including *A. vaginalis* are used locally as "a fodder for all kinds of domestic stock, used fresh, but preferably cut after fruiting and stored as hay; regarded as an excellent fodder for horses, but it is said to cause mucous diarrhoea if given in excess in the young and immature state during the rains."

1. **Alysicarpus vaginalis** (L.) DC., Prodr. 2: 353. 1825. non Hochst. ex Baker (1871); non Wall. (1831)—FIG. 4.

Hedysarum vaginale L., Sp. Pl. 746. 1753. TYPE: Ceylon, *Hermann* (?BM, not seen).

Herbs, suberect to prostrate, to 0.5 m tall; stems straw colored to black, glabrescent. *Leaves* unifoliolate, elliptic-orbicular, to 2.5 cm long, ca. 1.5 cm wide, apex rounded, apiculate, obtuse, truncate or subcordate basally, drying green, glabrous above, strigose-villose beneath; stipules erect, often amplexicaul, subulate, to 1.5 cm long, ca. 2 mm wide basally, acute, scarious, ciliolate. *Inflorescence* racemose, terminal, to 10 cm long. *Flowers* purple, ca. 5 mm long; the calyx deeply 5-lobed, the lobes unequal, acuminate, striate, puberulent; the standard obovate, ca. 5 mm long; the wings oblong, ca. 4 mm long, the claw ca. 1.5 mm long, the keel connivent, oblong, ca. 4 mm long; stamens diadelphous, the staminal sheath terete, to 7 mm long, ca. 0.6 mm wide, the filaments alternating in length, the longer filament to 0.6 mm long, the anthers rotund, ca. 0.3 mm long; ovary linear, ca. 3 mm long, ca. 0.5 mm wide, appressed villosulose, the style compressed, geniculate, swollen, the stigma subdiscoidal, truncate. *Fruits* strongly ascending, terete, drying black, puberulent, ca. 6-articulate, articles ca. 2 mm long; seeds ca. 2 mm long, suborbicular, lustrous, reddish brown.

This species is widespread in Panama and easily distinguished by its elliptic-orbicular, unifoliolate leaves and erect, terete loments.

BOCAS DEL TORO: Almirante, *Barrus 403* (GH). Milla 5, *Croat & Porter 16460* (MO). Bocas, *Lazor et al. 2376* (FSU). CANAL ZONE: Gamboa, *Busey 842* (MO). Ft. Kobbe, *Duke 3914* (MO). Toro Point, Ft. Sherman, *Duke 4336* (MO). Sosa Hill, *Duke 4655* (GH, MO). Ft. Clayton, *Dwyer 1001* (FSU, MO, SCZ). Curundu, *Dwyer 1764* (MO). Frijoles, *Ebinger 309* (MO, US). Madden Dam, *Maurice 823* (US). Miraflores Lake, *Tyson 1342* (FSU, MO, SCZ). Ft. Amador, *Tyson 2014* (MO, SCZ). Curundu, *Tyson 6631* (MO). Miraflores Lake, *White 263* (MO, US). CHIRIQUÍ: David airport, *Lewis et al. 739* (MO, NY). Puerto Armuelles, *Liesner 141* (MO, NY). COCLÉ: NE of Río Hato,

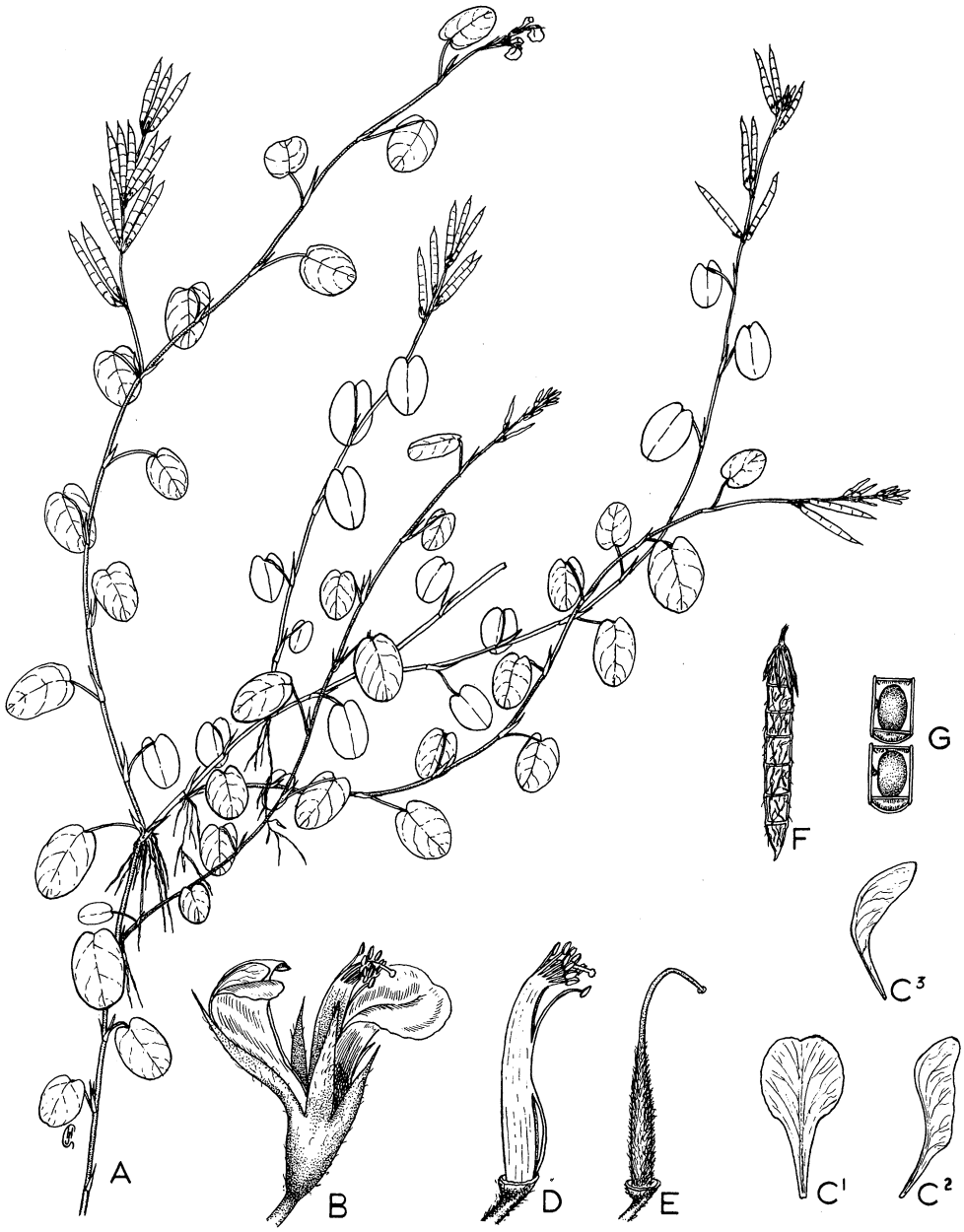

FIGURE 4. *Alysicarpus vaginalis* (L.) DC.—A. Habit (×3/5). [After *White 263.*]—B. Flower (×6).—C. Corolla.—C¹. Standard (×3³/₅).—C². Wing petal (×3/5).—C³. Keel petal (×3³/₅).—D. Stamens (×6).—E. Pistil (×6). [After *Duke 3914.*]—F. Fruit (×1⁴/₅).—G. Sections of fruit with seeds (×3³/₅). [After *White 263.*]

Lasseigne 4293 (MO). COLÓN: Río Piedras, *Blum et al. 2546* (MO, SCZ). Colón, *Correa 1216* (MO). Portobelo to Pilón, *Nee & Mori 3653* (MO, WIS). HERRERA: Los Pozos, *Burt & Koster 94* (MO). PANAMÁ: Río Pacora and Chepo, *Duke 5941* (MO). Riomar, *Duke 12416* (MO, NY); *Ebinger 496* (MO, US). San Jose Island, *Johnston 858* (GH, US). Panama City, *Mendez 112* (US). Between Río

Pacora and Chepo, *Porter et al. 5102, 5134* (both MO, SCZ). Riomar, *Tyson et al. 2319* (FSU, SCZ). SAN BLAS: Point opposite Ilsa Mosquito, *Duke 8993* (MO, NY). VERAGUAS: La Mata, *Koster 118* (MO).

5. ATELEIA

Michael O. Dillon[13]

Ateleia (DC.) Benth., Comm. Legum. Gen. 37, 37. Jun. 1837 (preprint); Ann. Wiener Mus. Naturgesch. 2: 101. 1838. LECTOTYPE: *Ateleia pterocarpa* Moc. & Sesse ex D. Dietr. (Pittier, 1918).

Pterocarpus section *Ateleia* DC., Prodr. 2: 419. 1825; Mém. Légum. 393. 1826.
Ateleia Ses. & Moc. ex DC., Prodr. 2: 419. 1825; Mém. Légum. 394. 1826, nom. in syn.

Unarmed *trees* or *shrubs*. *Leaves* imparipinnate; leaflets alternate to subopposite, subcoriaceous; stipules minute and caducous or none, reduced to tufts of hairs; stipels none. *Inflorescences* racemose, sometimes paniculate, terminal or axillary, 5–20 cm long; bracts small, deltoid or linear, persistent or caducous; bracteoles none. *Flowers* 10–several hundred, 5–14 mm long; calyx regular, campanulate, valvate or subimbricate in bud, truncate or shortly dentate, 5-lobed, the teeth ca. 0.5 mm long; petal 1, white or yellowish, clawed, cucullate, sometimes expanded, spatulate at anthesis, glabrous or pubescent, the margin erose or sinuate; stamens free, the anthers uniform, ellipsoid, ca. 1 mm long, dorsifixed; ovary 1–2 ovulate, the stigma subsessile, ovate, obliquely terminal, inflexed. *Fruit* indehiscent, samaroid, semiorbicular, a narrow wing along the upper suture, 2 valved, usually 1 seeded, compressed stipitate; seeds reniform, compressed, reddish brown to dark brown, the hilum lateral, orbicular or elliptic. Chromosomes: $n = 20$.

Ateleia is composed of about 17 species distributed throughout tropical and subtropical Central and South America. All the species are known from limited ranges with the exception of *A. gummifera,* which ranges throughout the West Indies and the eastern coast of Central America.

Literature:

Mohlenbrock, R. H. 1962. A revision of the leguminous genus *Ateleia*. Webbia 17: 153–186.

Pittier, H. 1918. A new species of *Ateleia* from Colombia. Contr. U.S. Natl. Herb. 20: 113.

1. **Ateleia gummifera** (DC.) D. Dietr.,[14] Syn. Pl. 4: 219. 1847.—FIG. 5.

Pterocarpus gummifer Bert. ex D.C., Prodr. 2: 419. 1925; Mém. Légum. 395. 1826. TYPE: Santo Domingo, *Bertero* (G-DC, holotype; MO, isotype).

Shrub or small *tree* to 7 m tall; branchlets thick, knotty, lenticellate, usually glabrous. *Leaves* alternate, 7–11(–13) foliolate, rachis puberulent, 5–10 cm long,

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[14] For additional synonymy see Rudd (1972).

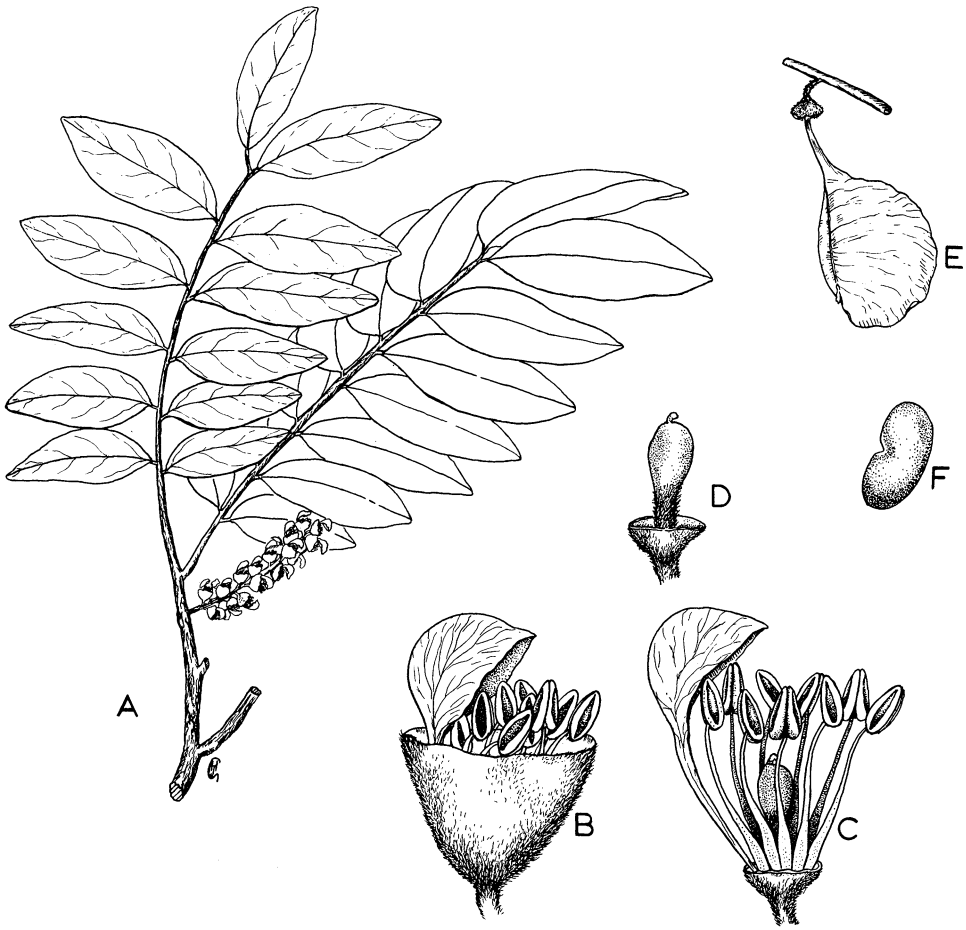

FIGURE 5. *Ateleia gummifera* (DC.) D. Dietr.—A. Habit (×3/5). [After *Allen 4083*.]—B. Flower (×7 1/5).—C. Stamens and petal (×7 1/5).—D. Pistil (×7 1/5). [After *Schipp 705*, Belize.]—E. Fruit (×1 1/5).—F. Seed (×4 4/5). [After *Allen 4083*.]

terete; leaflets subopposite, ovate to elliptic, obtuse, or rarely emarginate, cuneate to obtuse, 3–7 cm long, 1.5–3.0 cm wide, the upper surface glabrate, the lower surface dull white, puberulent, reticulate; petiolules ca. 2 mm long, puberulent. *Inflorescences* racemose, densely flowered, 6–17 cm long; bracts deltoid, commonly 1 mm long. *Flowers* pedicellate, the pedicels 1–2 mm long, villous; calyx campanulate, 2–3 mm long, tomentulose; petal yellow, 5–6 mm long, 2–4 mm wide, cucullate, the claw ca. 3 mm long, the blade suborbicular, irregularly sinuate; stamens 10, unequal; ovary stipitate, compressed, villous at the base, 2 ovulate. *Fruit* glabrous, 2.0–3.5 cm long, 1.0–1.5 cm broad, the wing 1–2 mm wide along the upper margin, the stipe 0.5–1.3 cm long; seed 5–7 mm long, 3.0–3.5 mm broad, ca. 2 mm thick, the hilum ca. 1 mm in diameter. Chromosomes: $n = 20$.

This species is the most widespread element of the genus, occurring throughout the West Indies and from the Yucatan south to Panama, from sea level to

1,000 m. It is infrequently collected and appears rare in Panama. There is considerable variation in leaflet shape and degree of pubescence, but flower and fruit characteristics appear constant throughout its range. No local names or uses are known from Panama; however, it is called "balsamo hediondo" or "cerezo" in Cuba and "tush che" in Belize.

HERRERA: Ocú, *Allen 4083* (MO).

6. BARBIERIA

Peter S. White[15]

Barbieria DC., Prodr. 2: 239. 1825. Mém. Légum. 241. *pl. 39.* 1825. TYPE: *B. polyphylla* DC., nomen illeg. (*Galactia pinnata* Pers., *Barbieria pinnata* (Pers.) Baillon).

Barbiera Spreng., Gen. Pl., ed. 9. 2: 587. 1831. orth. mut.

Woody *vine* or low *shrub,* branchlets hirsute, but pubescence sometimes becoming sparse on older stems. *Leaves* alternate, imparipinnate, many foliolate, the leaflets entire; stipels persistent, long subulate, stipules persistent, narrowly triangular, acuminate. *Inflorescence* of relatively few-flowered racemes, terminal and from upper axils, nodes 2–5 per raceme, 2–3 flowers per node; bracts narrow, acuminate, bracteoles 2 subtending the hypanthium, narrow, acuminate, flowers short pedicelled. *Flowers* large, red; hypanthium tubular, pubescent, persistent in fruit, the teeth 5, long, narrow, acuminate, nearly equal, stiff, at least when dry; petals red, long clawed, glabrous, the standard oblong, the wings oblong, adherent to and shorter then the keel; stamens diadelphous, the vexillary stamen free, the anthers uniform, the ovary sessile, the ovules numerous, the stigma small, terminal, the style elongate, barbate on upper margin. *Fruits* linear, straight, flattened, septate and transversely impressed outside between the seeds, pubescent, the two valves coiling in dehiscence; seeds oblong reniform.

Barbieria is a monotypic genus of tropical America.

1. **Barbieria pinnata** (Pers.) Baill., Hist. Pl. 2: 263. 1870.—FIG. 6.

Galactia pinnata Pers., Syn. Pl. 2: 302. 1807. TYPE: West Indies, not seen.
Clitoria polyphylla Poir. in Lam., Encycl. Méth. Bot. Suppl. 2: 300. 1811. TYPE: Puerto Rico, not seen.
Barbieria polyphylla (Poir.) DC., Prodr. 2: 239. 1825. Mém. Legum. 242. *pl. 39.* 1825.
B. maynensis Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 58, *pl. 264.* 1845. TYPE: Peru, *Poeppig 2367* (not seen, F frag.).

Woody *wine,* twining, trailing, or suberect, branchlets hirsute. *Leaves* alternate, imparipinnate; leaflets (9–)15–21(–23), elliptic with base and apex rounded, the apex mucronate, 1.5–7.0 cm long, 0.6–2.0 cm wide, surface glabrous to pubescent with minute scattered hairs above, the midrib hairy above, densely hairy and lighter beneath; paired stipels to 4 mm long, narrow; stipules 6–10 mm long, narrow; petiolules 1–3 mm long; petioles 1–4 cm long, hirsute, grooved. *Inflo-*

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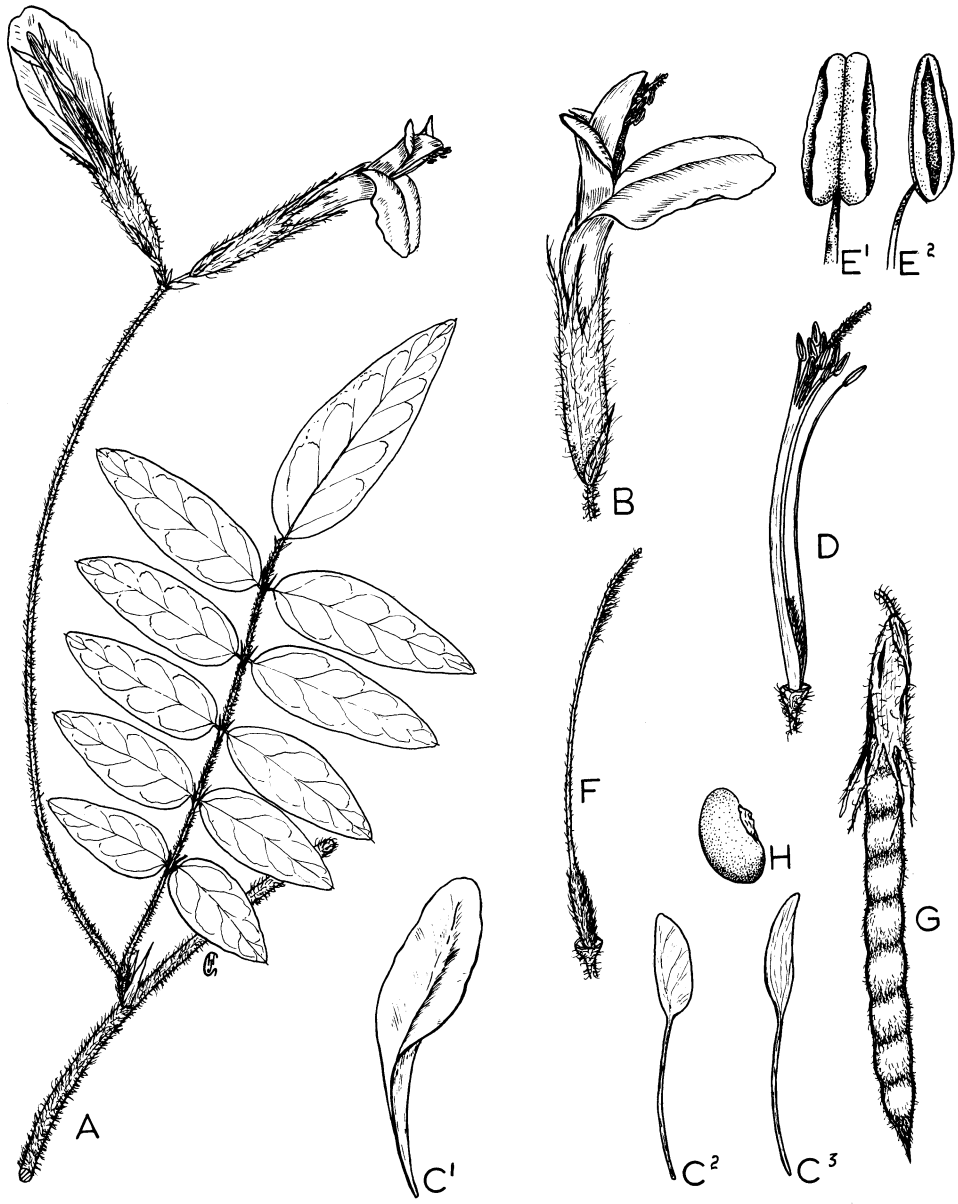

FIGURE 6. *Barbieria pinnata* (Pers.) Baill.—A. Habit (×3/5). [After *Skutch 2263.*]—B. Flower (×9/10).—C. Corolla.—C¹. Standard (×3/5).—C². Wing petal (×3/5).—C³. Keel petal (×3/5).—D. Stamens (×9/10).—E. Anthers.—E¹. Top view.—E². Side view.—F. Pistil (×9/10). [After *Tuerckheim 7845.*]—G. Fruit (×9/10).—H. Seed (×6). [After *Klug 3095,* Peru.]

rescence racemes, occasionally branched, to 25 cm long; flowers 2–3 from paired stipulelike bracts and a third bract between these on the rachis; pedicels ca. 5 mm long; bracteoles ca. 1 cm long at the base of the hypanthium. *Flowers* large, to 5.5 cm long, red; hypanthium ca. 3 cm long, 6 mm broad, densely pubescent

and with scattered longer hairs, the 5 teeth ca. ½ as long as the tube, ca. 1 cm long, narrow lanceolate acuminate; petals glabrous, standard to 5.5 cm long, ca. 1.5 cm wide, wedge shaped at the base, clawed, wings and keel petals all ca. 4.5 cm long, abruptly contracted to a claw, keel oblong; staminal column ca. 5 cm long, open above, glabrous; ovary sessile, ca. 7 mm long, terete, silvery pilose, ovules several, the stigma capitate, the style ca. 4 cm long, heavily bearded on upper margin. *Fruit* linear, ca. 5 cm long, 0.6 cm wide, compressed, pubescent, septate inside and indented on the outside between the seeds, 2 valves coiling in dehiscence; seeds 4–9, small, dark brown or black.

Barbieria pinnata, the only species in the genus, is found from Mexico to South America and in the West Indies. It has not yet been found in Panama, but is known from bordering countries and likely occurs there. Judging from the number of collections in major herbaria, *Barbieria pinnata* may be infrequent or rare throughout its range. The large red flowers make the plant showy when it is in bloom.

Barbieria pinnata is distinctive for its large blood-red flowers, clawed petals, long tubular calyx with sharp, equal calyx teeth, its long and hairy style, its long (to 1 cm) and narrow stipules, and its bracts and bracteoles.

7. CAJANUS

Muriel E. Poston[16]

Cajanus DC., Cat. Hort. Bot. Monspel. 85. 1813. nom. conserv. TYPE: *Cajanus cajan* (L.) Millsp.

Cajan Adans. Fam. Pl. 2: 326. 1736. Based on *Cytisus cajan* L. = *Cajanus cajan* (L.) Millsp.

Shrub or subshrub. *Leaves* trifoliolate, leaflets oblanceolate, puberulent; stipules lanceolate, caducous. *Inflorescence* an axillary or terminal panicle or raceme, flowers 6–12 per rachis; bracts small, caducous. *Flowers* with calyx campanulate, 5-lobed, the upper lobe longer; corolla yellow with brown to maroon striation, the standard ovate, auriculate, the wing oblong, the keel falcate; stamens diadelphous, the vexillary stamen free, the anthers monomorphic; ovary sessile with 4–6 ovules, the style slender, glabrous, the stigma capitate. *Fruit* oblong, 2-valved with oblique constrictions between the seeds, yellowish green with brown mottling, puberulent; seeds 4–5, obovoid, hilum oblong, estrophiolate.

Cajanus is an Old World genus of 1 or 2 species widely spread through Africa and Asia and has been introduced into the New World in cultivation.

1. **Cajanus cajan** (L.) Millsp. Publ. Field Columbian Mus., Bot. Ser. 2: 53. 1900.—FIG. 7.

Cytisus cajan L., Sp. Pl. 739. 1753. TYPE: India, herb Linnaeus (LINN 912:4, not seen; photo, MO).
Cajanus bicolor DC., Cat. Hort. Bot. Monspel. 85. 1813. TYPE: not seen.
Cajanus indicus Spreng. Syst. Veg. 3:248. 1826. TYPE: not seen.

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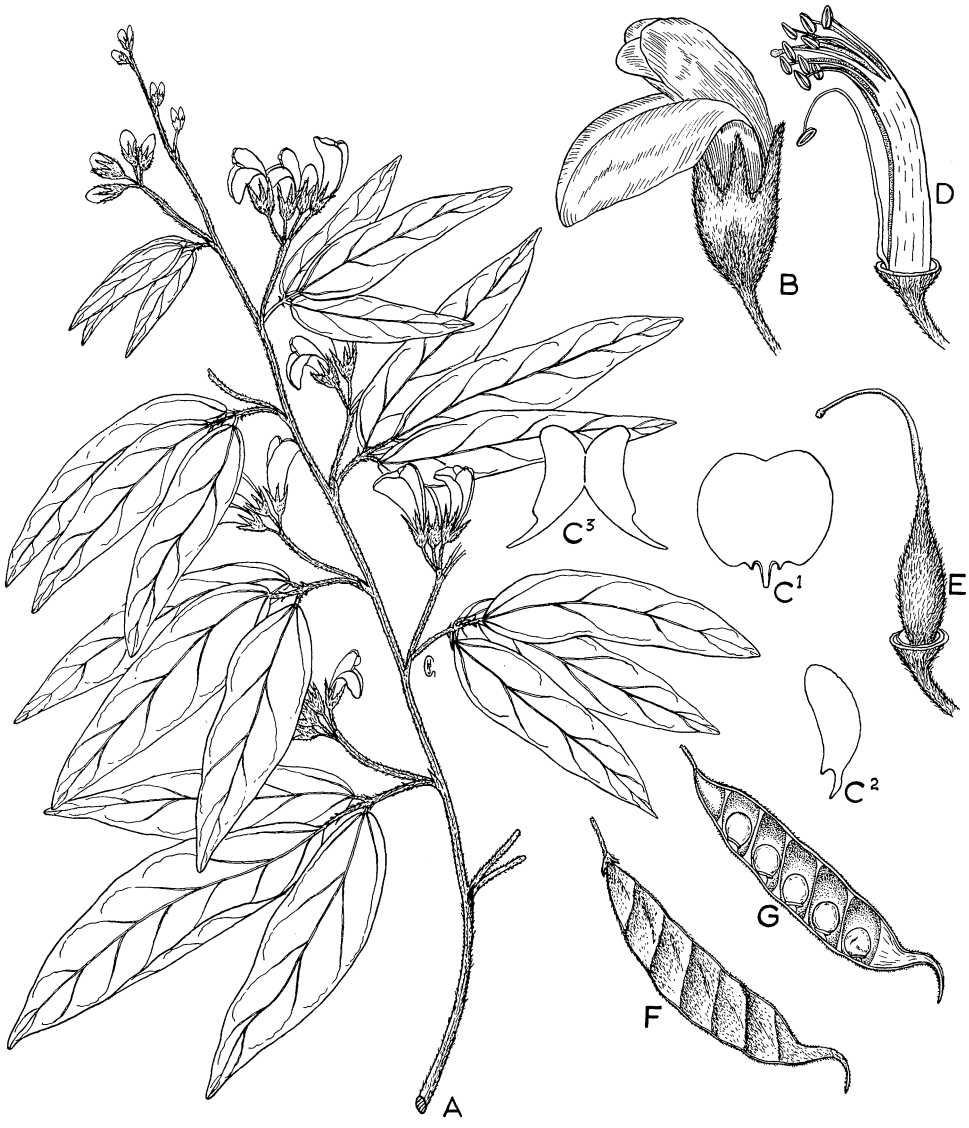

FIGURE 7. *Cajanus cajan* (L.) Millsp.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C^1. Standard (×1).—C^2. Wing petal (×1).—C^3. Keel petal (×1).—D. Stamens (×2).—E. Pistil (×2½). [After *Hunter & Allen 70.*]—F. Fruit (×½).—G. Opened fruit with seeds (×½). [After *Greenman & Greenman 5194.*]

Shrub or subshrub; stems angular, striate, strigose. *Leaves* trifoliolate; leaflets oblanceolate lanceolate, 4.3–8.2 cm long, 1.2–3.2 cm wide, the terminal leaflet slightly longer than the lateral leaflets, apically acute, basally cuneate, the margins revolute, velutinous and gland dotted beneath, glabrous above; petiolules 0.4–1.0 cm long, the lateral leaflets subsessile; petioles 0.6–1.2 cm long, angled, puberulent; stipules lanceolate, 2.0–5.0 mm long, strigose; stipels linear to subulate,

ca. 1.0 mm long. *Inflorescence* with racemes 4.0–9.0 cm long, 5–6 (–12)-flowered; peduncles 2.0–4.0 cm long, strigose; pedicel 0.6–0.8 mm long, strigulose; bracts subtending the flowers ovate, 0.5–0.7 cm long, 0.3 cm wide, caducous. *Flowers* with the calyx 0.8–1.0 cm long, not exceeding the corolla, puberulent, the upper lobes of the calyx partly united; corolla yellow striped with maroon or brown, 1.0–1.6 cm long, the standard obovate, 1.3–1.5 cm long, 1.4–1.5 cm wide, auriculate, the claw ca. 2.0 mm long, the wing oblong, 1.3–1.4 cm long, 0.5–0.7 cm wide, the claw ca. 4.0 mm long, the keel falcate, not auriculate, 1.2–1.5 cm long, 0.5–0.7 cm wide, the claw 0.5 cm long; stamens 1.3–1.4 cm long, vexillary stamen free; style 1.2–1.3 cm long, the stigma capitate. *Fruits* oblong, 5.5–7.0 cm long, 0.8–1.0 cm wide, green with brown mottling, puberulent, the beak 0.7–1.0 cm long, the compressions between the ovules oblique; seeds 4–5, ovoid, brown with white mottling, 5.0 mm long, 6.0 mm wide, the hilum linear.

Cajanus cajan is cultivated for its edible seeds known locally as Guandú, Guandul or pigeon-pea. It is found in tropical moist forest in Panama or where cultivated.

BOCAS DEL TORO: 10–15 mi S from mouth of Changuinola River, *Lewis et al. 929* (MO). CANAL ZONE: Between Miraflores and Panama, *Blum 2077* (MO). Without other locality, *Crawford 438* (NY). Barro Colorado Island, *Croat 4670* (SCZ), *7238* (DUKE, MO, NY, SCZ, US). Diablo Heights, *Gale*, Dec. 7, 1962 (SCZ). Corozal, *Greenman & Greenman 5194* (MO). CHIRIQUÍ: 2 km N of Punta de Purical, Burica Peninsula, *Busey 761* (MO). COCLÉ: El Valle de Antón, *Hammel 1746* (MO); *Lewis et al. 2589* (DUKE, MO). Penonomé, *Williams 360* (NY). COLÓN: Without other locality, *Wedel* Feb. 23 1940 (MO). DARIÉN: Upper Río Tuquesa, *Le Clezio 109* (MO). PANAMÁ: Isla del Rey, *Duke 9504* (DUKE, MO). Sabanas near Chepo, *Hunter & Allen 70* (MO). SE slope of Cerro Jefe, *Tyson 3551* (SCZ). Santa Clara, *Tyson & Blum 1884* (FSU, MO, SCZ). Cerro Azul, *Tyson et al. 6045* (FSU, SCZ). Cerro Campana, *Wilbur 24371* (DUKE). Pacora, *Williams 770* (NY). LOCALITY UNKNOWN: Tabernilla, *Cowell 283* (NY). Aspinwall, *Hayes 642* (NY).

8. CALOPOGONIUM

W. G. D'Arcy[17]

Calopogonium Desv., Ann. Sci. Nat. (Paris) ser. 1(9): 423. 1826. TYPE: *C. mucunoides* Desv.

Erect or climbing perennial *herbs*, often robust. *Leaves* pinnate trifoliolate, stipels and stipules scale-like. *Inflorescences* axillary *racemes* or fascicles, the rachis, when present, nodose with flowers in small fascicles on the nodes; pedicels short or long, bracts and bracteoles small, sometimes caducous. *Flowers* sometimes showy, the calyx campanulate tubular, 5-toothed, the upper pair fused partway up, forming a lip, the lower 3 lanceolate; corolla pink, white or violet, narrow, the standard obovate with inflexed basal auricles, the wings and keel narrow; stamens diadelphous, the vexillary stamen free, the other filaments united halfway or less, the anthers 8–9, all alike, ellipsoidal, glabrous, dorsifixed; ovary sessile, hirsute, ovoid, many-ovulate, the style slender, incurved, glabrate, especially above, the stigma capitate globose or compressed. *Legume* linear oblong, compressed, 2-valved, demarcated between the seeds, elastically dehiscent; seeds several, ovoid, aril wanting.

[17] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

Calopogonium is a genus of 6–8 species mainly centered in South America, but extending into Central America and introduced and naturalized in the Old World tropics.

There are reports that plants in this genus are toxic to livestock, and in some countries they have been used as insecticides. In Central America, the vines are sometimes used to scour pots.

a. Leaflets glabrate above; inflorescences fasciculate, pedicels more than 4 mm long; corolla pilose outside; seeds greenish ---------- 2. *C. galactioides*
aa. Leaflets pubescent overall; inflorescence racemose, pedicels less than 4 mm long; corolla glabrate outside; seeds brownish.
  b. Stems soon becoming fine puberulent or glabrate; bracteoles ca. 2 mm long, not exceeding the calyx tube, early caducous; pods more than 5 mm wide ---------- 1. *C. coeruleum*
  bb. Stems remaining long pilose velutinous; bracteoles 4–6 mm long, nearly as long as the calyx lobes, mostly persistent in flower; pod less than 5 mm wide ---------- 3. *C. mucunoides*

1. **Calopogonium coeruleum** (Benth.) Sauv., Ann. Acad. Habana 5: 337. 1869.—FIG. 8.

Stenolobium coeruleum Benth., Ann. Wiener Mus. Naturgesch. 2: 125. 1838. TYPE: not seen.

Vine, sometimes becoming large, yellowish pubescent, stems slender, softly villous with stout hairs to 2 mm long, these soon deciduous leaving a dense soft pubescence of short hairs. *Leaves* pinnate trifoliolate, leaflets ovate or rhomboidal, mostly 6–9 cm long, 4–6 cm wide, the lateral pair oblique, obtuse at each end, mucronate, mostly 3 veined at the base, slightly discolorous, appressed fine pubescent on both sides but more so beneath; petiolules 2–4 mm long; rachis 1–4 cm long; petiole mostly somewhat shorter than the terminal leaflet; stipels subulate, pilose, ca. 4 mm long; stipules caducous. *Racemes* elongate, sturdy but flexuous; peduncle mostly 1–5 cm long, puberulent; rachis to 20(–40) cm long, nodose, the nodes sometimes elaborated into short cymes; pedicels tomentose, ca. 2 mm long, inserted on the nodes, 2–5 at a time; bracts 1–3 mm long, pilose. *Flowers* bluish, the calyx tubular campanulate, ca. 4 mm long, the lobes subulate acuminate, pilose, about as long as the tube; standard glabrous, ca. 1 cm long, the wings narrowly spatulate oblong, about as long as the standard, the keel shorter; anthers oblong ovoid, 0.6 mm long; style ascending, pubescent to the tip. *Legume* linear oblong, 4–6 cm long, ca. 8 mm wide, impressed between the seeds laterally and slightly marginally, the beak small, curved, softly fine tomentose on the sides with longer hairs along the margins; seeds 4–8, squarish discoid, 4–5 mm across, shiny brown, the hilum oval, centered on one edge.

BOCAS DEL TORO: Water Valley, *Wedel 1814* (GH, MO, US). Old Bank Island, *Wedel 1981* (GH, MO, US). CANAL ZONE: Victoria Fill near Miraflores Locks, *Allen 1709* (GH, MO, US). Galen Point, Atlantic side, *Blum & Dwyer 2151* (FSU, MO, SCZ). Paraiso, *Croat 7152* (MO). Pipeline road 2½ mi from Gamboa Gate, *Croat 9359* (NY). Near Paraiso, *Croat 13255* (F, MO, NY, SCZ). Summit naval radio station, *Croat 14244* (MO). Albrook Tropic Test Site, *Dwyer 7314* (MO). C-12 Road, *Dwyer 8384* (MO). France Field, *Dwyer 8533* (MO). Near officers' club, Margarita, *Gentry 4833* (MO, PMA). Balboa Heights, *Greenman & Greenman 5053* (MO). Paraiso Station, *Hayes 113, 118* (both NY). Gatún, *Hayes 491* (NY). Barro Colorado Island, *Hladick 136* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 680,* (GH, MO), *742* (MO). ? Madden dam, 80 m, *Nee 7774* (MO). Valley of Masambí, road to Las Cascadas Plantation, 20–100 m, *Pittier 2669* (GH, NY, US). Quebrada Melgada, *Steyermark 17490* (GH, MO). Barro Colorado Island, *Woodworth & Vestal 443* (A, F, MO). CHIRIQUÍ: 20 km N

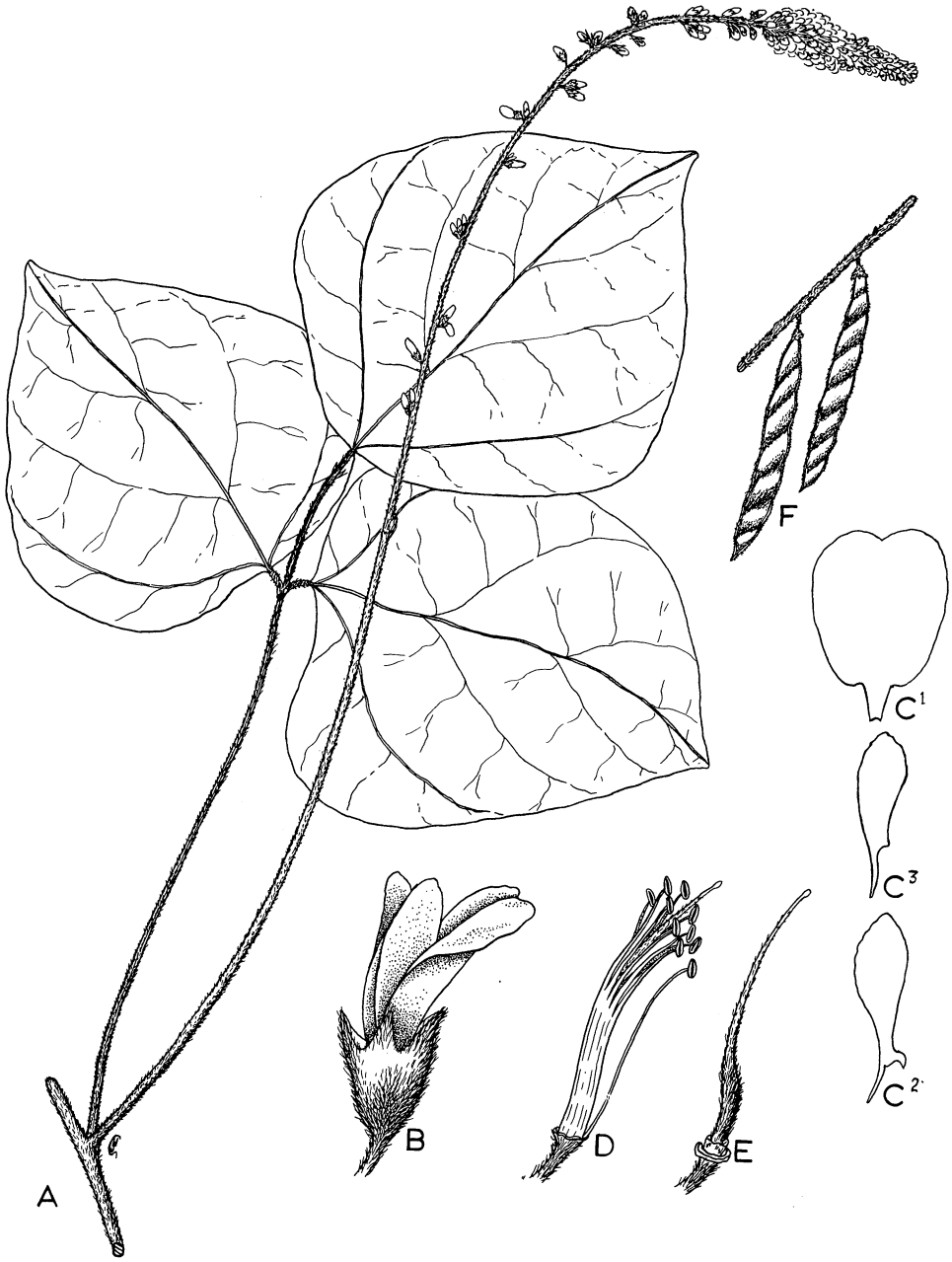

FIGURE 8. *Calopogonium coeruleum* (Benth.) Sauv.—A. Habit (×½).—B. Flower (×2½).—C. Corolla.—C[1]. Standard (×5).—C[2]. Wing petal (×2).—C[3]. Keel petal (×2).—D. Stamens (×3).—E. Pistil (×3). [After *Wedel 1956.*]—F. Fruit (×½). [After *Allen 1709.*]

of Puerto Armuelles, *Busey 408* (MO). Rabo de Puerco, 10.5 km W of Puerto Armuelles, *Busey 520* (F, GH, MO, NY). Quebrada Guanabanito beyond La Represa, 2 mi SW of Puerto Armuelles, 0–200 m, *Croat 22066* (F, GH, MO, NY). 4 mi from Paso Canoas on road to Cañas Gordas, *Croat 22221* (F, GH, MO). Quebrada Quanabano, 0–100 m, *Croat 22533* (MO). Las Vueltas-Boca del Monte, 0–

100 m, *Koster 111* (MO). Boquete, *Lewis et al. 618* (NY). COCLÉ: Road to El Valle close to Panamerican Highway, *Burt & Rattray 34* (MO). ca. 2 km de el Copé en la Madera, *Taylor 971* (PMA). Bismark above Penonomé, *Williams 597* (NY, US). DARIÉN: Pinogana, 20 m, *Allen 4278* (GH, MO). Isla Casaya, *Duke 10388* (MO, NY, US). Yaviza, 50 m, *Gentry & Mori 13513* (MO, NY). Manené, *Kirkbride & Bristan 1567* (MO). HERRERA: Chupampa, *Burt & Koster 86* (MO). 4 mi S of Los Pozos, *Tyson 2704* (FSU, MO). 10 mi S of Ocú, *Tyson et al. 2814* (MO, SCZ). LOS SANTOS: 4 mi SE of Posos, *Tyson 2704* (MO). PANAMÁ: Límite de Panamá-Zona del Canal, *Carrasco 41* (F, MO, PMA). Campo Experimental de Monte Oscuro, 10 m, *Correa 1920* (PMA). Cerro Jefe, 2700 ft, *Dwyer 8533* (MO). Capira, *Foster 2128* (F, MO, PMA, US). Sabanas near Chepo, *Hunter & Allen 100* (GH, MO). Agricultural Station at Matías Hernández, *Pittier 6956* (NY, US). La Capitana al lado del potrero, *Taylor 21* (PMA). Carretera de la Urbanizacion Chanis, Vía Cincuentenario, *Taylor 47* (PMA). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 71* (MO). 1–2 mi above Santa Fé, *Gentry 3054* (MO, PMA). Cañazas, *Tyson 3653* (MO). 8 mi S of Santiago, *Tyson 60443* (FSU, MO, SCZ).

2. **Calopogonium galactioides** (H.B.K.) Hemsl., Biol. Centr. Amer., Bot. 1: 301. 1880.

Glycine? galactioides H.B.K., Nov. Gen. Sp. Pl. 6:427. 1823. TYPE: Venezuela, not seen.
Stenolobium galactoides Benth.; Ann. Wiener Mus. Naturgesch. 2: 125. 1838. TYPE: not seen.
Galactia belizensis Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 133. 1932 fide Standley & Steyermark 24(5): 172. 1946. TYPE: British Honduras, *Bartlett 11449* (F, not seen).

Slender climbing *vine*; stems villous with ascending yellowish hairs, glabrescent. *Leaves* pinnate trifoliolate, the leaflets ovate or elliptical, mostly 2–4 cm long, 1.3–2 cm wide, obtuse at both ends, mucronate, the costa prominent above with ca. 4 arcuate veins on each side, glabrate above, appressed pilose beneath; petiolules 1–1.5 mm long, drying dark, pubescent; rachis to 9 mm long; petiole often longer than the terminal leaflet; stipels to 1 mm long pilose, caducous; stipules pilose. *Inflorescences* axillary fascicles of 2–5 flowers; pedicels ca. 5 mm long, puberulent; bracteoles 1–2 mm long, subulate, pubescent. *Flowers* white, pink or purplish, calyx ca. 5 mm long, villous hispid with coarse hairs, divided about halfway, the teeth acuminate subulate; corolla pilose outside, the standard emarginate, about twice as long as the calyx. *Fruit* linear oblong, 2–3 cm long, ca. 3 mm wide, nearly straight, compressed, falsely septate between the seeds, the beak 1–2 mm long, nearly straight; seeds plump, rectangular, dull greenish, 3 mm long, the hilum circular, located on one edge.

Calopogonium galactioides is amply distinct in a number of ways: fasciculate inflorescences, pilose corolla, and glabrous leaflet uppersides as well as in overall appearance which is of a delicate, small leaved vine. It is known in Panama only from western Chiriquí. The species ranges from southern Mexico to northern South America.

CHIRIQUÍ: Cuesta de Piedras, 730 m, *Burt & Koster 161* (MO, SCZ). San Bartolo Limite near Costa Rican border, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22193* (F, GH, MO, NY). Volcán de Chiriquí, Boquete District, 7000 ft, *Davidson 963* (GH, MO).

3. **Calopogonium mucunoides** Desvaux, Ann. Sci. Nat. (Paris) sér. 1. 9: 423. 1826. TYPE: ?Guyana, not seen.

Stenolobium brachycarpum Benth. in Seem., Bot. Voy. Herald 109. 1838. TYPE: Panama, Panama to Santiago, *Seemann* (?K, not seen).
Calopogonium orthocarpum Urb., Symb. Ant. 1: 327. 1899. SYNTYPES: Puerto Rico, *Krug 366, Sintenis 817, 1097* none seen, *3622* (MO), *5534, Stahl 976,* none seen.

Slender, sometimes wiry *vines*, twining or trailing, stems pilose with spreading golden hairs ca. 1 mm long. *Leaves* pinnate trifoliolate, the leaflets chartaceous, ovate, mostly 2–6 cm long, mucronulate, obtuse at both ends, lateral leaflets sometimes slightly oblique, the major veins prominent beneath, appressed pilose, more so beneath; petiolules ca. 3 mm long, tomentose; rachis mostly 5–15 mm long; petioles mostly longer than the terminal leaflet; stipels ca. 4 mm long, pubescent; stipules ovoid, ca. 3 mm long, pilose. *Racemes* slender, peduncles short in flower, elongate, 3–12 cm long in fruit, the rachis not expanded, flowers in fascicles of 2–6, becoming distant in fruit, pedicels 1–2 mm long, appressed pubescent; bracts and bracteoles narrowly ovate, to linear, striate, long pilose, ca. 4 mm long. *Flowers* blue or purple, inconspicuous or rarely showy, the calyx 4–7 mm long, deeply 4-fid, the lobes narrow, pilose, the sinuses somewhat exceeded by the bracts, the upper pair fused basally, basally deltoid, apically subulate; corolla with the standard 7–10 mm long, emarginate, slightly exceeding the wings, the keel shorter, curved; ovary villous, the style glabrous. *Legume* linear oblong, flat, mostly 2–3 cm long, ca. 4 mm wide, mostly straight, the beak 1–2 mm long, softly pilose with coarse reddish brown hairs, sometimes laterally impressed between the seeds; seeds 3–8 dark yellowish or reddish brown, compressed squarish, 2–3 mm long, the hilum circular, central on one edge.

This species is distinct in its hairy pods. They are transversely impressed and falsely septate between the seeds, but the transverse ridges are mostly hidden by the pubescence. Although reported to be sometimes showy in nature, on the herbarium sheet the flowers are seldom well preserved and are inconspicuous.

BOCAS DEL TORO: Railroad, Changuinola Valley, *Dunlap 385* (F, US). CANAL ZONE: Chiva Chiva, tower site, *Correa 490* (MO, PMA, SCZ). Barro Colorado Island, *Croat 6925* (MO, PMA, SCZ), *9104* (MO, SCZ). Pipeline Road NW of Gamboa gate, *Croat 12746* (MO, SCZ); *D'Arcy 10615* (MO). Frijoles near railroad station, *Croat 13220* (MO). Barro Colorado Island, *Croat 6925* (SCZ), *9104* (SCZ), *13169A* (MO). Corrosion lab, Miraflores Locks, *Dwyer 3037* (MO). Cocoli, *Dwyer 7207* (GH, MO). Chagres, *Fendler 79* (GH, MO). Outskirts of Ancón, *Greenman & Greenman 5070* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 736* (GH, MO). La Boca, *Mori & Kallunki 3677* (MO). Road C 29 6 km E of Gamboa, 190 m, *Nee 9001* (MO, US). ½ mi W of Summit Gardens, *Nee 9495* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Nowicke et al. 3587* (MO). Between Corozal and Ancón, 10–30 m, *Pittier 2174* (NY, US). Balboa Station, *Porterfield 1933* (NY). E end of air strip, Albrook Air Force Base, *Tyson & Lazor 6010* (FSU), CHIRIQUÍ: Concepción, *Baltimer 1526* (MO). Quebrada Guanabanito, 1 km W of dam at La Represa, *Busey 486* (F, MO). Puerto Armuelles, *Busey 507* (MO). Quebrada de Vuelta, *Busey 622* (MO). San Bartolo Limité, 10–11 mi W of Puerto Armuelles, *Croat 22021* (MO). Puerto Armuelles in bananas, *D'Arcy 10075* (MO). David airport, 25 ft, *Lewis et al. 766* (GH, MO). Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 22* (MO, NY). COCLÉ: Río Hato airstrip *Burch et al. 1130* (GH, MO, NY). Foot of Cerro Pilón above El Valle de Antón, 2000 ft, *Porter et al. 4596* (MO, NY, SCZ). COLÓN: Santa Rita 4 km desviación de la Transistmica, 150 m, *Gomez-Pompa et al. 3220* (MO). HERRERA: Las Minas, 340 m, *Burt & Koster 93* (MO). LOS SANTOS: Between Tonosí and Macaracas, *Oliver et al. 3539* (MO). 12 mi S of Macaracas, *Tyson et al. 3073* (GH, MO, SCZ). PANAMÁ: 1 mi E of Tocumen airport on side road off Panamerican Highway, *Blum & Tyson 1959* (FSU, MO, SCZ). Calzada Larga, *Carrasco 45* (MO, PMA). Campo Experimental de Monte Oscuro 12 km de Capira, 10 m, *Correa 1928* (PMA). Between Chepo and El Llano, *Croat 14493* (MO). Between Río Bayano Dam and Cañitas, *D'Arcy 9406* (MO). Hills between Capira and Potrero, 80–130 m, *Dodge & Hunter 8602* (MO), *8608* (MO). Sabanas near Chepo, *Hunter & Allen 77* (MO). SE slope of Cerro Campana, *Lewis et al. 3102* (MO). Las Cumbres, *Muñoz 18* (MO, PMA). 1 km S of Madden Dam, *Nee 8902* (MO). Sabanas N of Panama City, *Paul 534* (US). Bella Vista, *Standley 25400* (US). Bella Vista, *Standley 25400* (US). Las Sabanas, *Standley 25893* (US). La Garrapata, *Taylor 14* (PMA). 1 mi W of Bejuco on Panamerican Highway, *Tyson & Blum 2545* (FSU, MO, SCZ). VERAGUAS: 1 mi W of Santiago along old Interamerican Highway, *Tyson 5182* (FSU, PMA).

9. CANAVALIA

W. G. D'Arcy[18]

Canavalia DC.,[19] Prodr. 2: 403. 1825. TYPE: *C. ensiformis* (L.) DC. Nom. cons. contra *Canavali* Adans.

Canavali Adans., Fam. Pl. 2: 325, 531. 1763. TYPE: *Dolichos ensiformis* L. = *Canavalia ensiformis* (L.) DC. nomen rejic. contra *Canavalia* DC.

Wenderothia Schlecht., Linnaea 12: 330. 1838. TYPE: *W. discolor* Schlecht. = *Canavalia villosa* Benth.

Twining *vines*, prostrate, clambering or high climbing, rarely more or less erect subshrubs, mostly perennial, somewhat woody; stems often sturdy, mostly pubescent. *Leaves* alternate, pinnate trifoliolate, the leaflets mostly nearly symmetrical, ovate or elliptical, sometimes broad, mucronulate, rarely emarginate, mostly pubescent on both sides, pinnately veined, the principal veins and costa slender and elevated beneath; petiolules 5–7 mm long, mostly pubescent with stiff ascending hairs; petioles equalling or shorter than the terminal leaflet; stipels minute and caducous; stipules caducous. *Inflorescences* axillary racemes, mostly 10–60 cm long, pendant or prostrate and ascending; peduncles with swollen nodes each bearing 2–6 pedicels; bracts caducous; bracteoles rotund to acute, caducous; pedicels mostly 1–3 mm long, the flowers mostly resupinate. *Flowers* showy, somewhat fragrant; the calyx tubular or campanulate, bilabiate, the upper lip sometimes forming a short beak, and when pressed appearing either entire or emarginate, the lower lip of 3 minute teeth, the lateral pair often rotund, the lowest tooth mostly pointed; corolla white, purplish, bluish, pink or red, sometimes with white or yellow markings, the standard obovate, reflexed, emarginate (subgenus *Wenderothia*) or entire, the wings free, narrow, auricled, the keel ascending, united, auricled; stamens mostly united, the vexillary stamen sometimes more or less free; stigma capitate, the ovary pubescent. *Legume* 6–40 cm long and 1.5–5 cm wide, oblong, often falcate when young, apically beaked, sometimes stipitate, coriaceous or becoming woody, mostly compressed, with prominent longitudinal ridges and 1 or 2 (3) ridges on the valves, dehiscent, sometimes explosively, the valves often twisting, pubescent or glabrescent; seeds numerous imbedded in a papery endocarp, sometimes buoyant, brown, mottled or white, mostly ellipsoidal and somewhat compressed, the hilum peripheral, short or long, 7–35 mm long.

Canavalia is recognizable by its large, often woody oblong pods, and by the sturdy stems. The calyx is diagnostic with its often beaked upper lip and minute 3-toothed lower lip. The genus is pantropical in distribution with about 30 species in the New World and about 15 species in the Old World, mostly from the eastern Indian Ocean area and the western Pacific. A few species also occur in Hawaii. Only one species, *C. maritima*, is pantropical, a common element of beaches and coastlines, but at least two species are cultivated as experimental forage crops. *Canavalia ensiformis* was cultivated for food in pre-Colombian America.

[18] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

[19] Other synonyms are given by Sauer (1964); only these names relate directly to Panamanian plants.

Literature:

Sauer, J. 1964. Revision of *Canavalia*. Brittonia 16: 106–181.

a. Leaflets nearly circular, emarginate; terminal petiolule often more than 5 mm long; pedicels commonly 3 mm long; plants common on beaches and coastal rocks ---------- 7. *C. maritima*
aa. Leaflets narrower, pointed; terminal petiolule mostly less than 5 mm long; pedicels mostly less than 2.5 mm long; plants occurring behind beaches and inland.
  b. Calyx more than 15 mm long, lowest tooth mostly over 2.5 mm long; leaves mostly copiously pubescent, at least beneath ---------- 9. *C. villosa*
  bb. Calyx less than 15 mm long, lowest tooth less than 2.5 mm long; leaves often glabrate beneath.
    c. Lowest calyx tooth shorter than the lateral teeth.
      d. Pod with 2 extra longitudinal ridges spaced well away from the sutural ridge, pubescent overall at maturity, upper calyx lip shorter than the tube, the lowest tooth less than 2 mm long ---------- 1. *C. bicarinata*
      dd. Pod with one extra sutural ridge spaced near the sutural ridge, glabrate at maturity; upper calyx lip as long as the tube, the lowest tooth over 2 mm long ---------- 3. *C. dictyota*
    cc. Lowest calyx tooth longer than the lateral teeth.
      e. Seeds red or white; pedicels sometimes 2 mm long or more; cultivated species.
        f. Seeds white; hilum less than ½ as long as the seed; the lowest calyx tooth ca. 2.5 mm long ---------- 4. *C. ensiformis*
        ff. Seeds red or pink, hilum more than ½ as long as the seed; the lowest calyx tooth ca. 1.5 mm long ---------- 6. *C. gladiata*
      ee. Seeds brown; pedicels 2 mm long or less; wild species.
        g. Pods with extra ridge(s) spaced well away from the sutures; lowest calyx tooth less than 2 mm long.
          h. Pod with two extra ribs, evenly pubescent at maturity; seeds ca. 9 mm long ---------- 1. *C. bicarinata*
          hh. Pod with 1 extra rib, glabrescent; seeds ca. 17 mm long ---------- 8. *C. oxyphylla*
        gg. Pods with extra ridge near (to 6 mm) the sutural ridges; lowest calyx tooth mostly more than 2 mm long.
          i. Upper calyx lip forming a distinct beak or umbo ---- 5. *C. glabra*
          ii. Upper calyx lip emarginate, not forming an umbo ---------- 2. *C. brasiliensis*

1. **Canavalia bicarinata** Standley, Contr. U.S. Natl. Herb. 18: 106. 1916. TYPE: Panama, *Pittier 2354* (US, holotype, not seen; GH, NY, isotypes).

Wenderothia bicarinata (Standley) Piper, Contr. U.S. Natl. Herb. 20: 578. 1925.

Trailing *vine*; stems sparingly pubescent with ascending weak, brownish or white hairs. *Leaves* pinnate trifoliolate, leaflets to 15 cm long, 9 cm wide, ovate, apically obtuse or short acuminate, basally rounded, chartaceous, drying slightly discolorous, sparingly pubescent to villose with short hairs on 1 or both sides. *Inflorescence* axillary, 4–15 cm long, bracteoles rotund, ca. 1 mm long, pedicels wanting or to 1.5 mm long. *Flowers* red or rose; calyx ca. 12 mm long, tubular, pubescent with short, straight hairs, the upper lip short, apiculate, the lowest tooth ca. 1.5 mm long, pointed, slightly longer than the lateral teeth; standard 3 cm long. *Legume* mostly less than 15 cm long, woody, oblong with a short downcurved beak, sessile or short stipitate, ca. 2 cm wide, longitudinally ridged on the sutures and each valve with 2 additional ridges almost equidistant, pilose when young, maturing with fine even gray pubescence between the ridges; seeds ca. 9 mm long, ovoid or ellipsoidal, dark brown, mottled, the hilum ca. 7 mm long, ca. ¾ the length of the seed.

This species is distinct in its pods which have 2 longitudinal ridges in addition to those over the sutures, thus giving an appearance of evenly spaced ridges. The pods are usually grayish pilose when young and fine pubescent overall when mature. The upper calyx lip is short in relation to the tube.

Canavalia bicarinata occurs in Panama, Colombia, Peru and Ecuador. In Panama it is found at low elevations.

CANAL ZONE: Boy Scout road, Madden Dam area, *Dwyer 11971* (MO); *Mori et al. 4069* (WIS). Ft. Clayton, 1 mi on old Albrook Tower road, *Tyson & Dwyer 6504* (SCZ). CHIRIQUÍ: Monte Verde 2.5 km W of Puerto Armuelles, 80 m, *Liesner 65* (MO, NY). COCLÉ: Penonomé, 50–1000 ft, *Williams 132* (NY, US). DARIÉN: Near Refugio, 15–21 mi N of Santa Fé, 30 m, *Duke 10258* (MO). Isla Saboga, *Duke 10368* (MO). LOS SANTOS: 10 mi S of Tonosí, *Tyson et al. 2943* (SCZ). PANAMÁ: Taboga Island, *Dwyer 3104* (MO). Punta Paitilla, *Piper 5169* (GH, US). Around Alhajuela, 30–100 m, *Pittier 2354* (GH, NY). Taboga Island, *Standley 27925* (US). Between Las Sabanas and Matías Hernández, *Standley 31919* (US).

2. **Canavalia brasiliensis** Mart. ex Benth., Ann. Wiener Mus. Naturgesch. 2: 135. 1837. TYPE: Brazil, *Martius 12798* (M, not seen).

Canavalia panamensis Piper, Contr. U.S. Natl. Herb. 20: 569. 1925. TYPE: Panama, *Piper 5168* (US, not seen).

Vine trailing or climbing on herbs and shrubs, rarely high climbing; stems terete or drying slightly angled, puberulent with ascending white hairs. *Leaves* pinnate trifoliolate, the leaflets to 15 cm long, 11 cm wide, ovate, chartaceous, apically obtuse but often with a short acuminate and sometimes mucronulate tip, basally obtuse, truncate or rounded, mostly pubescent with short scattered hairs on both sides; petiolules 3–4 mm long, ascending pubescent; petioles mostly shorter than the leaflets. *Inflorescences* axillary racemes 10–20 cm long, the flowers mostly towards the apex; bracteoles rotund, ca. 1.5 mm long; pedicels 1–1.5 mm long. *Flowers* showy, pink, white or purplish, calyx campanulate tubular, 8–12 mm long, drying with evident veins but seldom mottled, slightly oblique, the upper lip as long as the tube, entire or emarginate, deflected upwards, and the area behind compressed, the area behind this compression expanded into a small hump or bulge, the lower lip consisting of 2 round or pointed lateral teeth and 1 slightly longer, lower tooth 2–2.5 mm long, pointed and often ciliolate; standard 2.25 cm long. *Legume* woody, to 20(25) cm long and to 2.5 cm wide, oblong with a short downcurved beak, each valve with prominent sutural ribs and one additional rib 4–6 mm from the sutural rib, usually quite glabrescent; seeds ca. 12, ellipsoidal, 12–15 mm long, brown, sometimes marbled, the hilum ca. 7 mm long, forming ca. ¾ of 1 edge.

This species is often difficult, especially when dried, to distinguish from other Panamanian species. From *Canavalia glabra* and *C. oxyphylla* it is distinguished by a larger lowest calyx tooth and often by the emarginate upper calyx lip. From *C. ensiformis* it differs in its smaller seed.

Canavalia brasiliensis is one of the most widespread and common of the *Canavalia* species. It has been recorded from Florida, Mexico and Central and South America as far south as northern Argentina. It is a species of disturbed lowlands, mostly below 1,000 m. This species has occasionally been planted in some countries as a cover crop.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 253* (US, F). Water Valley, *Wedel 809* (MO, GH). CANAL ZONE: Cocolí on road to Contractors' Hill, *Dwyer 7230* (NY, US, WIS). Summit, *Johansen 1924* (US). Amador, *Piper 6707* (MO, US). Between Corozal and Ancón, 10–30 m, *Pittier 2175* (NY, US). Balboa, *Standley 25508* (US). Sosa Hill, *Standley 26481* (US). Corozal Road near Panama, *Standley 26812* (US). Balboa, *Standley 28566* (US). Farfan Beach area, *Tyson et al. 3159* (FSU, MO). Flamenco Island, Amador, *Tyson 7372* (MO). PANAMÁ: Tocumen airport, *Dwyer 4885* (MO, WIS). Near Chepo, *Hunter & Allen 97* (MO). Debajo del puente de Juan Díaz, *Lara 47* (F, PMA). Sabanas N of Panama City, *Paul 594* (US). Agricultural station, Matías Hernández, *Pittier 6896* (GH, US), *6913* (US). Bella Vista, *Standley 25348* (US). Juan Franco Race Track near Panamá, *Standley 27693* (US). Juan Díaz, *Standley 30475* (US). Punta Paitilla, *Standley 30818* (US). Between Matías Hernández and Juan Díaz, *Standley 31951* (US).

3. **Canavalia dictyota** Piper, Contr. U.S. Natl. Herb. 20: 574. 1925. TYPE: Guyana, *Jenman 4211* (US, not seen).

Twining *vine* clambering on herbs and shrubs, sometimes high climbing; stems glabrescent. *Leaves* pinnate trifoliolate, the leaflets mostly to ca. 15 cm long, 6 cm wide, ovate or elliptic, apically obtuse mostly with a short, often blunt acumen, mucronulate, basally obtuse, slightly coriaceous, sparsely pubescent or glabrate. *Inflorescence* to 25 cm long, the peduncle and rachis becoming woody in fruit; bracteoles rotund, ca. 1 mm long; pedicels 1.5–2.5 mm long. *Flowers* pink or lavender; calyx ca. 13 mm long, tubular campanulate, the upper lip large and broad, nearly as long as the tube, deeply emarginate, forming a small beak, the lower teeth obtuse, 2–3 mm long, the lowest tooth shorter than the laterals; standard 2.5–3 cm long, erect. *Legume* to 20 cm long, 3.5 cm wide, oblong with a short, apical beak and a short basal stipe; compressed, becoming woody, glabrate, longitudinally ridged at the sutures and with an additional ridge 3–5 mm from the longitudinal ridge; seeds 6–9, 17–20 mm long, compressed ovoid to ellipsoidal, mottled brown, often buoyant, the hilum extending along most of one edge.

Canavalia dictyota may be distinguished by the lowest calyx tooth which is shorter than the 2 lateral teeth. It also has narrower leaves than many other species, and the seed is often buoyant. The pod has a distinct stipe. Plants are less pubescent than most other Panamanian species.

Almost all Panamanian collections of this species are from the same locality, an open area of tropical moist forest. *Canavalia dictyota* ranges through the Antilles and northern Central America.

CANAL ZONE: BARRO COLORADO ISLAND: *Bailey & Bailey 290* (F); *Brown 53, 107* (both F); *Croat 4675* (MO, SCZ), *4794* (F, MO, NY, SCZ), *7062* (MO), *7399* (F, MO, SCZ), *7228* (F, MO, NY, SCZ, US), *7702* (MO), *12944* (MO); *Foster 1477* (MO, PMA); *Shattuck 427, 628* (both F, MO); *Wetmore & Abbe 45* (A, MO), *45A* (F, GH), *366* (A, F, MO), *381* (F); *Wilson 77* (F); *Zetek 3801* (F, MO). CANAL ZONE: Mindi, *Cowell 183* (NY). Frijoles, *Croat 9051, 12607* (both MO), *13224* (F, MO). Miraflores, *White & White 63* (MO, US).

4. **Canavalia ensiformis** (L.) DC., Prodr. 2: 404. 1825.

Phaseolus maximus, siliqua ensiformis . . . . Sloane, Cat. Pl. Jamaica 1: 68. 1696. LECTOTYPE (fide Sauer) Sloane, Cat. Pl. Jamaica 1, *tab. 114. figs. 1–3.*

Dolichos ensiformis L., Sp. Pl. 2: 725. 1753. Based on *Phaseolus maximus, siliqua ensiformis* . . . . Sloane.

Vine, stems glabrescent. *Leaves* pinnate trifoliolate, leaflets to 20 cm long, broadly ovate, apically obtuse with a blunt apiculum, glabrate. *Inflorescence*

slender in flower, to 30 cm long; bracteoles obtuse, ca. 2 mm long; pedicels ca. 2 mm long. *Flowers* lavender; calyx tubular, ca. 14 mm long, sparingly pubescent, the upper lip about equalling the tube, emarginate, the lowest tooth slender, ca. 2.5 mm long, longer than the ovate lateral teeth; standard 2.75 cm long. *Legume* to 30 cm long, 3.5 cm thick, woody, oblong with a short apical beak and short basal stipe, explosively dehiscent, the valves glabrescent, each with a sutural rib and an additional rib ca. 5 mm from the sutural rib; seeds ca. 29 mm long, oblong, compressed, white or ivory, the hilum ca. 9 mm long, about ½ as long as the seed.

Canavalia ensiformis may be distinguished by its white seeds, which are not buoyant. The lowest calyx tooth is longer and narrower than any other Panamanian species except *C. villosa*. *Canavalia ensiformis* is also recognizable by its narrow calyx tube.

This species is cultivated from time to time for soil binding or fodder, and the plants collected in Panama may have been cultivated. Sauer (1964) indicated that this species was domesticated by pre-Colombian Indians and that current records of the plant all come from cultivation. The plants were cultivated as an annual crop, although plants may live longer than one year. In South America, the seeds and shoots are eaten.

CANAL ZONE: Vine on trellis at barracks, Fort Clayton, *Greenman & Greenman 5188* (MO).

5. **Canavalia glabra** (Mart. & Gal.) Sauer, Brittonia 16: 130. 1964.

Wenderothia glabra Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 10: 192. 1843. TYPE: Mexico, *Galeotti 3307* (P, not seen).

Canavalia villosa Benth. var. *glabra* (Mart. & Gal.) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 160. 1936.

C. munda Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 10. 1943. TYPE: Guatemala, *Steyermark 33179* (F, not seen).

Vine trailing or climbing on herbs and shrubs; stems glabrate, sometimes with sparse erect brownish hairs. *Leaves* pinnate trifoliolate, leaflets mostly 10–14 cm long, 4–7 cm wide, ovate, apically acuminate, acute or obtuse with a short acumen, sparsely pubescent with weak white hairs. *Inflorescence* to 20 cm long; bracteoles rotund, ca. 2 mm long; pedicels ca. 3 mm long. *Flowers* white or rose; calyx ca. 13 mm long, pubescent with short, dense hairs, the tube relatively long, the upper lip as long as the tube, forming a short umbo, the top of the calyx with a distinct hump behind the recessed area behind the lip, the lowest tooth ca. 2.5 mm long, pointed, exceeding the obtuse lateral teeth; standard ca. 4 cm long. *Legumes* to ca. 20 cm long, 3 cm wide, oblong with a pronounced beak and a short narrow stipe, compressed, glabrescent, with prominent longitudinal ridges at the sutures and each valve with an additional ridge near the sutural ridge; seeds to 15 mm long, oblong, compressed, the hilum ca. 7 mm long.

Canavalia glabra may be recognized by the hump on the top of the calyx and by the relatively long lowest calyx tooth. In spite of its epithet, the species is more pubescent than some other species in Panama.

This species ranges from southern Mexico to Peru, but it is more common in northern Central America.

HERRERA: Chitré, 20 m, *Allen 1108* (MO). LOS SANTOS: Headwaters of Río Pedregal 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2956* (MO, SCZ).

6. **Canavalia gladiata** (Jacq.) DC.,[20] Prodr. 2: 404. 1825.

Dolichos gladiatus Jacq., Collect. Bot. 2: 276, *tab. 215,* 1788. LECTOTYPE: Jacquin's plate (design. Sauer 1964).

Twining climbing *vines*; stems terete, glabrate, with a few minute retrorse weak hairs. *Leaves* pinnate trifoliolate; leaflets ovate, mostly ca. 10 cm long, ca. 6 cm wide; apically acute or short acuminate, basally rounded or obtuse, chartaceous, glabrate, the surface with scattered minute hairs. *Inflorescence* axillary, ca. 10 mm long; bracteoles caducous; pedicels ca. 1 mm long or obsolete, rachis with swollen glandular nodes. *Flowers* lavender; calyx tubular, 10–15 mm long, glabrate, the upper lip elongate, emarginate, the lowest tooth ca. 1.5 mm long, pointed, slightly exceeding the lateral teeth, puberulent; standard 2.5–3 cm long. *Legume* 24–30 cm long, ca. 5 cm wide, oblong, compressed, the beak slightly downturned, longitudinally ridged on the sutures and with an additional ridge 4–6 mm from the sutural ridges, glabrate or with minute, inconspicuous scattered white hairs; seeds dark red or pink, oblong ovate or elliptical, 3–4 cm long, ca. 2 mm wide, compressed, the hilum ca. 2 cm long, dark, ¾ the length of one edge of the seed.

This species may be distinguished by its very large pods and large pink or red seeds.

Canavalia gladiata is commonly cultivated in tropical regions of the Old World. The pods are cooked green and the seeds are also eaten. Sauer (1964) reports that it is unknown except in association with cultivation. The species is rarely cultivated in the New World. The single Panamanian record is of a plant cultivated as an ornamental patio climber. The large pods and unusual seeds render it a horticultural curiosity.

PANAMÁ: San Francisco de la Caleta, seeds obtained from Camino de la Pintada at Santa María, Coclé Province, *Arosemena* 26 Oct. 1979 (PMA).

7. **Canavalia maritima** (Aubl.) Thouars,[21] J. Bot. (Desvaux) 1: 80. 1813 '*Canavali*'.—FIG. 9.

Dolichos maritimus Aubl., Hist. Pl. Guiane Fr. 765. 1775. LECTOTYPE: (Sauer 1964) illustration of *Phaseolus maritimus purgans* . . . . Pluk., Phytogr. *tab. 51, fig. 2.* 1691.
Dolichos maritimus repens . . . . P. Br., Civ. & Nat. Hist. Jam. 293. 1761. Based on *Phaseolus maritimus purgans* . . . . Pluk.
D. roseus Swartz, Prod. Veg. Ind. Occ. 105. 1788. Based on *Dolichos maritimus* . . . . Browne.
Canavalia rosea (Swartz) DC., Prodr. 2: 404. 1825.

Prostrate *vine,* occasionally climbing; stems sparsely puberulent with short white hairs, glabrescent, sometimes stout. *Leaves* pinnate trifoliolate, the leaflets mostly ca. 10 cm long, 10 cm broad, broadly obovate, ovate or orbicular, apically rounded or emarginate, occasionally short acuminate, mucronulate, coriaceous,

[20] For a list of synonyms see Sauer, 1964. All synonyms listed by Sauer relate to Old World Plants and only the names noted here relate directly to Panamanian plants.

[21] For further synonyms see Sauer, 1964. Only these names relate directly to Panamanian plants.

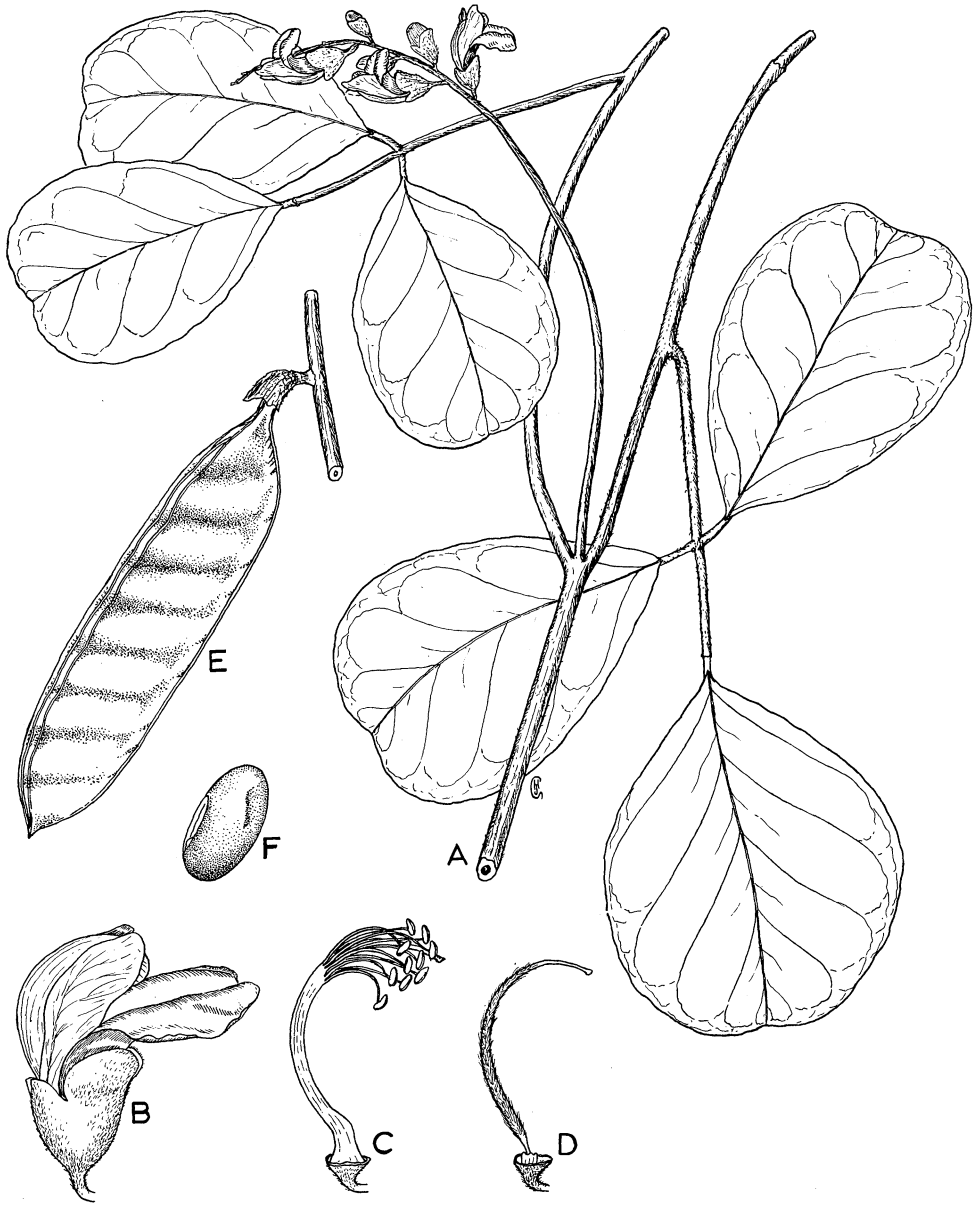

FIGURE 9. *Canavalia maritima* (Aubl.) Thouars.—A. Habit (×½). [After *Wedel 2131.*]—B. Flower (×1½).—C. Stamens (×1½).—D. Pistil (×1½). [After *Wedel 2835.*]—E. Fruit (×½).—F. Seed (×1). [After *Tracy 184.*]

sparsely puberulent with short white hairs on both sides, more so beneath; petiolules 5–9 mm long. *Inflorescence* axillary, to 30 cm long, prostrate but ascending at the tip; bracteoles often paired, obtuse, 1–1.5 mm long; pedicels 2–4 mm long. *Flowers* pale rose or blue; calyx tubular, 10–12 mm long, the upper lip

emarginate, short, not umbonate, the lowest tooth ca. 2 mm long, slightly exceeding the lateral teeth, moderately pubescent; standard ca. 3 cm long. *Legume* mostly 9–15 cm long, ca. 2.5 cm thick, oblong, minutely puberulent, longitudinally ridged at the sutures and each valve with 1 additional ridge 3–5 mm from the suture; seeds ca. 14 mm long, ovoid, brown, the hilum short, ca. 7 mm long; buoyant.

Canavalia maritima is distinct in its broad, apically rounded or emarginate leaflets, in its often longer petiolules and pedicels, and in the relatively short upper lip of the calyx.

This species is mostly restricted to sea beaches, where it is a pioneer on the sand along with *Ipomoea pes-caprae*. At the edges of beaches it sometimes climbs on rocks or thickets. *Canavalia maritima* is common to tropical and subtropical seacoasts in both hemispheres.

BOCAS DEL TORO: Isla Colón, *Wedel 449* (MO). Old Bank Island, *Wedel 2131* (MO). Isla Colón, *Wedel 2835* (MO). CANAL ZONE: Farfan area, Ft. Kobbe, *D'Arcy 9632* (MO); *Duke 4208* (MO). E of Gatún Locks, *Duke 4320* (MO). Farfan Beach, *Dwyer 6768* (MO). Chagres, *Fendler 80* (MO). Farfan Beach, *Lewis et al. 307* (MO). Balboa, *Mell 4* (NY). Fort Sherman, *Porter et al. 4982* (MO); *Tyson 2253* (MO). First island out Amador causeway, *Tyson & Lazor 6148* (PMA); *Tyson 7372* (PMA), *7382* (MO, PMA). CHIRIQUÍ: Guanaban, 2–4 km S of Puerto Armuelles, *Busey 499* (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 508* (MO). COLÓN: Río Piedras on road to Portobelo, *Blum et al. 2526* (MO). San Miguel de la Borda, *Croat 9862* (MO, NY, PMA). María Chiquita, *Dwyer 4467* (MO); *Taylor 113* (PMAO). LOS SANTOS: Monagre Beach, *Dwyer 4136* (MO). PANAMÁ: San Carlos, *Allen 1141* (MO). Punta Chame near S tip, *D'Arcy 10223* (MO). Isla Tobaguilla, *Duke 5875* (MO). Isla del Rey, *Duke 9550* (MO). Isla de Pedro Gonzales, Perlas Archipelago, *Dwyer 1715* (MO). Playa Coronado, *Gentry 2899* (MO). San Jose Island, *Harlow 98* (US); *Kennedy 2283* (MO). Bella Vista, *Killip 12008* (NY). Playa Coronado, *Koster 175* (MO). PANAMÁ: Vera Cruz, *Lewis et al. 2993* (MO, SCZ). Moro Island, *Mori et al. 4080* (WIS). Playa Farallón, Río Hato, *Taylor 112* (PMA). San Jose Island, *Tyson & Loftin 5051* (MO, SCZ). SAN BLAS: Naraganá Island, *Croat 16848* (MO). Isla Soskatupu, *Duke 8932* (MO). Isla Ustupo, *Gentry 6336* (MO).

8. **Canavalia oxyphylla** Standley & L. O. Williams, Ceiba 3: 201. 1953. TYPE: Honduras, *Allen 6458,* not seen.

Vine twining on shrubs and high climbing; stems glabrate. *Leaves* pinnate trifoliolate, leaflets mostly 10–12 cm long, 5–7 cm wide, ovate, apically acuminate, chartaceous, sparingly pubescent on both sides; petiolules 4–6 mm long. *Inflorescences* axillary, mostly 10–18 cm long; bracteoles obtuse or deltoid, 1–1.5 mm long; pedicels 1–1.5 mm long. *Flowers* white, pink or lavender; calyx 10–14 mm long, often drying mottled, tubular campanulate, the upper lip short, forming a distinct umbo, the lower teeth membranaceous, the lowest acute, 1.75–2 mm long, exceeding the obtuse lateral teeth; standard ca. 4 cm long. *Legume* oblong, the apical beak short, the basal stipe terete, stout, 1.5–2 cm long, woody, glabrescent, each valve with sutural ridges and 1 additional ridge situated more than 7 mm from the suture and hence often appearing medial on the valve; seeds compressed ovoid, ca. 17 mm long, tan colored, the hilum forming half the circumference.

This species is distinct in its pod which in addition to the sutural ridges has one longitudinal ridge appearing almost medially on the valves, and which has a stout, terete stipe 1–2 cm long. The seeds are quite flat, and the hilum is longer than on other Panamanian species. The lower calyx teeth are membranaceous

and conspicuously pubescent and the lowest is acute. The short upper lip forms a distinct umbo. In spite of these differences, the species is often difficult to distinguish in the herbarium from *C. brasiliensis* and *C. bicarinata*.

Canavalia oxyphylla ranges from southern Mexico to northern South America.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al. 2712* (MO). Water Valley, *Wedel 1595* (MO, GH, MO), *1803* (US), *1820* (GH, MO), *1846* (MO, GH). CANAL ZONE: Farfan beach area, *Tyson et al. 3161* (SCZ). CHIRIQUÍ: Monte Verde 2.5 mi W of Puerto Armuelles, 80 m, *Liesner 57* (GH). Above San Félix, road to Cerro Colorado, 800–1000 m, *Croat 33163* (MO). COCLÉ: El Valle, *Croat 13313* (MO, NY, SCZ); *Lewis et al. 2533* (MO, SCZ). COLÓN: 4 km NW of Salamanca, 13 km NE of Buenos Aires, 340–410 m, *Nee 9077* (MO, US). PANAMÁ: Capira along trail between Ledice and Aguacate, 300 m, *Foster 2147* (MO, PMA). Campo Experimental de Monte Oscuro, 12 km de Capira, 10 m, *Correa 1932* (PMA). VERAGUAS: Between Cañazas and foot of Cordillera Central, headwaters of Río Cañazas, 300–600 m, *Allen 197* (MO, US). Hills W of Soná, 500 m, *Allen 1032* (GH, MO, US).

9. **Canavalia villosa** Benth.,[22] Ann. Wiener Mus. Naturgesch. 2: 135. 1837. TYPE: Mexico, *Karwinsky M12819* (M, not seen).

Twining *vine* climbing on shrubs and trees, stems mostly puberulent with curved brownish hairs. *Leaves* pinnate trifoliolate; leaflets mostly 10–12 cm long, 5–8 cm wide, ovate or obovate, the lateral leaflets oblique, apically acuminate, basally obtuse or rounded, drying discolorous, pubescent along the veins and margin on both sides, mostly copiously pubescent on the lamina, especially beneath; petiolules and petioles mostly densely pubescent. *Inflorescence* mostly 12–20 cm long; bracteoles ca. 2 mm long, often wider, pointed or rounded, mostly tomentose; pedicels obsolete or to 3 mm long. *Flowers* blue, purplish, or pink; calyx 17–20 mm long, often drying mottled, campanulate, the upper lip as long as or longer than the tube, prominently umbonate or not, sometimes slightly emarginate, glabrate to tomentose, the lowest tooth narrow, 2.5–4.5 mm long, longer than the deltoid lateral teeth; standard ca. 3.5 cm long, often drying brownish and striate. *Legume* mostly 14–17 cm long, ca. 2.5 cm wide, oblong, sometimes slightly expanded apically, the beak short and hardly downturned, stipe evident or not, longitudinally ridged at the sutures and with 1 additional ridge 5–10 mm from the sutures, long shaggy pilose when immature, at maturity evenly pilose with soft erect hairs; seeds 12–17 mm long, elliptical discoid, light brown, mottled, the hilum short, 6–7 mm long.

Canavalia villosa is distinct in a number of features; long calyx, long and narrow lowest calyx tooth, elongate upper calyx lip, narrow pointed bracteoles, and usually in its general overall pubescence.

This species ranges from northern Mexico to Panama and has been occasionally collected in South America. In Panama most collections have been made in upland areas.

CHIRIQUÍ: El Barú above Boquete, 1200–1800 m, *D'Arcy 9932, 9934* (both MO). Lava flow between El Hato and Bambito, *D'Arcy 10034* (MO). Lava fields near town of Volcán, *Duke 9138* (MO, NY). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 325* (MO, GH, US), *603* (GH, NY, US). 2.5 km W of Puerto Armuelles, 80 m, *Liesner 57* (MO). San Félix 0–120 m, *Pittier 5298* (GH, NY, US). Boquete, 3800 ft, *Terry 1282* (A, F, MO, US). Baja Mono, 4000 ft, *Terry & Terry 1648a* (F). Lava flow 4 mi above Volcán, *Tyson 7285* (PMA). COCLÉ: El Valle de Antón, 1000–2000 ft,

[22] Several synonyms for this species are given by Sauer, 1964. Only this name has been used for Panamanian plants.

Lewis et al. 2612 (MO, SCZ). HERRERA: 4 mi S of Los Pozos, *Tyson 2678* (MO). LOS SANTOS: 11 mi N of Tonosí, *Tyson 2966* (SCZ). 12 mi S of Macaracas, *Tyson et al. 3077* (MO, FSU). PANAMÁ: Debajo del puente de Juan Díaz, *Lara 47* (F). VERAGUAS: Quebrada just S of Santa Fé, 450 m, *Nee 8045* (MO).

10. CENTROSEMA

W. G. D'Arcy[23]

Centrosema (DC.) Benth., Comm. Legum. Gen. 53. 1837; Ann. Wiener Mus. Naturgesch. 2: 117. 1840 (1839). TYPE: *C. brasiliana* (L.) Benth. nomen cons. vs. *Steganotropis* Lehm.

Bradburya Raf., Fl. Ludov. 104. 1817. TYPE: *B. scandens* Raf. = *Centrosema virginiana* (L.) Kuntze. Nomen rejic. vs. *Bradburia* Torr. & Gray (1842). Compositae.

Cruminium Desvaux, Ann. Sci. Nat. (Paris) sér. 1. 9: 423, Sept. 1826. TYPE: *C. giganteum* Desv. = *Centrosema plumieri* (Pers.) Benth.

Steganotropis Lehm. I. Sem. Hort. Bot. Hamburg 1826: 18. 1826; Linnaea 3 (Litt.): 11. 1828. TYPE: *S. conjugata* J. C. C. Lehmann. Nomen rejic. vs. *Centrosema* (DC.) Benth.

Clitoria sect. III *Centrosema* DC., Prodr. 2: 234. 1825.

Mostly twining *vines,* trailing, or sometimes high climbing, stems often wiry, puberulent. *Leaves* imparipinnate 1–5-foliolate, but mostly 3-foliolate, the leaflets narrow or broad; petiolules mostly short, drying wrinkled; petioles sometimes winged; stipels equalling or exceeding the petiolules (Panama); stipules prominently nervate. *Inflorescences* several flowered congested racemes, usually only one flower opening at a time; bracts and bracteoles nervate, the bracts often spathaceous or calyx-like, enfolding the bud. *Flowers* showy, the standard flat, discoid, often emarginate, with a distinct notch or spur near the base, mostly puberulent outside, the keel and wings directed upwards, curved; stamens diadelphous, the vexillary stamen free or nearly so, ovary linear, sessile, pubescent, the style incurved, sometimes persistent as an elongate beak, glabrous except basally, apically expanded into a blade, the stigma marginal on the style apex, minutely pubescent. *Legume* linear, dehiscent along the 2 valves, often spiralling, the sutures prominent, the apex sometimes long-beaked; seeds plump, ellipsoidal, numerous, the hilum linear along one edge.

Centrosema is a New World genus of perhaps 35 species ranging from the southern United States into Argentina and throughout the Antilles.

The genus is distinct in the notch or spur on the standard and in the flat, linear beaked pods. The striate bracts and stipules, and stipels as long as the petiolules are useful recognition features for the Panamanian species.

Centrosema virginiana (L.) Kuntze, widely dispersed in tropical America, has not been collected in Panama. Similar to *C. pubescens,* it has 5 subequal subulate calyx teeth and the pod is less than 4 mm wide.

Literature:

Barbosa-Fevereiro, V. P. 1977. *Centrosema* (A. P. de Candolle) Bentham do Brasil—Leguminosae—Faboideae. Rodriguezia 29: 159–219.

Fantz, P. R. 1979. A new species of *Centrosema* (Leguminosae) from Nicaragua and a key to the species in Central America. Sida 8: 152–156.

[23] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

a. Leaves unifoliolate (simple); petioles conspicuously winged ---------- 6. *C. sagittata*
aa. Leaves trifoliolate; petioles unwinged.
  b. Leaves mostly linear, less than 8 mm wide; pod less than 4 mm wide.
    c. Leaves with secondary venation at right angles to the midrib; flowers more than 2 cm long; stipules less than 5 mm long ---------- 1. *C. angustifolia*
    cc. Leaves with secondary venation ascending; flowers less than 1.5 cm long; stipules more than 5 mm long ---------- 3. *C. pascuora*
  bb. Leaves ovate or elliptical, more than 10 mm long; pod more than 4 mm wide.
    d. Bracts large, persistent 1–3 cm long, 8–15 mm wide; persistent stipules large ---------- 7. *C. vexillata*
    dd. Bracts smaller, caducous or persistent, less than 1 cm long, narrow, less than 8 mm wide; stipules smaller, 8–11 mm long.
      e. Bracts caducous; bracteoles calyx and pod drying dark; seeds 6–9 mm across; calyx lobes undulate; flowers pink and red ---------- 4. *C. plumieri*
      ee. Bracts persistent; bracteoles calyx and pod drying green or brown; seeds less than 6 mm long; calyx lobes pointed; flowers purple, blue or violet.
        f. Pod more than 7 mm wide, the margins ca. 1 mm wide; stipels 4–5 mm long; leaves glabrate above, mostly 8–13 cm long, narrowly ovate; petiolules 3–5 mm long ---------- 2. *C. macrocarpa*
        ff. Pod mostly less than 7 mm wide, the margins less than 1 mm wide; stipels 1–2 mm long; leaves pubescent above, mostly 4–8 cm long, broadly ovate, petiolules 1–3 mm long ---------- 5. *C. pubescens*

1. **Centrosema angustifolia** (H.B.K.) Benth., Comm. Legum. Gen. 54. 1837.—FIG. 10.

Clitoria angustifolia H.B.K., Nov. Gen. Sp. Pl. 6: 417. 1824. TYPE: Venezuela, not seen.

Slender twining *vines*; stems wiry, minutely pubescent with erect white hairs. *Leaves* pinnate trifoliolate; leaflets narrowly linear oblong, mostly 3–5 cm long, 5–9 mm wide, gradually long tapering to a blunt tip, basally rounded and minutely cordate, the costa conspicuous, lateral veins ca. 20–30 arising at right angles to the costa, anastomosing irregularly near the margin, shiny and glabrate above but with scattered minute reduced trichomes and a small tuft at the base, glabrous beneath, slightly revolute; petioles 1–1.5 mm long, drying wrinkled with a few hairs; rachis ca. 2 mm long, ridged or channelled dorsally; petioles mostly shorter than the terminal leaflet, sparingly pubescent with erect elongate hairs; stipels subulate, glabrous, exceeding the rachis; stipules narrowly deltoid, ca. 4 mm long, conspicuously striate. *Inflorescence* a few flowered congested raceme, only 1 flower opening at a time; peduncle slender, glabrate, 1–20 cm long; bracts spathaceous, strongly nervate, 10–15 mm long, the inner bract pointed; pedicels obscure. *Flowers* showy, purple, calyx cupular, 10 mm long, the sinuses rounded, the lobes deltoid, but the lowest lobe elongate, subulate, ca. 8 mm long, standard orbicular, flat, minutely emarginate, 2.5–3 cm across. *Legume* linear, 7–10 cm long including the acicular, 10–15 mm long beak, 3–4 mm wide, glabrous; seeds dark brown, discoid, ca. 2 mm long.

Centrosema angustifolia may be recognized by its smaller, narrower, subcoriaceous leaves with venation diverging at right angles from the costa, and by the seeds which are only about 2 mm long.

This species ranges from Central America to northern South America.

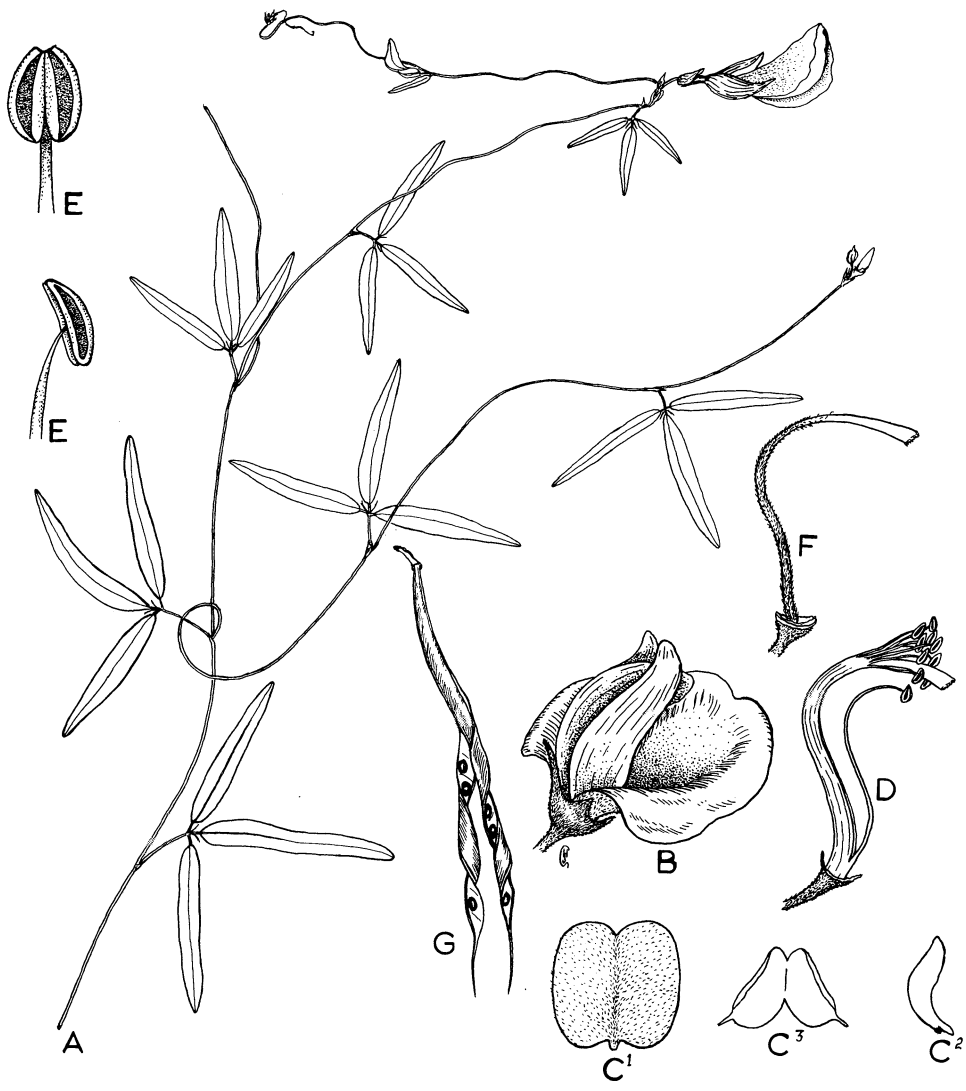

FIGURE 10. *Centrosema angustifolia* (H.B.K.) Benth.—A. Habit (×½). [After *Hunter & Allen 37.*]—B. Flower (×1).—C. Corolla.—C^1. Standard (×½).—C^2. Wing petal (×½).—C^3. Keel petals (×½).—D. Stamens (×2).—E. Anthers.—F. Pistil (×2). [After *Dodge et al. 16679.*]—G. Fruit with seeds (×½). [After *Dodge et al. 16679A.*]

CANAL ZONE: Government forest along Las Cruces Trail, 75 m, *Hunter & Allen 707* (MO). Ancón Hill, *Greenman & Greenman 5126* (MO); *Piper 5148; Standley 25182* (US); *26344* (MO, US). CHIRIQUÍ: Sabana de Marcelito near El Vigia, *Pittier 2380* (US). COCLÉ: Natá, 50 m, *Allen 814* (MO). HERRERA: to 8 mi SW of Las Minas, *D'Arcy 13541* (MO). PANAMÁ: Pacora, 35 m, *Allen 995* (MO). Road between Panamá and Chepo, *Dodge et al. 16679* (GH, MO). Cerro Campana, *Duke 5960* (MO). Savanas near Chepo, *Duke 6054* (MO). Las Sabanas, *Heriberto 142* (GH, US). Savanas near Chepo, *Hunter & Allen 37* (MO). Juan Díaz, *Killip 3162* (US). Taboga Island, *Miller 2023* (US). Laguna de Portala near Chepo, 50 m, *Pittier 4599* (US). Sabana de Dormisolo near Chepo, *Pittier 4650* (US). Big Swamp E of Río Tocumen, *Standley 26539* (US). Tumba Muerta Road near Panamá, *Standley 29748* (US).

2. **Centrosema macrocarpa** Benth., Ann. Nat. Hist. (Paris) ser. 1. 3: 436. 1839. TYPE: Guiana, *Schomburgk* (K, not seen).

Centrosema lisboae Ducke, Notizbl. Königl. Bot. Gart. Berlin 11: 548. 1932. TYPE: Brazil, *Ducke 2309* (G, not seen; photo MO).

Robust *vine,* stems terete, becoming somewhat woody, pilose with tan colored hairs, glabrescent. *Leaves* pinnate trifoliolate, the leaflets narrowly ovate, apically acute or slightly acuminate, mostly 8–13 cm long, 3–8 cm wide, basally rounded, papyraceous to subcoriaceous, glabrate on both sides or pubescent beneath; petiolules 3–5 mm long, stout; rachis and petioles drying grooved, pubescent; stipels linear subulate, about as long as the petiolules; stipules acute, nervate, 4–5 mm long. *Inflorescences* few flowered pseudoracemes, peduncles 2–6 cm long, the rachis thickened with conspicuous nodes, 2–3 cm long; bracts stipule-like; bracteoles ovate subspathaceous, ca. 10 mm long, ciliolate, glabrate, finely nervate, enclosing the calyx cup but not the longest tooth; pedicels 3–7 mm long, puberulent. *Flowers* pink and red within, green and pink outside; calyx cupular, the cup 3–4 mm long, the teeth dorsally pubescent, the longest 7–10 mm long, the others 4–5 mm long, the lower pair united about halfway up, the sinus acute; standard orbicular, ca. 3 mm long, puberulent dorsally. *Fruit* linear, mostly 15–20 cm long, 7–8 mm wide, compressed, smooth, the margins conspicuously thickened, ca. 2 mm wide, the beak 10–13 mm long, acicular, straight, glabrous; seeds dark brown, rectangular, 5–6 mm long, the hilum occupying one side.

This species is distinct in its narrow, pointed leaves with small stipels and its large pod. The vine is sturdier with stouter stems than most other Panamanian species of *Centrosema.*

Centrosema macrocarpa is widespread in tropical South America ranging as far as Sao Paulo, Brazil, and Panama. In Panama it has been collected in the Canal Zone and in Bocas del Toro.

BOCAS DEL TORO: Quebrada Huron, *Kirkbride & Duke 454* (MO). CANAL ZONE: Near water reservoir W of Cocoli, *Croat 9163* (MO). Road C21 near Police Lodge, *Croat 12987* (MO). K-9 Road, *Dwyer 3017* (MO). ½ km W of Summit Gardens, *Nee 9492* (MO).

3. **Centrosema pascuora** (Mart. ex Benth., Comm. Legum. Gen. 56. 1837. TYPE: Brazil, *Martius,* not seen.

Delicate *vine* or erect *herb*; stems slender, sparingly long pilose with spreading white hairs, glabrescent, sometimes reddish, a fine tomentum of minute hairs sometimes persistent near the base of the plant. *Leaves* trifoliolate, the leaflets linear, narrowly ovate, or oblong, mostly gradually tapering to the apex; apically mucronate, basally abruptly obtuse, mostly 4–10 cm long, 4–7 mm wide, glabrate, the major pinnate veins ascending, arcuate and anastomosing near the margin to form a submarginal vein, the minor venation reticulate, elevated; petiolules ca. 2 mm long with a few elongate white hairs; petioles mostly 2–4 cm long, glabrate, slender, drying angled; stipels subulate, 3–6 mm long; stipules ca. 7 mm long, acuminate deltoid, sometimes slightly reddish, strongly nervate. *Inflorescences* 1 or 2 peduncles per leaf axil, each peduncle 1 flowered but with an undeveloped flower at the apex; peduncles 5–10 mm long, sparingly pilose; bracts ca. 8 mm

long, ciliate, resembling the stipules but narrower; bracteoles resembling the bracts but broader, covering most of the calyx; pedicels about as long as the peduncles, glabrous. *Flowers* blue, standard ca. 2 cm long, calyx short cupular, the teeth subulate, the uppermost longest, ca. 7 mm long, the others ca. 5 mm long, the sinus between the lowest 2 shorter; standard orbicular, flat, ca. 2 cm long. *Legume* linear, slightly curved, compressed, mostly 4–8 cm long, 3–4 mm wide, the margins thickened, the beak acicular, to 10 mm long, sparingly pilose; seeds compressed rectangular, ca. 4 mm long, brown.

This species is superficially similar to *Centrosema angustifolia,* but the venation of the leaves is ascending rather than at right angles to the costa; the flowers are smaller and the seeds are larger.

Centrosema pascuora ranges from Panama to Ecuador and Brazil. In Panama it has been collected near the Pacific coast.

COCLÉ: Río Hato airstrip, *Burch et al. 1132* (GH, MO, US). PANAMÁ: Río Mar, *Tyson et al. 2303* (FSU, NY, SCZ).

4. **Centrosema plumieri** (Pers.) Benth., Comm. Legum. Gen. 54. 1837.

Clitoria plumieri Pers., Syn. Pl. 2: 303. 1807. Based on *Phaseolus ampla flore* . . . . Plumier. Descr. Pl. Amer. 5: 108. 1713 [1693]. TYPE: Plumier's illustration, based on a Plumier collection from Port-de-Paix, Hispaniola.

Robust twining *vine*; stems pubescent just above the nodes, otherwise often glabrate. *Leaves* pinnate trifoliolate, leaflets broadly ovate to rhombic 5–9(–15) cm long, sharply short acuminate, basally obtuse or cuneiform, shiny and glabrate above except on the midvein, copiously appressed pubescent beneath with straight white hairs; petiolules 3–4 mm long, drying dark, glabrate except tomentose ventrally; rachis and petiole drying with a conspicuous dorsal groove near the ends, glabrate to pilose; rachis 10–25 mm long, petiole mostly shorter than the terminal leaflet; stipels subulate, exceeding the petiolules, stipules obtuse, ca. 5 mm long, conspicuously striate, ciliolate. *Inflorescence* axillary, few flowered; peduncles stiff, drying dark, 2–10 cm long; bracts caducous; bracteoles 2, inserted at the top of the pedicel, spathaceous, 10–20 mm long, conspicuously nervate, apically ciliolate, often drying dark; pedicels 6–10 mm long. *Flowers* showy; calyx cupular, 4–6 mm long, the teeth undulate except for the slightly longer lowest tooth, glabrate; standard orbicular, emarginate, nearly flat, 5–6 cm across, white outside, purple inside, pubescent outside, wings and keel purple. *Legume* linear, flat, 10–14 cm long, ca. 10 mm wide, thick margined, mostly drying black, glabrate; seeds ellipsoidal, rhomboidal, 6–9 mm long, dark brown, the hilum along one corner.

This species is distinct in its broad, sharp pointed leaves and in its large showy flowers which are contrasting white and purple. The pod is larger than other Panamanian species of *Centrosema,* and the margins are much broader. The appressed pubescence of the leaf undersides is also distinctive when present.

Centrosema plumieri ranges throughout tropical America and is introduced to the Old World. In Panama it occurs mainly in moist forest areas.

BOCAS DEL TORO: Río Teribe just below Puerto Palenque, *Kirkbride & Duke 547* (MO). Almirante, *Sharp* 11 Nov. 62 (SCZ). Water Valley, *Wedel 1629* (GH, MO, US), *1753* (GH, US). CANAL ZONE: Tabernilla, *Cowell 269* (NY). Road to Contractors' Hill, *Dwyer 4004* (MO). Cocoli, *Dwyer 7203* (GH, MO), *7218* (GH). Gamboa, *Greenman & Greenman 5166* (MO). Observatory on Gamboa Road, *Hladik 235* (MO). Pedro Miguel, *Killip 3346* (US). Summit, *Lindsay 413* (MO). Chiva Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5178* (US). Between Miraflores and Corozal, *Pittier 2194* (NY, US). Gamboa, *Pittier 6517* (GH, NY, US). Old Las Cruces trail between Fort Clayton and Corozal, *Standley 29006* (US). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 555* (GH, MO). 1–5 mi S of Antón on road to coast, *Tyson & Blum 2577* (FSU, MO, SCZ). DARIÉN: Santa Fé, *Duke 9480* (MO, US). LOS SANTOS: Playa de Concepción, *Burch et al. 1268* (GH, MO, US). Between Tonosí and Macaracas, *Oliver et al. 3553* (MO). 12 mi S of Macaracas, *Tyson et al. 2935* (FSU, MO, SCZ). PANAMÁ: Sea beach from Panama Viejo to Bella Vista, *Allen 829* (F, GH, MO). Without other locality, *Kennedy 2014* (F). Matías Hernández, *Pittier 6884, 6897* (both US). Juan Díaz, *Standley 30473* (US). Between Matías Hernández and Juan Díaz, *Standley 31934* (US). SAN BLAS: Río Cartí, *Kennedy et al. 2014* (MO); *Perrin 1967* (MO). Between Río Pialla and Río Ailigandí, *Warner 190* (MO).

5. **Centrosema pubescens** Benth., Ann. Wiener Mus. Naturgesch. 2: 119. 1837. TYPE: Mexico, *Keerle,* Herb. Martius (?M, not seen).

Bradburya pubescens (Benth.) Kuntze, Rev. Gen. 1: 164. 1891.

Twining *vine* scrambling on herbs and shrubs, stems slender, often wiry, puberulent to pilose. *Leaves* pinnate trifoliolate; leaflets ovate, apically obtuse or acute, mucronulate, basally obtuse or rounded, mostly 4–8 cm long, 1.5–3.5 cm wide, the terminal leaflet largest, pubescent with short weak erect hairs, more so beneath; petiolules tomentose, 1–3 mm long; petioles shorter than the terminal leaflet; stipels subulate, 1–2 mm long; stipules deltoid acuminate, drying striate, 1–2 mm long. *Inflorescences* axillary, congested several flowered racemes; peduncle 2–5 cm long, bracts narrow, nervate, caducous; bracteoles 2, spathaceous, 5–8 mm long, conspicuously nervate, enveloping the lower calyx teeth; pedicels ca. 5 mm long, glabrate. *Flowers* showy, blue or violet, almost white; calyx cupular, the lower tooth mostly subulate, often pubescent, 2–3 times as long as the others, the other teeth deltoid, 2–3 mm long, glabrate; standard 3–5 cm broad, orbicular, nearly flat, emarginate, puberulent outside, with fine dark lines and often with a purplish spot. *Legume* linear oblong, greatly compressed, 6–7 mm across, the margins thickened, mostly straight, 5–7 cm long, the beak prominent, slender, 0.5–1.5 cm long; seeds 15–30, compressed rectangular, dark brown, mottled, ca. 3 mm long.

This species is distinct in its calyx which has only 1 elongate, subulate tooth, the others being short and the calyx margin nearly undulate.

Centrosema pubescens ranges from the southern United States to Argentina and is found in the Antilles.

Two Panamanian collections, e.g. *Folsom et al. 7174* and *Lewis et al. 677,* are conspicuously different in appearance from the mass of collections of this species from most of its range. The difference consists of much greater pubescence on bracteoles and bracts, the hairs being much denser and longer than in usual material. A number of other collections like these have been taken from widely scattered plants in Central America, but intermediates between this pubescent material and the usual pubescence have not been seen, suggesting that two different taxons are present. Bentham's original description of *Centrosema pubescens* notes bracts densely sericeous villous and bracteoles sericeous, which

seems to apply more to the pubescent plants than the usual less pubescent plants, so recognition of more than one taxon might require renaming of the commoner plants rather than the unusual plants. A study of variation within the full range of material and study of the type collection will be necessary to clarify the taxons and names to be recognized here.

BOCAS DEL TORO: Almirante, *Cooper 76, 189* (both F). Changuinola to 5 mi S of junction of Río Terebe, 100–200 ft, *Lewis et al. 931* (MO). Water Valley, *Wedel 1813* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 4398* (MO), *4947* (SCZ), *6986* (F, MO, SCZ), *7031* (MO); *Shattuck 715* (MO); *Wetmore & Abbe 157* (F, GH); *Woodworth & Vestal 500* (F, GH, MO), *716* (F). Pipeline road N of Gamboa, *Correa & Haines 539* (SCZ). Monkey Hill, *Cowell 45* (NY). Matachin, *Cowell 197* (NY). Pipeline road, 2.3 mi from Gamboa Gate, *Croat 12737* (MO). Miraflores, *Croat 12860* (F, SCZ). Road C21 3 mi from Gaillard Highway, *Croat 13002* (MO). Upper Río Pequení between Salamanca Hydrographic Station and Río Boqueron, 70 m, *Dodge & Allen 17280* (GH, MO). Banks of Quebrada La Palma and Cañon of Río Chagres, *Dodge & Allen 17344* (MO). France Field, *Dwyer 2893* (MO). Cocolí, road to Contractors' Hill, *Dwyer 7218* (MO, NY). France Field, *Dwyer 8520* (F). Chagres, *Fendler 70* (F, US). Ancón Hill, *Frost 2* (F). 0.4 mi SE of junction road K-2 & K-15, *Graham 318* (GH). Ancón, *Greenman & Greenman 5075* (MO). Hills E of Curundú, *Harvey 5194* (F). Paraíso, *Hayes 112, 797* (both NY). Gatún, *Hayes 815* (NY). Pipeline road, *Hladik 51* (NY). Gamboa, *Kennedy & Steiner 2467* (F). Pedro Miguel, *Killip 3348* (US). Ancón, *Macbride & Featherstone 17* (F, US). Boy Scout camp near Madden Lake & dam, *McDaniel 12657* (FSU). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5144* (US). Empire to Mandinga, *Piper 5145, 5156* (both US). Juan Mina, *Piper 5158* (US). Ancón, *Piper 5177* (US). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5179* (F, US). Gatuncillo, *Piper 5180* (US). Old Fort San Lorenzo, *Piper 5979* (US). Río Grande near Culebra, *Pittier 2078* (NY, US). Ancón, *Pittier 2763* (GH, NY, US). Balboa, *Standley 25270, 25486* (both US). Cerro Gordo near Culebra, *Standley 25959* (US). Balboa, *Standley 26067* (US). Corozal, *Standley 27391* (US). Gamboa, *Standley 28513, 29323* (both US). Río Pedro Miguel near East Paraiso, *Standley 29931* (US). Summit, *Standley 30111* (US). Between France Field and Cativa1, *Standley 30305* (US). Balboa, *Standley 30887* (US). Darién Station, *Standley 31576* (US). Howard Air Force Base near Red Devil drop zone, *Tyson 1841* (FSU, MO, SCZ), *1846* (SCZ). 1 mi N of Summit, *Tyson et al. 2743* (GH, MO, SCZ). Miraflores Locks area, *Tyson & Dwyer 2741* (SCZ). Without other locality, without collector (MO-1090658). CHIRIQUÍ: David/Concepción, 60 m, *Burt & Koster 135* (MO). Near Frontera, 100–200 m, *Burt & Koster 147* (MO). Volcán/Cuesta de Piedras, 1000–1200 m, *Burt & Koster 158* (MO). Puerto Armuelles, *Busey 513* (MO). Quebrada Caña Blanca, Burica Peninsula, 40 m, *Croat 22578* (MO). Baja Gualaca, 0–100 m, *Koster 171* (MO). Quebrada Guanabanito beyond La Represa 2 mi SW of Puerto Armuelles 0–200 m *Liesner 129* (NY). Quebrada Punta de Piedra, 2 mi SW of Puerto Armuelles, 0–100 m, *Liesner 346* (MO). Río Dupí, *Pittier 5241* (NY, US). COCLÉ: El Valle de Antón, *Burt & Rattray 39* (MO); *Croat 13290* (MO); *Dwyer 11957* (MO, US); *Lewis et al. 2566* (MO). Aguadulce, *Pittier 4954* (US). 10 mi E of Natá at Río Grande, *Tyson 5216* (FSU, MO, SCZ), *5250* (FSU, SCZ). 4 mi W of Anton on Río Chico, *Tyson & Blum 2596* (MO). Penonomé, 50–100 ft, *Williams 121* (NY). COLÓN: 10 mi SW of Portobelo, 2–4 mi from coast, *Liesner 1091* (MO). DARIÉN: Between Pinogana and Yavisa, 15 m, *Allen 271* (GH, MO, US). Manené, *Kirkbride & Bristan 1566* (NY). Yaviza along Río Chucunaque, *Stern et al. 150* (GH, US). HERRERA: Chitré, 20 m, *Allen 1089* (GH, MO, US). Ocú, 100 m, *Allen 4088* (MO). LOS SANTOS: 1 mi N of Tonosí, *Tyson et al. 2992* (MO, SCZ). PANAMÁ: Taboga Island, *Allen 136* (GH). La Chorrera/Bejuco, 0–100 m, *Burt & Rattray 24* (MO). Punta Chame, *D'Arcy 10235* (MO). Quebrada La Palma and Canon of Río Chagres, *Dodge & Allen 17344* (GH). Taboga Island, *Dwyer 2096* (MO). Río Coronado along Panamerican Highway, *Gentry 2906* (MO). Panama, *Hayes 172* (GH). Taboga Island, *Hunter & Allen 136* (GH, MO). San Jose Island, *Johnston 888, 1010, 1062* (GH). Chimán, *Lewis et al. 3354* (MO). Bellevista, *Macbride 2741* (F). Nuevo Emperador, *Muñoz 35* (MO). La Cresta, *Sandoval 13* (MO). Big swamp E of Río Tocumen, *Standley 26639* (US). Corozal road near Panama, *Standley 26809* (US). Taboga Island, *Standley 27905* (US). Río Tapia, *Standley 28191* (US). Tumba Muerto Road near Panama, *Standley 29703, 29752* (US). Between Las Sabanas and Matías Hernández, *Standley 31817* (US). SAN BLAS: Mouth of Ailigandí river to 2.5 mi inland, *Lewis et al. 76* (GH, MO, US); *Warner 178* (MO). VERAGUAS: Divisa/Santiago, 0–100 m, *Burt & Rattray 74* (MO). Puerto Mutis 12 mi S of Santiago, *Tyson 5190* (FSU, MO, SCZ), *6007* (SCZ).

6. **Centrosema sagittata** (Willd.) Brandegee ex Riley, Kew Bull. 1923: 344. 1923.

Glycine sagittata H. & B. ex Willd., Enum. Pl. 757. 1809. TYPE: not seen.

Centrosema hastata Benth., Comm. Legum. Gen. 56. 1837. TYPE: *Rudolphia dubia* H.B.K., Nov. Gen. Sp. Pl. 6: 432. *tab. 591.* 1823. TYPE: Colombia, not seen, cites *Glycine sagittata* Willd.

Centrosema dubia (H.B.K.) Hemsley, Biol. Amer. Centr. 1: 294. 1880.
Bradburya sagittata (Willd.) Rose, Contr. U.S. Natl. Herb. 8: 46. 1903.

Slender, twining *vine*; stems wiry, puberulent, glabrescent. *Leaves* simple, hastate to deltate, the blades mostly 9–15 cm long, apically acute or acuminate, the basal lobes oblique and obtuse, glabrate, with puberulence on the midvein above; petiolule wrinkled, pilose, 3–4 mm long; petiole shorter than the blade, the conspicuous wing 2–9 mm wide, gradually tapering to the base; stipels subulate, 2-nerved, about as long as the petiolules; stipules narrow, acute, prominently nervate, ca. 6 mm long. *Inflorescences* congested few flowered racemes, peduncle slender, mostly 1–2 cm long, becoming somewhat stout in fruit; bracts resembling the stipules, caducous, bracteoles 2, spathaceous, conspicuously nervate, to ca. 10 mm long. *Flowers* showy, mostly white, with some purple; calyx cupular, pubescent, the teeth subulate, ca. 5 mm long; standard orbicular, nearly flat, emarginate, ca. 5 cm long. *Legume* linear, flat, 12–18 cm long including the acicular beak, the beak 5–10 mm long, the margins evident, narrow, minutely puberulent overall, glabrescent; seeds plump, dark brown, ca. 5 mm long, the hilum along one edge.

CANAL ZONE: Near Ft. Kobbe, *Allen 2026* (GH, MO). Madden Dam, 50 ft, *Lewis et al. 17* (GH, MO). DARIÉN: Without other locality, *Bristan 1506* (MO). LOS SANTOS: Between Macaracas and Tonosí, 1.7 mi W of Highway 50 to El Cortezo, *Hammel 5299* (MO). PANAMÁ: Between Bayano Dam and Cañitas, *D'Arcy 938* (MO). Cañita de Chepo, *Escobar et al. 274* (MO). VERAGUAS: above Santa María along road to Santiago, 250–300 m, *Nee 8122* (MO).

7. **Centrosema vexillata** (Benth., Ann. Nat. Hist. (Paris) ser. 1. 3: 435. 1839. TYPE: Guiana, *Schomburgk* (K, not seen; photo MO).

Vine, sometimes robust, stems sometimes woody pilose with elongate, 2 mm long, weak yellowish hairs. *Leaves* pinnate trifoliolate, leaflets ovate, 5–12 cm long, apically acuminate, the acumen mucronulate, basally obtuse, above with minute hairs, sparingly pilose beneath, especially on the veins, petiolules 2–3 mm long, pilose; petioles slender, drying sharply grooved, pubescent; stipels linear, conspicuous, to 12 mm long, much exceeding the petiolules; stipules conspicuous, ovate, 5–11 mm long, finely nervate, sparingly long pilose. *Inflorescence* few flowered; peduncles slender, elongate, pubescent; bracteoles large, ovate, subspathaceous, nervate, ciliate, glabrous or pubescent, 2–2.5 cm long, 8–10 mm wide; pedicels 10–15 mm long, slender, pubescent; bracts stipule-like. *Flowers* (from Barbarosa-Fevereiro 1970) white; calyx puberulent, the tube 5–6 mm long, the upper teeth completely fused forming a lip 3–4 mm long, 3 mm wide, truncate or emarginate apically, the lower teeth triangular, the laterals 2–3 mm long, the median 5–7 mm long; standard 4.5–5 cm long, 5–6 cm wide, dorsally pubescent. *Fruit* straight, linear to oblong, compressed, ca. 10 cm long, 6–8 mm wide, copiously pubescent, ultimately black; seeds dark brown, rectangular 5–6 mm long.

Centrosema vexillata is distinct in its large stipels, stipules and bracteoles. The flat pubescent pods are also distinctive.

This species ranges from Panama to central Brazil. In Panama it has been found only near the coast.

PANAMÁ: Camino a Río en Chame, *Taylor 91* (PMA). SAN BLAS: Lower Río Ailigandí, *Duke 9324* (MO). Sasardí, 20 m, *Duke 10136* (MO, NY). Molia near Playon Chico, *Stier 65* (MO).

11. CHAETOCALYX

Michael O. Dillon[24]

Chaetocalyx DC., Prodr. 2: 243. 1825; Mém. Légum. 6: 262. 1826. TYPE: *Chaetocalyx vincentina* DC. = *C. scandens* (L.) Urb.

Boenninghausia Spreng., Syst. Veg. 3: 245. 1826. TYPE: *B. vincentina* Spreng. = *Chaetocalyx scandens* (L.) Urb.

Planarium Desv., Ann. Sci. Nat. (Paris) 9: 416. 1826. TYPE: *P. latisiliquum* (Poir.) Desv. = *Chaetocalyx latisiliqua* (Poir.) Benth. ex Hemsley.

Rhadinocarpus Vog., Linnaea 12: 108. 1838. LECTOTYPE: *R. brasiliensis* Vog. = *Chaetocalyx brasiliensis* (Vog.) Benth.

Isodesmia Gardner, London J. Bot. 2: 339. 1843. TYPE: *I. tomentosa* Gardner = *Chaetocalyx tomentosa* (Gardner) Rudd.

Raimondianthus Harms, Notizbl. Bot. Gart. Berlin-Dahlem 10: 387. 1928. TYPE: *R. platycarpus* Harms = *Chaetocalyx platycarpa* (Harms) Rudd.

Twining *vines,* herbaceous to suffrutescent; stems slender, 1–4 mm in diameter, subterete, striate, glabrous to densely pubescent. *Leaves* imparipinnate, 5–7-foliolate, the rachis glabrous to pubescent, 2.0–12.5 cm long; leaflets oblong, elliptical, ovate or obovate, 1–8 cm long, 0.5–5.0 cm wide, entire, acute to obtuse or retuse, mucronulate, basally rounded, cuneate or subcordate, glabrous to pubescent, sometimes micropunctate, pinnately veined; petiolules pulvinate, 1–2 mm long; stipules paired, attached basally, linear to deltoid-ovate, acute to attenuate, entire to setose-ciliate or laciniate; exstipellate. *Inflorescence* terminal or axillary, racemes, panicles, fascicles, or rarely solitary; bracts stipuliform; ebracteolate. *Flowers* 5-merous, 12–30 mm long; calyx campanulate, 5-lobed, subequal, glabrous to densely pubescent with tubercular-based trichomes, or absent, symmetrical to gibbous, basally articulate; corolla yellow or sometimes red to violet striate, the standard obovate to suborbicular, emarginate, the wings oblong, free, clawed, the keel nearly straight, clawed, free basally; stamens 10, filaments connate into a sheath, splitting above, or the vexillary stamen free, occasionally splitting below with maturity, the anthers dorsifixed, ellipsoidal, ca. 1 mm long; ovary sessile or stipitate, 6–16-ovulate, glabrous to densely pubescent, the style filiform, incurved, glabrous, the stigma capitate. *Fruit* a loment, 6–16-articulate, submoniliform, subterete to compressed, linear, reticulate to longitudinally striate, the articles oblong to quadrate; seeds elongate, 2.5–6.0 mm long, 1–2 mm wide, subcompressed, smooth, sublustrous, reddish brown, estrophiolate.

Chaetocalyx includes about 29 species ranging from southern Mexico into the Antilles, through Central America, and in South America in Peru, northern Argentina, southern Brazil and Uruguay. Most taxa occur in more or less mesic habitats up to 200 m. The genus is represented in Panama by only one species, *Chaetocalyx latisiliqua*.

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Literature:

Rudd, V. E. 1958. A revision of the genus *Chaetocalyx*. Contr. U.S. Natl. Herb. 32(3): 207–245.

1. **Chaetocalyx latisiliqua** (Poir.) Benth. ex Hemsley, Biol. Centr. Amer. 1: 268. 1880. TYPE: "Peru," herb. Jussieu (P-JU, holotype, not seen; microfiche MO).—FIG. 11.

Hedysarum latisiliquum Juss. ex Poir. in Lam., Encycl. Méth. Bot. 6: 432. 1804.
Poiretia latisiliqua (Poir.) Desv., J. Bot. (Desvaux) 1: 122. 1813.
Planarium latisiliquum (Poir.) Desv., Ann. Sci. Nat. (Paris) 9: 416. 1826.

Sparingly branched *vines*; stems brownish, puberulent and sparsely pubescent with trichomes ca. 1.5 mm long. *Leaves* 5-foliolate, rachis 4–10 cm long, sparsely sericeous; leaflets oblong-elliptic to obovate, 1–5 cm long, 0.6–3.0 cm wide, entire, obtuse mucronulate, base rounded to cuneate, discolorous, micropunctate, adaxial surface green, puberulent, abaxial surface whitish, lannose and puberulent; stipules lanceolate to linear, 3–10 mm long, 1–3 mm wide, attenuate, entire to setose-denticulate, puberulent. *Inflorescence* racemose, sometimes paniculate or fasciculate, the bracts stipuliform, the pedicels 6–12 mm long, hirsutullous. *Flowers* whitish yellow, 15–25 mm long; calyx campanulate, symmetrical, sparsely setaceous, 5–6 mm long, the tube 4–5 mm long, 3–4 mm in diameter, the lobes deltoid, acute, 1.0–2.5 mm long, usually ciliate; the standard broadly obovate, 10–15 mm long, ca. 15 mm wide, cleft to shallowly denticulate, the wings ca. 15 mm long, ca. 5 mm wide, obovate to oblong, the claw 1–2 mm long, the keel ca. 15 mm long, nearly straight, the claws 1–2 mm long; stamens monadelphous, connate into a sheath, split above, the filaments glabrous, the anthers uniform, versatile. *Fruit* a loment, 12–15-articulate, 6–8 cm long, 7–10 mm wide, linear, compressed, puberulent to subglabrous, margins longitudinally striate, centrally reticulate-striate, the stipe 5–7 mm long, the articles 4–5 mm long, 7–10 mm wide; seeds 2.5–3.0 mm long, ca. 1.5 mm wide, smooth, reddish brown.

This species ranges from Costa Rica to southern Ecuador. It is readily distinguished from the other species occurring in Central America by its 5-foliate leaves and wide fruits. In the province of Esmeraldas, Ecuador, this species is called "chupa-chupa," and its leaves are used to treat skin eruptions. No local names or uses have been recorded from Panama.

Though the type specimen in Jussieu's herbarium is marked "Peru," it was probably collected from present-day Ecuador, since no material has been recorded from Peru.

BOCAS DEL TORO: Region of Almirante, *Cooper 88* (F, NY, US). Changuinola Valley, *Dunlap 369, 400* (both US). Río Teribé, near Quebrada Lukulon, *Kirkbride & Duke 510* (MO, NY, SCZ). CANAL ZONE: Between Farfan Beach and Palo Seco, *Hunter & Allen 435* (MO). Gamboa, *McDaniel et al. 12731* (FSU). 1 km W of Gamboa, *Nee 9439* (GH, MO). Empire to Mandinga, *Piper 5155, 5165* (both US). Around Culebra, *Pittier 2212* (NY, US). Las Cascadas Plantation, near Summit, *Standley 25813, 29540* (both US). Balboa, *Standley 27158, 32153* (both US). Gamboa, *Standley 28322, 28452* (both US). Darién Station, *Standley 31592* (US). CHIRIQUÍ: Burica Peninsula, 6 mi S of Puerto Armuelles, *Busey 578* (MO); *Liesner 425* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5281* (FSU, SCZ). DARIÉN: Santa Fé, *Duke 9478* (MO, NY, US). Teotuma, *Duke 10059* (MO). Río Sabana, ca. 4 mi above Santa Fé, *Duke 10216* (MO, NY). Near Canglón river, *Duke & Bristan 355* (MO).

FIGURE 11. *Chaetocalyx latisiliqua* (Poir.) Hemsl.—A. Habit (×3/5).—B. Flower with one wing petal removed (×1⁴/5). [After *Skutch 2424*.]

Near Yaviza, *Gentry & Mori 13497* (MO). Puerto Indio, *Hammel 1087* (MO). LOS SANTOS: Road from Tonosí to Guanaco and Ave María, *Tyson et al. 3117* (MO). PANAMÁ: Cerro Campana, *D'Arcy 9554* (MO). Panamá Viejo, *Duke 5719* (MO). Cañita, *Escobar et al. 272* (MO). Vera Cruz, *Lewis et al. 3016* (MO). SE slope of Cerro Campana, *Lewis et al. 3147* (MO). Near Matías Hernández, *Pittier 6898* (NY, US). SAN BLAS: Sasardí, *Duke 10126* (MO, NY). VERAGUAS: 2–4 mi E of Santiago, *Duke 12351* (NY).

12. CLITORIA

Paul R. Fantz[25]

Clitoria L.,[26] Sp. Pl. 753. 1753. TYPE: *C. ternatea* L.

Neurocarpum Desv., J. Bot. Appl. 1: 119. 1813; J. Bot. Appl. 2: 75. 1814. TYPE: *N. janense* Desv. or *N. ellipticum* Desv.

Trees, shrubs, lianas, herbaceous *vines* or suffruticose *herbs,* erect or climbing; pubescence of uncinate (hooked) hairs common. *Leaves* trifoliate, less commonly 5- or 7-foliolate, petiolate, terminal leaflet usually larger; leaflets entire, the midrib and nerves impressed or weakly raised above, prominently raised below, ascending, usually arcuate towards the margin, joining the vein above, the minor veins conspicuously reticulate; stipules and stipels usually persistent, sometimes caducous, striate, usually erect, appressed. *Inflorescences* axillary or cauliflorous, racemose; flowers chasmogamous or sometimes cleistogamous (poorly observed in Panamanian material); pedicels usually paired; bracts 2–6, striate, pubescent adaxially, the inner pair caducous, usually smallest, between the pedicels, the middle pair often persistent, concave, opposite and appressed to the pedicel, sometimes spreading or reflexed in age, the outer pair caducous to semipersistent, between the pedicels; peduncles axillary, 1–several, short, often fascicled, cauliflorous; bracteoles 2, striate, persistent, frequently present in fruit, usually pubescent adaxially. *Chasmogamous flowers* resupinate, showy, bi-sexual, 5-merous, blue, violet, pink, or white, sometimes white fading yellow; calyx funnelform, persistent in fruit, conspicuously nerved, the apex 5-lobed, the upper 2 lobes subconnate, the lowermost lobe narrower, often longest; standard complicate, large and flag-like, erect, emarginate, short clawed, darker towards the edges and on the veins, the wings falcate oblong, spatulate, extending beyond the keel, shorter than standard, adherent in the middle to keel, long clawed, the keel petals incurved, acute, the claw elongate; stamens 10, diadelphous, vexillary stamen free or connate at base, the staminal column incurved, glabrous, often persistent in fruit, the free filaments filiform, the anthers basifixed, uniform; ovary stipitate, linear, compressed, many ovuled, densely pubescent, the style elongate, geniculate near the tip, usually twisting, flattened, bearded lengthwise, the stigma often pubescent around the base. *Fruit* stipitate, linear, compressed, slightly thickened on the upper or both sutures, costate or not, the valves flat or convex, often bearing uncinate (hooked) hairs, usually beaked by the persistent style or style base, splitting spirally, twisting; seeds subglobose or subreniform, glabrous, smooth or with a sticky coat. *Cleistogamous flowers* uncommon, inconspicuous

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[26] A complete list of generic synonyms is provided by Hutchinson (1967). Only *Clitoria* and *Neurocarpum* have been used for Panamanian material.

unless with fruit, petals usually lacking; the calyx infundibular, small, persistent in fruit, bracteolate, 5-lobed; stamens short, free or diadelphous, ovary similar to chasmogamous flowers but smaller, style bent abruptly back towards the base and the stigma in contact with anthers.

Clitoria is a genus of about 60 species, mostly located in the tropics with a few species in temperate zones. The bulk of the genus is neotropical. Tree species are rare and all neotropical. A number of shrubs have climbing tendencies. Several liana species can exist as erect shrubs when grown in open areas. Many species are associated with sandy soil.

The genus is of little economic use. *Clitoria ternatea* is frequently cultivated for ornament as a bushy creeper or as a trellis climber. It is often used as a forage crop for livestock which graze on the pods and leaves. In India, every part of the plant is reported used for medicinal purposes. A few other species are cultivated on a limited scale, planted as contour hedge plants to reduce erosion, to beautify roadways, or as attractive additions to gardens. A few species are used locally for bushrope, fish poisons, or placed in brews to "make a man out of you."

Some species exhibit great variation in leaf size and form, pubescence, stipule or stipel size, and the size of the flower parts, and these variations often can be observed in the same population or on the same plant. The frequently minute and inconspicuous uncinate (hooked) hairs must be viewed with a 25–30× or greater magnification. They are best seen by looking along the edge of a surface or along nerves. Surfaces bearing only uncinate hairs may appear glabrous to the naked eye, e.g. leaf uppersides of *C. guianensis, C. polystachya,* etc. Cleistogamous flowers are common in some species but are often overlooked by collectors. Three Panamanian species are known to bear cleistogamous flowers. Two of these species, *C. polystachya* and *C. guianensis,* are poorly collected from Panama. *Clitoria polystachya* material has deteriorated remnants of the cleistogamous flowers. None of the Panamanian specimens of *C. guianensis* bear cleistogamous flowers.

Clitoria is frequently confused with the genus *Centrosema*. Some members of these genera are superficially similar in appearance, but *Clitoria* differs from *Centrosema* in having funnelform rather than campanulate calyx, a spurless standard, wing petals extending beyond the keel, elongate, apically bent styles bearded lengthwise, and in usually having a stipitate fruit often thickened only along one suture, and with only 1 prominent longitudinal nerve.

Literature:

Bentham, C. 1858. Synopsis of the genus *Clitoria*. Jour. Linn. Soc., Bot. 2: 33–44.

Croat, T. 1974. Notes on the genus *Clitoria* (Leguminosae) in Panama. Phytologia 29: 130–134.

Howard, R. A. 1967. Notes on the cultivated woody species of *Clitoria* (Leguminosae). Baileya 15: 15–18.

a. Leaflets 5 or 7, upper surface with scattered appressed trichomes; inflorescence 1-flowered; bracteoles broadly ovate to orbicular, 5–8 mm wide; legume subsessile ------- 6. *C. ternatea*

aa. Leaflets 3, upper surface glabrous or with only uncinate trichomes (viewed at 30×); inflorescence 2- to several-flowered; bracteoles lanceolate to ovate, 1–4 mm wide; legume stipitate.
  b. Calyx teeth 8–15 mm long; bracteoles 7–15 mm long; leaflet apex obtuse to emarginate; legume costate with one prominent medial nerve on each valve.
    c. Petiole 3–5 mm long; flowers 5–7(7.5) cm long, bluish lavender to pink; pedicels 5–9 mm long; calyx tube 15–22 mm long, 8–11 mm wide at the throat; erect suffruticose perennial ---------- 3. *C. guianensis*
    cc. Petiole 25–45 mm long; flowers 4–5 cm long, white, drying yellow; pedicels 2–4 mm long; calyx tube 11–15 mm long, 4–7 mm wide at the throat; herbaceous vine ---------- 1. *C. falcata*
  bb. Calyx teeth 2–5(–6) mm long; bracteoles 3–6 mm long; leaflet apex acute to acuminate; legume ecostate.
    d. Flowers pink to rose, occasionally pale violet, 6–8 cm long; calyx tube 17–24 mm long, 9–12 mm wide at the throat; staminal column 43–49 mm long; stipe 20–37 mm long; legume densely pubescent; liana, rarely an erect shrub ---------- 4. *C. javitensis*
    dd. Flowers white, 2.5–4 cm long; calyx tube 7–12 mm long, 5–7 mm wide at the throat; staminal column 18–21 mm long; stipe 4–12 mm long; legume glabrate; erect shrub or tree.
      e. Leaves glabrous beneath; peduncles subsessile, to 1 cm long; blade of keel 8–10 mm long, 4–5 mm wide; legume 11–20 cm long, valves flat; stipe 10–14 mm long; tree 4–12 m tall ---------- 2. *C. glaberrima*
      ee. Leaves conspicuously pubescent beneath; peduncles elongate, 5.5–8 cm long; blade of keel 6–8 mm long, 2–3 mm wide; legume 3.5–4.5 cm long, valves turgid; stipe 4–7 mm long; shrub 0.6–5 m tall ---------- 5. *C. polystachya*

1. **Clitoria falcata** Lam., Encycl. Méth. Bot. 2: 51. 1786. TYPE: Saint-Domingue (P-JU, not seen).

C. rubiginosa Juss. ex Pers., Syn. Pl. 2: 303. 1807. TYPE: Saint-Domingue (P-JU, not seen).
C. glycinoides DC., Prodr. 2: 234. 1825. TYPE: Guiana Gallica, *Poiteau* (K).
Neurocarpum argentum Duch. & Walp., Flora 36: 228. 1853. TYPE: Panama (GOET?—not seen).

Herbaceous *vine,* twining and scandent; stem filiform, 2–3 mm thick, hollow, pubescence uncinate, densely rufo-pilose, becoming less reddish, pilose hirsute to glabrous near the base, striate, infrequently branched, the internodes 7–16 cm. *Leaves* trifoliolate, oblong elliptic, occasionally ovate, the apex obtuse, retuse, mucronate, the base obtuse to rotund, 3.5–7(9) cm long, 1.5–5 cm wide, dark green and glabrous above, pale and densely pilose below, becoming scattered pilose with uncinate hairs on nerves, the veins weakly raised above, prominently raised below, primary nerves 7–9 pairs, alternate, obliquely ascending, secondary nerves reticulate; petiole 2.5–4 cm long, weakly 4-angled to terete, abruptly bent at the base forming an acute to right angle with the stem, pubescent; rachis 0.5–1.5(2.3) cm, similar to petiole; stipules persistent, broadly ovate, acute, striate, pubescence uncinate, sparsely pilose, ciliate, 3–5 mm long, 3–3.5 mm wide; stipels persistent, linear lanceolate, acute, striate, pubescent, 3–7 mm long, 0.5–1 mm wide, longer than petiolules, the terminal stipels slightly shorter than lateral stipels; petiolules 4-angled, 3–4 mm long, dark colored, pubescence uncinate, densely pilose. *Inflorescence* of axillary racemes, 2 or 4(6) flowered, bearing either chasmogamous or cleistogamous flowers, chasmogamous flowers with the peduncle subequal to longer than petiole and rachis, 5–13 cm, the pubescence pilose, uncinate; bracts 4, inner pair not seen, 3–5 mm long, 1.5 mm wide, lanceolate, striate, acuminate, pubescence uncinate, pilose ciliate, becoming re-

flexed in age, outer pair usually narrower; pedicels 2–4(5) mm; bracteoles 7–12 mm long, 3–3.5 mm wide, lanceolate, striate, acuminate, pubescence uncinate, moderately pilose, ciliate, inserted 0.5–1 mm below the calyx; cleistogamous inflorescences with the peduncle 4–6.5 cm long, pilose and uncinate hairs; the bracts 3–3.5 mm long, 0.7–1.3 mm wide; the pedicels 2–3 mm; the bracteoles 6–7 mm long, 1.5–2 mm wide, inserted 0.5–1 mm below calyx. *Chasmogamous flowers* showy, lavender or white, sometimes becoming yellow with age; calyx tube 11–15 mm long, 4–7 mm wide at throat, pubescence uncinate, pilose, the lobes 9–13 mm long, ovate lanceolate, long acuminate, ciliate, 2–4 mm wide at base, the ventral lobe 12–14 mm long; standard 4–5 cm long, 3–4 cm wide, with sparse, appressed hairs denser along nerves and towards the margin, the apex ciliate, the wings extending beyond the keel 5–7 mm, the blade 14–17 mm long, 4–7 mm wide, the claw 9–13 mm long, the keel falcate, 7–9 mm across, 3–4 mm wide, the claw 16–18 mm; staminal column 20–27 mm long, incurved at tip, the free filaments 1–3 mm long, the anthers 1–1.2 mm long, 0.4–0.8 mm wide; ovary ca. 8 mm long, with dense white appressed, ascending hairs, the style 14–18 mm long, bearded, the stigma dilated; *cleistogamous flowers* inconspicuous, calyx tube 5–6 mm, 1.5 mm wide at the base to 2–3 mm wide at the throat, the lobes 5–7 mm long; corolla lacking. *Fruit* brown, slightly curved, biconvex, weakly compressed becoming subquadrangular, costate, 3–4.5(5) cm long, 8–9 mm wide, the pubescence uncinate and with few spreading hairs; stipe 8–9 mm long, enclosed in the calyx with the base of fruit; seeds cuboidal with rounded edges, a slight depression on the lateral faces, 4.5 mm long, 4 mm wide, brown, sticky, 5–8 per pod.

Clitoria falcata is found in Panama in disturbed open areas and savannas, and according to Croat (1974), "in tropical dry forest, premontane moist forest, and tropical moist forest along the Pacific slope." The species occurs in tropical South America, Central America, the West Indies, and tropical Africa.

Plants with chasmogamous flowers have been collected from September through January and with fruits from mid November to early December. Collections of cleistogamous flowers are infrequent, and all such collections were made in December. Cleistogamous flowers were often present with fruit or on the same plant with showy flowers.

CANAL ZONE: Ancón, road to Corozal, *Celestine 37* (US). Roadside near Madden Wye, *Croat 12617* (MO). Road C 21 near Police Lodge, *Croat 12984* (MO). Río Azote Caballo, 66–70 m, *Dodge et al. 16821* (GH, MO). Road C-21, *Duke 5772* (GH, MO). Road K5-16, *Duke 8970* (MO). Paraiso, *Dwyer 7155* (GH, MO). E of Fort Clayton, *Harvey 5102* (F). Hills E of Curundu, *Harvey 5193, 5195* (both F). Paraiso Station, *Hayes 173* (GH), *798* (NY). Corozal, *Killip 3255* (US). Ancón Hill, *Standley 25204* (MO, US). Balboa, *Standley 25416* (MO, US). Río Pedro Miguel near East Paraiso, *Standley 30039* (US). Survival school area, Curundu, *Tyson 1302* (MO, SCZ). Howard Air Force Base near Red Devil Drop Zone, *Tyson 1867* (MO, SCZ). Barro Colorado Island, *Woodworth & Vestal 693* (GH, MO). CHIRIQUÍ: Concepción, 100–200 m, *Burt & Koster 142* (MO). David airport, 25 ft, *Lewis et al. 765* (GH, MO). COCLÉ: Río Guias, *Gentry 5837* (MO). 4 mi W of Antón on Río Chico, *Tyson & Blum 2599* (MO, SCZ). PANAMÁ: El Valle, 350 m, *Burt & Rattray 32* (MO). La Chorrera, *Dodge et al. 16739* (GH, MO). Tocumen, *Dwyer 2993* (MO). San Jose Island, *Harlow 84* (GH). Sabanas, *Heriberto 160* (NY, US). San Jose Island, *Johnston 195* (BM, GH), *829* (GH). Without other location, *Killip 3246* (US). Corozal Road near Panamá, *Standley 26803* (US). Tumba Muerto Road near Panamá, *Standley 29791* (US). Between Matías Hernández & Juan Díaz, *Standley 32066* (US). Camino a Chepo en el centro de Instrucción Militar, *Taylor 125* (MO). PROVINCE UNKNOWN: *Halstead 1850* (NY).

2. **Clitoria glaberrima** Pittier, Bol. Soc. Venez. Ci. Nat. 8: 264. 1943. TYPE: Santa Lucia, Miranda, Venezuela, *Killip & Tamayo 37021* (VEN, holotype; isotypes F, GH, K, NY).

Tree 4–12 m tall, 8.5–38 cm dbh, the pubescence uncinate; branches terete, 3–7 mm thick, glabrous; twigs strigose and uncinate, soon glabrous, drying striate sulcate. *Leaves* trifoliolate 6–16 cm long, 3–9 cm wide, ovate, the apex abruptly narrowed to an acumen, 1–2 cm long, 2–8 mm wide, acute or obtuse, often mucronate, the base rotund to obtuse, glabrous both sides or sparsely pubescent on the midrib, light green, concolorous, membranous; veins impressed above, conspicuously raised below, the lateral veins mostly 7–10, alternate to subpaired, oblique, straight, the tips arcuate, minor veins conspicuously reticulate; petiole long, 3–9 cm, glabrous or glabrate, striate, twisting; rachis 1–4 cm long, as petioles; stipules caducous, 5–7 mm long, lanceolate, acute, striate, pubescence uncinate and sparsely strigose, apically ciliate; stipels caducous, 4–7 mm, subulate (not seen in Panamanian material); petiolules 5–7(9) mm long, weakly 4-angled, rugose, glabrous. *Inflorescences* axillary or at denuded nodes, contracted, to 1 cm long, several flowered; pedicels 3–5 mm long, usually paired, slender, pubescence uncinate, becoming 7–9 mm long in fruit, woody, 2–3 mm thick; bracts 3–5 mm long, lanceolate to ovate, striate, pubescence uncinate; bracteoles 3–5 mm long; inserted 0.5–2 mm below the calyx, deciduous, lanceolate, striate, pubescence uncinate. *Flowers* showy, chasmogamous, white or purple; calyx tube 7–12 mm long, 3–5 mm wide near the base to 5–7 mm wide at the throat, nervate, glabrate, pubescent, the lobes broadly deltoid, the apex acute to acuminate, 2–3 mm long, occasionally to 5 mm long with subulate apex, the ventral lobe subulate, uncinate ciliolate, becoming scarious, 3–6 mm; standard 2.5–4 cm long, 2–2.5 cm wide, white or deep blue, lilac, to purple with darker purple veins at the center, pubescence uncinate, the claw ca. 7–8 mm, the wings white, extending beyond the keel 4–6 mm, oblong with expanded apex, 12–18 mm long, 5–7 mm wide, the claw 8–12 mm long, the keel white, falcate, 8–10 mm across, 4–5 mm wide, the claw 14–21 mm long; staminal column nearly straight, 18–21 mm long, the free filaments 2–3 mm long, incurved, the anthers 1–1.4 mm long, ca. 0.6 mm wide; gynophore ca. 1 mm long, uncinate pubescent, the ovary 9–15 mm long, ca. 1 mm wide, densely white, appressed, sericeous, the style 11–13 mm long, the stigma globular. *Fruit* yellow green, stipitate, usually 1 per node, coriaceous, compressed, swollen around the seeds, depressed between, pubescence uncinate and sparse pilose, the valves straight, (8)11–20 cm long, 16–20 mm wide, twisting 1–1.5 times at maturity, the beak 5–9 mm, the stipe brown, included within calyx, 10–12 mm long, 2–3 mm thick, the expanded tip to 5–7 mm thick, weakly twisted, pilose and uncinate; seeds brown to dark brown, compressed, nearly orbicular, 7–10 mm long, 8–10 mm wide, 2–3 mm thick, smooth, glabrous, 7–12 per pod.

Clitoria glaberrima ranges from Venezuela to southern Mexico, but it is poorly represented in collections outside of Panama. It is found in dry tropical forests. It is found with flowers from August to December, and fruits from October to January.

Venezuelan material differs from the Central American material by having

usually the calyx teeth with subulate tips and teeth 5–6 mm long. Stipules and stipels persist longer. Intermediates are found in Panama with typical teeth to a few with subulate apex tips, and occasionally with stipules. Stipels were not seen in Central American material although scars were present. The distinction in characters is not clear enough to warrant separation of varieties.

CANAL ZONE: 1 mi beyond Madden Dam bridge, *Correa & Dressler 353* (MO). Hill above Thatcher Ferry Bridge, *Croat 17012* (MO, SCZ). Madden Dam, Boy Scout Road, *Dwyer 8387, 9166* (both MO). Madden Dam, *Lewis et al. 8* (MO, UC, US). Farfan Beach Area, *Tyson 1833* (MO, US), *1839* (MO, SCZ); *Tyson & Blum 2606, 2618* (both MO, US), *2619, 2620* (both MO), *3172* (GH, MO). Madden Dam, *Woodson et al. 1553* (GH, MO, US). COCLÉ: 2.5 mi from El Copé, *McDaniel & Cooke 14775* (MO). LOS SANTOS: Las Tablas, *Dwyer 1180* (MO). PANAMÁ: Isla Tabaguilla, *Duke 5882* (MO). Taboga, *Hayes 687* (K, M); *Killip 3180* (US). Alhajuela, *Paul 496* (US). Without other locality, *Pittier 6647* (US). Matías Hernández, *Pittier 6799* (GH, K, M, P, US).

3. **Clitoria guianensis** (Aubl.) Benth., J. Linn. Soc., Bot. 2: 40. 1858.—FIG. 12.

Crotalaria guianensis Aubl., Hist. Pl. Guiane 761 *tab. 305*. 1755. TYPE: *Crotalaria guianensis* Aubl., French Guiana, *Aublet* (?P, not seen; ?isotype, BM).
Clitoria guyanensis (Aubl.) Standley, Contr. U.S. Natl. Herb. 27: 215. 1928.

Plant suffruticose, perennial, low growing, 10–30 cm tall with uncinate pubescence; root stock woody, 2–7 mm thick, rarely branched, pubescent when young; thickened nodose where stem arises; stems usually 1 or few, erect to ascending, unbranched, becoming weakly zigzag above, the internodes usually 2–5 cm long, straight to weakly arcuate, striate, often purplish above, densely pilose when young, glabrate with age. *Leaves* trifoliate, short petiolate, sometimes the lower leaves unifoliate, sessile; leaflets oblong lanceolate, the apex acute or obtuse, mucronate, the base cuneate, 5–14 cm long, 8–26 mm wide, usually 4–10 times longer than wide, dark green, glabrate with minute uncinate pubescence above, pilose on the nerves, pale glaucescent, glabrescent below, the veins prominent on both sides, impressed above, raised below, primary veins 5–8 pairs, alternate, widely spaced, ascending, upcurved near base, minor veins reticulate, petioles (1)3–5(8) mm long, striate, pubescence uncinate, pilose; rachis (1)2–5(7) mm long; stipules ovate lanceolate, acuminate, 5–11 mm long, 2–3 mm wide, striate, pubescence uncinate, pilose ciliate; stipels linear, striate, 3–8 mm long, 1 mm wide, pubescence uncinate, pilose ciliate; petiolules 1.5–3 mm, pubescence uncinate, pilose. *Inflorescence* axillary, 2-flowered racemes or occasionally 2 pairs of flowers, chasmogamous, or cleistogamous; in chasmogamous flowers the peduncle 0.5–3.5 cm long, longer than the petiole, pubescence uncinate, pilose, striate, expanding at the tip; bracts 2,4,(6), the inner pair deciduous, 2 mm long, ca. 0.2 mm wide, the middle pair persistent, ovate, striate, pubescence uncinate, ciliate, 4–6(9) mm long, 1.5–2.5 mm wide, concave around the pedicel, the outer bracts semideciduous, 3–5 mm long, 1 mm wide; pedicels 5–9 mm long, pilose; bracteoles lanceolate, persistent, striate, pilose, ciliate, 9–12(15) mm long, 2.5–4 mm wide, inserted 1–2 mm below the calyx, rarely alternate and 3–6 mm below the calyx; in cleistogamous flowers, the peduncle 2–7 cm, pedicels 2–3 mm long; bracteoles 4–7 mm long, 1–1.5 mm wide, inserted 0.5–1 mm below the calyx. *Flowers* blue lavender, pinkish or white with a prominent purple to yellowish green midline and nerves on inner surface of the standard; calyx tube 15–

FIGURE 12. *Clitoria guianensis* (Aubl.) Benth.—A. Habit (×½).—B. Flower (×¾).—C. Corolla.—C[1]. Standard (×½).—C[2]. Wing petal (×½).—C[3]. Keel petal (×½).—D. Stamens (×¾).—E. Pistil (×¾). [After *Ebinger 987.*]—F. Fruit. [After *Drouet 2555.*]

22 mm long, 4–6 mm wide at the base to 8–11 mm wide at the throat, pubescence uncinate, pilose, the lobes 8–15 mm long, broad, 5 mm wide at base, oblong to ovate lanceolate, acuminate, ciliate, usually prominently 3-nerved, subequal; standard 5–7(7.5) cm long, 4.5–5.5 cm wide, glabrous outside except weakly uncinate to short ciliate near the tip, the wings extending 7–10 mm beyond the

keel, the blade 21–27 mm long, 7–10 mm wide, the claw 13–19 mm long, the keel falcate, the blade 13–15 mm across, 5–6 mm wide, the claw 22–29 mm long; staminal column 32–37 mm long, persistent, the free filaments 2–5 mm long, incurved, the anthers 1.4–2 mm long, 0.8–1 mm wide; gynophore ca. 6 mm long, the ovary ca. 8 mm long, compressed, linear, costate, densely pubescent, the style ca. 24 mm, the stigma dilated, ca. 8 mm diam. *Fruit* brown, stipitate, weakly convex, the valves 3.5–5 cm long, 6–10 mm wide, the persistent style beak to 11 mm, valves twisting at maturity; stipe enclosed in the calyx, ca. 11–12 mm long; seeds globose, dark reddish brown, smooth, sticky, glabrous, 3.5–4 mm long, 3–3.5 mm wide, 7–8 per pod; fruit of cleistogamous flowers 7–11 mm wide, glabrate, with violet sutures. *Cleistogamous flowers* small, inconspicuous corolla 1–2 mm, usually lacking; calyx tube 5–9 mm long, 1.5–2 mm wide at the base, 2–5 mm wide at the throat, pubescence pilose, minutely pubescent, the lobes 2–4 mm.

Clitoria guianensis ranges from tropical South America to southern Mexico, and is also present on some of the West Indian Islands. This species is frequently confused outside Central America with a superficially similar species of South America, the West Indies, Africa, and the East Indies. This second species is usually called *Clitoria laurifolia* Poir. or *C. cajanifolia* Benth. and is easily distinguished from *C. guianensis* by its sericeous, grayish-canescent leaflets below.

Clitoria guianensis is found in Panama in dry open pastures, savanas, and roadsides of tropical moist forest and premontane forest. Flowering occurs from January to August. Fruits were collected in March, July and August. Cleistogamous flowers are yet unknown from Panama but the majority of fruiting specimens from South America result from cleistogamy. They are borne from January to June.

This species shows wide variation in size of leaflets, stipules, bracteoles, and calyx.

CHIRIQUÍ: Without locality, *Wagner,* May 1858 (M). COCLÉ: Llanos outside of Penonomé, *Ebinger 1011* (F, MO). Penonomé and Coclé, *Stern et al. 987* (MO). Penonomé, 50–1000 ft, *Williams 99* (NY). PANAMÁ: Taboga Island, *Allen* 115 (MO). Cerro Campana, *Bartlett & Lasser 16905* (MICH); *Croat 14192* (F, MO); *Dwyer et al. 4844* (MO). Taboga Island, 0–250 m, *Miller 2022* (US); *Pittier 3572* (NY).

4. **Clitoria javitensis** (H.B.K.) Benth., J. Linn. Soc., Bot. 2: 42. 1858.

4a. **Clitoria javitensis** var. **portobellensis** (Beurling) Fantz, comb. nov.

Neurocarpum javitense H.B.K., Nov. Gen. Sp. Pl. 6: 409. 1823. TYPE: In ripa fluminis Tuamini prope Javitam, Missiones del Rio Negro, Venezuela, *Humboldt & Bonpland* (P).
Clitoria portobellensis Beurling, Kongl. Vetensk. Acad. Handl. p. 119. 1854. TYPE: In silvis montium, Portobelo, *Billberg,* Apr. 1826 (S).

Liana, high climbing to treetops or less commonly an erect shrub 2–4 m tall, the pubescence uncinate; stems to 1 cm thick, the branches terete, 3–8 mm thick, usually hollow, longitudinally striate sulcate, uncinate pubescent and short rufopilose, becoming glabrate; bark dark colored, splitting in longitudinal strips exposing a light-colored interior. *Leaves* trifoliolate, leaflets mostly oblong elliptic, narrowed rapidly to an acumen 1–2 cm long, the apex obtuse to acute, mucronate, the base broad, cuneate to obtuse, upper surface glabrous, short pilose on the midrib, rarely pilose on the primary nerves, the lower surface pilose to strigose,

becoming glabrate with few scattered hairs or hairs confined to midrib and major nerves, 7–15(18) cm long, 3–7(9.5) cm wide, the veins impressed above, raised below, the lateral veins alternate, 9–13 pairs, basally parallel to the midrib, then straight ascending with arcuate tips, minor nerves conspicuous, nearly parallel and perpendicular to the lateral veins from the middle to the tip, minor veins conspicuously reticulate; petiole 4–11 cm, longitudinally striate sulcate, often gradually twisting, the pubescence uncinate and rufo-strigose to pilose, glabrescent; rachis 1–3 cm long, stipules deciduous, ovate to lanceolate, (4)6–7 mm long, 2–3 mm wide, striate, pubescence strigose, the apex densest and ciliate; stipels linear to subulate, subequal to shorter than petiolule, deciduous, lateral stipels 4–7 mm long, 1.5 mm wide, the terminal stipels 1–3 mm long, 0.5–1 mm wide, pubescence uncinate and strigose to pilose; petiolules (3)4–6(8) mm long. *Inflorescences* axillary and cauliflorous, 0.5–4 cm long, several flowered, the internodes crowded 4–8 mm long, flowers usually paired at the nodes, axes usually densely pilose; bracts usually 3, persistent, 4–6 mm long, 1.5–3 mm wide, ovate, acuminate, weakly concave and appressed to pedicel, spreading to reflexed in age, striate, pubescence uncinate and strigose; pedicels 4–6 mm, strigose pilose, 1 mm thick, becoming 5–8 mm long in fruit, 3 mm thick, glabrate; bracteoles ovate to lanceolate, 4–6 mm long, 1.5–3 mm wide, acuminate, strigose ciliate, striate, inserted 1 mm below calyx. *Flowers* showy, chasmogamous, various shades of pink, rarely violet, the standard having darker pink, red, to purple lines within, the wings and keel white to pale pink; calyx tinged purple, finely strigose, striate, the tube 17–24 mm long, 5–8 mm wide near base to 9–12 mm wide at the throat, the lobes 4–5(6) mm long, broadly ovate, ca. 3 mm wide at the base, abruptly narrowed to the 2 mm long acumen, strigose and tinged red; standard (5.5)6.5–8.0 cm long, 3.5–4.5 cm wide, claw ca. 15–19 mm, densely rufo-velutinous outside in bud, tawny tomentose at maturity, the wings extending beyond the keel 8–10 mm, the blade 25–30 mm long, 7–10 mm wide, the claw ca. 18–27 mm and uncinate pubescent, densest near the base of the blade, the keel falcate, the blade 11–17 mm across, 4–6 mm wide, the claw 30–38 mm; staminal column nearly straight, 43–49 mm long, the free filaments 3–4 mm, curved abruptly inward, the anthers 1.8–2 mm long, ca. 0.7 mm wide; gynophore ca. 1 mm long, densely pubescent, the ovary 18–22 mm long, 1.5–2 mm wide, dense rufo-tomentose, the style 16–25 mm long, pilose bearded and uncinate, the stigma subcapitate, ca. 0.9 mm wide. *Fruit* stipitate, brown, hanging, the valves flat but weakly turgid around the seeds, densely rufo-strigose, 19–23 cm long, 18–24 mm wide, the beak usually 4–6 mm long, twisting at maturity, the stipe 24–33 mm long, 2–3 mm thick, included in the persisting calyx to shortly exserted, pubescence uncinate and reddish pilose strigose; seeds nearly orbicular, compressed on 2 sides, dark brown, smooth without a sticky coat, 9 mm long, 9–10 mm wide, 3 mm thick.

This showy species is noted throughout Panama for its pink flowers flowering from September to May with most collections of flowering specimens during December through February. Fruits are infrequently collected, usually in April and May, although *Gentry 2279* collected fragments of the fruit, perhaps from the previous season, in October, and *Gentry 4438* collected juvenile fruits in February.

BARRO COLORADO ISLAND: *Aviles 85a* (MO); *Bangham 599* (F, GH); *Brown 101, 136* (both F); *Croat 4216* (MO, NY), *4615* (MO), *4853* (F, MO, SCZ), *4967, 5067, 5285, 5333, 5595, 6605, 6734, 7071, 7077, 7091, 7340A, 7732, 7929, 8289, 8497, 8905, 9310, 12847* (all MO); *Duke 15039* (NY); *Dwyer 8452* (GH, MO); *Frost 8211/2* (F); *Graham 204* (GH); *Hunnewell 16424* (GH); *Killip 40030* (F, MO); *Montgomery 74* (MO); *Shattuck 312* (F, MO); *Wetmore & Abbe 6* (F, GH, MO), *6A* (GH, MO); *Wetmore & Woodworth 64, 71* (F, GH); *Woodworth & Vestal 347* (F, GH), *478* (F), *598* (F, GH), *675* (F, GH, MO), *735* (F, GH); *Wilson 23* (F, MO); *Zetek 15002* (F). CANAL ZONE: Juan Mina plantation, Río Chagres, region above Gamboa, 25 m, *Allen 4114* (G, MO). Gamboa, *Allen 3931* (G, MO). Frijoles, *Croat 13223* (MO). W arm of Quebrada Salamanca, 70 m, *Dodge et al. 17007* (G, GH, MO). Pipeline Road, 2–4 mi N of Gamboa, 100 m, *Gentry 6531* (MO, USF). Between Summit and Gamboa, *Greenman & Greenman 5239* (MO). Around Gorgona, *Guillard 2405* (US). Frijoles Station, *Hayes 492* (BM, E, K, M). Chagres River near Gatún, *Hayes 679* (NY). Gamboa Road, *Jones 268* (US). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5107* (US). Empire to Mandinga, *Piper 5140* (US). Culebra, 50–150 m, *Pittier 2231* (US). Between Alhajuela & El Vigia, *Pittier 2368* (US). Between Gorgona & Mamei, 10–30 m, *Pittier 2405* (GH, NY). Hills around Agua Clara Reservoir near Gatún, 20–30 m, *Pittier 2652* (F, NY, S, US). Las Cascada Plantation, *Standley 29557* (US). CHIRIQUÍ: Corotú, 6 m SW of airport of Puerto Armuelles, *Busey 399* (MO). Quebrada Manzanillo, 9 km S×SW of Puerto Armuelles, *Busey 733* (MO). COLÓN: Portobelo, *Billberg*, Apr. 1826 (S). Near Salamanca, 8 mi E of Transisthmian Highway, 100 m, *Gentry 6704* (MO). 10 mi SW of Portobelo, 2–4 mi from coast, 10–200 m, *Liesner 1084* (MO). Peluca, ca. 27 km from Transisthmian Highway on road to Nombre de Dios, Trail to Río Boqueron, *Kennedy 2642* (MO). DARIÉN: Río Sambú, 0–5 mi above Río Venado, *Duke 9262* (MO, NY, US). Piñas, *Duke 10617* (MO). Quebrada Sierre from Río Tuira to track between Ríos Cube & Ponus, *Gentry 4438* (MO). Mannene to Mouth of Río Cuasí, *Kirkbride, Jr. & Bristan 1402* (MO). Lucutí, Chepigana District, 50 ft, *Terry & Terry 1372* (F, GH, MO). PANAMÁ: San Jose Island, *Andersson 1852* (S). Panamá, *Cumming 1142* (BM, GH, K). San Jose Island, *Erlanson 35* (G, NY, US), *177* (GH). Río Pasiga to above waterfall on 2nd main fork, *Gentry 2279* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 92* (G, MO). San Jose Island, *Johnston 538, 628* (both GH), *670* (GH, MO), *1351* (GH). Panamá, *Sinclair* (K).

5. **Clitoria polystachya** Benth., Pl. Hartw. 60. 1840. TYPE: prope Talea, Mexico, *Hartweg 454* (CGE, K).

Clitoria multiflora Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 10: 188. 1843. SYNTYPES: Bois de Comaltepeque, Oaxaca, Mexico, *Galeotti 3232* (BR, F, G). Savanas, Cordillera, Mirado, Vera Cruz, Mexico, *Galeotti 3290* (BR).

Clitoria velutina Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 24. 1940. TYPE: Panama, *Davidson 784* (F, holotype; isotypes A, MO).

Shrub 0.6–5 m tall; branches 3–6 mm thick, pubescence dense, short, tawny, spreading pilose on juvenile branches, becoming gray, glabrate, the internodes 1–4 cm long. *Leaves* trifoliolate, membranous, oblong lanceolate to oblong ovate, dark green with uncinate pubescence and occasional scattered hairs above, dull, pale green, moderately dense, velutinous pilose below, the apex long acuminate, the mucro to 2 mm long, the base rotund to weakly emarginate, 4–11.5 cm long, 2–5 cm wide, the veins impressed above, raised below, primary veins 8–12, alternate, straight with arcuate tips; petioles 4–8 cm, angular, striate, densely tawny spreading pubescent; rachis 1–3 cm; stipules persistent, 6–8 mm long, 1.5–2 mm wide, attenuate, 1–2 mm, linear lanceolate, acute, striate, densely pilose; stipules persistent, terminal 4–7 mm long, lateral 6–10 mm long, 0.5–1 mm wide, linear, acute, densely pilose. *Inflorescence* an axillary few-flowered panicle, the flowers chasmogamous or cleistogamous, pubescent, in chasmogamous flowers the inflorescence 5.5–8 cm long, internodes 6–10 mm long, the lateral branches short, 4–6 mm long, 2–3 flowers per branch; bracts usually 2, 4–5 mm long, linear, acute, densely pilose; pedicels 3–5 mm; bracteoles persistent, 6 mm long, 1 mm wide, inserted 1–2 mm below the calyx, linear, acute, densely pilose; in cleistogamous flowers the inflorescences to 2 cm; bracts 2–3 mm long, the pedicels 2–3 mm

long; bracteoles 3–4 mm. *Flowers* with cleistogamous flowers inconspicuous; petals absent; calyx tube 5–6 mm long, 1–1.5 mm wide at the base to 2 mm wide at the throat, pilose, lobes 2 mm, chasmogamous flowers white with dark red centers inside the standard; calyx tube 8–11 mm long, 2–3 mm wide at the base to 5–6 mm wide at the throat, sometimes oblique to the pedicel, pubescence uncinate, pilose, the lobes deltoid ovate, 3–4 mm long, 2 mm wide at base, acuminate, sparsely pubescent, the ventral lobes 6–7 mm long; standard 2.5–3 cm long, 19–20 mm wide, moderately strigose, the wings extending beyond the keel ca. 2–3 mm, the blade ca. 12 mm long, 5 mm wide, the claw ca. 11 mm long, the keel falcate, ca. 6 mm across, 3 mm wide, the claw ca. 15 mm long; staminal column ca. 18–19 mm long, free filaments 2–3 mm, incurved, the anthers 1 mm long, 0.4 mm wide; ovary ca. 8 mm long, 0.8 mm wide, with dense white, appressed hairs except near the mid lateral face, the style ca. 14 mm long, curved abruptly 5 mm from tip. *Fruit* stipitate, brown, weakly convex, ecostate, the uncinate pubescence sparsely strigose to glabrate, 3.5–4 cm long, 8–8.5 mm wide; seeds dark brown, weakly reniform, the base and apex truncate, sticky, 2–2.5 mm long, 3.4 mm wide, 2 mm thick.

This species is known in Panama from only two collections. In northern Central America, the species is often found in pine forests or oak woods at 800–2,300 m or occasionally to 5,000 m. The species bears chasmogamous flowers from June to October. Cleistogamous flowers and fruits are known from June, August, and November to January.

CHIRIQUÍ: Savanna, Boquete, 5000 ft, *Davidson 784* (A, F, MO, US). Cerro de Lino above Boquete, *Pittier 3025* (US).

6. **Clitoria ternatea** L., Sp. Pl. 2: 753. 1753. TYPE: herb Linnaeus (LINN 902.1, not seen; microfiche seen).

Herbaceous vine, twining in understory; stems terete, 1–2 mm thick, weakly striate, strigose, densely strigose when juvenile, branched near the base, infrequently branched above, internodes usually 5–15 cm long. *Leaves* odd pinnate; leaflets 5 or 7, membranous, ovate or elliptic, the apex retuse, mucronate, the base cuneate to broadly cuneate, 1.5–4.5 cm long, 1–3.5 cm wide, concolorous, the upper surface with scattered strigose hairs to glabrate, strigose to sparse strigose below, more conspicuous on major nerves, the veins weakly raised above, conspicuously raised below, primary veins 5–6 pairs, alternate, ascending minor nerves reticulate, marginal nerve strigose; petiole 1.5–3 cm, weakly striate sulcate, strigose; rachis 2–6 cm long, internodes 1–2.5 cm long, weakly striate, often adaxially canaliculate, strigose; stipules persistent, linear, 4(5) mm long, 0.5–0.8(1.0) mm wide; striate, pubescence uncinate, sparsely strigose; stipels persistent, acicular, inconspicuous, pubescence uncinate, sparsely strigose, 1–2 mm long; petiolules subquadrangular, pubescence uncinate, strigose, 2(3) mm long. *Inflorescence* reduced to a solitary, axillary, chasmogamous flower; peduncle (4)7–12 mm, glabrous, the apex with 2 pulvini; bracts 2, ovate, acuminate, striate, concave and appressed to the pedicel or spreading ascending, the pubescence uncinate, ciliate, 2–3 mm long, 1 mm wide; pedicel strigose and uncinate, often twisting or bending at the swollen base, 3–6 mm long; bracteoles conspic-

uous, membranous, broadly ovate to nearly orbicular, appressed to the calyx, pubescence uncinate, sparsely strigose 6–10 mm long, 5–8 mm wide. *Flowers* showy, blue to violaceous; calyx membranous, conspicuously nerved, glabrate with uncinate hairs and rarely few scattered strigose hairs, the tube 9–14 mm long, 7–9 mm wide at the throat, the lobes 8–12 mm long, 3 mm wide at base, oblong, apically rounded, the excurrent nerve 1–2 mm long, ciliate, with uncinate hairs on nerves; standard 3.5–5.5 cm long, 2.5–3 cm wide, emarginate, the edges drying purple with strigose and uncinate hairs outside, denser towards the margin, the wings colored as the standard, the blade ca. 26 mm long, ca. 12 mm wide, extending beyong the keel 8–10 mm, the claw ca. 8 mm long, the keel falcate, ca. 9 mm long, ca. 6 mm wide, the claw ca. 15–17 mm; staminal column 17–19 mm, nearly straight below, weakly curved for last 3–4 mm, the free filaments 3–4 mm long, the vexillary filament curved, the anthers 1 mm long, 0.6–0.8 mm wide; gynophore ca. 1 mm long, the ovary 11–12 mm long, 1.5 mm wide with dense appressed ascending white hairs, the style ca. 15 mm, basally pubescent, becoming bearded towards the apex, densely bearded below the stigma. *Fruit* subsessile, basally enclosed at the base within the calyx, splitting the calyx tube, light brown becoming tan, slightly thickened along both sutures, the pubescence uncinate and strigose, becoming sparse with age; valves 10–11 cm long, 9–11 cm wide, nearly straight; seeds rectangular subreniform, smooth, glabrous, 5–6 mm long, 4 mm wide, 1.5–2 mm thick, 10 per pod.

A native of the Old World tropics, *Clitoria ternatea* is frequently prized in the neotropics, including Panama, as a cultivated ornamental. It often escapes and flourishes. Double flowered and white flowered forms from cultivation are known.

Specimens have been collected in flower in Panama in February, April, July, August, and November. Specimens with mature fruits and flowers were collected in February and August.

PROVINCE UNKNOWN: Panamá, *Andersson*, Apr. 1852 (S). *Mell*, 8 Feb. 1926 (NY). BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *Wedel 1771* (GH, MO). Little Bocas, Chiriquí Lagoon, *Wedel 2511* (GH, MO). CANAL ZONE: Government forest along Cruces Trail, 75 m, *Hunter & Allen 740* (GH, MO). Balboa, *Wall 383* (S). PANAMÁ: Punta Paitilla, *Taylor & Correa*, 12 Aug. 1970 (MO).

13. COLOGANIA

W. G. D'Arcy[27]

Cologania Kunth, Mimoses 205. 1819. LECTOTYPE: *C. angustifolia* Kunth.

Perennial *herbs* or *vines*; stems mostly slender, glabrate to pilose. *Leaves* 1–3-pinnate trifoliolate, leaflets ovate, oblong, or linear, mucronulate, pellucid, stipels subulate; stipules narrow, somewhat striate. *Inflorescences* axillary, short racemes or solitary flowers, sometimes aggregated as few flowered panicles, sometimes the flowers clustered to appear umbellate; bracts and bracteoles persistent, the bracteoles 2, inserted below the calyx and mostly much shorter than the calyx; pedicels evident. *Flowers* violet, showy; calyx tubular, the upper 2 teeth at least partly connate, the lowest tooth longest, somewhat gibbous basally;

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standard elliptical, emarginate, erect, laterally reflexed, wings oblong, the claw obtuse, the keel much smaller than the wings; stamens diadelphous, the vexillary stamen free, the anthers alike or alternate ones slightly smaller; ovary linear, pubescent, many ovuled, stipitate, the style incurved, glabrous, the stigma globose. *Legume* linear, compressed, elastically dehiscent by 2 valves, pilose; seeds numerous, compressed, lenticular or quadrate, the hilum oblong.

Cologania is distinguished mainly by its tubular calyx. The genus is best developed in Mexico, but ranges southward to Argentina and north into the southern United States. It includes 6–10 species. A few species have been cultivated for ornament.

Literature:

Rose, J. N. 1903. Synopsis of the species of *Cologania*. Contr. U.S. Natl. Herb. 8: 34–42.

a. Leaves trifoliolate, the leaflets ovate, chartaceous or membranaceous, the lateral venation ascending at about 45° ---------- 1. *C. biloba*
aa. Leaves unifoliolate (simple), the leaflets linear to narrowly ovate, subcoriaceous, the lateral venation strongly ascending ---------- 2. *C. procumbens*

1. **Cologania biloba** (Lindl.) Nicholson, Gard. Dict. 1: 363. 1884–9.

Glycine biloba Lindl., Bot. Reg. *tab. 1418.* 1831.

Trailing *herb*; stems slender, pilose. *Leaves* pinnate trifoliolate, the leaflets ovate, mostly 1.5–2.5 cm long chartaceous, apically obtuse, mucronulate, slightly lighter and the venation more prominent beneath, short pilose on both sides, basally rounded; petiolules 1–2 mm long, pilose; rachis ca. 3 mm long; petioles rarely as long as the terminal leaflet; stipels shorter than the petiolules; stipules ca. 2 mm long. *Inflorescence* 1–?2-fasciculate, axillary, the pedicels ca. 5 mm long) bracteoles 2, subulate, ca. 3 mm long, inserted near the top of the pedicel and barely exceeding it. *Flowers* showy, blue; calyx tubular, ca. 10 mm long, 3.5 mm wide, spreading pilose, the teeth short; standard exserted ca. 11 mm from the calyx. *Legume* not seen.

This species is known in Panama from only one collection taken on the lava flows west of El Baru, the same area where the other species of *Cologania* has been collected. The two species are amply different in leaf shape and pubescence.

Cologania biloba is one of a species complex which ranges from Panama to the southern United States. The name used here is supported by a good color illustration which resembles the Panamanian plant. Only one other name in the complex, *C. broussonetii* (Balb.) DC., based on *Glycine broussonetii* Balbis (1813) is older. Neither the name *C. biloba* nor *C. broussonetii* is in current use for plants of Central America, but none of the later names is clearly more acceptable for application to the Panamanian population.

CHIRIQUÍ: 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5832* (FSU, MO).

2. **Cologania procumbens** Kunth, Mimoses 205, *tab. 57.* 1819. TYPE: Colombia, *Humboldt & Bonpland,* not seen.—FIG. 13.

Trailing perennial *herb,* rootstock stout; stems short pilose with reflexed white hairs, branching mostly near the base. *Leaves* 1-foliolate, narrowly ovate to linear, mostly obtuse, mucronulate, basally rounded, often minutely cordate, subcoriaceous, glabrate, lateral nerves strongly ascending; petiolules less than 1 mm long with some long hairs; petioles mostly less than 10 mm long; stipels subulate, longer than the petiolules; stipules ca. 5 mm long, 0.5–2 mm wide, striate, pubescent. *Inflorescences* axillary 1–2-flowered fascicles; pedicels pilose, 8–15 mm long; bracts stipule-like; bracteoles subulate, long ciliate, 2–3 mm long, inserted ca. 1 mm below the calyx. *Flowers* showy, light purple; calyx tubular, 7–8 mm long, the teeth short, acute, the lowest the longest, sometimes somewhat purplish, sparingly pilose; standard ca. 2 cm long, glabrous, erect. *Legume* linear, ca. 5 cm long, ca. 3 mm wide, somewhat compressed, the beak short or indistinct, the stipe enveloped by the persistent calyx, hispid, especially at the apex; seeds not seen.

This species is distinctive in its unifoliolate, glabrate, coriaceous leaves which may vary considerably in shape on the same plant but which tend to be narrow. The erect blue flowers with erect standard and tubular calyx are good features for recognition.

Cologania procumbens ranges from Mexico to Panama and into South America. In Panama it has been collected on lava flows at ca. 1,000 m elevation.

CHIRIQUÍ: Llanos, slopes of Volcán de Chiriquí along Río Chiriquí Viejo, 1200 m, *Allen 992* (MO). Near Volcán, 1300 m, *Burt & Koster 155* (MO). Chiriquí Viejo Valley, *White 100* (MO, US).

14. CRACCA

Peter S. White[28]

Cracca Benth. in Benth. & Oerst., Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenh. 1853: 8. 1853. Nomen conserv. TYPE: *Cracca glandulifera* Benth.

Cracca L., Sp. Pl. 752. 1753; Gen. Pl., ed. 5. 1754. Nomen rejic. contra *Cracca* Benth. TYPE: *Cracca villosa* L. = *Tephrosia villosa* (L.) Pers. Not *Cracca* Hill, Brit. Herb. 285. 1756. TYPE: not designated, = *Vicia* L. Nor *Cracca* Medic., Vorl. Chrupf. Phys.-Ökon. Ges. 2: 359. 1787. TYPE: *Cracca benghalensis* (L.) Medic. = *Vicia benghalensis* L.

Benthamantha Alef., Bonplandia 10: 264. 1862. TYPE: *Benthamantha glandulifera* (Benth.) Alef. = *Cracca glandulifera* Benth.

Brittonamra Kuntze, Rev. Gen. 1: 164. 1891. TYPE: *Brittonamra caribaea* (Jacq.) Kuntze = *Cracca caribaea* (Jacq.) Benth.

Perennial *herbs,* sometimes shrubby, usually pubescent, at least when young. *Leaves* alternate, imparipinnate, petioled, the lateral leaflets more or less opposite, leaflets 3–many, oblong or elliptic, pubescent, often larger toward the tip of the leaf, petioluled, stipellate, stipulate. *Inflorescence* of axillary racemes, usually relatively few flowered, pedicels solitary in setaceous bracts. *Flowers* with cam-

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FIGURE 13. *Cologania procumbens* Kunth.—A. Habit (×½).—B. Flower (×1½).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×3).—E. Pistil (×3). [After *Allen 992.*]

panulate to funnelform hypanthium, teeth 5, narrow triangular to acuminate, more or less equal, petals yellowish or whitish, clawed, subequal, wing petals free, keel petals fused to apex; stamens diadelphous, odd filament free, alternate filaments from sheath somewhat unequal; ovary sessile, linear, compressed, pubescent, ovules numerous, style bearded along upper inside, the stigma terminal, capitate. *Fruit* sessile, linear, compressed, 2-valved, septate within between the seeds, the partitions marking off regular square or rectangular pockets holding the seeds, constricted outside between the seeds, the valves sometimes coiling in dehiscence; seeds many, compressed and square or rectangular in outline.

Cracca Benth. is a genus of about 10 species distributed from the southwestern United States to Argentina and also in the West Indies. The fruits, which are linear and regularly septate within to form more or less square chambers, are distinctive. Differences with *Tephrosia* Pers. are discussed under that genus.

The nomenclatural confusion among *Cracca* Benth., *Cracca* L., *Cracca* Hill, *Cracca* Medic., *Benthamantha* Alef., and *Brittonamra* Kuntze has also been discussed in the treatment of *Tephrosia* Pers. Two applications of the name *Cracca* were those of Hill (1756) and Medic. (1787), both applying the name to species of *Vicia* L. (1753). *Cracca* L. (1753) (=*Tephrosia* Pers., nomen conserv.) created confusion because it came into general use for *Tephrosia* species in the mid- and late 1800's. During this time, *Benthamantha* Alef. (1862) and *Brittonamra* Kuntze (1891) were proposed for the species of *Cracca* Benth. *Benthamantha* Alef. created nomenclatural confusion since it achieved popularity in the years between its publication and 1930 or so. The conservation of *Cracca* Benth. (1853) over *Cracca* L. (1753) resolved the situation since *Cracca* Benth. is older than both *Benthamantha* Alef. and *Brittonamra* Kuntze.

1. **Cracca mollis** (H.B.K.) Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 9. 1853.—FIG. 14.

Tephrosia mollis H.B.K., Nov. Gen. Sp. Pl. 6: 463. 1823. TYPE: Venezuela (P, not seen; microfiche, MO). Non Valet, Bull. Dept. Agr. Indes Neerl. 10: 17. 1907. TYPE: South Africa, not seen.
Benthamantha mollis (H.B.K.) Alef., Bonplandia 10: 264. 1862.
Brittonamra caribaea fo. *micrantha* (Micheli) Kuntze, Rev. Gen. 165. 1891.
Cracca micrantha Micheli in Durand & Pittier Bull. Soc. Roy. Bot. Belgique 30: 286.
Benthamantha micrantha (Micheli) Rose, Contr. U.S. Natl. Herb. 10: 99. 1906.
B. fruticosa Rose, Contr. U.S. Natl. Herb. 10: 99. 1906. TYPE: Mexico, *Painter & Rose 10087* (US).
B. panamensis Rydb., Fl. No. Amer. 24: 244. 1924. TYPE: Panama, *Pittier 2340* (Holotype, US; isotype, NY).
B. mollis var. *micrantha* (Micheli) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 525. 1937.

Woody-based perennial *herb* or *shrub* to 2 m tall; stems more or less hairy, often with pilose or silky hairs, usually glabrescent. *Leaves* alternate, imparipinnate, leaflets (9–)11–15(–19), ovate or elliptic, rounded at the base, rounded and mucronate at the apex, 6–45 mm long, 4–16 mm wide, mature leaflets averaging 25 mm long, 12 mm wide, larger towards the leaf apex, pubescent on both sides, hairs longer, denser and paler beneath; rachis hairy, to ca. 8 cm long; stipels linear, to 1.5 mm long, stipules linear, apparently deciduous, to 6 mm long. *Inflorescence* shorter than the leaves, of 2–6-flowered axillary racemes, bracts linear, apparently deciduous, ca. 1 mm long, subtending a single pedicel 1.5–3.0 mm long. *Flowers* with hypanthium campanulate, ca. 7 mm long, pubescent, the teeth narrow triangular to acuminate, ca. 4 mm long; petals to 9 mm long, the standard pale pink, apparently usually with darker, purplish stripes, pubescent outside, the wings purplish, glabrous, the keel light yellowish green, glabrous; stamens diadelphous, 10; ovary sessile, linear, the distal ½ of the style hairy, the stigma capitate. *Fruit* linear to oblong, to ca. 7 cm long, ca. 3 mm wide, pubescent or glabrous outside, regularly septate within to form square chambers, flattened and indented between the seeds outside, the style base persistent, 2-valved, the valves twisting on dehiscence, many-seeded; seeds compressed and approximately square, with rounded corners, 1–2 mm long, dark, glabrous.

Cracca mollis (H.B.K.) Benth. & Oerst. is found from Mexico to Ecuador and Venezuela. In Panama it is a more or less weedy plant of dry or disturbed forest.

According to the ranges stated by Rydberg (1924), four species of *Cracca* Benth. occur in Panama: *Cracca ochraleuca* (Jacq.) Benth. ("Peru to Panama");

FIGURE 14. *Cracca mollis* (H.B.K.) Benth. & Oerst.—A. Habit (×4/5).—B. Flower with one wing petal removed (×3 1/5).—C. Wing petal (×3 1/5).

Cracca mollis (H.B.K.) Benth. ("Yucatan . . . south to Ecuador and Venezuela"); *Cracca caribaea* (Jacq.) Benth. ("Hispaniola; Porto Rico; Lesser Antilles; Panama; also in northern South America"); and *Benthamantha panamensis* Rydb. (known only from the type locality in Panama). *Cracca ochraleuca* can be distinguished by the relatively few leaflets (5–7; sometimes 9). *Cracca caribaea* can be distinguished by the relatively large number of leaflets (11–25), the long inflorescences (4–6 cm long, occasionally shorter), and the relatively large corolla (ca. 10–14 mm long). None of the collections from Panama that I have seen average either as few leaflets as *C. ochraleuca* or as many as *C. caribaea*. None of the Panamanian collections have inflorescences or corollas as long as the dimensions given above for *C. caribaea*. Although I have not seen a type collection of *C. caribaea*, the characters cited above agree well with Jacquin's plate. Both *C. ochraleuca* and *C. caribaea* appear to be good species, but neither is among the collections from Panama reviewed here.

Rydberg's (1924) key to species of *Benthamantha* concerns pod pubescence: the pods of *B. panamensis* are glabrous (the phrase "or slightly granuliferous" is added in the species description), while those of *Cracca mollis* are pubescent ("puberulent" in the species description). Reading Rydberg's full descriptions adds the following points of difference: *Benthamantha panamensis* has stems to 30 cm or more; stipules 3–5 mm long; leaves 5–8 cm long; leaflets 11–15; leaflets 1.0–2.5 cm long; stipels 1 mm long; bracts 5 mm long; calyx lobes 4–5 mm long. *Cracca mollis*, according to Rydberg, has stems to 2 m tall; stipules 4–8 mm long; leaves to 5 cm long; leaflets 7–13, 1–4 cm long; stipels minute; bracts 3 mm long; calyx lobes 3–4 mm long. Resolution of the difference between these two species depends on examination of the type material of *Cracca mollis*, unavailable for the current study, and additional collections of *Benthamantha panamensis* which is now known only from the type collections. The collections of *Cracca* Benth. from Panama, although showing some variability perhaps due to age or habitat, are so generally similar to warrant treatment as one species. The pubescence of the pod, present in some Panamanian collections and not in others, is not regarded as a significant character at the species level. Provisionally, then, *Benthamantha panamensis* Rydb. is treated as a synonym of *Cracca mollis* (Jacq.) Benth.

CANAL ZONE: Madden Forest, *Croat 12901* (MO). Madden Dam, 50 ft, *Lewis et al. 3, 25* (both MO); *Porter et al. 4003* (MO). CHIRIQUÍ: Quebrada Mellize, 0–150 m, *Liesner 426* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5235* (MO, SCZ), *5244* (SCZ). PANAMÁ: Sabanas, *Paul 453* (US). Alhajuela, *Pittier 2340* (NY, US; the specimens bear different dates). Población de Chame, *Taylor 92* (PMA).

15. CROTALARIA

Donald R. Windler and Leo McLaughlin[29]

Crotalaria L. Sp. Pl. 714. 1753; Gen. Pl., ed. 5. 320. 1754. TYPE: *C. lotifolia* L. (see Polhill, 1968).

Herbs or shrubs, erect to prostrate. *Leaves* ternately compound or unifoliolate by reduction; leaflets entire, glabrous or pubescent, subtended by stipules; stip-

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ules varying greatly in size and shape. *Inflorescences* racemes, peduncles terminal or opposite leaves, bracts setaceous to foliaceous; bracteoles paired, similar in shape to the bracts and located on the pedicel or the calyx. *Flowers* sometimes showy, bisexual, 5-merous; calyx green, the bilabiate tube usually campanulate, glabrous or pubescent, the lobes usually longer to much longer than the tube; corolla papilionaceous, usually yellow (blue in *C. verrucosa*), standards orbicular or obovate, the apex rounded or retuse, the base clawed, the adaxial surface and veins near the base frequently becoming red-tinged, the wing petals oblong, attached to a stalk continuous with the lower margin (cleaver-shaped), the blades usually puckered between some of the veins, the keel petals usually twisted at the tip, lanate ciliate; stamens 10, monadelphous, the staminal tube open on the upper side, the anthers dimorphic with basifixed long anthers alternating with medifixed short anthers, the short anthers positioned above the elongate at anthesis; ovary terminated by a geniculate style. *Fruit* an inflated, sub-cylindric, sessile or short stipitate legume, glabrous or pubescent, the fruits of some species becoming black at maturity; seeds 7–46 per legume, oblique cordiform, the testa smooth and usually impervious to water.

Crotalaria is a genus of about 550 species, over 400 of which occur in Africa and about 70 of which appear to grow naturally in the New World. Polhill (1968) published a reorganization of sections in the genus based on floral morphology. Panamanian plants fall into five of Polhill's sections: *Calycinae—C. pilosa, C. rotundifolia, C. sagittalis*; *Crotalaria—C. longirostrata, C. retusa, C. spectabilis, C. verrucosa*; *Incanae—C. incana*; *Stipulosae—C. cajanifolia, C. maypurensis,* and *C. micans*.

Some species of *Crotalaria* have been used as cover crops and green manure crops in tropical countries. *Crotalaria juncea,* the sunnhemp of India, used for its fiber content, is probably the most economically important member of the genus. Monocrotaline, an alkaloid isolated from *C. spectabilis* has been shown to be active as a cancer retardant. A few species have been used as ornamentals and the young shoots and leaves of a few species have been used as pot herbs. Ingestion of mature *Crotalaria* tissue has been shown to be toxic due to the alkaloids which it contains. These alkaloids cause such symptoms as lesions in the heart, liver and kidneys, mast cells in the lungs, pulmonary hypertension, and heart failure.

Although no specimens of *Crotalaria pumila* Ortega have been observed from Panama, this weedy species should be expected. Collections of *C. pumila* are known from the United States, Mexico, Guatemala, Belize, Honduras, Nicaragua, Venezuela, Ecuador, Peru, Brazil, Bolivia, and Argentina. The species is a variable low growing, less than 0.6 m tall, trifoliolate herb which has small flowers, usually less than 10 mm long, with an elongated keel. It most closely resembles the larger, woody *C. longirostrata*. The two species can usually be separated on the basis of plant size: *C. pumila* 0.05–0.60 m tall, *C. longirostrata*—0.7–3.0 m tall.

Literature

Polhill, R. 1968. Miscellaneous notes on African species of *Crotalaria* L., II. Kew Bull. 22: 169–348.

Senn, H. A. 1939. The North American species of *Crotalaria*. Rhodora 41: 317–367.

Windler, D. R. 1974. A systematic treatment of the native unifoliolate Crotalarias of North America. Rhodora 76: 151–204.

a. Leaves unifoliolate.
  b. Leaves broadly rhombic or ovate; stipules crescent shaped; stems ridged; flowers blue or white and violet ---- 11. *C. verrucosa*
  bb. Leaves not rhombic or ovate; stipules other than crescent shaped; stems terete; flowers yellow.
    c. Leaves oblanceolate; bracteoles attached to the pedicel; calyx glabrous or strigulose; fruits brown at maturity.
      d. Stipules and bracts persistent, ovate, 0.5–1.5 cm long; calyx glabrous ---- 10. *C. spectabilis*
      dd. Stipules and bracts caducous, narrow, 0.2–0.3 cm long; calyx strigulose ---- 7. *C. retusa*
    cc. Leaves elliptic, lanceolate, or narrowly lanceolate; bracteoles attached to the calyx; calyx not glabrous; fruits black at maturity.
      e. Stipules decurrent for more than one internode; inflorescence terminal ---- 6. *C. pilosa*
      ee. Stipules decurrent for less than one internode; inflorescences leaf opposed.
        f. Plants erect ---- 9. *C. sagittalis*
        ff. Plant decumbent or prostrate ---- 8. *C. rotundifolia*
aa. Leaves trifoliolate.
  g. Inflorescences leaf opposed; stems usually terete ---- 1. *C. cajanifolia*
  gg. Inflorescences terminal or appearing so; stems usually striate.
    h. Petiole equal to or longer than the terminal leaflet; calyx lobes more than twice as long as the tube; bracteole at the junction of the pedicel and the calyx; fruits villous, trichomes often to 2.0 mm long ---- 2. *C. incana*
    hh. Petiole shorter than the terminal leaflet; calyx lobes less than twice as long as the tube; bracteole attached to the pedicel; fruits strigulose, trichomes usually less than 0.5 mm long.
      i. Calyx lobes nearly twice as long as the tube; standard 1.4–1.9 cm long (measured from the base of the calyx to the apex of the standard in the closed flower); keel not prolonged, bearing a cluster of trichomes on the external surface; fruit usually longer than 3 cm.
        j. Inflorescences crowded, usually with a tuft of curved bracts at the apex ---- 5. *C. micans*
        jj. Inflorescences lax, lacking a tuft of curved bracts at apex ---- 4. *C. maypurensis*
      ii. Calyx lobes about the same length as the tube; standard 1.3 cm or less; keel long attenuate no trichomes present on the external surface of the keel; fruit less than 3 cm long ---- 3. *C. longirostrata*

1. **Crotalaria cajanifolia** H.B.K., Nov. Gen. Sp. Pl. 6: 405, 1824. TYPE: Mexico: "in declivate montes Jorullo," 1050 m, *Humboldt & Bonpland* (P).

C. poeppigii Presl., Botanische Bemerk. 123. 1844. TYPE: Cuba: "In convallibus humidis Cubae ad Sumidaro," *Poeppig 6121* (M).
C. guatemalensis Benth., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1–2: 2., 1853. TYPE: Guatemala, *Friedrichsthal* (K).
C. carmioli Polak., Linnaea 41: 558. 1877. TYPE: Costa Rica, *Polakowsky 306* (B, not seen; photo F).
C. vitellina var. *schippi* Senn, Rhodora 41: 364. 1939. TYPE: British Honduras, Stann Creek, along sea beach, *Schipp 493* (holotype, GH, isotypes A, NY).

Herb, shrub, or *small tree* to 3 m tall; stem terete, strigulose. *Leaves* trifoliolate, the terminal leaflet elliptic or elliptic lanceolate, apex acute or acuminate, the base cuneate, 3.3–8.0 cm long, 1.0–3.3 cm broad, the margins entire, above

glabrous, beneath strigulose, veins 7–11 on each side of the midvein, lateral leaflets similar but slightly smaller; petiole 2.0–6.3 cm long; stipules linear triangular, ca. 1.0 mm long, persistent. *Inflorescences* leaf-opposed racemes bearing 20–36 flowers; bracts linear triangular, 1.0–1.7 mm long, persistent; pedicels 4.0–5.0 mm long; bracteoles absent or represented by a barely visible lobe above midpedicel. *Flowers* yellow, 9–11 mm long; calyx 8–9 mm long, the tube campanulate, the lobes about twice as long as the tube, strigulose; corolla yellow, occasionally tinged with purple, 7.0–9.5 mm long, the standard 7.0–9.5 mm long, 7–10 mm broad, retuse, the wings 6–8 mm long, the claws 1.5–2.5 mm long, oblong or elliptic, oblique, the keel 2.4 mm long, the short anthers 0.6–0.9 mm long; style with a pubescent stigma, curved geniculate, 6–8 mm long. *Legume* inflated, 1.3–2.3 cm long, strigulose, brown at maturity; seeds ca. 16, green or brown, oblique cordiform, to 3.8 mm long.

Crotalaria cajanifolia is a native New World weedy species occurring in Mexico, Central America, and locally in Cuba. In Panama, the species inhabits savannas, cultivated fields and waste places. It is characterized by its leaf-opposed inflorescences, small fruits and extremely small or absent bracteoles.

Senn treated this species as a part of the South American *C. vitellina,* a view not accepted here.

Standley (1928) gave the Panamanian common name "*zapatito del obispo*" for this species. He also pointed out that the young shoots of this and related species are a popular vegetable in Salvador, being cooked like spinach. One specimen, *Aviles 13* cited "*Pito*" as a common name.

CANAL ZONE: Barro Colorado Island, *Aviles 13* (F, MO). TTC Albrook tower, Fort Clayton, *Blum 1941* (FSU, MO, SCZ). Farfan Beach, from Thatcher Highway to Palo Seco, *Burch et al. 1402* (GH, NY). Near Summit Naval Radio Station, *Croat 12535* (F, MO, NY, SCZ). Ft. Kobbe, Farfan Beach, *D'Arcy 1651* (MO). Near La Chorrera, *D'Arcy 9433* (BALT, MO). Thatcher Ferry Road, *Duke 5758A* (MO). Albrook site, Tropic Test Center, *Dwyer 6607* (SCZ). Paraiso, *Dwyer 7161* (MO). Albrook, *Dwyer & Robyns 115* (MO). Road K-19, 2 mi from W border of Canal Zone to cleared area near Canal, *Gentry 1787* (DUKE, GH, MO, SCZ). Between Summit and Gamboa, *Greenman & Greenman 5252* (MO). Cerro Ancón, *Heriberto 135* (GH); *Killip 3034* (US), *12084* (GH). Curundú, *Kozlovsky & Sawyer* (WIS). 1 mi S of Summit Gardens, *Lazor & Blum 5345* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5682* (MO). Madden Dam, *Lewis et al. 10* (GH, MO). K-2 road vicinity of Contractors Hill, *Lewis et al. 2868* (DUKE, MO, NY). Panamerican Highway, ½ km E of Canal Zone border at Araijan, *Nee 7166* (DUKE, FSU, GH, MO). W side of Summit Gardens, *Nee 7559* (FSU, GH, MO). Sosa Hill, Balboa, *Standley 26415* (A). Ancón Hill, *Standley 3034* (MO). 2 mi N Cocolí, *Tyson 1630* (FSU, MO, SCZ). Farfan Beach area, *Tyson 1830* (FSU, MO). Albrook Field, *Tyson* (SCZ). Pipeline Road, *Wilbur & Teeri 13393* (DUKE). CHIRIQUÍ: Alanje, *Castillo 07* (MO). COCLÉ: El Valle, *Dwyer 1813* (FSU, MO). Panamerican Highway, 178 km W of Panama City, *Folsom 6896* (MO). El Valle de Antón, *Garcia 5* (F, MO, PMA); *Lezcano 11* (MO). 10 mi E of Natá at Río Grande, *Tyson 5268* (FSU), *5274* (DUKE, FSU, GH, PMA, SCZ). COLÓN: Near Salamanca, 8 mi E of Transisthmian Highway, *Gentry 6708* (F, MO). Quebrada Bonita on road to Rojas 2 km NW of Salamanca, *Nee 9118* (FSU, GH, MO, NY). Santa Rita Ridge ca. 7 mi from Transisthmian Highway, *Wilbur et al. 15065* (DUKE). HERRERA: Chitré, *Allen 1093* (MO). 4 mi S Los Pozos, *Tyson 2687* (FSU, MO, SCZ). PANAMÁ: Just outside Canal Zone vicinity of TTC Albrook Tower, *Blum 1859* (FSU, PMA). A orillas de la carretera que va a la cantera de la Zona del Canal, *Correa 2012* (MO). Cerro Campana, *Croat 12029* (F, NY, SCZ). Chilibre, *Dwyer 11968* (MO). First bend of Río Pasiga, *Gentry 2377* (MO). Cerro Azul, *Jaen 39* (DUKE, MO). Corozal Road near Panamá, *Standley 26864* (GH). Entrada Urbanización Chanis, *Taylor 67* (PMA). 2 mi S of Tocumen Airport, *Tyson & Clewell 5932* (BALT, SCZ). VERAGUAS: Camino hacia La Yeguada, *Carrasquilla et al.* (MO, PMA). Río Santa María along road to Santiago, 5 km S of Santa Fé, *Nee 8117* (DUKE, MO). Puerto Mutis, 12 mi S of Santiago, *Tyson 5195* (FSU, MO, SCZ). Without locality: *Hayes 17* (NY).

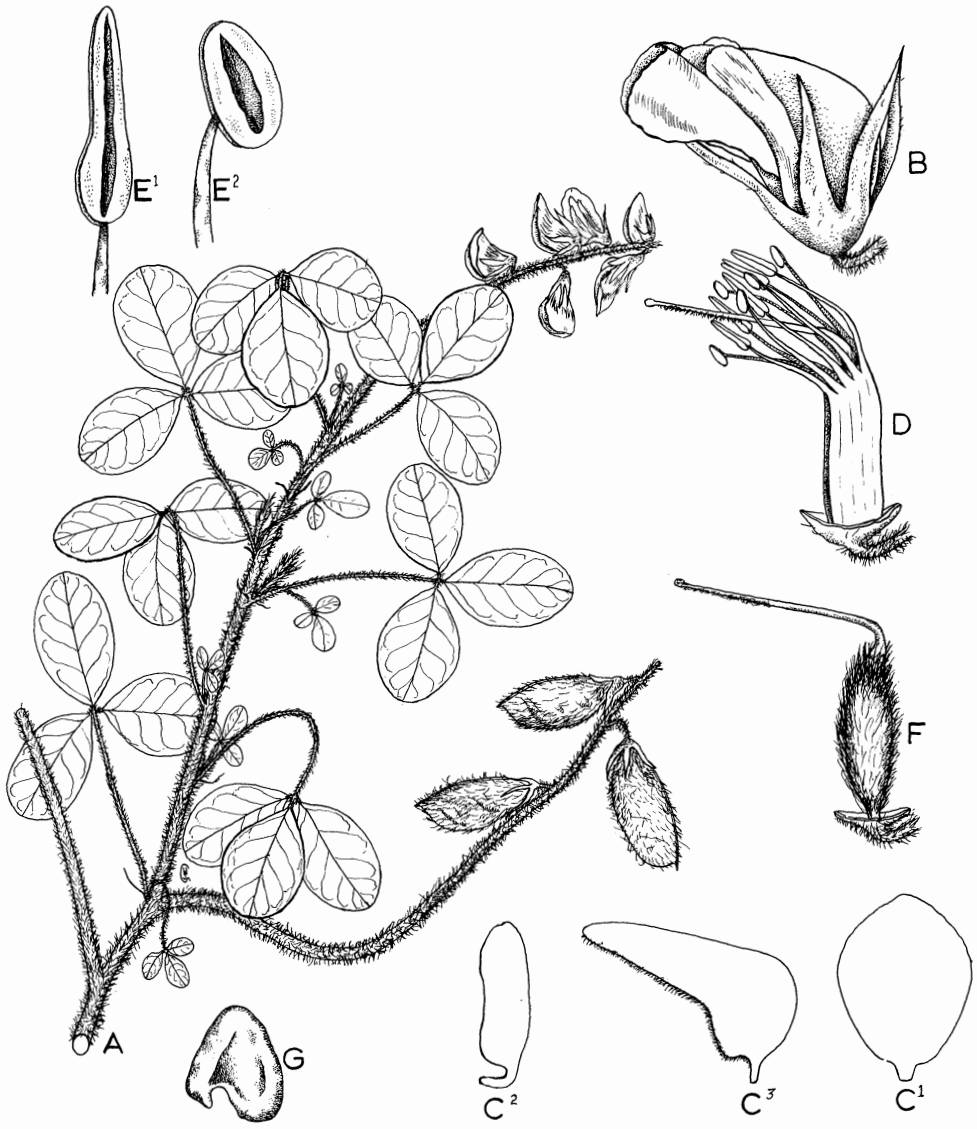

FIGURE 15. *Crotalaria incana* L.—A. Habit (×½). [After *Pringle 8282.*]—B. Flower (×2½).—C. Corolla.—C¹. Standard (×2).—C². Wing petal (×2).—C³. Keel petal (×2).—D. Stamens (×3).—E. Anthers.—E¹. Large anther (×15).—E². Small anther (×15).—F. Pistil (×3). [After *Mendez 113.*]—G. Seed (×4). [After *Pringle 8282.*]

2. **Crotalaria incana** L.,[30] Sp. Pl. 716. 1753. TYPE: Lectotype, Jamaica, Herbarium Sloane, Vol. 6, fol. 6 (BM).—FIG. 15.

Crotalaria purpurescens Lam., Encyl. Méth. Bot. 2: 200. 1786 (fide Baker, 1914). TYPE: Madagascar, collector unknown (P-LAM).

[30] Additional synonyms are provided by Senn (1939).

C. pubescens Moench., Encyl. Méth. Bot. 161. 1794. Superfluous when published. TYPE: Not seen.
C. glabrescens Andersson, Kongl. Svenska. Vetensk. Acad. Handl. 1853: 248. 1855, non Benth., 1843. TYPE: Galapagos, locis graminosis regionis mediae insulae Chatham, *Andersson 222* (P).
C. picensis Philippi, Anales Mus. Nac. Montevideo 13, 1891. TYPE: Chile: Pica, ? *Philippi II 1885* (SGO 39857).

Herb or *small shrub,* less than 1 m (−2 m) tall, stem terete, puberulous to pilose. *Leaves* trifoliolate, the terminal leaflets elliptic or obovate, apex rounded, mucronate or mucronulate, the base cuneate 1.8–6.0 cm long, 1.1–3.7 cm broad, the margins entire, above glabrous, strigose or pilose, beneath glabrous to pilose or villous, the veins 6–9 on each side of the midvein, the lateral leaflets similar, but slightly smaller; petiole 2–7 cm long; stipules caducous. *Inflorescences* terminal or sub-terminal racemes bearing 7–11 flowers; bracts setaceous and curly, deciduous before anthesis; pedicels 1.8–2.0 mm long; bracteoles narrowly triangular ca. 2 mm long, pilose, located on the top of the pedicel, caducous. *Flowers* yellow, 11–15 mm long; calyx 7.5–10.0 mm long, the tube campanulate, the lobes 2.5–3.0 times as long as the tube, pilose; corolla yellow, 10–13 mm long, the standard 11–14 mm long, 10–13 mm broad, retuse, the wings 10–13 mm long, the claws 1.5–1.9 mm long, oblong, oblique, the keel 12 mm long, the non-twisted beak short; stamens dimorphic, the long anthers 1.3–1.8 mm long, the short anthers 0.5–0.6 mm long; style with pubescent stigma, geniculate, 7.0–8.3 mm long. *Legume* inflated, 2.5–3.5 cm long, pilose, brown at maturity; seeds ca. 33, brown, oblique cordiform, to 3.0 mm long.

Crotalaria incana is a common tropical weed inhabiting cultivated fields, roadsides, and waste places. It is characterized by its short calyx tube and long lobes and its pilose to villous fruits. Leaflets on this species are frequently folded at pressing time, a character not shared with other Panamanian species.

Standley (1928) listed "frijolillo" as the only Panamanian common name for *C. incana,* but he reported five common names for the species in Salvador: "*chinchin,*" "*chipilin macho,*" "*chipilin,*" "*chilpilin de zope,*" and "*chilpilin de venado.*"

BOCAS DEL TORO: Bocas, along runway, *Lazor et al. 2433* (FSU). CANAL ZONE: Culebra Island, *Duke 4619* (MO). Gatún, *Cowell 312* (NY). Farfan Beach, *Blum & Godfrey 1678* (FSU, SCZ). Howard Air Force Base near Red Devil drop zone, *Tyson 1852* (MO, SCZ). La Boca, *Mori & Kallunki 3679* (MO). Miraflores Locks area, *Tyson 1602* (FSU, SCZ). Panama City, *Macbride 2623* (F); *Mendez 113* (MO). Near Playa Venado, *Wilbur & Teeri 1297* (DUKE). HERRERA: Salinas de Chitré, *Croat 9689* (MO, NY); *D'Arcy & Croat 4161* (MO). SAN SANTOS: 7 mi S of Chitré, *Croat 9702* (MO). Santa Ana, *Duke 12474* (MO, NY). PANAMÁ: Nueva Gorgona near beach, *Duke 4501* (MO). Taboga Island, *Allen 142* (GH); *Dwyer 2814* (FSU, MO); *Hunter & Allen 142* (MO).

3. **Crotalaria longirostrata** Hook. & Arnott, Bot. Beech. Voy. 6: 285. 1838. TYPE: Mexico, Talisco (Jalisco), *Lay & Collie* (holotype K).

Shrub or *small tree* to 2 m tall, stem terete, strongly striate when young. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic, the apex rounded or mucronulate, the base cuneate, 3.0–3.8 cm long, 0.7–1.0 cm broad, entire, above glabrous, beneath strigulose, the veins 8–10 on each side of the midvein, faintly visible, lateral leaflets similar but slightly smaller; petiole 1.5–3.0 cm long; stipules narrowly triangular, ca. 1.5 mm long. *Inflorescences* terminal racemes bearing 15–20 flowers; bracts narrowly triangular, 1.6–2.5 mm long, caducous; pedicels

4–5 mm long; bracteoles linear triangular, ca. 1 mm long, strigulose, located near the top of the pedicel. *Flowers* yellow, 11–14 mm long, calyx 6.0–6.5 mm long, the tube truncate, the lobes about as long as the tube, strigulose; corolla yellow or occasionally tinged with maroon, 10–13 mm long, the standard 10–15 mm long, 11–15.5 mm broad, retuse, the wings 9–11 mm long, the claws 1.5–2.0 mm long, oblong-elliptic oblique, the keel 12–13 mm long, the twisted beak strongly prolonged; stamens dimorphic, the long anthers 1.6–2.2 mm long, the short anthers 0.5–0.7 mm long; style with a pubescent stigma, sharply geniculate, 10–11 mm long. *Legume* inflated, 1.8–2.5 cm long, strigulose, brown at maturity; seeds ca. 16, beige to brown, oblique cordiform, to 3.2 mm long.

Crotalaria longirostrata is native to Mexico and Central America. The species, which is not common in Panama, occurs in grasslands, scrub-grasslands or open oak-pine forests. The species is characterized by its terminal inflorescence, short lobed calyx and its attenuated keel. *Crotalaria longirostrata* is most closely related to the herbaceous *C. pumila,* which is generally smaller in most characteristics and which appears to intergrade with it over part of its range. *C. pumila* is to be expected in Panama, but no specimens have thus far been observed.

The following local names are reported for the species in Central America: *Chipil, Chipilin, Chipilino, Parrajachel. Crotalaria longirostrata* is often sold in the markets as a pot herb. In El Salvador "The young growth and flowers are used in soup or folded into eggs. The plants are also said to be a sedative and the leaves used as a purgative or vomitive" (*Williams & Molina 9080* (MO)).

CHIRIQUÍ: Boquete, *Beliz 237* (MO); *Blum & Dwyer 2552* (FSU, SCZ). Callejon Seco, Volcán de Chiriquí, *Woodson & Schery 496* (GH, MO). Finca Lérida to Boquete, *Woodson et al. 1112* (GH).

4. **Crotalaria maypurensis** H.B.K., Nov. Gen. Sp. Pl. 6: 403. 1824. TYPE: Maypure, "Specimen in very bad condition" (*Inflorescence only,* P).

C. leptophylla Benth., Ann. Nat. Hist. 3: 430. 1839. TYPE: Br. Guiana, Savannahs of the Rupunoony, *Schomburgk 788* (K).

Shrub or *suffrutescent herb* to 1.5 m tall, stem striate, strigulose. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic to elliptic, the apex acute, acuminate or mucronulate, the base cuneate, 4.5–5.5 cm long, 1.1–1.5 cm broad, the margins entire, above glabrous, beneath sparsely strigulose, the veins 8–10 on each side of the midvein, the lateral leaflets similar, but slightly smaller; petiole 3–4 cm long, the stipules absent. *Inflorescences* terminal, lax racemes bearing up to 20 flowers; bracts linear triangular, 1–2 mm long, caducous; pedicels 5–6 mm long; bracteoles linear, 1 mm long, strigulose, located at the base of the calyx tube, caducous. *Flowers* yellow, 15–18 mm long; calyx 8–9 mm long, the tube truncate, the lobes about 1.5 times as long as the tube, strigulose; corolla yellow or tinged with violet, 15–18 mm long, the standard 13–14.5 mm long, 14.0–15.5 mm broad, retuse, the wings 13–14 mm long, the claws 2–3 mm long, oblong obovate, oblique, the keel 14–15 mm long, the non-twisted beak prolonged; stamens dimorphic, the long anthers 3.3–3.5 mm long, the short anthers 0.7–0.8 mm long; style with a pubescent stigma, curved geniculate, 9.5–12.0 mm long. *Le-*

gume inflated, 2.5–3.1 cm long, strigulose; seeds ca. 20, brown, oblique cordiform, to 3.0 mm long.

Crotalaria maypurensis is native in South America and reaches its northernmost locality in Panama. This species inhabits open situations at low elevations. It is characterized by terminal inflorescences on which the flowers are loosely arranged, by it general lack of stipules, and its short caducous bracts and bracteoles.

Senn (1939) used this name to apply to *C. acapulcensis,* a Mexican species which is similar, but differs from it in having distinct falcate stipules consistently present.

VERAGUAS: Ca. 5 mi NE of La Mesa, *Blum & Tyson 666* (FSU, MO, SCZ).

5. **Crotalaria micans** Link, Enum. Pl. Hort. Reg. Bot. Berol., Part 2: 228. 1822. TYPE: *Herb., Willd.,* America Meridionalis, *Humboldt 2172* (B-Willd. 13272, not seen; photo BALT).

C. anagyroides H.B.K., Nov. Gen. Sp. Pl. 6: 404. 1924. TYPE: Venezuela: prope Caracas, 470 hex (920 m) ?*Humboldt 598* (P).
C. dombeyana DC., Prodr., 2: 132. 1825. TYPE: *Dombey* (P, sheet 20/76).
C. stipulata Vell., Fl. Flum. 7: 307, 1825. TYPE: not seen, fide Sampaio e Peckolt, Arq. Mus. Nac. Rio de Janeiro 37: 331–394. 1943.
C. triphylla Vell., Fl. Flum. 7: 307. 1825. TYPE: not seen, fide Sampaio e Peckolt, Arq. Mus. Nac. Rio de Janeiro 37: 331–394. 1943.
C. brachystachys Benth., Linnaea 22: 512. TYPE: LECTOTYPE: Brazil, Ad Caldas in Minas Gerais, *Regnell 76* (K).

Shrub or *suffrutescent herb* to 3 m tall, stem striate, strigulose. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic to elliptic, apex acute, acuminate or mucronulate, the base cuneate, 4.5–7.1 cm long, 1.4–2.7 cm broad, the margins entire, above glabrous, beneath strigulose, the veins 7–16 on each side of the midvein, lateral leaflets similar, but slightly smaller; petiole 2.5–5.0 cm long; stipules linear triangular, ca. 4.0 mm long, frequently absent. *Inflorescences* terminal racemes, bearing 15–30 flowers; bracts linear, 7–10 mm long, caducous; pedicels 5–9 mm long; bracteoles linear, 6–10 mm long, strigulose, located just above mid-pedicel, caducous. *Flowers* yellow 12–18 mm long, calyx 10–13 mm long, the tube campanulate, the lobes 1.5–2.0 times as long as the tube, strigulose; corolla yellow, with purple veins, 14–18 mm long, the standard 13–14 mm long, 18–21 mm broad, retuse, the wings 12–15 mm long, the claws 3.0–3.8 mm long, oblong, oblique, the keel 13–15 mm long, the non-twisted beak short, stamens dimorphic, the long anthers 2.8–3.1 mm long, the short anthers 0.5–0.7 mm long; style with a pubescent stigma, curved geniculate, 8.5–9.0 mm long. *Legume* inflated, 3.2–3.5 cm long, strigulose, brown at maturity; seeds ca. 20, tan to brown, oblique cordiform, to 3.5 mm long.

Prior to this publication, this species has been treated as *C. anagyroides* by Senn (1939) and others.

Crotalaria micans occurs locally in Mexico, Central America, South America and the West Indies. This species inhabits savannas and other open situations. It is characterized by terminal inflorescences on which the large flowers are

grouped tightly, by its long curled bracts and bracteoles which are prominent among the buds and by its fruit size. It is most closely related to *C. maypurensis*, which has lax inflorescences and lacks the tuft of curled bracts.

One specimen, *Tyson 5676*, reports that this species is used as an ornamental.

CANAL ZONE: Old cement foundation, Summit Garden, *Nee 7308* (MO). Without other locality, *Cotterman & Klawe P-3* (MO). CHIRIQUÍ: 1 mi SW of Cerro Punta, *Tyson 5676* (FSU, MO, SCZ). Cultivated, Volcán, Escuela Agricola San Benito, *Croat 16187* (MO). Road from Volcán to Río Serano, 12 km from Escuela San Benito in Volcán, *Croat 26500* (MO). North side of Cerro Pando, *D'Arcy 6632* (BALT, MO). Near Lagunas, *D'Arcy 10,053* (BALT, MO). PANAMÁ: Entrada a Cerro Azul, *Carrera 15* (MO). Cerro Azul frente a la entrada del Colegio de la Santa Familia, *Reece 3* (DUKE, MO). Lava field ½ mi from El Hato de Volcán, *Wilbur et al. 11932* (DUKE). VERAGUAS: road between Laguna La Yeguada and Calobre, *Luteyn 1470* (DUKE, MO, NY). 5 mi NE of La Mesa, *Blum & Tyson 666* (MO).

6. **Crotalaria pilosa** Mill., Garden. Dict. No. 2, 1768, non Thunb., 1800. non Roxb. 1820. TYPE: *Houstoun*, "Vera Cruz in New Spain" (BM).—FIG. 16A–B.

C. pterocaula Desv., J. Bot. (Desvaux) 3: 76. 1814. TYPE: Habitat in America calidore *Desvaux* (P).

C. genistella H.B.K. Nov. Gen. Sp. Pl. 6: 398. 1824. TYPE: Crescit locis siccis, in Audibus Popayanensium, inter La Sequia et Almaguer, prope villam San Miquel et in ripa fluminis Putes, alt. 807, item prope Mariquitam Novo Granatensium alt. 400 hex. *Humboldt 2050* (P).

C. hexaptera Schrank, Syll. Ratisb. 2: 73. 1824, 1828. TYPE: Brazil: "Colitur in Caldario" *Martius*. Note: One specimen was located at Munich, *Martius 1609*, but the epithet *hexaptera* was not attached (Letter from Dr. Schreiber at M).

Crotalaria pterocaula var. *genistella* (H.B.K.) Benth. in Mart., Fl. Bras. 15: 20. 1859. TYPE: same as for *C. genistella*.

Crotalaria pilosa var. *skutchii* Senn, Rhodora 41:331. 1939. TYPE: Costa Rica: Prov. San Jose, El General, 730 m, *Skutch 3071* (GH).

Herb less than 1 m tall, the stem winged by decurrent stipules, strigose to pilose. *Leaves* unifoliolate, elliptic, lanceolate, narrowly lanceolate or linear, the apex acute or mucronulate, the base rounded to cuneate, 2.0–6.7 cm long, 3.5–15.0 mm broad, the margins entire, above glabrous or strigose to pilose, beneath strigose to pilose, the veins not evident; petiole 1.5 mm or less long; stipules inverted sagittate, winging the stem for more than one internode, causing the stem to appear continuously winged, the wings 0.5–1.0 cm broad, the nodal lobes 3–10 mm long. *Inflorescences* terminal or leaf opposed and terminal racemes, bearing 8–20 flowers; bracts linear or subulate, 3.1–4.0 mm long, persistent; pedicels 3.5–6.0 mm long; bracteoles narrowly elliptic or subulate, 2.5–4.5 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 9–14 mm long; calyx 9–13 mm long, the tube campanulate, the lobes 2–2.3 times as long as the tube, sericeous; corolla yellow, about 10–14 mm long, the standard 7–9 mm long, 7–12 mm broad, retuse, the wings 6–9 mm long, the claws 1.8–2.0 mm long, oblong obovate, oblique, the keel 8–12 mm long, the twisted beak short; stamens dimorphic, the long anthers 1.5–2.3 mm long, the short anthers 0.3–0.7 mm long; style with a pubescent stigma, sharply geniculate, 5.5–5.8 mm long. *Legume* inflated, 2.2–3.4 cm long, glabrous, black at maturity; seeds ca. 20, tan, brown or red brown, oblique cordiform, to 2.5 mm long.

Crotalaria pilosa is a species native to the New World occurring in Jamaica, Cuba, Central and South America. The species grows in savannas and on open

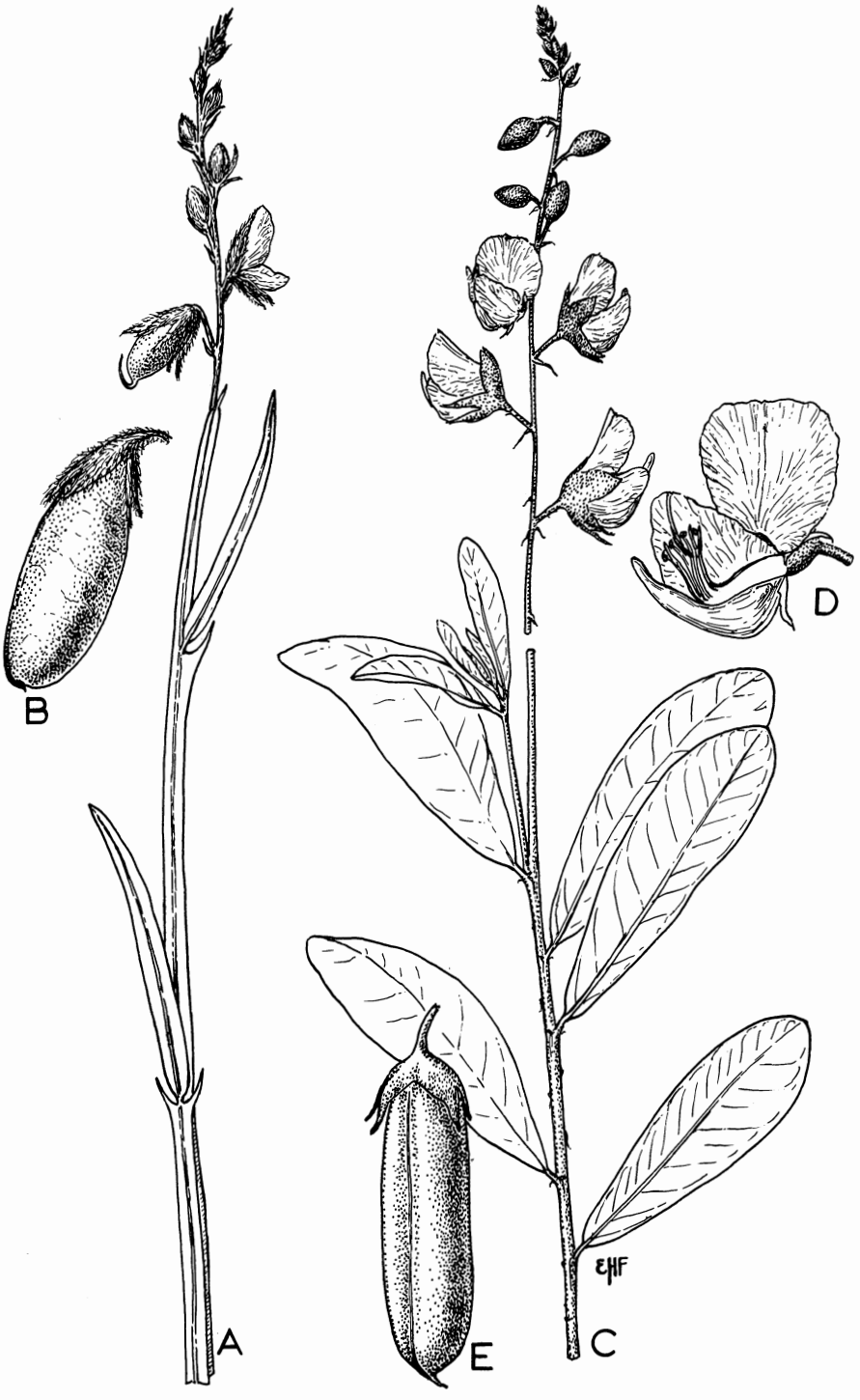

FIGURE 16. *Crotalaria*.—A–B. *Crotalaria pilosa* Mill.—A. Habit (×4/5).—B. Fruit (×1 3/5). [After *Johnston 22*.]—C–E. *Crotalaria retusa* L.—C. Habit (×4/5).—D. Flower (×1 3/5).—E. Fruit (×1 1/5).

ground. *Crotalaria pilosa* most closely resembles *C. sagittalis* in Panama, but may be easily distinguished by its terminal inflorescences and its winged stems.

The common name "Chiba-Chiba" was cited for this species on one specimen, *Sucre 138*. Standley (1928) cited the local name "frijolillo" for this species, but pointed out that the name is used for many species in the family.

CANAL ZONE: Ancón Hill, *Killip 12075* (GH); *Standley 25202* (US); *Standley 26357* (GH, US). Miraflores Lake near Navy Depot sign nearest to island, *White 170* (MO, US). CHIRIQUÍ: Boquete, *Terry 1266* (GH). COLÓN: Tocumen Airport, *Dwyer 3103* (GH). DARIÉN: Near Vera Cruz, *Duke 6027* (MO). HERRERA: Road between Las Minas and Pesé, *Duke 12305* (MO, NY). Ocú, *Ebinger 1078* (GH, MO); *Tyson et al. 2880* (MO, SCZ). Roadside El Potrero and Las Minas, *D'Arcy & Croat 4150* (MO); *Burch et al. 1332* (GH, MO, US). PANAMÁ: Near Arraijan, *Woodson et al. 1403* (GH, US). Cerro Campana, *D'Arcy 9579a* (BALT, MO); *Ebinger 928* (GH); *Croat 12167* (MO). Near Río Pacora and Chepo Highway, *Duke 5903* (MO); *Nee 6866* (DUKE, MO, US); *Tyson et al. 2343* (SCZ). Between Matías Hernández and Juan Díaz, *Standley 32079* (US). Pacora, *Allen 998* (MO). Between Río Pacora and Chepo, *Porter et al. 5157* (MO). Taboga Island, *Standley 28000* (US). Without other locality, *Jorgensen 3206* (MO); *Sucre 138* (RB). San Jose Island, *Johnston 22* (GH, US). LOS SANTOS: Los Asientos, *Wendehake 34* (PMA). WITHOUT LOCALITY: Canafistula, *Dwyer 2466* (MO).

7. **Crotalaria retusa** L., Sp. Pl. 715. 1753. TYPE: Lectotype, Ceylon, Herbarium Herman, folio 2:21 (BM).—FIG. 16C–E.

Dolichos cunifolius Forssk., Fl. Aegypt. Arab. 134. 1775. TYPE: Arabia, *Forsskal,* Feb. 1763 (C).
Lupinus cochinchinensis Loureiro, Fl. Cochinch. 429. 1790. TYPE: Not seen, probably not preserved.
Crotalaria retusifolia Stokes, Bot. Mater. Medica 3: 516. 1812. Superfluous when published.
Crotalaria cunifolia (Forssk.) Schrank, Syll. Ratisb. 2: 78. 1828.
Crotalaria hostmanni Steudel, Flora 26: 757. 1843. TYPE: Surinam: In pasture, 1842, *Hostmann 593* (P, holotype; NY, W, isotypes).

Herb, usually less than 1 m tall, stem striate, strigulose. *Leaves* unifoliolate, oblanceolate, the apex rounded or mucronulate, the base cuneate, 3.5–9.7 cm long, 1.4–3.6 cm broad, the margins entire, above glabrous, beneath puberulent with loosely appressed trichomes, the veins 7–12 on each side of the midvein; petiole 2–3.5 mm long; stipules frequently absent at flowering time, when present narrowly angular ovate and less than 2.5 mm long. *Inflorescenses* terminal racemes, bearing 14–20 flowers, bracts narrowly triangular, to 2.5 mm long; persistent, pedicels 5–9 mm long; bracteoles narrowly triangular, 0.5–1.0 mm long, puberulent, located at mid-pedicel. *Flowers* yellow, 17–24 mm long, the calyx 12–14 mm long, the tube truncate, the lobes 1.2–1.8 times as long as the tube, strigulose; corolla yellow, occasionally with purple veins, 17–24 mm long, the standard 14–18 mm long, 17–25 mm broad, retuse, the wings 13–15 mm long, the claws 3–4 mm long, oblong lanceolate, oblique, the keel 16–18 mm long, the twisted beak not prolonged; stamens dimorphic, the long anthers 2.8–3.1 mm long, the short anthers 0.8–1.0 mm long; style with a pubescent stigma, geniculate, 11–12 mm long. *Legume* inflated, 3.0–3.8 cm long, glabrous, dark brown to black; seeds ca. 23, tan to brown, oblique cordiform, to 4.5 mm long.

Crotalaria retusa is a naturalized, wide-spread weed in the New World tropics and is the most commonly collected species of the genus in Panama. This species may be confused with *C. spectabilis,* but is readily separated by bract characters and calyx indument.

Standley (1925) lists Costa Rican common names for this species: "quiebraplato," "gallincillo," "patillo," and the Puerto Rican names "matraca" and "sonajuelas."

BOCAS DEL TORO: Depression along runway at Bocas, *Lazor et al. 2361* (BALT, FSU, MO). Columbus Island, 3 mi inland, *Wedel 22* (MO, US). Isla Colón, *Wedel 52, 507* (both GH), *2825* (GH, NY, US). CANAL ZONE: Near Fort Sherman, *Bailey & Bailey 687* (GH). Ft. Kobbe, Farfan area, *D'Arcy 9621* (MO). Frijoles, *Duke 15045* (NY); *Ebinger 80* (GH, US). Barro Colorado Island, near Frijoles dock, *Foster 582* (DUKE). Pipeline Road between mile markers 0 and 11.1, ca. 16 mi N of Gamboa, *Lewis et al. 5419* (SCZ). Balboa, *MacBride & Featherstone 33* (F). Gamboa Golf Club, *Nee 7297* (US). Near Fort Sherman, *Piper 5889* (US). Without locality, *Pittier 3860* (US). Near Fort Sherman, *Standley 31222* (MO, US); *Tyson & Blum 3784* (FSU, SCZ). Pipeline Road NW of Gamboa (ca. 6 mi) *Wilbur & Teeri 13345* (DUKE). NW of Gamboa ca. 16 mi, *Wilbur & Teeri 13401* (DUKE). Limón Bay, S of Fort Sherman, *Witherspoon & Witherspoon 8680* (MO). CHIRIQUÍ: Puerto Armuelles, *Busey 512* (DUKE). Manzanillo, 9 km SSW of Puerto Armuelles, *Busey 736* (MO, NY). Quebrado Tuco 9 mi S of Puerto Armuelles, *Croat 22090* (F, MO). Puerto Armuelles, *Woodson & Schery 813* (GH, US). COCLÉ: Panamerican Highway at Río Chico bridge ½ km S of Natá, *Nee 10771* (US). 1–5 mi S of Antón on old road to coast, *Tyson & Blum 2585* (FSU, MO, SCZ). COLÓN: María Chiquita E of Río Piedras toward Portobelo, *Dwyer & Kirkbride 7781* (GH, US). Road to Piña at mouth of Chagres River, *Kirkbride & Hayden 317* (SCZ). Nuevo Chagres, *Lewis et al. 1854* (GH, MO, US). Between Piña and Gatún, *Luteyn 1274* (DUKE, F, MO). PANAMÁ: Juan Díaz, Carretera Central, *Castillo 22* (DUKE, GH). Near Cañitas, *D'Arcy 9425* (BALT, MO). Near Pacora, *D'Arcy 9633* (BALT, MO). Between Panamá and Chepo, *Dodge et al. 16666* (GH). Between Río Pacora and Chepo, *Porter et al.* (SCZ). Taboga Island, *Standley 27973* (US). W of Chepo on road to Panama City, *Tyson 5370* (FSU, SCZ). Camino de Pacora, *Wendehake 20* (DUKE, FSU, GH, US). WITHOUT LOCALITY: Cultivated, *Heriberto 92* (US); *Gale* (SCZ).

8. **Crotalaria rotundifolia** Walt. ex. J. F. Gmelin,[31] Syst. Nat. 2: 1095. 1792.

Crotalaria angulata Senn, 1939, not Mill. 1768. TYPE: (see Windler, 1974).

Crotalaria rotundifolia var. *vulgaris* Windler, Phytologia 21: 264. 1971. TYPE: South Carolina: Hampton Co., 3 mi NW of Yemassee on S.C. Highway 68, Sandhill. *Windler & Windler 2769* (holotype: NCU).

Anonymos rotundifolia Walter, Flora Caroliniana 181, 1788. TYPE: herb. Walter (BM; photo NCU). [Anonymos Walt. not intended as generic name.]

Herb, perennial, prostrate, to 3 dm long; stem terete, sparsely sericeous, pilose. *Leaves* unifoliolate, the leaflets narrowly elliptic to lanceolate, apex acute, acuminate or mucronulate, the base rounded to cuneate, 18–25 mm long, 5–13 mm broad, the margins entire, above strigose, beneath strigose, the veins on each side of the midvein obscure; petiole 1–2 mm long; stipules absent or winging the stem for up to one cm. *Inflorescences* leaf-opposed racemes, bearing 1–3 flowers, bracts linear, 3–4 mm long; pedicels 3–4 mm long; bracteoles linear, 3–4 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 9–10 mm long; calyx 9–10 mm long, the tube campanulate, the lobes 2–3 times as long as the tube, pilose; corolla yellow with maroon veins, 9–10 mm long, the standard 4.5–6.0 mm long, 4–7 mm broad, retuse, the wings 4–5 mm long, the claws 2–2.5 mm long, oblong oblanceolate, oblique, the keel 6–7 mm long, the twisted beak short; stamens dimorphic, the long anthers 0.9–1.5 mm long, the short anthers 0.3–0.5 mm long; style with a pubescent stigma, sharply geniculate, 4.0–5.5 mm long. *Legume* inflated, 1.7–2.0 cm long, glabrous, black at maturity; seeds ca. 15, brown, oblique cordiform, to 2.5 mm long.

Panamanian plants of this species are assigned to variety *vulgaris* Windler. Herbarium specimens of this species are sometimes difficult to distinguish from specimens of *C. sagittalis,* especially when the plants are dwarfed. When growing together in good conditions, the two are separable using the following characters:

[31] Additional synonymy is provided by Windler (1974).

C. rotundifolia is a prostrate perennial plant with a number of stems radiating from a central root stock. *C. sagittalis* is an erect annual or perennial plant with a single much branched stem. Peduncle length is also usually greater in *C. rotundifolia*.

Studies are underway to examine the relationship between *C. rotundifolia* of the S.E. United States and the plants of Mexico and Central America. This species is native to the Southern United States, Mexico and Central America. North of Panama it often inhabits well drained slopes in open pine woods.

CHIRIQUÍ: Boquete, *Lewis et al. 336* (F, SCZ). HERRERA: Without other locality, *Ebinger 1076* (US). PANAMÁ: Río Tapia, *Standley 28214* (US).

9. **Crotalaria sagittalis** L.,[32] Sp. Pl. 714. 1753. LECTOTYPE: *Kalm*, herb. Linnaeus (LINN 895.2).

Crotalaria tuerckheimii Senn var. *tuerckheimii*, Rhodora 41: 339. 1939. TYPE: Guatemala: Alta Verapaz, Coban, 1350 m, *Türckheim II 1282* (GH).

Herb or suffrutescent herb, 1–6 dm tall, the stem winged by decurrent stipules, villous. *Leaves* unifolioliate, elliptic or lanceolate, the apex obtuse, mucronate, acuminate or acute, the base rounded to cuneate, 2–5 cm long, 0.4–1.5 cm broad, the margins entire, above and beneath pilose, trichomes to 2.8 mm long, veins not evident; petiole 2 mm or less long; stipules inverted sagittate, winging the stem for one internode or less, tapering to the base, the wings 0.3–1.4 cm broad, the nodal lobes 0.4–1.5 cm long. *Inflorescences* leaf-opposed racemes bearing 1–5 flowers; bracts lanceolate to elliptic lanceolate, 4–7 mm long; pedicels 2.0–3.5 mm long; bracteoles linear to elliptic lanceolate, 2.5–6.0 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 11–16 mm long, the calyx 7–11 mm long, the tube campanulate, the lobes 2.5–3.0 times as long as the tube, strigulose; corolla yellow, occasionally with maroon veins, 6–8 mm long, the standard 5.5–7.0 mm long, 4.2–5.0 mm broad, retuse, the wings 5.0–5.5 mm long, the claws 1.8–2.0 mm long, oblong, oblique, the keel 6.5–7.0 mm long; short stamens dimorphic, the long anthers 0.8–1.1 mm long, the short anthers 0.3–0.4 mm long; style with a pubescent stigma, sharply geniculate, 4.0–5.3 mm long. *Legume* inflated, 1.8–2.8 cm long, glabrous, black at maturity; seeds ca. 25, tan, olive or brown, oblique cordiform, to 2.5 mm long.

Crotalaria sagittalis is a highly variable species native to North America. Its range is from northern United States to South America, being replaced in many South American habitats by *C. stipularia* and *C. velutina*. Of the Panamanian species it is most closely related to *C. pilosa*, differing from it in inflorescence position and stipule characters, and to *C. rotundifolia*, differing from it in habit.

Some specimens of this group are difficult to place and study is under way to reexamine the variation in Mexico to determine if the plants would be better treated by the recognition of additional taxa.

Standley (1928) cited the following common names for this species: Salvador—"chinchin," "cohetillo" and "espadilla"; Guatemala—"chipilin de montana."

[32] Additional synonyms are provided by Windler, 1974.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 117* (F). Without other locality, *Wedel 327* (GH, MO). CANAL ZONE: Contractors Hill, *Dwyer 2788* (FSU, GH, SCZ). Miraflores Locks area, *Tyson 1597* (FSU, MO, SCZ). Playa Kobbe, *Wilbur & Teeri* (DUKE, GH, MO). CHIRIQUÍ: Boquete, *Béliz 255* (MO); *D'Arcy 9780* (MO); *Davidson 598* (MO); *Woodson & Schery 789* (MO). 6.7 mi W of Boquete, on road through El Sato, *Luteyn 1493* (DUKE, US). El Hato, Llanos, *Ebinger 767* (GH, US); *Folsom et al. 7154* (MO); *Wilbur et al.* 11940 (DUKE). Nueva California, *Tyson 5716* (FSU, SCZ). Volcán, *Duke & Maxwell* 9216 (MO). HERRERA: Ocú, *Ebinger 1076* (F, MO, US). LOS SANTOS: Playa de La Concepción, *Burch et al. 1269* (MO). Los Asientos, *Wendehake 34* (MO, PMA). PANAMÁ: Río Teta, E of San Carlos at Highway 1, *Luteyn 1572* (DUKE). Tocumen, *Dwyer 1080 A, 2570* (both MO).

10. **Crotalaria spectabilis** Roth, Nov. Gen. Sp. Pl. 341. 1821. TYPE: *Benj. Heyne* ex "India Oriental," not seen.

C. sericea Retz., Obs. Bot. 5: 26. 1788. non Burm. f. (1768). TYPE: India, *Koenig* (LD).
C. leschenaultii DC., Prodr. 2: 125. 1825. TYPE: *Leschenault 176* Mts. de Nellÿgarrÿ (Ind. Orient) (G).
C. macrophylla Weinmann in Schrank, Syll. Ratisb. 2: 26. 1828. TYPE: not located.
C. altipes Raf., New Fl. N. Am. 2: 57. 1837. TYPE: Not seen, *fide* Merrill, Index Raf. 143. 1949. Description states that bracts are lanceolate so this may apply to *C. retusa* L.
C. retzius A. S. Hitch., Annual Rep. Missouri Bot. Gard. 4: 74. 1893. TYPE: India, *Koenig* (LD).

Herb or suffrutescent herb, to 2 m tall, stem terete, glabrous. *Leaves* unifoliolate, broadly angular oblanceolate or occasionally elliptic, apex rounded or mucronate, the base cuneate, 5.5–15.0 cm long, 3.5–7.5 cm broad, the margins entire, above glabrous, beneath strigulose with loosely appressed trichomes, the veins 8–12 on each side of the midvein; petiole 4–6.5 mm long; stipules triangular, 4.5–9.0 mm long. *Inflorescences* terminal or sub-terminal racemes bearing 21–36 flowers, bracts ovate-cordate, 8–11 mm long, persistent, pedicels 9–14 mm long; bracteoles lanceolate, 1.1–2.0 mm long, glabrous, located at mid-pedicel. *Flowers* yellow, 15–25 mm long, the calyx 9–13 mm long, the tube truncate, the lobes 1.0–1.5 times as long as the tube, glabrous; corolla yellow, 15–23 mm long, the standard 12–16 mm long, 14–18 mm broad, retuse, the wings 9–12 mm long, the claws 2–4 mm long, broadly oblong, oblique, the keel 13–15 mm long, the twisted beak prolonged; stamens dimorphic, the long anthers 2.5–3.1 mm long, the short anthers 0.7–1.0 mm long; style with a pubescent stigma, geniculate, 8.0–11.0 mm long. *Legume* inflated, 3.2–4.0 cm long, glabrous, brown or dark brown at maturity; seeds ca. 22, dark brown, oblique cordiform, to 4.5 mm long.

Crotalaria spectabilis is native to India and has become naturalized in many tropical localities in the Old and New Worlds. In Panama this plant has escaped from cultivation and its distribution is sporadic. Of the native Panamanian species this plant most closely resembles *C. retusa*. The two species can readily be distinguished by bract characteristics and the glabrous calyces of *C. spectabilis*.

This species has been grown for its attractive flowers and as a green manure crop. One specimen (*Loftin,* SCZ) carries the common name "rattle box."

CANAL ZONE: slope of Ancón Hill, *Woodson et al. 1335* (G, MO, US). Curundú, *Dwyer 1766* (MO, SCZ); *Loftin* (SCZ). Hills on W side of canal near Pedro Miguel Locks, *Stimson 5220* (DUKE, SCZ). COCLÉ: 12 km NE of Río Hato along highway to Panama City, *Lasseigne 4288* (MO, NY). COLÓN: San Lorenzo, Fort Sherman, *Quistgard 20* (MO). DARIÉN: Upper Río Tuquesa, *Le Clezio 270* (MO). Yaviza along Río Chucunaque, cultivated, *Stern et al. 106* (GH, MO, US). PANAMA: Hospital del Seguro Social, Vía Bolivar, *Taylor 114* (F, MO). Villa Guadalupe, *De Hoyas 22* (MO).

11. **Crotalaria verrucosa** L., Sp. Pl. 715. 1753. TYPE: Lectotype, Ceylon, Herbarium Herman, folio 3:4 (BM).

C. angulosa Lam., Encyc. Méth. Bot. 2: 197. 1786. Superfluous when published, listed *C. verrucosa* as syn. TYPE: herb. Lamark (P-Lam).
C. caerulea Jacq., Ic. Pl. Rar. 1: 144. 1794. TYPE: not seen.
C. flexuosa Moench, Suppl. Meth. Pl. 55. 1802. Superfluous when published, listed *C. verrucosa* as syn.
C. hastata Steud., Nom. Bot. 231. 1821. Based on unnamed variety of *C. angulosa* Lam. LECTOTYPE: herb. Lamark (P).
Crotalaria verrucosa var. *acuminata* DC., Prodr. 2: 125. 1825. TYPE: herb. DC. (G-DC).
C. acuminata (DC.) G. Don, Gen. Syst. 2: 134. 1832. Based on *C. verrucosa* var. *acuminata* DC.
Anisanthera versicolor Raf., Fl. Tell. 2: 60. 1837. TYPE: unknown, usage *fide* Merrill, Index Raf. 1949.
A. hastata Raf., Fl. Tell. 2: 61. 1837. TYPE: unknown, usage *fide* Merrill, Index Raf. 1949.
Crotalaria paramariboensis Miq., Ann. Mag. Nat. Hist. 11: 14. 1843. TYPE. "prope Paramaribo in hortis" *Miquel* (U, not seen; photo BALT, MO).
Phaseolus bulai Blanco, Fl. Filip., ed. 2, 572. 1845. TYPE: not seen, usage *fide* Merrill, Sp. Blanco, 177. 1918.
Quirosa anceps Blanco, Fl. Filip., ed. 2, 398. 1845. TYPE: not seen, usage *fide* Merrill, Sp. Blanco, 177. 1918.
Crotalaria coerulea Bedd., Madras. J. Lit. Sci. 3: 178–179. 1858. TYPE: not seen. Orthographic version of *C. caerulea* of Jacq.

Herb or *suffrutescent* herb to 2 m tall, stems angled, strigulose. *Leaves* unifoliolate, broadly angular ovate or rhombic, the apex rounded, the base cuneate to attenuate, 3.4–4.5 cm long, 2.2–3.0 cm broad; entire, above glabrous to sparsely strigulose, beneath strigulose, the veins 4–6 on each side of the midvein; petiole 2–3 mm long; stipules crescent shaped, encircling the nodes, to 1.0 cm long. *Inflorescences* terminal or sub-terminal racemes bearing 8–13 flowers, the bracts narrowly triangular, 2.0–2.5 mm long, persistent, the pedicels 3–5 mm long; bracteoles narrowly triangular, to 1.1 mm long, strigulose, located at mid-pedicel. *Flowers* blue or white tinged with violet, 11–16 mm long; calyx 10–13 mm long, the tube campanulate, the lobes about twice as long as the tube, strigulose; corolla blue or white tinged with violet, 13–15 mm long, the standard 11–16 mm long, 12–17 mm broad, retuse, the wings 11–14 mm long, the claws 2–3 mm long, oblong lanceolate, oblique, the keel 13–16 mm long, the twisted beak prolonged; stamens dimorphic, the long anthers 2.8–3.2 mm long, the short anthers 0.6–1.0 mm long; style with a pubescent stigma, curved geniculate, 8.5–10.0 mm long. *Legume* inflated, 2.4–3.0 cm long, strigulose; seeds ca. 11, tan to brown, oblique cordiform, to 4.5 mm long.

Crotalaria verrucosa is widespread in the tropics and occurs in Central America, the West Indies and Florida as an introduced plant in disturbed ground at elevations up to 1,150 meters. This species is the only Panamanian species which has blue or purple tinged flowers. It may also be distinguished from other species by its unique crescent shaped stipules and its leaf shape. Although some authors recognize varieties based on leaf shape, no leaf variations are recognized in this treatment.

BOCAS DEL TORO: Bohio Soldado, *Cowell 232* (NY). Chiriquí Lagoon, *Wedel 1275* (GH, MO); *Wedel 2794* (GH); *Wedel 2809* (NY). Isla Colón, *Wedel 2794* (MO). Careening Cay, *Wedel 2809* (MO). CANAL ZONE: Ahorea Lagarto to Culebra, *Cowell 363* (NY).

16. CYMBOSEMA[33]

W. G. D'Arcy[34]

Cymbosema Benth., Bot. (Hooker) 2: 60. 1840. TYPE: *C. roseum* Benth.

High climbing *vines*. *Leaves* pinnate trifoliolate, leaflets elliptical, pubescent, pinnately veined; stipels and stipules present. *Inflorescence* an elongate raceme, the peduncle and rachis both elongate, the pedicels short, 2–6 at a node; bracts ovate, clasping the calyx. *Flowers* narrow, the calyx cupular, 4-toothed, the teeth deltoid acuminate, mostly slightly shorter than the tube; corolla red, rarely violet, the standard slightly longer than the wings and the keel, the wings narrowly spathulate, minutely auriculate; stamens 10, diadelphous, the vexillary stamen free, the others basally united, anthers all alike; ovary villous, the style and the stigma glabrous. *Legume* oblong, slightly falcate, compressed, prominently beaked by the downcurved persistent style, pubescent; seeds 4–6, subglobose, shiny, the hilum linear along one edge.

This genus is distinct in the Panamanian flora in its short, oblong pods with prominent beak and in its narrow red flowers. It is hardly distinct, however, from *Camptosema* Hook. & Arn. (1832) of ultra Andean South America. *Camptosema* differs principally in the minute hilum on the seeds and longer pod. This is the same kind and degree of difference which separates *Stizolobium* from *Mucuna*. *Cymbosema* is monotypic ranging from southern Mexico to Peru while *Camptosema* includes about 15 species mostly to the south of the range of *Cymbosema*.

Literature:

Maxwell, R. H. 1970. The genus *Cymbosema* (Leguminosae): notes and distribution. Ann. Missouri Bot. Gard. 57: 252–257.

1. **Cymbosema roseum** Benth., Bot. (Hooker) 2: 60. 1840. TYPE: Brazil, *Schomburgk 850* (K, not seen).—FIG. 17.

High climbing *vine*; stems drying angled, villous with appressed white hairs, tardily glabrescent. *Leaves* pinnate trifoliolate, the leaflets elliptical or ovate, mostly 5–11 cm long, 3–6 cm wide, apically obtuse, acute or acuminate but blunt tipped and mucronulate, basally obtuse, often ultimately rounded, the midvein elevated and prominent beneath, 4–5 main, arcuate veins on each side, drying discolorous, pubescent on both sides with ascending, subappressed white hairs, petiolules ca. 3 mm long, tomentose; petioles shorter than the terminal leaflet, fine puberulent; stipels ca. 1 mm long, appressed, sparingly pubescent; stipules deltoid acuminate, 1–3 mm long, pubescent. *Inflorescences* erect, the peduncle elongate, 7–20 cm long, terete, pubescent, the rachis somewhat narrower, to 15 cm long; pedicels at first aggregated at the tip, later more distant, 1–3 at a node, 2–4 mm long, often drying dark; bracteoles ca. 1.5 mm long, broadly ovate, cucullate, mucronulate, puberulent, clasping the calyx base. *Flowers* red or ?lav-

[33] This treatment is modified from a treatment of the genus prepared by Richard H. Maxwell in 1969.

[34] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

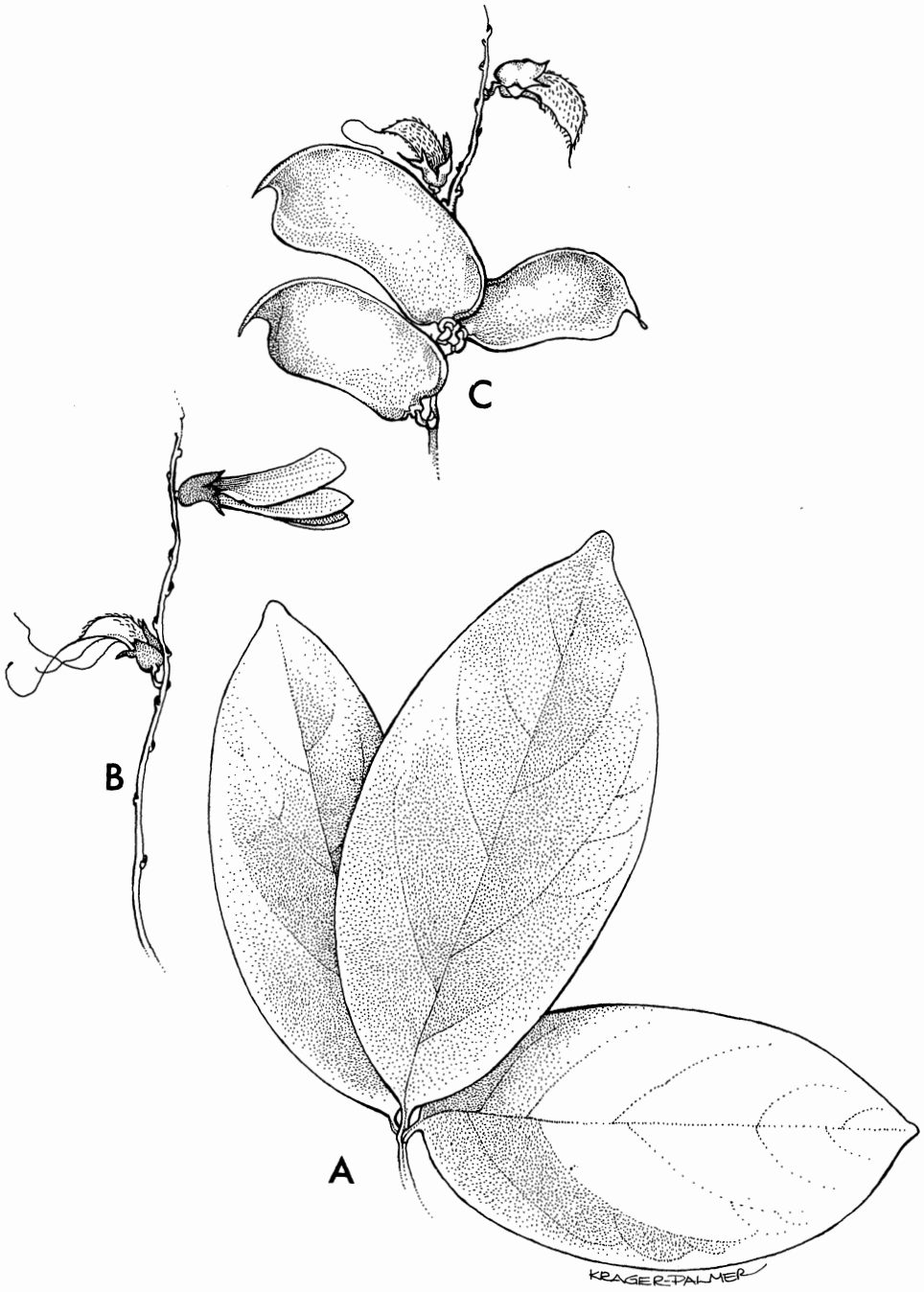

FIGURE 17. *Cymbosema roseum* Benth.—A. Leaf (×4/5).—B. Flower (×4/5). [After *Aviles 198.*]—C. Fruit (×4/5). [After *Shattuck 1094.*]

ender, 3–4 cm long, the standard slightly longer than the wings and keel, narrow, the wings and keel narrowly spatulate, minutely auricled; calyx tubular, the tube ca. 7 mm long, the 4 teeth deltoid, the upper lip longest, 4–5 mm long. The vexillary stamen free, the remainder fused basally, the anthers alike; ovary tomentose, the style and stigma glabrous. *Legume* oblong, compressed, prominently curved beaked, mostly 3.5–4 cm long, ca. 1.5 cm wide, drying slightly dark, the prominent curved beak 5–9 mm long, fine tomentose or velutinous, somewhat glabrescent; seeds 2–6, compressed globose, shiny, the hilum linear along the periphery of 1 side.

This species is rare in Panama occurring in tropical moist forests. It may be confused with *Dioclea guianensis* which has purple flowers, mostly less than 3 cm long, a fruit to 8 cm long with a short beak and the vexillary stamen is fused to the others. This species ranges from southern Mexico to Peru and Brazil. Most reports indicate that this species has red flowers; however, *Tyson & Clewell 5874* notes flowers lavender.

CANAL ZONE: Barro Colorado Island, *Aviles 19b* (MO); *Croat 8304* (MO, SCZ); *Shattuck 255* (F, MO), *1094* (F, MO); *Wilson 128* (F); *Woodworth & Vestal 687* (A, F, MO). PANAMÁ: Marsh area 2 mi S of Tocumen Airport, *Tyson & Clewell 5874* (FSU).

17. DALEA

Peter S. White[35]

Dalea [L.] Lucanus in L.,[36] Opera varia 244. 1758. nom. gen. conserv. Based on *Dalea* L. non *Dalea* Mill. 1754. (Solanaceae) nomen rejic. contra *Dalea* [L.] Lucanus, nec *Dalea* Browne, 1756. (inc. sed.), nec *Dalea* J. Gaertn., Fruct. 1: 235. 1788. (Verbenaceae).

[*Dalea* L., Hort. Cliff. 363, *tab. 22*. 1738. Based on a plant received from P. Miller = *Dalea cliffortiana* Willd.]

Parosela Cav., Descr. Pl. 185. 1802. TYPE: *Psoralea mutabilis* Cav. = *Dalea mutabilis* Willd. Non *Marina* Liebm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 103. 1853, emend. Barneby, Mem. New York Bot. Gard. 27: 55. 1977.

Thornbera Rydb., J. New York Bot. Gard. 20: 66. 1919. TYPE: *Thornbera albiflora* (Gray) Rydb. = *Dalea albiflora* Gray.

Perennial or annual *herbs* or *shrubs*; gland dotted and nearly always pubescent. *Leaves* alternate, imparipinnate, rarely paripinnate, trifoliate, or simple; leaflets relatively small, entire, conspicuously glandular dotted beneath, the rachis frequently margined or winged, glandular beneath; stipules herbaceous or gland-like; stipels usually represented by glands. *Inflorescence* of terminal or axillary spikes or racemes, often dense; bracts usually conspicuous, often glandular and pubescent. *Flowers* with the hypanthium campanulate or turbinate, 10-ribbed, often glandular, the glands and ribs sometimes obscured by pubescence; calyx teeth 5, more or less equal, as long as or longer than the cup; petals 5, white,

[35] Uplands Field Lab., Great Smoky Mountains National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

[36] For a more complete generic synonymy see Barneby (1977) and Hutchinson (1967); for a full discussion of taxonomic concepts in *Dalea* and its relatives, see Barneby (1977).

blue, purple, less commonly yellow, inserted on the staminal sheath, the standard clawed, frequently inserted below the wing and the keel petals, the wing and the keel petals perched on and disjointing from the staminal sheath, the keel petals partially united or free; stamens 10, 9, sometimes 5, sometimes indefinitely 5–10, monadelphous, the sheath split to varying degrees, the anther connective often gland tipped; ovary 2-ovulate, only 1 ovule fertile, sessile or short stipitate, the style filiform, the stigma usually minute. *Fruit* a small, 1-seeded, obovoid legume, sometimes glandular, indehiscent, included within the persistent calyx; seed 1, subreniform, smooth.

Dalea is a genus of 150 or more species of gland-dotted shrubs and herbs with its highest diversity in relatively open vegetation on xeric sites in Mexico and the highlands of Peru. Only two species are known from Panama which, with adjacent countries, represents a gap in the genus' general diversity. *Dalea* can be recognized by the following combination of characters: glands present, petals adnate to the staminal tube, anther connective often glandular-appendaged, fruit 1-seeded and included in the persistent calyx.

The authorship of the conserved name *Dalea* is a matter of current debate (Barneby, 1965, 1977; Committee for Spermatophyta, 1968). Available for conservation were *Dalea* [L.] Lucanus (1758), (sometimes cited as *Dalea* L., see below), *Dalea* Juss. (1789), *Dalea* Vent. (1799), and *Dalea* L. C. Rich. (1803). Barneby's (1977) opinion has been followed here. *Dalea* [L.] Lucanus is the earliest of the names listed above and makes sense taxonomically (Barneby, 1977).

One difficulty with *Dalea* [L.] Lucanus is that *Opera varia,* the work in which the name appears (1758), is a reprint of three pre-1753 Linnaean works bound as a single volume. Linnaeus did not recognize *Dalea* as a genus in *Species Plantarum* (1753) nor thereafter. Rather he made it clear that *Dalea* should be regarded as a synonym of *Psoralea* L. Because Linnaeus did not intend *Dalea* L. as a generic concept except in pre-1753 works, Barneby (1977) has proposed "Lucanus" for authorship of the genus, which is the name Barneby gives the anonymous editor of *Opera varia* since the book was published in Lucca. This editor provided legitimate publication for the pre-1753 genus *Dalea*. While this is somewhat dissatisfying, it seems the best current solution. The interested reader is referred to the works cited above for further considerations in this dilemma.

Petalostemon Michx., nom. gen. conserv., and *Kuhnistera* Lam. are both regarded as synonyms of *Dalea* by Barneby (1977), an opinion also expressed by Shinners (1949) but disagreed with by Isley (1958). No species of these two genera are known from Panama.

Sixteen *Dalea* species were reported for Guatemala (Standley and Steyermark, 1946) and five species for Costa Rica (Standley, 1937), but not all are members of *Dalea* sensu Barneby. The two Panamanian species, *D. carthagenensis* (Jacq.) Macbr. and *D. cliffortiana* Willd., are the most widespread of the species in Central America. Among the plants occurring in Costa Rica and Guatemala, only one other is a strong possibility for Panama, *Marina scopa* Barneby (*Dalea nutans* sensu Standley and Steyermark (1946) = *Parosela nutans* sensu Standley (1937) = *Parosela nutans* sensu Rydb. (1920), non *Psoralea nutans*

Cav., non *Marina nutans* (Cav.) Barneby). This is a weedy species of xeric climates found from Mexico and Guatemala southward to Costa Rica, becoming rarer at the southern end of its range. It is sparingly adventive in Venezuela and Cuba. The following characters for the genus *Marina* are extracted from Barneby's key (1977): *Marina* has 1-ovulate ovaries; flowers always pedicellate; hairs of the calyx neither spirally twisted nor fulvescent in age; ribs of the calyx not anastomosing at the tip of each calyx tooth; leaflets marked on the upper surface with sinuous pallid lineoles ascending obliquely from the midrib. *Dalea* has 2-ovulate ovaries (only 1 matures); flowers often sessile, if pedicellate, the calyx pubescent with spiral, fulvescent hairs, or the calyx ribs anastomosing at the tip of each calyx tooth and excurrent as a mucro, or both; leaflets not lineolate.

Literature

Barneby, R. C. 1965. Conservation and typification of *Dalea*. Taxon 14: 160–164.

———. 1977. Daleae Imagines. Mem. New York Bot. Gard. 27. 891 pp.

Committee for Spermatophyta (R. McVaugh, secretary). 1968. Conservation of generic names, VIII. Taxon 17: 85–87.

Isley, D. 1958. Leguminosae: Psoraleae of the United States, a generic survey. Iowa State College, J. Sci. 33: 23–36.

Shinners, L. H. 1949. Transfer of Texas species of *Petalostemum* to *Dalea* (Leguminosae) and the genus *Dalea* (including *Petalostemum*) in north-central Texas. Field and Lab. 17: 81–89.

Standley, P. C. 1937. Flora of Costa Rica. Field Mus. Nat. Hist., Bot. Ser. 18: part 2.

a. Leaflets obovate or elliptic, ca. 2 times longer than broad ---------- 1. *D. carthagenensis*
aa. Leaflets narrowly oblong to linear, much more than 2 times longer than broad ---------- 2. *D. cliffortiana*

1a. **Dalea carthagenensis** (Jacq.) Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 375. 1943.—FIG. 18.

Psoralea carthagenensis Jacq., Enum. Pl. Carib. 27. 1760; Sel. Stirp. Amer. 206. 1763. TYPE: Cartagena (Colombia), (W, not seen; microfiche, MO).
P. enneaphylla L., Sp. Pl., (ed. 3) 1076. 1764. TYPE: "habitat in Indiis," not seen.
P. emphysodes Jacq., Coll. 4: 144. 1790. TYPE: Venezuela (W, not seen; microfiche, MO).
P. phymatodes Jacq., Icon. Pl. Rar. 3: 13. *pl. 563*. 1792. nom. illegit., a superfluous name based on *Psoralea emphysodes* Jacq.
Dalea enneaphylla (Jacq.) Willd., Sp. Pl. 3: 1338. 1802.
D. phymatodes (Jacq.) Willd., Sp. Pl. 3: 1338. 1802.
D. domingensis DC., Prodr. 2: 246. 1825. TYPE: "in Sancto Domingo," *Bertero* (holotype, G-DC, not seen; fide Barneby, 1977).
D. domingensis Spreng., Syst. Veg. 3: 327. 1826. TYPE: "Hispaniola," *Bertero,* not seen.
Parosela domingensis (DC.) Millsp., Publ. Field Columbian Mus. Bot. Ser. 1: 21. 1895.
P. domingensis (DC.) A. Heller, Cat. N. Am. Pl., (ed. 2) 6. 1900.
P. emphysodes (Jacq.) Rydb., No. Am. Fl. 24: 113. 1920.
Dalea carthagenensis subsp. *typica* R. T. Clausen, Bull. Torrey Bot. Club 73: 572. 1946.
D. carthagenensis subsp. *domingensis* (DC.) R. T. Clausen, Bull. Torrey Bot. Club 73: 572. 1946.
D. emphysodes (Jacq.) R. T. Clausen, Bull. Torrey Bot. Club 73: 85. 1946.
Dalea emphysodes subsp. *emphysodes* R. T. Clausen, Bull. Torrey Bot. Club 73: 85. 1946.

FIGURE 18. *Dalea carthaginensis* (Jacq.) Macbr.—A. Habit (×1).—B. Flower (×8).

1b. **Dalea carthagenensis** (Jacq.) Macbr. var. **barbata** (Oerst.) Barneby, Mem. New York Bot. Gard. 27: 517. 1977.

Dalea vulneraria γ *barbata* Oerst., Viddensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 4. 1854. TYPE: Mexico, *Oersted* (holotype, C, not seen).
Dalea vulneraria γ *brevidens* Oerst., Viddensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 4. 1854. TYPE: Mexico, *Oersted* (C, not seen).
Parosela barbata (Oerst.) Rydb., No. Am. Fl. 24: 116. 1920.

Shrubs or *subshrubs* to 2 m tall. *Leaves* alternate, imparipinnate, (2.5–)3–6(–7.5) cm long, apparently drought deciduous; leaflets (7–)9–13(–19), entire, glandular dotted and paler beneath, gray green (on drying?), elliptic, the base and the apex rounded, the apex occasionally retuse, or obovate with cuneate base, the size quite variable even on the same plant, (8–)12–17(–20) mm long, (4–6–8(–10) mm wide, becoming larger toward the tip of leaf; rachis narrowly winged; stipules narrowly triangular, the stipels apparently represented by glands. *Inflorescence* of terminal and axillary spikes, ca. 1.0–2.5 cm long; bracts ovate, to 5 mm long, gland dotted, pubescent, usually exceeding the hypanthium, apparently eventually deciduous. *Flowers* with the calyx 5–9 mm long, hairy, teeth 5, narrow triangular, equal; petals 5, white, apparently fading maroon, each petal with an apical gland, standard ca. 5 mm long, clawed, the wings ca. 5 mm long, clawed, keel petals ca. 6.5 mm long, clawed; stamens 10, the anther connective prominently gland tipped; ovary oblong, ca. 2 mm long, the style ca. 8 mm long, pubescent at base. *Fruit* an ovate, 1-seeded legume, 2.3–2.7 mm long, the valves densely gland dotted; seeds small, oblong.

Dalea carthagenensis is found from south Florida and Mexico southward through the West Indies and Central America to Peru and Venezuela. Barneby (1977) recognized 8 geographical races which he assigned to varietal rank. *Dalea carthagenensis* var. *barbata* is found from Mexico to Panama and is disjunct in Andean Colombia. In this variety, the intercostal calyx glands are small, pale, and usually masked by pubescence of the calyx. In *Dalea carthagenensis* var. *carthagenensis,* the intercostal glands are blisterlike and readily visible.

COCLÉ: Olá, 20–280 m, *Pittier 5100* (NY). HERRERA: Between El Potrero and Las Minas, *Croat 9654* (MO, NY). N of Las Minas, *Croat 9671* (MO). 10 mi S of Ocú, *Tyson et al. 3823* (MO). PANAMÁ: San Carlos, 0–10 m, *Allen 1139* (GH, MO, NY). Río Las Lajas, 20 m, *Allen 1601* (GH, MO, NY).

2. **Dalea cliffortiana** Willd., Sp. Pl. 3: 1336. 1802. Based on *Psoralea dalea* L.—FIG. 19.

Psoralea dalea L., Sp. Pl. 764. 1753. TYPE: Plate 22 in Linnaeus, Hortus Cliffortianus. 1738 (fide Barneby 1977).
P. annua Mill., Gard. Dict., ed. 8. 1768. Superfluous substitute for the cited *Psoralea dalea* L.
Dalea linnaei sensu auct., non Michx., Fl. Bor. Am. 2: 57. 1803.
D. acutifolia S. & M. ex DC., Prodr. 2: 245. 1825. TYPE: Mexico, Calques Dess., Fl. Mex., *pl. 228* (fide Barneby 1977).
D. angustifolia G. Don, Gen. Hist. Dichl. Pl. 2: 223. 1832. TYPE: Mexico, *Pavon* (OXF, not seen).
Amorpha glandulosa Blanco, Fl. Filip. 555. 1837. TYPE: Philippines, not seen. (Specimen of *Parosela glandulosa* (Blanco) Merrill labeled "neotype" at GH.)
Dalea nigra Mart. & Gal., Bull. Acad. Bruxelles 10: 43. 1843. TYPE: Mexico, *Galeotti 3263* (holotype, BR, not seen; isotypes, BR, P, W, not seen).
D. annua (P. Mill.) Kuntze, Rev. Gen. Pl. 1: 178. 1891.

FIGURE 19. *Dalea cliffortiana* Willd.—A. Habit (×1).—B. Flower (×8).

D. annua β willdenowii Kuntze, Rev. Gen. Pl. 1: 178. 1891. TYPE: unknown (fide Barneby (1977), this is based primarily on *Dalea cliffortiana* Willd.).
D. dalea (Lucanus) MacMil., Metasp. Minn. Vall. 330. 1892.
Parosela dalea (Lucanus) Britt., Mem. Torrey Bot. Club 5: 196. 1893.
Dalea virgata Micheli, Bull. Herb. Boissier 2: 442, *tab. 9.* 1894. SYNTYPES: Costa Rica, *Pittier 1462, 3828, 6504* (none seen). Non *Dalea virgata* Lag. (1816).
Parosela acutifolia (DC.) Rose, Bot. Gaz. 40: 144. 1905.
Dalea glandulosa (Blanco) Merrill, Philip. Gov. Bur. Lab. Bull. 27: 37. 1905.
Parosela cliffortiana (Willd.) Rose, Contr. U.S. Natl. Herb. 10: 105. 1906.
P. nigra (Mart. & Gal.) Rose, Contr. U.S. Natl. Herb. 10: 105. 1906.
Thornbera dalea (Lucanus) Rydb., N. Am. Fl. 24: 120. 1920.
T. robusta Rydb., N. Am. Fl. 24: 121. 1920. TYPE: Costa Rica, not seen.
T. pumila Rydb., N. Am. Fl. 24: 120. 1920. TYPE: Mexico, *Brandegee 1904* (US).
Parosela dalea var. *robusta* (Rydb.) Macbr., Contr. Gray Herb. 65: 22. 1922.
P. pumila (Rydb.) Macbr., Contr. Gray Herb. 65: 23. 1922.
Dalea pumila (Rydb.) Riley, Kew Bull. 1923: 337. 1923.
D. robusta (Rydb.) Cowan, Brittonia 8: 60. 1954.

Herb to 0.7 m tall, usually much branched above; stems terete or slightly ridged from nodes, glabrous, sometimes pubescent on upper parts of stem, glandular dotted but glands less dense, less regular than on leaves. *Leaves* alternate, imparipinnate, (1–)1.5–3.0(–5) cm long including the petiole and the terminal leaflet; leaflets (5–)11–15(–19), entire, gland dotted below, gray green (on drying?), linear to narrowly elliptic, (2–)4–8(–15) mm long, including petiolule, 1–2 mm wide, the leaflets becoming larger from the base to the tip of the leaf; rachis narrowly winged; stipules narrow, stipels represented by paired glands. *Inflorescence* narrow, compact spikes, terminal on the main and the lateral axes, becoming 0.8–3.5 cm long, 0.6–0.8 cm wide; bracts abruptly acuminate, pubescent at least on the margins, with long, soft hairs, gland dotted, green with light colored scarious margin. *Flowers* with the calyx 3–5 mm long, densely pilose, the teeth 5, triangular to acuminate, equal; petals 5, the standard white or rose tinged, 3–5 mm long, clawed, the wing and keel petals blue to pink, exceptionally white; wings 2.0–2.5 mm long, the keel petals 2.0–3.5 mm long; stamens 9–10, connective minutely gland tipped; pistil more or less pubescent. *Fruit* a 1-seeded, obovoid, dry legume, 2.0–2.5 mm long, the style base persistent; single seed oblong, ca. 1.5 mm long.

Dalea cliffortiana Willd. is found in dry fields, roadsides, and other disturbed sites, e.g., river and streamsides, from Mexico to Panama. It has become naturalized in Ecuador and Venezuela and also in the Philippines (Barneby, 1977).

COCLÉ: Olá, 100–350 m, *Pittier 5720* (US). HERRERA: La Avena to Pesé, 200 ft, *Burch et al. 1301* (DUKE, MO). 4 mi S of Los Pozos, *Tyson 2686* (FSU, MO). 2 mi W of Divisa, *Tyson 5154* (FSU). 10 mi S of Ocú, *Tyson et al. 2803* (MO). LOS SANTOS: La Honda, 0–5 m, *McDaniel 8060* (DUKE, FSU, MO). WITHOUT LOCALITY: *Burch et al. 1213* (MO).

18. DESMODIUM[37]

B. G. Schubert[38]

Desmodium Desv., Jour. Bot. sér. 2. 1: 122. Pl. V, *Fig. XV.* 1813, nom. cons. TYPE: *D. scorpiurus* (Sw.) Desv. = *Hedysarum scorpiurus* Sw., typ. cons.

[37] A list of generic synonyms is provided by Hutchinson, *Genera of Flowering Plants* 1: 481. 1964. *Meibomia* is the name used for the genus by Standley in his *Flora of the Panama Canal Zone,*

Meibomia Heister ex Fabr., Enum. 168. 1759. LECTOTYPE: *Hedysarum canadense* L.
Perrottetia DC., Ann. Sci. Nat. 4: 95. 1825, *non* H.B.K. Nov. Gen. Sp. Pl. 7: 57 (folio ed.); 7: 73 (quarto ed.). *t. 622.* 1824 [Celastraceae]. See DC. Mém. Légum. 312. 1826.

Herbs, subshrubs, or *shrubs,* prostrate or scrambling to erect. *Leaves* 1–3 (or rarely–5)-foliolate, petiolate, stipulate; leaflets petiolulate and stipellate. *Inflorescences* axillary or terminal, racemose or racemose paniculate, or extremely dense and capitate; primary bracts striate and ciliate, each subtending 1 (pedicellate) flower, or a fascicle of 2 to several flowers; secondary bracts often present, similar to the primary bracts or depauperate, each subtending a single flower; bracteoles rarely if ever present in American species. *Flowers* pedicellate, papilionaceous, calyx 2-lobed, the upper lobe almost entire to bifid, the lower 3-toothed with the central tooth longer than the laterals, or the calyx almost equally 5-lobed; corolla exceeding the calyx, the standard slightly clawed, wings somewhat so, wings often attached to keel petals by a small appendage, keel petals long clawed, partially fused above; vexillary stamen free or partially fused; anthers uniform; ovary sessile or stipitate, ovules 2–many, the style slender, the stigma terminal. *Fruit* lomentaceous, i.e., transversely septate and forming (1–)2–many articles, usually stipitate, indehiscent, or tardily dehiscent, or in 1 species in Panama the walls between the sutures falling away leaving the sutures as a frame; articles variously shaped from nearly linear to almost saccate or circular and notched at the apex, sometimes folded on each other in accordion fashion (at least when young), the surfaces glabrous to densely pubescent with straight tapering or hooked trichomes, or these only on sutures, the articles 1-seeded. *Seeds* oblong or subquadrate to reniform.

A genus of some 300 or more species of tropical and temperate areas of the world excepting New Zealand, Europe, and the United States west of the Rocky Mountains. Standley (1946) records one species in cultivation in southern California as an ornamental. The greatest center of diversity is in eastern Asia; centers of considerable magnitude occur also in Brazil and Mexico.

There is a large group of ruderal species, some of which have become pantropical weeds, and another group of species, growing only in woodlands and forests, which are less abundant and have more precise and restricted distribution. Representatives of both groups occur in the flora of Panama.

The fruits of many species are covered with hooked hairs which become attached to passing animals or to trouser legs very easily. This accounts for much

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Contr. U.S. Natl. Herb. 27: 210–212. 1928. Schindler maintains the genus *Nephromeria* to include several species occurring in Panama. These species will be recognized in the text by their synonymy.

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This treatment, commenced many years ago, has been accomplished with the aid of colleagues in many herbaria in this country and abroad, including A, B, BM, BR, C, CAS, DAO, DUKE, ENCB, F, FSU, G, GH, K, L, MEXU, MICH, MO, NY, OS, P, PMA, S, SCZ, U, UC, UPS, US, W. Their assistance in making available type specimens and/or photographs of them for study, as well as specimens from Panama and neighboring countries, some on long-term loan, is acknowledged with gratitude. Many type specimens were photographed while the author was a Fellow of the John Simon Guggenheim Memorial Foundation, and some field work was carried on when she was a Taxonomist with the New Crops Research Branch, A.R.S., U.S.D.A. Use of the original manuscripts, sketches, and fragments of specimens, of the late Dr. A. K. Schindler, purchased from him by the Arnold Arboretum of Harvard University, has also been of great help in understanding certain species.

of the distribution of weedier species. It is also the reason for the rather widespread common name "pega pega" applied to many species. The reason for Hutchinson's placement of the genus *Desmodium* under that branch of his key having "Fruits without hooked hairs" is puzzling.

The genus *Desmodium* is the largest member of the tribe Desmodieae, even if considered in the narrowest sense and with many subgeneric taxa raised to generic status. It is treated broadly here with the "satellite" genera maintained in infrageneric categories.

Specimens of one collection, *Tyson 6339* from Chiriquí Province, have come to me from MO and FSU. The Missouri sheet was annotated as *Desmodium caripense* "vel sp. aff." The Tyson material differs from *D. caripense,* however, in shape and pubescence of the leaflets, those of *D. caripense* being ovate attenuate in outline, and glabrous or glabrescent on the abaxial surface; in having longer, persistent, more obviously clasping stipules; and in number of articles per loment. It is similar to *D. venustum* Steudel of Mexico which, however, has long bracts (0.9–1.5 cm) that are gradually acuminate; it seems also to bear some relationship to *D. alamanii* DC. which differs in its densely pyramidal, much shorter inflorescences, slenderer primary bracts, shorter pedicels, and smaller glabrescent articles of the loment. From *D. ghiesbreghtii* Hemsley the Tyson material differs in its much longer persistent stipules, longer pedicels (14 mm vs. 4 mm, in fruit in *D. ghiesbreghtii*), and longer and broader loment articles. Additional material, especially in flower, will help to determine whether *Tyson 6339* is an undescribed species and if its relationship is with those species noted here as well as with *D. maxonii* and its other relatives treated in an earlier paper (Schubert, 1941). The label on the Tyson collection reads: Chiriquí, canyon of waterfall 5 mi NE of El Volcán, 6500 ft.

Literature:

Blake, S. F. 1924. New American meibomias. Bot. Gaz. 78: 271–288.

Ohashi, H. 1973. The Asiatic species of *Desmodium* and its allied genera (Leguminosae). Ginkgoana 1: 1–318; pls. 1–76.

Schindler, A. K. 1928. Die Desmodiinen in der botanischen Literatur nach Linné. Repert. Spec. Nov. Regni Veg. Beih. 49: 1–371.

Schubert, B. G. 1940. *Desmodium*: preliminary studies I. Contr. Gray Herb. 129: 3–31.

———. 1941. *Desmodium*: preliminary studies II. Contr. Gray Herb. 135: 78–115; pls. 1–3.

———. 1963. *Desmodium*: preliminary studies IV. J. Arnold Arbor. 44: 284–297.

a. Leaves regularly unifoliolate, leaflets linear lanceolate; sutures of the whole loment remaining more or less intact after the walls of the articles fall away ---------- 3. *D. angustifolium*

aa. Leaves regularly trifoliolate, leaflets not linear lanceolate; each article of the loment detaching with its sutures intact or the upper suture alone pulling away (starting at the proximal end of the loment), or rarely the articles partially separating, then dehiscing along the lower suture.

b. Articles of loment with dorsal (upper) suture straight to deeply concave, i.e., narrowly or broadly notched or indented.

c. Articles of the loment almost orbicular or saccate in outline, essentially flat, notched on the dorsal suture, not filled by the seed.

d. Articles small, almost as broad (high) as long,[39] 10–12 mm broad (including notch), 12–14 mm long, notch on dorsal suture narrowly V-shaped, article ± beaked at the termini of the dorsal suture; stipe ± equal to pedicel in length, essentially glabrous ---------- 11. *D infractum*

dd. Articles of the loment much larger, usually 2 cm or more long and high; notch on dorsal suture narrow to broad; articles beaked or not; stipe equal to or exceeded by the pedicel, puberulent to pubescent or glabrate.

e. Articles with flattened shoulders or else beaked when fully mature; leaflets ± tomentose on abaxial surface; stipe of loment pubescent.

f. Articles with flattened shoulders when mature; pedicel about equal to the stipe in length ---------- 13. *D. macrodesmum*

ff. Articles with shoulders only partially, if at all, flattened, becoming beaked when fully mature; pedicel usually exceeding stipe ---------- 18. *D. rhynchodesmum*

ee. Articles without flattened shoulders and not becoming beaked at maturity, the notch forming a sharply acute or obtuse angle; leaflets not tomentose on abaxial surface; pedicel exceeding the glabrate stipe in length ---------- 19. *D. saccatum*

cc. Articles of the loment smaller and not saccate or orbicular in outline, essentially filled by the seed when mature; the dorsal suture straight or only slightly concave or invaginated at the center.

g. Flowers borne in pairs; each pair subtended by 1 large primary bract; each pedicel usually subtended by a smaller secondary bract, or secondary bract lacking.

h. Each pair of pedicels subtended by a primary bract; each pedicel usually subtended by a smaller secondary bract.

i. Stems with inconspicuous pubescence of short hooked trichomes; leaflets short pilose on abaxial surface.

j. Leaflets rhombic, rhombic ovate, or rhombic orbicular, obtuse or rounded at apex; stipe of loment 3–4.6 mm long ---------- 4b. *D. axillare* var. *axillare*

jj. Leaflets ovate, rather abruptly short acuminate; stipe of loment 4.6–8 mm long ---------- 4c. *D. axillare* var. *stoloniferum*

ii. Stems with long dense pubescence of straight trichomes; leaflets ovate or elliptic ovate, long pilose abaxially, acute to gradually (usually long-) acuminate ---------- 4a. *D. axillare* var. *acutifolium*

hh. Each pair of pedicels subtended by a primary bract only; secondary bracts lacking.

k. Primary bracts early deciduous, inflorescence lax; calyx puberulent and slightly short pilose along central tooth of lower lobe.

l. Leaflets (terminal) to 2.3 cm long and 1.5 cm wide; articles of the loment to 5.5 mm long ---- 1. *D. adscendens*

ll. Leaflets (terminal) to 0.6 cm long and 0.7 cm wide; articles of the loment to 4.5 mm long -------- 23. *D. triflorum*

kk. Primary bracts persistent, inflorescence dense; calyx long silky pilose and ciliate ---------- 5. *D. barbatum*

gg. Flowers borne singly (rarely in *D. incanum* more than one in a fascicle), each pedicel subtended by 1 large primary and 2 smaller secondary bracts.

m. Loments multiarticulate, dorsal suture straight; isthmi broad or narrow; margins of leaflets not undulate.

n. Isthmi (area between the articles) nearly equaling length of article, loments to 7-articulate; leaflets thick, veins prominent ---------- 10. *D. incanum*

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[39] The length of the article in species of *Desmodium* sect. *Nephromeria* is measured as are those in other sections of the genus, along the long axis of the loment, assuming that more than one article may always occur. This conforms also to the long axis of the seed. The height of the article is, therefore, the width in this sense.

nn. Isthmi (area between the articles) narrow, loments to 4-articulate; leaflets thin, veins not prominent ---------- 2. *D. affine*

mm. Loments 2–3-articulate, dorsal suture curved or invaginated; isthmi very narrow; margins of leaflets undulate ---- 24. *D. wydlerianum*

bb. Articles with dorsal suture straight to curved, or obtusely to acutely angulate.

o. Pedicels borne in fascicles of 2–several, each fascicle subtended by a narrowly ovate, greenish to stramineous primary bract; each pedicel further subtended by a similar slenderer secondary bract; young inflorescences with fascicles early distinct.

p. Isthmi between articles central.

q. Plants prostrate; articles slenderly elliptic, sutures scarcely constricted at isthmi ---------- 20. *D. scorpiurus*

qq. Plants erect, mostly tall and usually becoming shrubby; articles chiefly rhombic in outline (excepting occasionally the terminal), sutures markedly constricted.

r. Terminal article of each loment regularly much dilated, reniform to elliptic ---------- 9. *D. glabrum*

rr. Terminal article of each loment equaling the others in size and shape.

s. Leaflets thick and with prominent reticulate venation.

t. Pedicels stiff, ascending to spreading at maturity, borne in pairs ca. 1 cm apart, 1–1.6 cm long; articles of the loment 3–3.5 mm long, 2.6–3.5 mm wide ---------- 22. *D. tortuosum*

tt. Pedicels more slender, ascending, borne in pairs less than 1 cm apart, 1 cm (or less) long; articles of the loment smaller, 1.5–2.5 mm long, 1.5–2 mm wide.

u. Leaves regularly trifoliolate, abaxial surface rough; pedicels 6–10 mm long; at least the terminal (sometimes 3) article glabrous ---- ---------- 8. *D. distortum*

uu. Leaves regularly unifoliolate, abaxial surface velvety tomentose; pedicels 2.5–3 mm long; all articles of the loment with some straight pubescence ---------- 16. *D. perrottetii*

ss. Leaflets thinner, not prominently reticulate.

v. Pedicels to about 1.2 cm long, straight, stout; bracts deciduous; articles appearing twisted but not coiled ---- 17b. *D. procumbens* var. *procumbens*

vv. Pedicels longer, usually 1.2–2 cm long, flexuous, filiform; bracts persistent; articles appearing to be tightly coiled ------ 17a. *D. procumbens* var. *longipes*

pp. Isthmi between articles eccentric ---------- 7. *D. campyloclados*

oo. Pedicels borne in pairs, each pair subtended by a broadly ovate, stramineous to olivaceous primary bract; each pedicel usually further subtended by a smaller, sometimes differently shaped and much thinner and paler, i.e., depauperate, secondary bract; young inflorescences with bracts densely imbricate.

w. Isthmi between articles central ---------- 14. *D. maxonii*

ww. Isthmi between articles eccentric.

x. Pedicels short (2.5–6 mm long), reflexed or erect at maturity, leaflets sometimes lustrous above.

y. Stems and leaflets sericeous tomentose; pedicels strongly reflexed in fruit ---------- 21. *D. sericophyllum*

yy. Stems pilose, leaflets lustrous above; pedicels erect at maturity ---------- 6. *D. cajanifolium*

xx. Pedicels longer (mostly 1–2 cm long) or, if not longer, then pedicels not sharply reflexed in fruit and leaflets not lustrous above.

z. Scandent to erect plants with stout trisulcate stems ---------- ---------- 12. *D. intortum*

zz. Prostrate or decumbent plants with slender terete stems ---- ---------- 15. *D. molliculum*

1. **Desmodium adscendens** (Swartz) DC., Prodr. 2: 332. 1825.

Hedysarum adscendens Swartz, Prodr. 106. 1788; Fl. Ind. Occ. 3: 1263. 1806. TYPE: Ind. Occ. *Swartz* (S, holotype; GH, photo).
Hedysarum adscendens var. β *caeruleum* Lindl. Bot. Reg. *tab. 815*. 1824. LECTOTYPE: Bot. Reg. *tab. 815*.
Desmodium adscendens var. β *?coeruleum* (Lindl.) DC., Prodr. 2: 332. 1825.
Meibomia adscendens (Swartz) Kuntze, Rev. Gen. Pl. 1: 195. 1891, *pro parte*.

Herbs, 6–24 inches tall, repent or forming tussocks, the stem terete, striate with stiff, upwardly appressed to spreading pilosity. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate lanceolate with long attenuate apex and slightly auriculate base, 0.5–1 cm long, 1.5–3 mm wide, striate, ciliate, the abaxial surface glabrescent, persistent; petioles sulcate adaxially, pilose, 1–1.8 cm long; leaf rachis similar to the petiole, 0.3–0.8 cm long; stipels linear attenuate, ciliate, 1–2 mm long; petiolules stouter than leaf rachis and with stiffer pilosity, 1–3 mm long; leaflets elliptic obovate, acute to obtuse and emarginate at the apex, cuneate to rounded at the base, densely pilose on both surfaces, the terminal leaflet 1.7–4 cm long, 0.75–2 cm wide, lateral leaflets 1.3–3 cm long, 0.7–2 cm wide. *Inflorescence* of terminal and axillary racemes, rachis striate to grooved, sparsely to abundantly stiff pilose and finely puberulent with multicellular and uncinulate trichomes; primary bracts ovate acuminate with long attenuate apex, striate, ciliate, pilose and puberulent on abaxial surface, early deciduous, 3.5–5 mm long, 1.5–2 mm wide, each subtending 2 pedicels, secondary bracts absent or, if (rarely) present, depauperate; pedicels with pubescence similar to that of rachis, 0.5–1 cm long. *Flowers* with the calyx distinctly bilabiate, the tube minutely puberulent throughout, teeth of both lobes pilose along each midrib and at the apex, teeth of lower lobe 2–3 mm long, upper bifid lobe 2–3 mm long; corolla usually pink, standard obovate, short unguiculate, 4–5 mm long, 2.5–3.5 mm wide, wings oblong, broader above, short unguiculate, slightly auriculate, 3–3.5 mm long, 1–2 mm wide, keel petals triangular, truncate at the apex, gradually narrowed to a long claw, 3.5–4 mm long, 1 mm wide. *Loment* stipitate, stipe 0.5–2 mm long, 1–5-articulate, articles oblong, straight on the upper suture, curved below, constricted about ½ their width at the isthmi, uncinulate pubescent and puberulent throughout, 3.5–5.5 mm long, 2.5–3 mm wide; *seed* transversely elliptic, 2.5 mm long, 1.5 mm wide.

Desmodium adscendens is widespread in tropical areas of Asia, Melanesia (see Ohashi, 1973), Africa and America. With *Desmodium incanum* and *D. scorpiurus*, it is one of the most common species.

There is a much larger synonymy for *Desmodium adscendens* than here indicated. It has not, however, entered the literature of Panama.

BOCAS DEL TORO: Ojo del Agua ca. 7 km W of Almirante, 190–220 m, *Croat 38133* (MO). Changuinola Valley, *Dunlap 214* (US). Río Teribe, mostly 2nd growth near Quebrada Lukulon, 90 m, *Kirkbride & Duke 522* (SCZ). Zigla Road at junction of Changuinola and Teribe Rivers, *Lazor et al. 2488* (FSU, MO, SCZ). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 5904, 5951, 5989* (all MO), *6796* (A, MO), *8509* (MO), *10763* (MO, SCZ), *11060, 11165* (both MO), *11727* (MO, SCZ), *16569, 17035* (both MO); *Dodge 3479* (G, GH); *Ebinger 21* (GH, MO); *Luteyn 1348* (DUKE); *Netting 33* (MO); *Robyns 65-22* (MO); *Shattuck 142* (MO). Summit Gardens, *Bottimer 1508* (DAO). Frijoles, *Bottimer 1496* (DAO). Chagres, *Fendler 77* (K). 5 mi E of Ferry Thatcher bridge near mangrove swamp, *Lazor 3311* (FSU, SCZ). Pipeline road, 16.8 km from beginning of road; 0–100 m, *Mori &*

Kallunki 1765 (MO). Trail between Gamboa and Cruces, 50–80 m, *Pittier 3769* (G, GH, US). Frijoles, *Pittier 6835* (G, GH, US). Old Fort San Lorenzo, *Tyson 1559* (SCZ). Pipeline road, *Witherspoon & Witherspoon 8287* (MO). CHIRIQUÍ: Roadside above Princess Janca finca, Boquete, *D'Arcy & D'Arcy 6334* (MO). Volcán/Cuesta de Piedras, site 84, 1000–1200 m, *Burt & Koster 159* (MO). Boquete Dist., 3800 ft, *Davidson 711* (GH, MO, US). Just W of the Fortuna camp, 1400–1600 m, *Folsom et al. 5373* (MO). Between Concepción and Hato de Volcán, 1080 m, *Koster 159* (A). Nueva California, 4000 ft, *Tyson 5707* (DUKE, FSU, MO, SCZ). Boquete, 1200–1500 m, *Woodson & Schery 719* (G, GH, MO, US). Finca Lérida to Boquete, 1300–1700 m, *Woodson et al. 1166* (G, GH, MO, US). COCLÉ: Road past Furlong's Finca, N of Cerro Pilón, 880 m, *Croat 37512* (MO). Road to El Valle de Antón, *D'Arcy & D'Arcy 6717A, 6721, 6742* (all MO). Top of El Petroso, N of El Copé, 800 m, *D'Arcy 11336* (MO). Slopes of Cerro Pilón near El Valle, 700–900 m, *Duke 12189* (MO, OS). Foothills of Cerro Pilon near El Valle, 900 m, *Duke & Correa 14701* (NY). Summit of Cerro Pilón above El Valle de Antón, 2700 ft, *Dwyer et al. 4496* (MO). Boca del Toabré at confluence of Rió Toabré and Río Coclé del Norte, *Lewis et al. 5514* (MO, SCZ). El Valle, *Ebinger 951* (MO), *1121* (GH, MO). Summit at Alto Calvario, 900 m, *Folsom & Robinson 2394* (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al. 2610* (MO); 3100 ft, *Luteyn 4054* (DUKE); 2000 ft, *Porter et al. 4592* (MO); *Wilbur & Luteyn 11755* (DUKE). Bismark above Penonomé, *Williams 139* (US). COLÓN: Miguel de la Borda, *Croat 10044, 10054* (both MO). Gatún Lake, Goodyear Allweather Estate, *Seibert 1525* (MO, US). 5 mi NE of Sabanita towards Portobelo, *Wilbur & Luteyn 11618* (DUKE). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11178* (DUKE). DARIÉN: Río Pirre near crossing of trail from El Real to Tucutí, 20 mi W of El Real, *Duke 5200* (MO). Village of Manené, *Kirkbride, Jr. & Bristan 1614* (MO). Río Tuquesa at lower Tuquesa Mining Company camp called Charco Chiva (=Quebrada Venado on Darien radar map), 100 m, *Mori 6979* (MO). Río Paya, trail between Paya and Payita, *Stern et al. 356* (GH, MO, US). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11880* (MO). From 1 mi S to 10 mi N of Tonosi, *Duke 12480* (NY, OS). PANAMÁ: Cerro Campana, 2400–2700 ft, *Duke 8694* (MO). Between Cañasas and Sabalo, ca. 100 m, *Duke 14477* (MO, NY, OS). Chimán, *Lewis et al. 3300* (GH, MO). Cerro Azul, *Tyson 2175* (FSU, SCZ). SAN BLAS: Hills SE of Puerto Obaldía, *Croat 16723* (A), *16741* (MO). Puerto Obaldía, Croat *16867* (MO), *16875, 17009* (both A). Trail E of Cangandí-Mandinga airport road, 2–5 mi S of Mandinga airport, *Duke 14809* (NY). Puerto Obaldía, 0 to 50 m, *Pittier 4368* (US). Molia, *Stier 47* (MO). VERAGUAS: Río Primero Braso, 2.5 km beyond Agriculture School Alto Piedra near Santa Fe, 700–750 m, *Croat 25473* (MO). 0.6 mi beyond Escuela Agricola Alto Piedra, 730 m, *Croat & Folsom 34001* (MO). Mouth of Río Concepción, *Lewis et al. 2825* (GH, MO, UC). Base of Cerro Tute, 6.5 km outside of Santa Fé, *Folsom 3008* (MO).

2. **Desmodium affine** Schlecht., Linnaea 12: 312. 1838. TYPE: Mexico, Veracruz, Prope Jalapam et Hacienda de la Laguna, *Schiede*. Not seen.

Desmodium albiflorum Salzm. ex Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 17. 1854, nomen nudum; Benth. in Mart. Fl. Bras. 15(1): 99. 1859. TYPE: Brazil, Bahia, *Salzmann* (K, not seen; photo A).
Meibomia affinis (Schlecht.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. albiflora (Benth.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

Procumbent woody *herb* with erect peduncles; stem uncinulate puberulent and moderately long spreading pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate acuminate, striate, puberulent on abaxial surface, ciliate, persistent, 4–6.5 mm long, 2–2.5 mm wide; petioles sulcate on adaxial surface; pubescence similar to that of stem, 2.6–3.2 cm long; the leaf rachis similar, ¼ or less the length of petiole; stipels lance attenuate, striate, puberulent and ciliate, persistent, 2.5–4 mm long; petiolules stouter than the leaf rachis, densely spreading pilose, 1–2.5 mm long; leaflets thin, uncinulate puberulent and sparsely scattered pilose on adaxial surface, paler and with veins more prominent on the sparsely uncinulate puberulent and pilose abaxial surface, the margins ciliate at least near base, the terminal leaflet ovate, acute to obtuse, the base rounded to deltoid, 3.6–4.8 cm long, 2.3–3.2 cm wide, lateral leaflets obliquely oval, acute, 2.9–4 cm long, 1.7–2.5 cm wide. *Inflorescences* axillary and terminal; the rachis angulate, uncinulate puberulent, remotely if at all pilose; primary bracts ovate

acuminate, striate, puberulent and ciliate, not long persistent, 1.5–3 mm long, 1 mm wide; secondary bracts similar, 1–1.5 mm long, 0.5 mm wide; pedicels borne singly, each subtended by 1 primary bract and 2 secondary bracts (borne laterally), densely uncinulate puberulent, 8–11 mm long. *Flowers* with the calyx bilabiate, uncinulate puberulent, pilose on the teeth of both lobes, the teeth of lower lobe acuminate, almost equal, 3.5–4 mm long, the upper bifid lobe 3.5–4 mm long; corolla somewhat longer than the calyx, standard obovate, narrowly cuneate at base, 5.5 mm long, 4 mm wide, wings oblong, unguiculate, 6 mm long, 1.5 mm wide, keel petals oblong to remotely scythe shaped, long unguiculate, 5.5–6 mm long, 1.5–2 mm wide. *Loments* short stipitate, the stipe 1.5–2 mm long, to 5-articulate, articles oblong, the upper suture straight, the lower curved, constricted at the isthmi, articles densely uncinulate puberulent, 5.5–6 mm long, 2.5–3 mm wide; seed transversely elliptical, 3 mm long, 1.5 mm wide, the funicle short.

This species occurs in southern Mexico, Central America, the West Indies, and the northern half of South America.

The above noted seed measurements were taken from *Standley 28941* (GH), Honduras.

CANAL ZONE: Balboa, *Standley 25417* (US), *26076* (MO, US), *29262* (US).

3. **Desmodium angustifolium** (H.B.K.) DC., Prodr. 2: 328. 1825.—FIG. 20G.

Hedysarum angustifolium H.B.K., Nov. Gen. Sp. Pl. 6: 404 (folio ed.); 6: 517, 518 (quarto ed.). 1824. TYPE: Mexico (P; photo GH).
Desmodium linearifolium DC., Prodr. 2: 327. 1825; Mém. Légum. 325. 1826, non G. Don, Gen. Syst. 2: 294. 1832. TYPE: "ex itin. Nee in hb. Thib."
Meibomia angustifolia (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 197. 1891, non *M. angustifolia* (T. & G.) Kearney, Bull. Torr. Bot. Club 20: 481. 1893.
M. linearifolia (DC.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Desmodium angustifolium var. *typicum* Schubert, Contr. Gray Herb. 129: 27. 1940.

Tall, erect, somewhat woody *herbs* to almost 3 m high; stem angulate, glabrescent to densely uncinulate puberulent. *Leaves* unifoliolate, stipulate, petiolate; stipules early deciduous, ovate attenuate (the slender tip almost ½ the total length), striate, puberulent, stiffly ciliate, 3–9 mm long, 0.7–2 mm wide; petioles striate, minutely puberulent, 0.15–1 cm long, stipels lance attenuate, persistent, 1–3.3 mm long, petiolules puberulent and stiffly pilose, 0.5–1.7 mm long; leaflets sparsely to densely uncinulate puberulent on both the surfaces and sparsely strigose chiefly on the midrib and the veins of abaxial surface, linear lanceolate, acute and mucronate at the apex, acute at the base, (3–)8–16 cm long, 0.2–0.6 cm wide. *Inflorescence* racemose paniculate, rachis uncinulate-puberulent and somewhat stiffly pilose; primary bracts each subtending a fascicle of 2–several pedicels, ovate acuminate, striate, puberulent on the abaxial surface, stiffly ciliate, 1.7–3.5 mm long, 0.5–1 mm wide, each pedicel further subtended by a similar smaller lance acuminate secondary bract 0.8–2 mm long and 0.4–0.5 mm wide; pedicels pubescent as on the rachis, 4–7 mm long. *Flowers* with the calyx puberulent and stiffly pilose, the margins of the teeth of both lobes stiffly ciliate, the upper bifid lobe 2–2.4 mm long, lateral teeth of lower lobe 2–2.3 mm long,

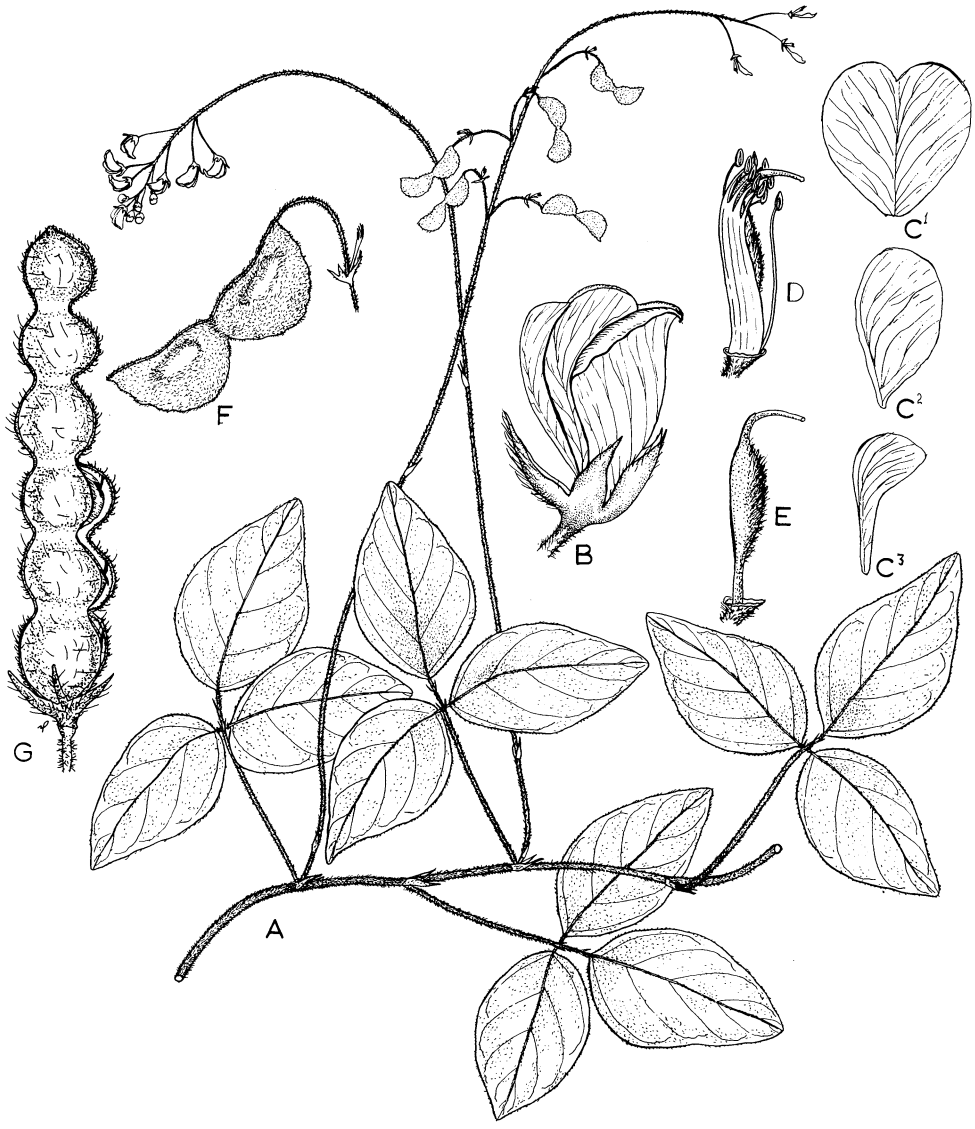

FIGURE 20. *Desmodium*.—A–F. *Desmodium axillare* (Sw.) DC. var. *acutifolium* (Kuntze) Urb.—A. Habit (×½).—B. Flower (×6).—C. Corolla.—C^1. Standard (×4).—C^2. Wing petal (×4).—C^3. Keel petal (×4).—D. Stamens.—E. Pistil.—F. Fruit (×2). [After *Erlanson 296*.]—G. *Desmodium angustifolium* (H.B.K.) DC. Fruit. Note dehiscence with the rim separating. [After *Allen 1269*.]

the central tooth 2–2.5 mm long; corolla with the standard flabellate and short unguiculate, 3–4.7 mm long, the wings oblong, slightly auriculate and short unguiculate, equaling or slightly exceeding the standard in length, the keel petals less markedly auriculate, longer unguiculate than the wings, 3.4–5 mm long and 1–2 mm wide. *Loment* short stipitate, 3–8-articulate, the stipe 0.5–2 mm long, the articles essentially orbicular, uncinulate puberulent on the surfaces and stiffly

pilose on surfaces and suture, 3–4 mm long, 2–2.5 mm wide, the walls of the articles often dehiscing from the suture which remains essentially intact; *seed* transversely oblong, 1.8 mm long, 1 mm wide.

This species ranges from Mexico and Central America to northern South America.

The characteristic falling away of the walls of the articles of the loment, often leaving the suture of the whole loment intact, distinguishes *Desmodium angustifolium*. This character occurs frequently in species of *Mimosa* but has been observed in only one other American species of *Desmodium*.

Desmodium gramineum Gray, which was treated by me (1940) as a variety of *D. angustifolium* is not related to this species, and my early treatment of *D. gramineum* in this way should not be followed.

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5181* (US). Sosa Hill, Balboa, *Standley 25274* (MO, US), and *26441* (US). CHIRIQUÍ: from Boquete to 3 mi N, 3300–4300 ft, *Lewis et al. 649* (MO). Sabana de la Tortuga between Boquete and Caldera, 300–700 m, *Pittier 5733* (US). HERRERA: 10 mi S. Ocú, *Tyson et al. 2877* (MO, SCZ). PANAMÁ: San José Island, *Johnston 370* (GH, US), *1269* (BM). El Valle, 580 m, *Rattray 29* (A); *Seemann 204* (K), *Seemann* (BM). Las Sabanas, *Standley 25898* (MO, US). Between Las Sabanas and Matías Hernández, *Standley 31869* (US). VERAGUAS: Above Río Santa María along road to Santiago, 5 km S of Santa Fé, 250–300 m, *Nee 8112* (MO). PROVINCE UNKNOWN: *Duchassaing* (P).

4. **Desmodium axillare** (Swartz) DC., Prodr. 2: 333. 1825.

Herbs, the stem repent and rooting at the nodes, the internodes 1.3–11 cm long. *Leaves* trifoliolate, stipulate, the stipules connate up to ½ their length, early deciduous; petioles to 10 times the length of the leaf rachises, leaf rachis to 12 mm long or occasionally lacking; petiolules of the lateral leaflets usually somewhat longer than those of the terminal leaflet. *Inflorescence* racemose, the racemes arising from the leaf axils; bracts early deciduous; calyx uncinulate puberulent over the whole surface with stout straight trichomes along the teeth of both lobes. *Flowers* with the corolla always exceeding the calyx; standard obovate or more rarely ovate, broadly acute below or narrowing slightly to an obtuse or truncate base, rounded at apex, retuse, the wings obliquely obovate, truncate or obtuse at apex, auriculate at base, short clawed, the keel petals fused, more or less falcate, obtuse at the apex, broadly clawed. *Loment* 1–3-, mostly 2-articulate, stipitate, the upper suture continuous, essentially straight.

This species is composed of three well defined, easily distinguishable varieties all of which occur in Panama.

4a. **Desmodium axillare** var. **acutifolium** (Kuntze) Urb., Symb. Ant. 4: 292. 1905.—FIG. 20A–F.

Meibomia axillaris (Swartz) Kuntze var. *β. acutifolia* Kuntze, Rev. Gen. Pl. 1: 195. 1891.
Nephromeria axillaris (Swartz) *β. acutifolia* ["acutifoliola"] (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1925.
Desmodium axillare var. *β. angustatum* Urb., Symb. Ant. 2: 303. 1900.
D. axillare var. *β. angustatum* fo. *robustius* Urb., Symb. Ant. 2: 303. 1900.
D. axillare var. *β. acutifolium* fo. *robustius* (Urb.) Urb., Symb. Ant. 4: 292. 1905. Based on *D. axillare* var. *β. angustatum* fo. *robustius*.
Nephromeria axillaris var. *β. acutifolia* (Urb.) Schindl. fo. *robustior* (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1925.

Hedysarum oblongifolium Bertero ex DC., Prodr. 2: 332. 1825, *pro syn.*
Desmodium oblongifolium Bertero ex DC., Prodr. 2: 332. 1825.
Meibomia umbrosa Britt., Bull. Torrey Bot. Club 37: 353. 1910.
M. prorepens Blake, Contr. U.S. Natl. Herb. 24: 6. 1922.

The variety *acutifolium* is characterized by the long dense pubescence of its stems in contrast to the short uncinulate pubescence on the stems of the other 2 varieties, and the ovate to elliptic ovate, usually long acuminate leaflets densely long pilose on the abaxial surface. It is found more or less throughout the range of variety *axillare* but more rarely.

This variety occurs in Central America, the West Indies, Colombia, British Guiana, and Brazil.

For citation of type material and some discussion of the synonymy see Schubert 1963.

CANAL ZONE: Ft. Kobbe, *Bottimer 1446* (A, DAO). Barro Colorado Island, *Bottimer 1481* (DAO); *Croat 5414, 6353, 7063, Croat 11797* (all MO); *Ebinger 22* (GH, MO); *Kenoyer 384* (US); *Shattuck 1046* (GH, MO). Pipeline Road near Gamboa, *Clewell & Tyson 3209* (FSU, MO), *3210* (MO). Behind Farfan Beach, *D'Arcy & D'Arcy 6087* (MO). 6 mi E of Chepo on Panamerican Highway, *Duke 4074* (MO). Ft. Kobbe, *Duke 4703* (MO). U.S. Army Tropic Test Center, Albrook, *Dwyer 6735* (MO). Gamboa, Naval Reservation, *Ebinger 488* (GH, MO). Río Chagres Bridge, ca. 2 km by road SE of Gamboa toward Balboa, *Lasseigne 4269* (MO). 2 mi N of Paraíso on Balboa Highway, side of hill overlooking Gaillaird Cut, *Lazor & Blum 5321* (SCZ). Altos del Río Pacora, 2500 ft, *Lewis et al. 2300* (GH, MO). Ancón Hill, *Standley 25172* (US). 1 mi N of Summit Garden, *Tyson & Blum 1980* (MO). Across highway from Summit Garden, *Witherspoon & Witherspoon 8696* (MO). CHIRIQUÍ: Between Concepción and David 100–200 m, *Koster 150* (A). COCLÉ: Trail to Las Minas, 2.8 miles NW of church in El Valle de Antón, 3100 ft, *Luteyn 4055* (DUKE). Road from El Valle to La Mesa, 2400–2600 ft, *Vaughan et al. 601* (MO). COLÓN: Colón *Kuntze* (NY); Colón Highway Bridge on Chagres River, *Lazor & Tyson 3029* (MO), *3063* (FSU, MO). DARIÉN: Gold mine at Caná, 500–600 m, *Croat 37584* (MO). Trail between Caná and Boca de Cupe, *Stern et al. 622* (MO). HERRERA: 1 mi N of Las Minas and 14 mi S of Ocú, *Wilbur et al. 12114* (DUKE). PANAMÁ: Roadside near Chepo, *Dodge 10717* (MO). 5–6 mi E of Chepo on Panamerican Highway, *Duke 4045* (GH, MO). Río Pita, 1–2 mi above tidal limit, *Duke 4799* (MO). San José Island, *Duke 12522* (MO, NY, OS); *Erlanson 296* (G, GH, US): *Johnston 98, Johnston 454* (both GH). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11881* (MO). PROVINCE UNKNOWN: Between Panamá and Sabanas, *Riley 114* (BM, MO, US).

4b. **Desmodium axillare** (Swartz) DC. var. **axillare**.

Desmodium axillare (Swartz) DC., Prodr. 2: 333. 1825.
Hedysarum axillare Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1274. 1806.
Meibomia axillaris (Sw.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.
D. axillare var. α *genuinum* Urb., Symb. Ant. 2: 303. 1900.
Nephromeria axillaris (Sw.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
Meibomia axillaris var. α. *obtusifoliola* Kuntze, Rev. Gen. Pl. 1: 195. 1891.
D. axillare var. α *obtusifoliola* (Kuntze) Urb., Symb. Ant. 4: 291. 1905.
Nephromeria axillaris var. α. *obtusifoliola* (Kuntze) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
Hedysarum reptans Poir. in Lam. Encycl. Méth. Bot. 6: 422. 1804.
Meibomia reptans (Poir.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
D. radicans Macfad., Fl. Jam. 1: 269. 1837. Based on *Hedysarum axillare* Sw.
Meibomia andina Rusby, Mem. Torrey Bot. Club 3: 21. 1893, *pro parte,* as to isotypes (GH, MO, US), not as to holotype (NY).

This, the most common and widespread of the three varieties of *Desmodium axillare,* is distinguished by its rhombic ovate, or rhombic orbicular terminal leaflets, and by the short stipes of its loments (3–4.6 mm) which are exceeded in length by those of the other two varieties.

Desmodium axillare occurs in Mexico, Central America, the West Indies, and the northern ⅔ of South America.

For photographs and discussion of the holotypes of *Hedysarum axillare* and *H. reptans* see Schubert 1963.

BOCAS DEL TORO: Almirante, *Barrus 404* (GH); *Carleton 68* (GH, NY, US), *Carleton 102* (US). Hill above RR station at Milla 7.5, *Croat & Porter 16384* (MO). 1.5 mi SE of Banana Plantation of Changuinola, *Lazor et al. 2458* (FSU, SCZ). Junction of Ríos Changuinola & Terebe, 100–200 ft *Lewis et al. 928* (MO, UC). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2138* (MO, UC). Without other location, *Wedel 225* (GH, MO), Water Valley, *Wedel 621* (GH, MO). CANAL ZONE: Barro Colorado Island, *Dodge 3463, 3478* (both GH). Panamerican Highway, Río Cañita, *Duke 3837* (GH, MO). Near Gatún Dam, *Foster & Chong 1352* (DUKE). Gatún Station, *Hayes 62* (G), *232* (NY). Gamboa, 20–100 m, *Pittier 3763* (NY, US), *Pittier 4439* (US). Las Cascadas Plantation near Summit, *Standley 25792* (US). CHIRIQUÍ: San Bartolo Limite near Costa Rican border, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22174* (MO). San Bartolo Arriba W of Puerto Armuelles, 125 m, *Croat 26724* (MO). N side of Cerro Pando, 6000 ft, *D'Arcy & D'Arcy 6658* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 453* (MO). Between Río Tinta and Río Tabasara, *Woodson et al. 420* (MO). COCLÉ: 44 km N of Penonomé on road to Coclesito, 300–500 ft, *Hammel 1668* (MO). DARIÉN: Path from Cañazas to Tortí, border Darién and Panamá, *Folsom 4962* (MO). Upper Río Tuquesa, *Le Clezio 208* (MO). El Real, Río Tuira 1 mi down from Pinogana near Quebrada Chuito, *Stern et al. 104* (MO). Bridge over Río Chucunaque downstream from Yaviza, on Panamerican Highway, *Stern et al. 151* (GH). HERRERA: Road between Las Minas and Pesé, 600 ft (U of Fla. site #4), *Duke 12343* (NY). [Variety uncertain: only inflorescence available, no stem or leaves.] PANAMÁ: Near Tapia River, Juan Díaz region, *Maxon & Harvey 6660* (US). PROVINCE UNKNOWN: Bohio Soldado, *Cowell 241* (NY, US).

4c. **Desmodium axillare** var. **stoloniferum** (Rich. ex Poir.) Schubert, J. Arnold Arbor. 44: 289. 1963.

Hedysarum stoloniferum Rich. ex Poir. in Lam., Encycl. Méth. Bot. 6: 421. 1804.
Desmodium spirale β. *stoloniferum* (Rich. ex Poir.) DC., Prodr. 2: 333. 1825.
D. stoloniferum (Rich. ex Poir.) Steud., Nom. Bot. ed. 2. 1: 496. 1840.
D. axillare var. γ. *sintenisii* Urb., Symb. Ant. 2: 303. 1900.
Meibomia sintenisii (Urb.) Britt. in Britton & Wilson, Sci. Surv. Porto Rico & Virgin Isl. 5: 402. 1924.
Nephromeria axillaris var. γ. *sintenisii* (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
D. axillare var. *sintenisii* sensu Schubert, Contr. Gray Herb. 135: 84–86, *pl. 1, figs. A1–7.* 1941.
Meibomia albida Blake, Contr. U.S. Natl. Herb. 24: 5. 1922.

The variety *stoloniferum* is intermediate in aspect between var. *axillare* and var. *acutifolium*. From both these varieties it may be distinguished by its ovate, abruptly short acuminate leaflets, and from var. *axillare* by the denser pilosity on the abaxial surface of the leaflets as well as by its longer pedicels and loment stipes.

Central America, the Greater Antilles, and the northern half of South America.

CANAL ZONE: Barro Colorado Island, *Croat 6290, 6630* (both MO), *10214* (MO, SCZ), *11254, 11264, 11311, 11828, 14019, 14982, 15118* (all MO); *Foster 828* (DUKE); *Knight* (WIS); *Netting 47* (MO); *Starry 168* (MO); *Wilbur & Weaver 10812* (DUKE, GH, MO). Behind Farfan Beach, *D'Arcy & D'Arcy 6087* (MO). Jenine, Río Cañita, *Duke 3871* (MO). Río Indio, *Steyermark & Allen 17436* (MO). CHIRIQUÍ: San Bartolomé, Peninsula de Burica, 0–50 m, *Woodson & Schery 873* (MO, NY, US). COLÓN: Gatún Lake, Goodyear All Weather Estate, *Seibert 1526* (US). DARIÉN: El Punteadero, bridge crossing of Panamerican Highway over Río Chununaque, down river from Yaviza, *Stern et al. 151* (MO). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2210* (MO). PANAMÁ: Río Sancantí, 2 mi upstream from Piria, 120 m, *Duke 14384* (NY). From Tortí to the Pilota del Toro, mountain overlooking Tortí Arriba, *Folsom et al. 5098* (MO). Juan Díaz, *Killip 3161* (US). SAN BLAS: Between Cangandí and Mandinga Indigena, *Duke 14756* (NY, OS).

5. **Desmodium barbatum** (L.) Benth. in Miq., Pl. Jungh. 224. 1852; Benth. & Oerst. in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn. 1853: 18. 1854.

Hedysarum barbatum L., Syst. Nat., ed. 10. 1170. 1759. TYPE: herb. Linnaeus (LINN 921.48; microfiche A-GH).
Perrottetia barbata (L.) DC., Ann. Sci. Nat. 4: 96. 1825.
Nicolsonia barbata (L.) DC., Mém. Légum. 313. 1826.
Urania barbata (L.) Desv., Mém. Soc. Linn. Paris 4: 309. 1826.
Meibomia barbata (L.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.

Herbs, prostrate to ascending or erect with white to fulvous appressed to spreading pilosity on stems, branches, petioles, and rachis of the inflorescence. *Leaves* usually trifoliolate, stipulate, petiolate; stipules conspicuous and persistent, deltoid attenuate, slightly auriculate at the base, striate and ciliate, somewhat pilose to glabrescent on abaxial surface, 6–10 mm; petioles sulcate on adaxial surface, 0.8–2.2 cm long, the leaf rachis similar, 0.2–0.7 cm long; stipels slender, ciliate, persistent, 1.5–4.5 mm; petiolules somewhat stouter and more densely pilose than leaf rachis, 1–2 mm long; leaflets almost orbicular to oval, elliptic obtuse or obovate, usually mucronate, often retuse, sparsely appressed pilose adaxially, densely so and with venation prominent abaxially, terminal leaflets 1.4–5 cm long, 0.5–2 cm wide, the lateral leaflets 1–3.8 cm long, 0.4–1.3 cm wide. *Inflorescence* of axillary and terminal short, congested, densely flowered racemes somewhat obscured by the long pubescence of bracts and calyces; bracts long persistent, ovate acuminate, striate, pilose to glabrescent on abaxial surface, ciliate, 5–7 mm long, 1.5–2 mm wide, secondary bracts lacking; pedicels uncinulate pilosulous, 3.5–9 mm long. *Flowers* with the calyx becoming reflexed, subequally 5-lobed, silky pilose, the lobes ciliate, 4–6 mm long; standard obovate, somewhat unguiculate, 4–5 mm long, 2–3.7 mm wide, the wings oblong, obtuse, short unguiculate, 3–4 mm long, 1–1.5 mm wide, the keel petals scythe shaped, truncate at the apex, long unguiculate, 3–4.5 mm long, 0.8–1 mm wide at the apex. *Loment* 1–5-articulate, straight on the dorsal suture, somewhat curved below between the wide isthmi, uncinulate pubescent on the surfaces; articles separating partially first, the lower suture dehiscing later, the articles 2–3.5 mm long, 2–2.5 mm wide; *seed* subquadrate to quadrate, 1.5 mm long, 1 mm wide, pale tan.

A polymorphic species widespread in tropical areas of the New World and in Africa and Asia.

Many variations have been named but in general the characters cannot be correlated with geographical distribution. In Panama there seem to be two forms, one repent and one erect, but there are many intergradations between the two extremes.

BOCAS DEL TORO: Almirante, *Rowlee & Stork 1000* (NY, US). Chiriquí Lagoon, *Wedel 1179* (GH, MO, US). Johns Creek, *Wedel 2758* (GH, MO, NY, US). CANAL ZONE: 1 mi from Miraflores, *Blum 1853* (FSU, SCZ). Summit Gardens, *Bottimer 1507* (DAO). Venado Beach, *Correa & Gonzalez 507* (A, DUKE, SCZ); *Correa & Gonzalez 524* (DUKE, FSU, MO). Near Summit Golf Course, *Croat 12792* (MO). 1 mi N of Summit Garden, *Croat 12891* (MO). Pipeline Road to 18 km N of Gamboa, *D'Arcy* (MO). Toro Point, Ft. Sherman, *Duke 4323* (MO). Paraiso, *Dwyer 7163* (MO). Fort Sherman, *Dwyer 7167* (MO). Chagres, *Fendler 76* (K, MO, US). Pipeline Road, 2–4 mi N of Gamboa, *Gentry 6536* (GH, MO). Empire Station, *Hayes 585* (K). Paraiso Station, *Hayes 799* (NY). Cerro Ancón,

Heriberto 129 (GH, US). 8 mi N of Gamboa on Pipeline Road, *Lazor 5276* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5661, 5684* (both MO). 3 km S. Gualaca, *McCorkle C-46* (FSU, SCZ). Near Gamboa Country Club, *Mori 413* (MO). Ancón Hill, *Piper 5116* (US). Culebra, 50–150 m, *Pittier 2142* (BM, C, NY, US), *4827* (NY, US). *Seemann 229* (BM, K), [Province uncertain]. Sosa Hill, Balboa, *Standley 25273* (MO, US). Ancón Hill, *Standley 26354* (C, US). Summit, *Standley 26948* (US). Frijoles, *Standley 27658* (US). Mt. Hope Cemetery, *Standley 28788* (US). Cerro Azul, 2000 ft, *Tyson 2128* (MO). Curundu, *Tyson & Blum 2523* (FSU, MO). 1 mi from Summit on road to FAA radar tower, *Tyson et al. 2771* (MO, SCZ). CHIRIQUÍ: Near Veladero, site 60, 0–100 m *Burt & Koster 125* (MO). Savanna just below Boquete, 800 m, *D'Arcy 9769* MO). Lava fields near town of Volcán, 4600 ft, *Duke 9215* (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 602* (GH, MO). Road to Gualaca 0–100 m, *Rattray 125* (A). Boqueté District, Volcancitos, 5500 ft, *Terry 1262* (GH, MO). COCLÉ: S of El Valle de Antón, 600–800 m, *Allen 2810* (G, GH, MO, US); *Bottimer 1473* (A, DAO). Savanna 4–6 mi E of Natá, 10–25 m, *Duke 12388* (NY). Penonomé, *Ebinger 995* (GH, MO); 50–1000 ft, *Williams 128* (NY, US). COLÓN: Portobelo Road ca. 1 mi W of Portobelo, *Gentry 1739* (MO, SCZ). DARIÉN: El Real, *Burch et al. 1069* (GH, MO, UC). HERRERA: Near Ocú, 100–200 m, *Burt & Koster 88* (MO). Between Panamerican Highway and Ocú, 100–200 m, *Koster 88* (A). PANAMÁ: Pacora, ca. 35 m, *Allen 990* (GH, MO, US). Cerro Campana, *D'Arcy 9581, 9602* (both MO). Between Panamá and Chepo, *Dodge et al. 16701* (MO). Cerro Campana, *Duke 5949* (MO). Tocumen area, *Dwyer et al. 7231* (GH, MO). Las Sabanas, *Heriberto 138* (US). Tumba Muerto, *Heriberto 176* (NY). Sabanas near Chepo, 30 m, *Hunter & Allen 19* (MO). Chilibre, *Jaén 45* (MO). San Jose Island, *Johnston 27* (US, MO), *672, 826* (both GH). Taboga Is., 200 m, *Killip 3187* (US). Between Tapía and Tocumen Rivers, 75 m, *Killip 3239* (US). Cerro Campana, *Lewis et al. 3131* (MO). Taboga Island, *Longfield 490* (BM, K, MO, US). Cerro Campana, 650–700 m, *McDaniel 8138* (FSU). Pacora-Chepo highway, vicinity Pacora River, *McDaniel 8179* (DUKE, FSU). El Llano-Cartí road, 5 km N of Panamerican Highway, 300 m, *Nee 7929* (DUKE, MO). Sabanas, *Paul 52* (US). Sabana de Juan Corso, near Chepo, 60–80 m, *Pittier 4647* (G, GH, NY, US). Matías Hernández, *Pittier 6873* (GH, NY, US). Nuevo Emperador, *Puga 30* (DUKE, MO). Road to Chepo near sea level, *Semple Pa-1* (US). Big swamp east of Río Tocumen, *Standley 26505* (US). Near Matías Hernández, *Standley 28887* (US). Between Matías Hernández and Juan Díaz, *Standley 32084* (US). Cerro Azul at 2000 ft, *Tyson 2128* (FSU, SCZ). W slope Cerro Campana, 2500 ft, *Tyson et al. 2347* (FSU, SCZ). Between Pacora and Chepo, 24 m, *Woodson et al. 1662* (GH, MO, NY, US). SAN BLAS: Mainland in front of Ustupo, *D'Arcy 9497* (MO). Mainland Point opposite Isla Mosquito, *Duke 8972* (DUKE, MO, OS). Mainland opposite Playon Chico, 0.3 mi from Caribbean, 0.200 m, *Gentry 6341* (MO). VERAGUAS: Divisa/Santiago, 0–100 m *Burt & Rattray 77, 81* (both MO). Near La Peña, 100–200 m alt., *Burt & Koster 107* (MO). Savanna 10 mi W of Santiago, *Duke 13646* (OS), *A13647* MO). Panamerican Highway ½ km W of Hwy. 50 turnoff to Ocú., 30 m, *Nee 8000* (MO). Above Río Santa María, road to Santiago, 5 km S of Santa Fe, 250–300 m, *Nee 8130* (FSU, GH, MO). Near Santiago, 0–100 m, *Rattray 81* (A).

6. **Desmodium cajanifolium** (H.B.K.) DC., Prodr. 2: 331. 1825.

Hedysarum cajanifolium H.B.K. Nov. Gen. Sp. Pl. 6: 410 (folio ed.); 525 (quarto ed.). *pl. 598*. 1824. TYPE: Amérique Equatoriale, Herb. *Humboldt & Bonpland* (P, holotype; GH, photo).
Hedysarum multiflorum Willd. ex. Schlecht. & Cham. Linnaea 5: 586. 1830; G. Don, Gen. Syst. 2: 292. 1832, nomen nudum. TYPE: Colombia, *Humboldt* (B-Willd 13797; microfiche A-GH).
Meibomia cajanifolia (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.

Herbs or *shrubs*, not much branched, 2–4 m high; stem terete, striate, densely uncinulate pubescent and pilose. *Leaves* trifoliolate, stipulate, short petiolate; stipules obliquely ovate, long attenuate, striate, ciliate, pilose and puberulent, early deciduous, ca. 4 mm long and 2 mm wide; petioles narrowly sulcate, densely uncinulate pubescent and pilose, 0.7–1 cm long; the leaf rachis similar, 0.6– 0.7 cm long; stipels lance attenuate, striate, ciliate, to 3.5 mm long; petiolules densely pilose to 2.5 mm long; leaflets narrowly ovate, obtuse and mucronate at the apex, cuneate to obtuse at the base, lustrous on the adaxial surface, pilose along the midrib and with scattered puberulence, duller and rather densely pilose abaxially; terminal leaflets 5–9 cm long, 1.6–3.3 cm wide, lateral leaflets 3.3–6 cm long, 1.3–2.5 cm wide. *Inflorescence* terminal and axillary, racemose to racemose paniculate, much branched and densely flowered; rachis somewhat angulate, uncin-

ulate pubescent; bracts early deciduous, primary bracts ovate acuminate, striate, puberulent, ciliate, each subtending 2 pedicels, 2–3.5 mm long, 0.5–1.5 mm wide; secondary bracts each subtending 1 pedicel (laterally), subulate, ciliate, to 1 mm long; pedicels slender, ascending, short spreading pilose, 5–6 mm long. *Flowers* with the calyx bilabiate, pilose and puberulent throughout, the teeth of both lobes ciliate; central tooth of lower lobe lanceolate to lance attenuate, 3–4 mm long, lateral teeth acute to obtuse, 2.5–3.5 mm long, the upper lobe only slightly bifid, 2.5–3.5 mm long; petals, especially the standard, papillate, the standard obovate, retuse, narrowed to the cuneate base, 5.5–8 mm long, 2–3 mm wide, the wings oblong, auriculate, unguiculate, equalling standard in length and width (above claw), the keel petals obliquely oblong, long unguiculate, equalling standard in length, 1.5–2 mm wide. *Loment* to 6-articulate, stipitate, stipe pilose to 3.5 mm long, but not exceeding calyx, articles obtusely triangular, isthmi narrow and eccentric, margins pilose, surfaces uncinulate puberulent and pilose, 5–6 mm long, 4–4.5 mm wide; seed obtusely oblong, 2 mm long, 1.3 mm wide.

This species is scattered in southern Mexico and Panama, the West Indies and the northern half of South America.

The plants are handsome, easily distinguished by their lustrous leaflets, densely flowered inflorescences, and short pedicellate flowers and loments.

BOCAS DEL TORO: *Carleton 217* (US). CANAL ZONE: W end of Gatun Lake Dam, *Blum & Tyson 1973* (FSU, MO), *B 1973* (SCZ). Frijoles, *Bottimer 1487* (A, DAO). Gamboa, *Bottimer 1620* (DAO). Between Goofy Lake in Cerro Azul and Main Highway, *Correa & Dressler 441* (DUKE, FSU, MO, SCZ). Gamboa Navy Pipeline, *Correa & Haines 531* (MO). Barro Colorado Island, *Croat sn-213* (MO); *Shattuck 561* (MO). 1 mi N of Paraiso near Gaillard Cut, *Croat 12653* (SCZ). 1 mi N of Summit Garden, *Croat 12890* (MO). Road to geologic test site north of Paraiso, *Croat 12971* (MO). Gaillard Highway near Paraiso, *Croat 13148A* (MO). Frijoles, *Foster 2056* (DUKE, GH, MO). Frijoles, *Busey & Croat 251* (MO). Ancón, *Greenman & Greenman 5069* (MO). Gamboa, *Greenman & Greenman 5170* (MO). Near Miraflores Locks, *Greenman & Greenman 5182* (MO). Between Summit and Gamboa, *Greenman & Greenman 5253* (MO). Paraiso Station, *Hayes 20* (NY). Summit road, *Jones 276* (MO, US). 3 mi N of Paraiso on the Balboa Highway, *Lazor & Blum 5324* (SCZ). Roadside ½ mi NW of Gamboa, 70 m, *Liesner 1401* (MO). Along RR, 1½ km W of Gamboa, 30 m, *Nee 9477* (MO). Headwaters of Río Providencia, 7.5 km SW of Gatún Dam, 25–140 m, *Nee & Gentry 8654* (MO). Empire to Mandinga, *Piper 5192, 5193* (both US). Gamboa, *Piper 5195* (SU). El Paraíso, 30–100 m, *Pittier 2519* (US). Gamboa, 40–80 m, *Pittier 4808* (BM, US). Between Panamerican Highway and Cerro Campana, *Porter et al. 4867* (MO). Cerro Gordo, near Culebra, *Standley 26044* (US). Summit, *Standley 26947* (MO, US). Frijoles, *Standley 27659* (US). Gamboa, *Standley 28336* (US). Old Las Cruces Trail between Ft. Clayton and Corozal, *Standley 29151* (US). Las Cascadas Plantation near Summit, *Standley 29615* (US). Río Pedro Miguel near East Paraíso, *Standley 30028* (US). Obispo, *Standley 31665* (US). 1 mi N of Summit on road to FAA tower, *Tyson & Blum 2751* (SCZ). Miraflores Lake, *White et al. 59* (US). Pipeline Road NW of Gamboa about 6 mi, *Wilbur & Teeri 13348* (DUKE). Pipeline Road N of Gamboa, *Wilbur & Weaver 11243* (DUKE). CHIRIQUÍ: 1 mi N of Limones, *Croat 22116* (MO). COCLÉ: El Valle, 800–1000 m, *Allen 85* (GH, MO, US); 600 m, *Allen 2774* (G, GH, MO, US). Between Las Tibias and El Copé, *Folsom & Collins 6426* (MO). COLÓN: Near Salamanca, 8 mi E of Transisthmian highway, 100 m, *Gentry 6710* (MO). PANAMÁ: Pacora, 35 m, *Allen 989* (GH, MO, US). San Carlos, 0–10 m, *Allen 1146* (MO). 2 km de Cañita, carretera hacia la Represa de Bayano, *Escobar & Escobar 273* (MO). Las Sabanas, *Heriberto 283* (NY, US). Río Tocumen N of Chepo road, *Hunter & Allen 250* (GH, MO). Juan Díaz, *Lara 42* (DUKE, MO). 2 km S of Alcalde Díaz, 200 m, *Nee 8895* (DUKE, MO). Sabanas, NE of Panama City, *Paul 186* (US). Las Cumbres (Peñoncito) *Puga 51* (MO). Between Las Sabanas and Matías Hernández, *Standley 31830, 31862* (both US). VERAGUAS: Near Pajal, 280 m, *Burt & Koster 109* (MO). Near Pajal between Santiago and Tolé, 100–200 m, *Koster 109* (A). Quebrada El Nance at the Santiago-Santa Fé road bridge, 11 km S of Santa Fe, 220 m, *Nee 8159* (DUKE, MO) PROVINCE UNKNOWN: *Duchassaing s.n.* (P); *Duke 6171* (MO); *Halstead 18* (K, NY); *Seemann 458* (BM, GH, K, S).

7. **Desmodium campyloclados** Hemsl., Biol. Centr.-Amer. Bot. 1: 276. 1880. TYPE: Nicaragua. Segovia, *Oersted* (K, holotype; GH, photo).

Meibomia campyloclada (Hemsl.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. sylvestris Blake, Bot. Gaz. 78: 273. 1924. TYPE: Colombia, Dept. Huila, Cordillera Oriental, E of Neiva, *Rusby & Pennell 577* (NY, holotype; GH, photo).
Desmodium immerens Macbr., Field Mus. Nat. Hist., Bot. Ser. 11: 23. 1931. TYPE: Peru, Yanano, 6000 ft, *Macbride 3725* (US, holotype; GH, photo).
D. flexuosum Pittier, [Leguminosas de Venezuela], Bol. Tecn. 5, Minist. de Agric. y Cria, Serv. Bot. 26. 1944, without Latin diagnosis or citation of type. (See discussion below.)
D. dubium Pittier, Bol. Soc. Venez. Ci. Nat. 11: 17. 1947. (See discussion below.)

Sprawling *herb* to slender straggling *shrub,* to 3 m or more, branches slender and elongate; stem and branches striate, soft pubescent with upwardly appressed pilosity. *Leaves* trifoliolate, stipulate, petiolate; stipules ovate attenuate, the slender apex equaling or exceeding the basal portion, stramineous, striate, pilose on the abaxial surface, ciliate, not persistent, 5 mm long, 1.5 mm wide; petioles sulcate, striate, with upwardly appressed pilosity shorter than that of stem, 2.5–5 cm long; leaf rachis similar, 1.5–2 cm long; stipels lance attenuate, puberulent and ciliate, 2.5–3.5 mm long; petiolules darker, stouter than the leaf rachis, spreading pilose, 2–3 mm long; leaflets mucronulate, thin, moderately appressed pilose on both the surfaces, the terminal leaflet ovate, obtuse at apex, cuneate at base, 6–6.7 cm long, 3–4 cm wide; lateral leaflets similar or somewhat rounded at the base, 5–5.5 cm long, 2.5–3 cm wide. *Inflorescence* axillary, racemose, lax; rachis spreading pilose and puberulent; pedicels borne in bracteate fascicles of 3–many with 2 lateral flowers developing first, the central 1 following, etc.; bracts early deciduous, the primary bracts narrowly ovate attenuate, striate, ciliate, puberulent and pilose over the abaxial surface, 4–4.5 mm long, 1–1.5 mm wide; secondary bracts similar, smaller, to 1.8 mm long, 0.2 mm wide; pedicels lax, finely puberulent, 12–19 mm long. *Flowers* with the calyx somewhat puberulent throughout, teeth of both lobes ciliate and somewhat pilose, especially central tooth of the lower lobe, all teeth of lower lobe 3 mm long, the upper bifid lobe 3 mm long; corolla with standard obovate, retuse, cuneate at the base, to 8.5 mm long and 6 mm wide, wings oblong, obtuse, short unguiculate, 7–7.5 mm long, 2.5 mm wide, keel petals narrowly oblong, truncate at the apex, unguiculate ca. ⅓ their length, 8–9 mm long, 2 mm wide. *Loment* to 5-articulate, stipitate, stipe 3 mm long; articles triangular, the upper suture slightly curved, the lower suture rather deeply indented at isthmi, uncinulate pubescent throughout, to 8 mm long and 4.5 mm wide; mature seeds not seen.

Desmodium campyloclados ranges from Central America south to Colombia, Venezuela, and Peru.

The slender pedicels and relatively large loment articles distinguish *Desmodium campyloclados*. This species is related to *D. procumbens* and *D. tortuosum* in the structure of its inflorescence; it differs from both these species in the shape of the loment articles and in having the isthmi between the articles eccentric.

The two species of Pittier cited in the synonymy of *Desmodium campyloclados, D. flexuosum* and *D. dubium,* seem to be equivalent to it. Both species are probably based on a collection from "around Canaguá, 1,500 m, State of Merida,

Venezuela, Nov. 10, 1943, legit V. M. Badillo n. 578." of which a fragment is in the Gray Herbarium. The type of *Desmodium dubium* was cited by Pittier as *Badillo 598* with the same locality and date of collection as *Badillo 578*. I think that the latter number was undoubtedly intended. The packet in which *Badillo 578* was sent by Pittier bears still another epithet, fortunately never published.

CHIRIQUÍ: Cerro Punta, Volcán de Chiriquí, 5500 ft, *Bottimer 1531* (A, DAO). Río Chiriquí Viejo north Volcán City, *Duke 9014* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5265* (FSU, SCZ), collection very immature, placed here with doubt.

8. **Desmodium distortum** (Aubl.) Macbr., Field Mus. Nat. Hist., Bot. Ser. 8: 101. 1930.

Hedysarum distortum Aubl., Hist. Pl. Guiane 2: 774. 1775. TYPE: French Guiana. *Aublet* (BM, holotype; GH, US, photo).
H. asperum Poir. in Lam., Encycl. Méth. Bot. 6: 408. 1804. TYPE: locality unknown according to Poiret (P-JU, holotype; GH, photo).
Aeschinomene aspera (Poir.) St. Hilaire, J. Bot. (Desvaux) 1: 60. 1813.
Desmodium asperum (Poir.) Desv., J. Bot. (Desvaux) 1: 122. 1813.
D. rubiginosum Benth., Ann. Nat. Hist. 3: 434. 1839. TYPE: British Guiana, Berbice, *Schomburgk 217* (K, holotype; G, isotype; GH, photo).
D. spectabile Miq., Linnaea 18: 570. 1844. TYPE: Surinam, Para, Onoribo, *Focke 880* (U, holotype; GH, photo).
Meibomia aspera (Poir.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. distorta (Aubl.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 281. 1926, not Schindl., Repert. Spec. Nov. Regni Veg. 20: 148. 1924.

Herbs or *shrubs*, to 3 m tall, branching mostly above, the stem slender, terete to subangulate, reddish, abundantly uncinulate puberulent and moderately long pilose with attenuate trichomes. *Leaves* trifoliolate, stipulate, and petiolate; stipules essentially amplexicaul, obliquely ovate attenuate, long ciliate, striate, puberulent and somewhat pilose on both the surfaces to glabrescent, soon reflexed, long persistent, 6–15 mm long, 3.5–6 mm wide; petioles sulcate, densely uncinulate puberulent and moderately pilose, 1.3–8 cm long; leaf rachis similar, 0.7–3 cm long; stipels elliptic attenuate, striate, ciliate, puberulent on abaxial surface, 4–11 mm long, to ca. 2 mm broad; petiolules somewhat stouter than the leaf rachis, densely pilose, 1.5–5 mm long; leaflets elliptic to ovate, mostly obtuse and apiculate, obtuse at the base, uncinulate puberulent and appressed pilose on the adaxial surface, prominently reticulate and abundantly soft pilose on the abaxial surface, rather densely ciliate, terminal leaflet 3.7–17 cm long, 2–6 cm wide, lateral leaflets 2–11 cm long, 1.5–5 cm wide. *Inflorescence* racemose paniculate, composed mostly of densely flowered slender, elongate racemes, the pairs of pedicels at maturity usually less than 1 cm apart; rachis ridged and grooved, densely patent pilose with slender trichomes glandular at the base and also uncinulate puberulent; primary bracts each subtending 2 pedicels, each of these further subtended by a secondary bract, slenderly ovate attenuate, striate, pilose, ciliate, finely puberulent within, soon deciduous, 2.5–5 mm long, 0.5–1.2 mm wide, secondary bracts similar, slenderer, 1–1.7 mm long, 0.2–0.5 mm wide, also quickly deciduous; pedicels slender, ascending, glandular pilose, 6–10 mm long. *Flowers* with the calyx bilabiate, glandular puberulent throughout and somewhat pilose, the teeth finely ciliate, the upper lobe orbicular, slightly bifid, 2–2.5 mm long, the central tooth of the lower lobe deltoid acuminate with stout pilosity

along its midrib, 2.5–3.5 mm long, the lateral teeth acute, 2.5 mm long; corolla rose purple to greenish purple, the standard obovate, acute at the base, 5–6 mm long, 3–4.5 mm wide, the wings oblong, obtuse, auriculate, 4.5–6 mm long, 1.5–2.5 mm wide, the keel petals scythe shaped, long unguiculate, 5–7 mm long, 1–2 mm wide. *Loment* stipitate, to 6-articulate, stipe 1.5–2 mm long; articles orbicular or nearly so but often becoming variously involuted, 1.5–2.5 mm long, 1.5–2 mm wide; seeds quadrate, obtuse at the ends, reddish brown, 2 mm long, 1 mm wide.

This species occurs from Mexico to northern South America.

It is not entirely clear whether *Desmodium hirsutum* Mart. & Gal. (1843) of Mexico is distinct from *D. distortum*. More Mexican material must be studied before a satisfactory conclusion can be reached. Should the two elements prove to be the same, *Desmodium distortum* (Aubl.) Macbr. is the name to be maintained for them. (See Standley & Steyermark 1946, under *Desmodium hirsutum* Mart. & Gal.).

CANAL ZONE: Across railway track from Summit Gardens, *Bottimer 1512* (A, DAO). Cocoli Road, *Burch et al. 1391* (GH, MO). Venado Beach, *Correa & Gonzalez 506* (A, SCZ). Hill S of Pedro Miguel Locks, *Croat 9175* (MO). Summit Naval Radio Station, *Croat 14241* (MO). Cocoli, *Dwyer 7209* (MO). Ancón, *Greenman & Greenman 5078* (MO). Gamboa, *Heriberto 94* (GH, US). Government forest, Las Cruces Trail, 75 m, *Hunter & Allen 711* (GH). La Boca, *Mori & Kallunki 3678* (MO). Ancón, *Piper 5186* (US). Around Culebra, 50–150 m, *Pittier 2233* (US). Balboa, *Standley 26400, 27155* (both US). Corozal, *Standley 27393* (US). Río Pedro Miguel near East Paraíso, *Standley 30037* (US). Balboa, *Standley 32138* (US). Curundu, *Tyson 3478* (FSU, MO, SCZ). Miraflores Lake, *White 59* (US). CHIRIQUÍ: 10 mi W of Puerto Armuelles, 100–300 m, *Liesner 90* (MO). Near Remedios, 0–100 m, *Koster 167* (A). 6 mi W of San Lorenzo, *Wilbur et al. 15473* (Duke). COCLÉ: Panamerican Highway and Río Teta, *Blum & Tyson 1890* (FSU, MO, SCZ). 3 mi NE of Antón, *D'Arcy & Croat 4102* (MO). Río Hato, 0–100 ft, *Rattray 43, 47* (both A). Penonomé, 50–1000 ft, *Williams 117* (NY). HERRERA: Ocú, 100 m, *Allen 4043* (MO). Road from La Avena to outskirts of Pesé, 200 ft, *Burch et al. 1275* (GH, MO). Between Santa María and Parita, 0–100 m, *Koster 119* (A, MO). Roadside, 10 mi S Ocú, *Tyson et al. 2812* (MO, SCZ). PANAMÁ: 500 m del Río Trapichito (La Chorrera), *Aguilera 15* (DUKE, MO). Avenida Eloy Alfaro (Tumba Muerto), *Carrasco 15* (MO). Campo Experimental de Monte Oscuro, 10 m, *Correa 1938* (MO). Taboga Island, *Dwyer 2813* (MO, SCZ). Cerro Jefe, 3100 ft, *Dwyer 8505* (MO). 500 m del Río Trapichito (La Chorrera), *Aguilera 15* (DUKE, MO). Taboga Island, *Hinds* (K); *Macbride 2816* (US). VERAGUAS: 1 mi W of Santiago along old Interamerican Highway, *Tyson 5172* (FSU, SCZ).

9. **Desmodium glabrum** (Mill.) DC., Prodr. 2: 338. 1825.

Hedysarum glabrum Mill., Gard. Dict., ed. 8. no. 12. 1768. TYPE: Mexico. Campeachy. *Houstoun* (BM, holotype; GH, photo).

H. molle Vahl, Symb. Bot. 2: 83. 1791. TYPE: ex insula St. Crucis, misit Dr. Pflug (C, holotype; GH, photo).

H. terminale Rich., Actes Soc. Hist. Nat. Paris 1: 112. 1792. TYPE: Cayenne. *LeBlond* (G, probable isotype; GH, photo).

H. emarginatum Poir., in Lam., Encycl. Méth. Bot. 6: 412 [no. 45]. 1804. TYPE: Martinique, herb. Lamarck (P-LAM. 307; GH, photo).

Desmodium molle (Vahl) DC., Prodr. 2: 332. 1825.

D. terminale (Rich.) DC., Prodr. 2: 327. 1825.

D. emarginatum (Poir.) DC., Prodr. 2: 338. 1825.

Meibomia glabra (Mill.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. mollis (Vahl) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. terminalis (Rich.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. emarginata (Poir.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Desmodium campestre Brandegee, Univ. Calif. Publ. Bot. 6: 43. 1914. TYPE: Mexico. Oaxaca, Picacho-San Geronimo, *Purpus 6810* (UC, holotype; GH, isotype).

Herb, erect, to 2 m; stem mostly simple, striate, grooved, densely uncinulate pubescent, pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules ovate, abruptly long attenuate, slightly auriculate at the base, striate, puberulent and pilose on abaxial surface, ciliate, usually turning dark purplish and becoming reflexed, persistent, to 6.5 mm long and 3 mm wide; petioles sulcate on adaxial surface, striate to ridged and grooved, densely uncinulate pubescent and somewhat pilose, to 3 cm long, leaf rachis similar, ca. 1 cm long, stipels lance attenuate or slightly broader, ca. 4 mm long; petiolules somewhat stouter than the leaf rachis, densely pilose, 1.5–2.5 mm long; leaflets slightly uncinulate puberulent especially along the midrib above, and abundantly pilose to tomentose on both the surfaces, terminal leaflet ovate acute, rounded to cuneate at the base, to ca. 7.5 cm long, 4.5–4.8 cm wide, lateral leaflets similar, slightly oblique, usually rounded at base, 3.5–5 cm long, 2.5–3 cm wide. *Inflorescence* racemose paniculate, often much branched, rachis striate, uncinulate puberulent and with somewhat glandular trichomes in addition; primary bracts narrowly ovate acuminate, striate, puberulent, and ciliate, 2.5 mm long, 0.5–0.7 mm wide, each subtending a fascicle of 3 to several pedicels; secondary bracts similar, smaller, each subtending a single pedicel, 0.8–1.3 mm long, 0.3–0.5 mm wide, all bracts early deciduous; pedicels with pubescence similar to that of rachis, 5–7 mm long; calyx puberulent throughout and moderately stiff pilose, the teeth of both lobes ciliate, the central tooth of the lower lobe 2–2.7 mm long, the lateral teeth 2–2.5 mm long, the upper bifid lobe 2–2.5 mm long; corolla with standard narrowly obovate tapering to an acute base, 2.5 mm long, 1.5 mm wide, the wings obliquely oblong, broadest at the apex and slightly auriculate at the base, unguiculate, to 2.5 mm long, 1 mm wide, keel petals scythe shaped, scarcely auriculate, narrowed to the claw, to 2.5 mm long and 0.7 mm wide. *Loment* almost sessile, to 3-articulate, the terminal article enlarged and flattened, essentially elliptic except for slight indentation over seed, uncinulate pubescent becoming glabrous except on suture at maturity, with reticulate venation prominent, subterminal articles quadrangular with alternate margins folded in or back and appearing twisted, uncinulate puberulent; *seed* transversely elliptic, 2 mm long, 1 mm wide.

This species occurs in Mexico, the West Indies, the northern half of South America and the Galapagos Islands.

CANAL ZONE: Farfan Beach area, *Tyson & Blum 2604* (FSU, SCZ). CHIRIQUÍ: Alanje/David, 0–100 m, *Burt & Koster 151* (MO). COLÓN: Punta Chame, *D'Arcy 10237* (MO). PANAMÁ: La Exposición, *Heriberto 276* (US). Bella Vista, *Standley 25401* (US). Panama City, *Seemann 219* (GH, K, S); *Seemann* (BM).

10. **Desmodium incanum** DC., Prodr. 2: 332. 1825. TYPE: Plumier, Ic. 149. *Fig. 1.* 1757.

Hedysarum canescens Mill., Gard. Dict., ed. 8. 1768. Based on *Hedysarum triphyllum fruticosum supinum* . . . . Sloane, Voy. 1: 185, *tab. 118, fig. 2.* 1707, non *Hedysarum canescens* L. (1753).

H. racemosum Aubl., Hist. Pl. Guiane 2: 774. 1775, non *Desmodium racemosum* DC. (1825). Based on Plumier, Ic. 149. *fig. 1,* 1757.

H. frutescens sensu Jacq., Hort. Bot. Vindob. 3: 47. *tab. 89.* 1776, non L. 1753 (=*Lespedeza*).

H. supinum Swartz, Prodr. 106. 1788; Fl. Ind. Occ. 3: 1264. 1806, non *H. supinum* Chaix ex Villars (1779).

H. incanum Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1265. 1806, non *H. incanum* Thunb. (1784).

H. canum J. F. Gmelin, Linn. Syst. Nat., ed. 13. 13(3): 1124. 1791. Based on Plumier, Ic. 149. *fig. 1.* 1757. Illegitimate renaming of *H. racemosum* Aubl.
H. canum Lunan, Hort. Jam. 305. 1814. Renaming of *H. incanum* Sw.
Aeschynomene incana (Swartz) G. F. Meyer, Prim. Fl. Esseq. 245. 1818, not Vog. (1838).
Desmodium racemiferum DC., Prodr. 2: 331. 1825. Based on *Hedysarum racemosum* Aubl., non Thunb. (1784), nec *Desmodium racemosum* DC. (1825).
Meibomia adscendens (Swartz) DC. var. *β incana* (Sw.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.
M. incana (Swartz) Vail, Bull. Torrey Bot. Club 19: 118. 1892.
M. supina (Swartz) Britton, Ann. New York Acad. Sci. 7: 83. 1892.
Desmodium supinum var. *amblyophyllum* Urb., Symb. Ant. 7: 229. 1911. LECTOTYPE: Dominican Republic: Santo Domingo prope Constanza, *Tuerckheim 3183* (NY).
D. canum (J. F. Gmelin) Schinz & Thellung in Schellenb., Schinz & Thellung, Mem. Soc. Neuchatel 5: 371. 1913; Repert. Spec. Nov. Regni Veg. 12: 428. 1913.
Meibomia cana (J. F. Gmelin) S. F. Blake, Bot. Gaz. 78: 276. 1924.
Desmodium frutescens Schindl., Repert. Spec. Nov. Regni Veg. 21: 9. 1925. Based on *Hedysarum frutescens* sensu Jacq., non L. 1753 (=*Lespedeza*).

Suffruticose to shrubby; stem to 3 m tall, ascending to generally erect, terete to subangulate, uncinulate puberulent to pubescent and somewhat pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate acuminate, striate, puberulent and pilose on the outer surface, ciliate, at least partially connate on the opposite side of the stem from the petiole, long persistent, 6–10 mm long, 1–2 mm wide; petioles sulcate adaxially, uncinulate puberulent and long spreading pilose, 1.3–3.5 cm long; leaf rachis similar, shorter, to 1.5 cm long; stipels subulate, puberulent, ciliate, 2–5.5 mm long; petiolules stouter, densely stiff pilose, to 3 mm long; leaflets variable, often nearly orbicular at the base of the plant and lanceolate at the apex, mostly elliptic, acute at the apex and rounded at the base, lustrous, darker, and with pilosity along midrib and some uncinulate puberulence on adaxial surface, densely pilose on the paler abaxial surface, terminal leaflets 4–9 cm long, 2.5–4.5 cm wide, the lateral leaflets 3.3–6 cm long, 1.8–2.7 cm wide. *Inflorescence* terminal and axillary, racemose; rachis angulate, ridged and grooved, densely uncinulate puberulent; pedicels usually solitary, each subtended by 1 primary bract and 2 lateral secondary bracts, all persistent; primary bracts lance acuminate, puberulent on the abaxial surface, ciliate, 2.2–4.5 mm long, 0.5–0.7 mm wide, secondary bracts similar, 1–1.8 mm long, 0.2–0.5 mm wide; pedicels also uncinulate puberulent, 5–10 mm long. *Flowers* with the calyx bilabiate, uncinulate puberulent and pilose, the central tooth of lower lobe 2.5–3.5 mm long, the lateral teeth 2–3.5 mm long, the upper bifid lobe 2.5–3.5 mm long; corolla exceeding the calyx, standard obovate, retuse, unguiculate, 3.5–5 mm long, 4–5 mm wide, the wings oblong, slightly auriculate, unguiculate up to ca. ⅓ their length, 3.5–6 mm long, 1.5–2 mm wide, the keel petals scythe shaped, obtuse at apex, scarcely auriculate, unguiculate, 3.5–6 mm long, 1.5–2 mm wide. *Loment* stipitate, to 8-articulate; stipe 1.5–2 mm long; articles essentially straight above, invaginated about ⅔ their width at the isthmi, uncinulate pubescent throughout, 3.5–4 mm long, 2.5–3 mm wide; seed obtusely oblong, 1 mm long, 0.5 mm wide.

This species occurs in tropical areas throughout the Americas. It is presumably introduced and widespread in the tropics of the Old World.

Desmodium incanum is a widespread more or less shrubby species varying chiefly in the shape of its leaflets. It may be distinguished by its long persistent stipules usually fused and nearly surrounding the stem at least when young, and by its pedicels which are usually borne singly and are each subtended by one

primary bract and two (lateral) secondary bracts. The extent of the range of *Desmodium incanum* is partially indicated by the extent of its synonymy, a new name and description apparently having been provided as it was discovered and collected in each successive new locality.

The vernacular names of *Desmodium incanum* are numerous, some having come with the workmen from the islands of the Antilles. Among the names recorded by collectors in Central America and the West Indies are the following: Pega-pega which is also used for other species of the genus; John Charles; wild pea-nut; strong back; strongbark; and cepa de caballo. The plants are commonly used medicinally, as a tea, and in decoctions as a remedy for inflammation of the stomach and for kidney ailments.

BOCAS DEL TORO: Talamanca Valley, *Carleton 120* (NY, US). Region of Almirante, *Cooper 191* (US). Hill above RR station at milla 7.5, *Croat 16389* (MO). Lincoln Creek, Changuinola Valley, *Dunlap 483* (US). Bar mouth, Changuinola Valley, *Dunlap 517* (GH, MO). Runway at Bocas, *Lazor et al. 2398* (FSU, MO, SCZ). Water Valley, Chiriqui Lagoon, *Wedel 1493, 1851* (both GH, MO, US). Old Bank Island, *Wedel 2060* (MO). Shepherd Island, *Wedel 2675, 2710* (both GH, MO, NY, US). CANAL ZONE: Colón, *Angermuller* (FSU). Barro Colorado Island, *Bailey & Bailey 136* (GH); *Bangham 565* (A); *Croat 4056, 4174* (both MO, SCZ), *5328, 6140* (both MO), *6421* (A), *6684, 6730* (both MO). *6795, 6928* (both A, MO), *7059, 7456* (both MO), *8261, 8675* (both A, MO), *9198* (MO); *9402* (MO, SCZ), *9203* (MO), *11719* (MO, SCZ), *11976* (MO); *Ebinger 30* (GH, MO), *154* (MO), *Foster 1376* (DUKE); *Luteyn 768* (DUKE). Gatun Lake, *Netting 36, 46* (both MO); *Starry 23, 113, 219* (all MO); *Shattuck 43* (GH, MO), *484* (MO); *Standley 40859* (US). Shore near lab, *Woodworth & Vestal 735* (GH). Ft. Kobbe, *Bottimer 1445* (A, DAO). Summit, *Bottimer 1506* (DAO). Monkey Hill, *Cowell 40* (NY). Trail between Río Indio Hydrographic Station and Natural Bridge of Río Puente, *Dodge & Allen 17488* (GH, MO). Just E of Gatun Locks, *Duke 4300* (MO). Chagres, *Fendler 78* (K, MO, P, US). Gamboa, *Greenman & Greenman 5161* (MO). Gatún, *Hayes 79, 81* (both NY). Las Sabanas, *Heriberto 195* (US). Corozal, *Heriberto 274* (US). Las Cruces Trail, 75 m, *Hunter & Allen 756* (MO). Río Chagres Bridge, ca. 2 km by road SE of Gamboa, *Lasseigne 4265* (MO). 2 mi W of Ferry Thatcher Bridge, *Lazor 2199* (FSU). Frijoles, 10–30 m, *Maxon 4708* (US). Near Ft. Randolph, *Maxon 6513* (US). Road C29, 6 km E of Gamboa, 190 m, *Nee 9003* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Dwyer 3584* (GH, MO). Gatún, *Ostenfeld 68* (C). Sabanas NE of Panama City, *Paul 150* (US). Corozal, *Piper 5185* (US). Frijoles, *Piper 5191* (US). Ft. Sherman, *Piper 5885* (US). Old Fort Lorenzo, mouth of Río Chagres, *Piper 5926* (US). Río Grande near Culebra, 50–100 m, *Pittier 2093* (BM, C, NY, US). Around Culebra, 50–150 m, *Pittier 3433* (US). Trail between Gamboa and Cruces, 50–80 m, *Pittier 3770* (US). Gamboa, 40–80 m, *Pittier 4438* (US). Ancón Hill, 20–75 m, *Seibert 383* (A, K, MO, NY). Las Cascadas Plantation near Summit, *Standley 25705* (US). Cerro Gordo near Culebra, *Standley 25973* (US). Hills W of the Canal near Gatún, *Standley 27295* (US). Mt. Hope Cemetery, *Standley 28797* (C, US). Río Pedro Miguel near East Paraiso, *Standley 30029* (US). Fort Clayton, Cardenas Creek area, *Tyson 1288* (MO). Fort Sherman near mouth of Chagres River, *Tyson 1534* (SCZ). Old Fort San Lorenzo, *Tyson 1559* (MO). Howard Air Force Base near Red Devil Drop Zone, *Tyson 1879* (FSU, SCZ). Fort Sherman main post, *Tyson 2243* (FSU, MO, SCZ). CHIRIQUÍ: David/Concepion, 60 m, *Burt & Koster 134* (MO). Near Frontera, 100–200 m *Burt & Koster 145* (MO). Monte Verde, 2.5 km W Puerto Armuelles, 80 m, *Busey 415* (MO). Rabo de Puerco 8 km W from Puerto Armuelles, 150 m, *Busey 443* (MO). Boquete, 3800 ft, *Davidson 596* (GH, MO). Road to Gualaca 0–100 m, *Koster 123* (A). Between David and Concepción, *Koster 134* (A). 2 km S of Gualaca, *McCorkle C-35* (FSU, SCZ). 4 km N of Burica, *McCorkle C-140* (FSU, SCZ). COCLÉ: El Valle, *Bottimer 1474* (A, DAO). Weedy field near Santa Clara Beach, *Croat 9603* (MO). Savanna 4–7 mi E of Natá, 10–25 m, *Duke 12397* (NY, OS). Penonomé, *Ebinger 1001* (MO). Road to El Valle, *Ebinger 1101* (MO); *Harkins 1191* (A). Olá, 100–350 m, *Pittier 5048* (US). Between Penonomé and Coclé, *Stern et al. 988* (MO, UC). Penonomé 50–1000 ft, *Williams 116* (NY, US). COLÓN: Río Piedras along road to Portobelo, *Blum et al. 2540* (FSU, GH, MO, SCZ). 2 mi E of Río Piedras, *Correa & Haines 239* (MO, SCZ). ¼ mi N of María Chiquita on road to Portobelo, *Croat 11348* (MO, SCZ). Ridge behind Garotte, *D'Arcy 9339* (MO). Road to Portobelo between Río Piedras and Portobelo, *Elias & Kirkbride 1644* (MO, UC). Colon Highway Bridge on Chagres River, *Lazor & Tyson 3029, 3063* (DUKE, FSU). Mouth of Río Piedras, *Lewis et al. 3174a* (MO). Santa Rita Ridge, 2 mi E of Transisthmian Highway, *Lewis et al. 5244* (MO, SCZ). Portobelo 0–20 m, *Pittier 2458* (NY, US). Palenque near sea level, *Pittier 4130* (US); *Rose 22074* (S, US). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11179* (DUKE). 5 mi NE of Sabanita towards Portobelo, *Wilbur*

& Luteyn 11621 (DUKE). DARIÉN: Santa Fé, *Duke 9493* (MO). Río Piñas, *Duke 10571* (MO). Hydro Camp Pico Pendejo in Monsoon Forest on Río Sabana 50 ft, *Duke 15453* (OS). El Real, *Folsom 4598* (MO). Village of Mannené, *Kirkbride, Jr. & Bristan 1603* (MO). El Real, *Lazor & Correa 3372* (MO), *3387* (FSU, MO); *Lazor & Tyson 3423* (FSU). PANAMÁ: Road to Arenosa from Espina, 16 km N of the Panamerican Highway, *Folsom 3447* (MO). Panama City, Parque Lefevre, *Harkins 1186* (A). San José Island, *Johnston 1006, 1086* (both GH), *Erlanson 131* (GH), *592* (NA). Bella Vista, *Killip 3117* (US); *Koster 145* (A). Chimán, *Lewis et al. 3363* (GH, MO, UC). Near Tapía River, Juan Díaz region, *Maxon & Harvey 6624* (US). Taboga Island, *Miller 1851* (US). Panamerican Highway 2 km W of El Llano, 0–100 m, *Nee 7959* (MO); *Peralta 23* (GH, MO). Taboga Island 0–250 m, *Pittier 3621* (US). Chepo, 60 m, *Pittier 4761* (NY, US). El Valle, 580 m, *Rattray 26* (A). Panamá, *Seemann* (BM), *Seemann* 227 (K). Bella Vista, *Standley 25352* (MO, US). Taboga Island *Standley 27087* (S, US), *27902* (C, US). Río Tapia, *Standley 28184* (US). Garrapata, camino a Platanares, *Taylor 16* (MO). HERRERA: Chitre/Divisa, roadside, 0–100 m, *Burt & Rattray 69* (MO); Vicinity of Ocú, ½ mi NE open pasture, *Stern et al. 1703* (MO). LOS SANTOS: 17.8 mi S of Macaracas, 1100 ft, *Lewis et al. 1612* (GH, MO). Vicinity of headwaters of Río Pedregal, 25 mi SW of Tonosí, 2,500–3,000 ft, *Lewis et al. 2932* (GH, MO), *2948* (MO, UC). Camino del Canal Los Asientos, Sur, *Corina Wendehake 22* (DUKE, MO). SAN BLAS: Puerto Obaldía, *Croat 16973* (MO). Mainland in front of Ustupo, *D'Arcy 9520* (MO). Mulatuppu (Río Ibedí), *Duke 8482,* without other locality *8536* (both MO), *Duke 14831* (NY, OS). Between Río Diablo and Río Acuatí near Narganá, *Duke 14860* (OS). Hydro Camp Cuadí on Río Cuadí, ca. 46 ft, *Duke 15467* (OS). San Blas-Darien Border, Camp Summit, 1200 ft, *Duke 15493* (OS). Soskatupu, *Elias 1672* (MO, UC). Headwaters of Río Mulatuppu, *Elias 1745* (MO, UC). Mouth of Ailigandi River to 2.5 mi inland, *Lewis et al. 166* (MO). Molia, *Stier 60* (MO). VERAGUAS: Savanna 10 mi W of Santiago, *Duke 13649* (OS). 5 mi N of Santiago, Santa María River, *Blum & Tyson 597* (MO, SCZ). PROVINCE UNKNOWN: *Halsted* (NY); *Hayes 51* (NY); *Cuming 1139* (K); *Duchassaing* [anno 1851] (P); *Sinclair* (K, MO).

11. **Desmodium infractum** DC., Prodr. 2: 330. 1825. Based on *Hedysarum biarticulatum* DC.—FIG. 21E–F.

Hedysarum biarticulatum Moc. & Ses. ex DC., Prodr. 2: 330. 1825. as synon., non L. Based on Fl. Mex. Icon. (ined.) *pl. 270* (G, not seen); volume known as "Calques des Dessins de la Flore du Mexique" (i.e. tracings of the original drawings, at GH).

H. infractum Sprengel, Syst. Veg. 4(2): 290. 1827. Based on *D. infractum* DC.

Desmodium barclayi Bentham, Bot. Voy. Sulphur 83. 1844. TYPE: Central America, *Barclay* (K, holotype; GH, NY, photos).

Meibomia barclayi (Benth.) Rose & Standl., Contr. U.S. Natl. Herb. 16: 216. *tab. 51, fig. e.* 1913.

M. infracta (DC.) Blake, Bot. Gaz. 78: 280. 1924.

Nephromeria barclayi (Benth.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 282. 1924.

Nephromeria infracta (DC.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 285. 1926.

Sprawling, subscandent *vine*; stem angulate, ridged and grooved, uncinulate pubescent with somewhat spreading stout, hooked, yellowish trichomes mostly on the ridges and with some puberulence of short, straight, pointed, white trichomes intermixed. *Leaves* trifoliolate, stipulate; stipules early deciduous, obliquely ovate, long acuminate, striate, ciliate, and somewhat soft pilose over abaxial surface, 5–7.5 mm long, 3–5 mm wide at base; petioles adaxially sulcate, ridged and grooved, sparsely to densely uncinulate puberulent to pubescent, 3–7 cm long, the leaf rachis similar to petiole, 1.5–2.5 cm long; stipels linear attenuate to narrowly deltoid attenuate, striate and ciliate, persistent, 2–3.5 mm long; petiolules greenish to dark brown, rugose, patent pilose with slender tapering trichomes, 2–3 mm long; leaflets ovate, obtuse to acute at apex, the terminal cuneate, the lateral leaflets rounded at base, the margins ciliate, adaxial surface bright to dark green, sometimes brownish in age, uncinulate puberulent along the midrib and the chief lateral veins or this puberulence somewhat scattered, sparsely to abundantly spreading pilose with straight tapering trichomes between them, or the 2 types intermixed, abaxial surface always paler, abundantly soft pilose with slender tapering trichomes, the midrib and the lateral veins prominent, the

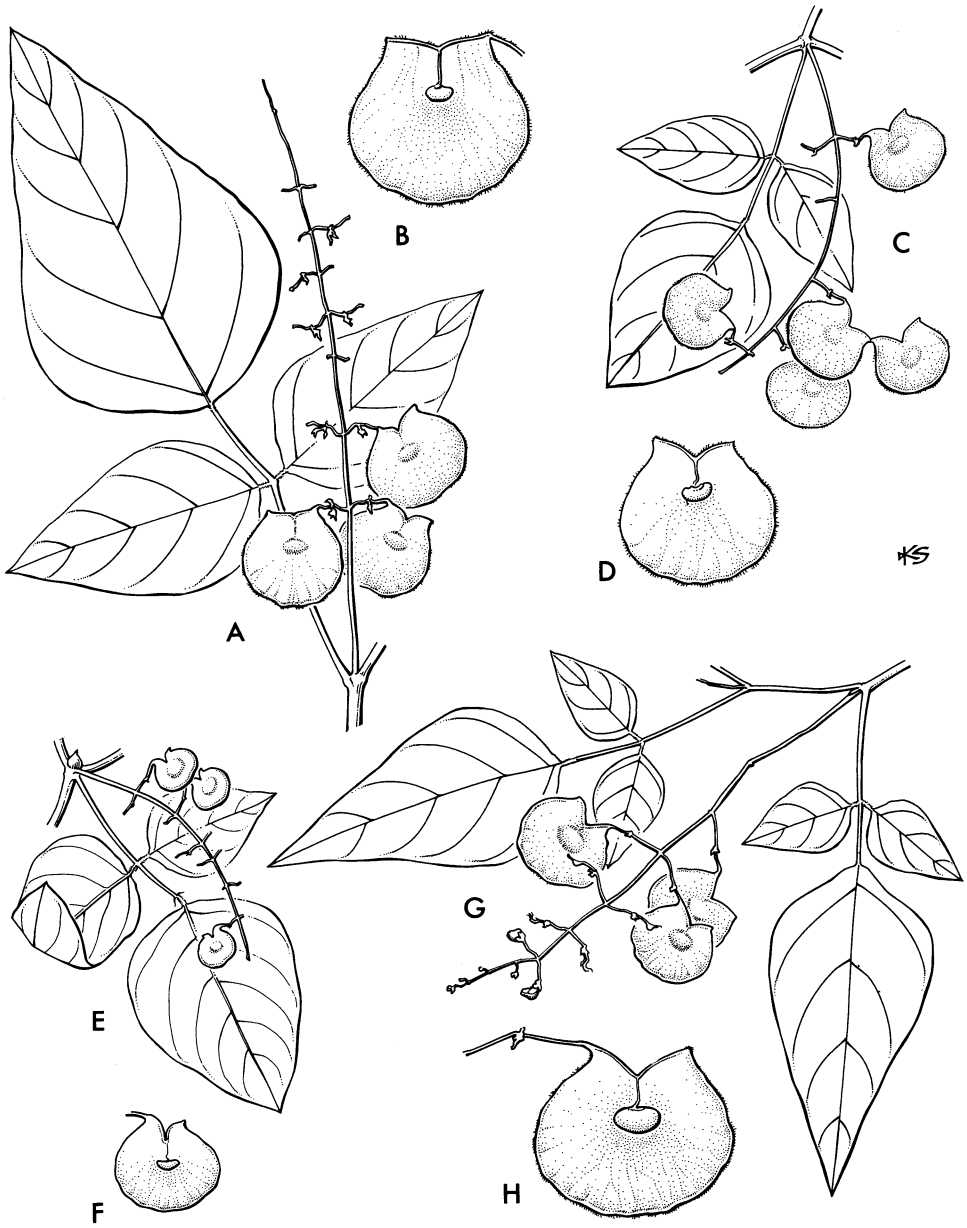

FIGURE 21. *Desmodium*.—A–B. *D. macrodesmum* (Blake) Standl. & Steyerm.—A. Habit (×½).—B. Article of loment split to show elongate funicle and seed inside (×1). [After *Wedel 1773*.]—C–D. *D. rhynchodesmum* (Blake) Standl.—C. Habit (×½).—D. Opened article showing funicle and seed (×1). [After *D'Arcy 11241* (A).]—E–F. *D. infractum* DC.—E. Habit (×½). [After *Tyson 6019* (GH).]—F. Opened article showing funicle and seed (×1). [After *Tyson 6019* (GH).]—G–H. *D. saccatum* Schubert.—G. Habit (×½). [After *Dwyer & Correa 7996*.]—H. Opened article (×1). [After *Dwyer 5028* (GH).]

terminal leaflet 6–7 cm long, 4.5–5.6 cm wide, the laterals 5–5.5 cm long, 3–3.5 cm wide. *Inflorescence* composed of axillary and terminal racemes or highly branched panicles; rachises angulate, striate, densely uncinulate pubescent with stout, yellowish, hooked trichomes underlain by minute, white trichomes; pedicels borne in pairs, each pair subtended by a primary bract; secondary bracts each subtending a single pedicel only rarely seen; primary bracts ovate acuminate, striate, ciliate, puberulent on abaxial surface, early deciduous, 5–7 mm long, 2.5 mm wide[40]; pedicels uncinulate puberulent, 4–7 mm long. *Flowers* with the calyx appressed pilose on the teeth of both lobes, quickly reflexing almost completely at flower maturity, then disintegrating, central tooth of lower lobe 5 mm long, lateral teeth 3.4 mm long, upper bifid lobe 3 mm long[41]; corolla[42] magenta to white, the standard orbicular, scarcely clawed, 4.5 mm long and broad, the wings almost rectangular, short clawed and slightly auriculate, truncate at apex, 5.5 mm long, 4 mm wide, keel petals partially fused, each scythe shaped and tapering to a slender base, 5 mm long, 1.5 mm wide at apex. *Loment* stipitate, (1–)2–3-articulate, the stipe slightly pubescent, becoming glabrate, 3–4 mm long; articles nearly orbicular, with a narrowly V-shaped notch ca. 2.5 mm deep on the dorsal suture, shoulders becoming somewhat beaked, the articles often overlapping, ciliate with both hooked and tapering trichomes, puberulent to glabrous on surfaces; seed reniform, reddish to brown, almost centrally placed in the article but not filling it, long funiculate, ca. 3.5 mm long, 2.5 mm wide.

In the sect. *Nephromeria,* of which it is a member, *Desmodium infractum* is most closely related to *D. painteri* (Rose & Standley) Standley, a species known only from the states of Mexico and Guerrero in Mexico. *Desmodium infractum* differs from *D. painteri* in its larger, more nearly orbicular articles with a narrower, deeper notch on the upper suture that usually flattens out into shoulders (at least on one side). It also differs in its ovate leaflets, rough above to the touch and with only moderately prominent venation below, whereas *D. painteri* has nearly orbicular leaflets with secondary venation prominent on the velvety abaxial surface. In *D. infractum* the pedicel and the stipe of the loment are essentially equal, in *D. painteri* the stipe is shorter (only ⅓–½ as long) than the pedicel.

Desmodium infractum is known from scattered localities in southern Mexico (Oaxaca, Nayarit, Michoacan or Guerrero, Chiapas, and Veracruz) and Central America where specimens have been seen from every country; in Panama it is known from Veraguas, Los Santos, and the Canal Zone; in South America it has been recorded from Colombia, Venezuela, and Ecuador (see Blake, 1924). Much material that was named *D. infractum* from the province of Bocas del Toro, Panama, is actually *D. macrodesmum.*

CANAL ZONE: Vicinity of Madden Dam, alt. 50 ft, *Lewis et al. 7* (GH, MO). Madden Dam area, *Dwyer 11969* (MO). LOS SANTOS: 10 mi N Tonosi, *Tyson et al. 2944* (MO, SCZ). 12 mi S Macaracas, *Tyson et al. 3063* (SCZ). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 6019* (FSU, GH, SCZ).

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[40] Measurements taken from Guatemalan material, *Standley 77910* (GH).

[41] Measurements taken from Guatemalan material, *Standley 74508* (GH).

[42] Measurements of corolla parts taken from Mexican material, *Martinez-Calderon 726* (A). Little flowering material of this species has been collected.

12. **Desmodium intortum** (Mill.) Urb., Symb. Ant. 8: 292. 1 Feb. 1920; non Fawc. & Rendle, Fl. Jam. 4: 34. 25 Mar. 1920.

Hedysarum intortum Mill., Gard. Dict., ed. 8. *Hedysarum* no. 11. 1768. TYPE: Cultivated, England, seed sent from Jamaica by Houstoun.
H. trigonum Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1267. 1806. Based on *Hedysarum intortum* Mill.
Desmodium trigonum (Swartz) DC., Prodr. 2: 332. 1825.
Meibomia intorta (Mill.) Blake, Bot. Gaz. 78: 286. 1924.
Meibomia trigona Gándara, Mem. y Rev. Soc. Cient. "Antonio Alzate" 51: 113. *pl. 14.* 1931. [Described as a new species from Salvador[?], not based on *Hedysarum trigonum* Sw., but belonging here nevertheless.]

Herbs, trailing to climbing; stem triquetrous and grooved, pilose and/or uncinulate pubescent. *Leaves* trifoliolate, stipulate, and petiolate; stipules ovate acuminate, striate, puberulent and somewhat to densely pilose, abundantly ciliate, 5.5–6.5 mm long, 2.5–5 mm wide; stipels linear to narrowly ovate attenuate, puberulent and ciliate, 3–4 mm long; petioles sulcate, finely ridged and grooved, long soft spreading pilose, 3.2–5 cm long; leaf rachis similar, slender, 0.5–1.2 cm long; petiolules stouter, more densely spreading pilose, 1.5–3 mm long; leaflets mostly ovate acute, moderately appressed pilose on both the surfaces, the terminal leaflet rhombic, acute at the apex and rounded to cuneate at base, 3.5–7 cm long, 2.4–4 cm wide, the lateral leaflets nearly elliptic, acute at the apex, rounded at the base, 3–5 cm long, 1.6–2.4 cm wide. *Inflorescence* chiefly terminal, racemose to racemose paniculate; rachis ridged and grooved, densely uncinulate puberulent; bracts ovate acuminate, finely striate, puberulent on abaxial surface, ciliate, 5.5–8.5 mm long, 3–4 mm wide; secondary bracts not seen; pedicels uncinulate puberulent, 4–6 mm long. *Flowers* with the calyx puberulent throughout with some long pilosity on the ciliate teeth of both lobes, the central tooth of lower lobe 4–5.5 mm long, the lateral teeth 2.5–4 mm long, the upper bifid lobe 2.5–3.5 mm long; corolla with standard 6–7.5 mm long, 4–4.5 mm wide, the wings 5.5–7.5 mm long, 2–2.5 mm wide above, the keel petals 5.5–8 mm long, 2–2.5 mm wide above. *Loments* stipitate, to 11-articulate; articles uncinulate pubescent throughout, slightly asymmetrical, more deeply indented below, ca. 3.5 mm long, 2.5 mm wide; seed reniform, 2 mm long, 1.3 mm wide.

In the treatment of *Desmodium* for the *Flora Fanerogámica del Valle de México*[43] (Rzedowski & Rzedowski 1979), *D. aparines* DC. (316, 317) is described as having pedicels from 5.5–16 mm long and as being much confused with *D. uncinatum*. Schindler, in 1926 (Repert. Spec. Nov. Regni Veg. 22: 274–276) proposed that the amalgam of collections relegated in the past to *Desmodium uncinatum* were, in fact, representatives of eleven somewhat related species, five of which he described, op. cit. 20: 142–144. 1924; 22: 274–276. 1926. with distinct geographical distribution. The distributions he cited were well defined, but the characteristics of the species were somewhat less so and, in the case of *D. aparines,* at least two elements are involved as is made clear from his manuscript notes and specimens of loments. According to Schindler the related species of the *Desmodium uncinatum* complex to be found in Panama are *D. aparines* and *D. intortum*. It is also possible that *D. sericeum* (Schindl.) Standl., *D. subseri-*

[43] Rzedowski, J., & G. C. de Rzedowski, *eds.* Flora Fanerogámica del Valle de México. vol. 1: 314–321. 1979.

ceum Malme and *D. hjalmarsonii* (Schindl.) Standl., all recorded from Costa Rica, may be found in Panama, too. Schindler is of the opinion that *D. uncinatum* is strictly South American in distribution, an opinion I question, although it does not seem to be in Panama. Under these circumstances it seems best not to annotate any collections as *D. aparines,* but to relate them to *D. intortum,* as most have been known, for the time being.

Two collections designated below with an asterisk (*), which I did name, some years ago, as *Desmodium intortum* have differences in type of pubescence of stem and pedicels, larger bracts and larger loment articles. They are part of the relationship of *D. intortum* but not typical.

BOCAS DEL TORO: Talamanca Valley, *Carleton 125* (US). CHIRIQUÍ: Concepción, *Bottimer 1523* (A, DAO). Volcán de Chiriquí, below village of Volcán, *Bottimer 1528a* (DAO). Volcán Cerro Punta, 1460 m, *Burt & Koster 153** (MO). Between Hato del Volcán and Concepción, *Correa & Lazor 1437* (MO). Audubon Cabin, *Croat 13793* (MO). Volcán de Chiriquí, 9000 ft, *Davidson 980* (A, MO, US). Valley of the Río Chiriquí Viejo, 5200–5600 ft, *Duke 8999* (MO). 7 mi S of Volcán on road from David, 600–750 m, *Graham 263* (GH). Between Hato de Volcán and Cerro Punta, 1460 m, *Koster 153** (A). Boquete, 990 m, *Maurice 752* (US). Pastures around Boquete, 1000–1300 m, *Pittier 2963* (US). Valley of the upper Río Chiriquí Viejo, *White 31* (MO). DARIÉN: Agua Fria, ca. 8 mi N of Santa Fé, ca. 50 m, *Duke 10116* (MO). Above Paca, *Williams 708* (US).

12a. **Desmodium intortum** var. **apiculatum** Schubert, Field Mus. Publ. Bot. 13(3): 427. 1943. TYPE: Peru, *Mexia 8158* (F).

Described many years ago, it can be distinguished from *D. intortum* var. *intortum* by its broad, apiculate primary bracts. However, in view of confusion surrounding the whole complex of *Desmodium intortum* and its relatives I prefer not to cite material at this time.

13. **Desmodium macrodesmum** (Blake) Standley & Steyermark, Fieldiana Bot. 24(5): 230. 1946.—FIG. 21A–B.

Meibomia macrodesma Blake, Contr. U.S. Natl. Herb. 24: 6. 1922. TYPE: Honduras, trail from Hacienda El Limón to El Paraíso, Dept. Copán, *Blake 7359* (US, holotype; fragm. GH).
Nephromeria macrodesma (Blake) Schindl., Repert. Spec. Nov. Regni Veg. Beih. 49: 370. 1928.

Scandent *herb* to many meters in length, stem terete and ridged and grooved, long uncinulate pubescent and shorter spreading pilose. *Leaves* trifoliolate, stipulate, stipules early deciduous, only the broad scars seen; petioles adaxially sulcate, angulate, uncinulate puberulent, 2–5 cm long; leaf rachis similar 1–2.5 cm long; stipels narrowly elliptic, long acuminate, striate, ciliate, puberulent on abaxial surface 3.5 mm long, 0.5 mm wide, early deciduous, few seen; petiolules stouter than the leaf rachis, densely stiff pilose 1.5–4 mm long; leaflets acute, the lateral leaflets somewhat obliquely so, the adaxial surface somewhat lustrous, moderately pilosulous, abaxial surface finely silky tomentose with reticulation prominent, terminal leaflet 5.5–10.6 cm long, 3–8.3 cm wide, lateral leaflets 3.2–7 cm long, 1.9–4.9 cm wide. *Inflorescence* of axillary and terminal racemes or developing into much branched panicles; rachis angulate, ridged and grooved, moderately to densely uncinulate pubescent; pedicels in pairs, each pair subtended by 1 primary bract, secondary bracts occurring rarely if at all; primary bracts ovate acuminate, striate, puberulent and ciliate, 4.5–6 mm long, 1.5 mm

wide; pedicels uncinulate puberulent and somewhat pilose, 2.5–5(–12) mm long. *Flowers* with the calyx finely puberulent and long stiff pilose, the teeth of both lobes ciliate, also stiffly short pilose at least on the teeth within, the central tooth of the lower lobe 4–5 mm long, the lateral teeth 3.5–4 mm long, the upper lobe semiorbicular, slightly bifid, 3–4 mm long; corolla exceeding the calyx, violet to purple, standard obovate, deeply retuse, remotely clawed at the base, 5.5–6.8 mm long, 4–5 mm wide, the wings trapeziform, obscurely auriculate, unguiculate at the base, 5.5–6.3 mm long, 3–4 mm wide, the keel petals scythe shaped, long unguiculate (ca. ⅔ their length), 5–6.5 mm long, 1.5–2.5 mm wide at apex. *Loment* stipitate, usually 2-articulate, stipe densely white pilose, 4–7 mm long; articles almost orbicular, shallowly notched above, the seed slightly above the center, the body of the article flat and papyraceous, reticulate, somewhat pilose on surfaces and velvety to the touch, long spreading pilose on sutures, 2.4–2.9 cm long, 2–2.5 cm wide, the isthmus connecting the 2 articles narrow; seed dark reddish brown, reniform (somewhat immature), 3 mm long, 1.5–2 mm wide.

This species is known from Panama, British Honduras, Guatemala and Honduras.

BOCAS DEL TORO: *Carleton 36* (GH). Water Valley, *Wedel 660* (GH, MO), *794, 901, 955* (all MO). Chiriqui Lagoon, *Wedel 1036, 1293, 1773, 2759* (all GH, MO, US). COCLÉ: Between Cerro Pilón and El Valle de Antón, 700–900 m, *Duke & Dwyer 13899* (MO). El Valle de Antón at the foot of Cerro Pilón, ca. 2000 ft, *Dwyer & Correa 7996* (MO, UC); *Ebinger 1114* (MO). PANAMÁ: Cerro Azul, 600 m, *Dwyer 1370, 5143* (both MO). Cerro Campana area, ca. 3000 ft, *Dwyer & Kirkbride 7817* (MO).

14. **Desmodium maxonii** (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 161. 1936.

Meibomia maxonii Standley, Contr. U.S. Natl. Herb. 18: 108. 1916. TYPE: Panama, *Maxon 5370* (US, holotype; GH, photo; NY, isotype).
Meibomia costaricensis Schindler, Repert. Spec. Nov. Regni Veg. 20: 140. 1924. [See note in discussion.]
Desmodium costaricense (Schindler) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 534. 1937.

Shrub to 2 m tall; stem terete, striate, finely uncinulate puberulent and when young long white pilose, glabrescent with pilosity only around nodes. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely lanceolate to ovate with long attenuate apex, striate, ciliate, puberulent and pilose on the abaxial surface, long persistent, 4.5–8 mm long, 3–4.5 mm wide; petioles sulcate, densely long pilose, 1–3.5 cm long; leaf rachis similar, 0.5–1 cm long; stipels subulate to linear lanceolate, striate, pilose and ciliate, 3–5.5 mm long; petiolules stouter than the leaf rachis, long spreading pilose, 2–3.8 mm long; leaflets ovate acute, rounded at the base, mucronate, dark green, puberulent and pilose and uncinulate puberulent on the adaxial surface, paler with prominent venation and long pilosity on the abaxial surface, the margins revolute, the terminal leaflet 3–6.5 cm long, 1.5–3.5 cm wide, the lateral leaflets 2.8–5.5 cm long, 1.2–2.5 cm wide. *Inflorescence* of many dense, short, terminal and axillary racemes, the crowded bracts at the apex with their tips prominent before flowering; rachis densely uncinulate puberulent and somewhat pilose; primary bracts each subtending 2 pedicels, ovate long attenuate, striate, ciliate, pilose on the abaxial surface, 6–10 mm long, 2–5 mm wide; sec-

ondary bracts each subtending 1 pedicel laterally, lance attenuate, ciliate, pilose on abaxial surface, 2.2–6 mm long, 0.2–0.6 mm wide; pedicels uncinulate puberulent and somewhat pilose, 6–12 mm long; calyx puberulent throughout, the teeth of both lobes ciliate, the central tooth of the lower lobe densely long pilose, the upper portion of the tube and the other teeth somewhat pilose, the central tooth of lower lobe 5–8 mm long, the lateral teeth 3–5.5 mm long, the upper lobe entire to bifid, 3–5.5 mm long; corolla with standard obovate to flabellate, rounded to retuse at the apex, narrowed to base, 1–1.3 cm long, 0.6–1.1 cm wide, the wings obliquely oblong, truncate at apex, short unguiculate, 7–12.5 mm long, 3.5–5 mm wide, keel petals broadly truncate at the apex, long unguiculate, 9.5–13 mm long, 4–5.2 mm wide above. *Loment* stipitate, 5–6-articulate; stipe 2.2–4 mm long; articles rhomboidal or appearing so because of alternately revolute margins, uncinulate puberulent, isthmi central, 3.5–4.5 mm long, 2.5–3.5 mm wide; seed reniform, ca. 2 mm long, 1 mm wide.

This species occurs in Central America and southern Mexico (Chiapas).

One collection of *Desmodium, Bottimer 1527,* seems to be a slightly aberrant form of *D. maxonii* but, unquestionably, is more closely related to this species than to any other. The pubescence of the leaflets, the shape, pubescence, and persistence of the stipules, and the shape but not the pubescence of the bracts are all as in *D. maxonii*. The elongate petioles and inflorescence rachises, the softer fine pubescence of the bracts and calyces, the straighter dorsal suture of the loments and the slightly eccentric isthmi indicate, perhaps, a lesser relationship also with some other species, or may be the result of some sort of ecological disturbance.

Included in the manuscript material of the late Dr. A. K. Schindler, purchased by the Arnold Arboretum before his death, are his notes, description, and citations of specimens of *Meibomia costaricensis*. Wherever possible he added annotations to the original studies to bring the information up-to-date before sending it on. For this species he indicated that the specimens *Tonduz 11769* (in part), *Nelson 3599,* and *Killip 3606* are, indeed, *Desmodium maxonii*. See my earlier comments (Schubert, 1941).

CHIRIQUÍ: 3.4 mi NE of Volcán, *Bottimer 1527* (A, DAO). Valley of the Río Chiriquí Viejo N Volcán City, *Duke 9058* (MO). Near El Potrero camp, Chiriquí Volcano, 1900 m, *Killip 3606* (US). Cuesta de Cerro Quemado, E slope of Chiriquí Volcano, 1800–2600 m, *Maxon 5370* (NY, US); *Pittier 3112* (US).

15. **Desmodium molliculum** (H.B.K.) DC., Prodr. 2: 331. 1825.

Hedysarum molliculum H.B.K., Nov. Gen. Sp. Pl. 6: 405 (folio ed.); 6: 519 (quarto ed.). 1824. TYPE: Exact locality unknown (P; GH, photo).

Heteroloma lanatum Desv. ex H.B.K., Nov. Gen. Sp. Pl. 6: 405 (folio ed.); 6: 519 (quarto ed.). 1824, nomen nudum in syn.

Desmodium mexicanum S. Watson, Proc. Amer. Acad. Arts 23 (II. 15): 271. 1888. TYPE: Mexico. Chihuahua, pine plains at the base of the Sierra Madre, *C. G. Pringle 1226* (GH, holotype).

Meibomia mollicula (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Herb, stem repent to scandent from a perennial rootstock, stems densely patent pilose with long white trichomes; leaves trifoliolate, stipulate, petiolate; stipules obliquely ovate, acuminate, striate, ciliate, puberulent and pilose on the

abaxial surface, becoming reflexed at maturity, long persistent, 4–5 mm long, 2 mm wide; petioles sulcate, patent pilose, ca. 1 cm long, the leaf rachis similar, ca. 2–5 mm long; stipels lance attenuate, ciliate, persistent, ca. 2 mm long; petiolules stouter than the leaf rachis, densely pilose 1–1.5 mm long; leaflets appressed pilose on both the surfaces, the terminal leaflet suborbicular, slightly retuse or mucronulate at the apex, rounded to cuneate at the base, to 1.5 cm long and wide, lateral leaflets slightly oblique, cuneate at the base, ca. 1 cm long and wide. *Inflorescence* generally erect, racemose, rachis ridged and grooved, densely uncinulate puberulent to pubescent and with some pilosity; pedicels borne in pairs (or 3's), each pair subtended by a primary bract and each pedicel further subtended by a smaller secondary bract, all early deciduous; primary bracts ovate acuminate, striate, ciliate, and somewhat pilose, 3–5.5 mm long and 1.5–2.5 mm wide; secondary bracts linear, ciliate, puberulent on abaxial surface, ca. 1 mm long and 0.2–0.5 mm wide; pedicels ascending, densely uncinulate puberulent, to ca. 1 cm long. *Flowers* with the calyx bilabiate, puberulent throughout, the central tooth of the lower lobe long acuminate and long pilose, 2.5–4 mm long, lateral teeth acute, only slightly pilose, 2–3 mm long, the upper slightly bifid lobe 2–3 mm long; standard obovate retuse, cuneate at the base, 5.5–6 mm long, 3–4 mm wide, the wings oblong, obtuse and truncate at the apex, unguiculate, 5–6 mm long, 1.5 mm wide, the keel petals scythe shaped, obtuse and truncate at the apex, long unguiculate, 6.5 mm long, 1.5 mm wide. *Loment* stipitate, to 5-articulate, the articles curved above and below, the isthmi slightly eccentric, uncinulate pubescent throughout, to 5 mm long and 3.5 mm wide. Seed suborbicular to quadrate, 2 mm long, 1.5 mm wide.

Desmodium molliculum is known from Panama from 2 incomplete specimens with smaller leaflets than usual. It occurs from Mexico to South America at rather high altitudes.

The persistent, soon reflexed stipules, early deciduous bracts, and ascending pedicels in a rather loose raceme serve to distinguish *D. molliculum* from other species with similar habit and distribution. The seed measurements noted above were taken from *Koch 77382* (A), Mexico.

CHIRIQUÍ: Llanos del Volcán, 1120–1200 m, *Seibert 345* (MO). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5833* (SCZ).

16. **Desmodium perrottetii** DC., Mém. Légum. 7: 324. 1825. TYPE: Guiane Française. *Perrottet* 1820 (G, holotype; GH, photo).

Meibomia distorta (Aubl.) Schindler var. *perrottetii* (DC.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 282. 1926.

Herb; stem apparently simple, terete to subangulate, finely striate, uncinulate puberulent. *Leaves* unifoliolate; stipules transversely oblique, ovate attenuate, striate, densely long pilose on the abaxial surface, finely long pilose on the adaxial surface, ciliate, persistent, 8.5 mm long, 4 mm wide; stipels ovate attenuate, striate, pilose and puberulent, ciliate, persistent, 6 mm long, ca. 1 mm wide; petiolate, petiole densely uncinulate puberulent, sulcate, striate, 1 cm long; petiolule densely stiff spreading pilose, 3 mm long; single leaflet narrowly ovate elliptic

to ovate, obtuse at the apex and the base, broadest slightly below the middle, uncinulate puberulent and somewhat appressed pilose on the adaxial surface, tomentose with dense, long, appressed pilosity, and with prominent venation on abaxial surface, 6.5–8.5 cm long, 4.5–5 cm wide. *Inflorescence* much branched, racemose paniculate, rachises angulate, striate, uncinulate puberulent and with long spreading gland based trichomes; primary bracts ovate attenuate, striate, pilose, ciliate, early deciduous, ca. 3 mm long, 1 mm wide; secondary bracts 1 mm long, slender (only few seen); pedicels borne in pairs, ascending, with pubescence similar to that of inflorescence rachis, 2.5–3 mm long. *Flowers* with the calyx bilabiate, the teeth of both lobes all ciliate, the surface puberulent and somewhat pilose throughout, the upper bifid lobe obtuse, 2 mm long, the central tooth of the lower lobe acuminate, 2.5 mm long, the lateral teeth acute, 2 mm long; corolla with standard obovate, slightly retuse at the apex, gradually narrowed to the base (which is ca. 2 mm wide), 3.5 mm long, 2.5 mm wide, the wings obliquely oblong, obtuse at the apex, scarcely unguiculate (short clawed), 3.5 mm long, 1.5 mm wide, the keel petals scythe shaped, truncate at the apex, unguiculate (long clawed), 3.5 mm long, 1 mm wide. *Loment* stipitate, to 5-articulate; stipe 2 mm long; articles orbicular, the subterminal ones twisted or with the margins revolute, pubescent with fine glandular trichomes and long stiff spreading pilosity, 2 mm long, 1.5 mm wide; seeds brown, almost quadrate, 0.7 mm long, 0.5 mm wide.

Desmodium perrottetii is known from British Guiana, French Guiana and Peru.

It was treated as a variety of *Meibomia distorta* by Schindler which may be a more reasonable disposition. However, it would be best to see more material before making a final decision.

COCLÉ: Between Paso del Arado and Olá, 20–280 m, *Pittier 5022* (US).

17. **Desmodium procumbens** (Mill.) Hitchc., Ann. Rep. Missouri Bot. Gard. 4: 76. 1893.

Herb with several to many stems arising from the base and soon becoming procumbent. *Leaves* trifoliolate or occasionally unifoliolate, stipulate, petiolate; leaflets narrowly to broadly ovate. *Inflorescence* axillary and terminal, racemose to racemose paniculate and highly diffuse; primary bracts subtending fascicles of 3 to several pedicels, of which 2 mature together first; secondary bracts similar to the primary but smaller. *Flowers* with the calyx puberulent and scattered short pilose throughout. *Loments* sessile to short stipitate, to 5-articulate; articles with isthmi central, rhombic in outline appearing slightly to much twisted.

17a. **Desmodium procumbens** var. **longipes** (Schindler) Schubert, Contr. Gray Herb. 129: 8. 1940.

Hedysarum tenellum H.B.K., Nov. Gen. Sp. Pl. 6: 408 (folio ed.); 522 (quarto ed.). 1824, non D. Don, Prodr. Fl. Nepal. 243. 1825, nec Sprengel ex DC., Prodr. 2: 333. 1825, in syn. TYPE: *Humboldt & Bonpland,* Caracas, 440 hex. (P, holotype; GH, photo).

Desmodium tenellum (H.B.K.) DC., Prodr. 2: 333. 1825.

Cyclomorium caracasanum Walp., Repert. 2: 890. 1843. TYPE: Caracas *Moritz 25* (B?, not seen).

Meibomia tenella var. *longipes* Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924. TYPE: *Bernoulli & Cario 1206,* Guatemala. Retalhuleu.

The variety *longipes* differs from var. *procumbens* in its more diffuse and delicate aspect, almost completely glabrous stems, thinner leaflets somewhat broader in proportion to their length and more abundantly pilose on both surfaces, and most conspicuously by its slender and elongate, only slightly puberulent pedicels, 12–27 mm long, and its smaller loment articles, 1.5 mm long and 1.3–1.5 mm wide, which seem tightly twisted and have essentially glabrous sutures.

This species occurs in southern Mexico, Central America, and northern South America.

Variety *longipes* occasionally has its upper leaves unifoliolate and, in some areas (near Zamorano, Honduras), it often bears quinquefoliolate leaves.

For an earlier treatment of this variety and a discussion of the synonymy involved see Schubert 1940.

CANAL ZONE: Quebrada Fea, Quebrada Pura and Cañon of Río Chagres, 70–100 m, *Dodge & Allen 17410* (G, GH, MO). Río Grande near Culebra, 50–100 m, *Pittier 2126* (NY, US). Las Cascadas Plantation near Summit, *Standley 29685* (US). CHIRIQUÍ: Cerro de la Plata near San Félix, 120–150 m, *Pittier 5154* (US). COCLÉ: Olá, 100–350 m, *Pittier 5080* (US). PANAMÁ: Río Tocumen, *Standley 29427* (US).

17b. **Desmodium procumbens** var. **procumbens.**

Hedysarum procumbens Mill., Gard. Dict., ed. 8. *Hedysarum* no. 10. 1768. TYPE: Jamaica. *Houstoun,* 1730 (BM; GH, photo).

H. spirale Swartz, Prodr. 107. 1788. Fl. Ind. Occ. 3: 1273. 1806. Based on the type of *Hedysarum procumbens* Mill., which Swartz cited in synonymy.

Desmodium spirale (Swartz) DC., Prodr. 2: 332. 1825.

D. tenuiculum DC., Prodr. 2: 333. 1825. TYPE: *Bertero,* Santo Domingo (G-DC; GH, photo), based on *Hedysarum tenellum* Sprengel, non H.B.K.

Hedysarum tenellum Spreng. ex DC., Prodr. 2: 333. 1825, nomen in syn.

Desmodium sylvaticum Benth., Pl. Hartw. 1: 116. 1843. TYPE: *Hartweg 650* (K, holotype; GH, isotype).

Meibomia spiralis (Swartz) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

M. procumbens (Mill.) Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924.

M. procumbens var. *sylvatica* (Benth.) Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924.

Stem terete, striate, uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules lance attenuate, obliquely auriculate at base, minutely puberulent on abaxial surface, 4–6 mm long, 1–1.5 mm wide; petioles sulcate, uncinulate puberulent, 1–3.3 cm long, leaf rachis similar to petiole, 0.4–0.7 cm long; stipels linear lanceolate, 1.7–2 mm long; leaflets pilose and uncinulate puberulent on both surfaces, the margins stiffly ciliate, the terminal leaflets narrowly to broadly ovate rhombic, obtuse to acute at the apex, mostly cuneate at base, 2.3–6 cm long, 1–3.6 cm wide, the lateral similar, slightly oblique, 1.7–4.5 cm long, 0.8–2 cm wide. *Inflorescence* rachis densely uncinulate puberulent; primary bracts, each subtending 2 to more pedicels, essentially linear to narrowly ovate attenuate, striate, ciliate, puberulent over abaxial surface, 1.5–2.5 mm long, 0.5 mm wide; secondary bracts, each subtending a single pedicel, linear, ciliate, and puberulent, 0.5–0.8 mm long; pedicels stiff, uncinulate puberulent, 5–7 mm long. *Flowers* with the teeth of both calyx lobes ciliate, the central tooth of the lower lobe 1.5–2 mm long, the lateral teeth 1.3–1.5 mm long, the upper bifid lobe 1.3–1.5 mm long; standard obovate to flabellate, slightly retuse at the apex, mostly rounded

above and cuneate at base, 2–3.5 mm long, 1.5–3 mm wide, the wings oblong, obtuse, scarcely auriculate, short unguiculate, 2–2.5 mm long, 1 mm wide, the keel petals remotely scythe shaped, truncate at the apex, narrowed to the unguiculate base, 2.5–3.5 mm long, 0.8–1 mm wide. *Loment* with articles uncinulate puberulent throughout, 3 mm long, 2 mm wide.

This species occurs from northern Mexico southward through Central America, the West Indies, and the northern half of South America, in tropical Africa and the Philippine Islands (where probably introduced).

Variety *procumbens* is the most widespread of the four varieties of *Desmodium procumbens*. Although its leaflets may have prominently reticulate venation and an aspect closely approaching that of *D. tortuosum* to which it is related, *D. procumbens* var. *procumbens* may be distinguished by its smaller, much less conspicuous stipules, its shorter pedicels, usually borne at right angles to the inflorescence rachis at maturity, and its loment articles regularly smaller and more consistently rhombic in outline.

BOCAS DEL TORO: Changuinola, *Godfrey 67321* (FSU). CANAL ZONE: Sabanas N of Panama City, *Paul 585* (US). Experiment Station, *Pittier 6909* (G, K, US). Hospital grounds, Ancón, *Pittier 6909* (P). Balboa, *Standley 25491* (US). Frijoles, *Standley 27651* (US). Gamboa, *Standley 28472* (US). Near Ft. Randolph, *Standley 28757* (US). Darién Station, *Standley 31569* (US). PANAMÁ: 1 mi E of Tocumen Airport on side road off Panamerican Highway, *Blum & Tyson 1958* (FSU, SCZ). San José Island, *Johnston 542* (BM, GH), *1005* (GH). Bella Vista, *Standley 25328* (US). Corozal road near Panamá, *Standley 26771* (S, US). Taboga Island, *Standley 27081* (C, US). Juan Franco Race Track near Panamá, *Standley 27698* (S, US). Taboga Island, *Standley 27948* (US). Tumba Muerto Road, near Panamá, *Standley 29728* (US). Taboga Island near village, *Tyson & Loftin 5144* (FSU, MO, SCZ). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 6015* (FSU, MO, SCZ). PROVINCE UNKNOWN: Camino de Las Sabanas, *Heriberto 264* (US).

18. **Desmodium rhynchodesmum** (Blake) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 535. 1937 [Fl. Costa Rica].—FIG. 21C–D.

Meibomia rhynchodesma Blake, Bot. Gaz. 78: 278. 1924. TYPE: Costa Rica. Tuis, 650 m, *Tonduz 11448* (US-694364, holotype; isotypes US-943724, fruit, US-943725, flower).

Herbaceous vine to subshrub (?), scandent, festooning on thicket (*D'Arcy 11241*) or climbing on trees (*Shank & Molina 4180,* Costa Rica); stem subterete to subangulate, uncinulate pubescent with upwardly directed, yellowish trichomes and also minutely puberulent; *leaves* trifoliolate, stipulate, stipules early deciduous, only the scars seen; petioles subterete to angulate, ridged and grooved, sulcate on adaxial surface, uncinulate puberulent throughout, 2.3–4 cm long, the leaf rachis similar to the petiole, 1–1.9 cm long; stipels linear attenuate, ciliate, early deciduous, 3 mm long[44]; petiolules stouter than the leaf rachis, rugose, spreading pilose with straight tapering trichomes, those of terminal leaflet 2–3.5 mm long, of lateral leaflets 1.5–2 mm long; terminal leaflets ovate acute, usually cuneate at base, apiculate at apex, the laterals elliptic, slightly oblique, rounded at the base, acute and apiculate at the apex, all minutely uncinulate puberulent on the adaxial surface, rather densely soft white pilose on the abaxial surface, the terminal leaflets 4.2–9 cm long, 3–6.7 cm wide, laterals 2.8–5.7 cm long, 1.6–3.1 cm wide. *Inflorescence* of axillary racemes or these forming a large,

[44] Inflorescence/infructescence of isotypes from Costa Rica included in this description.

lax, spreading panicle[45], rachises angulate, ridged and grooved, minutely puberulent and glandular dotted, and with uncinulate pubescence of pale golden trichomes; pedicels regularly borne in pairs, but each 2 not always maturing together, each pair subtended by an ovate acuminate striate primary bract[44], minutely puberulent over the abaxial surface and somewhat pilose, the margins ciliate, ca. 3.5 mm long and 2 mm wide; secondary bracts[44], each subtending 1 pedicel, rare, linear with a tuft of trichomes at the apex, 0.5–1 mm long, 0.25 mm wide; pedicels minutely puberulent with fine, short, white trichomes and sparsely to abundantly uncinulate puberulent with longer, yellowish (or white) trichomes, 4.5–5 mm long. *Flowers* with the calyx minutely puberulent throughout and with long stiff tapering trichomes along the whole surface of the central tooth of lower lobe, scattered on the other teeth and on the upper lobe, all teeth ciliate, the central tooth of the lower lobe 3.5–4.5 mm long, the lateral teeth 3–3.5 mm long, the upper bifid lobe 3–3.5 mm long; standard[44] obovate, slightly tapered toward the base, 6.5 mm long, 4 mm wide, the wings remotely rectangular in outline, truncate at the apex, slightly auriculate and short unguiculate at the base, 5 mm long, 3 mm wide, the wings scythe shaped, long unguiculate, obtuse at the apex, 5.5 mm long, 1.5 mm wide; vexillar stamen fused ca. ¼ its length, then free from the others. *Loment* stipitate, 1–2-articulate, the stipe pilose with appressed to spreading or downwardly directed tapering trichomes, 3.5–4.5 mm long; articles saccate, notched at the apex, the shoulders beaked at maturity, the margin ciliate throughout, the surface minutely puberulent, 1.7–2.3 cm long and high; seed reniform, to ca. 4 mm long and 2 mm wide, funicle to ca. 3.5 mm long.

Since 1924, when Blake described *Desmodium rhynchodesmum* (as *Meibomia*), the only other material that has been referred to this species is one specimen from Limon Province in Costa Rica, and the two collections from Panama, one from Bocas del Toro and one from Colón. Decisions about the distinctness of *D. rhynchodesmum* must await the collection of more material and better field observations. However, it seems this species can be reasonably well distinguished from its closest relatives, *D. macrodesmum* and *D. saccatum* by the characters cited in the key. Schindler, Repert. Spec. Nov. Regni Veg. 22: 288. 1926, equates *Meibomia rhynchodesma* with *Nephromeria metallica* (Rose & Standley) Schindler, which is, in my opinion, incorrect.

BOCAS DEL TORO: Trail leading to ridge above Almirante, *Gentry 2760* (MO). COLÓN: Río Iguanita, 390 m, *D'Arcy 11241* (A, MO).

19. **Desmodium saccatum** Schubert[46]. TYPE: Panama, *Dwyer 2990* (MO 1800522, holotype).—FIG. 21G–H.

Vines, sometimes high climbing; stem terete, uncinulate puberulent to pubescent, glabrescent, finely striate, to 1 m (or more) in length. *Leaves* trifoliolate,

[45] Seen only on flowering isotype from Costa Rica (US 943725).

[46] *Desmodium saccatum* Schubert, spec. nov. A speciebus affinibus differt articulis saccatis, incisura in suturo superiori angulo acuto vel obtuso formanti, in maturitate in humeros non applanata.

stipulate, stipules stramineous ovate acute to acuminate, lobed to auriculate at the base, striate and with scattered long pilosity over the abaxial surface, ciliate, early deciduous (2–)3–4 mm long, (1.5–)2–3 mm wide at base; petioles remotely to obviously sulcate adaxially, somewhat angulate, striate, moderately to abundantly uncinulate puberulent, usually glabrescent, 2–5.5 cm long; leaf rachis similar to the petiole, 1–2.5 cm long; stipels linear lanceolate to linear attenuate, green to stramineous, striate, puberulent, and ciliate, somewhat swollen and slightly auriculate at the base, usually early deciduous, 2.5–4 mm long; petiolules dark green, stout, rugose, densely pilose with yellowish red, straight, tapering trichomes and some short, hooked ones intermixed, those of the terminal leaflets 2–4 mm long, of the laterals 1.5–3 mm long; leaflets triangular to subrhombic in outline, the terminal leaflet usually cuneate at the base, acuminate to the apex, the laterals truncate to rounded at the base, acute at the apex, all usually mucronate, moderately uncinulate puberulent and moderately to abundantly appressed pilose with stout trichomes on the adaxial surface, abundantly longer appressed pilose with tapering stout whitish or golden trichomes, the latter especially along the midrib and the margins which are sometimes involute and always somewhat ciliate, the terminal 6–12 cm long, 3–6 cm wide, the laterals 3–6 cm long, 2–3.3 cm wide. *Inflorescence* of long, lax, axillary racemes and panicles of ephemeral flowers; rachises uncinulate puberulent with golden trichomes; pedicels regularly borne in pairs, each pair subtended by an ovate acuminate, striate, ciliate, early deciduous primary bract, 2.5–3 mm long, 1–2 mm wide, secondary bracts rarely seen; pedicels uncinulate puberulent with slender trichomes, 9–12 mm long. *Flowers* with the calyx puberulent throughout, long stiff, appressed pilose with golden trichomes over the teeth of both the lobes, the central tooth of the lower lobe 3–4.5 mm long, the lateral teeth 2.5–4 mm long, the upper bifid lobe 2–4 mm long; corolla white to blue, standard obovate, scarcely clawed, 3.5–6.5 mm long, 3–5 mm wide, wings semi-elliptic, obliquely trapezoid, short auriculate, short clawed, 4–5.5 mm long, 2.5–4 mm wide, the keel petals partially fused, roughly scythe shaped, tapering toward the base, 3.5–9 mm long, 1.5–3 mm wide at the apex; stamens fused from the base for about ½ their length, then vexillar stamen becoming free. *Loment* stipitate, the stipe puberulent, becoming glabrous, 3–5 mm long; articles green, sometimes with a pink tinge, becoming brown at maturity, densely soft pilose throughout but only minutely puberulent to glabrescent over surface when mature, ciliate on sutures, 2–2.9 cm long, 1.7–2.3 cm wide from the base of the notch to the base of the article, the notch ca. 5 mm long; seed subreniform, 2.5–6.5 mm long, 1.4–4 mm wide.

The four species *Desmodium infractum, D. macrodesmum, D. rhynchodesmum,* and *D. saccatum* are related members of a group Schindler treated as *Nephromeria* subgenus *Nephromeria*. He maintained *D. axillare* in *Nephromeria* subgenus *Swartziella*. At present I consider these species as members of *Desmodium* section *Nephromeria* Bentham. They are distinguished from the species Schindler treated as the genus *Meibomia,* which includes most of the remaining species of Panama, by the almost orbicular loment articles, dehiscence of the loment by the upper, seed-bearing suture, a vine-like habit, ephemeral flowers, and long funiculate seeds not filling the articles. *Desmodium axillare* differs substantially from this group of species and will be discussed in detail elsewhere.

The four species noted above differ from each other as indicated in the key. *Desmodium saccatum* is the only member of the group having a straight-sided, broadly V-shaped notch, which does not flatten out into shoulders or become beaked at maturity.

COCLÉ: El Valle de Antón, 860–900 m, *Croat 37386* (MO); *Duke & Dwyer 13899* (SCZ); *Dwyer* (MO); *Ebinger 1114* (MO); *Lewis et al. 2529* (MO); *Spellman et al. 593* (MO). COLÓN: Santa Rita Ridge lumber road, 300–500 m, *Correa & Dressler 909* (DUKE, FSU, MO); *Gentry 6113* (MO); *Wilbur et al. 15029* (DUKE). PANAMÁ: Cerro Campana, 780–875 m, *Croat 25215* (A, MO). La Eneida, region of Cerro Jefe, *Dressler & Williams 3954* (MO). Cerro Azul, 600 m, *Dwyer 1370* (SCZ, US); *Dwyer 2990* (MO). Cerro Campana, *Gentry 5781* (FSU). Near Portobelo, *Gentry 6325* (DUKE, MO). Cerro Campana, *Witherspoon & Witherspoon 8381* (A, MO).

20. **Desmodium scorpiurus** (Swartz) Desv., J. Bot. (Desvaux) 1: 122. 1813; DC., Prodr. 2: 333. 1825, not *D. scorpioides* Micheli, Bull. Soc. Bot. Belg. 30: 289. 1891, error for *D. scorpiurus*.

Hedysarum scorpiurus Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1269. 1806. TYPE: Jamaica. *Swartz* (S, holotype; GH, photo).
Desmodium virgatum Desv., J. Bot. (Desvaux) 1: 122. 1813, not *Hedysarum virgatum* Thunb.
Desmodium arenarium H.B.K., Nov. Gen. Sp. Pl. 6: 412 (folio ed.): 6: 527 (quarto ed.). 1824; DC., Prodr. 2: 331. 1825. TYPE: Venezuela, Atures, *Humboldt & Bonpland 851* (P, holotype; GH, photo).
Desmodium multicaule DC., Prodr. 2: 331. 1825. TYPE: Peru. *Lagasca 48* (G-DC, holotype; GH, photo).
Desmodium parviflorum Mart. & Gal., Bull. Acad. Bruxelles 10: 185. 1843. TYPE: Mexico, Veracruz. *Galeotti 3337* (P, isotype; F, GH, photos).
Meibomia scorpiurus (Swartz) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Meibomia arenaria (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia multicaulis (DC.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Nissoloides cylindrica M. E. Jones, Contr. West. Bot. 18: 135. 1935. TYPE: Mexico, Jalisco, Guadalajara. *Jones 3784* (GH, isotype).

Prostrate or repent to ascending, much branched *herb*; stem angulate, striate, sparsely uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate, acuminate, auriculate at base, auricles of the 2 stipules usually overlapping on the opposite side of the stem from the petiole base, puberulent, long ciliate, usually persistent, 2–3.5 mm long, 1.8–3 mm wide; petioles sulcate, long pilose along the groove, otherwise angulate, striate, and uncinulate puberulent, 0.9–2 cm long, the leaf rachis similar, 0.2–0.5 cm long; stipels lance attenuate, striate, ciliate, 0.8–2 mm long; petiolules of terminal leaflets 1–2 mm long, of lateral leaflets 0.8–1.5 mm long; leaflets somewhat uncinulate puberulent and appressed pilose on the adaxial surface with trichomes ca. 1 mm long, moderately appressed long pilose and remotely uncinulate puberulent on the abaxial surface, the margins ciliate, the terminal leaflet elliptic, obtuse at the base and the apex or cuneate at base, 0.9–2.5 cm long, 0.7–2 cm wide, the lateral leaflets obliquely elliptic, rounded at the base, acute at the apex, 0.8–2.2 cm long, 0.4–1.5 cm wide. *Inflorescence* of axillary and terminal racemes; rachis angulate, striate, uncinulate puberulent, remotely pilose with glandular trichomes; primary bracts narrowly ovate acuminate, striate, puberulent and pilose on the outer surface, puberulent on the inner surface, often reflexed at maturity, 1.5–2.5 mm long, 0.8–1 mm wide, each subtending an indeterminate number of pedicels and each pedicel further subtended by a smaller similar secondary bract borne more or less laterally, 0.8–

1 mm long, 0.3–0.4 mm wide; pedicels somewhat uncinulate puberulent and moderately pilose with glandular trichomes, 4–8 mm long. *Flowers* with the calyx minutely puberulent and stiffly long pilose throughout, teeth of the lower lobe slender, the central tooth 2–3 mm long, the lateral teeth 2–2.5 mm long, the upper lobe 2–2.6 mm long, bifid for 0.5 mm of its length; corolla exceeding the calyx, the standard obovate, deeply retuse, the 2 halves of the apex rounded, narrowed to an obtusish base, 3.5–4.5 mm long, 2.5–4 mm wide, the wings oblong, truncate above, auriculate and short unguiculate, 3.3–4 mm long, 1.5 mm wide, the keel petals scythe shaped, narrowed to a tapering base, 3.5–4.5 mm long, 1–1.5 mm wide. *Loment* short stipitate, the stipe 1 mm long, 7–8-articulate, the articles narrowly elliptic, isthmi almost as wide as the articles, the surfaces strongly and closely reticulate, densely uncinulate pubescent, 4 mm long, 1.5 mm wide; seed rectangular, 2 mm long, 1 mm wide.

Desmodium scorpiurus ranges throughout tropical America, occurring occasionally as a weed in tropical areas of the Pacific, and in Africa.

Its fruit and stipules serve to distinguish *Desmodium scorpiurus* from other American species; it seems to have no close relatives in the New World. *Desmodium scorpiurus* is the conserved type of the conserved name *Desmodium*.

BOCAS DEL TORO: Almirante, *Barrus 403* (GH). Junction of Ríos Changuinola and Terebe, 100–200 ft, *Lewis et al. 962* (MO). CANAL ZONE: Barro Colorado Island, *Bottimer 1486* (A, DAO); *Croat 6923* (MO), *6972* (A, MO), *13799* (MO, SCZ), *15580* (A, MO); *Hladick 88* (MO); *Netting 7* (MO); *Shattuck 120* (MO); *Starry 278* (MO). Corozal to Pedro Miguel, *Cowell 398* (NY). Ancón, *Croat 9236* (MO); *Greenman & Greenman 5001* (DUKE). Empire Station, *Hayes 504* (BM, K). Las Cruces Trail, 75 m, *Hunter & Allen 691* (G, GH, MO). Balboa Heights, *Killip 3396* (US). ½ mi NW of Gamboa, 70 m, *Liesner 1395* (MO). Balboa, *Macbride & Featherstone 45* (US). La Boca, *Mori & Kallunki 3683* (MO). Ancón, *Piper 5183, 5187, 5194* (all US). Río Grande near Culebra, 50–100 m, *Pittier 2107* (US). Ancón, 20–80 m, *Pittier 6909* (NY). Summit near Gatún, *Standley 27317, 30114* (both US). Balboa, *Standley 30838* (US). Darien Station, *Standley 31531, 31566* (both US). CHIRIQUÍ: Gualaca, 0–100 m, *Burt & Koster 122* (MO). Rabo de Puerco 8 km W of Puerto Armuelles, 50–150 m, *Croat 21970* (MO). Ridge above Brazo Seco near Costa Rican border, 100–200 m, *Croat 22565* (MO). Road to Alanje, 0–100 m, *Koster 138* (A). Quebrada Mellize 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 432* (MO). COCLÉ: El Valle, *Bottimer 1476* (A, DAO). Penonomé, 50–1000 ft, *Williams 103* (NY). COLÓN: Without other locality, *Rodway* (K). Colon, *Rose 22064* (US). LOS SANTOS: Near Sabana Grande, 0–100 m, *Burt & Koster 100* (MO). Las Cruces/Macaracas, 100–200 m, *Burt & Koster 101* (MO). Between Las Cruces and Macaracas on way to Tonosí, 100–200 m, *Koster 101* (A). Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2995* (DUKE, MO, UC). PANAMÁ: Near Chepo, 0–100 m, *Burt & Rattray 13* (MO). Near Pacora, 0–100 m, *Burt & Rattray 19* (MO). Between Chepo and El Llano, *Croat 14494* (MO). Savannas near Chepo, *Duke 6051* (MO). Río Pacora just below confluence with Río Corso, *Duke 11997* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5103* (MO). San Jose Island, *Johnston 1000, 1092* (both GH, U). Savanas, *Macbride, 2651* (US). Between Río Pacora and Chepo, *Porter et al. 5135* (MO). Near San Carlos, 0–100 m, *Rattray 36* (A). VERAGUAS: Atalaya/Ponuga, 100–200 m, *Burt & Koster 100A* (MO). Between Atalaya and Ponuga, 100–200 m, *Koster 100A* (A).

21. **Desmodium sericophyllum** Schlecht., Linnaea 12: 317. 1838. TYPE: Mexico, Veracruz, "San Andres et Hac. de la Laguna (*Schiede*)" (not seen).

Meibomia sericophylla (Schlecht.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

Perennial *herb,* sometimes procumbent to ascending, becoming 1 m or more long; stems angulate, ridged and grooved, densely white tomentose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate attenuate, striate, puberu-

lent and pilose on the abaxial surface, abundantly ciliate, usually becoming reflexed, often early deciduous, 5–7.5 mm long, 2–3.5 mm wide at the base; petioles sulcate, densely tomentose, 1.3–2 cm long; leaf rachis similar to petiole, 0.4–1 cm long; stipels linear attenuate, pilose, and ciliate, to 3.5 mm long; petiolules stout, densely tomentose, 2–4 mm long; leaflets softly appressed pilose and dark on adaxial surface, paler and tomentose on the abaxial surface with some reticulate venation evident, the leaflets ovate to elliptic, acute to obtuse and mucronulate at the apex, rounded to cuneate at the base, the terminal leaflet 3.5–6 cm long, 2–3.5 cm wide, the lateral leaflets 3–5 cm long, 1.5–2.5 cm wide. *Inflorescence* racemose to racemose paniculate; rachis subangulate, finely ridged and grooved, uncinulate puberulent throughout; pedicels borne in pairs, each pair subtended by an ovate acuminate, striate, ciliate primary bract, puberulent and somewhat pilose on the abaxial surface, 8–9.5 mm long, 3–5 mm wide; secondary bracts minute, if present, not persistent; pedicels densely uncinulate puberulent, becoming reflexed soon after anthesis, 2.5–4 mm long. *Flowers* with the calyx minutely puberulent throughout, the teeth of both the lobes somewhat ciliate, especially at the apex, and with at least scattered pilosity along the central tooth of the lower lobe and on the upper lobe; central tooth of the lower lobe 4–5 mm long, the lateral teeth 3–3.5 mm long, the upper bifid lobe 3 mm long; standard obovate, slightly retuse, cuneate at the base, 5.5–9 mm long, 4–6 mm wide, the wings oblong, obtuse at the apex, unguiculate at the base, 5.5–10 mm long, 1.5–3 mm wide, the keel petals scythe shaped, curved and truncate at the apex, long unguiculate, 5.5–10 mm long, 1.5–3 mm wide. *Loment* stipitate; stipe 1–2.5 mm long, to 7-articulate; articles suborbicular to subrhombic in outline, with the upper suture usually slightly curved, the lower almost angulate, surfaces uncinulate puberulent throughout, 3–4 mm long, 3 mm wide, the isthmi at least slightly eccentric, ca. 1.5 mm wide; seed subreniform, 2 mm long, 1.5 mm wide.

This species is known in Panama only from Chiriquí Province. It occurs from Central Mexico southward through Central America, to Venezuela and Colombia. Two collections cited below, *Tyson 5824* (FSU, MO, SCZ) and *5831* (SCZ) are somewhat atypical in leaflet shape, but conform reasonably well in other characters to this species.

It is easy to distinguish *Desmodium sericophyllum* from other species of the genus in Panama by its leaflets which are velvety to the touch on both surfaces, and by its short pedicels which become reflexed at anthesis or soon after, so that, for a time at least, the loments appear to be imbricated.

CHIRIQUÍ: 3.4 mi NE of Volcán, *Bottimer 1528* (A, DAO). El Boquete, 1000–1400 m, *Cornman 2055* (US); *Maurice 715* (US). Between Cerro Vaca and Hato del Loro, eastern Chiriquí, 850–1100 m, *Pittier 5386* (NY, US). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5744* (SCZ); 3 mi N El Volcán on lava flow, 5000 ft, *Tyson 5824* (FSU, MO, SCZ), *5831* (SCZ); *Davidse & D'Arcy 10340* (A).

22. **Desmodium tortuosum** (Swartz) DC., Prodr. 2: 332. 1825.

Hedysarum purpureum Mill., Gard. Dict., ed. 8. *Hedysarum* no. 6. 1768. TYPE: Mexico, Veracruz, *Houstoun* 1730 (BM, holotype; GH, photo).
Hedysarum tortuosum Swartz, Prodr. 107. 1788. TYPE: Jamaica, *Swartz* (S, holotype; GH, photo).
Meibomia tortuosa (Swartz) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Meibomia purpurea (Mill.) Vail in Small, Fl. S.E. US. 639. 1903.
Desmodium purpureum (Mill.) Fawcett & Rendle, Fl. Jamaica 4: 36. 1920, non Hook. & Arn. Bot. Beechey's Voy. 62. 1832.

Woody *herb* or *shrub* to 3 feet tall, branching from the base; stems terete, striate, uncinulate pubescent and somewhat pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate attenuate, long persistent, often reflexed, striate, ciliate, puberulent on the abaxial surface, becoming glabrous, 3–12.5 mm long, 1–7 mm wide; petioles sulcate, ridged, pubescent as the stem, 0.75–5 cm long; leaf rachis similar, 0.45–2 cm long; stipels lance attenuate, striate, ciliate, puberulent, 1–7 mm long; petiolules stouter than leaf rachis, densely stiff pilose, 1–2.5 mm long; leaflets elliptic to ovate, mostly obtuse at the apex, cuneate at the base, with prominently reticulate venation, sparsely to moderately uncinulate puberulent and pilose on both the surfaces, ciliate, the terminal leaflet 2.4–8 cm long, 1–2.7 cm wide, the lateral leaflets 2–5 cm long, 1–2.4 cm wide. *Inflorescences* axillary and terminal, racemose to racemose paniculate; rachis striate, uncinulate puberulent, moderately to densely and finely glandular pilose, becoming less densely so in age; primary bracts, each subtending 2 to more pedicels, narrowly ovate attenuate, striate, ciliate, minutely puberulent on abaxial surface, 5–6.5 mm long, 0.5–1.5 mm wide; secondary bracts, each subtending 1 pedicel, similar, smaller, ca. 2 mm long and 0.4–0.5 mm wide; pedicels with pubescence similar to that of rachis, stiff and ascending to spreading at maturity, 1–1.6 cm long. *Flowers* with the calyx minutely puberulent and abundantly pilose throughout, the teeth of both lobes ciliate, the central tooth of the lower lobe long attenuate, 3–4 mm long, the lateral teeth 2–3 mm long, the upper bifid lobe 2–3 mm long; standard obovate, slightly retuse at the apex, gradually narrowed to the base, 2.5–3.5 mm long, 2 mm wide, the wings obtusely oblong, auriculate and short unguiculate, 2.5–3.5 mm long, 1–1.5 mm wide, the keel petals obliquely oblong, broader above, unguiculate about ⅓ their length, 3–4 mm long, 1 mm wide. *Loment* 5–7-articulate, stipitate, the isthmi central; stipe 0.5–1 mm long; articles mostly orbicular, sometimes with the margins alternately revolute and appearing rhomboidal, uncinulate pubescent throughout, 3–3.5 mm long, 2.6–3.5 mm wide; seed reniform, 1.5 mm long, 1 mm wide.

Desmodium tortuosum ranges throughout subtropical and tropical America. It is found as an escape from cultivation and becomes weedy in most tropical areas of the world.

The thick leaflets with prominently reticulate venation, the large persistent stipules and the long, stiff, ascending to spreading pedicels distinguish *Desmodium tortuosum* most easily from its relatives. This species is grown as a green manure in the southeastern United States and other parts of the world.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 197* (GH, US). Lincoln Creek, Changuinola Valley, *Dunlap 482* (US). Bocas, *Lazor et al. 2325, 2334* (both FSU, SCZ). Without other locality, *Wedel 379* (GH, MO). Isla Colón, 0–120 m, *Wedel 551* (GH, MO). CANAL ZONE: Coastal Island beyond Fort Amador, *D'Arcy 9235* (MO). Ancón Hill, *Duke 4620* (MO). Old Miraflores bridge, *Dwyer 1013* (MO). Farfan Beach, *Dwyer 6799* (MO). Frijoles, *Ebinger 308* (GH, MO). Madden Dam, *Ebinger 848* (GH, MO). Ancón, *Greenman & Greenman 5014* (MO), *5017* (DUKE, MO). Between Frijoles and Monte Lirio, 30 m, *Killip 12166* (GH, NY, US). Balboa, *Macbride & Featherstone 46* (US). Gamboa, *Piper 5188* (US). Balboa, *Standley 25522, 25562, 25654* (all US), *Standley 27001* (MO, US). Near Gatún, *Standley 27333* (US). Corozal, *Standley 27360* (US). Frijoles, *Standley 27636* (US). Gamboa, *Stan-*

dley 28345 (US). Río Pedro Miguel near East Paraíso, *Standley 30027* (C, US). Ft. Sherman, *Standley 31161* (C, US). Darien Station, *Standley 31532* (US). Obispo, *Standley 31783* (US). Balboa, *Standley 32106* (US). Barro Colorado Island, *Standley 40950* (US). Miraflores Locks area, *Tyson 1127* (SCZ). Ft. Amador causeway island, *Tyson 5415* (FSU, SCZ). Near Playa Venado, *Wilbur & Teeri 12965* (DUKE). COCLÉ: El Valle de Antón, 1000–2000 ft, *Lewis et al. 2521A* (MO). COLÓN: Colón, *Rose 22077* (GH, NY, US). DARIÉN: Boca de Cupe, 40 m, *Allen 913* (GH, MO, US). Río Pirre, *Duke 4967* (MO). Río Pirre near crossing of trail from El Real to Tucutí, *Duke 5193* (MO). Ascent of Cerro Pirre from Río Pirre S of El Real, 750–1030 m, *Duke 5363* (MO). El Real, *Lazor & Correa 3372* (FSU). LOS SANTOS: Pocrí, *Dwyer 2521A* (A), *2521B* (MO). PANAMÁ: Punta Chame, *D'Arcy 10238* (MO). Taboga Island, *Dwyer 2813* (MO); *Killip 3183* (US); *Standley 27964* (US).

23. **Desmodium triflorum** (L.) DC., Prodr. 2: 334. 1825.

Hedysarum triflorum L., Sp. Pl. 749. 1753. TYPE: Herb. Linnaeus (LINN 921.45).
H. stipulaceum Burm., Fl. Ind. 168. *tab. 54, fig. 2.* 1768.
Aeschynomene triflora (L.) Poir. in Lam., Encycl. Méth. Bot. 4: 451. 1798. ("*Aeschinomene*")
Pleurolobus triflorus (L.) St. Hil., Nouv. Bull. Soc. Philom. 3: 192. 1812.
Hedysarum granulatum Schum. & Thonn. in Schumacher, Beskr. Guineiske Pl. 362. 1827; Danske Vid. Selsk. Naturv. Afhndl. 3: 136. 1829; Schubert, J. Arnold Arbor. 44: 294. 1963.
Desmodium bullamense G. Don, Gen. Syst. 2: 294. 1832.
Desmodium triflorum var. β. *minus* Wight & Arn., Prodr. 1: 229. 1834.
Desmodium triflorum var. γ. *villosum* Wight & Arn., Prodr. 1: 229. 1834.
Hippocrepis humilis Blanco, Fl. Filip. 585. 1837.
Desmodium caespitosum Bojer, Hort. Maurit. 10. 1837.
Desmodium granulatum (Schum. & Thonn.) Walp., Repert. 1: 737. 1842.
Desmodium stipulaceum (Burm.) Hassk., Cat. Pl. Hort. Bot. Bogor. 274. 1844.
Desmodium parvifolium sensu Blanco, Fl. Filip., ed. 2. 408. 1845, non DC. *fide* E. D. Merrill, Specie Blancoanae 183. 1918.
Nicolsonia reptans Meisn. Linnaea 21: 260. 1848.
Nicolsonia reptans Hook. f. & Benth. in Hook., Niger Fl. 304. 1849.
Sagotia triflora Duchass. & Walp., Linnaea 23: 738. 1850.
Nicholsonia triflora Griseb., Goett. Abhandl. 7: 202. 1857.
Meibomia triflora Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. α. *glabrescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. α. *glabrescens* forma *coerulescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. α. *glabrescens* forma *purpurea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. α. *glabrescens* forma *violacea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. β. *pilosa* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. β. *pilosa* forma *violacea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. β. *pilosa* forma *flavescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. β. *pilosa* forma *virescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Desmodium triflorum var. *pigmaeum* Hoehne, Comm. Linh. Telegr. Matto Grosso, Ann. 5. Bot. 8: 73. (1917) 1919.

Low creeping *herbs* often with several stems from the base or rooting at the nodes, suggesting a species of *Trifolium* in habit and aspect; stem terete and striate to angulate, moderately to abundantly long white pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules stramineous, obliquely ovate, long acuminate, truncate at the base, striate, somewhat pilose on the abaxial surface, ciliate, long persistent, 2–3.5 mm long, 1–1.5 mm wide; petioles sulcate adaxially, long pilose and minutely uncinulate puberulent, 3–7.5 mm long; leaf rachis similar 1–2 mm long; stipels inconspicuous, ca. 0.5 mm long, petiolules stouter than the leaf rachis, densely pilose, 0.5–1 mm long; leaflets obovate, retuse and sometimes nearly truncate at apex, cuneate at base, essentially glabrous adaxially, abundantly pilose and minutely uncinulate puberulent on the abaxial surface or pilose, terminal leaflet 5–10 mm long, 5–11 mm wide, the lateral leaflets similar or more nearly elliptic, 4–7.5 mm long, 4–8 mm wide. *Inflorescences* axillary, densely compressed, usually composed of 3–4 pairs of flowers; primary bracts ovate,

short acuminate, striate, ciliate, long persistent, 2.5–3 mm long, 0.7–1.5 mm wide, each subtending 2 pedicels; secondary bracts, when rarely present, depauperate; pedicels densely long pilose or only uncinulate puberulent, 4.5–8 mm long; calyx remotely bilabiate, the teeth of both the lobes equal, each ciliate and with a long pilose, reddish midrib, 2.5–3.5 mm long; corolla with a more or less orbicular but long-unguiculate standard, 3.6–4.5 mm long, 2–3 mm wide above the claw, the wings oblong and long unguiculate, equalling the standard in length, 1 mm wide, the keel petals scythe shaped, long unguiculate, as long as the standard, 1–1.3 mm wide. *Loment* sessile, to 5-articulate, straight or curved on the upper suture, slightly invaginated on the lower; articles uncinulate pubescent throughout, ultimately separating at the wide isthmi, 2.5–4 mm long and wide; seed nearly orbicular, 1.5 mm long and almost as wide.

This species is widespread in tropical areas. It is often introduced and appears as a weed on lawns, but is noted by some collectors as a good lawn plant. It is said to be eaten by cattle.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 303* (US). Changuinola, *Godfrey 67321* (FSU). Almirante, *Lazor et al. 2332* (FSU, SCZ). Bocas, *Lazor et al. 2355* (FSU, MO, SCZ). CANAL ZONE: Frijoles, *Bottimer 1515* (A, DAO). Chagres, *Fendler 84* (GH, MO, US). Between Summit and Gamboa, *Greenman & Greenman 5264* (MO). Barro Colorado Island, *Hladick 89* (MO). Ancón, *Piper 5184* (US). Río Grande near Culebra, 50–100 m, *Pittier 2077* (US). Barro Colorado Island, *Shattuck 195* (MO). Near Gatún, *Standley 27325* (US). CHIRIQUÍ: Between David and Concepcion 0–100 m, *Koster 132* (A). Puerto Armuelles, 20 m, *Liesner 142* (MO). COCLÉ: Aguadulce near sea level, *Pittier 4856* (US). COLÓN: Santa Rita Ridge, 2 mi E of Transisthmian Highway, *Lewis et al. 5241* (MO, SCZ). Portobelo, 5–100 m, *Pittier s.n.* (US); *Rose 23998* (US). PANAMÁ: Madden Dam 75 m, *Allen 789* (GH, MO). San José Island, *Erlanson 589* (GH, US). Sabanas near Chepo, 30 m, *Hunter & Allen 22* (GH, MO). Sabanas NE of Panama City, *Paul 185* (US). Corozal Road near Panama, *Standley 26813* (US). Taboga Island, *Standley 27098* (MO, US). Hospital del Seguro Social, *Taylor 64* (PMA).

24. **Desmodium wydlerianum** Urban, Symb. Ant. 2: 302. 1900; Schubert, Contr. Gray Herb. 129: 29, *pl. 2, figs. D1–7.* 1940. TYPE: Portorico parte orientale: *Wydler 140* (G, holotype; F, GH, isotypes).

D. spirale β. *stoloniferum* (Poir.) DC., *sensu* DC., Prodr. 2: 333. 1825. TYPE: Porto Rico, *Bertero* (G-DC; GH, photo).

D. lunatum Huber, Bol. Mus. Paraense Hist. Nat. 4: 568–570, *fig. 2.* 1906; non Brandegee 1908. TYPE: Brazil, Chinganilla (Pampa del Sacramento), *Huber 15* (not seen, but fig. 2 agrees well with material of *D. wydlerianum*).

Meibomia lunata (Huber) Hoehne, Anexos. Mem. Inst. Butantan Secc. Bot. 1: 39, *tab. 14.* 1921.

M. wydleriana (Urb.) Britt., Sci. Surv. Porto Rico & Virgin Isl. 5: 403. 1924.

Slender *subshrubs,* to 4 dm or more, often repent, the stem rooting at the nodes, angulate, striate, uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules elliptic acuminate, striate, uncinulate puberulent over the abaxial surface, ciliate, to 6 mm long, 1.5 mm wide; petioles sulcate on the adaxial surface, striate, uncinulate pubescent and sparsely pilose, 5–4.5 cm long, the leaf rachis similar, more slender, 1.4–1.6 cm long; stipels lance attenuate, striate, uncinulate puberulent on the abaxial surface, ciliate, 1.5–3.5 mm long; petiolules stouter than the leaf rachis, densely pilose and uncinulate pubescent, 2.5–3 mm long; leaflets thin, dark green and often with a blotch above, much paler beneath, terminal leaflet ovate acuminate, truncate at the base, with undulate margins, uncinulate puberulent to pubescent on the midrib and the chief lateral veins,

similarly pubescent over the whole surface or glabrescent, pubescence of the abaxial surface similar but less abundant and less conspicuous, 7–8 cm long, 5.5–6 cm wide, the lateral leaflets similar but slightly oblique, 5–6.4 cm long, 3–3.5 cm wide. *Inflorescence* of axillary racemes, rachis angulate, ridged and grooved, uncinulate pubescent; bracts early deciduous, none seen on Panama specimens, primary bracts narrowly ovate, striate, puberulent, ciliate, ca. 1.5 mm long; secondary bracts similar, ⅓ as long; pedicels borne singly, each subtended by 1 primary and 2 lateral secondary bracts, pubescent as the rachis or with sparsely scattered pilosity in addition, 1.2–1.6 cm long. *Flowers* with the calyx uncinulate puberulent throughout, teeth of both the lobes somewhat appressed pilose, the central tooth of the lower lobe 2.5–3.5 mm long, the lateral teeth to 3 mm long, the upper bifid lobe to 3 mm long; standard orbicular to obovate, short unguiculate, to 4.5 mm long, 3.5–4 mm wide, the wings suboblong and short unguiculate, to 4.5 mm long, 1.5–2 mm wide, the keel petals remotely scythe shaped, long unguiculate, 4.5–5 mm long, 2 mm wide. *Loment* stipitate to 3-articulate, the stipe 1–1.5 mm long, the articles densely uncinulate pubescent on the surfaces, the dorsal suture slightly invaginated, the ventral suture rounded, isthmi eccentric and narrow, 7–11.5 mm long, 3–3.5 mm wide; *seed* almost naviculate in outline, 4 mm long, 2 mm wide.

Desmodium wydlerianum occurs in central America, the West Indies and the northern half of South America. Originally described from Puerto Rico, this species has now been found in most of tropical America in humid forests at relatively low altitudes.

The seed measurements noted above were taken from *Skutch 4346* (GH, Costa Rica).

CANAL ZONE: Barro Colorado Island, *Croat 5884, 14983, 17395* (all MO). Las Cruces Trail, *Tyson 1774* (FSU, MO, SCZ). DARIÉN: Río Paya, trail between Paya & Payita, *Stern et al. 362* (GH, MO). Río Paya, trail to Pucro, *Stern et al. 413* (GH, MO, US).

19. DIOCLEA

Richard H. Maxwell[47]

Dioclea H.B.K.,[48] Nov. Gen. Sp. Pl. 6: 437, *tab. 576*. 1824. LECTOTYPE: *D. sericea* H.B.K.

Vines, woody, in clumps, or high-climbing lianas. *Leaves* trifoliolate, the lateral leaflets usually smaller than the terminal, the margins entire, revolute, with variable pubescence; stipels setaceous to filiform; stipules lanceolate or triangulate, produced below insertion or non-produced. *Inflorescences* erect, usually single and axillary, fasciculate racemose, tuberculate; bracts linear to triangulate, persistent to caducous; bracteoles ovate, flabellate to orbicular, persistent or caducous. *Flowers* shades of violet, purple and blue; calyx tube 4–5 lobed, pubescent within, glabrous or variously pubescent without, the upper lobes partially or completely fused; lamina of the standard oblanceolate to somewhat orbicular,

[47] Indiana University Southeast Herbarium, 4201 Grant Line Road, New Albany, Indiana 47150.

[48] Several generic synonymies are listed by Hutchinson, *Genera of Flowering Plants* 1: 426. 1964. None of these names applies to Panamanian material.

emarginate, basally biauriculate and usually bicallose, glabrous or puberulent, carnose or membranous, the wings free, the lamina obliquely oblong to obliquely ovate, auriculate, occasionally with a spur, the keel petals fused distally, the lamina triangulate to somewhat obliquely oblong, auriculate; stamens 10, the vexillary filament free ca. 3 mm, basally, then fused to the staminal sheath, all the filaments free distally, the anthers dimorphic or monomorphic; pistil compressed, geniculate, the ovary villous, the upper style glabrous, the stigma capitate, glabrous. *Fruits* oblong, flat, compressed or turgid, with variable dehiscence, pubescence variable; seeds large, few, soft-cuboidal or hard-turgid; if small, then many, hard and flat, oblong to sub-orbicular; the hilum linear or short-oblong, encircling ca. $^1/_5$ to nearly ½ or to ca. ¾ the testa.

Dioclea is a pantropical genus of about 50 species with the great majority in tropical South America.

Literature:

Pittier, H. 1944. Leguminosas de Venezuela, I. Papilionáceas. Min. Agric. Cria. Ser. Bot. Bol. Téc. 5. Caracas.

Burkart, A. 1970. Las Leguminosas Faseólas argentinas de los géneros *Mucuna, Dioclea* y *Camptosema*. Darwiniana 16: 175–218.

a. Large coarse vines, frequently high-climbing forest lianas; stipules large, produced; anthers dimorphic (5 perfect and 5 imperfect); bracts from 6–20 mm long, caducous or occasionally semipersistent; seeds large, turgid or compressed, 1–4(–5); lamina of the standard carnose, glabrous; keel petals rostrate.
   b. Fruits turgid, fleshy; seeds soft, cuboidal, the hilum encircling ca. ½ the testa; leaflets with the primary lateral veins in 10–14 pairs, the apices abruptly elongate; bracts 6–10 mm long; keel petals sharply beaked or hooded.
      c. Leaflets papyraceous, non-rugose above, sparsely pubescent below; calyx yellowish, sparsely pubescent with short, dark brown hairs; pedicels ca. 9 mm long; stipules ca. 15 mm long ---------- 5. *D. pulchra*
      cc. Leaflets coriaceous, rugose above, densely pubescent below; calyx darker, with dense ferruginous pubescence; pedicels ca. 5 mm long; stipules ca. 25 mm long ---------- 1. *D. aurea*
   bb. Fruits coriaceous to ligneous; seeds hard, globose, the hilum encircling $^2/_3$–$^4/_5$ the testa; leaflets with the primary lateral veins in ca. 8(–10) pairs, apices usually acute; bracts 15–30 mm long; keel petals with obtuse or truncate beaks.
      d. Flowers 2.3–3.0 cm long, borne on pedicels ca. 7 mm long; fruits ca. 3 cm thick, the upper suture paralleled by thick ribs, the lower margin somewhat constricted between the seeds, the exocarp obliquely fissured; the bracts spreading, to ca. 30 mm long, ciliate; seeds ca. 2 cm thick, reddish, frequently with a scale-like piece of rim aril persisting ---------- 3. *D. megacarpa*
      dd. Flowers 1.5–2.0 cm long, borne on pedicels 2–6 mm long; fruits ca. 2 cm thick, the upper suture paralleled by thin wings, the lower margin non-constricted between the seeds, the exocarp without distinct oblique fissures; bracts erect or reflexed, 9–20 mm long, with appressed pubescence; seeds ca. 1.5 cm thick, dark, frequently with a woody piece of funiculus persisting.
         e. Inflorescences, flower buds and young fruit indumentum nigrescent ferruginous; bracts erect, linear, caducous; fruits with the pedicel attachment at the upper suture, the upper margin usually straight; bracteoles usually caducous ---------- 8. *D. wilsonii*
         ee. Inflorescences, flower buds and young fruit indumentum fulvous, occasionally ferruginous; bracts reflexed, usually lanceolate, semipersistent; fruits with the pedicel attachment median, the upper margin frequently downcurved distally; bracteoles usually persistent ---------- 6. *D. reflexa*

aa. Smaller woody vines (except *D. paniculata*), frequently in clumps in open scrub or forest edges; stipules small, non-produced; anthers uniform (10 perfect); bracts ca. 3 mm long, persistent; seeds small, flat, 5–12 (except 2–4 in *D. paniculata*); lamina of the standard membranous, puberulent or glabrous; keel petals not rostrate.
  f. Smaller woody vines, frequently common in open areas; leaflets papyraceous; flowers 15–25 mm long, standard puberulent; inflorescences usually single; fruits oblong, the upper suture paralleled by distinct ribs or wings to either side; seeds oblong rounded, 5–12, the hilum long linear.
    g. Calyx tube glabrous; pedicels usually longer than 5 mm long; bracteoles suborbicular, 6–10 × 4–6 mm, caducous; keel petals with the median portion of the upper margin fimbriate ---------- 7. *D. virgata*
    gg. Calyx tube pubescent; pedicels ca. 5 mm long, usually less; bracteoles lanceolate to ovate, ca. 3 × 2 mm, persistent or caducous; keel petals with a wide median portion of the upper margin variously dentate or serrate ---------- 2. *D. guianensis*
  ff. Higher climbing lianas, along rivers or in moist forest areas; leaflets rigid, brittle; flowers 10–12 mm long, standard glabrous; inflorescences single, double or occasionally branched; fruits usually elliptic, the upper suture paralleled by shallow ribs ca. 1 mm to either side; seeds oval, 2–4, the hilum short oblong ---------- 4. *D. paniculata*

1. **Dioclea aurea** R. H. Maxwell[49]. TYPE: Colombia, *Sneidern 5555* (S, holotype).

Vines, coarse, twining, climbing; stems terete, with hirsute, fulvous ferruginous pubescence. *Leaves* with leaflets coriaceous, the lamina broadly ovate, the terminal leaflet to ca. 17 cm long, 14 cm wide, the laterals to ca. 14 cm long, 11 cm wide, inequilateral, the upper surface rugose, glabrous except the midrib, the lower surface with dense, fulvous ferruginous or aureus erect trichomes of various lengths, the apices abruptly acute, the apex ca. 7 mm long, the bases rounded to cordate, the primary lateral veins in 11–14 pairs; petioles to 11 cm long, the rachis to 5 cm long, both fulvous hirsute; stipules to 15 mm long distally, probably 10 mm long below insertion (broken), striate, villous outside, sparsely pilose inside; stipels filiform, 5–10 mm long, pubescent. *Inflorescences* axillary, ca. 20 cm long, ferruginous tomentose, flowering ⅔ of length; tubercles short clavate with globose heads; bracts lanceolate, ca. 6 mm long, hirsute ferruginous outside and inside, caducous; bracteoles oval, ca. 4 × 4 mm, ferruginous pubescent outside, glabrous inside, persistent, with similar bractlets; pedicels ca. 5 mm long. *Flowers* with buds upcurved slightly at the calyx lobes, flowers ca. 1.8 cm long, calyx tube ca. 8 mm long with dense ferruginous pubescence, fulvous velutinous inside and extending up the lobes, the upper lobe blunt, emarginate, ca. 5 mm long, 10 mm wide, the lateral lobe lanceolate falcate, ca. 7 mm long, 4 mm wide, the lower lobe lanceolate, ca. 8 mm long, 3 mm wide; standard obovate, ca. 15 mm long, 9 mm wide with a claw ca. 4 mm long, the wings narrowly obovate, ca. 18 mm long, 9 mm wide with a claw ca. 6 mm long, the keels semiorbicular, ca. 10 mm long with a claw ca. 4 mm long, the upper margin basally auriculate with a supramedian lobe, the lower margin rising distally ca. 9 mm, culminating in a hooded beak; stamens 10, the base of the vexillary filament free ca. 3 mm, sparsely pubescent, the vexillary and alternate anthers of the staminal sheath imperfect, less than 0.5 mm long, perfect anthers ca. 1 mm long; pistil straight, ca. 11 mm, geniculate, rising distally ca. 9 mm, the ovary ca. 7 mm long, subsessile, fulvous

[49] *Dioclea aurea* Maxwell, spec. nov. Frutex scandens, magnus, grossus, caulibus hirsutis, ferrugineis. Folia stipulis productis, foliolis coriaceis, pagina supra rugosa, infra dense pubescente, pilis erectis fulvi-ferrugineis, venis latualibus primarius paribus 12–14 disposites. Legumina carnosa, turgida, seminibus paucis, mollis.

canescent, the hairs to 2 mm long, 3–4-ovulate, the style frequently ?twisted, the lower style not swollen, with long, strigose hairs, the upper style glabrous, ca. 5 mm, the stigma capitate, terminal. *Fruits* turgid, fleshy, oblong, to ca. 9 cm long, 4.6 cm wide, 4.5 cm thick, probably indehiscent, the exocarp yellow brown with erect ferruginous hairs, the sutures indistinct; seeds 1 to few, soft, overgrown, probably similar to *D. pulchra,* with the hilum nearly ½ encircling.

Dioclea aurea resembles *D. pulchra* in the hooded beak of the keel petals, the relatively small bracts and stipules, and the fruits and seeds. The primary differences are in the leaflets and indumentum, with *D. aurea* possessing coriaceous and rugose leaflets and a coarser, more dense indumentum.

The new species is closely related to other Colombian collections which exhibit a kind of indeterminate growth in the inflorescences, bracts and even calyx lobes. This plasticity characterizes *Dioclea* as a whole.

The fruit description is based on the Panama collection and the floral description on the Colombian collections cited.

PANAMA. DARIÉN: Cloud Forest, Casí-Caná trail on Cerro Campamiento, E of Tres Bocas, headwaters of Río Cuasi, *Kirkbride (& ?Duke) 1257,* (MO). COLOMBIA. CALDAS: Pueblo Rico, La Selva, 1500 m, *Sneidern 5427, 5555* (both S).

2. **Dioclea guianensis** Benth., Comm. Legum. Gen. 70. 1837. (Ann. Wiener Mus. Naturgesch. 2: 134. 1839.) TYPE: Guyana Parima Mts., *Schomburgk 83* (K, holotype; G, F, US, W, isotypes).—FIG. 22.

D. panamensis Duchass. & Walpers ex Walpers, Flora 36: 229. 1853. TYPE: Panama, *Duchassaing* (GOET), non Seemann (1880).

D. comosa (Meyer) Kuntze var. *panamensis* (Walpers) Kuntze, Rev. Gen. Pl. 1: 179. 1891. TYPE: Panama, *Kuntze 691* (NY).

Vines of open areas and forest edges; stems with fuscous pubescence. *Leaves* with leaflets lanceolate, rhomboid to oblong, 7–10 × 4–6 cm, the apex acute, pubescent or glabrous above, usually pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 6 pairs; petioles 4–6 cm long, with the rachis 1–7 mm long, densely puberulent, the stipels to 2 mm long; stipules triangulate, ca. 3 mm long, not produced. *Inflorescences* slender, to ca. 60 cm long, flowering ca. ½ the length, the tubercles sessile or short clavate with globose heads, indumentum canescent fuscous; bracts narrowly ovate to triangular, ca. 3 × 2 mm, usually persistent; bracteoles ovate, ca. 3 × 2 mm, mostly persistent; pedicels 2–5 mm long. *Flowers* 1.5–2.0 cm long, the calyx tube 6–10 mm long, membranous, sparsely sub-strigose without, canescent velutinous or subtomentose within, the upper calyx teeth fused, entire, the upper lobe obtuse, to ca. 9 mm long, the lateral lobes acute to lanceolate, to ca. 8 mm long, the lower lobe linear lanceolate to lanceolate, to ca. 9 mm long; standard orbicular or obovate, membranous, puberulent apically, bicallose or ecallose, 10–20 mm long, weakly biauriculate with a claw 2–7 mm long, the wings obliquely obovate, 10–22 mm long, usually spurred, the claw 3–6 mm long, the keel obliquely oblong, 10–18 mm long, 4–9 mm wide distally, weakly auriculate, the claw ca. 4 mm long, the upper margin variously serrate medially, not rostrate; staminal sheath and pistil subsigmoidal, the anthers perfect, monomorphic; ovary 8–12 mm long, ca.

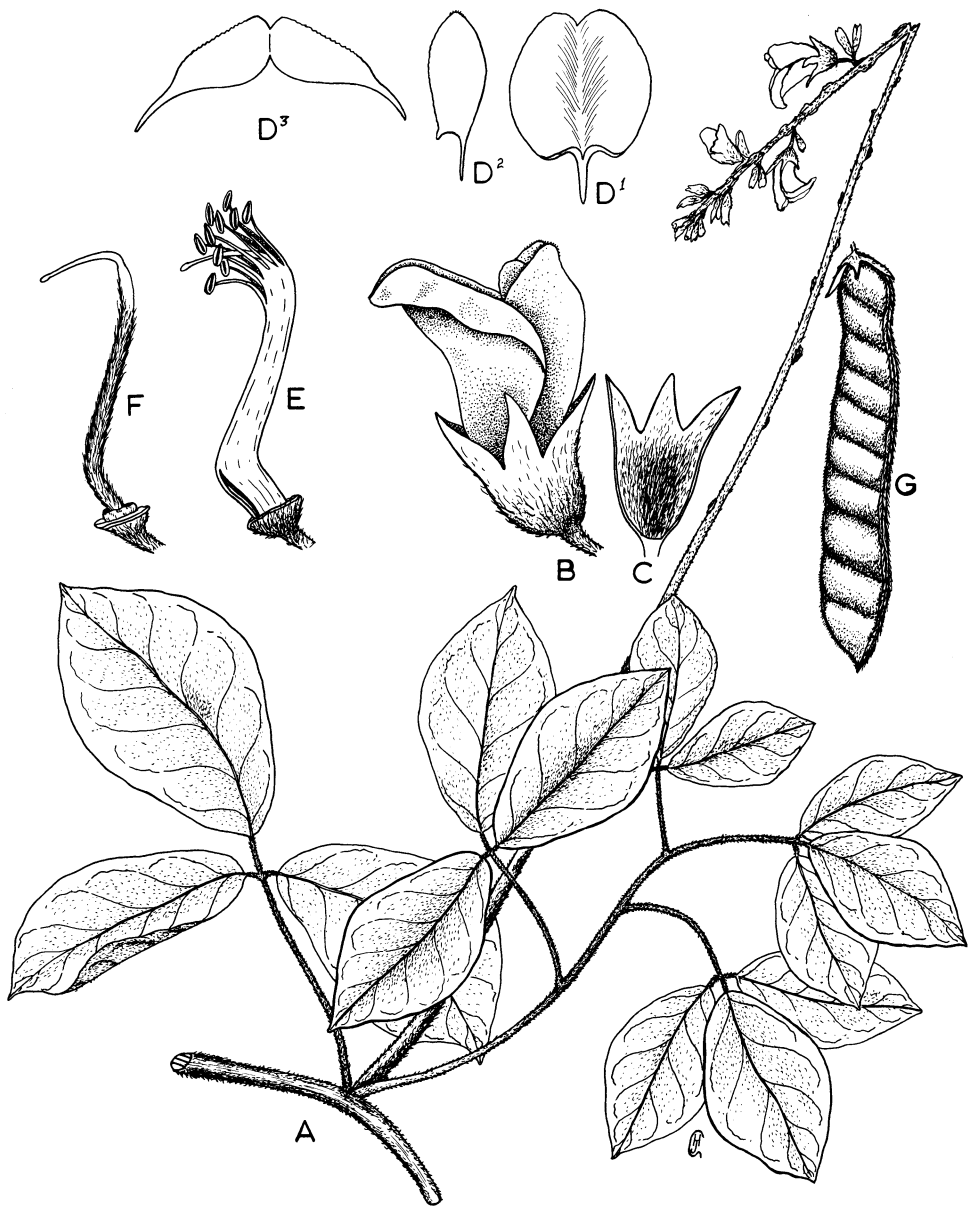

FIGURE 22. *Dioclea guianensis* Benth.—A. Habit (×¼). [After *Allen 4149.*]—B. Flower (×¾).—C. Calyx (×¾).—D. Corolla.—D¹. Standard (×½).—D². Wing petal (×½).—D³. Keel petals (×½).—E. Stamens (×1).—F. Pistil (×1). [After *Greenman 5133.*]—G. Fruit (×¼). [After *Allen 1.*]

1.3 mm wide, short stipitate, canescent or sub-velutinous, 8–13-ovulate, the style glabrous, ca. 6 mm long. *Fruits* compressed, oblong, ca. 10 × 1.0–1.4 × 0.4 cm, the upper suture paralleled by thin wings or slightly thicker ribs, the lower swollen; seeds 5–11, flat, elliptic oblong, 7–12 × 4–6 × 2 mm, hard, reddish brown, frequently maculate, the hilum encircling nearly ½ the testa.

Dioclea guianensis is distributed through Central America into Mexico, northern and northwestern South America, as well as Trinidad.

The type of *Dioclea guianensis* has small flowers. Panamanian specimens show a size ranging from over 1.5 cm to slightly over 2 cm in length. As the flower size increases the orbicular standard shape becomes oblong or obovate and the wings tend to assume shapes oblanceolate rather than obliquely oblong, but the spur or the protuberance opposite the auricle tends to remain. Panamanian material also shows a pubescence on the undersurface of the leaflets that is sparse and erect rather than the denser appressed to dense sericeous pubescence of some Guyanan specimens. There are variants in Belize with flowers approaching 3 cm long that I have not seen in Panama.

Pittier in 1944 and afterwards attempted to segregate several species from the *D. guianensis* complex, but he did not supply Latin diagnoses for the names, leaving them not validly published. After an extensive study of the specimens he examined, I conclude that to recognize these taxa is untenable taxonomically and would serve no useful purpose. Our primary area of disagreement is in the weight placed on flower size and indumentum. I place little weight on these characters because of the tremendous variance present. All the *D. guianensis* specimens I have seen from Panama can be grouped under var. *guianensis* sensu lato.

Dioclea guianensis can be separated from *D. virgata* by its ovate bracteoles, pubescent calyx, serrate upper keel margin, and smaller, narrower fruits. *Dioclea guianensis* is distinguished from *D. paniculata* in its more open habitat, habit, larger flower size, serrate upper keel margin, papyraceous leaflets, somewhat oblong seed shape, and linear hilum.

WITHOUT EXACT LOCALITY: *Duchassaing* (GOET, P); *Kuntze 691* (NY); *Seemann* (BM); *Seemann 461* (GOET-mounted sheet, mixture in envelope). BOCAS DEL TORO: Río Changuinola, *Dwyer 4078, 5752* (both MO). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 4841, 7147* (both MO); *Shattuck 134* (MO); *Wetmore & Abbe 61* (F); *Wilson 123* (MO); *Woodworth & Vestal 691* (LE, MO), *726* (A, MO). Pedro Miguel, *Allen 1* (BR, G, F, MO, U). Between Miraflores & Panama, *Blum 2069* (FSU, MO). Cerro Ancón, *Celestine 74* (US). Dirt road to Chiva-Chiva town, *Correa 493* (FSU, MO). Gaillard Highway NW of Summit Gardens, *Croat 8883* (MO). 2.5 mi N of Summit Gardens, *Croat 12833* (F, MO). Gaillard Highway near Gamboa, *Croat 13139* (MO). 1–2 mi NW of Summit Gardens, *Croat 13917, 14045* (both MO). K-10, *Duke 15194* (MO). Fort Sherman, beach, *Dwyer 6585* (SIU). C-21 Road, *Dwyer 8382* (MO, SIU). Ancón Hill, *Greenman & Greenman 5133* (MO). ½ mi W of Summit Gardens, *Hansen 3008* (MO). Summit, *Hayes* 9 Feb. 1862 (BM). Empire Station, *Hayes 562* (BM, M). Hill W of Curundú, *Harvey 5233* (F). Gamboa, *Heriberto 86* (US). Without other locality, *Hicken 1907* (SI). Military Road near Summit Gardens, *Hladik 133* (MO). Las Cruces trail, *Hunter & Allen 766* (G, MO). Without exact location, *Johansen* Jul. 1924 (US). Gamboa Road, *Jones 307* (US). ½ mi N of Gamboa, *Lazor & Tyson 5659* (MO). 2 mi N on Panamerican Highway towards Nuevo Emperador, *Lewis et al. 5222* (MO). Chiva-Chiva Trail 2 mi above Red Tank, *Maxon & Harvey 6592* (US). 1½ mi N of Summit Gardens, *Nee 9515* (MO). Between Rodman Marine Base & Chorrera, *Nowicke et al. 3578* (MO). Chiva-Chiva Trail Red Tank to Pueblo Nuevo, *Piper 5174* (F, NY, US). Empire to Mandinga, *Piper 5175* (US). Culebra, *Pittier 2148* (US). Between Corozal & Ancón, *Pittier 2176* (NY, US). Summit, *Standley 26908* (US). Old Las Cruces Trail between Ft. Clayton & Corozal, *Standley 29107* (US). Balboa, *Standley 29296* (US). Río Pedro Miguel near East Paraíso, *Standley 30020* (US). Summit, *Standley 30097* (A, US). Road K-9 near Río Cocolí, *Stern et al. 31* (MO). Quebrada Bonita, *Steyermark & Allen* 27 Dec 1934 (MO). 5 mi N of Cocolí, *Tyson 3878* (MO). Miraflores Lake, *White 192* (MO, US). Ancón Hill, *R. S. Williams 25* (MO, US). BOCAS DEL TORO: Río Changuinola, *Dwyer 4078, 5752* (both MO). CHIRIQUÍ: Near Remedios, *Burt & Koster 166* (MO). 12.4 mi N of David, *Lewis et al. 697* (MO, NY, UC, US). Boca Chica, *Pittier 5121* (US). COCLÉ: Antón-Penonomé roadside, *Burt & Rattray 48* (MO). 3 mi NE of Antón, *D'Arcy 4109* (MO). Penonomé, *Dwyer 2030* (SIU). 2 mi E of Río Hondo, along Panamerican Highway, *Gentry 2913* (MO). 7.5 mi from Penonomé towards Caimito, *McDaniel & Cook 14816* (MO). Penomoné, *R. S. Williams 365* (NY, US). COLÓN: Río Chagres, above Gamboa, *Allen 4149* (G, MO). Calzada Larga, *de Gracia*

11 (MO). PANAMÁ: Campana, *Allen 4033* (G, MO). Cerro Azul, *Cotterman & Klawe P-15* (MO, US). Isla del Rey, *Duke 9563* (MO). Between Río Sulugandí & Río Espavé, *Gentry 4983* (MO). Lídice near the river, *Jaramillo 14* (FSU). Savanas of Río Yguana, *J. F. Macbride 2630* (F, US). Panamerican Highway at Continental Divide, *Nee 8289* (MO, US). Sabanas N of Panama City, *Paul 600* (US). La Chorrera, *Paz 20* (MO). Bella Vista, *Piper 5176* (US). Sabana de Juan Corso near Chepo, *Pittier 4741* (BM, NY, US). Cerro Campana, *Porter et al. 4298* (MO). Between Río Pacora & Chepo, *Porter et al. 5159* (MO). Punta Paitilla, *Standley 26228* (US). Juan Franco Race Track, *Standley 27767* (US). Río Tapia, *Standley 28182* (US). Matías Hernández, *Standley 28912* (US). Tumba Muerto Road, *Standley 29786* (US). Juan Díaz, *Standley 30551* (US). Between Matías Hernández & Juan Díaz, *Standley 32010* (US). Road to Monte Oscuro, *Varela 26* (MO).

3. **Dioclea megacarpa** Rolfe, Kew Bull. 139. 1901. TYPE: Trinidad & Tobago, Trinidad, St. Annes, ?Cangrehol, *Hart 6406* (K, lectotype; photos C, F, NY, S, SI of type at K).

D. reflexa, sensu Fawcett & Rendle, Fl. Jamaica 4(2): 59, *tab. 18.* 1920. non Hook. f. See Amshoff loc. cit.

Vines, coarse, high climbing; stems pilose. *Leaves* with the lamina broadly elliptic to obovate orbicular, to ca. 20 cm long, 12 cm wide, the apex with an abrupt acumination, ca. 3 mm long, usually pubescent above, often rough with persistent hair bases, sparsely velutinous below, chartaceous, slightly cordate at the base, the lateral veins oblique, the primary lateral veins in 7–10 pairs; petioles sparsely pilose, the rachis to ca. 5 cm long, stipels 4–7 mm long; stipules lanceolate, to 35 mm long, including region below insertion, densely pilose outside. *Inflorescences* stout to ca. 70 cm long, flowering on ½ the length, the tubercles sessile, the indument ferruginous; bracts linear lanceolate, ca. 20 mm long, finally caducous, spreading or somewhat reflexed, pilose; bracteoles flabellate to orbicular, 2–4 × 2–4 mm, ferruginous without, persistent; pedicels ca. 7 mm long. *Flowers* with the buds somewhat incurved, the flowers ca. 2.5 cm long, occasionally to ca. 3 cm long; calyx tube 12–15 mm long, carnose, ferruginous pubescent without, velutinous within, the upper calyx lobes partially fused, emarginate, ca. 7 mm long, 10 mm wide, the lateral lobes acute, ca. 7 mm long, the lower lobe lanceolate, ca. 10 mm long; lamina of the standard obovate orbicular, carnose, glabrous, bicallose, to ca. 25 mm long, the auricles semi-orbicular, reflexed, the claw ca. 5 mm long, the wings broadly obliquely oblong, to ca. 25 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 8 mm long, ca. 9 mm wide distally, auriculate, the claw ca. 5 mm long, the upper margin slightly undulate, culminating in a truncate beak; stamens 10, the vexillary anther and the inner alternate anthers of the staminal sheath imperfect, the perfect anthers ca. 0.5 mm long; ovary short stipitate, villous, 2–4(–5)-ovulate, the upper style glabrous, ca. 5 mm long, the lower part bulbous. *Fruits* oblong, frequently somewhat arcuate, ca. 18 × 6 × 3 cm, partially dehiscent, the fuscous pubescence usually persistent, the upper suture indehiscent, paralleled by the thick ribs, the lower margin truncate, frequently constricted between the seeds, the suture becoming sulcate, the exocarp with oblique fissures; seeds (1–)3–4(–5), sub-orbicular, ca. 3 × 3 × 2 cm, hard, reddish, the hilum encircling nearly ⅔ the testa.

Rolfe's syntypes included collections from Paraguay. These syntypes were removed by Hassler and others were added to form the basis of *Dioclea paraguariensis* Hassl., Fedde, Rep. Spec. Nov. 16: 228. 1919. Burkart (1952) placed

D. paraguariensis in synonymy under the name *D. megacarpa* Rolfe, but after reexamining the 2 taxa, he restored *D. paraguariensis* to species rank as separate from the more northern *D. megacarpa*. See Burkart (1970), in Darwiniana 16(1–2): 182–186, Figs. 4, 5, for his explanation and excellent illustrations of *D. paraguariensis*. I am not as sure that *D. paraguariensis* and *D. megacarpa* are distinct taxonomically although I have not found where their distribution overlaps. I have also found that *D. violacea* Mart. ex Benth. (1839) with *Pohl 338* (W) as lectotype is an earlier name for *D. paraguariensis* Hassl. (Note synonymy under *D. wilsonii* below). It seems best to maintain *D. megacarpa* as a good species.

The long spreading bracts, large flowers, fruits, fruit sutures, exocarp, and large reddish seeds, frequently with a papery, persistent piece of rim aril, are characters which distinguish this taxon. (Useful reference: Janzen, D. H. 1971. Escape of Juvenile *Dioclea megacarpa* (Leguminosae) Vines From Predators in a Deciduous Tropical Forest. Am. Natur. 105: 97–112.) Duke reports the native name "Ojo de Buey."

CANAL ZONE: Gov. Reservation, Ancón, *Bangham 608* (A). COCLÉ: Llano Bonito, N of Margaritas, *Seibert 540* (A, MO, NY). DARIÉN: Chepigana, *Duke & Bristan 268* (MO, NY, US). PANAMÁ: Common along the beach, *Dwyer 1685* (MO). San José Island, *Erlanson 408* (G, NY, US); *Harlow 3* (US); *Johnston 53* (US), *360* (GH), *568* (US). Punta Paitilla, *Standley 30814* (US). SAN BLAS: Isla Pino near Mulatupo Island, *Elias 1707* (MO, SIU, US), *1715* (MO).

4. **Dioclea paniculata** Killip ex R. H. Maxwell, Phytologia 40: 243. 1978. TYPE: Colombia, Cundinamarca, Quebrada Cabana, Hacienda El Cucharo between Tocaima and Pubenza; 380–600 m, *Killip et al. 38329* (US, holotype; COL, US, isotypes).

Twining *vines,* high climbing; stems terete, sparsely pubescent. *Leaves* with the lamina widely lanceolate, elliptic, ovate, occasionally obovate, 6.5–14 cm long, 2.5–8 cm wide, the lateral leaflets smaller, inequilateral, the apices acute, obtuse or abruptly acuminate with the extension 10–15 mm long, the bases rounded, occasionally slightly cordate, the upper surface shining or dull, glabrous, sparse pubescent below or with a few hairs on the primary veins, with ca. 6 pairs of primary lateral veins; rachis 7–18 mm long, $^1/_5$–$^1/_2$ the petiolar length, with dense ferruginous pubescence when young, quickly glabrous; stipels setaceous, ca. 1 mm long, usually persistent; stipules linear or lanceolate, sometimes deeply bifurcate or trifurcate, the lobes linear, the middle longest, 1.5–4.0 mm long, not produced, frequently with secondary bracts surrounding the emerging inflorescence and leaf cluster. *Inflorescences* terminal or axillary, emerging with the leaves, single, double, occasionally branched, 3–18 cm long; each tubercle with 3–8 flower buds, the tubercles clavate with the heads usually elongate upwards and swollen; primary bract at the base of the tubercle linear lanceolate, ca. 2 mm long, glabrous, caducous; bracteoles ovate to orbicular, ca. 1.8 mm long, semipersistent; flowers subsessile. *Flowers* blue violet to deep purple, 10–12 mm long; calyx tube ca. 3 mm long, ferruginous pubescent, the upper lobes entire or emarginate, the lobes subequal, 1.5–2 mm long; standard with the lamina obovate, weakly auriculate or not callose, striate, ca. 8 mm long, 6.5 mm wide, glabrous, the claw ca. 2 mm long, the wings oblanceolate or somewhat oblong, auriculate,

striate, ca. 6 mm long, 2.5 mm wide, glabrous, the claw ca. 2.5 mm long, the keel petals somewhat oblong to obliquely oblong, ca. 6.5 mm long, 2 mm wide, glabrous, the claw ca. 2.5 mm long, the upper margin entire, not rostrate; vexillary filament often weakly fused to the staminal sheath, the anthers perfect, monomorphic; ovary ca. 6 mm long, short stipitate, densely villous with rigid, white hairs interspersed with dark brown hairs, ca. 5-ovulate, the style upcurved or ascending, glabrous for ca. 2 mm, shortly exserted through the keel petals. *Fruits* elliptic, flat, dehiscent, sessile, 5.5–8.5 cm long, 2.1–2.4 cm wide, 2.5–5 mm thick, exocarp of young fruits with dark brown pubescence, finally glabrous, the upper suture slightly raised with shallow parallel ribs ca. 1 mm to either side, the lower margin somewhat swollen; seeds 2–4, flat, oval, brownish, smooth, shining, ca. 13 mm long, 10 mm wide, 3 mm thick, surrounded by papery, red, packing tissue, the hilum oblong, 2.5–3.0 mm long.

This species is fairly common in Colombia. The Panama collections are not good specimens and most of the species description is from Colombian material.

CANAL ZONE: 4 km W of Gatun Dam, 190–200 m, *Nee 8911* (MO, PMA). COLÓN: 15 km E of Colón, Santa Rita lumber road, *Dressler 3797* (MO).

5. **Dioclea pulchra** Moldenke, Phytologia 1(1): 6. 1933. TYPE: Colombia, Boyaca, El Umbo & Mt. Chapon region, *Lawrance 528* (A, F, G, MO, NY, S, U, UC, US).

Vines, high climbing lianas; stems pilose. *Leaves* with leaflets broadly elliptic to obovate, to 18 × 11 cm, the apex acuminate, ca. 15 mm long, sparsely appressed strigose above and beneath, chartaceous, slightly cordate truncate to rounded at the base, the lateral veins oblique, primary lateral veins 10–12 pairs; petioles canaliculate, strigose-pilose, the rachis to ca. 5 cm long, stipels ca. 7 mm long; stipules lanceolate, to 14 mm long, produced for ca. 6 mm below insertion, pubescent without. *Inflorescences* stout, 15–40 cm long, flowering ⅔ the length, the tubercles subsessile to clavate; bracts linear, usually emerging from the tubercles, occasionally persistent, erect, ca. 6 mm long, fuscous ferruginous pubescent; bracteoles broadly ovate or flabellate, 2 × 2–3 mm, fuscous ferruginous without, persistent; pedicels ca. 9 mm long. *Flowers* ca. 2 cm long; calyx tube yellowish, 7–10 mm long, carnose with sparse fuscous ferruginous pubescence without, velutinous within, the upper lobes partially fused, emarginate ca. 5 mm long, 8 mm wide, the lateral lobes slightly falcate, lanceolate, ca. 6 mm long, the lower lobe broadly lanceolate, ca. 9 mm long; standard broadly obovate rotund, carnose, glabrous, bicallose, to ca. 16 × 17 mm, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong ovate, ca. 16 mm long, ca. 8 mm wide, the claw ca. 5 mm long, the keels triangulate, ca. 8 mm long, ca. 11 mm wide distally, the auricle inconspicuous, the claw ca. 4 mm long, the upper margin usually with 1 prominent lobe, the beak narrow or hooded; staminal sheath sub-sigmatoidal, the anthers dimorphic, perfect anthers ca. 1 mm long, the middle anther frequently 1.5 mm long; ovary short stipitate, densely argenteous fuscous villous, (2–)5(–6)-ovulate, the upper style glabrous, ca. 5 mm long. *Fruits* green, fleshy, cylindrical oblong, ca. 15 × 5 × 4 cm, ?indehiscent, fuscous or ferruginous velutinous, the upper and lower suture inconspicuous;

seeds 2–4, cuboidal, 3.5 × 3.5 × 2.5 cm, soft, light brown, maculate, the hilum encircling nearly ½ the testa.

This species and the next are members of the *Dioclea* series with fleshy fruits. This species in Panama is considered conspecific with *D. pulchra* of the Colombian Andes flora rather than *D. malacocarpa* Ducke of the Amazonian flora. These two species are so close I had, at one time, considered *D. pulchra* a variety, but since then it has become apparent there are several fleshy fruited species that have evolved down the Andean chain as well as extending into Central America.

A common name "Mandeva" is reported from Darién (*Kirkbride & Duke 1140*). The fleshy fruits with soft seeds, small bracts, thin leaflets with a high number of primary lateral veins, and keel petals frequently with hooded beaks separate this and the following species from other high, climbing, forest lianas in *Dioclea*.

WITHOUT LOCALITY: *Carleton 259* (US). BOCAS DEL TORO: Changuinola Valley, *Dunlap 101* (F). Río Changuinola, *Dwyer* (MO). Almirante, *McDaniel 5110* (MO). Changuinola, island potrero, *Stork*, 1923 (UC); *Stork C78* (UC, US). Water Valley, *Wedel 786* (MO). Chiriquí Lagoon, *Wedel 2670* (GH, MO, US). DARIÉN: La Boca de Pirre, *Bristan 1274* (NY). Río Tuira, between Río Punusa & Río Mangle, *Duke 14590* (MO, NY). El Real, Río Cuasí S of Tres Bocas, *Kirkbride & Duke 1140* (MO). El Real, Río Tuira, *Stern et al. 121* (MO, US).

6. **Dioclea reflexa** Hook. f., Niger Fl. 306. 1849. TYPE: W. Africa, Cape Palmas and region of Fernando Poo, *Vogel 32* (K, holotype).

Canavalia reflexa (Hook. f.) Wright, Sauv. Cub. 535. 1869. Fide Sauer, Brittonia 16(2): 179. 1964.
Dioclea panamensis Seemann in Hemsley, Biol. Centr. Amer. Bot. 1: 302. 1880, nomen nudum. Based on *Fendler 83* (GH, K, MO, US) & *Seemann 455* (BM), non Duchass. & Walpers (1853).

Coarse *vines*; stems glabrate to fuscous pilose. *Leaves* with leaflets broadly elliptic to obovate, 5–23 cm long, 3–13 cm wide, the apex acute or shortly acuminate, usually glabrous except the primary veins, reticulate above, sparsely pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 8 pairs; petioles pilose, the rachis 2–3 cm long, the stipels filamentous, 3–14 mm long; stipules lanceolate, to ca. 22 mm long, produced to ca. 10 mm below insertion, pilose without. *Inflorescences* stout, to ca. 45 cm long, flowering ½ the length, the tubercles clavate, the head elongation variable, the indumentum usually fuscous ferruginous, occasionally the buds nigrescent; bracts lanceolate, 10–20 mm long, ca. 3 mm wide, occasionally persistent, reflexed, with appressed aureus-cinereous pubescence; bracteoles flabellate, 2–3 × 2–4 mm, fuscous puberulent without, persistent; pedicels 3–6 mm long. *Flowers* with straight buds, ca. 1.5–2.0 cm long; calyx tube ca. 7 mm long, carnose, fuscous ferruginous pubescent without, fuscous velutinous within, the upper calyx lobes partially fused, emarginate, 2–5 mm long, ca. 7 mm wide, the laterals acute, ca. 5 mm long, the lower acute, ca. 6 mm long; standard rotund orbicular to obovate, carnose, glabrous, bicallose, ca. 15 mm long, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong to obovate, ca. 10 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 9 mm long, ca. 10 mm wide distally, weakly auriculate, the claw ca. 5 mm long, the upper margin undulate or with 1 prominent lobe, culminating in an obtuse beak; stamens 10,

the vexillary and inner, alternate anthers of the staminal sheath imperfect, the perfect anthers ca. 1 mm long; ovary shortly stipitate, argenteous villous, 2–4 (–5)-ovulate, the upper style glabrous, ca. 6 mm long, the lower part bulbous. *Fruits* compressed, elliptic oblong, to ca. 17 × 5.5 × 2.4 cm, dehiscent, the pedicel attached medially, somewhat convex above, naviculate below, glabrate, the upper suture paralleled by thin wings, the lower margin swollen, sulcate; seeds (1–)2–4, semi-orbicular to oblong, ca. 30 × 25 × 14 mm, hard, dark brown, frequently maculate, the hilum encircling ca. ¾ the testa.

Dioclea reflexa is distributed pantropically. This is due to a flotation adaptation of the seeds which are occasionally found in the drift. These seeds however, cannot be distinguished from those of *D. wilsonii* and possibly other species, such as *D. javanica* Benth. of Asia.

Dioclea reflexa is difficult to distinguish from *D. wilsonii* and there may be some gene exchange. In general *D. reflexa* would be found at low altitudes, but not in the drift flora. Its indumentum ranges from light fulvous to ferruginous, but never as dark as *D. wilsonii*. The reflexed bract attitude, upon which the epithet is based, is a conservative character, but the width and indumentum are variable. The tendency for bracts and bracteoles to persist is also variable. The lower margin of *D. reflexa* fruits becomes sulcate and partially opens, but not enough to allow the seeds to disperse. This character can be seen in most Panamanian material, but may not hold world wide. The finally glabrous exocarp of *D. reflexa* is smooth, somewhat thicker than that of *D. wilsonii* and is frequently constricted somewhat between the seeds and also along the lower margin. The pedicel attachment of *D. wilsonii* is invariably at the upper margin, which is straight, while that of *D. reflexa* is variable, and fruits with a median attachment may be obovate in shape.

For flower color, seasonal aspects and other field characters of *D. reflexa, D. wilsonii* (as *D. violacea*) and *D. megacarpa,* see Johnston (1949). Johnston, I. M. 1949. The Botany of San Jose Island. Sargentia 8: 150–153, Plate 8, Fig. 4–5. Ducke, A. 1925. Arch. Jard. Bot. Rio de Janeiro 4: 97, *tab. 4, D. violacea* fide Ducke = *D. wilsonii*.

WITHOUT LOCALITY: *Seemann* (GOET). BOCAS DEL TORO: Chiriquí Lagoon, Johns Creek, *Wedel 2760* (GH, MO); CANAL ZONE: Barro Colorado Island: *Croat 5017* (MO, US), *5062, 7387, 8110, 8390, 12762, 13118, 14884* (all MO); *Wetmore & Abbe 64* (MO). Skunk Hollow, *Blum & Dwyer 2109* (MO). Westerly arm of Quebrada Salamanca, *Dodge et al. 16995* (BR, G, GH, MO, S). Skunk Hollow, *Dwyer 5435* (FSU, MO, SIU). Fort Sherman, *Dwyer 6621* (MO). France Field, U.S. Mine Emplacement Center, *Dwyer 8539* (MO). Chagres, *Fendler 83* (GH, MO, US). Near Gatún, *Gaillard* 1911 (US). Río Pequení, *Seemann 455* (BM). CHIRIQUÍ: Burica Peninsula, Guanabano, *Croat 22526* (MO). COLÓN: near Salamanca, *Gentry 6702* (MO). Between Río Piedras & Puerto Pilón, *Lewis et al. 3221* (MO). DARIÉN: Río Chunaque between Yaviza & junction with the Tuira, *Gentry 13484* (MO). PANAMÁ: San José Island, *Johnston 615, 653, 711* (all GH), *1207* (GH, S), *1254* (GH); *Kennedy 2275* (MO). Drowned forest of Quebrada Ancha, *Steyermark & Allen,* 21 Dec 1934 (MO). SAN BLAS: Ailigandí, *Dwyer 6832* (MO, SIU).

7. **Dioclea virgata** (L. C. Rich.) Amshoff, Meded. Bot. Mus. Herb. Rijks. Univ. Utrecht 52: 59. 1939.

Dolichos virgatus L. C. Rich., Act. Soc. Hist. Nat. Paris 1: 111. 1792. TYPE: French Guiana, not seen.

Mucuna virgata Desv., Ann. Sci. Nat. (Desvaux) 1: 423. 1826. TYPE: French Guiana, *L. C. Richard*(?) herb. *Desvaux* (P).

Dioclea lasiocarpa Mart. ex Benth., Comm. Legum. Gen. (Ann. Wiener Mus. Naturgesch. 2: 133. 1839) 69. 1837. TYPES: Brazil: Minas Gerais, *Pohl 3222* (W); Pará, *Martius* (BR, M); Bahia, *Martius 2016* (M).

Vines of open areas and forest edges; stems with canescent ferruginous pubescence. *Leaves* with leaflets broadly lanceolate, ovate to narrowly obovate, 7–10 × 4–6 cm, the apex acute, usually glabrescent above with variable pubescence below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 6 pairs; petioles 4–6 cm long, the rachis 4(–10) mm long, densely puberulent to strigose; stipels to 2 mm long; stipules triangulate, ca. 3 mm long, not produced. *Inflorescences* slender, to ca. 70 cm long, flowering about ½ the length, the tubercles subsessile to elongate, inflorescence indumentum canescent subtomentose to glabrescent; bracts triangulate rhombic, ca. 3 × 2 mm, persistent; bracteoles sub-orbicular, 6–10 × 4–6 mm, caducous; pedicels (5–)7(–15) mm long. *Flowers* ca. 2.5 cm long, the calyx tube ca. 8 mm long, membranous, glabrous without, canescent velutinous within, the upper calyx teeth fused, entire, the upper lobe acute obtuse, ca. 8 mm long, the lateral lobes falcate, broadly lanceolate, ca. 6 mm long, the lower lobe lanceolate, ca. 8 mm long; standard orbicular obovate, to ca. 25 mm long, membranous, puberulent apically, bicallose, biauriculate, the claw 7 mm long, the wings obliquely obovate, to 22 mm long, usually spurred, the claw 7 mm long, the keel obliquely oblong to nearly oblong, to ca. 20 mm long, ca. 10 mm wide distally, weakly auriculate, the claw ca. 5 mm long, the upper margin with 7–10 medial fimbriae, ca. 2 mm long; stamens 10, glabrous, anthers uniform; ovary ca. 11-ovulate, canescent velutinous, the style glabrous distally for ca. 7 mm. *Fruits* flat, oblong, usually obtuse basally, straight above, naviculate below, frequently with a falcate apex, to ca. 11.0 × 2.0 × 0.4 cm, dehiscent, with erect, stiff, ferruginous pubescence, the upper suture paralleled by thin wings, the lower swollen; seeds 7–12, flat, elliptic oblong, ca. 10 × 6 × 2 mm, hard, reddish brown, frequently maculate, the hilum encircling nearly ½ the testa.

This species is widespread throughout tropical South America and extends through Central America into Mexico.

The sub-orbicular, caducous bracteoles, glabrous calyx and fimbriate upper keel margin are characters which readily separate *D. virgata* from the closely related *D. guianensis* with its forms and varieties.

CANAL ZONE: Pipeline road, *Croat 12371* (MO); *Gentry & Dressler 1974* (MO). DARIÉN: Near Piñas, *Duke 10618* (MO). Río Aretí, *Duke & Nickerson 14907* (MO). PANAMÁ: El Llano-Cartí Road, 5 km from Panamerican Highway, *Witherspoon 8720* (MO).

8. **Dioclea wilsonii** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 310. 1929. TYPE: Honduras, Point Triunfo, near Tela, *P. Wilson 336* (F).

D. violacea sensu Mart. Fl. Bras. 15(1): 162. 1859 (based on collections such as *Guillemin* (K)); non *D. violacea* Mart. ex Benth. (1837), based on *Pohl 338* (W lectotype) and *Martius* (BR paratype).

D. altissima Rock, Leg. Pl. Hawaii 201, *tab. 83*. 1920, non Velloso, Fl. Flum. 296. 1825; Icon. 7: *tab. 77*. 1831.

D. violacea auct. mult., non Benth. 1837.

Coarse *vines*; stems glabrescent to densely ferruginous pilose. *Leaves* with leaflets broadly elliptic to obovate, 7–16 cm long, 4–11 cm wide, the apex abruptly acute, usually glabrous except the primary veins, reticulate above, sparsely pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 7 pairs; petioles sparsely strigose to pilose, the rachis 2–3 cm long, stipels to 15 mm long; stipules lanceolate, 15–30 mm long, produced to ca. 10 mm below insertion, pilose and ciliate without. *Inflorescences* to 45 cm long, flowering more than ½ the length, the tubercles clavate, the head elongation variable, the inflorescence indumentum ferruginous nigrescent; bracts linear, erect, ca. 8 mm long or longer, caducous; bracteoles broadly ovate to flabellate, 2–3 × 4 mm, caducous; pedicels 2–6 mm long. *Flowers* with straight buds, ca. 1.5 cm long, calyx tube ca. 7 mm long, carnose, ferruginous-nigrescent pubescent without and within, the upper calyx lobes partially fused, emarginate, ca. 5 mm long, ca. 9 mm wide, the laterals acute, ca. 6 mm long, the lower acute, ca. 7 mm long; standard rotund orbicular, carnose, glabrous, bicallose, to 15 mm long, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong to obovate, to ca. 15 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 8 mm long, ca. 9 mm wide distally, auriculate, the claw ca. 5 mm long, the upper margin undulate, culminating in an obtuse beak; stamens 10, the anthers dimorphic, the vexillary anther and the inner, alternate anthers of the staminal sheath imperfect, perfect anthers ca. 1 mm long; ovary stipitate, argenteous villous or bicolored, 3–4-ovulate, the upper style glabrous, ca. 5 mm long, the lower part bulbous. *Fruits* compressed, oblong, to ca. 10 × 6 × 1–2 cm, pedicel attached along the upper suture, straight above, naviculate below, indehiscent, glabrate, the upper suture paralleled by thin wings, the lower margin thin; seeds 2–4(–5), semi-orbicular to oblong, ca. 30 × 25 × 15 mm, hard, dark brown, the hilum encircling ca. ¾ of testa.

In trying to match fruits with flowers, Bentham mixed fruits of *Dioclea wilsonii* with flowers of *D. violacea* in his *D. violacea* description in *Flora Brasiliensis*. The taxonomy was confused apparently until Standley named *D. wilsonii*. At least this was the opinion of the late C. V. Morton of the U.S. National Herbarium when I discussed the nomenclatural problem with him. *Dioclea violacea,* on the basis of the syntypes Bentham used in his original description, is the same as *D. paraguariensis* Hassler and very closely related to *D. megacarpa*.

Dioclea violacea is about as closely related to *D. megacarpa* as *D. wilsonii* is to *D. reflexa,* but the latter are sympatric while the former are apparently not. *Dioclea wilsonii* is found in eastern Brazil, throughout northern South America, in some of the West Indies and throughout Central America into Mexico. It is also found in the Hawaiian Islands and some of the Pacific Islands and I have annotated collections from the Malagasy Republic (Madagascar) as *D. wilsonii* (as possible introductions?), but Madagascar plants may prove not to be the same species.

It is generally assumed that *D. wilsonii* seeds are distributed as part of the oceanic drift as are *D. reflexa* seeds from which they cannot be distinguished. Actually collections show *D. reflexa* to be more widely distributed and that much of the *D. wilsonii* distribution could be due to man rather than drift.

This species can be separated from the closely related *D. reflexa* in possessing a very dark inflorescence indumentum, erect bracts, and an indehiscent fruit.

BOCAS DEL TORO: Water Valley, *Wedel 861* (GH, MO, US). Chiriquí Lagoon, *Wedel 1054, 1155* (both GH, MO), *1688* (GH, MO, US), *2147, 2728* (both MO). CANAL ZONE: Barro Colorado Island, *Bangham 568* (A, F, US); *Croat 5279, 6726, 6862* (all MO); *Foster 980* (MO), *1334* (F, MO), *1425* (MO); *Shattuck 441* (F, US); *Standley 40992a* (US, fruit only). COLÓN: between France Field and Catival, *Standley 30390* (US). HERRERA: near Las Minas, along Río Las Trancas, *Stern et al. 1802* (MO, US). PANAMÁ: Empire Station, *Hayes 313* (BM, K). San José Island, *Johnston 418* (BM, GH, MO, P, U, US), *612* (GH), *1170* (BM, GH).

20. DIPHYSA

Peter S. White[50]

Diphysa Jacq., Enum. Syst. Pl. Carib. 7. 1760. TYPE: *D. carthagenensis* Jacq.

Trees or *shrubs,* unarmed or with spinescent branches; branchlets, pedicels, and/or calyx glandular viscid in some species. *Leaves* alternate, imparipinnate, petioled; lateral leaflets opposite, subopposite, or alternate, entire, short petioluled; stipels absent; stipules small, caducous. *Inflorescence* of short axillary racemes or fascicles; pedicels solitary at the nodes, jointed below the calyx, each 2-bracteolate. *Flowers* yellow; hypanthium campanulate, the 5 lobes unequal, the 2 uppermost lobes relatively broad, the 2 lateral lobes equal to these in length but narrower, the lowest lobe narrow, acute, longer than the others; petals yellow, unequal, the standard the longest, the keel petals the shortest, all petals short clawed; the standard reflexed with 2 basal callosites inside, the wing and the keel petals often auriculate; stamens diadelphous, the odd stamen free, the anthers uniform; ovary stipitate, the style glabrous, the stigma small, terminal, ovules many. *Fruit* distinctively inflated, stipitate, oblong, the pericarp splitting into 2 layers, a papery inflated exocarp and a firm endocarp, the legume thus with a bladder on each side; seeds oblong, compressed, attached near one end.

Diphysa is a genus of some 15–18 named species of which perhaps only ½ will prove to be distinct (Standley & Steyermark, 1946). The species are found from Mexico, where the number of species is greatest, south through Central America to northern South America. *Diphysa* is readily recognized by its papery, reticulately veined, inflated exocarp, which gives the fruit a bladdery appearance.

1. **Diphysa robinioides** Benth. in Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 11. 1854. TYPE: Nicaragua, not seen.—FIG. 23.

D. carthagenensis sensu Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 13. 1854. not *D. carthagenensis* Jacq., Enum. Syst. Pl. Carib. 28. 1760; Sel. Stirp. Amer. 208. *tab. 181. fig. 51.* 1763.

Medium-sized *tree,* usually 5–9(–23) m tall, branchlets usually glabrous or sparsely pubescent. *Leaves* alternate, imparipinnate, to 16 cm long; leaflets

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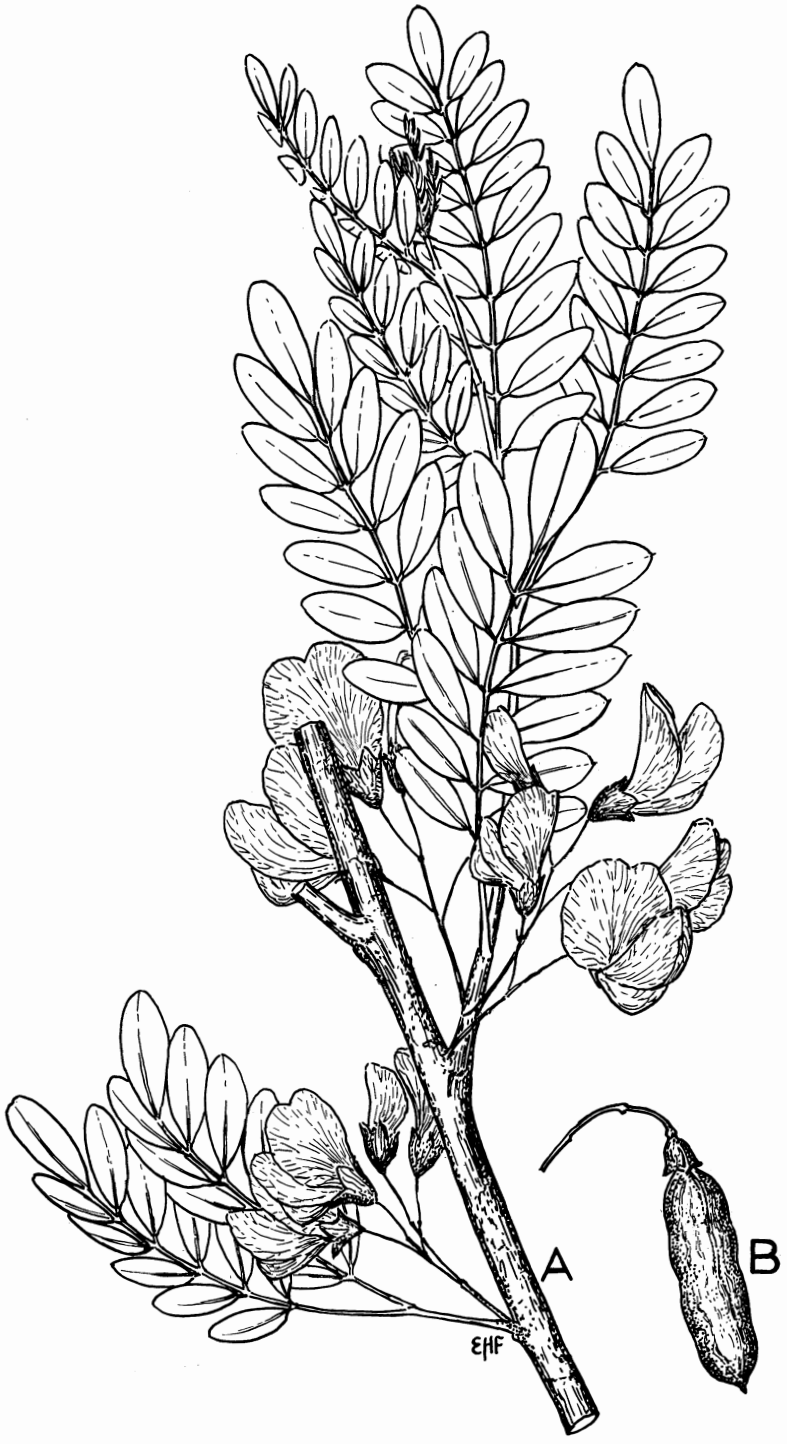

FIGURE 23. *Diphysa robinioides* Benth.—A. Habit (×1).—B. Fruit (×1).

(5–)9–15(–21), the lateral leaflets opposite or subopposite, oval or obovate, usually 1.5–3.5 cm long, 0.5–1.0 cm wide, unequal, even on the same specimen, distal leaflets often larger, rounded or retuse at the apex, glabrous and paler beneath, short-petioluled; petioles 1–3 cm long; stipules 2–4 mm long, caducous. *Inflorescence* of short axillary racemes, 4–7 cm long, 3–6-flowered, appearing with new growth at the end of dry season, pedicels 4–6 mm long. *Flowers* bright yellow, to 2 cm long; hypanthium funnel shaped, 6–9 mm long, glabrous, the upper teeth partly united, broader than others, the lateral and lowest tooth triangular, the lowest tooth slender; standard circular, to 20 mm long, the claw ca. 4 mm long, the wings free, obovate to oblong, auriculate, the keel with basal auricles prominent; stamens diadelphous; ovary with stipe ca. 4 mm long. *Fruit* a legume with exocarp on either side thin, inflated, conspicuously reticulate veined, (4–)6–11 cm long, 1.5–2.0 cm wide, glabrous; fruiting pedicels 1.5–2.0 cm long, stipe 5–8 mm long; seeds light brown, ca. 6 mm long, ca. 3 mm wide.

Diphysa robinioides is found from southern Mexico to Panama. It is apparently a common tree in parts of Panama, including the Canal Zone (Standley, 1928). Common names in Panama include "macano" and "cacique." It is used as a living fence post.

Jacquin (1763) was in error when he cited his plate CLXXX; no figure 51 appears in that plate, but does appear on the next page, plate CLXXXI and the species figured is *Diphysa carthagenensis*. Most references cite 180, but 181 appears to be correct.

Diphysa robinioides is somewhat variable in leaflet size (usually longer than 15 mm, rarely shorter), leaflet texture (usually thin, rarely thick), whether the leaflet apex is rounded or retuse, pubescence (usually none or sparse), and length of legume (usually 6–11 cm long). Collections of flowering specimens have young leaves only. These are, of course, smaller, thus somewhat confusing the situation. Young fruits which may look mature are shorter than fully mature fruits, also complicating the situation. *Diphysa robinioides* is apparently closely related to *D. carthagenensis* Jacq. The latter species is distinguished by its smaller leaflets (7–15 mm long), shorter corolla (ca. 10 mm long), and shorter legume (ca. 4 cm long). *Diphysa carthagenensis*, like *D. robinioides*, is usually glabrous. *Diphysa carthagenensis* has been found in Colombia, Venezuela, Guatemala, and Mexico, and is therefore to be looked for in Panama.

Diphysa floribunda Rose is also similar to *D. robinioides*. It has the large leaflets, corolla, and legume of that species but it is densely pubescent on branches and peduncles. The leaves are also pubescent, at least when young. *Diphysa floribunda* has been found in Mexico and Guatemala. It may represent a variety of *D. robinioides* (Standley & Steyermark, 1946). *Duke 9317* from Río Ailigandi, San Blas, has the short (4 cm) legumes of *D. carthagenensis* but is leafless. Further collections are necessary for satisfactory determination. *Lewis et al. 181*, also collected along the Río Ailigandi, is clearly *D. robinioides*.

WITHOUT LOCALITY: *Seemann 202* (US). CANAL ZONE: Pacific Saddle Club area, *Blum 2055* (FSU, GH, MO, SCZ). Pacora Road, *Correa & Dressler 444* (GH, MO). Gaillard Highway near Paraiso, *Croat 13174* (DUKE, F, MO, NY, SCZ). Near Paraiso, *Croat 13254* (DUKE, F, MO, SCZ). Cerro Galera, 350–400 m, *Gentry 6608* (MO). Summit, *Johansen s.n.* (NY). Gatuncillo, *Piper 5119* (US). Balboa, *Standley 27129* (GH, US). Paraiso, *Tyson 7401* (MO). CHIRIQUÍ: San Lorenzo, *Godfrey*

67334 (FSU, MO). San Félix, 0–120 m, *Pittier 5234* (NY, US). Comarca del Barú, *Stern & Chambers* 134 (US). 3 mi S of El Volcán, 4000 ft, *Tyson 886* (FSU, MO). COCLÉ: S rim of El Valle de Antón, 800 m, *Allen 2283* (F, GH, MO, NY, US). El Valle de Antón, *Folsom & Kauke 2766* (MO). 1 mi from El Valle, *Garner 32* (FSU, SCZ). Capellanía, *Gonzalez 4* (DUKE, MO). El Valle, *White & White 67* (MO, US). Penonomé, *Williams 122* (NY, US). DARIÉN: Jeniné, *Duke 3486* (MO). HERRERA: Chitré, 20 m, *Allen 1096* (GH, MO, US). Ocú, 100 m, *Allen 4074* (MO). Road from Ocú to Chupampa, *Graham 224* (GH). Ocú, *Stern et al. 1742* (MO, US). 4 mi S of Los Pozos, *Tyson 2694* (FSU). LOS SANTOS: 7 mi S of Las Tablas, *D'Arcy 4205* (MO). 1–2 mi W of Candelaria, *Duke 12432* (MO, NY). Las Tablas, *Dwyer 1146* (NY), *2494* (US). Road from Macaracas to Chitré Highway, *Tyson et al. 3149* (FSU, MO, SCZ). PANAMÁ: Pacora Road, *Correa & Dressler 444* (SCZ, US). Chepo, *Gentry & Tyson 1728* (F, FSU, MO, SCZ). Near Panama City, *Hunter* (GH, MO). Ancón Hill, *Hunter* (MO). Chepo, *Kluge 28* (US). Cerro Azul, 600 m, *Lao & Holdridge 39* (DUKE). Bellevista, *MacBride 2751* (F, US). Sabanas, *Paul 169* (US). Sabana de Juan Corso, *Pittier 4641* (US). Corozal Road, *Standley 26822* (US). Between Las Sabanas and Matías Hernández, *Standley 31826* (GH, US). W of Chepo, *Tyson 5371* (FSU, MO, SCZ). Cerro Azul above lake, *Tyson & Lazor 6087* (FSU). SAN BLAS: Lower Río Ailigandí, *Duke 9317* (MO). Ailigandí river bank, *Lewis et al. 181* (GH, MO, US). VERAGUAS: E of Santiago, 30 m, *Duke 12351* (MO). Between Quebrada El Nance and Santa Fé, 250 m, *Nee 8146* (MO). Between San Francisco and Santa Fé, *Stern et al. 1919* (MO, US). El Embalsadero, *Tyson 6091* (SCZ).

21. DUSSIA

Michael O. Dillon[51]

Dussia Krug & Urban ex Taubert, Naturl. Pflanzenfam. 3, Abt. 3: 193. 1892. TYPE: *Dussia martinicensis* Krug & Urban ex Taubert.

Vexillifera Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 139. 1922. TYPE: *Vexillifera micranthera* Ducke = *Dussia discolor* (Benth.) Amsh.

Cashalia Standley, J. Wash. Acad. Sci. 13: 440. 1923. TYPE: *Cashalia cuscatlanica* Standley = *Dussia cuscatlanica* (Standley) Standley & Steyermark.

Trees, to 50 m high, to 1 m in diameter, the trunk straight, high crowned, the bases buttressed, the bark smooth, gray, sap blood red; stems terete, striate or slightly angular, puberulent to tomentose, glabrate. *Leaves* imparipinnate, 5–25-foliolate, the leaflets alternate to subopposite, exstipellate; stipules minute, caducous. *Inflorescence* axillary, racemose or racemose paniculate. *Flowers* rarely andromonoecious, pink to purple, 15–25 mm long; calyx campanulate, somewhat oblique, the 5 lobes subequal; standard orbicular reniform, persistent; wing straight, the keel petals similar to wings, dorsally tomentose; stamens 10, subequal, the filaments connate at the base, 1 subfree, the anthers dorsifixed, versatile, ovate; ovary 1–5-ovulate, pubescent, brevistipitate or subsessile, the style pubescent, incurved, the stigma apical, minute. *Fruit* narrowly ovoid ellipsoid to obovoid, compressed laterally, 2-valved, dehiscent, orange velutinous, commonly 1–2-seeded; seeds red, ellipsoid or cylindrical, the hilum small, linear, lateral; cotyledons thick and fleshy, radicle short, inflexed.

Dussia is an American tropical rain forest element represented by ten species, principally from the Antilles and southern Mexico southward to central Peru and the Amazon basin of Brazil. Each species is essentially endemic, occupying small geographic range and usually quite rare within a community. Since all species are large, buttressed trees, adequate collections are difficult to obtain, and flowering

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or fruiting material is often lacking. Two apparently rare species are found in Panama, each used locally as a lumber source.

Literature:

Rudd, V. E. 1963. The genus *Dussia* (Leguminosae). Contr. U.S. Natl. Herb. 32(4): 247–277.

a. Leaves 11–25-foliolate, the leaflets predominately oblong to obovate, 7–15 cm long, 2.5–9.0 cm wide, the lower surface villous with subpatent or sometimes crisp pubescent; bracts larger than bracteoles, 5–10 mm long, 2–4 mm wide, the bracteoles 5–7 mm long, 2–3 mm wide ---------- 1. *D. cuscatlanica*

aa. Leaves 5–9-foliolate, the leaflets predominantely elliptic to ovate or obovate, 9–15 cm long, 6–9 cm wide, the lower surface crisp pubescent; bracts smaller than bracteoles, 7–10 mm long, 4–7 mm wide, the bracteoles 9–12 mm long, 8–9 mm wide ------ 2. *D. macroprophyllata*

1. **Dussia cuscatlanica** (Standley) Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 341. 1940.—FIG. 24.

Cashalia cuscatlanica Standley, J. Wash. Acad. Sci. 13: 441. 1923. TYPE: El Salvador, Finca Colima, Sierra de Apaneca, Ahuachapan, *Standley 20197* (F, holotype; GH, isotype).

Dussia grandifrons Johnst., J. Arnold Arbor. 19: 118. 1938. TYPE: Guatemala, Quezaltenango, *Skutch 2027* (A, holotype).

Tree to ca. 50 m tall; young stems yellowish to reddish pubescent, patent to crispate, glabrate. *Leaves* 11–25-foliolate; the petioles ca. 9 cm long, the rachises 20–40 cm long; petiolules 4–10 mm long; leaflets 5–11 cm long, 3–6 cm wide, the lower leaflets more oval to ovate, terminal leaflet usually obovate, others usually oblong, the apex acuminate to acute, the base obtuse, truncate or subcordate, the upper surface glabrous, the lower moderately pubescent with patent to slightly crispate trichomes. *Inflorescence* racemose, yellowish to reddish tomentose; bracts tridentate to rhombic or lanceolate, erose to entire, acuminate, 5–10 mm long, 2–4 mm wide, bracteoles obovate, entire or dentate, acuminate, 5–7 mm long, 2–3 mm wide. *Flowers* (15–)18–25 mm long; calyx 8–10 mm long, the lobes 4–5 mm long; corolla pale pink with a greenish streak along the standard. *Fruit* 5–10 cm long, 2.5–3.5 cm wide, dehiscent, the valves curling; seeds 2.0–3.5 cm long, 1.3–1.7 cm in diameter.

This species is found infrequently in forests from southern Mexico to Panama. It is distinguished from the following species in having more leaflets, flowers with the bracteoles smaller than the bracts, and usually larger 2-seeded fruits. It is known by several local names, "matabuey" (Mexico), "cashal" (El Salvador), "palo de tigre" (Guatemala), and "pizarro" (Panama).

CHIRIQUÍ: 8 km N of El Volcán, *Little 6048* (MO, US). DARIÉN: El Real, *Duke 2110* (MO, NY). Río Balsa between Manené and Tusijuanda, *Duke 13555* (MO, NY). Summit of Cerro Pirre, *Gentry & Clewell 7010* (MO).

2. **Dussia macroprophyllata** (Donnell Smith) Harms, Repert. Spec. Nov. Regni Veg. 24: 212. 1928.

Diplotropis macroprophyllata Donnell Smith, Bot. Gaz. 61: 56. 1913. TYPE: Costa Rica, Las Vueltas, Tucurrique, Cartago, *Tonduz 12949* (US, holotype).

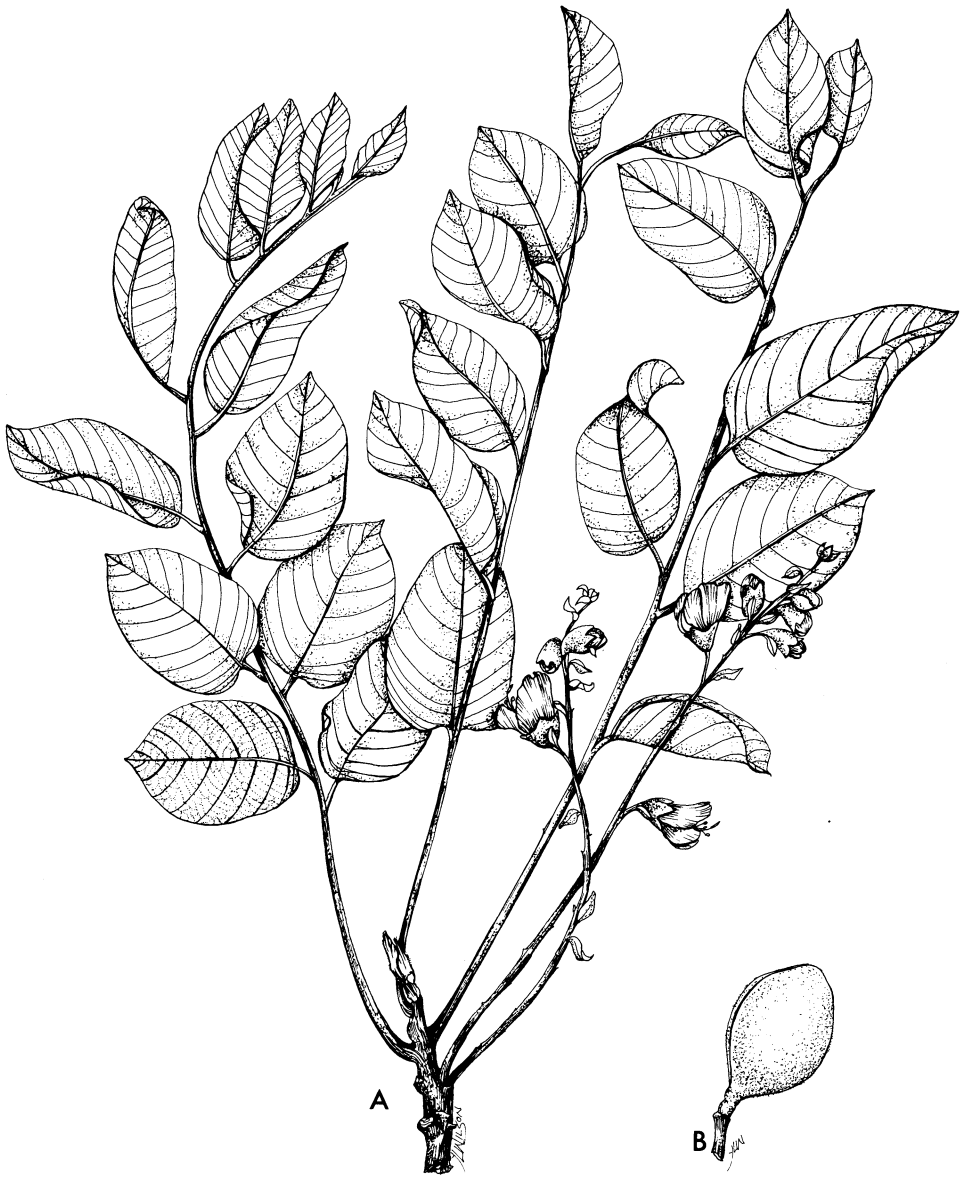

FIGURE 24. *Dussia cuscatlanica* (Standl.) Standl. & Steyerm.—A. Habit (×½). [After *Duke 8210.*]—B. Fruit (×½). [After *Duke 13555.*]

Cashalia panamensis Standley, Trop. Woods 16: 16. 1928, nomen nudum, Publ. Field Columbian Mus., Bot. Ser. 4: 212. 1929. TYPE: Panama, *Cooper 520* (F, holotype).

Tree to ca. 40 m tall; young stems yellowish to reddish tomentose. *Leaves* 7–9-foliolate, rarely 11-foliolate; leaflets 6–18 cm long, 4–9 cm wide, ovate, elliptic, elliptic oblong, or obovate, the apex obtuse or sometimes acuminate, densely crisp pubescent below, glabrous above. *Inflorescence* racemose, reddish tomen-

tose, the bracts clawed, rhomboid lanceolate, acuminate, 7–10 mm long, 4–7 mm wide, oblique, erose; bracteoles ovate, clawed, cordate, erose, 9–12 mm long, 8–9 mm wide, acute. *Flowers* 17–20 mm long; calyx ca. 10 mm long, the lobes ca. 5 mm long; corolla purplish. *Fruit* ca. 5 cm long, ca. 2.5 cm wide, 1-seeded.

Dussia macroprophyllata is better collected to the north in Costa Rica. It is distinguished by its large leaflets, relatively small fruits, and bracteoles that are larger than the bracts. It is known locally in Panama as "citron."

BOCAS DEL TORO: Almirante, *Cooper 520* (F). COLÓN: Ca. 7 km SW of Portobelo along Río Guanche, *Mori & Kallunki 5203* (MO).

22. ERIOSEMA

Muriel E. Poston[52]

Eriosema (DC.) G. Don, Gen. Hist. 2: 347. 1832. Nomen cons.

Rhynchosia sect. *Eriosema* DC., Prodr. 2: 388. 1825. TYPE: *Eriosema rufum* (H.B.K.) G. Don.
Euriosma Desv., Ann., Sci. Nat. I. 9(1): 421. 1826. Nomen rejic. TYPE: *E. sessiliflora* Desv.
Euryosma Walp., Rep. 1: 785. 1842. orth. mut. *Eriosema* (DC.) G. Don.

Perennial *herbs* or *subshrubs*; stems angular to terete, striate, pubescent. *Leaves* trifoliolate or rarely unifoliate; leaflets gland-dotted below; stipules lanceolate or oblong, usually persistent. *Inflorescence* axillary or terminal, racemose, the flowers sometimes congested at the tips; bracts lanceolate, striate strigulose, caducous. *Flowers* with the calyx campanulate, the teeth 5, gland-dotted; corolla papilionaceous, the standard usually yellow with reddish purple to maroon striations, obovate with auriculate base, the wings narrowly oblong, lobed above the claw, the keel falcate; stamens 10, diadelphous, the vexillary stamen free, the anthers equal; ovary sessile or subsessile, villous, the style curved, slender, the stigma capitate. *Fruit* oblong, bivalved; seeds 2, ovoid, black, brown or mottled, the striophiole white, the hilum linear or oblong.

Eriosema is a pantropical genus of about 500 species with the greatest diversity in Africa. In the Americas 38 species are currently recognized (Grear, 1970). Although *Eriosema* has often been confused with *Rhynchosia* the two genera can be separated on the basis of habit, petiolar characters, arrangement of the calyx lobes, and characters of the hilum and the striophiole.

Literature:

Grear, J. W. 1970. A revision of the American species of *Eriosema* (Leguminosae-Lotoideae). Mem. New York Bot. Gard. 20(3): 1–98.

a. Leaves trifoliolate.
  b. Leaflets ca. 5 times long as wide, linear to lanceolate.
    c. Leaflets ciliate; inflorescence compact, few-flowered; calyx 2–7 mm long ---------- 1. *E. crinitum*
    cc. Leaflets not ciliate pubescent; inflorescence a spiciform raceme, multiflorate; calyx 3–5 mm long ---------- 4. *E. violaceum*

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bb. Leaflets less than 5 times long as wide, broadly lanceolate to lanceolate ---------- 2. *E. diffusum*

aa. Leaves unifoliolate ---------- 3. *E. simplicifolium*

1. **Eriosema crinitum** (H.B.K.) G. Don, Gen. Hist. 2: 348. 1832.

Glycine crinita H.B.K., Nov. Gen. Sp. Pl. 6: 421. 1823. TYPE: Venezuela, "montosis Novae Andalusiae, in Cerro del Cocollar," not seen.

Rhynchosia crinita (H.B.K.) DC., Prodr. 2: 389. 1925.

Eriosema pinetorum Standley, Field Mus. Nat. Hist., Bot. Ser. 8: 315. 1931. TYPE: British Honduras, not seen.

Herb to *subshrub*; stems erect to ascending from a thick rootstock, puberulent to externally pilose. *Leaves* trifoliolate, leaflets linear to lanceolate, apically mucronate to acute, basally cuneate, the margins ciliate, 4.2–7.2 cm long, 0.7–1.2 cm wide, strigose above, glabrous below, the terminal leaflet exceeding the lateral leaflets; petioles 0.1–0.4 cm long, pilose; stipules lanceolate, connate, strigose externally, 1.0–1.6 cm long, 0.1–0.2 cm wide. *Inflorescences* not exceeding the leaflets, few-flowered, the peduncle 0.4–1.0 cm long; pedicels 0.4–0.5 cm long; bracts subtending the inflorescence 1.5 cm long, 0.3 cm wide; subtending bracteoles caducous, 0.5–0.7 cm long, 0.1–0.2 mm wide. *Flowers* with the calyx 0.4–0.9 cm long, the lobes 0.2–0.7 cm long, the upper lobe the longest, strigose; corolla yellow, 1.0–1.5 cm long, the standard obovate, 1.0–1.3 cm long, 0.7–0.8 cm wide, auriculate at the base, the claw 1.0 mm long, the wings oblong 1.0–1.1 cm long, 0.3–0.4 cm wide at the largest point, the claw 0.3–0.4 cm long; stamens 0.8–1.1 mm long, the vexillary stamen free; ovary sericeous. *Fruit* ovate, 1.2–1.5 cm long, 0.5–0.7 cm wide, externally strigose; seeds ovoid, 2.0–4.0 mm long. 1.0–2.0 mm wide, black brown mottled.

Eriosema crinitum appears to have continuous variation throughout its range in Panama and is the most common *Eriosema* species occurring there. *Eriosema crinitum* occurs in savannas, campos, cerrados, usually in sandy soils, at 300–2700 m. Grear (1970) has described three varieties which he considers to have distinct morphological characters well correlated with geographical distribution. *Eriosema crinitum* var. *fusiformis* (Rusby) Grear is separated by its smaller stature and its whitish silky pubescence. *Eriosema crinitum* var. *macrophyllum* Grear is separated by its smaller fruits and more numerous flowers. Neither of the varieties has been reported from Panama or surrounding regions.

CANAL ZONE: Ancón Hill, *Piper 5552* (US); *Standley 25186* (US). CHIRIQUÍ: Boquete, *Allen 4712* (GH, MO); *D'Arcy 6313* (MO); *Davidson 760* (F, MO). Sabana de la Tortuga between Boquete and Caldera 300–700 m, *Pittier 3301* (US). Llanos del Volcán, 1120–1200 m, *Siebert 339* (MO). COCLÉ: Natá, 50 m, *Allen 829* (MO). Cerro Pilón, 2700 ft, *Dwyer 1051* (MO). Llanos outside Penonomé, *Ebinger 1030* (F, MO, NY). PANAMÁ: Hills above Campana, 600–800 m, *Allen 1312* (MO). Between Chepo and El Llano in burned area, *Croat 14491* (MO). Chepo, *Dodge 16690* (MO). Savanna near Río Pacora and Chepo highway, *Duke 5897* (MO). Cerro Campana, *Duke 6026* (MO); 2400–2700 m, *Duke 8679* (MO, OSU, US). Between Río Pacora and Chepo, *Dwyer et al. 5091* (MO). Cerro Campana, *Ebinger 912* (F, GH, MO). 69 km W of Panamá near Panamerican highway, *Folsom 4109* (MO). 7 mi W of Chepo, *Gentry & Tyson 1629* (MO, SCZ). Cerro Campana, *Lewis et al. 3149* (MO); *McDaniel 6820* (FSU); *Nee 6846* (MO). Las Sabanas, *Standley 25913* (US). W slope of Cerro Campana, 2500 ft, *Tyson et al. 2375* (FSU, NY, SCZ). Near Arraijan, *Woodson 1401* (GH, MO). VERAGUAS: San José, 18 km S of Santa Fé, 400 m, *Nee 8173* (MO).

2. **Eriosema diffusum** (H.B.K.) G. Don, Gen. Hist. 2: 347. 1832.—FIG. 25.

Glycine diffusa H.B.K., Nov. Gen. Sp. Pl. 6: 420. 1823. TYPE: Colombia, "prope fluvium Putes, prov. Popayanensium" not seen.
Rhynchosia diffusa (H.B.K.) DC., Prodr. 2: 388. 1825.
Rhynchosia diffusa var. *oblongifolia* DC., Prodr. 2: 388. 1825. TYPE: not seen.
Eriosema diffusa var. *oblongifolia* (DC.) G. Don, Gen. Hist. 2: 347. 1832.
Eriosema diffusa var. *holosericeum* Seem., Bot. Voy. Herald 110. 1853. TYPE: Panama, Volcano of Chiriqui, *Seemann,* not seen.

Erect *herb* or *subshrub,* the stems ascending from a woody base, terete, densely seriçeous. *Leaves* trifoliolate, the leaflets oblanceolate to obovate, 2.5–4.7 cm long, 0.8–1.2 cm wide, apically acuminate, basally cuneate, the margins revolute, pubescence strigose above, tomentose silvery beneath, especially along the veins, the terminal leaflet longer than the laterals, the petioles 1.0–2.0 mm long, densely white sericeous; stipules lanceolate, connate to occasionally splitting, 0.6–1.0 cm long, 0.3–5.0 cm wide, externally strigose. *Inflorescence* 1.5–3.8 cm long, not exceeding the leaflets; flowers 5–10 per cluster; peduncles 1.8–3.0 mm long, 1.0–1.5 mm wide; pedicels 0.3–0.5 cm long; bracts subtending the flowers lanceolate, caducous, 2.0–4.0 mm long, 1.0–1.5 mm wide. *Flowers* with the calyx 3.0–4.0 mm long, the tube 1.0–1.5 mm long, externally pubescent, gland dotted; corolla yellow, 7.0–8.0 mm long, the standard ovate, 8.0–9.0 mm long, 4.0–4.5 mm wide, auriculate at the base, the wings oblong, 0.6–0.7 cm long, the claw 0.2 mm long, the keel falcate, 0.6–0.7 cm long, the stamens 0.7 cm long. *Fruit* ovate, 0.9–1.1 cm long, 0.5–0.7 cm wide, brown strigose; seeds ovoid, 3.0–3.3 mm long, 1.5–2.0 mm wide, black or mottled.

Eriosema diffusum ranges from Mexico to northern Colombia, occurring on savannas and grassy banks near streams. In Chiriqui, Panama, it occurs on lava fields. *Eriosema diffusum* is recognized by the silvery pubescence of the underside of the leaves. Seemann described *E. diffusum* var. *holosericeum* based on plants collected in Chiriqui, which have copious pubescence on both the upper and lower leaflet surface. However, this single character difference does not seem to warrant segregation of a variety (Grear, 1970).

CHIRIQUÍ: Near Volcán, 1300 m, *Burt & Koster 156* (MO). Boquete, 3800 ft, *Davidson 728* (GH, MO, US). Near Volcán, 4600 ft, *Duke 9181* (MO, OS), *9204* (NY, MO); *Ebinger 763* (MO). ½ mi S of Bambito on lava flow, 1600 m, *Lazor & Correa 2710* (FSU, MO, SCZ); *Partch 69-28* (MO). Forest near Boquete, 1000–1300 m, *Pittier 2945* (GH, MO, NY). Llanos del Volcán, 1120–1500 m *Siebert 340* (MO); *Tyson 5748* (FSU), *5858* (FSU, MO, SCZ). Río Chiriquí Viejo valley, *White 85* (GH, MO, US). Near El Hato del Volcán, *Wilbur et al. 17194* (MO), *11934* (F, MO, NY). PANAMÁ: Road between Panamá and Chepo, *Dodge 16634* (GH, MO). Pacora, *Paul 268* (US). Penonomé, 50–1000 ft, *Williams 582* (US, NY). VERAGUAS: 18 km S of Santa Fé on Santiago road, 400 m, *Nee 8173* (MO).

3. **Eriosema simplicifolium** (H.B.K.) G. Don, Gen. Hist. 2: 348. 1832.

Glycine simplicifolia H.B.K., Nov. Gen. Sp. Pl. 6: 419. 1823. TYPE: Venezuela, "prope Atures, ad cataractas Orinoci," not seen.
Rhynchosia simplicifolia (H.B.K.) DC., Prodr. 2: 389. 1825.
Eriosema lanceolatum Benth., Ann. Nat. Hist. 3: 438. 1839. British Guiana. *Schomburgk 651* (US, isotype).

Herbs procumbent to decumbent; stems terete, villous to pilous. *Leaves* unifoliolate, the leaflets ovate, 6.0–7.5 cm long, 1.5–3.0 cm wide, apically obtuse,

FIGURE 25. *Eriosema diffusum* (H.B.K.) G. Don.—A. Habit (×½).—B. Leaflet underside.—C. Flower (×3).—D. Corolla.—D^1. Standard (×2).—D^2. Wing petal (×2).—D^3. Keel petal (×2).—E. Stamens (×3).—F. Pistil (×3). [After *White 85.*]—G. Fruit (×1½).—H. Fruit opened to show seeds (×1½).—I. Seed (×3). [After *Davidson 728.*]

basally cuneate, the margins entire, sericeous on both the surfaces, occasionally strigose below; petioles 0.2–0.5 cm long, heavily strigose; stipules lanceolate, 0.4–1.0 cm long, 0.1–0.3 cm wide. *Inflorescence* few flowered with 2–4 flowers, 3.0 cm long; peduncle 1.5–1.8 cm long; pedicel 0.4–0.5 cm long; bracts lanceolate,

caducous, 0.4–0.8 cm long, 0.2–0.3 cm wide. *Flowers* with the calyx 0.5–0.6 mm long, the tube 2.0 mm long, strigose; corolla yellow, 0.9–1.0 cm long, the standard obovate, 1.1–1.3 cm long, 0.5–0.6 cm wide, auriculate at the base, the wings oblong, 1.1–1.2 cm long, 0.4–0.5 cm wide, the keel falcate, 1.2–1.3 cm long, 0.4–0.5 cm wide; stamens 1.0–1.2 cm long. *Fruit* ovate, 1.5 cm long, 0.7 cm wide, brown strigose; seeds ovate, 4.0 mm long, black.

Eriosema simplicifolium ranges from Central America and the Greater Antilles to northern South America. Grear (1970) has segregated *E. simplicifolium* into two varieties: var. *micranthum* is restricted to Bolivia, Paraguay, and southeastern Brazil and is differentiated by its smaller flowers and occasionally erect habit. However, *E. simplicifolium* appears to have continuous variation throughout its range in Panama and surrounding regions. In Panama *E. simplicifolium* occurs on llanos, usually in sandy soils.

CHIRIQUÍ: Llanos W of Gualaca, 500 ft, *Allen 5050* (GH, MO). San Félix, 0–120 m, *Pittier 5257* (NY, US).

4. **Eriosema violaceum** (Aubl.) G. Don, Gen. Hist. 2: 347. 1832.

Cystisus violaceous Aubl., Hist. Pl. Guiane 2: 766. 1775. TYPE: French Guiana, "Guianae in pratis Macouria," not seen.
Crotolaria lineata Lam. Encyl. Méth. Bot. 2: 202. 1786. TYPE: not seen.
Rhynchosia violacea DC., Prodr. 2: 388. 1825. TYPE: not seen.

Herb or *subshrub*, few to many branched; branches erect or ascending from a woody base; stems puberulent, villous. *Leaves* trifoliolate, the leaflets linear lanceolate, 4.7–8.0 cm long, 0.6–1.2 cm wde, apically obtuse, basally cuneate, the margins revolute, the upper and the lower surface strigose, the lower surface gland dotted, terminal leaflet ⅓ longer than the laterals; petioles 2.0–4.0 mm long, densely villous, appressed, the stipules lanceolate, striate, connate, pilose, persistent, 6.0–10.0 mm long, 2.0–3.0 mm wide. *Inflorescence* 4.7–7.0 cm long, multiflorate with 30–35 flowers, in loose clusters; peduncle 2.2–3.0 cm long; pedicel 1.8–2.0 mm long; bracts subtending the flowers caducous, ovate, 2.5–4.0 mm long, 1.5 mm wide; bracts subtending the inflorescence lanceolate, 0.6 cm long, 0.2 cm wide, striate, puberulent. *Flowers* with the calyx 0.3–5 mm long, the lobes 1.5–3.0 mm long, the upper lobe slightly longer, externally glandular, villous; corolla yellow, 6.0–8.0 mm long, the standard obovate, 7.0–8.0 mm long, 4.0–5.0 mm wide, auriculate at the base, the wings oblong, 7.0–7.5 mm long, 2.5–3.0 mm wide, the claw 2.0 mm long, the keel 7.0–7.5 mm long, 2.5–3.0 mm wide, the claw 3.0 mm long; stamens 7.0 mm long. *Fruit* ovate, 0.7–1.0 cm long, 0.4–0.6 cm wide, densely villous; seeds 3.5–4.5 mm long, oval black.

Eriosema violaceum ranges from southern Mexico and the Greater Antilles southward to central and northwestern Brazil. It occurs in savannas, cerrados and palm and pine forests and, particularly in Panama, along streambanks. *Eriosema violaceum* is distinguished by its narrow leaflets with revolute margins and its many flowered raceme.

CANAL ZONE: Río Azote, 66–70 m, *Dodge et al. 16847* (MO). COCLÉ: Penonomé, 50–1000 ft, *Williams 96* (NY). PANAMÁ: near Pacora, 0–100 m, *Burt & Rattray 18* (MO). Río Puente near junction

with Río Chagres, *Dodge et al. 16846* (GH, MO). Río Pacora and Chepo, *Duke 5912* (MO). Orillas del camino ca. 1.5 km del Río Cabra, camino a Chepo, *Taylor* (MO).

23. ERYTHRINA

John D. Dwyer[53] & W. G. D'Arcy[53]

Erythrina L., Sp. Pl. 706. 1753; Gen. Pl., ed. 5. 316. 1754. TYPE: *E. herbacea* L.

Micropteryx Walp., Linnaea 23: 739. 1850. LECTOTYPE: *M. poeppigiana* Walp. = *Erythrina poeppigiana* (Walp.) O. F. Cook.
Duchassaingia Walp., Linnaea 23: 741. 1850. LECTOTYPE: *D. glauca* Walp. = *Erythrina fusca* Lour.

Trees or *shrubs,* usually armed. *Leaves* alternate, pinnately 3-foliate, the leaflets large, the terminal leaflet usually larger than the laterals, the lateral leaflets usually inequilateral; stipels small; stipules minute, caducous. *Inflorescence* axillary or terminal; flowers numerous, disposed laterally in pseudoracemes; peduncles usually spineless; pedicels thickened distally. *Flowers* large; calyx inequilaterally campanulate or tubular, the margin subentire, lobed or vaguely toothed; standard often large, short or long clawed, thick, greatly exceeding the keel, the keel petals often coherent along the lower margin, apically glabrous; stamens 10, monadelphous or diadelphous with 9 stamens alternating long and short, the anthers versatile; ovary stipitate, fusiform, somewhat curved, the style slender, elongate, incurved, glabrous, the stigma capitate. *Legumes* stipitate, linear oblong, often moniliform, mostly constricted between the seeds, dehiscent, often twisted at maturity; seeds several, ellipsoidal, colored, the hilum lateral.

Erythrina includes about 108 species in tropical and subtropical areas of Old and New Worlds. It is distinguished from other Panamanian Papilionatae by its woody habit, red or orange flowers, by the wing petals being much smaller than the keel, and by the elongate stipe below the ovary.

The genus has been intensively studied for many years by B. A. Krukoff, New York Botanical Garden, and this treatment relies heavily on his published works and annotations on herbarium sheets. In addition, Mr. Krukoff supplied copious notes and advice which helped form a basis for this treatment. The key to species is modified from Krukoff's key.

Krukoff (1939) recognized 10 Species Groups in the New World *Erythrina,* but later Krukoff and Barnaby (1974) reorganized *Erythrina* on a worldwide basis, recognizing 5 subgenera and 26 sections. Two subgenera, *Micropteryx* and *Erythrina* occur in Panama, the first with sects. *Micropteryx* and *Duchassaingia,* and the second with sects. *Edules, Erythrina,* and *Gibbosae.* Section *Cristae-Galli* Krukoff (Subgenus *Micropteryx*) is introduced.

Flowers and fruits of all species of *Erythrina* were well illustrated by Krukoff and Barnaby (1974), and reference to these illustrations can be an aid in determining the plants.

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a. Seeds dark brown or black; calyx mostly campanulate; introduced and native species.
  b. Seeds 25–35 mm long, soft, drying wrinkled ---------- 5. *E. edulis*
  bb. Seeds 12–19 mm long, hard, drying smooth.
    c. Leaflets mostly blunt tipped; wing petals about ½ as long as the keel ---------- 6. *E. fusca*
    cc. Leaflets mostly sharp tipped; wing petals minute, less than ⅓ as long as the keel.
      d. Pod papery; stipels forming stalked cups 1–4 mm long ---- 9. *E. poeppigiana*
      dd. Pod leathery or woody; stipels less than 0.5 mm long, not forming stalked cups ---------- 4. *E. crista-galli*
aa. Seeds red; calyx mostly tubular campanulate; native species.
  e. Calyx truncate but with a conspicuous bulge on the ventral side just below the rim ---------- 7. *E. gibbosa*
  ee. Calyx 1 or 2 toothed (lobed), lacking a bulge on the side.
    f. Seeds less than 10 mm long; leaflets as broad or broader than long, blunt tipped (sometimes short acuminate) ---------- 1. *E. berteroana*
    ff. Seeds more than 10 mm long; leaflets longer than broad, sharp pointed.
      g. Pod persistently pubescent, at least between the seeds (lens may be needed).
        h. Keel petals united by outer margins; calyx at least twice as long as wide ---------- 3. *E. costaricensis*
        hh. Keel petals free; calyx less than ½ as long as wide ---- 8. *E. lanceolata*
      gg. Pod glabrous at maturity.
        i. Calyx with 2 subequal lips ---------- 2. *E. chiriquensis*
        ii. Calyx with 1 lip forming a pronounced beak ---------- 10. *E. rubrinervia*

1. **Erythrina berteroana** Urban, Symb. Ant. 5: 370. 1908. SYNTYPES: Colombia, Santa Marta, *Bertero 2126, 2772* (B, not seen).—FIG. 26.

E. neglecta Krukoff & Moldenke, Phytologia 1: 287. 1938. TYPE: Panama, *Williams 372* (NY, not seen).

Trees, branchlets smooth, lustrous, armed, the spines occasional, pyramidal, to 0.6 cm long, often obviously reflexed at the apex. *Leaves* with the leaflets 5–17 cm long, 5–20 cm wide, obliquely ovate to ovate rotund or the terminal leaflets subrhomboidal, as wide or wider than long, shortly acuminate apically, widely cuneate basally, the margins vaguely irregular, slightly revolute, thick chartaceous, smaller leaflets often subcoriaceous, glabrous above, minutely puberulent

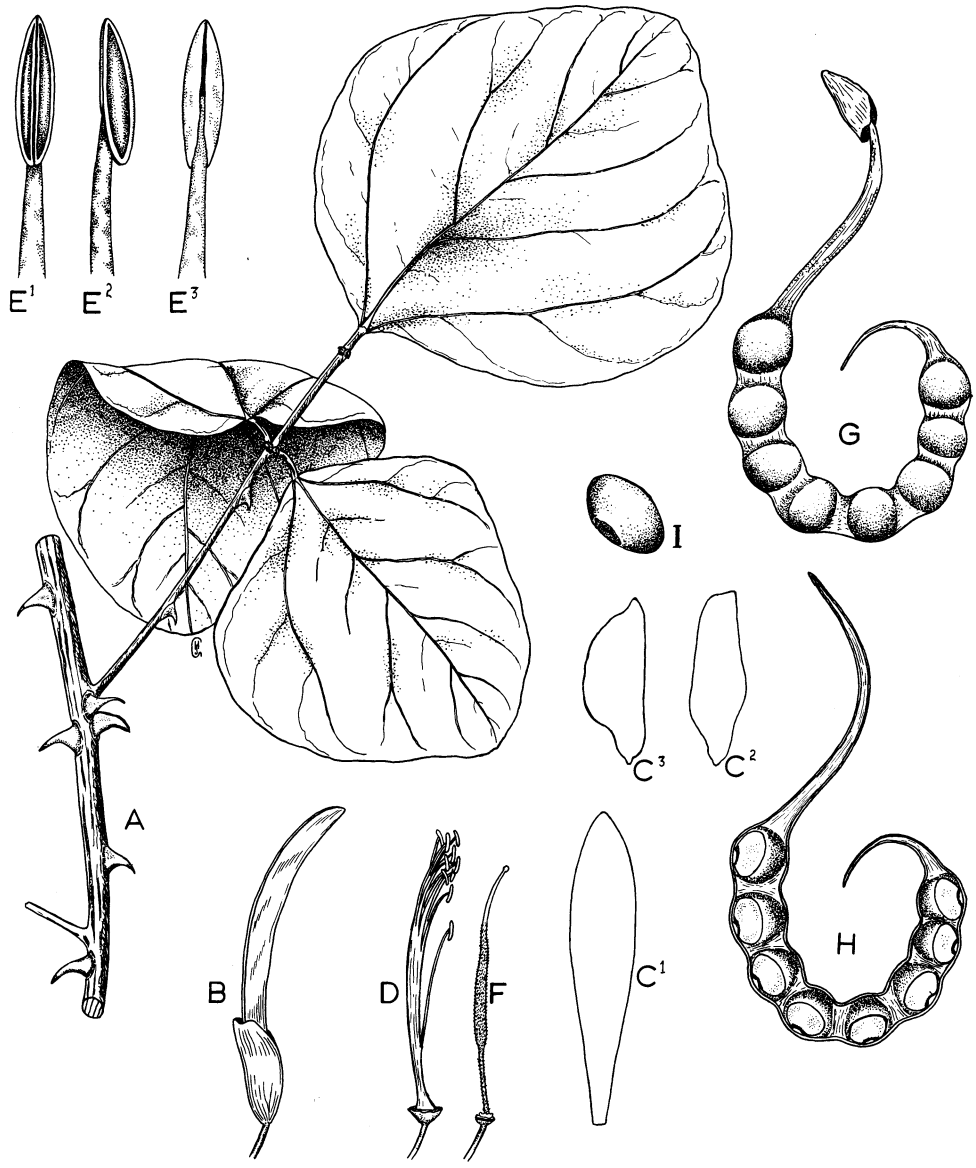

FIGURE 26. *Erythrina berteroana* Urban.—A. Habit (×½). [After *Dwyer 1237.*]—B. Flower (×½).—C. Corolla.—C¹. Standard (×½).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×½).—E. Anthers.—E¹. Abaxial view (×5).—E². Lateral view (×5).—E³. Adaxial view (×5).—F. Pistil (×½). [After *Allen 1631.*]—G. Fruit (×½).—H. Fruit opened to show seeds (×1).—I. Seed (×1). [After *Dwyer 1237.*]

beneath, often appearing glaucous, the main veins 5–6, petiolules to 1 cm long, glabrous, rugulose, often a different color than the rachis; petioles 4.5–15 cm long, glabrous; rachises 1.5–5 cm long, glabrous. *Inflorescences* to 0.5 m long, usually glabrous; pedicels to 10 mm long; bracts ovate, ca. 10 mm long; bracteoles narrowly ovate, acute, ca. 12 mm long. *Flowers* with calyx narrowly campanu-

late, ca. 16 mm long and 4 mm wide, stiffly carnose, minutely puberulent, the teeth distinguishable as irregular and rounded elevations, standard elliptic, ca. 80 mm long and 20 mm wide, thick petaloid, glabrous, the wings oblong, ca. 10 mm long and 2.5 mm wide, tapering only gradually basally, the claw ca. 2 mm long; keel petals subcircular, ca. 8.5 mm long and 6.5 mm wide; odd stamen free at the base, then united to the middle of the sheath, the other stamens of 2 lengths, the laterally disposed stamens free for ca. 15 mm, the median (carinal position) free for 4–7 mm, the anthers ca. 3 mm long; ovary slender, stipitate for 1.5 mm, linear, ca. 17 mm long and 1.5 mm wide, ferrugineous puberulent, the style ca. 30 mm long, the stigma capitate, ca. 0.3 mm long. *Legumes* stipitate moniliform, to 15 cm long and 1.5 cm wide, the stipe 2.5 cm long.

Erythrina berteroana is distinct in its small black-marked red seeds.

This species is well distributed throughout the West Indies and on the continent, ranging from Mexico to Colombia and Venezuela (Zulia). It occurs from low to middle elevations. In Panama, *Erythrina berteroana* occurs from sea level up to about 1,800 m, with most collections taken from tropical moist forest. It is one of the commonest species in the genus in Panama.

BOCAS DEL TORO: Almirante, *Sharp* 11 Nov. 1962 (SCZ). CANAL ZONE: Miraflores, *Blum 542* (FSU, MO, SCZ). Old gun site route C-2 past Pacific Saddle Club, *Blum 2056* (FSU, MO, SCZ). Without other locality, *Blum 2238* (FSU, MO, SCZ). Cocolí Road, *Correa & Gonzalez, 513* (MO, PMA, SCZ). NE of Madden Dam, *Correa & Stimson 31* (MO, SCZ). Highway near Paraíso, *Croat 7161* (MO). Summit Garden, *Croat 12313* (F, MO, SCZ). Near Boy Scout Road, *Croat 12916* (MO). Gaillard Highway near Paraíso, *Croat 13148* (F, MO). Near Summit Naval Radio Station, *Croat 14237* (MO). Between Farfan Beach and Vera Cruz, *Duke 11737* (MO). Summit Garden, *Dwyer 1237* (FSU, MO). Farfan Beach, *Dwyer et al. 4690* (MO). Cocoli Baptist Church, *Dwyer 7212* (GH, US). K-2 Road, *Dwyer & Hayden 7541* (GH, MO, US). Madden Dam, *Ebinger 854* (F, MO, US). Off road from Madden Dam to Chilibre, *Folsom 3661, 3662, 3663* (all MO). Paraíso, *Folsom 3664* (MO). Near Pina, *Gentry 8629* (MO). Río Providencia and ridge S of river, 5–170 m, *Gentry & Nee 8746* (MO). Back of Curundú, *Harvey 5255* (F). Without other locality, *Haynes 501/9305* (A). Farfan Beach and Palo Seco, 5 m, *Hunter & Allen 444* (GH, MO). Near Summit Gardens, *Kennedy et al. 2207* (MO). 4 mi SE of Gamboa on highway to Balboa, *Lasseigne 4286* (MO). 1 mi E of Canal Zone boundary, *Lazor 2866* (FSU). Madden Dam, 50 ft, *Lewis et al. 31* (MO). Cocolí Road, *Lewis et al. 776* (GH, MO, US). Sabana of Panamá, 10–50 m, *Pittier 2541* (US). Between Gatún and Lion Hill, 10–20 m, *Pittier 2571* (US). Big swamp E of Río Tocumen, *Standley 26704* (US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29037* (US). Balboa, *Standley 32125* (US). Madden Dam, Transisthmian highway, *Stern et al. 351* (GH, MO). Venado Beach near Fort Kobbe, *Stimson 5247* (SCZ). 1 mi N of Summit on road to FAA tower, *Tyson et al. 2749* (SCZ). Paraíso, *Tyson 5339* (FSU, MO, SCZ). Cocoli Baptist Church, *Tyson & Dwyer 6484* (MO, SCZ). CHIRIQUÍ: Remedios, 0–150 m, *Allen 3663* (MO, US). Quebrada Guanabanito 1 km W of La Represa, *Busey 487* (F). Boquete, 3800 ft, *Davidson 735* (A, MO, US). Santa Marta Bugaba, *de Caballero 19* (MO). Dolega, *Dwyer & Hayden 7758A* (MO). Between inspection station and Volcán, *Folsom 3935, 3836, 3937* (all MO). 1 mi N of Harias San Miguel, Concepción, *Folsom 3957* (MO). Boquete, 3800 ft, *King 5320* (US). 1 km E of Remedios, *Nee 10107* (MO). S side of Boquete, 1050–1100 m, *Nee 10642* (MO). Finca Collins, 5500 ft, *Stern et al. 1146* (GH, MO, US). Boquete, 1200–1500 m, *Woodson & Schery 751* (GH, MO). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 582* (GH, MO). El Valle, *Folsom & Kauke 2740* (MO); *Kennedy 2114* (MO), *2211* (F, MO); *Nee 9219* (MO). COLÓN: Quebrada Bonita 2 km NW of Salamanca, 90 m, *Nee 6994* (MO). DARIÉN: Slopes of Cerro Pirre, 200–500 m, *Gentry & Clewell 7045A* (MO). HERRERA: Ocú, *Stern et al. 990* (MO). LOS SANTOS: Between Limón and Punta Mala, *D'Arcy & Croat 4210* (MO). Punta Mala, *Tyson 2719* (MO, SCZ). Road from Macaracas to Chitré Highway, *Tyson et al. 3150* (MO, SCZ). PANAMÁ: Bejuco, *Allen 1631* (F, GH, MO, US). Río Maje 4–5 mi above falls near Bayano Lake, 100 m, *Croat 34673* (MO). Between Panamá and Chepo, *Dodge et al. 16639* (MO). Río Charco Espiritu on Tocumen Highway, *Duke 5694* (MO). Isla Saboga, *Duke 10366* (MO). Tocumen, *Dwyer 2103* (MO), *5017* (MO). Entrance to paved road to Cerro Azul from main highway, *Dwyer 3097* (MO). Near Chepo, *Hunter & Allen 27* (GH, MO); *Kluge 13* (US). Nuevo Guararé, Arraiján, 20 m, *Lao 112* (MO, PMA). Bellevista, *Macbride 2752* (F,

US). La Jagua, Pacora River, 25–30 m, *McDaniel 10332* (MO). Mamoní River above Chepo, 20–25 m, *Pittier 4731* (GH, US). Matías Hernández, *Pittier 6939* (F, GH, MO, US). Villa Rosario, *Saldaña 27* (PMA). Juan Franco Race Track, *Standley 27689* (US). Tumba Muerto Road near Panamá, *Standley 29783* (US). Juan Díaz, *Standley 30489* (US). Between Las Sabanas and Matías Hernández, *Standley 31897* (US). SAN BLAS: Mainland opposite Achituppu, *Lewis et al. 108* (GH, MO). VERAGUAS: 5 mi N of Santiago near Santa Maria River, *Blum & Tyson 593* (MO, SCZ). Between Santa Fé and Escuela Agricola Alto Piedras, 420 m, *Croat & Folsom 33835* (MO). San Francisco, *Dwyer 1293* (MO). 2 mi from Santiago toward Atalaya, *Dwyer et al. 7402* (US, MO). 1–2 mi above Santa Fé, *Gentry 3050* (MO); *Liesner 839* (MO). Just S of Santa Fé, *Nee 8023* (MO). 2 mi S of Cañazas, *Tyson 3724* (FSU). WITHOUT LOCALITY: *Lewis et al.* (MO).

2. **Erythrina chiriquensis** Krukoff, Brittonia 3: 322. 1939. TYPE: Panama, *White & White 31* (US, holotype, not seen; isotypes, MO).

Trees; branchlets smooth, armed, the spines deltoid, flat, to 1 cm long. *Leaves* with the leaflets ovate deltoid, 6–20 cm long, 4–12 cm wide, the terminal leaflets usually slightly larger, the acumen often to 1.5 cm long, truncate at the base, the margins vaguely revolute, thick chartaceous, glabrous above and below, the main veins 4–8; petioles 10–15 cm long, smooth, glabrous; rachises 3–4.5 cm long; stipules narrowly rectangular. *Inflorescences* with the peduncles to 27 cm long and 0.6 cm wide, rubescent, sympodium longer in fruit, pedicels 0.3–1.5 mm long. *Flowers* with the calyx narrowly campanulate, ca. 13.5 mm long and stiffly carnose to subcoriaceous, rough, glabrous to ferrugineous villosulose; teeth obsolete; standard subsessile, narrowly oblong, to 60 mm long, 5–15 mm wide, tapering gradually toward the apex, concave, subcuneate, basally carnose, glabrous; wing petals oblong to somewhat circular ca. 9.5 mm long, obtuse basally, delicately petaloid, glabrous except for the puberulent margins, the keel petals semicircular, 8.5–10 mm long, 6–7 mm wide, obliquely rounded, truncate basally, irregular undulate on the upper margin, thickened and puberulent on the lower margin, the claw ca. 1.5 mm long; staminal sheath 25–30 mm long, 1.5–3 mm wide, the long anthers ca. 3.3 mm long, glabrous, the short anthers ca. 2.5 mm long, pilose, the odd filament united to the sheath for ca. 8 mm then free for ca. 15 mm; ovary stipitate for ca. 7 mm, vaguely sigmoid and linear fusiform, ca. 13.5 mm long and 1.5 mm wide, the hairs ferrugineous, curled, the style subulate. *Legumes* stipitate for ca. 3 cm, to 13 cm long, 1.5–2 cm wide, narrowly cuneate apically, the beak to 3 cm long, ca. 0.6 cm wide basally, the seminiferous areas 2–3 per pod, often interrupted by a narrow constriction, 0.5–0.9 cm wide, to 5 cm long, smooth, vaguely reticulate, minutely ferrugineous farinose; seeds oblong, ca. 1.2 cm long, 0.6 cm wide, dull or bright scarlet.

Erythrina chiriquensis is known only from upland Chiriqui, Panama, where it is common. The pods tend to be much shorter than most other species in Panama and they are usually not moniliform or crinkled.

CHIRIQUÍ: Cerro Punta, 2000 m, *Allen 1526* (MO), *3474* (GH, MO). S of Finca Lérida, 6000–7000 ft, *Allen 4757* (GH, MO). Cerro Punta, 7000 ft, *Blum et al. 2440A* (FSU, SCZ); *Correa 1346* (MO); *Croat 10497* (MO, SCZ), *10526* (MO, SCZ). Between Boquete and Monte Rey, *Croat & Porter 15639* (MO). Cerro Punta, 6000 ft, *Folsom 3999* (MO). Nueva Suisa near Audubon Cabin, *Gentry 5992* (MO, GH, SCZ). Cerro Punta, *Lao 354* (MO); *Mori & Kallunki 5669* (MO); *Stern et al. 81* (MO, US); *Tyson 872* (FSU, MO), *5823* (FSU, MO, SCZ). Valley of upper Río Chiriquí Viejo, 1300–1900 m, *White & White 31* (MO). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 284* (GH), *295* (MO). Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 913* (A, MO, US).

3. **Erythrina costaricensis** M. Micheli, Bull. Herb. Boissier 2: 445. 1894. TYPE: Puntarenas, Costa Rica, *Pittier 4804* (BR, not seen).

E. panamensis Standley, J. Wash. Acad. Sci. 17: 10. 1927. TYPE: Panama, *Pittier 2656* (US, holotype: not seen).
E. colombiana Krukoff, Brittonia 3: 325. 1939. TYPE: Colombia, *Lawrance 648* (US, not seen).
E. costaricensis var. *panamensis* (Standley) Croat, Fl. B.C.I. 471. 1979.

Trees, the branchlets often with silver mottling, smooth, occasionally glabrous, often armed, the spines scattered. *Leaves* with the leaflets ovate trapeziform, obliquely ovate to ovate elliptic, 9–22 cm long, 6–20 cm wide, narrowly acuminate at the apex, oblique, rounded or widely cuneate at the base, thin chartaceous to subcoriaceous, reticulate, often glaucous beneath, glabrous to densely puberulent, the hairs appressed and often confined to the costa and secondary veins; petiolules 0.5–1.7 cm long, arachnoid villose to glabrescent; petioles 5–22 cm long; rachises 2–20 cm long. *Inflorescences* with bracts linear lanceolate, to 6 mm long, ca. 0.8 mm wide; bracteoles resembling smaller bracts. *Flower* with the calyx narrowly campanulate or tubular, 15–30 mm long, 8–10 mm wide, chartaceous to subcoriaceous, glabrous or puberulent, bilabiate, the lobes evanescent or to 7 mm long, the teeth scarcely evident; standard obovate elliptic or narrowly oblong, 60–75 mm long, 12.5–16 mm wide, tapering acutely apically, ultimately obtuse, obtuse basally, the claw to 9 mm long, stiff carnose or thin coriaceous, glabrous; wing petals obovate oblong or oblong, 7–9 mm long, obtuse apically and basally, delicately petaloid, the claw indistinct; keel petals circular oblong or inequilaterally ensiform, ca. 8 mm long, 3.5–10 mm wide, briefly broad acuminate apically, oblique basally, petaloid, glabrous, the claw indistinct; staminal sheath 1–2 mm wide medially, the filaments crassate, ca. 0.8 mm wide, the odd filament often briefly united to the sheath, the anthers 3–4 mm long; ovary flat, 10–15 mm long, puberulent, fusiform, sigmatioid, to 60 mm long, ca. 1 mm wide, ferruginous lanose, the stipe filamentous, the style flat basally, cylindrical subulate above, to 20 mm long. *Fruit* with stipes to 5 cm long, moniliform, 15–23 cm long, 1–2 cm wide, the style base to 5 cm long, farinose with minute deciduous hairs, some hairs persisting between the seeds, the seeds scarlet, ca. 1 cm long or longer and 0.7 cm wide.

Erythrina costaricensis is a species of the lowlands, occurring commonly in tropical wet and tropical moist forests. The species is known only from Costa Rica, Panama and Colombia.

Croat (1979) separated plants from lowland central Panama varietally from the typical Costa Rican plants, saying they have larger leaves, more constricted pods, red instead of orange flowers, and that the Panamanian plants bloom while leafless while those from Costa Rica are reported to bloom while bearing leaves.

BOCAS DEL TORO: Potrero, Changuinola Valley, *Dunlap 443* (F, US). Río Terebe between Quebrada Huron and Quebrada Schlunjik, *Kirkbride & Duke 458* (MO, SCZ). 10–15 mi inland from mouth of Changuiola River, *Lewis et al. 875* (GH, MO). Water Valley, *Wedel 1766* (MO). CANAL ZONE: BARRO COLORADO ISLAND: *Aviles 3* (F), *45* (MO); *Brown 16* (F); *Croat 6286* (MO, SCZ), *6476* (F, MO), *6490* (F, MO, SCZ), *6560, 6625, 8667, 12710* (all MO); *Frost 212* (F); *Harvey 50* (F); *Kenoyer 329* (US); *Killip 39975* (US), *40036* (MO, US); *Oppenheimer 67-1-17-1415* (MO); *Salvoza 874* (A); *Shattuck 56, 852* (both F, MO); *Standley 31352, 40892, 40843* (all US); *Woodworth & Vestal 311* (A,

F). W end of Gatún Lake and dam, *Blum & Tyson 2001* (FSU, MO, SCZ). Gamboa Pipe Line on Tropic Test Center lands 2 km S of main dirt road, *Correa & Haines 484* (MO). Pipeline road within 5 mi of Gamboa gate, *D'Arcy 9265* (MO). Hill C-6, Ft. Sherman, *Duke 4392* (MO). Pipeline road, *Folsom 1938* (MO). Río Providencia 3 km SE of Achiote, *Gentry & Nee 8657* (MO). Gatún, *Goldman 1854* (US). Gatún Station, *Hayes 97* (GH). Pipeline Road, Río Agua Salud, *Kennedy 1890* (MO). Río Indio de Gatún, *Maxon 4808* (US). Río Petitpie from Ft. Sherman–Gatun Locks road, *Mori & Kallunki 2659* (MO). Río Mendosa above Pipeline Road, *Nee 7601* (MO). Río Providencia 7.5 km SW of Gatún Dam, 25–140 m, *Nee & Gentry 8667* (MO). Between Gorgona and Gatún, *Pittier 2287* (US). Quebrada Bonita, 70–80 m, *Steyermark & Allen 1934* (GH, MO). Quebrada Salamanca, 70 m, *Steyermark & Allen 16984* (GH). Quebrada Ancha, 70 m, *Steyermark & Allen 16984a* (MO). 6 mi N of Gamboa near Río Frijol, *Tyson 1447* (FSU, MO, SCZ). CHIRIQUÍ: Progreso, *Cooper & Slater 10532* (F, US). San Bartolo Limite, *Croat 22010* (MO, US). Quebrada Melliza 6 mi S of Puerto Armuelles, *Liesner 496* (F, MO). COCLÉ: Cerro Pilón, *Correa 54* (MO, SCZ). La Mesa, *Croat 13370* (MO). 18 km past Sardinilla on way to Nombre de Dios, 150–300 m, *Croat 26126* (MO). La Mesa, 2200 ft, *Dwyer 10562* (MO). 7 km N of El Cope de Veraguas, Alto Calvario, *Folsom 1207* (MO). La Mesa above El Valle, *Folsom & Raul, 5637* (MO). 7 km N of El Copé, 750–850 m, *Folsom & Collins 6435* (MO). La Mesa N of Cerro Gaital, 2400 ft, *Hammel 3848* (MO). COLÓN: Tres Brazos sawmill, Icacal, between Salud and Boca de Río Indio, *Howell 63* (MO). Peluca on road to Nombre de Dios, *Kennedy 2776* (GH, MO). Río Buenaventura near Portobelo, *Kennedy & Gra 2248a* (MO). Río Guanche 6 km S of Portobelo, 0–10 m, *Nee 7268* (MO). Quebrada Ancha 4 km E of Buena Vista, *Nee 7776* (MO, US). Río Guanche, 50 m, *Sullivan 139* (MO). DARIÉN: S slope of W peak of Cerro Tacarcuna, 1100–1300 m, *Gentry et al. 16880* (MO). Río Cuasí, 0–2.5 mi S of Tres Bocas, *Kirkbride & Duke 1130* (MO). Between Caná & Boca de Cupe, *Stern et al. 633* (GH, MO, US). Río Cuasí, Chepigana District, 800 ft, *Terry & Terry 1413* (A, F, MO). Caná, *Williams 782* (US). PANAMÁ: El Jefe, *Duke 9398* (MO). Mountains above Tortí Arriba, *Folsom et al. 6594* (MO). Cerro Campana, *Gentry 4906* (MO). Without other locality, *Hayes* (GH). Cerro Campana, *Porter et al. 4280* (MO, SCZ). Cerro Campana, collector unknown, 25 Mar. 1969 (MO).

4. **Erythrina crista-galli** L., Mant. 99. 1767. TYPE: Brasil, not seen.

Armed *tree,* leafy when flowering. *Leaves* with the leaflets elliptic or ovate, 5–8 cm long, 2–3 cm wide, chartaceous, puberulent but soon glabrous, the costa sometimes armed beneath. *Inflorescence* of flowers solitary or in 2's or 3's in the leaf axils, often subterminal; pedicels 1.2–6 cm long, pubescent with deciduous hairs; bracts linear lanceolate, 2.4–3 mm long; bracteoles somewhat smaller. *Flowers* with the calyx papery, broadly campanulate, 10–17 mm long, slightly shorter on the upper side, 10–15 mm wide at the mouth, the apex bilobed, pubescent in bud, soon glabrous; standard red, elliptic, sometimes broadly so, ca. 4 cm long, 2.1–2.6 cm wide, the wings variously shaped, sometimes toothed, 7–12 mm long, the keel petals falcate, 32–53 mm long; stamens 3.6–6.2 cm long, separate for 0.3–0.7 cm; pistil 3.4–6 cm long, the ovary densely pubescent, the stipe sparingly pubescent. *Fruit* woody, 14–39 cm long, 1.2–1.5 cm wide, slightly constricted between the seeds, the stipe 2–4 mm long, somewhat expanded upwards, the acumen 0.7–1 cm long, slender but stiff; seeds black with dark markings, 12–19 mm long, 5–8 mm wide, hard, smooth.

Erythrina crista-galli is distinct among species of *Erythrina* growing in Panama in its dark seeds, in its short, wide calyx, and in its wing petals which are much shorter than the keel or standard.

The species occurs naturally in Brasil and is known in Panama only in cultivation. It is a favorite cultivated tree in some parts of the world, but only one collection has been made in Panama. The above description is taken mainly from Krukoff (1939).

CANAL ZONE: Albrook across from Building 808, *Tyson 6261* (MO).

5. **Erythrina edulis** Triana ex Micheli,[54] J. Bot. 6; 145. 1892. TYPE: Colombia, *Triana* (K, holotype, not seen).

Tree, sometimes armed. *Leaves* with leaflets ovate to broadly ovate, mostly 8–21 cm long, 5.5–16.5 cm wide, apically acute or acuminate, basally rounded, truncate, obtuse or cuneate, chartaceous or subcoriaceous, glabrous, not waxy, the principal secondary veins 7–12 on each side; costa sometimes armed; petioles puberulent, glabrescent, mostly 11–36 cm long; petiolules 3–11 cm long, 1.5–3.5 mm thick; rachises densely puberulent. *Inflorescences* with the bracts mostly lanceolate, to 5.2 mm long, 1.5 mm wide, the smaller ones broader; bracteoles resembling the smaller bracts but usually smaller, fruiting pedicels 0.7–1 cm long. *Flowers* with the calyx thin, papery, broadly campanulate, 8–11 mm long on the lower side, 7–10 mm long on the upper side, 8–10 mm wide at the mouth, the margin irregularly lobed, pubescent; standard broadly elliptic, 2–3.5 cm long, 1–2.5 cm wide, emarginate or retuse, clawed, the wings variously shaped, 3–6.5 mm long, the keel petals elongate orbicular, often lobed ventrally near the apex, 10–20 mm long; stamens 2–3.5 cm long; ovary 1.8–3 cm long, densely pubescent, stipitate. *Legume* somewhat woody, thick, mostly 13–25 cm long, ca. 2 cm wide, the acumen ca. 2 cm long, the stipe slender, 3.5–4.5 cm long; seeds 5–6, dark brown, 25–35 mm long, 10–18 mm wide, soft, drying wrinkled.

Erythrina edulis is cultivated for its pods which are boiled or fried. It ranges from Panama to Bolivia, occurring mostly at 1,000–2,500 m elevation, but it sometimes occurs nearly at sea level. In Panama it is known only from upland Chiriquí.

CHIRIQUÍ: Finca Collins, Boquete, *Blum & Dwyer 2530A* (SCZ). Lower road to Bajo Mono, *Folsom et al. 2229* (MO). N slope of Barú E of Bajo Chorro region, 600–6500 ft, *Hammel 3017* (MO). Quebrada El Velo near Finca Lérida, 1700 m, *Nee 10624* (MO). Bajo Mono ca. 3 km NW of Boquete, 1400 m, *Skog et al. 4062* (MO). Boquete above Jaramillo, N slopes of Cerro Palo Alto, 4000 ft, *Webster 16663* (MO).

6. **Erythrina fusca** Loureiro,[55] Fl. Cochinch. 427. 1790. Based on *Gelala aquatica* Rumphius, Herb. Amb. 2: 235, *tab.* 5. 78. 1750.

Large *trees*. *Leaves* with the leaflets ovate to oblong, 7–14 cm long, 5–11 cm wide, round obtuse apically, obtuse to vaguely cordate basally, thin coriaceous, minutely bullate, usually green, glabrous above, puberulent to minutely farinose below, the principal secondary veins, 6–9, the costa prominulous above, often aculeate; petioles 9–13 cm long, ca. 0.3 cm wide, minutely puberulent to glabrous; rachises 8–25 cm long, pubescent, often aculeate. *Inflorescence* with bracts and bracteoles ovate or broadly ovate, to 2 mm long; pedicels to 2 cm long and 0.2 cm wide. *Flowers* with the calyx broadly campanulate, to 17 mm long, asymmetric, longer on the lower side, chartaceous, pubescent, the hairs deciduous, the teeth scarcely evident; standard orange, trapeziform, to 90 mm long and 40 mm wide, widely deltoid apically, obtuse basally, coriaceous, glabrous, the claw

[54] For additional synonyms see Krukoff & Barneby (1974). Only this name has been used for Panamanian plants.

[55] For additional synonyms see Krukoff & Barnaby (1974). Only this name has been used for Panamanian plants.

ca. 20 mm long, the wing petals obliquely semicircular, ca. 25 mm long and 20 mm wide, obliquely rounded apically, the claw scarcely evident, the keel petals connate, ovate falcate, about twice the length of the wing petals, 12–17 mm wide, truncate, oblique basally; staminal sheath ca. 17 mm long, coriaceous, glabrous, the filaments crassate, ca. 1 mm wide, the anthers ca. 4 mm long, the odd stamen ca. 35 mm long; ovary stipitate for ca. 15 mm, linear, ca. 10 mm long, puberulent, the style linear subulate, ca. 15 mm long, erect. *Legume* with the stipe linear cuneate, ca. 3 mm long, moniliform, ca. 20 cm long and 1.5 cm wide, the beak ca. 2 cm long, falcate, farinose; seeds ca. 1.5 cm long and 0.7 cm wide, opaque, drying brown, smooth, hard, the scar to 0.7 cm long.

Erythrina fusca is the most widespread species in the genus, occurring in the American tropics and from Madagascar to Tonga and the Caroline Islands in the Pacific Ocean. It is apparently dispersed by ocean currents, and it is commonly planted for shade. In Panama it occurs in the lowlands, commonly in tropical moist and tropical wet forests.

BOCAS DEL TORO: Farm Six, Almirante, *Cooper 471* (MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 8203* (F, MO, SCZ, US), *15159* (MO, SCZ); *Foster 2180* (F, GH, US); *Kenoyer 395* (US); *Woodworth & Vestal 507* (A, F, MO). Miraflores, *Blum 2212* (FSU, SCZ). Bohio, *Christopherson 142* (US). Between Paraiso and country club, *Croat 7170* (MO). Near Albrook Air Force Base, *Croat 13146* (MO, SCZ). Chagres, *Fendler 81* (GH, MO, US). S end of Pedro Miguel locks, *Graham 305* (GH). Gatún, *Hayes* Jan. 20, 1860 (MO). Las Cruces Trail, 75 m, *Hunter & Allen 450* (GH, MO). Summit Road, *Jones 288* (US). Below Gatún, *Maxon 4790* (US). Between Gatún and Lion Hill, 10–20 m, *Pittier 2571* (GH). Ancón, *Pittier 2744* (US). Darién Station, *Standley 31645* (US). Miraflores Locks, *Stern et al. 3* (GH, MO, US). Curundú, *Tyson 2632* (FSU, MO, SCZ, US). Between Fort Davis and Fort Gulich, *Tyson & Lazor 6236* (FSU). Miraflores Lake, *White & White 62* (MO, US). CHIRIQUÍ: Burica Peninsula, Puerto Limones, *Croat 22121A* (MO). COLÓN: Juan Mina Plantation, Río Chagres above Gamboa, *Allen 4104* (MO). Río Gatuncillo, Santa Rosa, 25 m, *Allen 4155* (MO). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11169* (F, MO, US). PANAMÁ: Arraijan, *Allen 1628* (F, GH, MO, US). Tocumen, *Cedeno 16* (MO). Without other locality, *Cotterman & Klawe,* 3 July 1960 (US). Panamá Viejo, 5–10 m, *Dodge 17518* (GH, MO). Tocumen, *Dwyer* 31 Dec. 1962 (MO). Between Río Pacora and Chepo, *Dwyer et al. 5093* (MO, SCZ). San Jose Island, *Johnston 955* (GH). Cerro Azul, *Lao 484* (MO). Panama City, *Macbride 2608* (F, US). Nuevo reparto el Carmen a 500 m de la Transistmica, *Osorio 44* (MO). Sabanas N of Panama City, *Paul 362* (US). Matías Hernández, *Pittier 6942* (GH). Big swamp E of Río Tocumen, *Standley 26524* (US). Corozal Road near Panamá, *Standley 26779* (US). Juan Díaz, *Standley 30503* (US). Between Matías Hernández and Juan Díaz, *Standley 31933* (US).

7. **Erythrina gibbosa** Cufod., Arch. Bot. Sist. 10: 34. 1934. TYPE: Costa Rica, Alajuela, *Brenes 828* (NY, fragm.).

Small *trees* or *shrubs,* usually leafless at anthesis; twigs drying yellow, armed with spines to 0.8 cm long, moderately appressed pilose. *Leaves* with the terminal leaflets ovate lanceolate or rhombic ovate, 8–30 cm long, 4–15 cm wide, long acuminate apically, cuneate to truncate basally, chartaceous, sparsely pubescent to glabrous; petiolules to 0.8 cm long; petioles 10–15 cm long, to 0.3 cm wide, the spines occasional; rachises 2–3.5 cm long, pubescent; stipules narrowly lanceolate, to 2 cm long. *Inflorescences* ca. 15 cm long, densely villose above; bracts linear lanceolate, to 4 mm long and 1 mm wide. *Flowers* with the calyx campanulate, ca. 15 mm long and 9 mm wide apically, to 3 mm wide basally, conspicuously ventricose on the lower surface, chartaceous, puberulent or glabrous, thickened apically on the lower side, the teeth scarcely evident; standard subsessile, narrowly oblong, ca. 60 mm long and 12 mm wide, acute apically, cuneate basally,

carnose, glabrous, the wing petals narrowly oblong, ca. 11 mm long and 4 mm wide, obtuse apically, petaloid, the claw scarcely measurable, the keel petals ca. 10 mm long and 5 mm wide medially, obliquely acute apically, obtuse basally, the claw inconspicuous; staminal sheath ca. 2.5 mm wide, the filaments to 20 mm long, the median anthers pubescent, the anthers 2–3 mm long; ovary stipitate for 17 mm, linear falcate, ca. 20 mm long and 1.5 mm wide, the hairs dense, soft, appressed, the style curved, ca. 17 mm long. *Fruits* subligneous, coiled and twisted when mature, conspicuously and irregularly undulate crenulate on the ventral side; seeds uniformly scarlet, soft, wrinkled when dry.

Erythrina gibbosa occurs in Central America from Honduras to Panama. In Panama it has been collected from sea level to about 1,200 m.

BOCAS DEL TORO: Chiriqui Lagoon, *Wedel 1196* (GH, MO, US). Río Cricamola between Finca St. Louis & Konkintoe, 10–50 m, *Woodson et al. 1930* (A, MO, GH, US). CHIRIQUÍ: Volcán Chiriquí and Río Chiriquí Viejo, 1200 m, *Allen 995* (MO). Palo Santo 3 mi N of Volcán, *Croat 13580* (FSU, MO). Upper Río Gariché, 1050–1100 m, *Seibert 364* (A, MO). COCLÉ: El Valle, *Allen 110* (A, MO), *765* (MO), *2714* (MO, US), *3622* (GH). Club Campestre, *Duke 13232* (MO) El Valle, *Dwyer & Correa 8019* (MO); *Dwyer 1839a* (US); *Folsom & Kauke 2755* (MO); *Gentry 6794* (MO); *Hunter & Allen 330* (GH, MO, US); *Kennedy et al. 2212* (F, MO); *Lao 276* (MO). VERAGUAS: Río Tercero Braso above Santa Fé, *Croat 27335* (MO). Alto Piedra Santa Fé, *Lao 514* (MO). N of Santa Fé, *Mori & Kallunki 2537* (MO). 11 km from Escuela Agricola Alto de Piedra, Río Dos Baca, *Mori & Kallunki 3125* (MO). WITHOUT LOCALITY: *Moore 41* (F).

8. **Erythrina lanceolata** Standley, Contr. U.S. Natl. Herb. 17: 432. 1974. TYPE: Costa Rica, *Wercle (Pittier 3693)* (US, not seen).

Shrub or small *tree,* leafy when blooming; often armed. *Leaves* with the leaflets ovate, apically acute to long acuminate, basally rounded or obtuse, chartaceous, soon glabrescent above, beneath becoming glabrous or remaining sparingly puberulent with sparse, weak hairs, and with a minute waxy reticulum visible under a lens, unarmed, the petioles about as long as the terminal leaflet. *Inflorescence* with the bracts linear lanceolate, 1–1.3 mm long, ca. 0.3 mm wide, the bracteoles slightly smaller; pedicels 0.3–1 cm long, thick and longer in fruit. *Flowers* with the calyx thin, campanulate, 7.5–17 mm long, slightly shorter on the lower side, 5.5–8 mm wide at the mouth, the apex slightly bilobed, sparsely pubescent with appressed hairs, soon glabrescent; standard scarlet, narrow, oblanceolate, 4–8 cm long, 1–2 cm wide, rounded or retuse apically, the wings mostly rounded, not hastate, the keel petals 5–12 mm long, about equalling the wings; stamens 3.6–6.1 cm long, free for 1–2.4 cm; pistil 3.2–5.3 cm long, the stipe and ovary pubescent. *Legume* linear, terete, compressed between the seeds, 15–32 cm long, the pubescence persistent at least between the seeds, the stipe mostly 4–8 cm long, the acumen 2–8 cm long; seeds scarlet, unmarked, 10–13 mm long.

Erythrina lanceolata ranges from Honduras to Panama, occurring mostly at middle elevations. The species is attributed to Panama on the identification of a single collection of the species by Krukoff. As little material was available for study, none in flower, many details of the above description were taken from Krukoff (1939).

CHIRIQUÍ: 2.5 km from Questa Piedra along Río Monte road, *Folsom 3986* (MO).

9. **Erythrina poeppigiana** (Walp.) O. F. Cook, Bull. U.S. Dept. Agric. Bot. 25: 57. 1901.

Micropteryx poeppigiana Walp., Linnaea, 23: 740. 1850. TYPE: Peru, *Poeppig* (not seen; photos F, GH, NY).
Erythrina darienensis Standley, Contr. U.S. Natl. Herb. 18: 108. 1916. TYPE: Panama, *Pittier 5578* (US, holotype; isotypes, GH, NY).

Large *trees,* often armed. *Leaves* with the leaflets rhomboid or deltoid, deltoid ovate to suborbicular, 5–18 cm long, 5.5–15 cm wide, acuminate or obtuse at the apex, the base variable, thinly chartaceous, usually scabrous beneath; stipels forming stalked cups 1–4 mm long; petioles 10–30 cm long; rachises elongate. *Inflorescences* to 35 cm long; bracts ovate, to 1.5 mm long, ca. 0.8 mm wide, the bracteoles somewhat smaller than the bracts. *Flowers* with the calyx narrowly cylindrical campanulate, ca. 5 mm long and wide, the teeth absent or present as glandular points, carnose, minutely puberulent; standard scarlet, elliptic, to 50 mm long and 20 mm wide, varying from acute to obtuse apically and basally, the claw scarcely evident, the wing petals obovate or oblong, ca. 12 mm long and 5 mm wide, rounded, tapering obtusely basally, glabrous, the claw indistinct, the keel petals falcate, to 45 mm long and 10 mm wide; staminal tube 30–40 mm long, ca. 1 mm wide; pistil to 50 mm long, the stipe glabrous, the ovary linear, finely puberulent, the style filiform sigmatoid. *Legume* chartaceous, to 25 cm long and 1.5 cm wide, the seeds coffee colored, ca. 12 mm long.

Erythrina poeppigiana ranges from Panama to Bolivia. In Panama it has rarely been collected, and all collections are from the lowlands.

CANAL ZONE: Summit road, *Jones 284* (US). DARIÉN: Boca de Pauarando on Sambú River, *Pittier 5578* (GH, MO-photo, NY, US).

10. **Erythrina rubrinervia** H.B.K., Nov. Gen. Sp. Pl. 6: 434. 1824. TYPE: Colombia, *Humboldt & Bonpland 1787* (not seen; photo NY).

Shrub or small *tree,* usually armed, leafy when flowering. *Leaves* with the terminal leaflet rhombic ovate, mostly 10–20 cm long, 5–12 cm wide, apically acuminate, basally cuneate, unarmed, the secondary veins 8–11 on each side, chartaceous, soon glabrescent, minutely reticulate waxy beneath; petiolules 8–30 cm long, often armed, soon glabrescent; petioles 4.5–10 mm long; 1–2.5 mm thick, soon glabrescent. *Inflorescences* with the bracts caducous, the bracteoles narrowly elliptic, ca. 1 mm long, ca. 0.3 mm wide, the pedicels 0.3–0.9 cm long, pubescent, becoming 0.9 cm long in fruit. *Flowers* with the calyx thin, tubular campanulate, 14–30 mm long on the lower side, 10–21 mm long on the upper side, narrowed toward the base, 4–6 mm wide at the top, the margin entire but with the lowest tooth 1.5–2 mm long, glabrescent; standard scarlet, narrowly elliptic oblanceolate, 4.5–7.5 cm long, rounded or subacute, the wing petals apically denticulate, mostly slightly smaller than the keel petals, the keel petals abruptly acute or acuminate, 6–12 mm long, 4–5 mm wide; stamens 4.3–6.6 cm long, free for 1–2 cm; ovary and stipe densely pubescent. *Legume* somewhat woody, 18–36 cm long, ca. 1.5 cm wide, constricted between the seeds, the stipe 3–5 cm long, the acumen 3–6 cm long; seeds numerous, uniformly scarlet, 10–12 mm long, 6–8.5 mm wide.

This species occurs in Belize, Panama, Colombia, Peru and Bolivia. It is usually a species of middle elevations occurring between 1,000–2,500 m.

DARIÉN: Premontane rain forest E of Tres Bocas, *Kirkbride & Duke 1211* (MO). PANAMÁ: 8 km SW of Cerro Brewster, 300 m, *Lewis et al. 3480* (MO). VERAGUAS: Valley of Río Dos Bocas 15.6 km NW of Santa Fé, *Croat 27763* (MO).

24. FLEMINGIA

Muriel E. Poston[56]

Flemingia Roxb. in Ait., Hort. Kew., ed. 2. 4: 349. Dec. 1812. nomen cons. vs. *Flemingia* Rottl. (1803, Acanthaceae) et *Lourea* St. Hil. (1812). TYPE: *F. strobilifera* (L.) Ait.

Shrub. *Leaves* unifoliate; leaflets oblanceolate, glabrous above, gland-dotted below; stipules lanceolate, caducous, striate; stipels absent. *Inflorescences* axillary racemes; bracts foliaceous, persistent, overtopping the flowers. *Flowers* with calyx campanulate, the lobes subequal, the upper lobes free; corolla yellow with maroon striation, the standard obovate, auriculate, the wings oblong, the keel falcate; stamens diadelphous, the anthers monomorphic; ovary subsessile, short with 2 ovules, the style slender, the stigma capitate. *Fruits* oblong, turgid; seeds 1–3, the hilum short.

Flemingia is an Old World genus that has been introduced into the New World.

1. **Flemingia strobilifera** (L.) Ait., Hort. Kew., ed. 2. 4: 350. 1812.—FIG. 27.

Hedysarum strobiliferum L., Sp. Pl. 746. 1753. TYPE: India, not seen.
Moghania strobilifera (L.) St. Hil. ex Jackson, Index Kew. 2: 252. 1894.

Shrub or *subshrub*; stems terete, strigose. *Leaves* unifoliate; leaflet ovate to obovate, 9.5–15.0 cm long, 4.0–9.0 cm wide, apically acute, basally truncate to cuneate, glabrous to puberulent above, gland-dotted to villous beneath, the margins revolute; petiole 1.0–2.0 cm long, strigose; stipules lanceolate, striate, 3.0–4.0 mm long, caducous. *Inflorescences* exceeding the leaves, racemes or terminal panicles, distichous, 6.0–15.0 cm long, 15–20 flowered; peduncle 1.0–2.0 cm long, strigose; pedicel 2.0–3.0 mm long, strigulose; flowers 1–2 per node; bracts conspicuous, enclosing the flowers, obovate to cordate, 1.5–2.0 cm long, 0.8–1.2 cm wide, mucronate, basally truncate, strigulose, gland-dotted; bracteoles subtending each flower, ca. 1.0 mm long, strigulose. *Flowers* with the calyx campanulate, 4.5–5.0 mm long, the tube ca. 1.0 mm long, the upper lobe of calyx somewhat longer than others, corolla 6.0 mm long, the banner orbicular, 5.0–6.0 mm long, 7.5–8.0 mm wide, auriculate, the claw ca. 1.0 mm long, the wing oblong, not auriculate, 5.5–6.0 mm long, 1.0 mm wide, the claw 2.0 mm long, the keel falcate, 8.0 mm long, 2.0 mm wide, the claw 2.0 mm long; stamens 6.0 mm long, vexillary stamen free; ovary sessile to subsessile, the style slender, the stigma capitate. *Fruits* oblong, turgid, 0.8–1.0 cm long, 0.3–0.5 cm wide, twisting in dehiscence,

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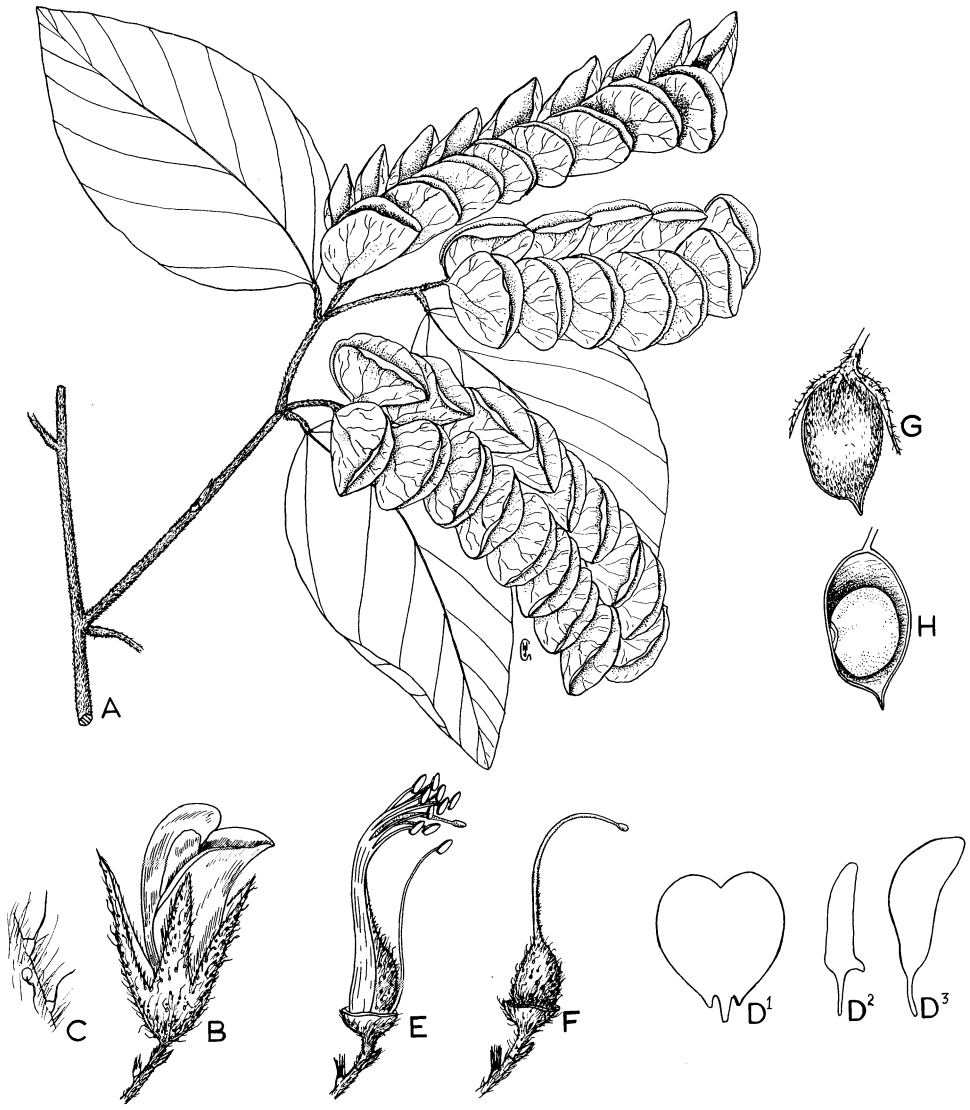

FIGURE 27. *Flemingia strobilifera* (L.) Ait.—A. Habit (×½).—B. Flower (×4).—C. Glandular hairs.—D. Corolla.—D[1]. Standard (×3).—D[2]. Wing petal (×3).—D[3]. Keel petal (×3).—E. Stamen (×5).—F. Pistil (×5). [After *Wedel 1863.*]—G. Fruit (×3).—H. Fruit opened to show seed (×3). [After *Allen 2078.*]

the beak ca. 1.0 mm long, strigose; seeds 2(–3), ovoid, 3.0 mm long, brown black with red mottling, the hilum ovate, 1.0 mm long, estrophiolate.

BOCAS DEL TORO: Old Bank Island, Chiriqui Lagoon, *Wedel 1863* (MO). CANAL ZONE: Summit, *Allen 2079* (F, GH, MO). Transisthmian highway, Atlantic side, *Blum & Dwyer 2138* (MO). W end of Gatún Lake dam, *Blum & Tyson 1974* (MO, SCZ). Cocoli Road, *Burch et al. 1392* (F, GH, MO, NY, SCZ). Contractors Hill, *Correa & Gonzales 517* (FSU, GH, MO, NY, SCZ). Between Paraiso and Country Club, *Croat 7168* (MO). 1 mi N of Summit Gardens, *Croat 9090* (MO, SCZ). Las Cruces

Trail, *Dwyer 1953* (FSU). Albrook, U.S. Army Tropic Test Center site, *Dwyer 6590* (MO). Cocoli Road, *Dwyer 7227* (GH, MO). Madden Dam, *Dwyer 8375* (MO). Albrook, U.S. Army Tropic Test Center site, *Dwyer & Robyns 4* (MO). K-9 roadside, *Gale* Sept. 12, 1962 (SCZ). Boyd-Roosevelt highway at Río Escondido, *Graham 322* (GH). W bank of Canal opposite Miraflores, *Harvey 5226* (F). Without other locality, *Humphrey 241* (F, MO). 3 mi above Gamboa Bridge, *Kennedy et al. 2301* (F, MO, NY). 3 mi N of Miraflores on Balboa highway, *Lazor & Blum 5337* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5689* (MO). Contractors Hill, *Lewis et al. 2875* (DUKE, MO). Road S-1 between Gatún and Pina, Fort Sherman, *Liesner 1337* (F, MO, NY). Headwaters of Río Providencia, 7.5 mi SW of Gatún Dam, *Nee & Gentry 8675* (MO). Madden Dam, *Nee & Mori 3682* (MO). Fort San Lorenzo, *Tyson & Blum 3752* (SCZ). 2 mi from Summit Garden SE to Gamboa, *Wilbur & Teeri 13381* (DUKE). COLÓN: Santa Rosa, Río Gatuncillo, *Allen 4160* (MO). Salamanca, *Gentry 6699* (MO); *Nee 9071* (MO). Roadside between Limón and Buena Vista, *Wilbur & Weaver 10817* (DUKE, GH, MO). DARIÉN: Hydro camp Pico Pendejo on Río Sabana, *Duke 15448* (MO). PANAMÁ: Nuevo Emperador, *Sandoval 21* (DUKE, MO).

25. GALACTIA

W. G. D'Arcy[57]

Galactia P. Br., Civ. Nat. Hist. Jam. 298. 1756. TYPE: *G. pendula* Pers.

Herbs, trailing or climbing vines or rarely shrubs, perennial. *Leaves* pinnate (Panama) or digitate trifoliolate or simple; stipels and stipules present. *Inflorescences* axillary and terminal, nodose racemes, elongate or short, sometimes subsessile; bracts and bracteoles usually present. *Flowers* mostly pink, purplish or white, the calyx 4-dentate or 4-fid, the upper tooth broader; corolla glabrous or the standard somewhat pubescent; stamens united or the vexilary stamen free, the anthers alike, all fertile, sometimes alternating in height; ovary narrow, mostly pubescent, the style glabrous, curved or nearly straight, the stigma minute. *Fruit* straight or slightly curved, compressed, sometimes laterally compressed between the seeds or marginally when immature, partially false septate between the seeds, dehiscent by 2 valves; seeds ovoid, dark brown, the hilum small, oval.

Galactia includes about 50 species of temperate and tropical regions of the world, the species most numerous in South America and the Antilles.

a. Plant erect or ascending, sometimes lax and scandent at the top, not reaching 1 m tall; petiolar rachis less than 5 mm long; leaflets mostly less than 2.5 cm long; standard exceeding the wings and keel ---------- 1. *G. latisiliqua*

aa. Plant a trailing or climbing vine, mostly exceeding 1 m in length; petiolar rachis more than 5 mm long; leaflets mostly more than 2.5 cm long; standard hardly exceeding or shorter than the wings and keel ---------- 2. *G. striata*

1. **Galactia latisiliqua** Desv., Ann. Sci. Nat. 9: 414. 1826. SYNTYPES: ? Peru, Dombey; Sine loc. ex don. Lavallee (both P, neither seen).

Wiry perennial *herb* or *suffrutex,* erect or ascending, apically somewhat scandent, rooting from a short slender tap root, branching at the ground and only sparingly above; stems densely pubescent, tardily glabrescent. *Leaves* pinnate, trifoliolate, the leaflets alike, the lateral pair slightly smaller, thick, ovate, mostly (Panama) 1.5–2.5 cm long, apically rounded, mucronate, basally rounded or obtuse, the veins 3–5 on each side, prominent beneath, above ascending pilose to glabrous, beneath pilose to appressed pubescent; petiolules 1–1.5 mm long, drying

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dark, pubescent; rachis to 3 mm long; petioles shorter or longer than the terminal leaflet. *Inflorescence* lax, few flowered, to 3 cm long, peduncle slender, puberulent; pedicels 1–2 mm long, glabrate; bracts ca. 1 mm long, pubescent. *Flowers* pink, ca. 7 mm long, the calyx pubescent, 4-fid about ⅔ way down, the standard longer than the wings, erect. *Legume* flat, oblong, slightly falcate, 3–4 cm long, ca. 5 mm wide, softly pubescent on the sides, the margin straight, the valves slightly compressed between the seeds, tardily dehiscent, ultimately curling; seeds 6–10, brown and mottled, compressed ovoid, 3–4 mm long.

This species may be distinguished by its non-climbing habit. *Galactia latisiliqua* is a South American species hitherto reaching only as far north as Colombia (Santander) and Guyana. Material from Panama is doubtfully identified with this species as material seen from South America is more pubescent and has somewhat larger leaves than the plants from Panama. It is possible that the Panamanian collections represent depauperate individuals of *G. striata*. They are smaller in most parts than material of *G. striata* seen from many countries.

All Panamanian collections were made in the Pacific lowlands of western Panama during the dry season.

CHIRIQUÍ: Roadside, Veladero, 0–100 m, *Burt & Koster 126* (MO). Concepción, *Burt & Koster 143* (MO). Gualaca nursery bed, 0–100 m, *Koster 174* (MO). VERAGUAS: Trail between Cañazas and Cordillera Central, 300–600 m, *Allen 192* (MO).

2. **Galactia striata** (Jacq.) Urban, Symb. Ant. 2: 320. 1900.—FIG. 28.

G. striata Jacq., Hort. Bot. Vindob. 1: 32, *tab. 76*. 1770 [1771]. TYPE: Jacquin (BM, not seen).
G. tenuiflora (Willd.) Wight & Arn., Prod. Fl. Penin. Ind. Orient. 1: 761. 1842.
G. striata var. *tenuiflora* (Willd.) Burk., Darwiniana 16: 721. 1971.

Trailing or prostrate perennial *vine*, not rooting at the nodes; stems pubescent to tomentose with weak hairs to 1.5 mm long. *Leaves* pinnate trifoliolate; leaflets about equal or the lateral pair slightly shorter, symmetrical, ovate, mostly 3–6 cm long, 2–3 cm wide, apically obtuse, minutely emarginate and mucronulate, basally rounded, slightly discolorous, thin pilose with loose hairs, more so beneath, often glabrescent above, the costa and 4 main veins on each side prominent beneath, often glabrescent above, the costa and 4 main veins on each side prominent beneath; petiolules ca. 2 mm long, often conspicuously 2-angled; foliar rachis 5–8 mm long; petiole mostly shorter than the leaflets; stipels glabrous, ca. 1 mm long; stipules 1–2 mm long, pilose. *Racemes* mostly solitary, lax, open, 5–10 cm long, the peduncle and rachis pubescent; pedicels 1–2 mm long, 1–3 arising at a node, puberulent, the bracts ca. 1 mm long, cucullate, pubescent. *Flowers* 8–10 mm long, pink, mostly drying white, the calyx puberulent, deeply 4-fid, the lobes narrowly acute; corolla exserted ½–⅓ way from the calyx, the standard reflexed, glabrate, the wings about as long as the standard, broad; anthers linear, 0.6 mm long, versatile; ovary linear, tomentose, the style glabrous, the stigma minute. *Legume* flat, oblong, sometimes falcate, mostly 3–5 cm long, ca. 5 mm wide, the margins thick, straight or slightly undulate between the seeds when young, the persistent style forming a small beak, sessile in the calyx, softly pilose on the valves, and on the margins with minute straight whitish hairs, the valves separating and ultimately curling; seeds mostly 5–8, ovoid, oblique, 3.5–5.5 mm

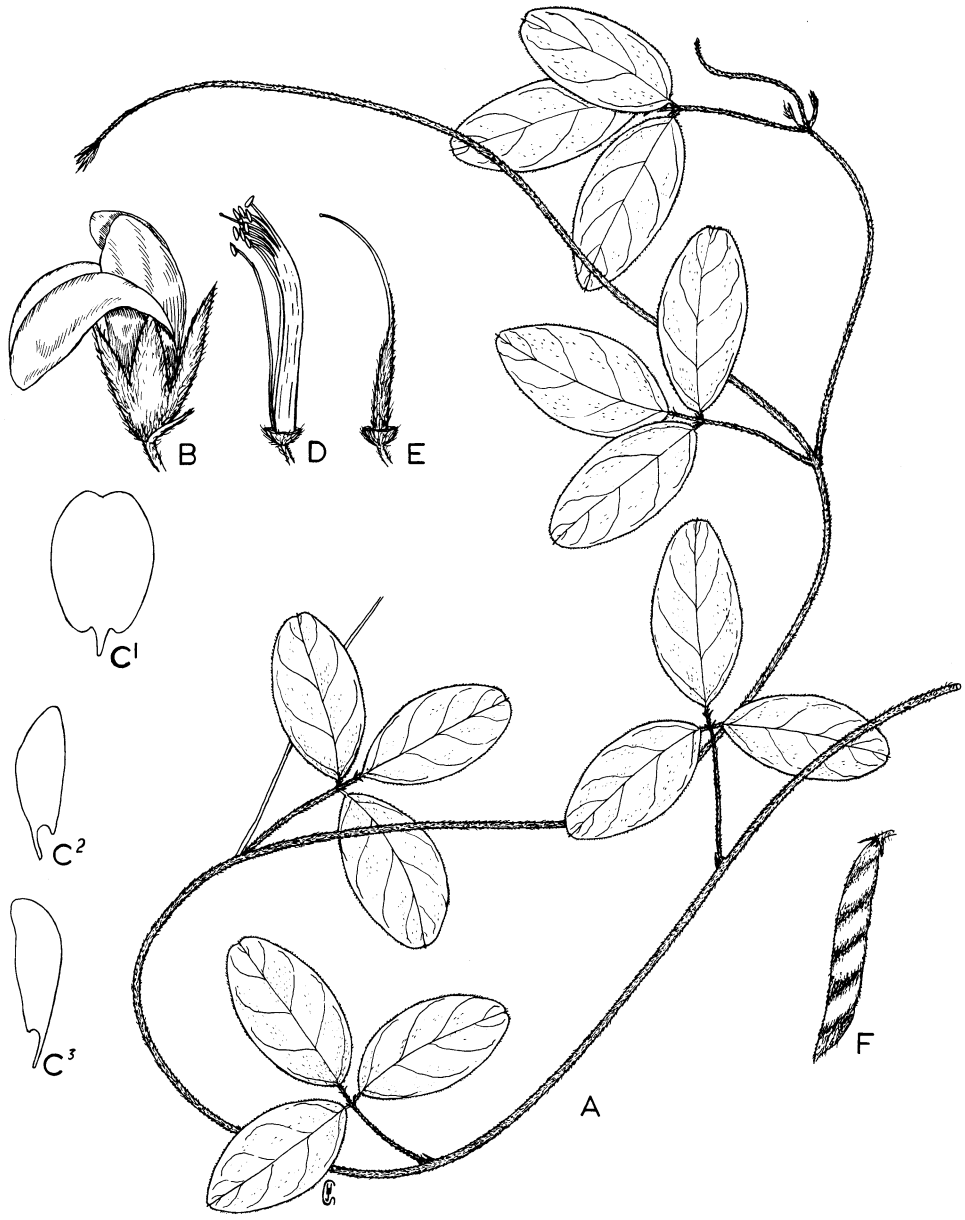

FIGURE 28. *Galactia striata* (Jacq.) Urban.—A. Habit (×½).—B. Flower (×2½).—C. Corolla.—C¹. Standard (×2).—C². Wing petal (×2).—C³. Keel petal (×2).—D. Stamens (×2½).—E. Pistil (×2½). [After *Dressler 1861.*]—F. Fruit (×½). [After *Gaumer 566.*]

long, dark brown and mottled, the hilum short, surrounded by the small light colored, usually caducous aril.

Galactia striata is common in disturbance in lowland Panama, and it ranges from the United States to Argentina and is naturalized in much of the palaeo-

tropics. The small but bright pink flowers are usually seen singly on fencerows and in thickets.

Several varieties have been distinguished in this species, but their identity and variability are not well understood. Much material from Africa and Central America has been known as *Galactia tenuiflora* or *G. striata* var. *tenuiflora*, but this may not represent a distinct taxon.

CANAL ZONE: Pipeline road, 1.2 mi NE of Gamboa gate, *Croat 12735* (MO, NY). Curundú, *D'Arcy 13428* (MO). Albrook Site, U.S. Army Tropic Test Center, *Dwyer 7118* (MO). 0.5 mi W of Summit, *McDaniel 12717* (FSU, MO). Río Agua Salud near Frijoles, *Piper 5149* (US). Red Tank to Pueblo Nuevo, *Piper 5166* (US), *5167* (MO). Cerro Gordo near Culebra, *Standley 26030* (US). Sosa Hill, Balboa, *Standley 26470* (US). Summit, *Standley 26939, 26956, 29617, 30057* (all US). Farfan Beach area, *Tyson 1805* (MO). Howard Air Force Base at Red Devil drop zone, *Tyson 1846* (MO). Curundú, *Tyson 6428* (FSU, MO, SCZ). CHIRIQUÍ: Veradero, 0–100 m, *Burt & Koster 124* (MO). 1 mi W of airport at Puerto Armuelles, sea level, *Croat 21913* (MO). Quebrada Quanabanao, Distrito Guanano, 0–100 m, *Croat 22507* (FSU, MO). DARIÉN: Punta Garachiné, *Duke 10484* (MO, NY). HERRERA: 10 mi S of Ocú, *Tyson et al. 2811* (MO, SCZ). LOS SANTOS: Monagre Beach 5 mi S of Chitré, *Tyson et al. 3009* (GH, MO). PANAMÁ: Without other locality, *Duchassaing 1850* (GH). Beach at Nueva Gorgona, *Duke 4559* (MO). Bella Vista, *Heriberto 227bis* (US); *Killip 12198* (US). San Jose Island, *Johnston 161, 1103* (both GH). San Jose Island, *Johnston 364* (GH, MO, US). Between Savanas and Río Yguana, *Macbride 2650* (F). Bella Vista, *Standley 25301* (US). Taboga Island, *Standley 27972* (US). Between Matías Hernández and Juan Díaz, *Standley 32009* (US). Playa Coronado, *Taylor 85, 186* (both PMA). SAN BLAS: Ailigandí River, *Duke & Bristan 330* (MO). VERAGUAS: Trail between Cañazas and foot of Cordillera Central, 300–600 m, *Allen 192* (US). Puerto Mutis, 12 mi S of Santiago, *Tyson 6002* (FSU, MO, SCZ).

26. GLIRICIDIA

Peter S. White[58]

Gliricidia H.B.K., Nov. Gen. Sp. Pl. 6: (ed. quarto) 393 in nota; (ed. folio) 309 in nota. 1824. TYPE: *Robinia sepium* Jacq. = *Gliricidia sepium* (Jacq.) Walp.

Glyciridia DC., Prodr. 2: 260. 1825. *Gliricidia* H.B.K. orth. mut.
Gliciridia Micheli, Bull. Herb. Boissier 2: 442, *tab. 10*. 1894. *Gliricidia* H.B.K. orth. mut.
Hybosema Harms, Feddes Repert. Spec. Nov. Regni Veg. 19: 66. 1923. TYPE: *H. ehrenbergii* (Schlecht.) Harms = *Gliricidia ehrenbergii* (Schlecht.) Rydb.

Shrubs or medium sized *trees*, unarmed. *Leaves* alternate, sometimes subopposite or opposite, but never exclusively so, odd pinnate; leaflets entire, often drying with purple mottling beneath; estipellate; stipules small, caducous. *Inflorescences* clustered racemes, axillary or cauline, appearing before or with the leaves; bracts inconspicuous, caducous, ebracteolate, pedicels present. *Flowers* often rose or rose tinged; hypanthium distinctively cup shaped, the calyx teeth short and broad or absent; petals 5, about the same length, free except the basally connate keel petals, short clawed, the standard nearly orbicular, erect or reflexed; stamens 10, diadelphous, the odd stamen free, the anthers all the same shape; ovary short stipitate, slender, straight, flattened, glabrous, the ovules several to 10 or more, the style glabrous, about ½ the length of the ovary, the stigma capitate. *Fruit* a dehiscent legume, stipitate, flattened, often wider toward the tip, the margin not or only slightly thickened, not septate and not or only faintly indented between the seeds on the outside, glabrous; the 2 valves hard and often coiling in dehiscence.

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Gliricidia is a genus of 6–9 species of Mexico, Central America, the West Indies, and northern South America. North temperate botanists often remark on its similarity to *Robinia* L. There is also a superficial resemblance to *Lonchocarpus* of the Dalbergieae. *Lonchocarpus* can be distinguished by its indehiscent fruits and the wing petals which are often adherent to the keel petals. *Gliricidia* leaves almost always dry mottled with purple beneath.

The name *Gliricidia* appears to have been taken from Jacquin's (1763) phrase "Glis vel Gliricida" for the common name "Raton vel Mata-Raton" referring to the use of the plant for mouse poison. In first referring to the plant in *Nova Genera et Species,* Kunth spelled the name "Gliricida," but in the footnote where he formally described the genus and in all subsequent usage, including the index to the *Nova Genera et Species,* he spelled the name "Gliricidia," so the spelling "Gliricida" must be taken as a typological variant which Kunth did not intend to use. Cowan's (1959) argument (Taxon 8: 59) that "Gliricida," being more etymologically correct and should be used, is not supported. In Kunth's *Synopsis Plantarum* (1826), published two years after *Nova Genera et Species,* only the spelling "Gliricidia" appears.

Kunth described the genus in a footnote pertaining to *Robinia maculata* H.B.K. (=*R. sepium* Jacq.) and it might be argued that that species should be recognized as the type of the genus. However, Kunth was citing the relationship of *Robinia maculata* H.B.K. to *R. sepium* Jacq. and was referring to the latter in his description.

Literature:

Blohm, H. 1962. Poisonous plants of Venezuela. Stuttgart.

Cowan, R. S. 1959. Leguminosae of the Western Hemisphere. Notes on choices of lectotypes. Taxon 8: 58–60.

Kunth, C. S. 1826. Voyage aux régions équinoctiales du Nouveau Continent, fait en 1799–1804, partie 6. Botanique, sect. 5. Synopsis plantarum. Paris.

Walpers, W. G. 1842. Repertorium botanices systematicae. Leipzig. 1: 679.

1. **Gliricidia sepium** (Jacq.) Walp., Repert. Bot. Syst. 1: 679. 1842.—FIG. 29.

Robinia sepium Jacq., Enum. Pl. Carib. 28. 1760; Sel. Stirp. Amer. 1: 211, 2: *tab. 179, fig. 101.* 1763. TYPE: Colombia, *Jacquin,* not seen. non *Robinia sepium* Sw. (1788).

R. maculata H.B.K., Nov. Gen. Sp. Pl. 6: (ed. quarto) 393, (ed. folio) 309. 1824. TYPE: Mexico, *Humboldt & Bonpland* (P, not seen; microfiche MO).

Lonchocarpus sepium (Jacq.) DC., Prodr. 2: 260. 1825.

L. maculatus (H.B.K.) DC., Prodr. 2: 260. 1825.

Galedupa pungam Blanco, Fl. Filip. (Ed. 1) 558. 1837. TYPE: Philippines, *Blanco,* not seen.

Robinia variegata Schlecht., Linnaea 12: 301. 1838. TYPE: Mexico, *Schiede,* not seen.

Gliricidia maculata (H.B.K.) Walp., Repert. Bot. Syst. 1: 679. 1842.

Millettia luzonensis A. Gray, U.S. Expl. Exped., Bot. 1: 456. 1854. TYPE: Philippines, collector unknown, collection not located.

Gliricidia maculata var. *multijuga* Micheli in Donell Smith, Bot. Gaz. 28: 284. 1895. TYPE: Guatemala, *Hyde & Lux,* D. Smith distrib. no 3296 (US, isotype).

Gliricidia lambii Fern., Bot. Gaz. 20: 533. 1895. TYPE: Mexico, *Lamb 451* (NY, holotype; isotype, GH).

Gliricidia sepium f. *maculata* (H.B.K.) Urb., Symb. Ant. 2: 289. 1900.

Robinia hispida L., Mant. Pl. 101. 1767. pro parte, exclus. type (LINN 913.2, not seen; microfiche MO).

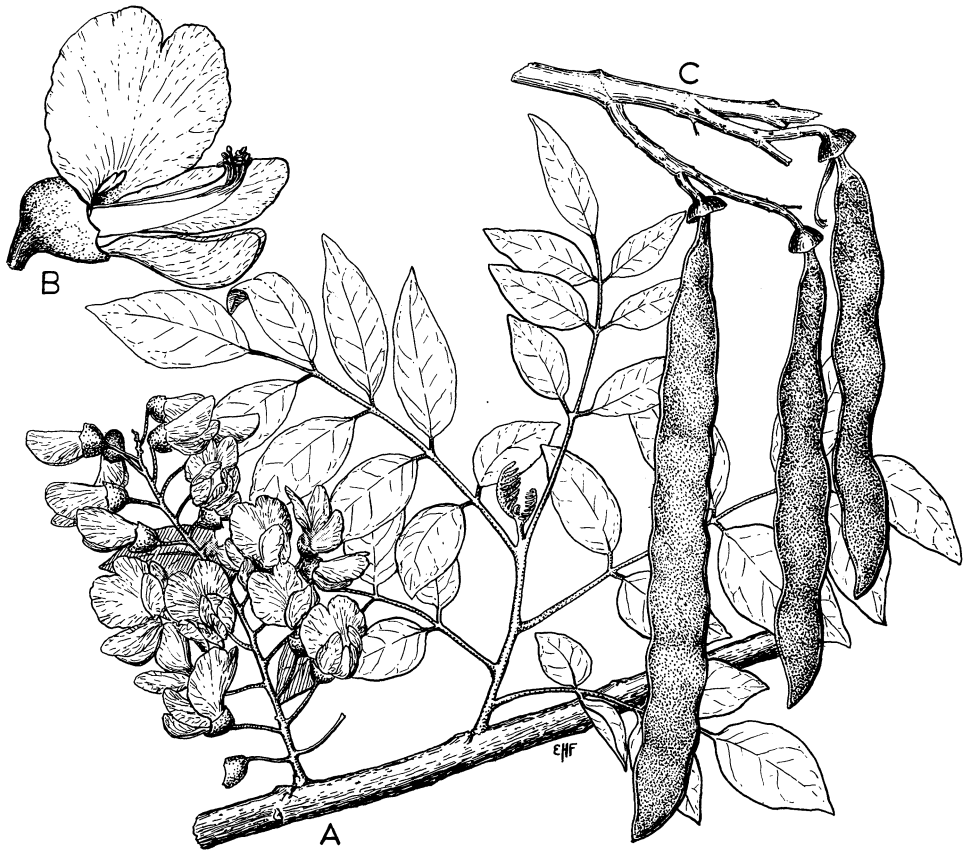

FIGURE 29. *Gliricidia sepium* (Jacq.) Walp.—A. Habit (×½).—B. Flower with one wing petal removed (×1½).—C. Fruit (×½).

Gliricidia sepium (Jacq.) Steud., Nom. Bot., ed. 2, 1: 688. 1840. comb. not valid.
G. maculata (H.B.K.) Steud., Nom. Bot., ed. 2, 1: 688. 1840. comb. not valid.
G. sepium (Jacq.) Griseb., Abh. Königl. Ges. Wiss. Göttingen 7: 52. 1857. Redundant combination.

Trees to 10 m tall with spreading crowns. *Leaves* usually alternate, subopposite or opposite, to ca. 30 cm long; leaflets 5–19, the lateral leaflets mostly opposite, oval to elliptic, 2–7 cm long, 1–3 cm wide, usually glabrous above, sparsely pubescent and lighter beneath, nearly always purple mottled beneath when dry; rachis and petiole lightly to evenly pubescent, petiolules pubescent; stipules minute, caducous. *Inflorescences* conspicuous, preceding the leaves; racemes clustered from branches or older wood and hence the inflorescence appearing compound; individual racemes 4–15 cm long, the flowers borne singly, uniformly distributed along the axis; bracts minute, soon deciduous. *Flowers* pink and lilac to white, the petals usually tinged with yellow toward the base; pedicels 5–10 mm; hypanthium cup shaped, ca. 5 mm long, the calyx teeth low to absent; standard nearly round, erect, ca. 20 mm long, 15–20 mm wide, emarginate, the claw slender, to 5 mm long, the wings oblong, ca. 20 mm long, 5 mm wide, the keel petals ca. 18 mm long, ca. 5 mm wide, coherent at the base;

stamens diadelphous, the tube ca. 12 mm long, 3 mm wide at the base, free filaments alternately long and short; ovary linear, ca. 1 cm long, 1 mm wide, glabrous, the stipe to 5 mm long, the style to ca. 4 mm long, the stigma capitate. *Fruit* light to dark brown, narrow, oblong, ca. 15 cm long, 2 cm wide, the stipe to 1 cm above the persistent cup shaped calyx, margined, surface dull, glabrous, faintly wrinkled or striate; the valves hard, twisting in dehiscence; seeds 3–10, dark brown, nearly round to somewhat oblong, compressed, to 1 cm long.

Gliricidia sepium is native from Mexico to Colombia and in the West Indies. It is also widely cultivated in the New World and was early introduced into the Old World tropics where it has become naturalized, at least in some areas, e.g., the Philippines. It is used as a living fencepost, for hedges, and as a shade tree for cocoa and coffee, although it is less suited to the latter crop since it is leafless for part of the year. The ground bark, leaves, and seeds are used for poisoning rats and mice. The plant is reported to be poisonous to dogs and horses, but cows and goats apparently graze the leaves with no harm (Blohm, 1962). Poultices of the fresh leaves are used to treat skin afflictions. In parts of Central America the flowers are fried and eaten. The species is apparently especially common in the woods and pastures of the Pacific plains in Central America. Common names in Panama are "mata-ratón," and "madre de cacao." (For additional common names and other notes see Standley, 1928.)

In describing the genus *Gliricidia,* Kunth stated that it included *Robinia sepium* Jacq. and *R. maculata* H.B.K., but Kunth did not make the combinations in *Gliricidia*. Steudel's 1840 citation is invalid since he used the names as synonyms of *Lonchocarpus sepium* and *L. maculatus*. Walpers (1842) made valid combinations under *Gliricidia*.

The specific epithet "sepium" is apparently derived from the Latin "saepes" (genitive plural "saepium" or "sepium") meaning "of hedges," which is appropriate since the tree is widely planted as living fenceposts. Thus the epithet does not change in form with gender and the usage in Index Kewensis, Suppl. 13, as "*Robinia sepia*" is in error.

BOCAS DEL TORO: Almirante, *Blum 1349* (FSU, MO, SCZ); *Carleton 155* (US). Almirante, *Cooper 528* (F). Along runway at Bocas, *Lazor et al. 2338* (FSU). Bocas del Toro Island airport, *Lewis et al. 779* (MO). Isla Colón, 0–120 m, *Wedel 505* (GH, MO). Chiriquí Lagoon, *Wedel 1198* (GH, MO, US). Water Valley, *Wedel 2747* (GH, MO, US). CANAL ZONE: Near mouth of Río Chagres, *Allen 871* (F, GH, MO). Near Paraíso, *Croat 13953* (MO). Banks of the Chagres River, below Gatún, near sea level, *Maxon 4838* (US). Ancón, *Piper 5133* (US). Summit Road, *Stern & Chambers 157* (MO, NY, US). Road from Macaracas to Chitré Highway, *Tyson et al. 3151* (MO). Fort Sherman, *Tyson & Blum 3781* (MO). Summit, roadside, *Woodworth & Vestal 477* (F, GH). CHIRIQUÍ: 1.6 mi W of Puerto Armuelles, 50 m, *Croat 21927* (DUKE, left-hand specimen; MO, right-hand specimen). Boquete, 3300–4200 ft, *Lewis et al. 393* (MO). 2 km NE of Remedios, 15 m, *Nee 10124* (MO, US, WIS). COLÓN: Puerto Pilón, *Correa & Dressler 1191* (DUKE). Penonomé, 50–1000 ft, *Williams 341* (NY). DARIÉN: El Real along trail to Río Pirre, *Stern et al. 289* (GH, MO, US). HERRERA: Paris de Parita, *Carrasquilla 173* (DUKE, MO). Outskirts of Chitré, *Stern et al. 1230* (GH, MO, US). Las Minas, along Río Las Trancas, *Stern et al. 33625* (MO). 4 mi S of Los Pozos, *Tyson 2701* (FSU, MO, US). 5 mi S of Pesé, *Tyson et al. 2886* (MO, SCZ). LOS SANTOS: El Ejido de Los Santos, *Lao 88* (DUKE, MO). Road from Macaracas to Chitré Highway, *Tyson et al. 3151* (FSU, SCZ). PANAMÁ: Panama Viejo, *Dodge 17517* (GH, MO). Taboga Island, *Dwyer 2812* (FSU), *2872, 4467* (both MO). Bellevista, *MacBride 2759* (F, US). Taboguilla Island, *Miller 1983* (US). Roadside between Chepo and Río Bayano, *Porter et al. 5176* (MO, SCZ). Taboga Island, *Standley 27076, 27857* (both US). SAN BLAS: *Duke 10179* (MO, OS). VERAGUAS: Santiago, *Allen 1077* (MO). Soná, *Allen 4261* (MO, US). Cañazas, *Tyson 3608, 3626* (both MO). 2 mi S of Cañazas, *Tyson 3723* (FSU, MO, SCZ).

27. INDIGOFERA

Peter S. White[59]

Indigofera L.,[60] Sp. Pl. 751. 1753; Gen. Pl., (ed. 5) 333. 1754. LECTOTYPE: *Indigofera tinctoria* L. (India).

Anil Mill., Gard. Dict. Abr., ed. 4. 1754. TYPE: *Anil, sive Indigo Americana, siliquis . . .* Mill. = *Indigofera tinctoria* L.
Anil(a) Kuntze, Rev. Gen. Pl. 1: 159. 2: 938, 965. 1891. Based on *Indigofera* L.

Herbs or *shrubs*; more or less strigose with pale appressed hairs attached by their centers, these hairs often lending a gray green appearance to the plant. *Leaves* imparipinnate or pinnately or digitately 3-foliolate, less commonly simple; usually short-petioled; leaflets entire, venation, except for the midvein, obscure; stipels present, often inconspicuous; stipules setaceous, deciduous, apparently slightly adnate to the petioles. *Inflorescence* of axillary racemes or spikes, often dense, pedicels short or apparently absent, the flowers single in the axil of a caducous bract, the bracteoles absent. *Flowers* usually reddish or white, the hypanthium campanulate, the 5 calyx lobes subequal, corolla more or less pubescent outside, the standard broad, circular, subsessile, strigose outside, the wing petals oblong, somewhat adherent to the keel, auriculate, the keel petals coherent, laterally spurred; stamens 10, diadelphous, the vexillary stamen free, the sheath slender, the anthers with an apical projection; ovary slender, sessile, few to many ovulate, usually strigose, the style short, bent upward, glabrous, the stigma capitate. *Fruits* oblong or linear, rarely globose, curved or straight, usually terete or 4-angled, not usually compressed, dehiscent or apparently indehiscent, septate between the seeds; seeds globose to cylindric and truncate, compressed or 4-angled, attached at the middle.

Indigofera is a genus of some 800 species in the warmer to tropical regions of both the New and Old Worlds and is particularly diverse in Africa. About 10 species occur in Central America, of which 4 are native in Panama. The Old World species *Indigofera tinctoria* L., formerly in cultivation in Central America, is perhaps to be looked for in Panama as persistent on old sites of cultivation. It has become naturalized in the West Indies (Rydberg, 1923) but apparently has not spread much from cultivation in Central America (Standley and Steyermark, 1946). *Indigofera tinctoria* L. resembles *I. suffruticosa* Mill. (described below) but has pods straight or slightly curved, 6–12 seeded, and 2–4 cm long.

The 4 species in Panama, weeds in the dry zones of the country, are easily recognized due to their gray green cast which results from pale, appressed, medifixed hairs. Additional unusual characters are the appendaged anthers and septate legumes. There is a tendency for *Indigofera* species to darken on drying. The flowers are "slightly explosive," the stamens and pistil being under some tension within the keel petals and springing outward when the petals are parted.

Indigofera was formerly economically important as the source of the blue dye indigo. Before the cultivation of coffee, this was the most important export crop

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[60] For additional generic synonymy see Hutchinson, 1967.

of Central America. Indigo is no longer extracted from the plant, synthetic dyes having supplanted the natural source. The final decline of the industry was probably in the mid- to late 1800's. The extraction procedure exposed workers to toxic chemicals (Standley, 1928). Cut plants were fermented in vats of water, after which they were trampled by the workers. Eventually the indigo settled to the bottom of the vats as a precipitate (Standley, 1928; Standley and Steyermark, 1946; see also colorful accounts in Miller, 1768, and Lunan, 1814, and also the references cited in Taylor, 1976). The most important species for indigo manufacture in Central America were the native *Indigofera suffruticosa* and the introduced *I. tinctoria*.

Indigofera species apparently contain compounds with medicinal properties (Blohm, 1962; Standley and Steyermark, 1946), but medicines prepared from the plants can also have poisonous effects (Blohm, 1962). The seeds of several species are said to be poisonous. In Brazil, the roots of *Indigofera lespedezioides* H.B.K. and *I. suffruticosa* were used as fish poisons; the macerated roots were also used as an insecticide (Miller, 1768; Lunan, 1814; Blohm, 1962).

Literature:

Blohm, H. 1962. Poisonous plants of Venezuela. Stuttgart.
Lunan, J. 1814. Hortus jamaicensis. Vol. 1. Jamaica. 538 pp.
Miller, P. 1768. Gardener's Dictionary, edition 8.

a. Leaflets 7–19, the fruits either strongly constricted between the seeds or strongly curved.
  b. Fruits straight or slightly curved and strongly constricted between the seeds ---------- 3. *I. panamensis*
  bb. Fruits strongly curved, not constricted between the seeds ---------- 4. *I. suffruticosa*
aa. Leaflets 1–7, the fruits neither strongly constricted between the seeds nor strongly curved.
  c. Erect plant, leaves 1–5(–7) foliolate, the leaflets ascending, widest toward tip, cuneate at base, fruits 12–20 mm long ---------- 2. *I. lespedezioides*
  cc. Sprawling or suberect plant, leaves 5(–7) foliolate, the leaflets not ascending, widest near the middle, rounded at base, fruits (20–)25–35 mm long ---------- 1. *I. jamaicensis*

1. **Indigofera jamaicensis** Spreng., Syst. Veg., (ed. 16) 3: 277. 1826. TYPE: Jamaica, *Bertero* (?TO, not seen).—FIG. 30A–C.

I. flaccida Koenig ex Roxb., Hort. Beng. 98. 1814 (without description); *In* W. Carey, ed., Fl. Indica, (ed. 2) 3: 375. 1832. TYPE: India, not seen. (fide Rydberg 1923.)

I. mucronata Spreng. ex DC., Prodr. 2: 227. 1825. TYPE: Jamaica, *Bertero* (TO, not seen); probably the same collection as cited for *I. jamaicensis* Spreng. Non *Indigofera mucronata* Lam., Encycl. Méth. Bot. 3: 247. 1789. TYPE: South Africa (P-JU, not seen; microfiche MO) = *Indigofera cytisoides* L., Mant. 2: 271, in nota. 1771. Nor *Indigofera mucronata* Willd. ex Spreng., Syst. Veg., (ed. 16) 3: 276. 1826. in syn. = *Indigofera lespedezioides* H.B.K., Nov. Gen. Sp. Pl. 6: 457, (ed. quarto). 1824. An *Indigofera mucronata* Sesse & Moc., Fl. Mex., (ed. 1) 189, 190. 1887, (ed. 2) 173, 174. 1894. TYPE: Mexico, not seen.

I. lespedezioides sensu Hook. & Arn., Bot. Beech. Voy. 415. 1840. Non *Indigofera lespedezioides* H.B.K., Nov. Gen. Sp. Pl. 6: 457, (ed. quarto). 1824.

I. heterophylla Presl., Abh. Böhm. Ges. Wiss. 3: 485. 1844. Bot. Bemerk. 55. 1844. TYPE: Mexico, not seen. (fide Rydberg 1923.) Not *Indigofera heterophylla* Thunb., Prodr. Pl. Cap. 133. 1800. TYPE: South Africa, not seen. Nor *Indigofera heterophylla* Roxb. ex Wight & Arn., Prodr. 200, 201. 1834. TYPE: India, not seen.

I. subulata sensu Griseb., Fl. Brit. W.I. 181. 1859, et alia auct. Non *Indigofera subulata* Vahl. ex Poir., Encycl. Suppl. 3: 150. 1813. TYPE: Guinea (P-JU, not seen; microfiche MO).

I. tephrosioides sensu Micheli, Bull. Soc. Roy. Bot. Belgique 30: 286. 1891. Non *Indigofera tephro-*

FIGURE 30. *Indigofera*.—A–C. *Indigofera jamaicensis* Spreng.—A. Habit (×¾).—B. Flower (×3¾).—C. Flower with corolla removed (×6).—D–E. *Indigofera suffruticosa* Mill.—D. Leaf (×1½).—F. Fruit (×1½).

sioides H.B.K., Nov. Gen. Sp. Pl. 6: 455, (ed. quarto). *tab. 580.* 1824. TYPE: Ecuador (B, not seen; photo MO).

I. macilenta Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 26. 1940. TYPE: Mexico, *Gentry 2335* (holotype F; isotypes GH, MO, US).

Perennial *herbs* or *shrubs,* trailing, sprawling, or suberect, the branches ridged in narrow lines from the nodes when young, strigose to glabrate. *Leaves* 5(–7) foliolate; leaflets broadly elliptic to ovate, when mature ca. 18–25 mm long, 8–12 mm wide, rounded apically, mucronate, rounded basally, strigose, the petiolules ca. 1.0–1.2 mm long; petioles ca. 15–18 mm long; rachis 2–3 cm long; stipels apparently absent, perhaps represented by tufts of brown hairs at the rachis nodes; stipules setaceous, ca. 2 mm long. *Inflorescence* of relatively lax and open axillary racemes 6–12 or more cm long, in fruit (8–)15(–18) cm long, nodes ca. 40, not all bearing mature flowers or fruits; flowering pedicels ca. 1 mm long; fruiting pedicels recurved, ca. 1.5 mm long; bracts narrowly triangular, 1 mm long. *Flowers* reddish, 5–6 mm long, the hypanthium cup broadly campanulate, ca. 1.5 mm long, the 5 subequal teeth triangular tapering acuminately to bristlelike tips, 2 mm long; petals subequal, the standard obovate with cuneate base, ca. 5 mm long, 3–4 mm wide, with scattered hairs outside, the wings 4.5 mm long, the blade oblong elliptic, narrower basal part ca. 2 mm long, auriculate, the keel petals fused, obovate, 5 mm long, narrowed to free cuneate bases ca. 1.5 mm long; staminal sheath ca. 3 mm long, the anthers ca. 0.5 mm long; ovary linear, ca. 3 mm long, the style upcurved, 1 mm long, the stigma capitate. *Fruits* linear, straight or slightly curved, (20–)25–35 mm long, angled, not narrowed above the remnants of the calyx, strigose, strongly reflexed on recurved pedicels, 12–15-seeded; seeds oblong to subreniform, ca. 2 mm long, 0.8 mm wide, light brown, smooth, dull.

Indigofera jamaicensis Spreng. is found from southern Mexico to Colombia and Venezuela and also in the West Indies. It has been introduced and is apparently established in parts of the Old World tropics. It is a weedy plant, low or suberect and apparently often leaning on or clambering over other plants. It is common in the drier parts of Central America. It is called "anilillo" in Mexico and Guatemala (Standley & Steyermark, 1946).

The names *Indigofera mucronata* Spreng. ex DC. and *I. subulata* Vahl ex Poir. have both been much in use for this species, while the name *I. jamaicensis* Spreng. has been ignored. In publishing *Indigofera mucronata* in 1825, de Candolle attributed the name to "Spreng. in Herb. Balb." Following the description, he indicated the collector (Bertero) and the type locale (Jamaica). De Candolle apparently was unaware of the earlier *I. mucronata* Lamarck (1789) for a South African plant not resembling the New World plant in question. In the year after de Candolle's publication, Sprengel seems to have recognized this problem. He cited *Indigofera mucronata* Lam. as a synonym of *I. cytisoides* L. and published a new name, *Indigofera jamaicensis* Spreng., for the Bertero collection from Jamaica. His description is close to that of *I. mucronata* Spreng. ex DC., and it is likely that they are based on the same collection.

Indigofera subulata Vahl ex Poir. (1813) has also been widely used for this species. It is based on a plant from Guinea described as having 1–3-foliolate leaves. A collection in P-JU (microfiche, MO) bearing the legend "*Indigofera*

subulata Vahl. Guinea. 1804" would seem to be the type. It is predominantly 3-foliolate and is clearly not the New World plant under consideration here. In de Candolle's text under *Indigofera subulata* Vahl ex Poir. he dropped Poiret's reference to unifoliolate leaves and cited "*Indigofera mucronata* Spreng.," although several pages later he described a separate *I. mucronata* Spreng. ex DC. Similarly, under the description of *I. mucronata* Spreng. ex DC., he states "Valde accedit ad *I. subulatum* sed folia bi nec unijuga." This relating of an Old and New World plant and de Candolle's ignorance of *I. mucronata* Lam. would seem to be the source of the confusion.

BOCAS DEL TORO: Almirante, *Barrus 405* (GH). Changuinola to 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 819* (GH, MO). CANAL ZONE: Corozal to Pedro Miguel, *Cowell 396* (NY). Road to Radar Station, 1 mi N of Summit Garden, *Croat 12651* (MO, NY). Summit Naval Radio Station, *Croat 14242* (MO). Telephone trail between Río Indio Hydrographic Station and natural bridge of Río Puente, *Dodge & Allen 17476* (GH, MO). Fort Kobbe, *Dwyer 3029A* (MO). Near Fort Clayton, *Greenman & Greenman 5186* (DUKE, MO). Camino de Corozal, *Heriberto 275* (NY, US). Las Cruces Trail, 75 m, *Hunter & Allen 741* (MO). Frijoles railroad tracks, *Killip 3372* (NY, US). 2 mi N of Paraíso on road to Colon, *Lazor & Blum 5322* (FSU). Madden Dam, 50 ft, *Lewis et al. 26* (GH, MO, US). La Boca, *Mori & Kallunki 3682* (MO). Chiva-Chiva Trail, red tank to Pueblo Nuevo, *Piper 5108* (US). Gamboa, *Piper 5115* (US). Empire to Mandinga, *Piper 5135* (US). Río Grande near Culebra, 50–100 m, *Pittier 2113* (NY, US). Gamboa, 20–100 m, *Pittier 4786* (NY, US). Donato Trail, Barro Colorado Island, *Shattuck 562* (MO). Las Cascadas Plantation, near Summit, *Standley 25770* (US). Frijoles, *Standley 27639* (US). Gamboa, *Standley 28356* (US). Obispo, *Standley 31779* (US). 1 mi N of Summit Garden, *Tyson & Blum 1989* (DUKE, MO, SCZ). 1 mi N of Summit on road to FAA radar tower, *Tyson et al. 2753, 2759* (both MO). Fort San Lorenzo, *Tyson & Blum 3691* (FSU, MO). Albrook Air Force Base, E end of air strip, *Tyson & Lazor 6014* (FSU). Curundú, *Tyson & Lazor 6112* (FSU). CHIRIQUÍ: Frontera, 100–200 m, *Burt & Koster 146* (MO). Rabo de Puerco, 150 m, *Busey 448* (MO). Boquete, *Davidson 795* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 249* (MO). Monte Verde, 80 m, *Liesner 21* (MO). Quebrada Melliza, 0–150 m, *Liesner 497* (MO). COCLÉ: El Valle, 582 m, *Burt & Rattray 33* (MO). COLON: Juan Mina plantation, Río Chagres above Gamboa, 25 m, *Allen 4116* (MO). 4 km E of Buena Vista, 3 km N of cement plant, road to Sardinilla, 85 m, *Nee 7793* (MO). DARIÉN: *MacBride 2705* (F, MO, US). HERRERA: 10 mi S of Ocú, *Tyson et al.* (MO, SCZ). ½ mi N of Macaracas on Río La Villa, *Tyson et al. 3141* (MO, SCZ). LOS SANTOS: Chitré-Las Tablas, 0–100 m, *Burt & Rattray 51* (MO). Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2981* (MO). Between Tonosí and Macaracas, *Oliver et al. 3540* (MO). 12 mi S of Macaracas, *Tyson et al. 2928* (MO, SCZ). PANAMÁ: Road to El Valle close to Interamericano, 0–100 m, *Burt & Rattray 37* (MO). Bayano Dam, *D'Arcy 9424* (MO). Airstrip near beach, Panama City, *Duke 4007* (MO). El Llano, *Duke 5855* (MO). Río Pacora just below confluence with Río Corso, *Duke 12020* (MO). Río Pasiga, *Gentry 2379* (MO). 1 mi N of Goofy Lake, *Oliver et al. 2685* (MO). Agricultural Experiment Station at Matías Hernández, *Pittier 6895* (GH, NY). Matías Hernández, *Sosa* (F). Bella Vista, *Standley 25330* (US). Corozal Road near Panamá, *Standley 26818* (US). Cerro Azul, 2000 ft, *Tyson 2058* (MO, SCZ), *2133* (MO), *2143* (FSU, MO, SCZ). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 72* (MO). Atalaya-Santiago, 100–200 m, *Koster 115* (MO). Puerto Mutis, 12 mi S of Santiago, *Tyson 6012* (FSU, SCZ).

2. **Indigofera lespedezioides** H.B.K., Nov. Gen. Sp. Pl. 6: 457 (ed. quarto). 1824. TYPE: Mexico (P, not seen; microfiche, MO).

I. grisea Desv., Ann. Sci. Nat. (Paris) 9: 410. 1826. TYPE: "Hab. in Para.," (?P, ?PC, not seen).

I. humboldtiana Spreng., Syst. Veg. (ed. 16) 3: 276. 1826. TYPE: Mexico (holotype, P, not seen; microfiche, MO; paratype, B, not seen; microfiche, MO).

I. mucronata Willd. ex Spreng., in syn., Syst. Veg. (ed. 16) 3: 276. 1826. Non *Indigofera mucronata* Lam., Encycl. Méth. Bot. 3: 247. 1789. Nor *Indigofera mucronata* Spreng. ex DC., Prodr. 2: 227. 1825. An *Indigofera mucronata* Sesse & Moc., Fl. Mex. (ed. 1) 189, 190. 1887. (ed. 2) 173, 174. 1894.

I. pascuorum Benth., Ann. Nat. Hist. Ser. 1. 3: 431. 1839. TYPE: British Guiana, *Schomburgk 96* (G, not seen; photo, MO).

I. pohliana Benth., Ann. Nat. Hist. Ser. 1. 3: 431. 1839. TYPE: Brazil, *Pohl* (PR, not seen).

Anila lespedezioides (H.B.K.) Kuntze, Rev. Gen. Pl. 160. 1891.

Indigofera acasonicae Brandegee, Univ. Calif. Publ. Bot. 7: 326. 1920. TYPE: Mexico, *Purpus 8510* (holotype, UC, not seen; isotypes, GH, MO).

Perennial *herbs* or *shrubs*, stems not much branched, at least above, stiffly erect, appressed strigose, ridged in narrow lines from the nodes when young, later terete, base stout and woody, the whole plant strigose. *Leaves* ascending, (1–)3–5(–7) foliolate, typically simple below and compound above; leaflets cuneate at the base, widest toward the tip, mucronate, the largest simple leaflets to 28 mm long, 8 mm wide, other leaflets averaging 20 mm long, 6 mm wide, the smallest 10 mm long, 1.8 mm wide; petiolules to 1 mm long; petioles 1–3 mm long, rachis 3–15 mm long, stipels setaceous, inconspicuous, less than 1 mm long, stipules narrow triangular, acuminate, ca. 3 mm long. *Inflorescence* of axillary racemes, as long as or longer than the leaves when in full bloom or fruit, the axis to 4 cm long, the nodes 10–30, not all bearing mature flowers or fruits; pedicels single in the axils of narrow triangular caducous bracts, pubescent; bracts to 3 mm long. *Flowers* with pink or ?yellow corolla, 4–6 mm long, the hypanthium 2–3 mm long including the triangular teeth, campanulate, pubescent, teeth about equal to the cup, the lower longer than the upper; standard circular, ca. 5 mm long, short clawed, the wing petals oblong, ca. 5 mm long, to 1.5 mm wide, the claw about equal to the blade, the keel petals narrowly oblong, ca. 5 mm long, to 1.5 mm wide, the staminal sheath linear; pistil linear, pubescent, the style 2–3 mm long, the stigma capitate. *Fruits* reflexed, linear, 12–20 mm long, 1.7–2.0 mm wide, beaked with persistent style base 1 mm long, 2-valved, the valves only slightly twisted on dehiscence, pubescent outside, septate within, 7–10 seeded, the calyx remnants persistent at the base, nonstipitate, fruiting pedicels 1–2 mm long; seeds oblong or subreniform, 1.5 mm long, dull brown, smooth.

Indigofera lespedezioides is found from southern Mexico southward to Bolivia and Brazil and also in the Greater Antilles. The plant is distinctive among Panamanian species because of its leaves, the lower ones unifoliolate, and all leaflets ascending, short petiolate, and widest toward the tip, and its short, straight legumes which are usually densely pubescent.

The original description of this species fails to mention the occurrence of unifoliolate and trifoliolate leaves that are so distinctive and conspicuous on Panamanian collections. This is perhaps explained by the fact that the type collection (P; microfiche, MO) appears to be the upper ½ of a stem, the unifoliolate and trifoliolate leaves being more common in this species on the lower parts of the stem. However, there are some flowering and fruiting collections from Panama which have unifoliolate leaves to at least the base of the inflorescence. A fruiting collection in the Willdenow Herbarium (B, not seen; microfiche, MO) is clearly conspecific with the Panamanian material. This is one of two sheets cited by Sprengel in his description of *Indigofera humboldtiana* Spreng. (=*Indigofera lespedezioides* H.B.K.), the other being the type of *I. lespedezioides* itself. This strengthens the case for using the name *I. lespedezioides* for the Panamanian material.

CANAL ZONE: Las Cruces Trail, between Fort Clayton and Corozal, *Standley 29187* (US). Las Sabanas, *Zetek* (MO). CHIRIQUÍ: Boquete, 4000 ft, *Davidson 748* (F, GH, MO, US). COCLÉ: E of Río Teta and Interamerican Highway, *Blum & Tyson 1880* (SCZ). Near Santa Clara Beach, *Croat 9602* (MO). 4–6 mi E of Natá, 10–25 m, *Duke 12391* (MO). Penonomé, *Ebinger 1027* (MO). Picacho de

Olá, 350–600 m, *Pittier 5067* (NY, US). Between Penomomé and Coclé, *Stern et al. 980* (MO). Penonomé, 50–1000 ft, *Williams 604* (NY, US). HERRERA: Near Chupampa, 0–100 m, *Burt & Koster 85* (MO). PANAMÁ: Pacora, 35 m, *Allen 1000* (MO, US). Chepo, 0–100 m, *Burt & Rattray 15* (MO). Pacora, 0–100 m, *Burt & Rattray 20* (MO). Río Pacora, Chepo Highway, *Duke 5907* (MO). Río Mar, 5–20 m, *Duke 12420* (MO, NY). Las Sabanas, *Heriberto 139* (NY); *Standley 25929* (MO, US). Between Las Sabanas and Matías Hernández, *Standley 31854* (US). 1.5 km del Río Cabra, camino a Chepo, *Taylor* (DUKE, F, MO). Pacora, 25 m, *Woodson et al. 732* (GH, MO, US). Between Pacora and Chepo, ca. 25 m, *Woodson et al. 1664* (GH, MO, NY, US).

3. **Indigofera panamensis** Rydb., N. Amer. Flora 24: 147. 1923. TYPE: Panama, *Williams 123* (NY).

Shrub to 2.5 m, much branched, the stems ascending, slender, slightly lined from the nodes when young, later terete, whole plant strigose with appressed medifixed hairs. *Leaves* (7–)11–15(–19) foliolate, leaflets narrowly elliptic to obovate, rounded at the apex, mucronate, rounded or broadly cuneate at the base, lowermost leaflets smaller than the terminal ones, 10 mm long, 3 mm wide, the largest leaflets 24 mm long, 8 mm wide, the middle leaflets typically ca. 15–17 mm long, 5–7 mm wide, strigose, greener and less densely hairy above; petiolule 1.5 mm long, the petiole 5–10 mm long, the rachis 3.0–4.5(–6.0) cm long; stipels setaceous, inconspicuous, 0.5–0.75 mm long; stipules setaceous, inconspicuous, ca. 1 mm long. *Inflorescences* of dense axillary racemes ca. 4 cm long, to 5 cm long in fruit, thus shorter than the largest mature leaves, the nodes ca. 40–70 but not all with mature flowers or fruits; pedicels single, ca. 1 mm long, recurved in fruit; bracts small, inconspicuous, setaceous, barely 1 mm long, early deciduous. *Flowers* dull red, ca. 5 mm long, the hypanthium campanulate, ca. 1.25 mm long, the 5 teeth subequal, triangular, ca. 0.5 mm long, strigose; petals subequal, the standard obovate, narrowed to cuneate base, 4.5 mm long, hairy outside, the wing petals with blade narrow elliptic, ca. 3.5 mm long, tapered to the claw, ca. 1.0–1.5 mm long, auriculate at the base, the keel petals fused above, obovate, ca. 4 mm long, narrowed to the free clawed bases; staminal sheath ca. 2 mm long, the anthers ca. 0.5–0.75 mm long; pistil ca. 3.5 mm long, scattered hairy, ovary linear, the style upcurved, ca. 1 mm long; stigma capitate. *Fruits* straight or slightly curved, 15–20 mm long, strongly constricted between the seeds, ca. 1 mm wide between the seeds, 2 mm wide at the seeds, tapering to a slender beak 1–2(–3) mm long, tapering basally to a narrowed portion 1–2 mm long above the persistent remnants of the calyx cup, (2–)3–4 seeded; seeds oblong to subreniform, 2–3 mm long, 1.0–1.5 mm wide, smooth, dull, brown.

Indigofera panamensis Rydb. is endemic to Panama where it is known from three provinces on the Pacific side of the country. It is found primarily in dry to moist climatic areas in fairly open vegetation such as forest edges, roadside disturbed areas, and brushy slopes. This species is readily recognized when in fruit: the fruits are 3–4 seeded, more or less straight, and strongly constricted between the seeds, thus bringing to mind short strings of beads. If the similarity of leaves and flowers is any indication, the plant is closely related to *Indigofera suffruticosa* Mill. The fruits of the latter species also provide easy identification: they are strongly curved, not constricted between the seeds, and resemble miniature bananas. However, when in leaf or flower, the separation of these two species proves more difficult. *Indigofera suffruticosa* Mill. tends to have larger leaflets,

longer stipules, and longer bracts. The problem with leaflet size is, of course, that leaves enlarge as they mature. Herbarium sheets may thus be inconclusive as to mature leaflet size. The bracts are early deciduous in both *Indigofera panamensis* and *I. suffruticosa*; and, in fact, stipules may be difficult to find as well. The two species both have stems lined from the nodes when young; these lines are seemingly more persistent on *I. suffruticosa* stems than on *I. panamensis* stems with age. The older stems of *I. suffruticosa* are thus noticeably to obscurely angled in cross section.

CANAL ZONE: TTC Albrook Tower out C-15 road, *Blum & Dwyer 2160* (FSU, MO, SCZ). Chiva-Chiva Trail red tank to Pueblo Nuevo, *Piper 5109* (US). Chiva-Chiva Road, *Smith & Smith 3339* (F, MO, NY). Sosa Hill, Balboa, *Standley 25266* (GH, US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29227* (GH, US). Curundú, road past Survival School, *Tyson 3473* (FSU, MO, SCZ). COCLÉ: 1.5 mi below El Copé, *McDaniel & Cooke 14781* (FSU, MO). Penonomé, 50–1000 ft, *Williams 123* (NY). HERRERA: 4 mi S of Los Pozos, *Tyson 2696* (FSU, MO, SCZ).

4. **Indigofera suffruticosa** Mill., Gard. Dict., (ed. 8). *Indigofera* no. 2. 1768. Based on "*Colutea affinis fruticosa argentea . . .*," Sloane, Cat. Jam. 142. 1696.—FIG. 30D–E.

I. tinctoria Mill., Gard. Dict., (ed. 8). *Indigofera* no. 1. 1768. Not *I. tinctoria* L., Sp. Pl. 751. 1753.
I. anil L., Mant. 272. 1771. TYPE: "Habitat in India," not seen.
I. divaricata Jacq., Hort. Schoenb. *pl. 365*. 1798. TYPE: not located.
I. guatimala Lunan, Hort. Jam. 420. 1814. Based on: "*Assurgens minusque divisa . . .*," P. Br., Civ. Nat. Hist. Jam. 302. 1756.
Indigofera tinctoria var. *brachycarpa* DC., Prodr. 2: 224. 1825. pro parte (fide Rydberg 1923). TYPE: a plant cultivated in Europe, not seen.
Indigofera anil var. *polyphylla* DC., Prodr. 2: 225. 1825. TYPE: Santo Domingo, not seen.
I. comezuelo Moc. & Sesse ex DC., Prodr. 2: 225. 1825. in syn.
I. drepanocarpa Berg., in Berg. & Schmidt, Darst. Offiz. Gew. 4: 30d. 1863. (pro parte fide Rydberg 1923.)
Anila tinctoria var. *vera* Kuntze, Rev. Gen. Pl. 160. 1891. TYPE: St. Thomas (NY).

Perennial *herbs* or *shrubs* to 3 m tall, much branched, the branches lined and angled from the nodes when young, later more faintly lined and angled to nearly terete; whole plant strigose with pale medifixed hairs. *Leaves* (9–)13(–17) foliolate, the leaflets elliptic to obovate, rounded apically, mucronate, acute basally, the terminal leaflets largest, to 40 mm long, 15 mm wide, the smaller mature leaflets to 15 mm long, 5 mm wide, average leaflets ca. 30 mm long, 7 mm wide, strigose above, pubescence denser and leaflets paler beneath; petioles to 2.5 cm long, petiolules 1–2 mm long; rachis typically 6–8(–12) cm long; stipels inconspicuous, setaceous, to 0.8 mm long; stipules inconspicuous, setaceous, 2–3 mm long. *Inflorescence* of dense axillary racemes ca. 3–4 cm long, the axis somewhat longer in fruit, to 5 cm long, thus shorter than the leaves, nodes ca. 40–70 but not all with mature flowers or fruits; pedicels single, recurved, just under 1 mm long in flower, just exceeding 1 mm long in fruit; bracts setaceous, early deciduous, to 2 mm long. *Flowers* rust red, to ca. 4 mm long, with the hypanthium campanulate, ca. 1.5 mm long, the cup 1 mm long, the subequal deltoid teeth ca. 0.5 mm long, strigose; petals subequal, the standard 3–4 mm long, densely hairy outside, obovate, the wings oblong, the claws to 0.8 mm long, auriculate, the keel petals fused, obovate, densely hairy outside; staminal sheath linear, ca. 2 mm long, the anthers ca. 0.5 mm long; ovary linear, the style upcurved, the

stigma capitate. *Fruits* to 15 mm long, ca. 2.2 mm in diameter, strongly curved and resembling miniature bananas, the slender beak 1–2 mm long, not narrowed above persistent remnants of the calyx cup; seeds (3–)5–6(–7), rectangular angled, at least when dry, ca. 1.5 mm long, 1 mm wide, dull, brown, smooth.

Indigofera suffruticosa is found from South Carolina, Florida and Texas southward to Bolivia and Argentina, and also in the Bermudas and the West Indies. It is naturalized in tropical Africa, Asia, and Australia. It is common in the drier parts of Central America. The fruits of *I. suffruticosa* are strongly curved and resemble miniature bunches of bananas. *Indigofera suffruticosa* is apparently related to the Old World *I. tinctoria,* which has also become established or is at least persistent after cultivation in parts of the New World tropics. Differences with *I. panamensis* have been discussed under that species.

Indigofera suffruticosa is the most important species as a source of indigo dye in the New World tropics (see discussion above). Common names are "anil" (for indigo dye) and "jiquelite" for the plant (Standley, 1928).

Without location, *Hayes 298* (NY). BOCAS DEL TORO: Changuinola, *Godfrey 67326* (FSU, MO). Runway, Bocas, *Lazor et al. 2344* (FSU, MO, SCZ). Changuinola, 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 790* (GH, MO, US). Chiriquicito, 5 mi S along Río Guarumo, *Lewis et al. 1967* (GH, US). Almirante, *McDaniel 5116* (FSU, MO); *Wedel 414* (GH, MO). Chiriquí Lagoon, *Wedel 1175* (GH, MO, US). Shepherd Island, *Wedel 2719* (GH, MO, US). CANAL ZONE: Farfan Beach, *Blum & Godfrey 1679* (DUKE, FSU). Venado Beach, *Correa & Gonzalez 501* (GH, MO, SCZ), *505* (DUKE). Farfan Beach, *Dwyer 11959* (MO). Chagres, in the old fort, *Hayes 355* (NY). Madden Road, 80–110 m, *Nee 7613* (MO). Old Fort Lorenzo, mouth of Rio Chagres, *Piper 5970* (US). Balboa, *Standley 25568* (US). Corozal, *Standley 27395* (US). Gamboa, *Standley 28464* (US). Fort Randolph, *Standley 28746* (MO, US). Río Pedro Miguel, near East Paraíso, *Standley 30035* (US). Balboa, *Standley 32145* (GH, US). Curundú, near Tropic Survival School, *Tyson & Blum 2525* (FSU, MO). Pipeline Road, *Wilbur & Weaver 11231* (DUKE, MO). Playa Venado, *Wilbur & Teeri 12976* (DUKE, F, GH, MO, NY). CHIRIQUÍ: Quebrada Punta de Piedra, 0–100 m, *Croat 22462* (MO). 2 mi S of Puerto Armuelles, *Wilbur et al. 13576* (DUKE, MO). 6 mi W of San Lorenzo, *Wilbur et al. 15392* (DUKE). COCLÉ: Río Grande, *Burch et al. 1167* (GH, MO, US). Aguadulce, near sea level, *Pittier 4958* (US). Penonomé, 50–1000 ft, *Williams 108* (NY, US). HERRERA: 1 mi N of Chupampa, on road to Ocú, *Wilbur et al. 12110* (DUKE). LOS SANTOS: Las Tablas-Pedasí, 0–100 m, *Burt & Rattray 58* (MO). Las Tablas-Chitré, 0–100 m, *Burt & Rattray 63* (MO). Pocrí, beach, *Dwyer 1189* (MO). Playa de Monagre, 0–5 m, *McDaniel 8048* (DUKE, FSU). PANAMÁ: San Carlos, 0–10 m, *Allen 1132* (GH, MO, US). Coronado Beach, 6 mi E of San Carlos, *Croat 14263* (MO). Chepo Highway W of Pacora, *Duke 5934* (MO). Río Ailigandí, *Duke 10853* (MO). Bayano Cuna, *Duke 14502* (MO). Chagres, *Fendler 101* (MO). Bella Vista, *Heriberto 31* (US). Vera Cruz beach, *Lewis et al. 3005* (DUKE). Bald Hill Road, San Jose Island, *Johnston 1060* (GH, MO, US). 2 km W of El Llano, *Nee 7968* (MO). Bella Vista, *Standley 25395* (US). Corozal Road, near Panama, *Standley 26797* (US). Río Mar, *Tyson et al. 2316* (FSU, SCZ). VERAGUAS: Río Santa María along road to Santiago, 5 km S of Santa Fé, 250–300 m, *Nee 8138* (MO).

28. LABLAB

W. G. D'Arcy[61] & Muriel E. Poston[62]

Lablab Adans., Fam. Pl. 2: 325, 550. 1763. *Dolichos lablab* L. = *Lablab purpureus* (L.) Sweet.

Dolichos sensu auct., non sensu Verdcourt 1971; International Code of Botanical Nomenclature 1978, p. 352. See Westphal, Taxon 24: 189–192. 1975.

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Herbs usually twining, stems terete, strigulose. *Leaves* trifoliolate, leaflets rhomboid to ovate, apically acute, basally cuneate, stipellate, the stipules small. *Inflorescences* axillary racemes, the rachis elongate, the flowers 1–5 arising from tubercles on the rachis, the bracts caducous. *Flowers* with campanulate calyx, the lobes 5, the upper teeth united to apices; standard orbicular, auriculate, 2 callosites or elongated appendages on the inner face, the wing obovate, the keel falcate; stamens diadelphous, vexillary stamen free, the anthers monomorphic; style curved, flattened, the stigma capitate. *Fruits* broadly oblong to falcate, laterally compressed, beaked, seeds ovoid, black, hilum oblong with a white aril.

Lablab is endemic to the Old World with cultivated species found in the New World.

1. **Lablab purpureus** (L.) Sweet, Hort. Brit. 481. 1826. [1827].—FIG. 31.

Dolichos purpureus L., Sp. Pl., ed. 2. 1021. 1763. TYPE: not determined.
Dolichos lablab L., Sp. Pl. 725. 1753. LECTOTYPE (design. Verdcourt): *Phaseolus niger lablab* Alpini, De plantis Aegypti liber, ... 74, *tab. 75*. 1640.

Climbing *herbs*; stems terete, strigose. *Leaves* trifoliolate, leaflets ovate to broadly rhomboid, 8.0–13.0 cm long, 6.5–12.5 cm wide, the lateral leaflets asymmetric, apically acute, basally cuneate to truncate; petioles 8.0–12.0 cm long, strigose; petiolules 2.5–3.0 cm long, strigose, stipels linear, 4.0 mm long, the stipules lanceolate, 4.0–5.0 mm long, caducous. *Inflorescences* axillary racemes to 30.0 cm long; flowers 10–15 per rachis, fasicled in groups of 2–3 at tubercles on the rachis; peduncles 18.0–15.0 cm long, the pedicels short 0.3 cm long; bracts subtending the flowers ovate, 3.0 mm long, 2.0 mm wide, strigose, caducous. *Flowers* with the calyx campanulate, 6.0–8.0 mm long, the lobes 2.5–3.0 mm long, upper 2 lobes fused; corolla white to purple, standard obovate, auriculate with 2 callosites running along the inner face, 1.5 cm long, 1.2 cm wide, the wings oblong to obovate, 1.5 cm long, 1.0 cm wide, the keel falcate, 1.5 cm long, 0.4 cm wide; stamens 1.5 cm long; style 1.3–1.5 cm long curved, flattened, the stigma capitate. *Fruits* broadly oblong, 5.2–8.0 cm long, 1.5–2.5 cm wide, strigose, the beak falcate, 1.0–1.5 cm long; seeds ovoid, 3–5, 1.3 cm long, 0.8 cm wide, the hilum oblong with white aril.

CANAL ZONE: Summit, *Johansen* May 1924 (US). Balboa, Sosa Hill, *Standley 25284, 32151* (both US).

29. LENNEA

Peter S. White[63]

Lennea Klotzsch in Link, Klotzsch and Otto, Ic. Pl. Hort. Berol. 2: 65. *tab. 26*. 1842. TYPE: *Lennea robinioides* Klotzsch (Mexico) = *Lennea melanocarpa* (Schlecht.) Vatke.

Trees or *shrubs*. *Leaves* alternate, imparipinnate; rachis grooved; stipels narrowly triangular or setaceous, persistent; stipules deciduous. *Inflorescences* of

[63] Uplands Field Lab., Great Smoky Mts. National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

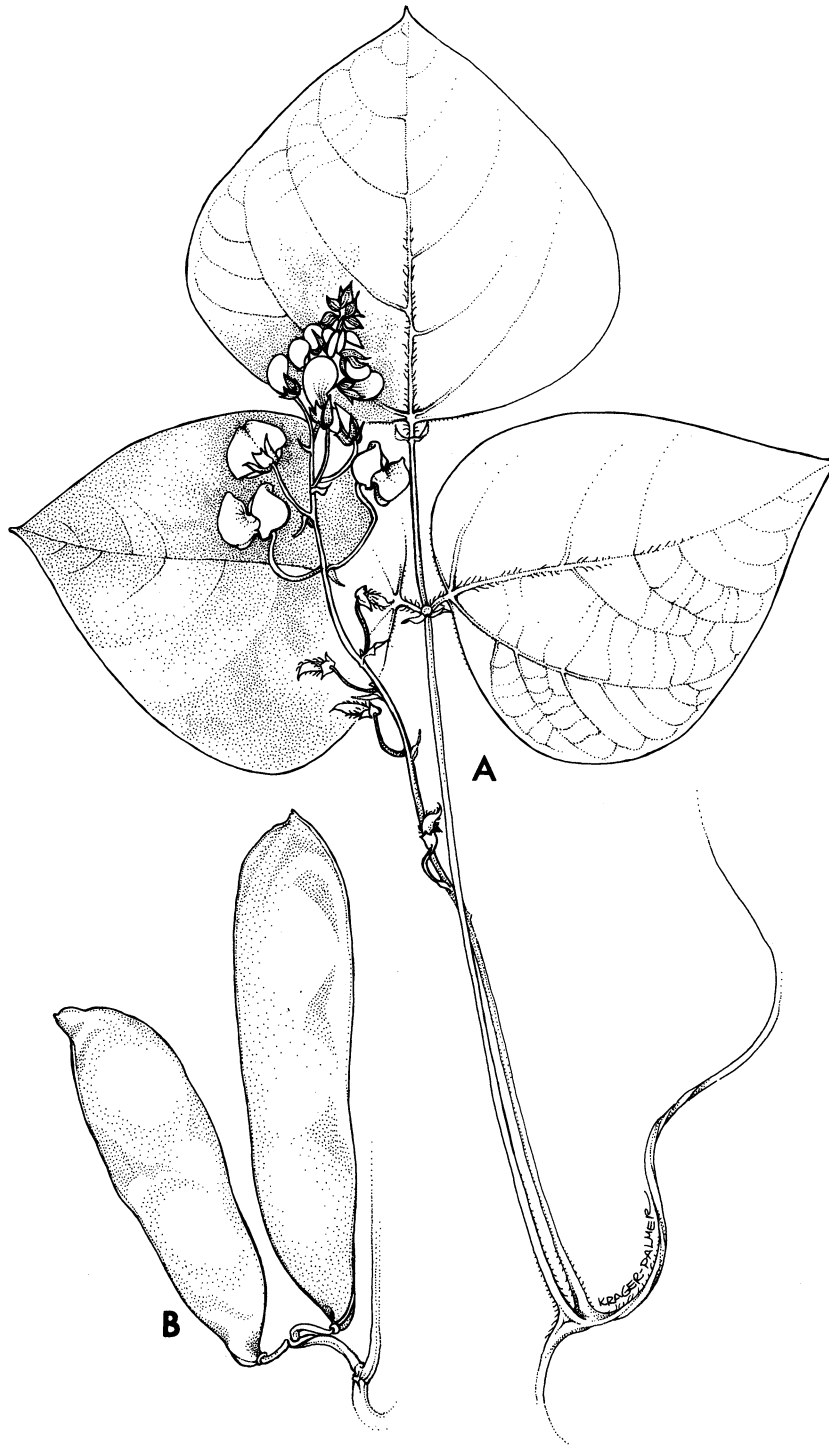

FIGURE 31. *Lablab purpureus* (L.) Sweet—A. Habit (×7/10). [After *Schultes & Smith 308*, Colombia]—B. Fruit (×7/10). [After *de la Cruz 4325*, Guyana.]

axillary racemes, frequently clustered at the nodes, generally shorter than the leaves, appearing with or before the leaves; bracts triangular to subulate, deciduous by fruiting stage; bracteoles absent. *Flowers* with hypanthium campanulate, the 5 teeth triangular, often acuminate, mostly as long as or shorter than the cup; petals equal, short-clawed, free except the keel petals united along lower margin at the apex, the standard obcordate, the wing and keel petals oblong, curved; stamens 10, monadelphous, the vexillary stamen fused to staminal sheath for a short distance towards the base, free above and below this; ovary sessile or short stipitate, slender, several-ovulate, the style coiled, the stigma terminal, small. *Fruits* linear, flattened, few to several seeded, 2-valved; seeds compressed, oblong to nearly circular.

Lennea Klotzsch is a genus of five species found in northern Central America, Mexico, Honduras, and in Panama. It is to be expected in Nicaragua and Costa Rica. It is apparently unknown from South America, although several collections have been made in Darien Province in eastern Panama.

The genus was described from plants grown horticulturally in Germany from seed collected in Mexico. Like other relatives described here it resembles the temperate genus *Robinia*. The coiling of the style is distinctive among related genera in Panama.

1. **Lennea viridiflora** Seem., Bot. Voy. Herald 107 (corrected page). 1857. TYPE: Santiago de Veraguas, Panama, *Seemann 1189* (K, not seen; photo F, MO).—FIG. 32.

L. rubioides Seem., Bot. Voy. Herald 107 (uncorrected page). 1853. Nomen nudum.

Small *trees*; branchlets hairy with stiff hairs to glabrous, dull, tan to grayish. *Leaves* with 9–13 elliptic to ovate leaflets, the lateral leaflets mostly opposite or subopposite, obtuse or often retuse, 2–8 cm long, 1–4 cm wide, the first pair often the smallest on the leaf, thin in texture, dull above, sometimes slightly paler beneath, when mature with appressed, fine, stiff, non-overlapping hairs beneath; stipules narrow, to 5 mm long, apparently deciduous, stipels obvious, setaceous, to 2 mm long, persistent, stiff, the petiolules 2–3 mm long. *Inflorescence* with raceme axis 2–5 cm long, the flowers close, subtended by ovate-triangular bracts, pedicels 2–3 mm long, the axis, bracts and the pedicels pubescent with stiff dark red brown or yellow brown tinged hairs. *Flowers* ca. 7–9 mm long with the petals extended, the hypanthium tube campanulate, ca. 3 mm long, the 5 teeth narrow triangular, acute, extending ca. 1 mm beyond the rim of the cup, the lowermost tooth longest, ca. 1.2–1.8(–2) mm long, the 2 uppermost united for about ½ of their length, the whole calyx pubescent with stiff hairs as on the inflorescence; petals of subequal length, the standard reflexed, circular, ca. 6 mm long, 6 mm wide, glabrous, the claw ca. 1 mm long, wings oblong, ca. 5 mm long, glabrous, the claw ca. 2 mm long, the keel petals fused for part of the length, ca. 7 mm long with scattered hairs or glabrous; stamens 10, the vexillary stamen leaving the sheath near the base, the 9 other stamens leaving the sheath in a regular series, the outermost with longer free filaments, the innermost with shorter filaments as seen when the sheath is opened at the position of the vexillary stamen;

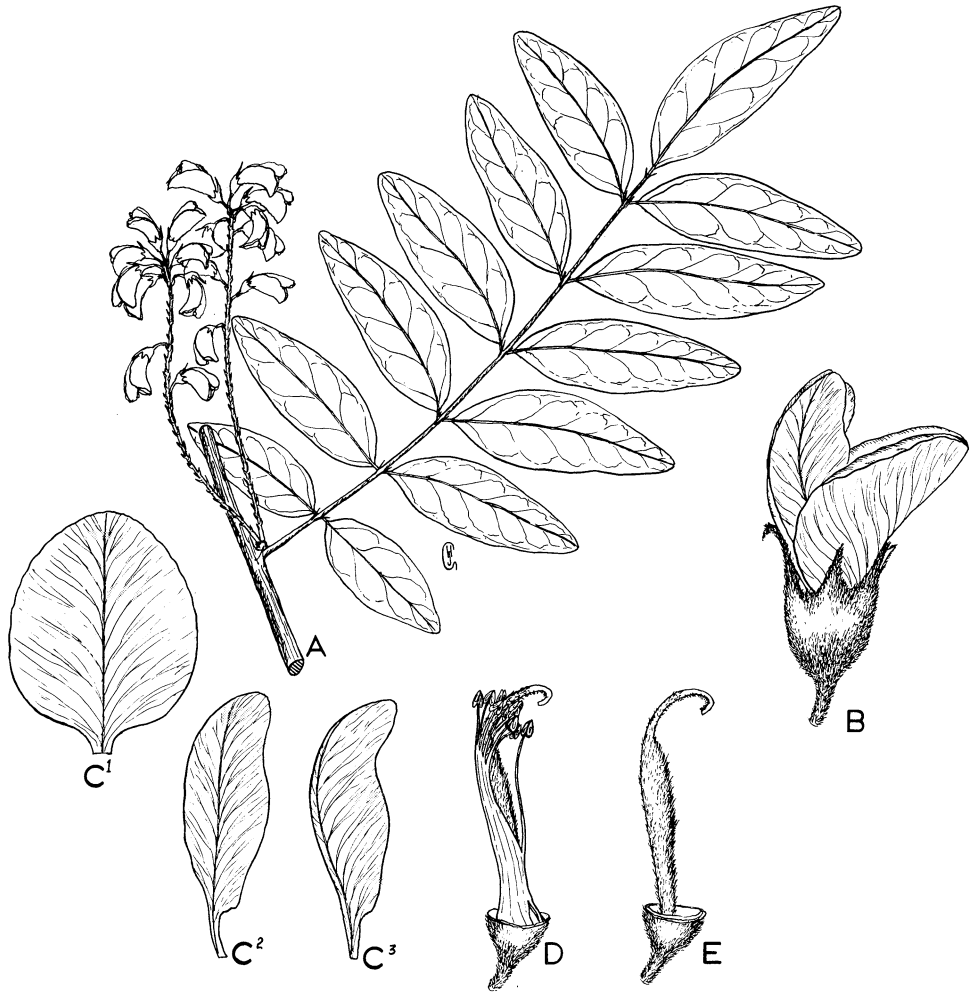

FIGURE 32. *Lennea viridiflora* Seem.—A. Habit (×3/5).—B. Flower (×3 3/5).—C. Corolla.—C1. Standard (×3 3/5).—C2. Wing petal (×3 3/5).—C3. Keel petal (×3 3/5).—D. Stamens (×3 3/5).—E. Pistil (×3 3/5). [After *Pittier 5101*.]

ovary compressed, linear, ca. 5 mm long, appressed hairy, the style coiled, sometimes forming an almost complete turn, the stigma terminal, capitate. *Fruit* compressed, narrow oblong, tapered abruptly to acute tip formed by the persistent style base, with woody valves, compressed strongly between the seeds, the outer surface dark brown, strongly reticulate wrinkled, at least on drying, usually glabrous but sometimes with remote hairs on the surface and with scattered hairs on the edges; seeds 3–6, compressed, roundish to oblong, dark brown, smooth, ca. 8 mm long, 7 mm wide.

Lennea viridiflora Seem. is apparently endemic to Panama where it was first collected by Seemann in Santiago de Veraguas. In the original printing of the Botany of the Voyage of the Herald, Seemann lists this plant as "*Lennea ru-*

bioides" and attributes this name to Link, Klotzsch, and Otto. This is an apparent corruption of *Lennea robinioides* Klotzsch (=L. *melanocarpa* [Schlecht.] Vatke). Seemann soon came to recognize that his collection was distinct from *Lennea melanocarpa,* and in a correction page printed in 1857 described it as a new species, *Lennea viridiflora* Seem.

Lennea viridiflora is apparently closely related to *Lennea salvadorensis* Standl., a plant known only from the type locale in El Salvador. *Lennea salvadorensis* bears an overall resemblance to *L. viridiflora,* but the calyx and flowers are smaller, and the fruits are lighter brown in color. Two other species of *Lennea* also resemble *Lennea viridiflora. Lennea brunnescens* Standl. of Mexico can be distinguished by the dense pilosity of the legume surface, glabrous or with remote hairs in *Lennea viridiflora* as treated here. *Lennea melanocarpa* (Schlecht.) Vatke bears a close similarity in leaf to *L. viridiflora,* but the inflorescence axis is glabrous and more slender. It should be noted that the inflorescence of *L. viridiflora* becomes glabrous in fruit. The calyx of *Lennea melanocarpa* is also glabrous or only puberulent near the margin. In *L. viridiflora* the calyx is closely and densely pubescent with straight, stiff hairs. The fifth and final species of *Lennea, L. modesta* Standl. & Steyermark, is found in Guatemala. Its abruptly tapered leaflets are distinctive.

Two Panamanian collections possess somewhat unusual features: *Pittier 5101* has calyx lobes longer than those on other flowering collections. In this flowering collection, the longest calyx lobe averages 2 mm in length (1.8 mm on younger flowers), whereas for the other collections the longest calyx lobe ranges from 1.2–1.5 mm (maximum 1.8 mm) long when the flower is fully expanded. The Pittier collection is the only one from Cocle Province. The absence of other differences argues that these collections do not represent a species distinct from *Lennea viridiflora,* as the calyx lobe lengths are somewhat variable depending on flower age. The other unusual collection is *Duke 4873.* This fruiting collection has scattered hairs along the legume margin and remote hairs on the surface of the legume.

CANAL ZONE: Madden Dam, *Ebinger 874* (F, MO). Gaillard highway, N of Paraiso, *Lewis et al. 5367* (DUKE, MO, NY, SCZ). Boy Scout Road, Madden Dam Area, *Porter et al. 4025* (DUKE, GH, MO, NY, SCZ). Farfan Beach, *Tyson et al. 3164* (MO). Miraflores Locks, near Fort Clayton, *Tyson 5340* (DUKE, FSU, MO, SCZ). N of Miraflores road at railroad, *Tyson & Gentry 6409* (GH, MO, NY, SCZ). Road to Miraflores Locks, *Tyson & Lazor 6064* (FSU). COCLÉ: Between Paso del Arado and Olá, 20–280 m, *Pittier 5101* (US). DARIÉN: Hill near Río Chucunaque ca. 4 mi below Yaviza, *Duke 4873* (GH, MO, NY, SCZ). Near Refugio, 15–21 mi N of Santa Fé, 30 m, *Duke 10311* (MO). Río Sabana above Santa Fé, *Duke 14083* (DUKE, F, GH, NY, MO). Patiño, *Pittier 6609* (GH, specimen labeled "B"; NY-photo, left-hand specimen; US, left-hand specimen). Río Congo, *Pittier 6976* (US). VERAGUAS: Santiago, *Seemann 1189* (not seen, photo-F, NY).

30. LUPINUS

David B. Dunn[64]

Lupinus L., Sp. Pl. 721. 1753; Gen. Pl., ed. 5. 322. 1754. TYPE: *L. albus* L.

Mostly erect or ascending *herbs,* rarely shrubs; roots sometimes stout, sometimes with large nodules; stems mostly pubescent. *Leaves* 5- or more digitate,

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the leaflets narrow, pubescent, sometimes sericeous, sometimes glaucous, with a single midnerve; petiolules inconspicuous; petioles elongate; stipules mostly narrow, adnate to the petiole. *Inflorescences* often showy, blue, purple, red or yellow, racemose, the rachis terminal, several–many flowered; pedicels slender. *Flowers* with the calyx 2-lipped nearly to the base, the upper lip about as long as the lower; corolla glabrous or sparingly pubescent, the standard broad, the wings apically connate, the keel often beaked; stamens monadelphous, the filaments unequal, glabrous, the anthers dimorphic; ovary sessile, the style curved upwards, the stigma capitate, often bearded. *Legume* oblong, somewhat compressed and obliquely constricted between the seeds, dehiscing explosively with a spiral tension, 2–12 seeded; seeds plump with a small, sunken hilum.

The genus includes about 200 species in western North America but with species throughout the western hemisphere and in the Mediterranean region. Perhaps as many as 200 species occur in South America. Many species grow in full sun and sandy soil. Some species are used for fodder, while others are well known for poisoning cattle. The toxicity varies with species as to part of the plant implicated, type of toxic response, etc. Nothing is yet known about the toxicity of the Panamanian species. In some countries, the seeds have been used as a coffee substitute following leaching of alkaloids from the seeds. "Lupin" (English), "Altramuz," "Lupino" (Spanish).

a. Plants erect, to 50–100 cm tall, branching above; leaflets 5–7, the largest 3–4 cm long, 8–11 mm wide, complanate; standard 10–13 mm long, the keels glabrous or occasionally sparsely ciliate above distally; stipules to 5 mm long ---------- 1. *L. clarkei*

aa. Plants decumbent in age 15–30 cm long, branching at the base; leaflets 8–11, the largest 2–3 cm long, 3–6 mm wide, conduplicate; standard 9–10 mm long, the keels densely ciliate above distally; stipules 12–15 mm long ---------- 2. *L. costaricensis*

1. **Lupinus clarkei** Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853. 1. 1854. TYPE: Costa Rica, *Oersted 4891* (C, not seen, photo UMO; isotype K).—FIG. 33.

L. elegans var. *campestris* sensu Smith, Sp. Lupulin. 93. 1938, not var. *campestris* (Schlecht. & Cham.) Smith, Sp. Lupulin. 77. 1938. Based on *Seemann* (K, not seen by Smith or this writer), *Maxon 5304* (US) and *Killip 3605* (herb. Smith, not seen).

Normally annual branched *herb* to 1.5 m tall, mature stems terete, rigid, puberulent to tomentose, the twigs drying minutely angled. *Leaves* 5–7 digitately compound, the leaflets 3.5–4.5 cm long, 6–10 mm wide, narrowly ovate to oblanceolate, apically obtuse or rounded, mucronulate, basally narrowed into the indistinct petiolule, the costa prominent, conspicuously elevated beneath, subplane above, the lamina glabrate to sparsely pubescent on both sides, the hairs spreading and curled, to 1 mm long, shorter and denser beneath, the margins pilose, the undersides with a whitish bloom; petiolules to 1 mm long; petioles slender, 3–5 cm long, slightly exceeding the leaves; stipules narrowly deltoid to linear subulate, ca. 3 mm long, dark, pubescent. *Inflorescences* showy terminal racemes, blue or purple with pinkish or reddish tinges, the rachis tomentose with curved hairs and moniliform hairs to 1 mm long, 6–15 cm long, the flowers uncrowded on pedicels ca. 3 mm long. *Flowers* with the calyx deeply divided, the lower lip somewhat reflexed, 4–5 mm long, entire or 3-denticulate tomentulose,

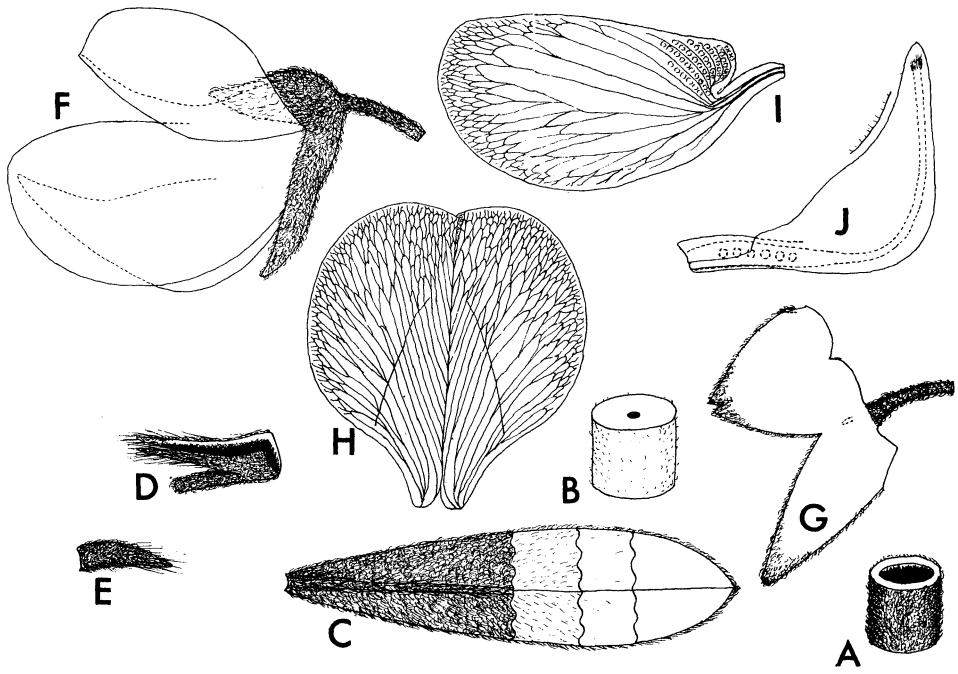

FIGURE 33. *Lupinus clarkei* Oerst.—A. Young stem (×3⅓).—B. Stem at end of growing season (×3⅓).—C. Leaflet (×1⅔).—D. Stipule (×3⅓).—E. Bract (×3⅓).—F. Flower (×3⅓).—G. Calyx (×3⅓).—H. Standard (×3⅓).—I. Wing petal (×3⅓).—J. Keel showing outline of gynoecium. [After series of 25 dissections at hand.]

the upper lip ca. 5–7 mm long, minutely bifid, applied to the standard; standard blue or purple, 10–13 mm long, broad, the wings apically united, often partly pinkish or red, slightly longer than the standard, the keel glabrous, slightly saccate with narrow beaks, sometimes sparsely ciliate; anthers dimorphic, the lowermost linear, 2 mm long, the uppermost ovoid, ca. 0.5 mm long; ovary copiously ascending pilose, the style evenly curved upward, the stigma capitate, long bearded. *Legume* oblong, ca. 4 cm long, 8–10 mm wide, with distinct, oblique constrictions between the 7–8 seeds, drying dark, sometimes slightly reddish, copiously pilose with hairs to 2.5 mm long, minutely beaked; fruiting pedicels stout but not much longer than in flower; seeds plump, mottled, dark, ca. 5 mm long.

Lupinus elegans H.B.K. [TYPE: Mexico, herb. H.B.K. (P not seen; microfiche MO)] to which the Cham. & Schlecht., *Lupinus campestris* was subordinated by Smith is not closely related to either *L. clarkei* or *L. campestris*. *Lupinus clarkei* and *L. campestris* are part of a closely related complex.

This species is known from Panama, Costa Rica and Honduras and is found in open upland sites, commonly above 2,000 m elevation.

CHIRIQUÍ: 10 mi above Boquete on road to Volcán, *Croat 34819* (MO). Potrero Muleto, *Croat 34946* (MO). Roadside to 10 km below summit of El Barú toward Boquete, *D'Arcy 9776, 9791, 11055* (all MO). W slope of Chiriquí Volcano, *Davidse & D'Arcy 10246* (MO). Boquete District, Volcán de Chiriquí, *Davidson 866* (GH, MO, US). Cuesta Grande, E Slope of Chiriquí Volcano, 2900 m, *Maxon 5304* (US). Volcán Barú, *Mori & Bolten 7419* (MO). Finca Lérida to Peña Blanca, 1750–2000 m,

Woodson & Schery 326 (MO, US). Boquete District, Volcán de Chiriquí, 11200 ft, *Terry 1328* (MO). Canyon 5 mi NE of El Volcán, 7500 ft, *Tyson 6349* (MO). Potrero Muleto to summit, Chiriquí Volcano, *Woodson & Schery 394* (MO). Casita alto, Chiriquí Volcano, 1500–2000 m, *Woodson et al. 805* (A, MO).

2. **Lupinus costaricensis** Dunn[65]. TYPE: Costa Rica; *Dodge & Thomas 6826* (MO-holotype; photo UMO, isotypes GH).—FIG. 34–35.

L. aschenbornii sensu Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 545. 1938, not Schauer, Linnaea 20: 739. 1847.

Annual *herb,* occasionally extending into a second season of growth, then ligneous below, weak stemmed and sprawling to decumbent, to 15–30 cm long, branching mainly at the base, the slender terete stems only 2.5 mm diameter, densely canescent with curved hairs ca. 0.5 mm long, and with numerous spreading pilose hairs 1–2 mm long, glabrescent. *Leaves* 8–11-digitately compound, the larger leaflets 2–3 cm long, 3–6 mm wide, generally conduplicate, glabrous above, thinly pilose beneath; petioles filiform, 4–6 cm long, twice as long as the leaflets, pubescent as on the stems; stipules subulate-caudate, 12–15 mm long, the free tips 6–8 mm long, with both long and short hair types. *Inflorescences* inconspicuous, the lower flowers held within the foliage, the rachis with both hair types as on the stems, racemes only 5–12 cm long, the flowers whorled or scattered; bracts 5–10 mm long, caducous by anthesis; pedicels 2.5–3.5 mm long, hispidulose. *Flowers* with the calyx strongly 2-lipped, the lower lip nearly straight, 5–6.5 mm long, entire or tridentate, densely pilose canescent outside, the upper lip 4–5 mm long, deeply bifid, the notch 1.6–3 mm deep; the standard obovate; 9–10 mm long, 7–8 mm wide, the wings apically connate, slightly longer than the standard, less than 5 mm wide, occasionally with lateral cilia on the veins of the crimped basal portion, the keels densely ciliate above toward the acumen; ovary strongly ascending pilose, the style curved upward, the stigma capitate, bearded. *Legume* oblong, 2–3 cm long, 6–7 mm wide, canescent and copiously pilose with longer hairs, slightly constricted between the 7–8 seeds; seeds dark, mottled, convex, 3 mm long, 2 mm wide.

The taxon described here is quite distinct from *L. aschenbornii,* which is caespitose, often fistulose, perennial and freezes back annually to a subsurface fleshy taproot. C. P. Smith studied the type of *L. aschenbornii* and he cited multiple specimens from Nevado de Toluca and Popocatepetl as typical of *L. aschenbornii.* Smith considered Nevado de Toluca as the most probable type locality.

This species is known only from Volcán Chiriquí and Costa Rica. It is found high on the slopes of volcanos in open areas. Plants with only the primary inflo-

[65] *Lupinus costaricensis* Dunn, spec. nov. *Herbae* annuae, caules 2.5 mm crassi, pagina multis pilis patentibus 1–2 mm longis ferenti, canescenti pilis crispis brevibus 0.5 mm longis. *Foliola* foliorum majorius 8–11, linear-oblanceolata, conduplicata, supra glabra, inferius tenuiter pilosis, 2–3 cm longis, 3–6 mm latis; petioli filiformibus, 4–6 cm longis; stipulis subulatis-caudatis, 12–15 mm longis, ad petioli 6–7 mm ad basim connatis. *Inflorescentiae* inconspicuae, racemis 5–12 cm longis. *Flores* calycibus bilabiatis, labio superiore 4–5 mm longo, bifido, incisura 1.6–3 mm profunda, labio inferiore 5–6.5 mm longo, integro vel tridentato, vexillo obovato, 9–10 mm longo, 7–8 mm lato, carina dense ciliata supra distaliter. *Legumen* dense pilosum, oblongum, 2–3 cm longum, 6–7 mm latum; semina 7–8, fusca, 3 mm longa, 2 mm lata.

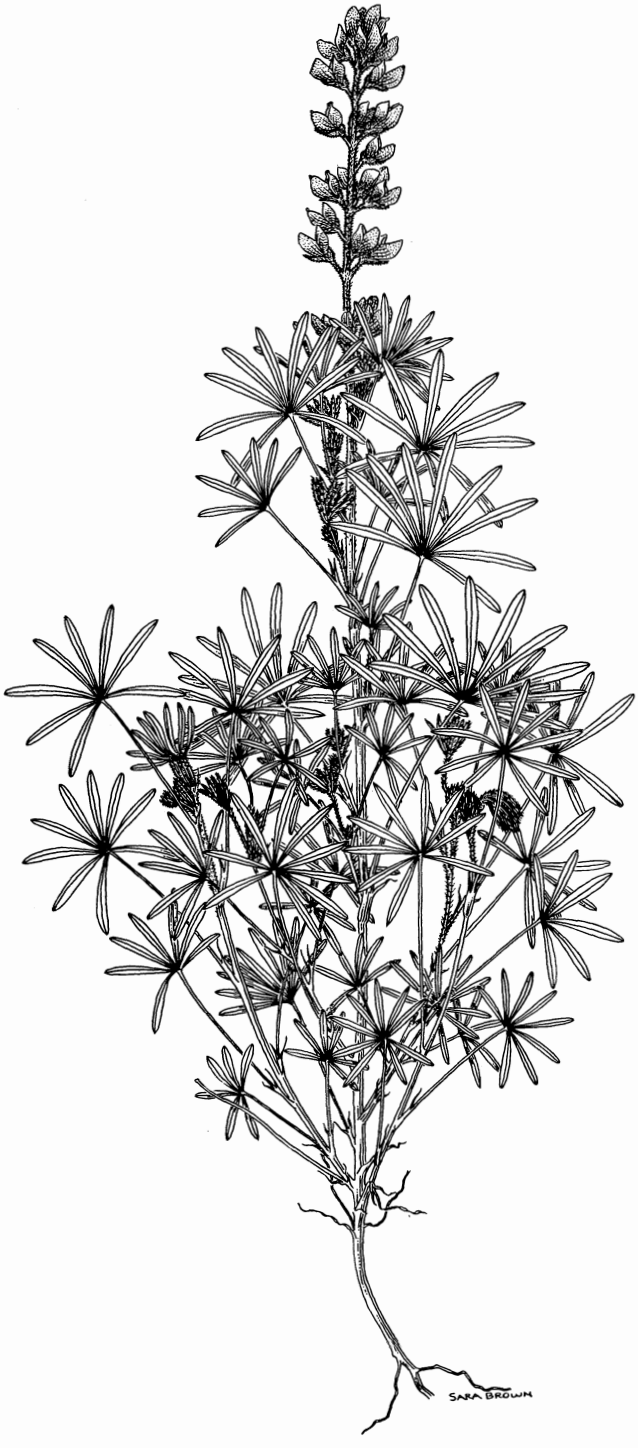

FIGURE 34. *Lupinus costaricensis* Dunn. Habit (×½).

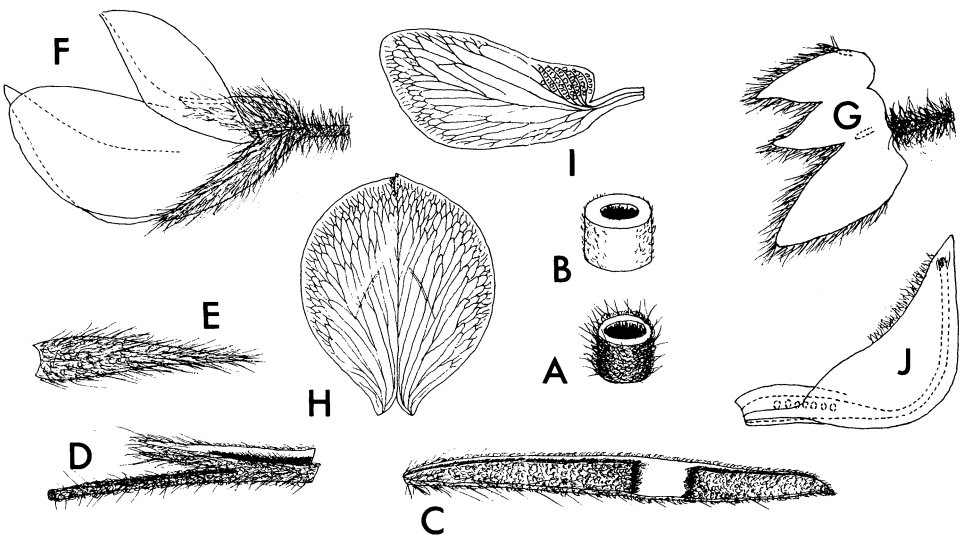

FIGURE 35. *Lupinus costaricensis* Dunn.—A. Young stem (×3⅓).—B. Stem at end of growing season (×3⅓).—C. Leaflet (×1⅔).—D. Stipule (×1⅔).—E. Bract (×3⅓).—F. Flower (×3⅓).—G. Calyx (×3⅓).—H. Standard (×3⅓).—I. Wing petal (×3⅓).—J. Keel showing outline of gynoecium (×3⅓). [After a series of 15 dissections at hand.]

rescences flowering were generally collected from January through March. Occasional collections from August to October were sprawling and ligneous below, with multiple inflorescences in fruit and only occasional late branches with few flowered racemes.

COSTA RICA: CARTAGO: Volcán Irazú, 10000–11330 ft, *Allen 682* (GH); 2400 m, *Blaisdell 2* (MO); 3350 m, *Brooks,* Jan. 1970 (UMO); *Davidse & Pohl 839* (MO); 2400 m, *Dodge 3423* (MO). Finca Chiluca, S slope Volcán Irazú, *Dodge & Thomas 6826* (GH, MO). Volcán Irazú, 9000 ft, *Hunnewell 16632* (GH); 10000 ft, *Mart 4798* (GH); 3350 m, *Moore, Jr., 6654* (BH); *Seibert 1622* (MO); *Webster et al. 12093* (MICH). Finca Chiluca, S slope Volcán Irazú, *Wilbur & Stone 8734* (MSC). Volcán Irazú, 3350 m, *Williams 16024* (MO); *Williams & Molina 13905* (GH). PANAMA: CHIRIQUÍ: Cerro Pando, Valley of upper Río Chiriquí Viejo, *White 51* (MO).

31. MACROPTILIUM

James A. Lackey[66] & W. G. D'Arcy[67]

Macroptilium (Benth.) Urb., Symb. Ant. 9: 457. 1928.

Phaseolus sect. *Macroptilium* Benth., Comm. Legum. Gen. 76. 1837. TYPE: *M. lathyroides* (L.) Urban.

Vines or sometimes erect or sprawling *herbs,* sometimes perennial from a thick rootstock. *Leaves* pinnate trifoliolate or rarely unifoliolate; leaflets glabrous or pubescent but lacking uncinate hairs, stipels ciliate to tomentose; stipules nervate, not prolonged below the insertion. *Inflorescences* with stiff, elongate

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peduncles, the flowers mostly congested at the apex; bracteoles narrow, at least distally, nervate, caducous, rachis with small swellings at the nodes, lacking extrafloral nectaries; pedicels equalling or shorter than the calyx. *Flowers* purplish, red, violet, or white, the interior often vivid; calyx campanulate, the teeth free, the upper 2 teeth sometimes reduced; standard orbicular, emarginate, with 2 small basal auricles, lacking median thickenings; wings longer than the standard and the keel, long stipitate, the keel petals apically spiralled, basally adnate to the staminal tube; style apically recurved and thickened, caducous. *Legume* linear, turgid or compressed, non septate; seeds numerous, small with a short hilum.

Macroptilium is a genus of about 20 species, all native to the New World tropics, although at least one species is naturalized in the Old World. The plants are sometimes planted for forage, and the seeds are sometimes used for food.

a. Stems conspicuously hollow, easily crushed, often 3–7 mm in diameter; standard 12–16 mm long ---------- 3. *M. lathyroides*
aa. Stems solid or with a minute, less than 1 mm diameter, lumen, not easily crushed, 1.0–2.5 (4) mm in diameter; standard 8–13 mm long.
  b. Leaflets linear to lanceolate; pods 3–4 cm long ---------- 2. *M. gracile*
  bb. Leaflets ovate to broadly lanceolate; pods 4–9 cm long.
    c. Plants pubescent; leaflets generally hastate or mitten-shaped; stems usually solid ---------- 1. *M. atropurpureum*
    cc. Plants minutely pubescent to almost glabrous; leaflets generally entire; stems minutely hollow ---------- 4. *M. longepedunculatum*

1. **Macroptilium atropurpureum** (DC.) Urban,[68] Symb. Ant. 9: 457. 1928.

Phaseolus atropurpureus DC., Prodr. 2: 395. 1825. 'atropurpureus.' Based on an unpublished plate in Sessé & Mociño, Icones Florae Mexicana (G).

Twining and clambering *vine*; stems long pilose. *Leaves* pinnate trifoliolate; leaflets ovate, elliptical or linear, often 2–3 lobed, the lobes and sinuses mostly rounded; apically acute or obtuse, mucronate, basally obtuse or truncate, the costa and the major lateral veins prominent beneath, obscure above; softly tomentose on both sides, more so beneath, mostly 2–4 cm long, 8–25 mm wide; lateral petiolules ca. 1.5 mm long, terminal petiolule ca. 2 mm long, petiole and rachis spreading short pilose; stipels subulate, 1 mm long, pubescent; stipules narrowly acute, striate, ca. 3 mm long. *Inflorescences* to 30 cm long, the flowers distributed along the apex of the peduncle; peduncle retrorsely short pilose; bracts and bracteoles narrowly ovate, acute, 1–1.5 mm long, cucullate, nervate, ciliolate; pedicels 1–2 mm long, puberulent. *Flowers* deep red to black purple; calyx tubular campanulate, densely pilose or merely puberulent, the tube 4 mm long, the teeth lanceolate, ca. 2 mm long, subequal; standard 1.5–2 mm long. *Legume* linear, 7–10 cm long, 2–4 mm wide, appressed pilose; seeds oblong ovoid, dark, shiny, ca. 3 mm long, the aril white.

Macroptilium atropurpureum is distinct in its pubescent, usually lobed leaves.

This species ranges widely in the neotropics. In Panama it occurs in Pacific watershed areas with substantial dry season.

[68] For a list of other names see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

CANAL ZONE: Ancón, *Greenman & Greenman 5066* (DUKE). La Boca, *Mori & Kallunki 3675* (MO). Between Corozal and Ancón, *Pittier 2173* (NY). 1 mi N of Summit, *Tyson et al. 2744A* (SCZ). Contractors Hill, *Tyson & Dwyer 6494* (MO). COCLÉ: Río Hato Airstrip, *Burch et al. 1129* (MO.) LOS SANTOS: Chitré-Las Tablas, 0–100 m, *Burt & Rattray 52, 98* (both MO). Monagre Beach, 5 mi SE of Chitré, *Tyson et al. 3011* (SCZ). PANAMÁ: 2 km W of entrance to Lago Mar on Panamerican Highway, *Folsom & Lantz 1901* (MO). Sardinilla, *Taylor 37* (MO).

2. **Macroptilium gracile** (Benth.) Urban, Symb. Ant. 9: 457. 1928.

Phaseolus gracilis Poepp. ex Benth., Ann. Wiener Mus. Naturgesch. 2: 77. 141. 1838. TYPE: Cuba, *Poeppig*, not seen.

Perennial *herb* or *vine*, erect or sprawling; stems slender, wiry, with minute, white retrorse hairs on emerging, soon glabrous, terete; rootstock woody, enlarged. *Leaves* pinnate trifoliolate; leaflets linear, mostly 3–7 cm long, 2–5 mm wide, apically pointed or blunt, mucronulate, basally narrowed, truncate, rarely ovate and 7–8 mm wide, glabrous or sometimes scabrous above; petiolules inconspicuous, ca. 1 mm long, yellowish, strigose; petioles slender, about as long as the terminal leaflet, strongly angled, minutely puberulent; stipels 0.5–1.0 mm long, scale-like; stipules subulate, pubescent, ca. 1 mm long. *Inflorescences* terminal, 20–25 cm long; peduncle slender, the nodes swollen, glandular; bracteoles and bracts subulate, ca. 1.5 mm long, ciliate; pedicels 1 mm long, ca. 2 mm long in fruit, disposed along the apex of the peduncle. *Flowers* red, purple or pink; calyx tubular, ca. 4 mm long, the teeth subequal, deltoid to subulate, much shorter than the tube, evenly minutely puberulent; standard 1.5 cm long, the keel spiralled. *Legume* linear, 3–5 cm long, ca. 2 mm wide; seeds (Standley & Steyermark) 2 mm long, shiny.

This species resembles *Vigna linearis*, but the leaves are often scabrous and are more pubescent. Only the major lateral veins of the leaves are prominently at right angles to the costa whereas in *V. linearis*, much of the minor venation parallels the major lateral veins. The calyces are quite different in the two species.

Macroptilium gracile is wide ranging in Central and South America and in the Antilles, occurring in grassy savannahs with seasonal drought. In Panama it has been collected in the Pacific lowlands.

COCLÉ: Penonomé, *Williams 131* (NY, US). PANAMÁ: Pacora, 35 m, *Allen 815* (MO, NY), *996* (MO). Llanos of lower Río Cabra, *Maurice 791* (US). Panama Golf Course, *Piper 5146* (US). Sabana de Juan Corso near Chepo, 60–80 m, *Pittier 4745* (US). Between Río Pacora and Chepo, *Porter et al. 5137* (MO).

3. **Macroptilium lathyroides** (L.) Urban,[69] Symb. Ant. 9: 457. 1928.—FIG. 36.

Phaseolus lathyroides L., Sp. Pl., ed. 2: 1018. 1763. TYPE: not seen.

Erect *herb*, later sprawling or sometimes twining; stems tough, slender, retrorsely silver pilose on emerging, often glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate or elliptical, mostly 2–4 cm long, 1.5–3.5 cm wide, apically obtuse, short acuminate or acute, rarely rounded, basally deltoid, obtuse, or rounded; densely appressed pilose on emerging, soon glabrate; petiolules 1–2 mm long,

[69] For a list of other names see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

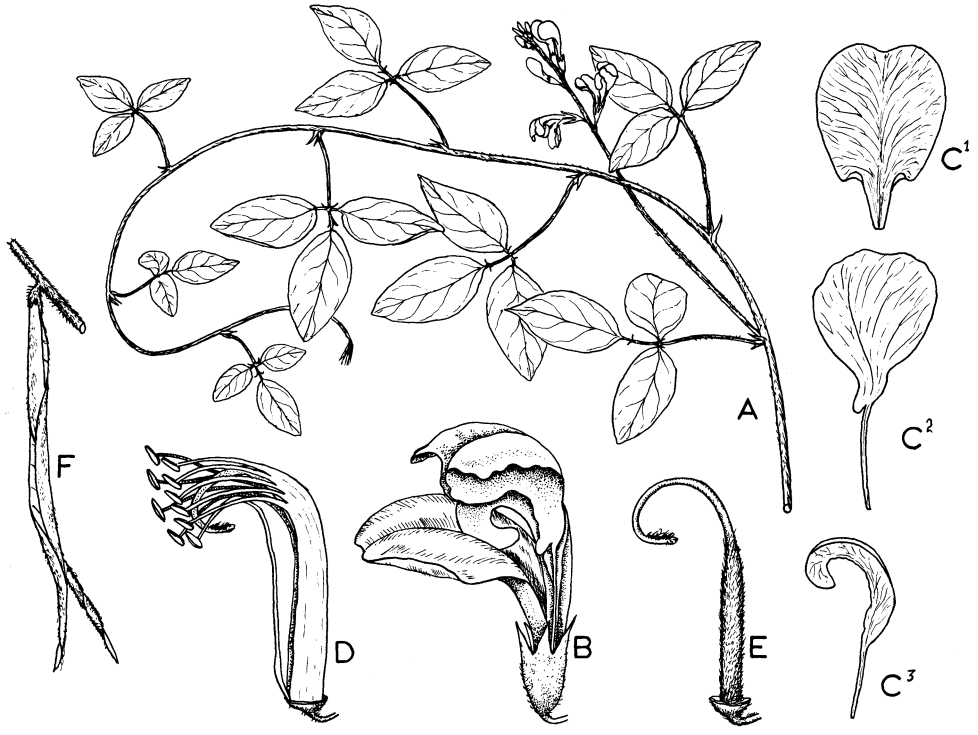

FIGURE 36. *Macroptilium lathyroides* (L.) Urban.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C^1. Standard (×1½).—C^2. Wing petal (×1½).—C^3. Keel petal (×1½).—D. Stamens (×2½).—E. Pistil (×2½). [After *Hunter & Allen 721.*]—F. Fruit (×1½). [After *Hunter & Allen 8601.*]

ascending pilose; petiole and rachis slender, drying angled; stipels lanceolate, glabrous, striate, ca. 3 mm long; stipules lanceolate, striate. *Inflorescences* elongate, mostly 10–30 cm long, the flowers mostly near the apex; peduncle narrowing upwards, the nodes enlarged; bracteoles subulate, pilose, caducous; pedicels shorter than the calyx, often twisted, pilose. *Flowers* scarlet to purple red to nearly black; calyx tubular, 4–6 mm long, pubescent, the teeth lanceolate, much shorter than the tube; standard 12–15 mm long; keel spiralled. *Legume* linear, straight or slightly curved, mostly 7–12 cm long, ca. 3 mm wide, evenly somewhat turgid, maturing brown, inconspicuously strigose; seeds oblong ovoid, 2–3 mm long, dark, mottled.

CANAL ZONE: Mindi, *Cowell 186* (NY). Ancón, *Greenman & Greenman 5067* (MO). Gamboa, *Heriberto 98* (US). Between Farfan Beach and Palo Seco, *Hunter & Allen 438* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 721, 734* (both MO). Fort Randolph, *Maxon & Harvey 6547* (US). Balboa, *Standley 25628* (US). Summit, *Standley 27324* (US). Gamboa, *Standley 28459* (US). Fort Randolph, *Standley 28745* (US). Summit, *Standley 30047* (US). Darien Station, *Standley 31575* (US). COCLÉ: Near Río La Mona, *Blum & Tyson 1886* (MO, SCZ). 2.5 km S of Antón, *Lasseigne 4297* (MO). COLÓN: Las Cruces Trail at Portobelo, *Ebinger 125* (F, MO). Colón, *Rose 22070* (GH, US). HERRERA: Chitré-Davisa, 0–100 m, *Burt & Rattray 67* (MO). 2 mi W of Divisa, *Tyson 5153* (SCZ). LOS SANTOS: Between Tonosí and Macaracas, *Oliver et al. 3576* (MO). PANAMÁ: Matachui to Las Cascadas, *Cowell 337* (NY). Hills between Capira and Potrero, 80–130 m, *Dodge & Hunter 8601* (MO). Taboga Island, *Dwyer 3102* (MO). Juan Franco Race Track near Panamá, *Standley 27684* (US).

4. **Macroptilium longepedunculatum** (Benth.) Urban, Symb. Ant. 9: 457. 1928.

Phaseolus longepedunculatus Mart. ex Benth., Comm. Legum. Gen. 77. 1837. SYNTYPES: Brazil, Paraguay, none seen.
P. campestris Benth., Comm. Legum. Gen. 77. 1837. TYPE: non Benth. 1859.

Perennial *vine*; stems pilose with weak spreading or appressed hairs. *Leaves* pinnate trifoliolate; leaflets ovate, rhombic, elliptical oblong or linear, sometimes shallowly lobed, mostly 2–4 cm long, 1–3 cm wide, sericeous to short pilose, perhaps sometimes scabridulous; apically obtuse, mucronulate, basally truncate; petiolules ca. 1 mm long, tomentose; petioles pilose, drying strongly angled, sometimes longer than the terminal leaflet; rachis short; stipels lanceolate, ca. 1 mm long, long ciliate; stipules lanceolate subulate, 3–5 mm long, nervate, ciliate. *Inflorescences* 20–30 cm long, the flowers clustered at the apex or distributed along the top half of the peduncle, mostly paired; peduncle glabrate; bracteoles and bracts ovate, acuminate, nervate, ciliolate, 1–2 mm long; pedicels stout, 0.5–1 mm long. *Flowers* red to violet; calyx tubular campanulate, pubescent, the tube ca. 3 mm long, the teeth deltoid, the upper pair connate; standard ca. 1.5 cm long. *Legume* linear, straight or slightly falcate, 3–6 cm long, 2–3 mm wide, turgid.

CANAL ZONE: Fort Sherman, *Piper 5887* (NY). Near Old Fort San Lorenzo, *Piper 5961* (NY). COCLÉ: Aguadulce, *Pittier 4889* (US). LOS SANTOS: Chitre-Los Santos, *Burt & Koster 97* (MO). PANAMÁ: Between Río Pacora and Chepo, *Dwyer et al. 5094A* (MO). VERAGUAS: Atalaya-Santiago, 100–200 m, *Koster 114* (MO).

32. MUCUNA

W. G. D'Arcy[70]

Mucuna Adans., Fam. Pl. 2: 325, 579. 1763. Nomen conserv. TYPE: *M. urens* (L.) DC. Type conserv.

Zoophthalmum P. Br., Hist. Jam. 295. 1756. Based on *Dolichos urens* L. = *Mucuna urens* (L.) DC. Nomen rejic.
Hornera Neck., Elem. Bot. 3: 43. 1790.
Citta Loureiro, Fl. Cochinch. 2: 456. 1790. T: *C. nigricans* Loureiro = *Mucuna nigricans* (Lour.) Jackson.
Negretia Ruiz & Pavón, Prodr. 98, *tab. 21*. 1794. LECTOTYPE: *N. elliptica* R. & P. = *Mucuna elliptica* (R. & P.) DC.
Macroceratides Raddi, Mem. Mat. Fis. Soc. Ital. Sci. 18 (fis.): 392. 1820. TYPE: *M. pseudo-stizolobium* Raddi.

Literature:

Burkart, A. 1970. Las Leguminosas-Faséolas Argentinas de los géneros *Mucuna, Dioclea* y *Camptosema*. Darwiniana 16: 175–218.

High climbing woody *vines*. *Leaves* pinnate trifoliolate, the lateral leaflets oblique; stipels scale-like; stipules often caducous. *Inflorescences* axillary racemes, the peduncles often elongate and the pedicels subumbellate, at least in bud, bracts often subfoliaceous, enclosing the bud, caducous; pedicels arising in

[70] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

2's and 3's on an expanded portion of the peduncle. *Flowers* showy, the calyx campanulate, often with irritating hairs, the upper teeth connate, the lower 3 usually unequal; corolla with the standard shorter than the wings, the wings with margins basally ciliate, the keel narrow, apically falcate and indurate; stamens diadelphous, the upper stamen free, the filaments alternately thick and thin, long and short, the anthers sometimes pilose; ovary tomentose, the short stipe surrounded by a glandular disc, the style slender, glabrous or pubescent, the stigma capitate, sometimes of a tuft of hairs. *Legume* oblong, thick or flattened, the margins often winged, undulate between the seeds and somewhat compressed laterally between the seeds, the surface sometimes lamellate with parallel or irregular raised lamellae which may form elongate enations, mostly densely covered with stiff irritating hairs, tardily dehiscent; seeds flat or convex, discoid, the hilum narrow around more than ½ the periphery.

Mucuna is widely distributed in the tropics, mostly confined to moist or wet forests. The genus includes perhaps a dozen species.

a. Inflorescences short, less than 15 cm long; flowering pedicels less than 10 mm long; flowers more than 5 cm long, the wings more than 15 mm wide at the middle ---------- 3. *M. rostrata*
aa. Inflorescences elongate, the peduncle more than 30 cm long; flowering pedicels more than 15 mm long; flowers less than 5 cm long, the wings less than 15 mm wide.
  b. Leaves copiously pubescent beneath, at least until flowering.
    c. Flowers less than 4 cm long, the lowest calyx tooth broad, less than 3 mm long; wings less than 8 mm wide; fruit flat, lacking raised lamellae -------- 1. *M. holtonii*
    cc. Flowers more than 4 cm long, the lowest calyx tooth narrow, more than 5 mm long; wings more than 10 mm wide; fruit thick, with conspicuous raised transverse lamellae ---------- 4. *M. sloanei*
  bb. Leaves glabrate beneath.
    d. Lowest calyx tooth narrow, 7–13 mm long; lateral leaflets mostly 3-veined from the base; fruit mostly 3–7 seeded ---------- 5. *M. urens*
    dd. Lowest calyx tooth deltoid, 3–5 mm long; lateral leaflets mostly 4-veined from the base; fruit mostly 1–3 seeded ---------- 2. *M. mutisiana*

1. **Mucuna holtonii** (Kuntze) Moldenke, Phytologia 1: 7. 1933.

Stizolobium holtonii Kuntze, Rev. Gen. Pl. 1: 207. 1891. SYNTYPES: Costa Rica, *Kuntze* (?NY, not seen) and Colombia, *Holton 971* (K, not seen).
Mucuna andreana Micheli, Morot. J. Bot. 6: 146, *tab. 5, 6*. 1892. TYPE: Colombia, *André 1978*, not seen. Also cites *Holton 971*, not seen.

High climbing *vine*, stems slender, slightly angled, minutely tomentulose, tardily glabrescent. *Leaves* trifoliolate, the leaflets about equal, 9–15 cm long, 5–9 cm wide, apically short acuminate, mucronate, manifestly costate, the terminal leaflet with 5–6 major veins on each side, the lateral leaflets strongly oblique, chartaceous, velutinous, later glabrescent especially above, with only a few hair bases remaining; petiolules 7–10 mm long, tomentose, glabrescent and turning black; petioles mostly shorter than the leaves, tomentose, glabrescent; stipules caducous; stipels ca. 3 mm long. *Inflorescences* pendant, contracted, racemes with peduncle elongate, to 5 m long, slender, flexuous, minutely tomentose velutinous, the raceme enclosed in bud by gray velutinous, papery deciduous bracts and forming a globose 'bud' ca. 5 cm across, sinuous; pedicels velutinous, 15–18 mm long upon inflorescence opening, becoming 5 cm long at anthesis and stout in fruit. *Flowers* greenish or yellowish, the calyx deciduous, cupular, velutinous

outside with appressed, ascending gray or golden hairs, ca. 10–15 mm long, pilose inside, the teeth small, deltoid umbonate; corolla ca. 4 cm long, drying dark, the standard 18–22 mm long, the wings and keel narrowly tubular, exserted about ½ their length from the standard; anthers basally barbate with elongate hairs, the stigma capitate, a tuft of ascending hairs. *Fruit* oblong, flat, 1–6 seeded, 14–25 cm long, 5 cm wide, the margin conspicuously undulate between the seeds, softly villous outside, lustrous within and falsely septate between the seeds; seeds discoid, black, 2–3 cm wide, ca. 0.8 cm thick, the hilum linear around $^3/_4$–$^4/_5$ of the periphery, lighter colored.

Mucuna holtonii has leaves velutinous on both sides until time of flowering. The inflorescence is greatly contracted, appearing in bud as a ball at the end of a long, slender, pendant peduncle, and later with the flowers on elongate and slightly bent pedicels. The legumes are flat with undulate margins. The legume lacks stinging hairs, but there may be some on the calyx.

This species is found in Panama from sea level to at least 1,500 m, occurring in forests and in areas of disturbance. It ranges from Mexico (Chiapas), to Colombia. It is apparently closely related to Peruvian and Ecuadorean material going under the name *M. elliptica* Ruiz & Pavón, which differs in having seeds slightly thicker and more convex, and in the legumes having stinging hairs. The appearance of the legume and also of its indumentum is much like that of *M. elliptica*.

BOCAS DEL TORO: Banks of Changuinola River, *Dunlap 441* (F, US). Changuinola to 5 mi S at junction Ríos Changuinola and Terebe, 100–200 ft, *Lewis et al. 943* (GH, MO, US). Almirante Bay, *Wedel 8* (MO, US). CANAL ZONE: Road C-16 NW of Pedro Miguel, *Croat 12255* (MO). Pipeline road 3 mi N of Gamboa gate, *Croat 13951* (MO, SCZ). Madden Dam, *Dwyer 1965* (MO, PMA, US). Between Chilibre and Madden Dam on Transisthmian Highway, *Dwyer 8396* (GH, MO). Chagres River 3 mi above Gamboa Bridge, *Kennedy et al. 2304* (F, MO). Pipeline Road 2 km NW of Gamboa, 50 m, *Nee 7853* (MO, US). Gatuncillo, *Piper 5136* (US). Gamboa, *Pittier 4788* (US). COCLÉ: Limón, N of Alto Calvario, *Folsom 5848* (MO). COLÓN: Quebrada Bonita, 13 km NW of Buena Vista, 3 km NW of Salamanca, 100–170 m, *Nee 7632, 9075* (both MO). DARIÉN: Ascent of Cerro Pirre from Río Pirre S of El Real, 100–600 m, *Duke 5286* (MO). Between Rio Perrecénega and Rancho Frío, 500–2500 ft, *Duke & Elias 13877* (MO). Río Aretí, *Duke & Nickerson 14925* (MO). Río Pirre near town of Pirre, *Gentry & Clewell 6922* (MO). Río Pucro below Pucro, *Gentry & Mori 13531* (MO). Quebrada Camachimuricate cerca casa de Bartolo, *Kennedy 2840* (F, GH, MO). Caná, 1750 ft, *Stern et al. 482* (GH, MO). VERAGUAS: Above Santa Fé on slopes of Cerro Tute, 1200–1400 m, *Gentry 6280* (MO).

2. **Mucuna mutisiana** (H.B.K.) DC., Prodr. 2: 406. 1825.—FIG. 37.

Negretia mutisiana H.B.K., Nov. Gen. Sp. Pl. 6: 442. 1823. TYPE: Colombia, *Mutis*, not seen.

High climbing *vine*; stems terete with straight, appressed reflexed hairs, soon glabrous, drying black. *Leaves* trifoliolate, the leaflets about equal, mostly 7–12 cm long, ovate, apically acuminate, basally obtuse or rounded; lateral pair mostly 4-veined, sparingly pilose with straight hairs on both the surfaces, thin and papery, often drying dark; petiolules 7–10 mm long, sometimes stout, the terminal petiolule articulated near the apex, glabrate, tuberculate; petioles mostly somewhat shorter than the leaves; stipels scale-like, 1–3 mm long, glabrate; stipules narrowly ovate, pilose, often caducous. *Inflorescences* subterminal pendant racemes, the peduncle to 3 m long, slender, terminally fine gray puberulent and minutely angled; pedicels 25–40 mm long becoming slightly longer and stout in fruit; bracts broadly ovate, mostly 15–18 mm long, evenly gray velutinous, often

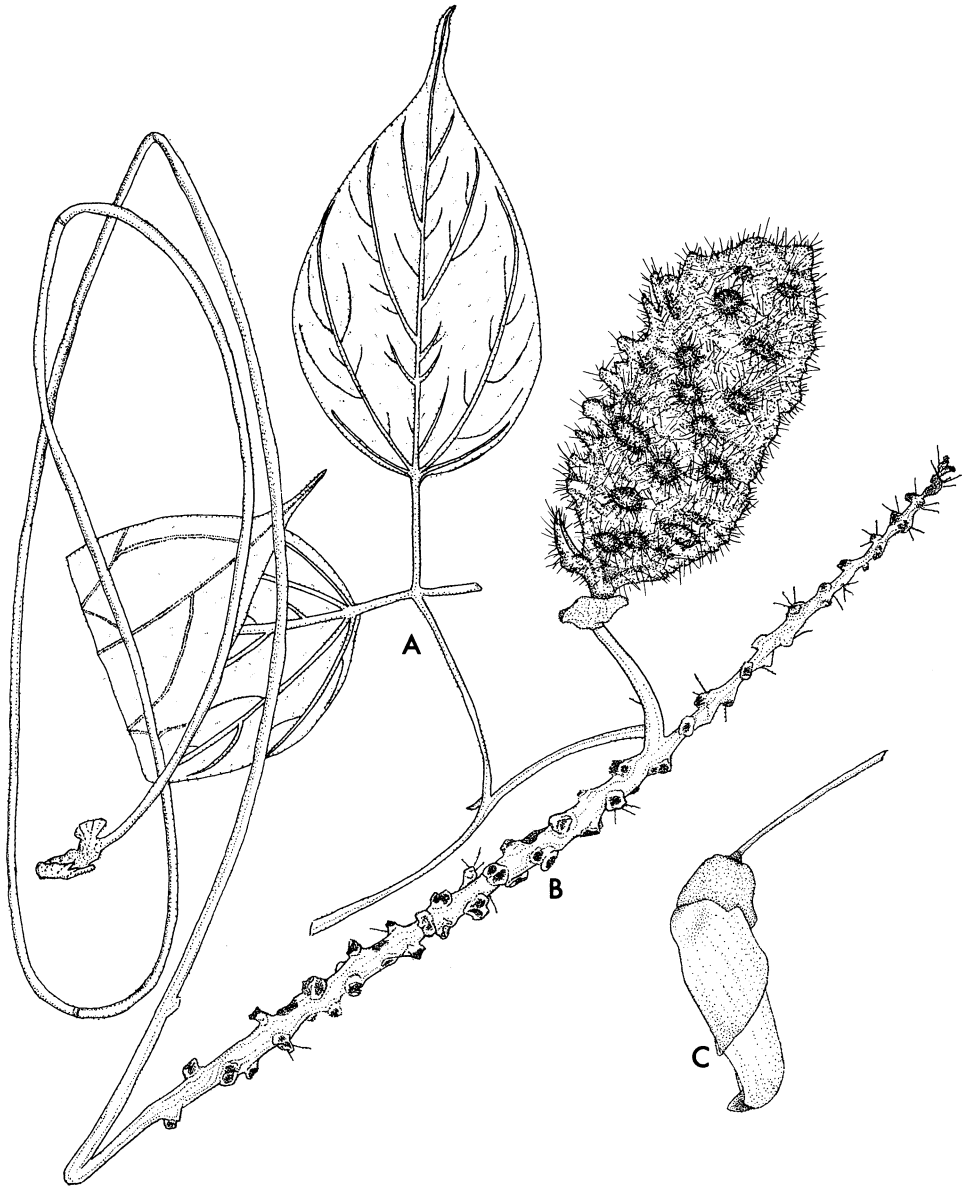

FIGURE 37. *Mucuna mutisiana* (H.B.K.) DC.—A. Leaf with 2 leaflets remaining.—B. Fruiting inflorescence (×½). [After *Hammel 5442.*]—C. Flower (×½). [After *Croat 12790.*]

caducous. *Flowers* showy, white, cream, green or brown, often with purple markings, the calyx cupular, ca. 10 mm long, evenly gray or brown velutinous, the teeth short deltoid, the longest 3–5 mm long; standard ca. 2.5 cm long, mostly enveloping the wings and the keel, the wings 4–5 cm long, darker, connate, apically broadening, the keel 3.5–5 cm long forming a slender tube, but not connate along the upper edge, apically sharply bent and indurated; stamens with the

filaments united ¾ way up, the free portion equal, the united portion biseriate, apically curved; ovary ascending tomentose, the style ascending pilose, less so apically, the stigma minute, peltate. *Legume* few seeded, 6–15 cm long, 3–5 cm wide, constricted between the seeds and undulate along the margin, transversely or obliquely ridged with narrow, irregular lamellae to 3 mm tall, the entire legume covered with brownish deciduous stinging hairs; falsely septate between the seeds, tardily dehiscent; seeds dull, dark brown, convex-discoid, the hilum linear around ¾ of the periphery, the testa hard, almost flinty.

This species is distinguished from other Panamanian species of *Mucuna* by the short lobes on the calyx and by the lamellae on the fruit which sometimes form elongate enations more than 10 mm long.

Mucuna mutisiana occurs in Costa Rica, Panama, Colombia and perhaps farther south.

BOCAS DEL TORO: Almirante-Changuinola Canal, *Blum 1407* (FSU, MO, SCZ). Junction Ríos Changuinola and Teribe, 100–200 ft, *Lewis et al. 935* (GH, MO). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2094* (MO). Chiriquí Lagoon, *Wedel 1003* (GH, MO), *1097* (GH, US), *1106* (GH, MO, US). Water Valley, *Wedel 1486* (GH, MO, US). Old Bank Island, *Wedel 1990* (MO, US). Fish Creek Hills, *Wedel 2430* (GH, US). CANAL ZONE: BARRO COLORADO ISLAND: *Bailey & Bailey 348* (F); *Croat 4800* (MO, SCZ), *7425* (F, MO), *7426* (MO, SCZ), *10167* (MO, SCZ), *11715* (MO), *12593* (MO, PMA, SCZ); *Foster 682* (F, GH, PMA), *1322* (F, PMA), *1424* (F, PMA); *Shattuck 286* (F, MO); *Wetmore et al. 53* (A, F, GH, MO). Road to Pina, 100 m, *Busey & Mahler 344* (F, GH, MO). Pipeline Road near Gamboa, *Clewell & Tyson 3262* (PMA). Dirt road to Chiva-Chiva town, *Correa 495* (MO, SCZ). Highway NW of Summit Garden, *Croat 12611* (F, MO, SCZ). Near Summit Golf Course, *Croat 12790* (MO, SCZ). Allbrook U.S. Army Tropic Test Center, *Dwyer 7116* (MO). Chagres, *Fendler 459* (MO). E of Fort Clayton, *Harvey 5119* (F). K 9 road, *Hladik 42* (MO). Chagres River 3 mi above Gamboa Bridge, *Kennedy et al. 2306* (MO). Río Grande near Culebra, *Pittier 2139* (US). Between France Field and Catival, *Standley 30212* (U). George Green Forest Preserve behind Cerro Tigre, *Tyson et al. 2511* (FSU, MO, SCZ). 1 mi N of Summit on road to Gamboa, *Tyson et al. 2754* (FSU, MO, SCZ). Farfan Beach area, *Tyson et al. 3185* (MO). COCLÉ: El Valle, *Ebinger 1124* (F). Penonomé, 50–1000 ft, *Williams 394* (US). DARIÉN: El Real, 15 m, *Allen 970* (GH, US). Yavisa, *Stern et al. 84* (GH). LOS SANTOS: 10 mi SW of El Cortezo, southern Azuero, *Hammel 5442* (MO). PANAMÁ: Río Teribe near El Llano, *Duke 5675* (MO). Río Mamoní, *Duke 6055A* (MO). San Jose Island, *Johnston 209* (GH), *245* (GH, MO, US), *677* (GH). Alcalde Díaz, 190 m, *Nee 8297* (US). Matías Hernández, *Pittier 6885* (GH, US). Río Tapía, *Standley 28275* (US). SAN BLAS: Opposite Ustupo-Concepción, *Mori 393* (WIS).

3. **Mucuna rostrata** Benth. in Mart., Fl. Bras. 15(1): 171. 1859. TYPE: Brasil, *Spruce 1625* (?K, not seen).

High climbing woody *vine,* stems glabrate. *Leaves* trifoliolate, the leaflets mostly 9–12 cm long, ovate, apically acuminate, basally obtuse or truncate, 3–4 veined from the base, above glabrous except for appressed ascending hairs on the principal veins, beneath sparingly short pilose to glabrous, the principal veins with stout, mostly appressed and ascending yellowish or brownish hairs, often tufted at the very leaf base; petiolules 7–9 mm long, pubescent, drying dark; petioles mostly about as long as the terminal leaflet, glabrate; stipels linear, ca. 3 mm long; stipules 3–4 mm long, ascending pubescent. *Inflorescences* short racemes, the peduncle 4–13 cm long, the pedicels subumbellate in bud, often becoming well spaced in flower, ca. 10 mm long, appressed pubescent, becoming 10–20 mm long and stout in fruit; bracts subfoliaceous, velutinous on both sides, early caducous, perhaps confined to the lower portion of the inflorescence. *Flowers* showy, yellow or orange, calyx oblique cupular, softly velutinous with minute

hairs inside and out, and with scattered stout hairs on the cup outside, 2–3 cm long, the upper 2 teeth united into a broadly obtuse hood or into a deltoid lobe 5–8 mm long, the lower 3 teeth narrowly deltoid to linear, ca. 10 mm long; corolla mostly drying black, 6–9 cm long, the standard ½–⅔ as long as the wings, to 5 cm long, the wings mostly rhomboidal, to 1.8 cm wide, sometimes slightly acuminate; keel narrowly falcate, the apex indurated and often drying yellowish; anthers copiously pilose with curly hairs; stigma a capitate cone of hairs. *Legume* oblong, compressed but apparently little compressed between the seeds, with numerous, parallel transverse lamellae to 5 mm tall, 4–5 mm apart, copiously hispid with brownish stinging hairs; seeds not seen.

Mucuna rostrata is distinct from other Panamanian members of the genus in its short racemes, short pedicels, and large flowers. The anthers are more pubescent, the stigma is bigger than other species, and the wing petals are relatively much wider. Little fruiting material has been seen or described in the literature, and the uniformity of the pod is unknown. The pubescence of the leaflet undersides is variable in amount.

This species has been collected a number of times in Bolivia, Peru, and Ecuador but is a rare plant in Panama.

CANAL ZONE: BARRO COLORADO ISLAND: *Netting 25* (F, MO); *Shattuck 489* (F, MO, US); *Wetmore & Abbe 12* (A, F, GH, MO); *Wilson 136* (F); *Zetek 15000* (F). 5 km SE of Achiote, *Gentry & Nee 8715* (MO). Lion Hill, *Goldman 1881* (US). COLÓN: Portobelo, *Pittier 2450* (US). DARIÉN: Río Chucunaque between Yavisa and Río Tuira, *Gentry 13481* (MO).

4. **Mucuna sloanei** Fawcett & Rendle, J. Bot. 55: 36. 1917. Based on *Phaseolus brasiliensis frutescens* . . . . Sloane, Voy. Madera, Barbados, etc. 1: 178. 1707. TYPE: Herb Sloane 3: 69 (BM, not seen, designated by Fawcett & Rendle).

High climbing robust *vine*; stems appressed tomentose, especially near the nodes, glabrescent, the hairs whitish. *Leaves* trifoliolate, the leaflets mostly 7–10 cm long, ovate, apically acute obtuse or short acuminate, basally obtuse or truncate, the lateral leaflets strongly oblique, the midvein prominent, 3-veined at the base, 3–5 prominent veins on each side higher up, glabrescent above, softly fine pubescent beneath with appressed, whitish hairs; petiole mostly as long as or shorter than the terminal leaflet; petiolules ca. 5 mm long, ascending hispid; stipels linear, ca. 2 mm long, the stipules caducous. *Inflorescence* pendant racemes, the peduncle ca. 8 cm long, appressed pubescent with whitish hairs, glabrescent but some pubescence usually persistent in lines, the flowers congested on the enlarged 1–3 cm long rachis; pedicels mostly short, to 15 mm long, pubescent, becoming stout in fruit; bracts subfoliaceous, 1–2 cm long, ovate, cucullate, hispid, early caducous; bractlets wanting. *Flowers* yellow, showy, the calyx cupular, the cup 6–12 mm long, papery, minutely pubescent inside and out, the hairs finer outside but outside with scattered coarse hairs, the upper teeth united into an upcurved lip 10–15 mm long, the lower pair of teeth obtuse, with linear tips, the lower tooth acute or acuminate deltoid, ca. 8 mm long, slightly exceeding the lower pair; corolla ca. 5 cm long, drying orange, the standard 2.5–3 cm long, ?erect, the wings and the keel narrow, exserted ca. 2 cm from the

standard, oblong falcate; style appressed pubescent, the stigma a small capitate knob. *Legume* oblong, mostly 2–4 seeded, ca. 10 cm long, 4 cm wide, short beaked, the surface with prominent transverse lamellae 4–6 mm high, copiously covered with deciduous, yellowish or brownish stinging hairs, the surface constricted between the seeds, the margin winged, the wings irregular, 4–8 mm wide, drying black; seeds convex lenticular, 2–3 cm across.

Mucuna sloanei may be recognized by its pubescent leaf undersides and by its yellow flowers, and there are many minor differences separating the species from other Panamanian elements, e.g. the papery calyx, the erect standard, the orange-drying corolla, the capitate stigma, the caducous bracts and lack of bracteoles etc. Occasional glabrate individuals, e.g. *Tyson et al. 3185* may be confused with *M. mutisiana*.

Mucuna sloanei occurs in the Antilles and in Central America. It is also found, perhaps introduced, in Africa. It has been collected only a few times in Panama, mostly near the sea.

CANAL ZONE: Fort Kobbe, *Duke 6078* (MO). Farfan Beach, *Lewis et al. 56* (GH, MO, US). Farfan Beach area, *Tyson et al. 3185* (FSU, MO). COCLÉ: El Valle, *Allen 78* (MO, US). PANAMÁ: San Carlos, 0–10 m, *Allen 1135* (GH, MO). San Jose Island, *Johnston 248* (GH, MO, US), *530* (GH, US), *957* (GH), *1356* (GH). Bella Vista, *Standley 25351* (US). Taboga Island, *Tyson et al. 5133* (FSU, MO, SCZ).

5. **Mucuna urens** (L.) DC., Prodr. 2: 405. 1825.

Dolichos urens L., Syst., ed. 10: 1162. 1759. Based on *Zoophthalmum* P. Br., Hist. Jam. 295. 1756. TYPE: *Browne*, Jamaica, not seen.
D. altissimus Jacq., Sel. Stirp. Amer. 203, *tab. 182, fig. 85*. 1763. TYPE: not seen.
Stizolobium altissimum (Jacq.) Pers., Syn. Pl. 299. 1807.
Mucuna altissima (Jacq.) DC., Prodr. 2: 405. 1825.

High climbing woody *vine*, stems slender, glabrate. *Leaves* trifoliolate, leaflets mostly ca. 10 cm long, 5 cm wide, ovate, apically acuminate, basally obtuse or rounded, the lateral leaflets oblique, costate with 3 prominent veins at the base and 1–3 prominent veins distally on each side, glabrescent, more so above, beneath with scattered short hair bases persisting, the leaf base sometimes with a few stouter hairs; petioles somewhat shorter or longer than the terminal leaflet; petiolules ca. 10 mm long, drying dark; stipels caducous, stipules scale-like, 2–3 mm long, pilose. *Inflorescence* pendulous, the peduncle elongate, slender, glabrate, the rachis thick, ca. 3 cm long; appressed pubescent, striate, the pedicels slender, 4–5 cm long, stout in fruit, appressed pubescent; bracts not observed. *Flowers* pale greenish white or yellow, the calyx cupular, the cup ca. 9 mm long, the upper teeth united into a rounded or emarginate crest, ca. 10 mm long, the lower pair of teeth deltoid to acute, 6–7 mm long, the lower tooth linear, 11–13 mm long, appressed velutinous outside and inside, a few coarse ?stinging hairs on the cup outside; corolla ca. 4 cm long, the standard, ca. 2.5 cm long, the wings clavate falcate, ca. 8 mm wide at the widest, exserted 8–12 mm from the standard, drying dark; anthers ca. 3 mm long, basally barbate; stigma capitate tufted. *Fruits* oblong, becoming 20 cm long, 6 cm wide, the surface and margin with conspicuous irregular 5–10 mm high lamellae, not constricted between the seeds, copiously hispid with reddish brown stout stinging hairs, the beak slender, 1–2 mm

thick, the stipe slender, 2–3 mm thick, 0–2 cm long; falsely septate between the seeds; seeds not seen.

This species is distinct from other Panamanian species of *Mucuna* in its pod, which is larger and longer with irregular lamellas, and which is sometimes beaked and stipitate. It is also distinct in its calyx, the lower tooth of which is linear deltoid and elongate.

Identifying this material with *M. urens,* which is an Antillean species, is done with some hesitation; no good fruiting material of typical *M. urens* was seen, and the calyx teeth are longer than on most Antillean material. The pedicels are also much longer than those on Antillean material seen. The above description was made from Panamanian and Costa Rican material at MO.

All collections of this species except for that from El Valle by Seibert are from upland Chiriqui, 1,500–2,000 m, an area from where no other species of *Mucuna* have been reported.

CANAL ZONE: Gatún Station, *Hayes 134* (GH). CHIRIQUÍ: Finca Collins, Boquete, *Blum & Dwyer 2531A* (GH, MO, SCZ). Cerro Horqueta, 4500–7000 ft, *Blum & Dwyer 2605* (FSU, SCZ); *Dwyer et al. 450* (MO); *Dwyer & Lallathin 8738* (GH, MO). Boquete, *Ebinger 740* (MO); *Kirkbride 156* (MO). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 324* (MO). Bajo Mono and Quebrada Chirquero, 1500 m, *Woodson & Schery 517* (MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 969* (GH, MO, US). COCLÉ: El Valle de Antón, 500–700 m, *Seibert 434* (GH, MO). DARIÉN: Between Caná and Boca de Cupe, *Stern et al. 628* (GH, MO).

33. MYROXYLON

Michael O. Dillon[71]

Myroxylon L.f., Suppl. Pl. 34, 233. 1781. Nom. cons., non J. R. & G. Forster, 1776. TYPE: *M. peruiferum* L.f.

Toluifera L., Sp. Pl. 384. 1753; Gen. Pl., ed. 5. 181. 1754. Nom. rejic. TYPE: *T. balsamum* L.
Myrospermum sect. *Myroxylon* (L.f.) DC., Prodr. 2: 95. 1825.

Unarmed *trees. Leaves* alternate, imparipinnate, 5–15 foliolate; leaflets alternate, with pellucid glandular dots and lines; stipules and stipels minute or absent. *Inflorescences* racemose, terminal and axillary; bracts and bracteoles caducous. *Flowers* pedicellate, small; calyx turbinate-campanulate, 5-lobed, subequal, valvate in bud; petals 5, whitish, subequal, free, the standard larger than the wings, the keel narrow; stamens 10, free, subequal, exserted, the anthers uniform, oblong, acuminate, sagittate, dorsifixed; ovary long stipitate, 2-ovulate near the apex, the style short, incurved, the stigma terminal, minute. *Fruits* stipitate, compressed, indehiscent, samaroid, 1-seeded at the apex, unequally winged basally; seeds subreniform, resinous, the hilum elliptic, subapical. Chromosomes: $n = 14$.

The genus *Myroxylon* is represented by 2 species distributed from Mexico to northern South America and cultivated in Ceylon and the Congo. In Panama, *M. balsamum* is known from tropical moist forest in the Canal Zone, Panama and Darien Provinces. Rudd (1972) recognized two varieties in Panama (*balsamum*

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and *pereirae* (Royle) Harms) with the note that the most important differences between the varieties seemed to be the chemical and physical properties of the balsam. In the absence of morphological characters allowing distinction of these varieties, they are not recognized in the present treatment.

Myroxylon supplies the "balsam of Peru" used pharmaceutically and in perfumery. Despite its most common name, it was originally discovered and has since been produced commercially in El Salvador. The wood is strong and durable, and it is used for cabinet work. In addition to commercial uses, this species is utilized by native peoples for poles in house construction, "orcones" and "pilones." The Choco of Darién call this plant "pido quera," which translates to peccary perfume; the bark is burned in the sun to attract these animals. The fruits are not consumed.

Literature:

Baillon, M. H. 1873. Sur les toluifera et sur l'origine des baumes de Tolu et du Pérou. Assoc. Franc. l'Avanc. Sci., Lyon, 510–521, plate X.

Ruiz, H. 1777–1788. Travels of Ruiz, Pavón, and Dombey in Peru and Chile (1777–1788). English translation, Publ. Field Mus. Nat. Hist., Bot. Ser. 21: 176–177. 1940.

1. **Myroxylon balsamum** (L.) Harms,[72] Notizbl. Bot. Gart. Berlin 5: 94. 1908.—FIG. 38.

Toluifera balsamum L., Sp. Pl. 384. 1753. TYPE: Colombia, "in America prope Carthagenam," collector unknown (presumably BAS, not seen).

Tree to 40 m tall, d.b.h. ca. 1 m; bark smooth, with abundant lenticels. *Leaves* usually imparipinnate, 5–10 foliolate; rachis and petiolules pubescent, terete; rachis 5–15 cm long; leaflets alternate, lanceolate to elliptic, acute to acuminate, obtuse at the base, 3–11 cm long, 1.8–4.0 cm wide. *Inflorescence* racemose, axillary, to 20 cm long, closely cinereous tomentose; pedicels 1.0–1.5 cm long. *Flowers* oblique on the pedicel; calyx campanulate, 1.5–4.5(–6.0) mm long, finely ribbed, the lobes ca. 1.5 mm long; the standard orbicular, ca. 9 mm in diameter, cordate basally, the claw ca. 1 mm long; wings elliptic to narrowly spatulate, ca. 1 cm long, ca. 4 mm wide, the claw 2 mm long; keel subelliptic, ca. 8.5 mm long, ca. 3 mm wide, the claw ca. 1.5 mm long; ovary short stipitate for ca. 2 mm, villosulose; style subulate. *Fruit* a samara, narrowly obovate, to 11 cm long, glabrous, stipitate, ca. 1 cm long; wing to 8 cm long, 1–2 cm wide, the seminiferous area turgid at the apex of the fruit, obliquely oblong, 2–3 cm wide, ca. 1 cm thick.

This species ranges from southern Mexico to northern South America, where it is replaced by *Myroxylon peruiferum* L.f., which ranges south to Argentina. In Panama, it flowers from January to June, fruiting between September and March.

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[72] For a list of synonyms see Rudd (1972). Only the listed names have been used for Panamanian material.

FIGURE 38. *Myroxylon balsamum* (L.) Harms.—A. Habit (×½).—B. Fruit (×½).

DARIÉN: Santa Fé, *Duke 8391* (MO); Campamento Buena Vista, *Stern et al. 856* (MO). PANAMÁ: Chepo. *Pittier 4765* (MO).

34. ORMOSIA

Michael O. Dillon[73]

Ormosia Jacks., Trans. Linn. Soc. London 10: 360. 1811. Nomen cons. TYPE: *O. coccinea* (Aubl.) Jacks. (=*Robinia coccinea* Aubl.).

Trees to 60 m, or rarely shrubby; trunks sometimes buttressed, bark gray, rough. *Leaves* imparipinnate, 3–19 foliolate, occasionally unifoliolate; leaflets coriaceous or subcoriaceous, 1.5–35.0 cm long, 0.5–20.0 cm wide; rachis to 50

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cm long; stipules 0.5–15.0 mm long, deltoid to linear, caducous, possibly lacking in some species; stipels rare, minute, usually acicular. *Inflorescence* racemose, many flowered, terminal or pseudoterminal; bracts stipuliform, deltoid to lanceolate, 0.5–10.0 mm long, 0.5–4.0 mm wide, pubescent, frequently caducous; bracteoles paired, subtending the calyx, deltoid to filiform, 0.5–8.0 mm long, 0.5–1.0 mm wide. *Flowers* yellow, lilac, or dark purple; calyx campanulate, 5-lobed, upper 2 lobes subconnate; petals 5, free, the standard suborbicular, wings oblique, obovate to oblong, the keel similar to wings, incurved, free, often overlapping dorsally; stamens 10, free, alternately subequal; anthers versatile. *Fruit* 1–6 seeded, oblong or rarely elongate, compressed or turgid around seeds, dehiscent or rarely indehiscent, woody or fleshy, 2-valved, continuous or with septa between seeds; seeds ellipsoid, globose or lenticular, unicolored, red, yellow, or black, or bicolored, red and black or yellowish and red, the hilum terminal, elliptic or linear; chromosomes: $n = 8$.

Ormosia is a genus of some 100 species, approximately half of which are American tropical rain forest elements and the remainder of the Old World. This Asian-American disjunct distribution is curious, with no single species common to both hemispheres. In Panama, six species are recognized, two of these endemic, *O. panamensis* and *O. cruenta*, with the other four distributed south to Brazil. While *Ormosia isthmensis* Standl., described originally from Oaxaca, has been reported from Panama (Rudd, 1965), all specimens annotated as such are referable to other taxa, usually *O. macrocalyx* Ducke or *O. coccinea* var. *subsimplex* (Spruce ex Benth.) Rudd.

While lacking major economic importance, most species do yield wood of good quality. In Panama, various species are used locally for building and furniture construction. This genus finds greatest importance among native peoples for personal adornment and medicinal preparations. The bright red seeds are used in necklaces, hence the common name "necklace tree."

Leaves, bark, and roots are used alone or in combination with other drug plants for a wide variety of ailments and maladies. In eastern Venezuela, *Ormosia monosperma* ("pionia montañero") is utilized as follows: "the seed used by doctor; cook seed and drink for pains of the heart; also cooked seed placed in water, given to children to put around their necks for sore throat" (collectors notes, *Steyermark 61330* [MO]).

Seeds of several species have been tested as possible drug sources. The alkaloids ormosine and ormosonine have been isolated, possibly from *O. avilensis* or *O. venezolana,* with the former reportedly having a physiological effect resembling morphine (Hess & Merck, 1919). *Ormosia macrocalyx,* originally identified as *O. panamensis,* has yielded the alkaloid panamine, which induced hypotensive action in test dogs (Lloyd & Horning, 1958).

Literature:

Hess, K. & F. Merck. 1919. Über Ormosin und Ormosinin, zwei neue Alkaloide aus *Ormosia dasycarpa*. Ber. 52: 1976–1983.

Lloyd, H. A. & E. C. Horning. 1958. Alkaloids of *Ormosia panamensis* Benth. and related species. Amer. Chem. J. 80: 1506–1510.

Rudd, V. E. 1965. The American species of *Ormosia* (Leguminosae). Contr. U.S. Natl. Herb. 32(5): 279–384.

a. Mature leaflets glabrous beneath (inconspicuously pubescent in *O. panamensis*), secondary veins not conspicuously raised; mature fruits essentially glabrous, seeds unicolored red.
  b. Leaflets 2–6(–8) cm long, 1.0–3.5 cm wide (Panama) ---------- 3. *O. cruenta*
  bb. Leaflets 6–15 cm long, 3–10 cm wide.
    c. Fruit submolliform, constricted between seeds, black or dark brown, shiny, glabrous, septa lacking between seeds (Mexico to Brazil) ---------- 4. *O. macrocalyx*
    cc. Fruit suborbicular, not constricted between seeds, yellow sericeous, glabrate, seeds separated by septa (Panama) ---------- 5. *O. panamensis*
aa. Mature leaflets pubescent beneath, secondary veins conspicuously raised; mature fruits pubescent or glabrous, seeds bicolored red and black.
  d. Mature fruit densely puberulent, not shiny; leaflets reddish pubescent beneath (Panama, Colombia, Venezuela) ---------- 6. *O. tovarensis*
  dd. Mature fruit glabrous; pubescence white (Panama, northern South America).
    e. Leaflets with lower surface sparsely pubescent with minute appressed trichomes (Panama, northern South America) ---------- 2a. *O. coccinea* var. *subsimplex*
    ee. Leaflets with lower surface finely and tightly crisped-pubescent (Panama, Amazonian Basin) ---------- 1. *O. amazonica*

1. **Ormosia amazonica** Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 139. 1922. TYPE: Brazil, Para: Obidos, *Ducke 14833* (G, holotype, not seen; MO, photo).

Ormosia euneura Harms, Notizbl. Bot. Gard. Berlin 9: 972. 1926. TYPE: Peru, Loreto, Iquitos, *Tessmann 3665* (fragment, F; photo neg. #1908, MO).

Tree to ca. 20 m; young stems greyish to yellowish tomentulose. *Leaves* 7–11-foliolate; rachis 14–40 cm long, tomentulose; petiole 7–12 cm long; petiolules 5–10 mm long; leaflets coriaceous, elliptical, ovate, or obovate, 15–22 cm long, 6.0–11.0 cm wide, the apex obtuse, short acuminate, the base rounded to cordate, the margin sometimes revolute, glabrous above, finely and tightly crisped-pubescent beneath. *Inflorescence* terminal, the axes yellowish tomentulose. *Flowers* purplish, 15–17 mm long; calyx 8–10 mm long, yellowish to reddish tomentulose, 5-lobed, the teeth 4–6 mm long. *Fruit* dehiscent, subligneous or coriaceous, glabrate, black to dark brown, 1–3-seeded, 2–5 cm long, 1.5–2.5 cm broad; seeds bicolored, red with a black spot; 10–13 mm long, 9–11 mm wide, 7–8 mm thick.

This species was recently collected in Panama on Barro Colorado Island, Canal Zone. Although sterile, the collection is best referred to this taxon until flowering material is available for study. Previously it had been known only from the Amazonian Basin of Brazil and Peru, and its occurrence north of the equator marks a considerable range extension.

Inflorescence, flower and fruit characteristics are taken from Rudd (1965).

Ormosia amazonica is distinctive among the Panamanian species with its large leaves and leaflets with upper surfaces glabrous and lower surfaces finely and tightly crisp-pubescent.

CANAL ZONE: Barro Colorado Island, *Foster 2866* (MO).

2. **Ormosia coccinea** (Aubl.) Jacks., Trans. Linn. Soc. London 10: 360. 1811.

2a. **Ormosia coccinea** var. **subsimplex** (Spruce ex Benth.) Rudd, Contr. U.S. Natl. Herb. 32: 328. 1965.

Ormosia subsimplex Spruce ex Benth., Mart. Fl. Bras. 15(1): 316. 1862. TYPE: Venezuela, Amazonas, San Carlos, *Spruce 2955* (K, holotype, not seen).

Tree, to ca. 30 m; trunk commonly 60(–100) cm d.b.h., outer bark thin, hard, reticulate, flaking easily; stems subflexuose, reddish to yellowish tomentulose, glabrescent. *Leaves* imparipinnate, 9(–14)-foliolate, 25–40 cm long; rachis 8–30 cm long, tomentulose to subsericeous, the petiole 6–10 cm long; leaflets coriaceous, elliptic, oblong to obovate, 7–18 cm long, 4.0–7.5 cm wide, abruptly acuminate, obtuse to subcordate basally, glabrous above, somewhat shiny, the lower surface sparsely pubescent with minute, appressed trichomes, somewhat viscid, the costa tomentulose. *Inflorescence* cymose-paniculate, terminal, to 30 cm long, axes yellowish to reddish tomentulose, glabrescent. *Flowers* purple, 10–15 mm long; calyx yellowish or reddish tomentulose, 7–9 mm long, 5-lobed, the teeth 3–5 mm long; corolla 10–15 mm long. *Fruit* dehiscent, woody, black or dark brown, glabrous at maturity, shiny, usually 1 or 2 seeded, oblong or obovate, 3.5–5.0 cm long, 2.0–2.5 cm wide, abruptly narrowed at the apex, the valves 2–3 mm thick; seeds bicolored, red and black, 10–15 mm long, 9–12 mm wide, 7–10 mm thick.

This variety is distributed in tropical moist forest from Panama to Colombia, Peru, Venezuela, and Brazil, with variety *coccinea* found in northern Brazil and adjacent French Guiana, Surinam and British Guiana. Variety *subsimplex* is readily recognized among the Panamanian taxa by its large, coriaceous, glabrescent leaflets, woody 1–2-seeded fruits and bicolored seeds. It flowers from June to August and fruits mature in 4–6 weeks. The fruits and exposed seeds persist until flowering the following year. It is known locally as "alcornoque" or "pernillo de monte."

CANAL ZONE: Near Indio Tower, *Johnston 1793* (A). San Pablo, collector unknown *9.267* (US). BARRO COLORADO ISLAND: *Croat 5104* (MO, SCZ, US), *5120* (MO, NY, SCZ, US), *6577* (F, MO, NY, SCZ, US), *8112* (MO), *8440* (MO, US), *10395* (MO, NY), *11306* (MO), *12685* (MO, NY), *12702* (MO); *Foster 1114* (PMA); *Shattuck 1103* (F, MO, US). VERAGUAS: Isla de Coiba, *Dwyer 1617* (GH), *2373* (F, MO, NY, PMA).

3. **Ormosia cruenta** Rudd, Contr. U.S. Natl. Herb. 32(5): 318. 1965. TYPE: Panama, *Davidson 848* (US, holotype; A, F, MO, isotypes).

Tree, to 30 m tall; stems reddish tomentose. *Leaves* imparipinnate, 5–11 foliolate, the rachis 8–10 cm long, velutinous, glabrescent; petioles ca. 2 cm long; leaflets subcoriaceous, elliptic to elliptic-oblong, 2–8 cm long, 1.0–3.5 cm wide, the apex acute, obtuse basally, glabrous above, shiny, glabrous below, somewhat shiny. *Inflorescence* racemose, terminal, axes reddish velutinous. *Flowers* 15–18 mm long; calyx reddish velutinous, ca. 10 mm long, 5-lobed, the teeth ca. 4 mm long; petals lilac; ovary subsessile, reddish villous, 3–5-ovulate. *Fruit* dehiscent, sublignous, glabrous, somewhat shiny, black, 1-seeded, 2.0–2.5 cm long, 1.5 cm wide, 1 cm thick; seeds red, 8–10 mm long, 9–10 mm wide, 7–9 mm thick, the hilum ca. 2 mm long, ca. 1.5 mm wide.

This species is only known from the mountains of western Panama at 800–1,300 m. It is distinctive among the Panamanian species with its small leaflets and legumes.

A collection (*Lindsay 481* [MO]) from the Canal Zone Experimental Garden

appears to be *Ormosia cruenta*; however, its leaflets are more acuminate than other collections examined.

CHIRIQUÍ: Boquete, *Davidson 848* (A, F, MO, US). COCLÉ: Cerro Pajita, *Allen 4499* (F, GH, MO, NY, US).

4. **Ormosia macrocalyx** Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 137. 1922. TYPE: Brazil, Amazonas: Lago Teffe, *Ducke 7345* (BM, isotype, not seen).

O. toledoana Standley, Carnegie Inst. Wash. 461: 64. 1935. TYPE: British Honduras, Toledo: Forest Home, *Schipp 1052* (holotype F; isotype MO).
O. chlorocalyx Ducke, Bol. Técn. Inst. Agron. N. 2: 23. 1944. TYPE: Brazil, Amazonas: Esperanca, Rio Solimoes, "boca do Javari," *Ducke 1516* (isotypes F, MO).

Tree to ca. 40 m; young stems finely pubescent, glabrate. *Leaves* 7–11-foliolate; rachis 15–40 cm long; petiole 4–10 cm long, conspicuously swollen at the base; petiolules pulvinate, 5–8 mm long; leaflets ovate to ovate-oblong, 6–15 cm long, 4–10 cm wide, glabrous, the apex obtuse to short acuminate, rounded to subcordate basally. *Inflorescence* terminal, paniculate, to 30 cm long, greyish to yellowish pubescent, the bracts linear, 3–10 mm long, ca. 1 mm wide, the bracteoles subulate, 1.0–1.5 mm long. *Flowers* purplish, 18–25 mm long; calyx 8–15 mm long, grayish pubescent, 5-lobed, the teeth 3–5 mm long; petals ca. 2 mm long; standard minutely biappendiculate basally. *Fruit* dehiscent, coriaceous, circular to oblong, flattened, to ca. 10 cm long, ca. 3 cm wide, 1–4-seeded, the lateral margins straight or submolliform, glabrous; seeds red, ovoid, ca. 1 cm long, ca. 10 mm broad, ca. 8 mm thick, the hilum elliptic. Chromosomes: $n = 8$.

This species is distributed from southern Mexico to the Amazon Basin of Brazil, usually in moist forests up to 100 m. In Panama it is known from tropical moist forest in the Canal Zone, Bocas del Toro, and Veraguas, and from premontane wet forest in Chiriqui Province. It appears to flower during mid-rainy season, with the fruits persisting most of the year. A chromosome number of $n = 8$ was reported by Atchison for *O. macrocalyx* as *O. panamensis*.

BOCAS DEL TORO: *Cooper & Slater 125* (A, GH, US). CANAL ZONE: Cascadas Road near Summit, *Avilla 407* (MO, SCZ). Barro Colorado Island, *Croat 13217* (F, MO, US). Highway near Fort Kobbe, *Dwyer 2666* (MO). Curundu, *Dwyer & Robyns 6* (MO). Barro Colorado Island, *Foster 2091* (GH, PMA, US). Tropical Test Center Site, Chiva Chiva Trail, *Gentry 6335, 8751* (both MO). Corozal area, *Mori & Kallunki 3063* (MO, US). Corozal cemetery, *Schubert & Lindsay 602* (GH, US). Fort Clayton, *Tyson 3472* (SCZ). Corozal area, *Tyson & Dwyer 2789* (FSU, MO, SCZ). CHIRIQUÍ: Progreso, *Cooper & Slater 243* (F, GH, NY, US). PANAMÁ: Alrededores del Hotel Panamá, 8 Mar 1971, *Holdridge* (PMA). VERAGUAS: Santiago, *Dwyer 1347* (MO, SCZ).

5. **Ormosia panamensis** Benth., Seem. Bot. Voy. Herald 111, *fig. 5*. 1854. TYPE: Panama, *Seemann 1673* (K, holotype, not seen; BM, isotype, not seen; MO, photo).—FIG. 39.

O. stipitata Schery, Ann. Missouri Bot. Gard. 30: 90, *fig. 2*. 1943. TYPE: Panama, *White 306* (holotype, MO).

Tree to ca. 15 m tall; young stems yellowish or golden sericeous, glabrate. *Leaves* 5–9-foliolate, the rachis 9–17 cm long, sparsely pubescent, glabrate, the petiole 5–8 cm long; leaflets subcoriaceous, oblong-lanceolate, gradually long

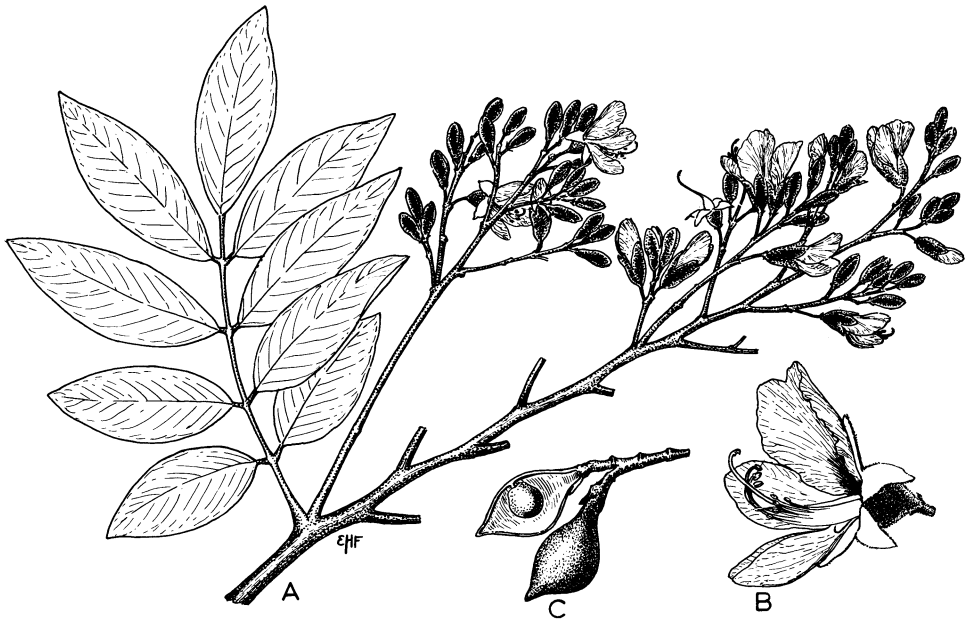

FIGURE 39. *Ormosia cruenta* Rudd.—A. Habit (×½).—B. Flower with one wing petal removed (×1½). [After *Allen 4999.*]—C. Fruit (×½). [After *Davidson 848.*]

acuminate at the apex, obtuse basally, 10–15 cm long, 3–6 cm wide, glabrate above, inconspicuously golden puberulent below. *Flowers* lilac; calyx densely yellowish sericeous, 8–11 mm long, 5-lobed, the teeth 3–4 mm long; corolla ca. 2 cm long. *Fruit* dehiscent, coriaceous, yellowish sericeous, glabrate; light brown or yellowish, suborbicular when mature, flattened, ca. 4 cm in diameter, not constricted between seeds, the valves thick with an adnate margin, 5–15 mm wide; seeds 1–4, separated by septa, ca. 1.5 cm long, dark red.

This species is only known from Panama, and it appears rare locally in Bocas del Toro, Chiriqui, and Barro Colorado Island, Canal Zone. Its dehiscent, coriaceous legume, lacking constrictions between the seeds, is distinctive among the Panamanian species. It is unique among the American species in possessing septae between the seeds, a character also found in some Asiatic species. It is known locally as "peronil."

BOCAS DEL TORO: Talamaca Valley, near Almirante, *Cooper & Slater 150* (US). CANAL ZONE: Barro Colorado Island, *Foster 1128* (F, MO, PMA, SCZ). 1 km N of Gamboa near summit of Cerro Pelado, *Nee 9060* (MO). CHIRIQUÍ: Near David on road to Gualaca, *Birdsall* (US); *Holdridge 2* (US); *Roy* (US).

6. **Ormosia tovarensis** Pittier, Bol. Soc. Venez. Ci. Nat. 4: 85. 1938. TYPE: Venezuela, Distrito Federal: El Avila, *Delgado 59* (VEN, holotype; F, isotype).

Tree to ca. 25 m; young stems yellowish to reddish tomentose. *Leaves* 7–9-foliolate, the rachis 12–36 cm long, reddish tomentose, the petiole 4–15 cm long, reddish tomentose, the petiolules 3–10 mm long, reddish tomentose, the leaflets

coriaceous, elliptic, oblong-elliptic or obovate, 8–30 cm long, 1–18 cm wide, rounded at each end, the margins often revolute, the upper surface glabrous, densely reddish pubescent with moderately crispate hairs beneath, the secondary veins raised. *Inflorescence* terminal, the axes reddish tomentose, the bracts deltoid, 5–6 mm long, the bracteoles linear-deltoid, ca. 2 mm long. *Flowers* 15–16 mm long, violet; calyx reddish tomentulose, 10–11 mm long, 5-lobed, the teeth 4–5 mm long; ovary yellowish pubescent with crispate hairs. *Fruit* yellowish to reddish velutinous, 1–3-seeded, 4–9 cm long, 3–4 cm wide, ca. 2 cm thick, the valves ligneous; seeds bicolored red and black, 15–22 mm long, 13–19 mm wide, 10–18 mm thick, the hilum 3.0–3.5 mm long.

This species was previously known from the rain forests of the coastal cordillera of Venezuela and the Cordillera Oriental of Colombia, and its occurrence on Cerro Tacarcuna, Darien, marks its northwestern extreme in distribution. On Cerro Tacarcuna it occurs in elfin forest between 1,800–1,850 m.

The specimens cited here are sterile and are only tentatively being assigned to *O. tovarensis* on the basis of leaflet size, shape and pubescence. Inflorescence, flower and fruit characteristics are taken from Rudd (1965). Fruiting material may prove this to be another or perhaps a new species.

DARIÉN: Top of W peak of Cerro Tacarcuna, *Gentry & Mori 13988* (MO). Headwaters of Tacarcuna River, *Holdridge* (US).

35. PACHYRHIZUS

W. G. D'Arcy[74]

Pachyrhizus Rich. ex DC., Prodr. 2: 402. 1825. TYPE: *P. angulatus* Rich. ex DC. = *P. erosus* (L.) Urb., nomen & typus cons. vs. *Caraca* Thou.

Caraca Thou., Dict. Sci. Nat. 6: 35. 1805 [?1806]. Nomen rejic. vs. *Pachyrhizus* DC. Based on *Dolichos bulbosus* L.

Taeniocarpum Desv., Ann. Sci. Nat. 9: 420. 1826. TYPE: *T. articulatum* (Lam.) Desv. = *Pachyrhizus erosus* (L.) Urb.

Robynsia Mart. & Gal., Bull. Acad. Bruxelles 10(2): 193. 1843. non Drapiez 1841, nec Hutch. 1931. TYPE: *R. macrophylla* Mart. & Gal. = *Pachyrhizus erosus* (L.) Urb.

Twining annual or perennial *vines*; stems terete; roots tuberous. *Leaves* pinnate trifoliolate; leaflets entire, lobed or deeply dissected, stipels subulate, stipules caducous, rachis and petioles with longitudinal ridges running onto the stipels. *Inflorescences* axillary pseudoracemes, the peduncle often longer than the petiole, the flowers somewhat congested apically; bracteoles subulate, shorter than and subtending the calyx; pedicels slender, slightly longer than the calyx. *Flowers* blue; calyx campanulate tubular, 2-lipped, the upper 2 teeth mostly connate, the lower teeth acute, shorter than the tube; standard emarginate with 2 basal incurved auricles, the wings auriculate, medially adherent to the keel, the keel equalling the wings; stamens diadelphous, the anthers 10, elliptical, dorsifixed; ovary subsessile, multiovulate, the style incurved, sometimes forming a circle, dorsally glabrous, bearded the full length of the ventral, incurved surface. *Legume* oblong, compressed, nearly straight, internally septate between the seeds; seeds globose, compressed.

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Pachyrhizus is distinguished by its curved, ventrally pubescent style, often lobed leaves, flowers which are not resupinate, and tuberous roots. Although treated here as monotypic, Clausen (1946) adopted a narrow species concept and recognized six species and several varieties.

The genus was widely cultivated in pre-Columbian times and ranges throughout the Neotropics, occurring mainly at lower and middle elevations. It has been introduced to the Old World and is naturalized there. The tubers of *Pachyrhizus* are cultivated for food in many tropical countries and the plants are sometimes cultivated for forage. The seeds are reported to be toxic.

1. **Pachyrhizus erosus** (L.) Urban, Symb. Ant. 4: 311. 1905.—FIG. 40.

Dolichos erosus L., Sp. Pl. 2: 726. 1753. TYPE: ?Herb. Linnaeus (LINN 900.11 not seen; microfiche MO).
D. bulbosus L., Sp. Pl., ed. 2. 1021. 1763. Renaming of *D. erosus* L.
D. articulatus Lam., Encycl. Méth. Bot. 2: 296. 1786. Based on Plumier, Plant. Amer. *tab. 220*. 1755.
Pachyrhizus angulatus Rich. ex DC., Prodr. 2: 402. 1825. Renaming of *Dolichos bulbosus* L.
Stizolobium bulbosum (L.) Spreng., Syst. Veg. 3: 252. 1826.
S. domingense Spreng., Syst. Veg. 3: 525. 1826. Based on *Dolichos articulatus* Lam.
Taeniocarpum articulatum (Lam.) Desv., Ann. Sci. Nat. 9: 421. 1826.
Robynsia macrophylla Mart. & Gal., Bull. Acad. Bruxelles 10(2): 193. 1843. LECTOTYPE: Mexico *Galeotti 3278* (BR, not seen).
Pachyrhizus articulatus (Lam.) Duch. & Walp., Flora 36: 226. 1853.
P. bulbosus (L.) Kurz, Asiat. Soc. Beng., J. 45(2): 246. 1876. (not seen.)
Cacara erosa (L.) Kuntze, Rev. Gen. Pl. 1: 165. 1891.
Pachyrhizus panamensis Clausen, Cornell Univ. Agric. Exp. Sta. Mem. 264: 21. 1944 [1945]. TYPE: Panama, *Killip 12080* (US, holotype; isotypes GH, NY).
P. vernalis Clausen, Cornell Univ. Agric. Exp. Sta. Mem. 264: 23. 1944. [1945]. TYPE: Guatemala, *Steyermark 38553* (F, not seen).

Herbaceous *vines*; stems pilose, often drying hollow; rootstock tuberous. *Leaves* pinnate trifoliolate, the leaflets ovate to broadly ovate, the terminal leaflet broadest and often 3–7 lobed, the sinuses and lobes acute or rounded, mucronate, the lateral leaflets oblique, often less lobed or entire, basally deltoid, 3-veined from the base, drying slightly discolorous, glabrate or densely soft tomentose; petiolules 4–5 mm long, stout, pilose; petioles and rachis slender, drying angled, pubescent; stipels 1–2 mm long, acicular, sericeous, basally extended into definite ribs on the rachis; stipules minute, caducous. *Inflorescences* axillary pseudoracemes, mostly 12–20 cm long, the flowers congested near the apex, the peduncle mostly longer and stouter than the petioles, the bracteoles resembling the stipels, subtending and much shorter than the calyx; pedicels ca. 2 per node, slender, ca. 5 mm long. *Flowers* blue, calyx 5–8 mm long, tubular, 2-lipped, the upper 2 teeth mostly connate, the lower 3 acute or acuminate, shorter than the tube, subequal or the lowermost longest and acuminate; standard ca. 15 mm long, suborbicular, emarginate, the wings and the keel about as long as the standard, sometimes ciliolate. *Legume* oblong, ca. 10 cm long, 1.5–2 cm wide, compressed, appressed strigose.

This species is distinct in its broad, often lobed leaflets and in its tuberous roots. In Panama, upland populations are generally densely pubescent while plants from the lowlands are glabrate. Clausen (1947) distinguished the more pubescent plants as *Pachyrhizus panamensis*, noting that petals of these plants

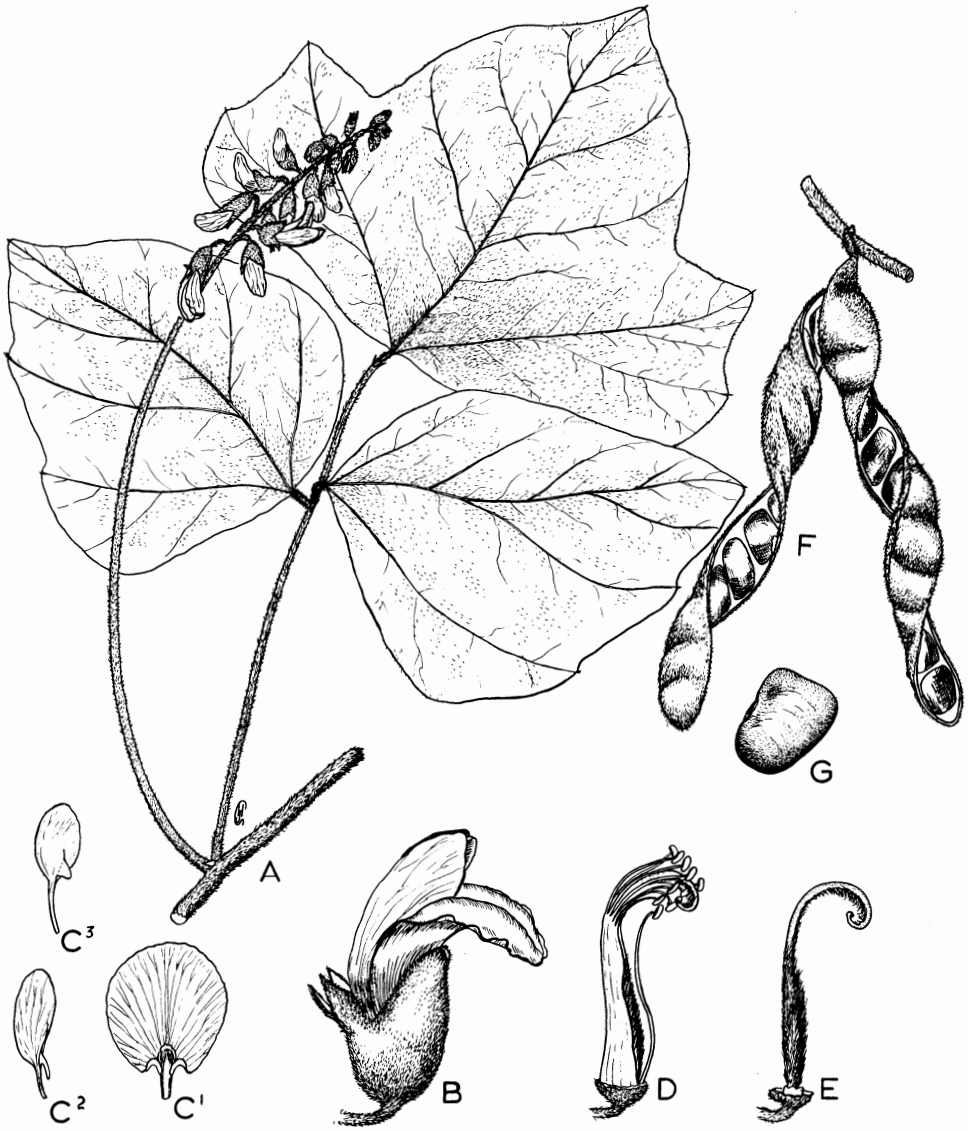

FIGURE 40. *Pachyrhizus erosus* (L.) Urban.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×2).—E. Pistil (×2). [After *Allen 2027.*]—F. Fruit (×½).—G. Seed (×1½). [After *Greenman 5053.*]

are usually ciliolate. However, these differences are not of specific import. By coincidence, the specimen he selected for the type of his species is an unusually pubescent species from Ancon Hill in the lowlands, thus the distinction between upland and lowland races is not absolute.

Pachyrhizus erosus ranges throughout the Neotropics and has been introduced and naturalized in parts of the Old World. It is cultivated for its edible tubers, but many of the Panamanian collections appear to have been taken from the wild.

The seeds are toxic. The species is known in English as the *Yam Bean,* and in Spanish as *Jícama.*

BOCAS DEL TORO: Big Bight, Chiriquí Lagoon, *Wedel 2981* (GH, MO, US). CANAL ZONE: Fort Kobbe, *Allen 2027* (F, GH, MO, NY, US). Ancón, *Celestine 28* (US). Fort Sherman, *Dwyer & Robyns 132* (MO). Chagres, *Fendler 74* (MO), *75* (F, GH, US). Balboa Heights, *Greenman & Greenman 5053* (MO). Cerro Ancón, *Heriberto 117* (GH, US). Ancón Hill, 100–200 m, *Killip 12080* (GH, NY, US). Madden Dam, 50 ft, *Lewis et al. 29* (MO). Junction Chagres Boy Scout Road and Madden Dam Road, *Mori et al. 4070* (MO, WIS). Madden Dam, *Nee 7774* (MO). Cerro Ancón, *Standley 25200* (US). Sosa Hill, Balboa, *Standley 25271* (US). Gatún, *Standley 27281* (US). Mount Hope Cemetery, *Standley 28798, 28803* (both US). Between France Field and Cativa1, *Standley 30213* (US). Curundú, *Tyson & Blum 2534* (FSU, MO). CHIRIQUÍ: Quebrada del Medio 2 km N of Punta de Burica, 40–80 m, *Busey 747* (MO). Quebrada Guanabanito 2 mi SW of Puerto Armuelles, *Croat 22071* (DUKE, F, MO). Burica Peninsula above Quebrada Yerbazales, 200 m, *Croat 22586* (MO). Bajo Mono, Boquete District, *Davidson 496* (US). Boquete, *Lewis et al. 618* (MO); *Pittier 2918* (GH, NY, US). COLÓN: Río Guanche, *D'Arcy 9721* (MO). LOS SANTOS: 16 mi S of Macaracas at Quebrada Bejuco, *Tyson et al. 3091* (MO, SCZ). PANAMÁ: Isla de Pedro Gonzales, *Dwyer 1720* (MO). SE side of Madden Lake near Puente Natural, 90 m *Nee & Hansen 14046* (MO, WIS). Ruins of Old Panama, *Pease 22878* (GH). SAN BLAS: Mainland opposite Achituppu, *Lewis et al. 102* (GH, MO, US).

36. PHASEOLUS

James A. Lackey[75] & W. G. D'Arcy[76]

Phaseolus L., Sp. Pl. 723; Gen. Pl., ed. 5. 323. 1754. TYPE: *P. vulgaris* L.

Vines, herbs or *subshrubs. Leaves* pinnate trifoliolate, the leaflets mostly entire, pubescent or glabrate but minute, uncinate hairs present, the stipels often oblong, thin, glabrous; stipules acute, nervate, often pubescent, not prolonged below the insertion. *Inflorescences* axillary, the flowers congested in fascicles along the rachis, the nodes not swollen, not glandular, the rachis eglandular; bracteoles ovate or greatly reduced and much shorter than the calyx, nervate, puberulent, persistent at least until anthesis; bracts ovate or lanceolate, nervate, puberulent; pedicels mostly longer than the calyx. *Flowers* blue, purple, violet, yellow or white; calyx mostly 2-lipped, the upper teeth partly united; standard symmetrical, orbicular, basally appendaged, the wings partly spiralled, apically cucullate, the keel in 2–3 spirals; vexillary stamen free, the free part of the others elongate, the anthers nearly uniform; ovary 1–many ovulate, the style apically thickened, curved in 1.5–2.5 spirals, hairy inside, distally caducous. *Legume* linear or oblong, straight or slightly curved, not septate, compressed or turgid, sometimes beaked; seeds 1–many, oblong to reniform, the hilum short and central.

Phaseolus includes about 50 species, all of the New World, although under older circumscriptions, the genus may embrace 100–300 species.

In Panama, *Phaseolus* is a genus of both uplands and of low elevations. Various members of the genus are widely cultivated for food in both temperate and tropical countries.

a. Bracts conspicuous, foliaceous, more than 5 mm long; inflorescences dense, many flowered; pods pubescent.

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b. Bracteoles longer than the calyx; flowers bright red (white), 16–25 mm long; lowest calyx tooth conspicuously more tomentose than the others; pod more than 6 cm long; stipels more than 4 mm long; cultivated species ---------- 1. *P. coccineus*
bb. Bracteoles minute, shorter than the calyx; flowers red to purple (white), 11–15 mm long; lowest calyx tooth only slightly pubescent, hardly more so than the others; pod less than 6 cm long; stipels less than 4 mm long; native species ------ 3. *P. tuerckheimii*

aa. Bracts inconspicuous, minute, less than 5 mm long; inflorescences open, few flowered; pods mostly glabrate.
c. Pod straight, narrow, mostly 5–10 seeded; peduncle less than 1 cm long; flowers more than 10 mm long, the standard glabrate outside with a few hairs on the midvein; stipels more than 1.5 mm long ---------- 4. *P. vulgaris*
cc. Pod curved, broad, mostly 2–4 seeded; peduncle more than 2 cm long; flowers less than 10 mm long, the standard scattered pubescent outside; stipels less than 1.5 mm long ---------- 2. *P. lunatus*

1. **Phaseolus coccineus** L., Sp. Pl. 724. 1753. TYPE: Herb. Linnaeus (LINN 899.2, not seen; microfiche MO).

P. formosus H.B.K., Nov. Gen. Sp. Pl. 6: 449. 1823. TYPE: near Toluca, Mexico, not seen.
P. obvallatus Schlecht. Linnaea 12: 328. 1838. TYPE: Mexico, *Ehrenberg* not seen.
Phaseolus coccineus ssp. *obvallatus* (Schlecht.) Maréchal et al., Taxon 27: 199. 1978.
P. multiflorus Lam., Encycl. Méth. Bot. 3: 70. 1789. Renaming of *P. coccineus* L.
P. polyanthus Greenm., Publ. Field Columbian Mus., Bot. Ser. 2: 253. 1907. TYPE: Mexico, *Barnes et al. 20* (F, not seen).
Phaseolus coccineus ssp. *polyanthus* (Greenm.) Maréchal et al., Taxon 27: 199. 1978.

Herbaceous *vine,* often large, stems softly hirsute, somewhat glabrescent, becoming stout, ca. 2–3 mm thick. *Leaves* pinnate trifoliolate, leaflets broadly ovate, the lateral pair strongly oblique, mostly 6–10 cm long, 6–8 cm wide, apically acute or acuminate, basally truncate, subcordate or rounded, the venation conspicuous on drying, sparingly soft pubescent with long and short hairs; petiolules thick, 3–5 mm long, petioles mostly longer than the terminal leaflet, stipels conspicuous, 4–6 mm long, cucullate, striate and pubescent outside, pubescent basally within. *Inflorescences* elongate cymose pseudoracemes to 30 cm long, sparingly flowered proximally, somewhat congested apically, the rachis drying sharply angled and tomentulose, especially upwards, bracts subfoliaceous, conspicuous, to 1 cm long, linear to broadly ovate, often acute, sometimes acuminate; bracteoles 2, ovate, subtending and slightly exceeding the calyx; pedicels mostly straight, 15–18 mm long, much longer than the calyx, becoming somewhat woody in fruit. *Flowers* red to lavender, showy; calyx cupular, 10–13 mm long, glabrate except the lower tooth, the upper teeth united forming a hood, the lower teeth acute, the lowermost longest; standard, ca. 2 cm long. *Legume* oblong, somewhat falcate, ca. 10 cm long, 15 mm wide, compressed or slightly turgid, beaked, softly short pubescent; seeds 5–8.

This species is distinguished by its elongate pedicels, its paired ovate bracteoles, by its large, conspicuous stipels and by the ciliate to tomentose lowest calyx tooth. This species is usually recorded as having scarlet flowers, but in Panama collectors more often note lavender or magenta flowers.

In Guatemala this species is much cultivated for food, and in the United States it is cultivated for its showy flowers as 'Scarlet Runner Bean.'

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, 1800–2000 m, *Allen 1397* (MO). Nueva Suissa, *Croat 13508* (F, MO, NY, PMA). Bajo Mono, Boquete District, 4500 ft, *Davidson 496* (MO). Río

FIGURE 41. *Phaseolus lunatus* L.—A. Habit (×3/5). [After *McDaniel & Tyson 12690.*]—B. Fruit (×3/5). [After *Burt & Koster* 3 Oct. 1971.]

Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9019* (MO, NY). Nueva Suissa near Audubon Society Cabin, *Gentry 5986* (MO). Cerro Punta, 6000 ft, *Tyson 7097* (PMA). 2 km W of La Garita, 3 km WNW of Cerro Punta, 2000 m, *Wilbur et al. 15292* (DUKE). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 313* (MO). Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 918* (MO, NY, US).

2. **Phaseolus lunatus** L.,[77] Sp. Pl. 724. 1753. TYPE: not determined.—FIG. 41.

Erect, ascending or nearly prostrate slender *vine*, sometimes somewhat scandent, sometimes branched; stems pilose with weak hairs, glabrescent. *Leaves* pinnate trifoliolate, leaflets ovate to deltoidal, sometimes rhombic ovate, apically deltoid, blunt but mucronulate, basally broader, sometimes rounded, mostly 6–8 cm long, 4–6 cm wide, 3 veined from the base, the lateral veins distally arcuate, somewhat evanescent, mostly drying concolorous, the sparse minute pubescence mostly confined to the costa; petiolules 2–3 mm long, puberulent; rachis mostly 1.5–3 cm long; stipels minute but evident, persistent, mostly 0.5–1.0 mm long; petioles mostly longer than the terminal leaflet, glabrate or sparingly pubescent with weak, subappressed hairs at anthesis. *Inflorescences* axillary or lateral, short or elongate pseudoracemes to 25 cm long, the nodes often well spaced proximally, more condensed distally, the bracts mostly 2–3 cm long, acute, sericeous, inconspicuous, the rachis and the peduncle sparingly pilose, glabrescent; pedicels 1–4 per node, slender, 6–9 mm long; bracteoles mostly ca. 1 mm long, pubescent or not, 3-nervate, spathaceous, subtending the calyx less than ½ as long as the calyx. *Flowers* greenish or purplish, the calyx 2–3 mm long, the tube campanulate, the limb somewhat flaring, the lobes rounded or short deltoid, ciliolate; standard ca. 1 cm long, broad, flat, often puberulent externally, keel spiralled. *Legume* flat, slightly turgid around the seeds, falcate, 3–8 cm long, 1.5–2 cm broad, glabrate; seeds 2–4, reniform, compressed.

This species is distinct in its glabrate leaflets and pods, inconspicuous bracts and bracteoles, and short calyx teeth. It is represented by both cultivated and wild varieties which differ in seed size and, according to Marechal et al. (1978), in the wild forms having glabrous standards. The species is believed to be native to Central America and perhaps the Antilles, so some of the populations collected in Panama are probably native to the country. This species is commonly referred to as the *Lima bean* (English) or as *Habas* (Spanish).

CANAL ZONE: Isla Perico near Fort Amador causeway, *McDaniel & Tyson 12690* (MO). Sosa Hill, *Standley 25243* (US). Balboa, *Standley 25647, 30894* (both US). CHIRIQUÍ: Quebrada Guanabanito beyond La Represa 2 mi SW of Puerto Armuelles, 0–200 m, *Croat 22076* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 318* (DUKE, F, MO, NY, PMA). HERRERA: Near Los Pozos, 20 m, *Burt & Koster,* 10 March 1971 (MO). PANAMÁ: Bella Vista, *Standley 25304* (US). Las Sabanas, *Standley 25932* (US). Tumba Muerto Road near Panamá, *Standley 29792* (US). Camino a Sardinilla, *Taylor 38* (PMA). VERAGUAS: Atalaya-Santiago, 100–200 m, *Koster 117* (MO).

3. **Phaseolus tuerckheimii** Donnell Smith, Bot. Gaz. 56: 54. 1913. TYPE: Guatemala, *Tuerckheim 1536,* not seen. Paratype: Costa Rica, *Pittier 10539* (US).

P. chiriquinus Standley, Contr. U.S. Natl. Herb. 18: 109. 1916. TYPE: Panama, *Pittier 3111* (US, holotype; isotype NY).

Herbaceous *vine*, sometimes high climbing; stems stout, sericeous, becoming softly short tomentulose, drying angled, to 3 mm thick. *Leaves* pinnate trifoliolate; leaflets ovate, sometimes narrow, mostly 4–7 cm long, apically acute or acuminate, basally rounded, drying somewhat discolorous, softly densely pubes-

[77] For a list of other names see Maréchal et al., 1978. Only this name has been used for Panamanian plants.

cent above and beneath, the veins elevated beneath, the minor venation sometimes drying reticulate; petiolules ca. 3 mm long, tomentose; petioles mostly shorter than the terminal leaflets, densely puberulent; stipels conspicuous; 2–3 mm long. *Inflorescences* mostly elongate pseudoracemes to 30 cm long, the basal portion devoid of flowers, the peduncle basally stout, narrowing and becoming more densely pubescent upwards; bracts subfoliaceous, linear to broadly ovate, to 7 mm long, sericeous; bracteoles linear, glabrate, caducous, ca. 1 mm long; pedicels slender, ca. 10 mm long with scattered long hairs. *Flowers* white to bright violet or purplish; calyx sericeous overall, ca. 4 mm long, the tube ca. 3 mm long drying with umbonate or wing-like longitudinal enations, the limb flaring somewhat, the teeth deltoid, ca. 3 mm long, the uppermost longest, acute; standard 1.5 cm long, the keel convolute, spiralled. *Legumes* oblong, compressed, slightly turgid around the seeds, ca. 4 cm long, densely tawny hirsute; seeds ca. 4.

This species is distinguished by its dense overall pubescence and by its subfoliaceous bracts and minute bracteoles. The fluting on the dried calyx is an interesting feature. *Phaseolus tuerckheimii* ranges from southern Mexico to Panama. In Panama it occurs only at upper elevations in Chiriqui Province where it is apparently shade tolerant and is found climbing on trees.

CHIRIQUÍ: Volcán de Chiriqui, Boquete District, 7500 ft, *Davidson 948* (MO). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9064* (MO). Cuesta de Cerro Quemado, E slope of Chiriquí Volcano, 1800–2160 m, *Pittier 3111* (NY). Cerro Punta, 6000 ft, *Tyson 7099* (PMA).

4. **Phaseolus vulgaris** L.,[78] Sp. Pl. 723. 1753. TYPE: ?India, Herb. Linnaeus (LINN 899.1, not seen; microfiche MO).

Climbing or trailing *vine* or erect *herb*; stems glabrous or pubescent. *Leaves* pinnate trifoliolate, the leaflets mostly ovate, sometimes broad, the lateral leaflets mostly oblique; glabrate to velutinous, apically acute, or acuminate, the petiolules 2–4 mm long, stout, pubescent; petioles often exceeding the terminal leaflet; stipels linear, costate, glabrous, as long as or shorter than the petiolules; stipules lanceolate, striate, glabrous. *Inflorescences* axillary, mostly 3–10 cm long; peduncle mostly slender and weak; rachis contracted; bracteoles and bracts spathaceous, exceeding the calyx, striate; pedicels slender. *Flowers* white, yellowish or purplish; calyx campanulate, the teeth rounded; standard 1–2 cm long. *Legume* linear, turgid, often slightly curved, glabrate, mostly 10–20 cm long; seeds subglobose to oblong, to 1.5 cm long, variously colored.

Phaseolus vulgaris, the well-known string bean or kidney bean in English, the frijol or the frijol negro in Spanish, is cultivated in almost every country in the world, and in some places it escapes and has naturalized. It is a native of the New World, and it was widely disseminated by pre-Colombian man. No collections have been seen from Panama, but the species is grown as a crop plant, mainly in upland areas, to judge from reports of vendors in markets and from fresh vegetables served in restaurants in Panama City from time to time. There

[78] No attempt has been made here to research synonyms for this widespread cultivated species.

is also a substantial import of frijoles negros from the United States and other countries for use as food.

This species is distinct from other species of *Phaseolus* in Panama in its long turgid pods and light colored flowers. Many races of *Phaseolus vulgaris* exist in cultivation, many of quite different appearance, and until specimens are obtained of the Panama elements it is not fruitful to try to amplify details of the above description or to indicate more features of difference. The above description was made from a range of cultivated material from Central America held at MO.

37. PUERARIA

W. G. D'Arcy[79]

Pueraria DC., Ann. Sci. Nat. 4: 97. 1824. LECTOTYPE: *P. tuberosa* (Willd.) DC.

Neustanthus Benth., in Miq., Pl. Jungh. 234. 1852. TYPE: *N. javanicus* Benth.
Glycine L., Sp. Pl. 753; Gen. Pl., ed. 5. 334. TYPE: *G. javanica* L. Nomen rejic. versus *Glycine* Willd. 1802.

Robust scrambling *vines,* sometimes high climbing, ?shrubs; stems herbaceous or woody, pubescent. *Leaves* pinnate trifoliolate, the leaflets large, entire, lobed or undulate margined; stipels mostly present, the stipules ovate to linear, often produced below the enlarged point of insertion, the lower element sometimes bifid. *Inflorescences* elongate stout racemes, sometimes branched, the flowers somewhat clustered at the end of the rachis; bracts often caducous, bracteoles ovate; pedicels inserted 1–7 at a node. *Flowers* sometimes appearing before the leaves; calyx campanulate, 5-toothed, the upper pair free or fused into a lip; corolla mostly bluish, pinkish or violet; standard broad, entire or emarginate, minutely spurred, the wings spurred; stamens 10, the vexillary stamen free or united to the others, usually at the middle of the filament, the anthers all alike; ovary pubescent, the style curved or abruptly bent, glabrous, the stigma glabrous. *Legume* oblong, compressed, usually pilose.

This genus of about 20 species is native to southern and eastern Asia. Two species are adventive or naturalized in the New World.

Literature:

Verdcourt, B. 1968. The identities of *Dolichos trilobus* L. and *Dolichos trilobatus* L. Taxon 17: 170–173.

1. **Pueraria lobata** (Willd.) Ohwi,[80] Bull. Tokyo Sci. Mus. 18: 16. 1947, not seen.—FIG. 42.

Dolichos lobatus Willd., Sp. Pl. 3: 1047. 1803. TYPE: *Dolichos trilobus* Houttuyn, Nat. Hist. ed. Panzer. 8: 560. *tab. 64, fig. 1.* 1782, fide Verdcourt 1968.
Pachyrhizus thunbergianus Sieb. & Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 237. 1846.
Pueraria thunbergiana (Sieb. & Zucc.) Benth., J. Linn. Soc. Bot. 9: 122. 1865.

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[79] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.
[80] For other synonyms see Verdcourt, 1968. Only these names relate to Panamanian plants.

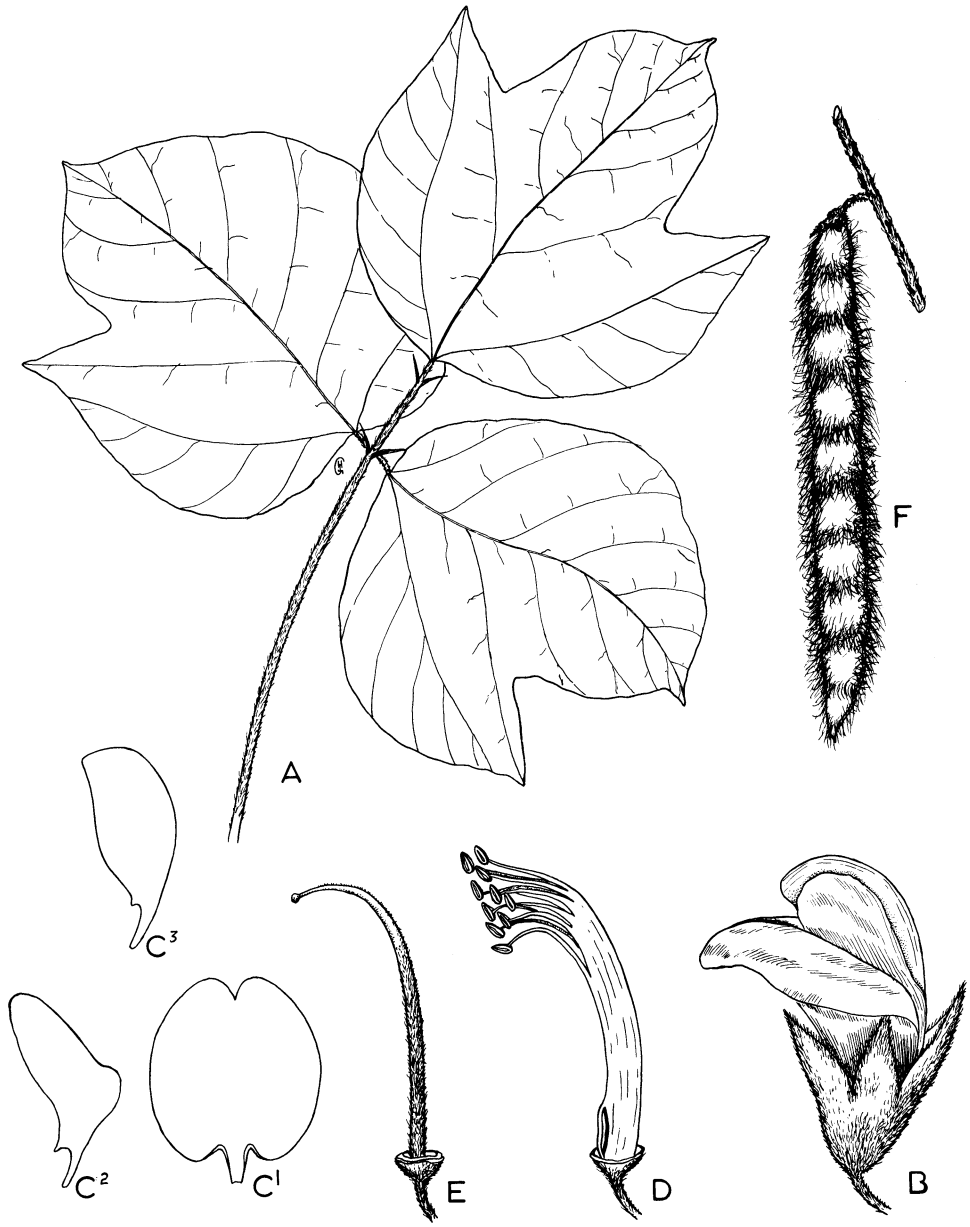

FIGURE 42. *Pueraria lobata* (Willd.) Ohwi.—A. Habit (×½). [After *Wedel 2482.*]—B. Flower (×1½).—C. Corolla.—C^1. Standard (×1).—C^2. Wing petal (×1).—C^3. Keel petal (×1).—D. Stamens (×1½).—E. Pistil (×1½). [After *Wedel 2605.*]—F. Fruit (×1). [After *Henry 953.*]

Robust *vines* clambering on the ground and on shrubs, occasionally high climbing; stems terete, branching, puberulent with appressed short hairs. *Leaves* pinnate trifoliolate, the leaflets often large and somewhat felty, broadly ovate, often 3-lobate, apically short acuminate, the sinuses rounded to obtuse, mucron-

ulate, basally rounded, truncate or subcordate, 3 nerved from the base and pinnate veined above, discolorous, appressed pubescent on both sides, often with coarse hairs, often ca. 15 cm long and 15 cm wide, the lateral leaflets strongly oblique; petiolules 4–7 mm long, often stout, tomentose; rachis 2–5 cm long; petioles shorter than the terminal leaflet; stipels linear, pubescent, 4–7 mm long; stipules oblong or ovate, puberulent, 4–8 mm long and produced 3–5 mm below the point of insertion, the insertion point ovate. *Inflorescences* often few, to 30 cm long, the peduncle stout, pubescent, sometimes with 1 or 2 empty stipule-like bracts along its length; rachis slightly thinner, often more than twice as long as the peduncle; pedicels 3–6 mm long, pubescent, inserted mostly in 3's at the nodes; bracts ovate and stipule-like, caducous; bracteoles ovate, ciliate and pubescent, 3–5 mm long. *Flowers* pink or violet, ca. 2 cm long, the calyx campanulate, puberulent outside, the cup ca. 5 mm long, the lobes obtuse, unequal, the upper pair mostly or completely fused into a lip, the lowest tooth narrow and usually longest; corolla with the standard broad, emarginate, glabrous, slightly shorter than the wings and the keel, with 2 minute basal auricles, the wings oblong, medially coherent; stamens 10, the vexillary stamen free at the base, perhaps fused to the filament column part way up, the anthers all alike; ovary pubescent, the style and the stigma glabrous, the style bent abruptly upwards. *Legume* oblong, 4–6 cm long, 4–7 mm wide, long beaked, flat and compressed slightly between the seeds, drying dark, copiously pilose with long, 2–3 mm, yellowish hairs.

This species is native to southern and eastern Asia. It has been widely used in other warm parts of the world for forage and erosion control, and it is naturalized in many places. In Panama it is very abundant but has been collected only from islands in the Chiriqui Lagoon area of Bocas del Toro and from a few other lowland localities. *Pueraria lobata* is an aggressive vine which can quickly cover all vegetation and soil over several hectares. In spite of its vigorous vegetative growth it is sometimes seldom flowering and fruits are not always formed. It is known by the Japanese name "Kudzu."

BOCAS DEL TORO: Isla Colón, *Wedel 136* (MO). Without other locality, *Wedel 374* (MO), *511* (GH, MO), *2482* (MO). Colombus Island, *Wedel 2605* (GH, MO), Isla Colón, *Wedel 2803* (GH, MO, NY).

38. RHYNCHOSIA

Muriel E. Poston[81]

Rhynchosia Loureiro,[82] Fl. Cochinch. 425, 460. 1790. nom. conserv. TYPE: *R. volubilis* Lour.

Leycephyllum Piper, J. Wash. Acad. Sci. 14: 363. 1924. TYPE: *L. micranthum* Piper.

Herbs or subshrubs, twining or trailing, erect to ascending; stems terete to angular and striate. *Leaves* trifoliolate, ovate to rhomboid, gland dotted above

[81] Department of Biology, Howard University, Washington, D.C. 20059.

[82] For a list of synonyms see Grear, 1978. Only these names have been used for Panamanian plants.

and beneath; stipules caducous, striate, free; stipels reduced when present; petioles 1.2–8.0 cm long, villous; petiolules 0.4–3.0 cm long, terminal petiolules longer than the laterals. *Inflorescence* racemose, axillary; bracts caducous or persistent, small, striate. *Flowers* with the calyx campanulate, the upper teeth at least partly connate; corolla papilionaceous, usually yellow with maroon markings, the standard obovate, auriculate with a short claw, the wings oblong, not auriculate, the claw narrow, the keel falcate, wider than the wings, the claw attenuate; stamens diadelphous, the vexillary stamen free, the anthers monomorphic; the style slender, the stigma entire, capitate, the ovary sessile, biovulate. *Fruits* ovate to oblong, 2-valved, pubescent, gland-dotted; seeds 2 ovate, black often with some red, hilum lateral, ovoid to elongate.

Rhynchosia is a genus of several hundred species found in both the Old World and New World tropics. The genus has its greatest diversity in Africa.

Literature:

Grear, J. W. 1979. A revision of the New World species of *Rhynchosia* (Leguminosae-Faboideae). Mem. New York Bot. Gard. 31(1): 1–168.

a. Calyx lobes 2–3 times longer than calyx tube; seeds never red.
  b. Stipules lanceolate to ovate, 0.3–1.0 cm long, 0.1–0.5 cm wide, terminal petiolules 2.0–11.0 mm long ..... 7. *R. reticulata*
  bb. Stipules linear to lanceolate, 1.5–3.0 mm long, ca. 0.5 mm wide; terminal petiolules 1.5–2.0 cm long ..... 1. *R. calycosa*
aa. Calyx lobes equal to or not more than 2 times longer than calyx tube; seeds red and black.
  c. Seeds mostly less than 4 mm long ..... 4. *R. minima*
  cc. Seeds mostly more than 4 mm long.
    d. Plants viscid; stipules persistent; hilum linear ..... 2. *R. edulis*
    dd. Plants not viscid; stipules caducous; hilum ovate.
      e. Stipels absent; pods deeply constricted between seeds, glabrous to densely puberulous, shiny black with age ..... 3. *R. erythinoides*
      ee. Stipels present; pods not deeply constricted, densely puberulous, green or brown, never shiny black.
        f. Bracts lanceolate to ovate, 2.0–5.0 mm long; pedicels ca. 5.0 mm long ..... 6. *R. quercetorum*
        ff. Bracts lanceolate, 1.5–3.0 mm long; pedicels 1.0–2.0 mm long ..... 5. *R. precatoria*

1. **Rhynchosia calycosa** Hemsley, Diagn. Pl. Mex. 48. 1880. TYPE: Panama, *Fendler 72* (MO, isotype).

Dolicholus calycosus (Hemsley) Standley, Contr. U.S. Natl. Herb. 18: 108. 1916.

Herbaceous to suffruticose *vine*; stems weakly angled to terete, strigose to puberulous. *Leaves* trifoliolate; leaflets ovate to deltoid or ovate rhomboid, 2.5–7.0(–9.0) cm long, 1.5–5.5 cm wide, apically acute, basally cuneate to obtuse, strigose above, villous and gland dotted beneath; terminal petiolule 1.5–2.0 cm long, the lateral petiolules 0.2–0.3 cm long; petiole 2.5–4.2 cm long, villous; stipels subulate, 1.0–2.0 mm long, the stipules linear to lanceolate, 1.5–3.0 mm long, caducous. *Inflorescence* exceeding the leaves, 7.0–20.0 cm long; peduncles 1.0–6.5 cm long; pedicels 1.0–2.0 mm long; bracts lanceolate, 3.0–4.0 cm long, ca-

ducous. *Flowers* with the calyx equalling or exceeding the corolla, 7.0–11.0 mm long, the lobes 7.0–9.0 mm long, ca. 2.0 mm wide, upper lobes united halfway up; corolla yellow, 6.0–10.0 mm long, the standard obovate, auriculate, 7.0–10.0 mm long, 3.0–5.0 mm wide, the claw ca. 1.0 mm long, the wing oblong, 6.0–8.0 mm long, ca. 2.0 mm wide, the claw ca. 2.0 mm long, the keel falcate, 6.5–7.5 mm long, 1.5–2.0 mm wide, the claw ca. 1.5 mm long; stamens ca. 7.0 mm long, vexillary stamen free. *Fruits* ovate to oblong, 1.5–2.5 cm long, 0.5–0.8 cm wide, puberulous to strigose, gland dotted, the beak ca. 2.0 mm long; seeds 2, suborbiculate, ca. 3.5 mm long, 3.0 mm wide, black brown mottled, hilum ovate, 1.0–1.5 mm long.

This species ranges from Central America to Ecuador. In Panama it is found in secondary growth and dry forested areas.

CANAL ZONE: Road C-21 near Police Lodge, *Croat 12993* (MO, SCZ). Quebrada La Palma and Cañon of Río Chagres, *Dodge & Allen 17342* (GH, MO). Las Cruces Trail, *Hunter & Allen 761* (GH, MO). CHIRIQUÍ: Baja Gualaca, *Koster 172* (MO). COCLÉ: Río Hato airstrip, *Blum & Dwyer 2479* (MO). Río Grande, *Burch et al. 1168* (GH, MO). DARIÉN: Agua Fria 8 mi N of Santa Fé, *Duke 10105* (MO, US). Camp Lagarto, *Duke 15192* (MO). Camp Hydro on Río Mortí, *Duke 15416* (MO). LOS SANTOS: 3 mi S of Carreta, 5 mi S of Las Tablas, *Burch et al. 1243* (GH, MO, US). Las Tablas, *Koster 121* (MO). PANAMÁ: Hills between Capira and Potrero, *Dodge & Hunter 8605* (GH, MO). San Jose Island, *Johnston 1106* (GH, MO). VERAGUAS: El Embalsadero, 8 mi W of Santiago, *Tyson 6080* (FSU, MO, SCZ).

2. **Rhynchosia edulis** Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 123. 1874. TYPE: Paraguay, *Balansa 1553* (not seen; photo, US).

Dolicholus ixodes Standley, Contr. U.S. Natl. Herb. 18: 107. 1916. TYPE: Panama, *Williams 119* (holotype, US).
Rhynchosia ixodes (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 4: 214. 1929.

Vine, herbaceous to suffrutescent, stems angular to terete, pubescent. *Leaves* trifoliolate, ovate to ovate rhomboid, 1.0–3.5 cm long, 1.0–2.3 cm wide, apically acute, basally obtuse, strigulose above, hirsutulose, gland dotted beneath, viscid on both surfaces; terminal petiolule ca. 1.0 cm long, the lateral petiolules obsolete or to 1.0 mm long; petiole ca. 1.3 cm long, viscid; stipels caducous; stipules lanceolate ca. 0.5 cm long. *Inflorescence* equal to or exceeding the leaves, ca. 2.0 cm long; peduncle ca. 1.0 cm long; bracts lanceolate 2.0–3.0 mm long, caducous; pedicels ca. 0.4 cm long. *Flowers* with the calyx not exceeding the corolla, viscid, puberulent, ca. 0.4 cm long, the lobes 2.0–3.0 mm long, the upper lobes partially united; corolla purplish, to 6.5 mm long, the standard obovate, auriculate, gland dotted, ca. 5.0 mm long, ca. 3.5 mm wide, the claw ca. 1.0 mm long, the wings oblong, ca. 4.5 mm long, ca. 1.5 mm wide, the claw ca. 1.5 mm long, the keel falcate, ca. 4.5 mm long, ca. 2.0 mm wide, the claw ca. 2.0 mm long; stamens 4.5 mm long. *Fruits* oblong ovate, strigose, gland dotted, viscid, ca. 1.5 cm long, 0.6 cm wide, the beak ca. 3.0 mm long; seeds ovoid, ca. 4.0 mm long, hilum linear, 1.0–2.0 mm long.

This species is known from southeastern Arizona through to South America. In Panama it is found in roadside savannas.

PANAMÁ: Between Río Pacora and Chepo; *Porter et al. 5136* (MO).

3. **Rhynchosia erythinoides** Schlecht. & Cham., Linnaea 5: 587. 1830. TYPE: Mexico, inter Misantlem et Nantlam in sylvis. *Schiede & Deppe* not seen.—FIG. 43.

Leycephyllum micranthum Piper, J. Wash. Acad. Sci. 14: 363. 1924. TYPE: Costa Rica: Las Vueltes, Turrique, *Tonduz 12951* (isotype, US).

Suffrutescent to woody *vine*, the stems angled, becoming terete, strigulose to puberulose. *Leaves* trifoliate, the leaflets ovate, ovate rhombic to lanceolate, 3.0–10.0 cm long, 2.5–8.0 cm wide, apically acute to acuminate, basally rounded to cuneate, sparsely villous, gland dotted below, glabrous to sparsely villosulose above; petiolule of terminal leaflet 1.5–3.0 cm long, petiolule of lateral leaflet 0.2–0.4 cm long; petiole 2.5–8.0 cm long, villosulose; stipels absent; stipules lanceolate, 2.0–3.0 mm long, 0.5–1.0 mm wide, caducous. *Inflorescence* branching, equal to or exceeding the leaves, 5.0–13.5 cm long; peduncles 0.6–1.0 cm long; pedicel 1.0–2.0 mm long; bracts lanceolate, 1.5–3.0 mm long, 0.5–2.0 mm wide, caducous. *Flowers* with the calyx not exceeding the corolla, 3.0–4.0 mm long, the lobes of the calyx lanceolate, 1.0–2.0 mm long, villosulose, gland dotted; corolla yellow with maroon striations, 5.0–7.0 mm long, the standard obovate, auriculate, 5.0–7.0 mm long, 4.5–6.0 mm wide, the claw ca. 1.0 mm long, the wings oblong, 5.0–7.0 mm long, 1.5–2.5 mm wide, the claw ca. 1.0 mm long, villosulose, the keel falcate, 5.5–7.5 mm long, 2.0–3.0 mm wide, the claw 1.5–2.0 mm long; stamens 5.0–7.0 mm long, vexillary stamen free. *Fruits* ovate, deeply constricted in the middle, 1.5–2.0 cm long, 0.5–1.0 cm wide, brown to black, hirsutulose, gland dotted, the beak ca. 1.0 mm long; seeds 2, ovoid, ca. 4.0 mm long, ca. 3.0 mm wide, black with a red band around, the hilum ovate, ca. 3.0 mm long.

This species ranges from eastern Mexico to Ecuador, occurring in thickets and in clearings and secondary growth.

BOCAS DEL TORO: Old Bank Island, Chiriqui Lagoon, *Wedel 1982* (GH, MO, NY, US), *2084* (GH, MO). CANAL ZONE: BARRO COLORADO ISLAND: *Busey & Croat 242* (MO); *Croat* 28 August 1971, *10201, 10331, 10928, 11899* (all MO), *13817* (F, MO, NY); *Foster 2173* (F, US); *Shattuck 139* (F, MO), *750* (MO, US), *812* (F, MO); *Wilson 1217* (F, MO); *Woodworth & Vestal 414* (F, MO), *596* (A, F, MO). Chagres, *Fendler 66* (F, MO, US). Near Gatún, *Hayes 911* (NY). W of Limon Bay, Gatún Locks and Gatún Lake, *Johnston 17211* (A, MO). Hills around Agua Clara Reservoir near Gatún, *Pittier 2651* (GH, NY, US). CHIRIQUÍ: W of San Bartolo Limite near Costa Rican border, *Croat 22157B* (MO). Roadside to Cañas Gordas, 18 km from Paso Canoas, near Quebrada de Vuelta, *Croat 22215* (MO). COLÓN: Santa Rita Ridge, 5 mi from highway, *Croat 13188* (MO, NY). María Chiquita, *Dwyer 2992* (MO, US). Santa Rita East Ridge, *Dwyer 8411* (MO). PANAMÁ: Beyond Cerro Jefe, *Duke & Dwyer 15069* (MO). Bismark above Penonomé, *Williams 564* (NY, US).

4. **Rhynchosia minima** (L.) DC., Prodr. 2: 385. 1825.

Dolichos minimus L., Sp. Pl. 726. 1752. LECTOTYPE: Jamaica, St. Jago de La Vega. *Sloane,* not seen (selected by Verdcourt, 1971).

Herbaceous to suffrutescent *vine*; stems angular, puberulent to villosulose. *Leaves* trifoliolate, the leaflets ovate to ovate rhomboid to orbicular, 2.0–3.8 cm long, 1.0–3.0 cm wide, apically acute, basally cuneate to truncate, glabrous to finely strigulose above, puberulose to villosulose, gland dotted beneath; petiolule

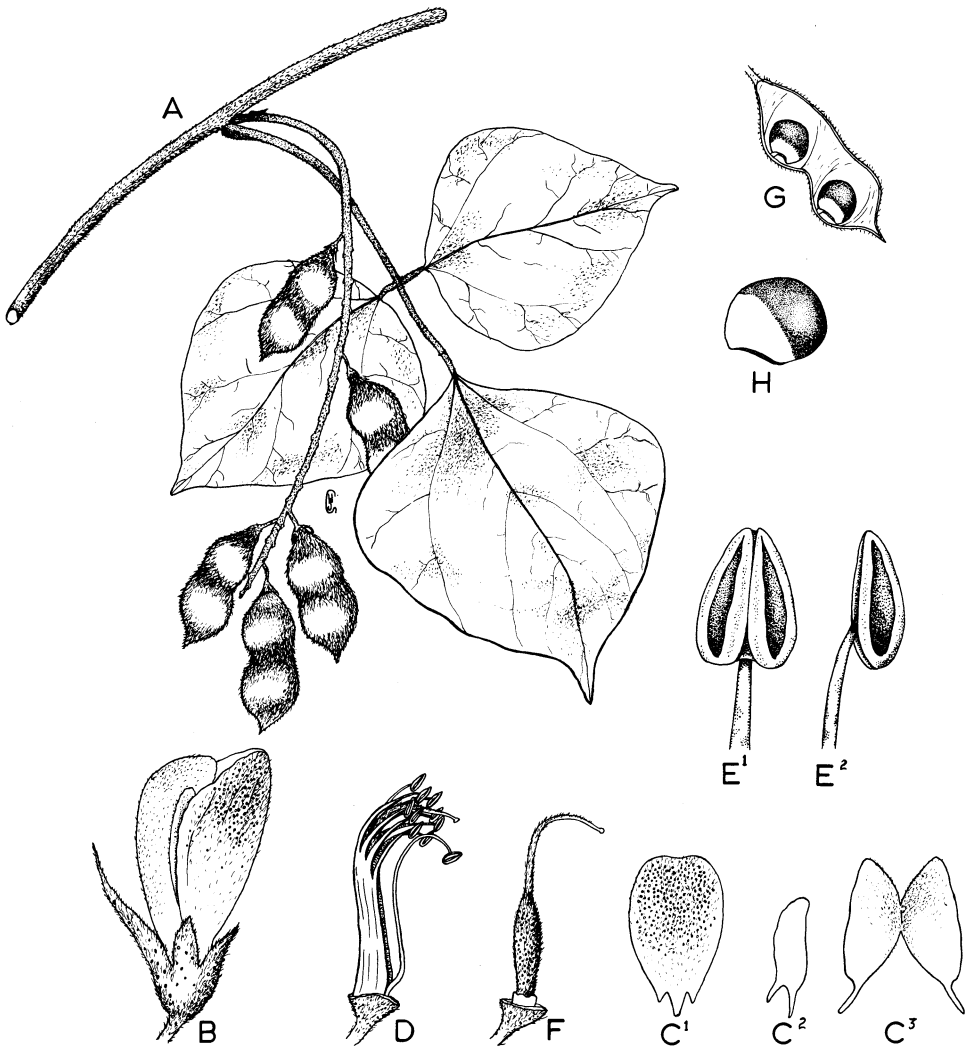

FIGURE 43. *Rhynchosia erythrinoides* Schlecht. & Cham.—A. Habit (×½). [After *Davidson 927.*]—B. Flower (×5).—C. Corolla.—C¹. Standard (×2½).—C². Wing petal (×2½).—C³. Keel petal (×2½).—D. Stamens (×5).—E. Anthers.—E¹. Abaxial view.—E². Lateral view.—F. Pistil (×5). [After *Wedel 2084.*]—G. Fruit (×¾).—H. Seed (×2). [After *Davidson 927.*]

0.3–1.0 cm long, the terminal leaflet with longer petiolule; petiole 1.2–4.0 cm long; strigose; stipels subulate, ca. 1.0 mm long; stipules linear to lanceolate, 3.0–10.0 mm long, 0.5–1.0 mm wide, persistent, villosulose. *Inflorescence* equalling or exceeding the leaves, 6.8–13.5 cm long, many flowered, the peduncle 1.2–7.0 cm long, the pedicels ca. 2.0 mm long; bracts lanceolate, ca. 1.0 mm long, caducous. *Flowers* with the calyx not exceeding the corolla, 2.0–4.0 mm long, the lobes 1.0–3.0 mm long, lanceolate, the upper lobes united part way, puberulose, gland dotted; corolla yellow with purplish striations, puberulose, gland

dotted, 5.0–7.0 mm long, 3.0–5.0 mm wide, the claw 1.0 mm long, the wings oblong, 4.0–5.0 mm long, 1.75–2.0 mm wide, the claw 1.0 mm long, the keel falcate, 5.0–6.0 mm long, 1.5–2.0 mm wide, the claw 1.0–2.0 mm long; stamens 5.0–7.0 mm long. *Fruits* oblong, ovate, strigose, gland dotted, 0.9–1.5 cm long, 0.3–0.4 cm wide, the beak 0.5–1.0 mm long; seeds ovoid, brown, black mottled ca. 3.0 mm long, ca. 2.0 mm wide, hilum ovate, 0.5–1.0 mm long, the strophiole lobes narrow.

This species is nearly cosmopolitan, occurring throughout Mexico and Central America and south into Argentina.

BOCAS DEL TORO: Careening Cay, vicinity of Chiriqui Lagoon, *von Wedel 2819* (MO, NY, US). CANAL ZONE: ½ mi NW of Gamboa, 5 Apr. 1973, *Liesner 1396* (F, MO); *Standley 28527* (US). 2½ km W of Gamboa, gravel along RR, *Nee 9502* (F, GH, MO). Balboa, *Standley 25646* (US), *Standley 32143* (US). CHIRIQUÍ: Corotu, 6 km SW of the airport of Puerto Armuelles, *Busey 398* (F, GH, MO, US). 1.6 m W of Puerto Armuelles, ca. 50 m, *Croat 21934* (F, GH, MO, NY). Distrito Guanabano; Quebrada Quanabano, 0–100 m, *Croat 22512* (F, MO). Quebrada Mellize, 6 km S of Puerto Armuelles; 0–150 m, *Liesner 419* (MO, NY). PANAMÁ: Campo Experimental de Monte Oscuro, 12 km de Capira, *Correa 1929* (MO). Riomar, *Dwyer 1844* (MO). El Capitano, 3 mi E of Chepo, *Tyson 5357* (MO). Tocumen, *Dwyer 2583* (FSU, GH, NY). Forestry Reserve, *Flores 28* (F). LOS SANTOS: Chitré/Las Tablas, 0–100 m, *Burt & Rattray 53* (MO). 5 mi S of Pocri, *Croat 9732* (MO, SCZ). 6 mi S of Las Tablas, *D'Arcy 4184* (MO). 12 mi S of Macaracas, *Tyson et al.* (MO, SCZ). VERAGUAS: Atalay/Santiago, *Koster 116* (MO).

5. **Rhynchosia precatoria** (H. & B. ex Willd.) DC., Prodr. 2: 385. 1825.

Glycine precatoria H.B.K., Nov. Gen. Sp. Pl. 6: 425–426. 1823. TYPE: Mexico: prope Acapulca, not seen.
G. precatoria H. & B. ex Willd., Enum. Pl. Hort. Berol. 2: 755. 1809. TYPE: not seen.
Indigofera volubilis Wendl., Bot. Beob. 55. 1798. TYPE: not seen.

Herbaceous to suffrutescent *vine,* the stems angular becoming terete, villous to strigose, gland dotted. *Leaves* trifoliolate, the leaflets obovoid to deltoid, 3.5–8.5 cm long, 2.5–7.5 cm wide, apically acute, basally obtuse to cuneate, sparsely villosulose above, gland dotted, villosulose beneath; terminal petiolule 1.2–2.3 cm long, lateral petiolule 0.2–0.3 cm long; petiole 2.5–7.2 cm long, villous; stipels obsolete; stipules lanceolate, ca. 3.0 mm long, caducous, villous. *Inflorescence* equal to or exceeding the leaves, 6.5–10.5 cm long; peduncles 1.0–2.0 cm long; pedicels 1.0–2.0 cm long; bracts lanceolate, caducous, 1.5–3.0 mm long. *Flowers* with the calyx not exceeding the corolla, 3.0–5.5 mm long, the lobes 1.0–2.5 mm long, the upper lobes longer than the others, puberulent; corolla yellowish green streaked with brown, 0.6–0.8 cm long, the standard orbicular, auriculate, gland dotted, ca. 0.8 cm long, ca. 0.4 cm wide, the claw ca. 1.5 mm long, the wings oblong, ca. 0.7 cm long, ca. 0.2 cm wide, the claw ca. 1.5 mm long, the keel falcate, ca. 0.7 cm long, ca. 0.1 cm wide, the claw ca. 0.2 cm long; stamens ca. 0.7 cm long. *Fruits* ovate oblong, strigose, 1.5–2.0 cm long, 0.6–0.8 cm wide, the beak 2.0–3.0 mm long; seeds ovoid, ca. 5.0 mm long, ca. 3.0 mm wide, red and black, the hilum linear to ovate, 2.5 mm long, the strophiole lobes narrow.

This species ranges from Mexico to Colombia. It is found in young secondary growth in thickets.

PANAMÁ: Pacora, *Burt & Rattray 21* (MO). San Jose Island, *Erlanson 382* (GH, NY, US); *Johnston 588, 1132* (both GH), *1331* (GH, US).

6. **Rhynchosia quercetorum** Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 555. 1937. TYPE: Costa Rica: "Oak forests, Santa María de Dota" *Standley & Valerio 43431* not seen.

Rhynchosia picta Seem., Bot. Voy, Herald 110. *tab. 20.* 1850; Steud., Nom. 1840. TYPE: Panama: "Volcano of Chiriqui, Veraguas" *Seemann 1678* not seen.

Herbaceous to suffruticose *vine,* stems angular becoming terete with age, strigose. *Leaves* trifoliolate, the leaflets ovate to rhomboid, 4.0–10.0 cm long, 4.0–9.0 cm wide, apically acuminate to acute, basally cuneate to obtuse, glabrous to villosulose above, gland dotted and tomentose to villosulose beneath; terminal petiolule 1.5–3.0 cm long, the lateral petiolule 0.2–0.3 cm long; petiole 3.0–8.0 cm long, strigose; stipules lanceolate 0.4–0.6 cm long, caducous; stipels ca. 1.0 mm long, caducous. *Inflorescence* equal to or exceeding the leaves, branching, ca. 8.5 cm long; peduncles 1.5–3.5 cm long; pedicels ca. 5.0 mm long; bracts lanceolate to ovate, 2.0–5.0 mm long, caducous. *Flowers* with the calyx not exceeding the corolla, 3.0–4.0 mm long, the lobes 2.0–3.0 mm long, the vexillary lobes united ca. ½ to apex, the calyx strigose to villous; corolla yellow streaked with maroon, the standard obovate, puberulose, gland dotted, auriculate, 7.0–10.0 mm long, 4.5–8.5 mm wide, the claw ca. 1.0 mm long, the wings oblong, 6.0–10.0 mm long, 2.0–4.0 mm wide, the claw ca. 1.5 mm long, the keel falcate, 7.0–10.0 mm long, ca. 3.0 mm long, the claw ca. 2.0 mm long; stamens 7.0–9.0 mm long. *Fruits* oblong ovate, heavily strigose, viscid, gland dotted, greenish brown but not black, 2.8–4.0 cm long, 0.8–1.0 cm wide, the beak 3.0–4.0 mm long; seeds ovoid to subglobose, red and black with equal areas of coloration, 4.0–5.0 mm long, 3.0–4.0 mm wide, the hilum ovate, ca. 2.0 mm long, strophiole lobes narrow.

This species is distributed throughout Central America to Colombia. Plants of *R. quercetorum* occur in open forested areas in Panama and have been collected only in Chiriquí above 1,500 m.

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, *Allen 1482* (MO, NY, US). Cerro Punta, *Allen 3499* (MO). Finca Lerida, S slopes of Quebrado Velo, *Allen 4738* (MO). Boquete, Finca Collins, *Blum & Dwyer 2547A* (FSU, SCZ); *Davidson 555* (A, F, MO, US), *927* (F, MO, US), *1067* (F, GH, US). S slopes of Volcán Chiriquí, *Terry 1302* (F, GH, MO). Boquete, *von Hagen 2124* (MO, NY). Finca Lerida to Piña Blanca, *Woodson & Schery 307* (MO, US). Callejon Seco, Volcán Chiriquí, *Woodson & Schery 495* (GH, MO, US).

7. **Rhynchosia reticulata** (Swartz) DC., Prodr. 2: 385. 1825.

Glycine reticulata Swartz, Prodr. 105. 1788. TYPE: Jamaica, Swartz, not seen.
Dolicholus kuntzei Kuntze, Rev. Gen. Pl. 3(2): 61. 1898. TYPE: not seen.
Dolicholus hondurensis Rose, Contr. U.S. Natl. Herb. 10: 101. 1906. TYPE: Honduras, "Dept. Santa Bárbara near San Pedro Sula," not seen.
Rhynchosia hondurensis (Rose) J. D. Smith, Enum. Pl. Guat. Index 8: 172. 1907.
Dolicholus angulatus Standley, Contr. U.S. Natl. Herb. 18: 107. 1916. TYPE: Panama, "between Miraflores and Pedro Miguel, Canal Zone," not seen.

Herbaceous to suffruticose *vine;* stems angled to terete, villous to strigose along ridges. *Leaves* trifoliolate, leaflets ovate to obovate, the lateral leaflets asymmetric, 2.5–6.5 cm long, 2.3–5.5 cm wide, apically acute, basally cuneate to subcordate, finely strigulose above, reticulate, strigulose and gland dotted be-

neath; terminal petiolule 2.0–11.0 mm long, the lateral petiolules 1.0–2.0 mm long; petiole 2.0–4.5 cm long, angled, villous; stipels linear, 1.0–2.0 mm long; stipules lanceolate to ovate 0.3–1.0 cm long, 0.1–0.5 cm wide, caducous to persistent. *Inflorescence* shorter or longer than the leaves, 5.0–13.5 cm long, densely, ca. 20–30, flowered; peduncles 1.5–2.5 cm long, pedicels ca. 3.5 mm long; bracts lanceolate, 3.0–5.0 mm long, caducous. *Flowers* with the calyx usually equal to or exceeding the corolla, 0.7–1.1 cm long, the lobes lanceolate, 0.5–0.9 cm long, puberulent, gland dotted; corolla yellow, 0.6–1.0 cm long, puberulent, gland dotted, the standard obovate, auriculate, 8.0–9.5 mm long, 3.0–4.0 mm wide, the claw ca. 1.0 mm long, the wing oblong, 7.5–8.0 mm long, ca. 2.0 mm wide, the claw ca. 1.0 mm long, the keel falcate, 7.5–9.0 mm long, ca. 2.0 mm wide, the claw 1.0–1.5 mm long; stamens 5.0–9.0 mm long. *Fruits* oblong ovate, 1.5–2.0 cm long, 0.5–0.7 cm wide, the beak 1.0–2.0 mm long, puberulent; seeds 2, ovoid, ca. 3.0 mm long, brown black, hilum ovate, ca. 1.0 mm long.

This species ranges from Mexico to South America including the Greater Antilles. It occurs in disturbed areas, moist forests, thickets, and savannas below 1,200 m. Grear (1978) delimited two varieties of *R. reticulata* but in Panama these varieties do not appear to be distinguishable on the basis of geography and morphology.

CANAL ZONE: Pipeline road 2½ mi from Gamboa gate, *Croat 9385* (MO, SCZ). Gaillard highway 1 mi NW of Summit Garden, *Croat 13919* (F, MO, SCZ). Pipeline road 4 mi from main gate, *Croat 14100* (MO, SCZ). Without other locality, *Greenman & Greenman 5135* (MO). Near Summit Garden, *Hladick* (MO). Balboa, *Standley 26086* (MO, US). 1 mi N of Summit on road to Gamboa, *Tyson 2765* (MO). CHIRIQUÍ: Near Veladero, *Burt & Koster 127* (MO). Francis Arriba School, ca. 14 mi N of David, *Lewis et al. 681* (GH, MO). COCLÉ: Entrance to Río Hato Air Base, *Blum & Tyson 1867* (FSU, MO, SCZ). HERRERA: El Portero, Las Minas, *Burt & Koster 90* (MO). Highway N of Las Minas, *Croat 9668* (MO, NY). 10 mi S of Ocú, *Tyson et al. 2804* (FSU, MO, SCZ). PANAMÁ: La Chorrera, Bejuco, *Burt & Rattray 25* (MO, NY). Between Chepo and El Llano, *Croat 14487* (MO, NY). Río Tocumen N of Chepo road, *Hunter & Allen 239* (GH, MO). Between Río Pacora and Chepo, *Porter et al. 4205* (MO, SCZ). VERAGUAS: Between Cañazas and the foot of the Cordillera Central, Headwaters of Río Cañazas, *Allen 191* (A, MO, US). La Pena, *Burt & Rattray 83* (MO). Without locality: *Hayes 720* (NY).

39. SESBANIA

Peter S. White[83]

Sesbania Scopoli,[84] Introd. 308. 1777. Nomen conserv. contra *Sesban* Adanson, *Agati* Adanson. LECTOTYPE: *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill (designated by Jones, 1960).

Sesban Adans., Fam. Pl. 2: 327, 604. 1763. Nomen rejic. contra *Sesbania*. Based on *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill.

Agati Adanson, Fam. Pl. 2: 326, 513. 1763. Nomen rejic. contra *Sesbania*. Based on *Robinia grandiflora* L. = *Sesbania grandiflora* (L.) Pers.

Sesbana R. Brown in Ait., Hort. Kew., (ed. 2) 4: 330. 1812. *Sesbania* Scop., orth. mut.

Daubentonia DC., Comm. Mem. Legum. 285. 1823. TYPE: *Piscidia punicea* Cav. = *Sesbania punicea* (Cav.) Benth.

Resupinaria Raf., Sylva Tell. 115. 1838. TYPE: *Robinia grandiflora* L. = *Sesbania grandiflora* (L.) Pers.

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[84] For additional generic synonymy see Hutchinson, 1967.

Emerus Kuntze, Rev. Gen. Pl. 1: 180. 1891. TYPE: *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill. Non *Emerus* Mill. (1754) nor *Emerus* Guettard (1753).

Daubentoniopsis Rydb., Amer. J. Bot. 10: 497. 1923. TYPE: *Aeschynomene longifolia* Cav. = *Sesbania longifolia* (Cav.) DC.

Annual or perennial *herbs, shrubs,* or small *trees. Leaves* alternate, even pinnate, often relatively narrow in outline and with numerous leaflets; leaflets oblong, entire, obtuse at the apex, rounded at the base, often glaucous, short petioluled; stipules small, deciduous; stipels minute or apparently absent. *Inflorescence* of relatively short and few-flowered axillary racemes; bracts and bracteoles small, apparently deciduous. *Flowers* with the hypanthium broadly campanulate, as broad as long or broader, the 5 teeth equal, often short, truncate to triangular with the tip acute to acuminate; often thin; petals white, yellow, purplish, red, sometimes white spotted with color or variegated; standard longer than other petals, nearly round in outline, reflexed, short clawed and usually appendaged at the base, the wing petals free, the keel petals curved, joined below, with long claws; stamens diadelphous, the vexillary stamen free, geniculate near the base, the united stamens equal or 5 alternate ones somewhat longer; ovary stipitate, linear, the stigma small, capitate. *Fruit* often long and slender, terete (in extra-Panamanian species sometimes compressed, 4-angled or 4-winged), short stipitate, beaked, septate between the seeds within, the outside indented between the seeds in some species, 2-valved, indehiscent in a few species, the calyx often not persistent in fruit; seeds many oblong, slightly compressed, smooth, brown.

Sesbania is a genus of some 50 species of the tropical and warm parts of both the New and Old World. Among its relatives in Panama it is distinguished by the relatively long and narrow even pinnate leaves. Three species are known from Panama, one of which, *Sesbania grandiflora* (L.) Pers., is an introduced tree. The two other species are native herbs.

Sesbania sesban (L.) Merrill, a weedy plant native to the Old World tropics, has become established in parts of the West Indies and South America. It has not yet been collected in Panama, but is to be looked for there. In general it resembles *Sesbania emerus* and *S. exasperata,* which are treated below, but can be distinguished by several characters: the calyx teeth are low triangular, less than 1 mm long, and acute; calyx is less than 5 mm long; corolla is less than 1.5 cm long; racemes are 5–12 flowered; outside of the legume is indented between the seeds. In *Sesbania emerus* and *S. exasperata,* the calyx lobes are acuminate, longer than 1 mm; calyx is more than 6 mm long; corolla is more than 1.5 cm long; the racemes are usually less than 6-flowered, and the outside of the legume is not or only slightly indented between the seeds.

Sesbania sesban, the type species, has received attention in recent literature regarding tautonyms and paratautonyms (Nicolson, 1975; Terrell, 1977). Terrell (1977) argues that names such as *Lycopersicon lycopersicum* should be regarded as tautonyms since the two words that make up the binomial are orthographic variants of one another. Both the generic name and the specific epithet are inflected variants of the same stem word. He feels that such names are prone to confusion. On the other hand, he feels that such names as *Sesbania sesban* are less confusing. Here, the stem of the specific epithet is uninflected. Terrell (1977)

argues that the two words making up the binomial *Sesbania sesban* are not orthographic variants and that the binomial is not a tautonym. Terrell's argument and proposal seem entirely reasonable and with this in mind the name *Sesbania sesban* (L.) Merrill is used here.

The type of *Agati* Adanson was initially listed in the Code (1961) and in the *Index Nominum Genericorum* as *Robinia caragana* L. Later, both were corrected to *Robinia grandiflora* L., i.e., in later editions of the Code list of conserved and rejected names and in a correction card in the ING list.

Literature:

Jones, K. 1960. The lectotype species selections of Britton and Brown and the standard species of Hitchcock and Green. Taxon 9: 175–189.

Nicolson, D. H. 1975. Paratautonyms, a comment on proposal 146. Taxon 24: 389–390.

Seemann, B. 1857. The botany of the voyage of the H.M.S. Herald. London. 483 pp.

Terrell, E. E. 1977. The name for tomato. Taxon 26: 129–148.

a. Flowers large, 6–9 cm long; fruit (20–)30–50 cm long; an introduced small tree, but sometimes flowering when quite young ---------- 3. *S. grandiflora*

aa. Flowers smaller, ca. 1.5–2.5 cm long; fruit 15–25 cm long; native herbs or with shrubby appearance to several m high.

b. Legume 3–4 mm broad; seeds 3–4 mm long; corolla less than 2 cm long; pedicels in both flower and fruit relatively slender, rarely more than 1 mm wide, if so then not over 2 mm wide in fruit ---------- 1. *S. emerus*

bb. Legume 4–6 mm broad; seeds 4–5 mm long; corolla 1.8–2.5 cm long; pedicels relatively stout, over 2 mm wide in fruit ---------- 2. *S. exasperata*

1. **Sesbania emerus** (Aubl.) Urban, Feddes Repert. Spec. Nov. Regni Veg. 16: 149. 1919.—FIG. 44.

Aeschynomene emerus Aubl., Hist. Pl. Guiane 2: 775; Tabl. noms. 1. 1775. TYPE: Guiana, *Aublet*, not seen.

Coronilla occidentalis Willd., Sp. Pl., (ed. 4) 1147. 1802. TYPE: West Indies, *Humboldt* (B, not seen; microfiche MO).

Sesban occidentalis (Willd.) Poir. in Lam., Encycl. Méth. Bot. 7: 129. 1806.

Sesbania occidentalis (Willd.) Pers., Syn. Pl. 2: 316. 1807.

Sesbania macrocarpa sensu Seemann, Bot. Voy. Herald 108. 1857, non *S. macrocarpa* Muhl. ex Raf., Fl. Ludov. 137. 1817.

Emerus sesban var. *occidentalis* (Willd.) Kuntze, Rev. Gen. Pl. 1: 181. 1891.

Sesban emerus (Aubl.) Britton & Wilson, Sci. Surv. Porto Rico 5: 395. 1924.

Erect *herbs* or *shrubs* to 2 m tall, glabrous. *Leaves* long and narrow with numerous regularly spaced, short stalked leaflets; leaflets ca. 70–100, narrowly oblong, rounded at both ends, mucronate at the apex, to 25 mm long, ca. 3 mm wide; petioles 5–10 mm long; petiolules to 1 mm long; rachis to ca. 20 cm long; stipules linear to lanceolate, acuminate, to 5 mm long, apparently deciduous. *Inflorescences* axillary racemes with 3–5 flowers on thin pedicels ca. 10 mm long. *Flowers* 12–18 mm long; hypanthium broad campanulate, to 5 mm wide, ca. 5 mm long, including the calyx teeth, the teeth 1.0–1.5 mm long, triangular with abruptly acuminate tips; standard suborbicular, ca. 15 mm wide and long with raised appendages at the base of the blade, short clawed; wing petals oblong, ca.

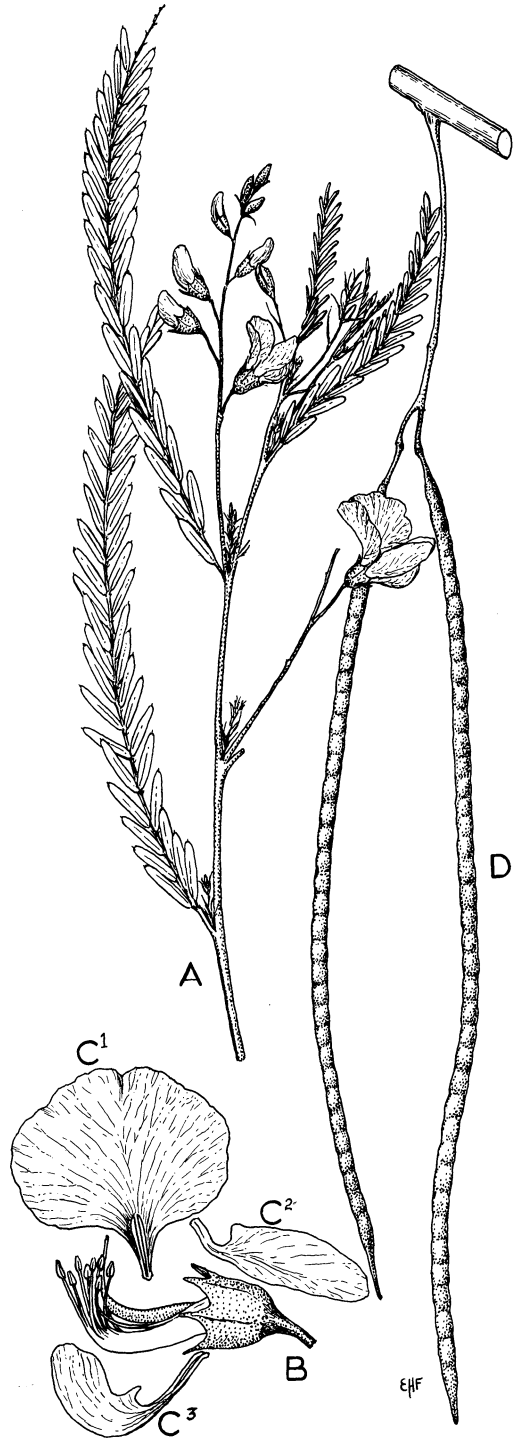

FIGURE 44. *Sesbania emerus* (Aubl.) Urban.—A. Habit (×⅔).—B. Flower, exploded (×2).—C. Corolla.—C^1. Standard.—C^2. Wing petal.—C^3. Keel petal.

15 mm long, short clawed; keel petals slightly shorter than the other petals, upcurved; stamens with free portion of filaments alternately unequal. *Fruit* long and narrow, to 25 cm long, 3–4 mm wide, beaked, stipitate, the margins thickened, glabrous; seeds numerous, oblong, 3–4 mm long.

Sesbania emerus is found in fields and wet ground in Panama and northward throughout Central America. It is also found in the West Indies. The relation of *Sesbania emerus* to *S. exaltata* (Raf.) Cory and *S. macrocarpa* Muhl. ex Raf., both of the southern United States and to *S. exasperata* H.B.K. awaits monographic study. *Sesbania exasperata* H.B.K., in material seen by the author, has consistently broader pedicels and fruits and longer petals than *S. emerus*. Seemann's (1857) reported *S. macrocarpa* Muhl. ex Raf. from Panama proved to be *S. emerus*.

CANAL ZONE: Río Grande Station, *Hayes 772* (NY). Balboa, *Standley 25648* (US). CHIRIQUÍ: 1 mi W of Puerto Armuelles, *Croat 22037* (MO). LOS SANTOS: Managre Beach, 5 mi SE of Chitré, *Tyson et al. 3018* (MO, SCZ). PANAMÁ: S of Tocumen Airport, *D'Arcy 9662* (MO). 2 km W of El Llano, 0–100 m, *Nee 7953* (DUKE, MO, US). Between Matías Hernández and Juan Díaz, *Standley 31963* (US). Vía Tumba Muerto, *Taylor* (MO). VERAGUAS: Santiago-San Francisco Road at Río Santa María, 60 m, *Nee 8195* (MO).

2. **Sesbania exasperata** H.B.K., Nov. Gen. Sp. Pl. 6: 534. 1824. TYPE: Venezuela (P, not seen; microfiche, MO).

Lotus palustris Vell., Fl. Flum. 315. 1825; Atlas 7, *tab. 137*. 1835. TYPE: Brazil, not seen. Non Willd., Sp. Pl. (ed. 4) 1394. 1802.
Sesbania dubia Steud., Nom. Bot., (ed. 2) 2: 572. 1841. TYPE: Brazil, not seen. Non H.B.K., Nov. Gen. Sp. Pl. 6: 534, *tab. 660*. 1824.
Emerus exasperatus (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 181. 1891.
Sesban exasperatus (H.B.K.) Rydb., No. Amer. Fl. 24: 203. 1924.
Sesbania sesban sensu Johnston, Sargentia 9: 161. 1949. Non *S. sesban* (L.) Merrill.

Erect *herbs* or *shrubs*, to 3 m tall. *Leaves* 20–30 cm long, leaflets 30–50–70 or more, narrowly elliptic to narrowly oblong, rounded at both ends, mucronate apically, to 30 mm long, to 5 mm wide; petiolules to 1 mm; petioles more than 1 cm long, petiole base slightly sheathing and the stems often noticeably 3-lined from the nodes. *Inflorescence* of 2–6 flowered axillary racemes, pedicels relatively stout, over 2 mm wide. *Flowers* 1.8–2.5(–3.0) cm long when pressed, the standard not reflexed; hypanthium broad campanulate, 7–10 mm long, 6–7 mm wide when pressed, the teeth 3–4 mm long, triangular, acuminate; petals yellow, standard ovate, 3 cm long, 1.8 cm wide; wings oblong to obovate, to 2.5 cm long, the claw to 0.5 cm long; keel petals obovate, to 2.5 cm long, the claw to 0.5 cm long, upcurved; staminal sheath to 15 mm long. *Fruit* long and narrow, to 25 cm long, 4–6 mm wide, beaked, stipitate, dull, brown, the flat surface slightly indented between the seeds, the margins thickened and also slightly indented between the seeds; fruiting pedicels to 2 mm thick; seeds numerous, oblong, 4–5 mm long.

Sesbania exasperata H.B.K. is represented by a single collection from Panama, which was wrongly reported by Johnston as *Sesbania sesban*. Due to the paucity of Panamanian material, the description above was partly drawn from a

range of South American material at MO. The species is predominantly South American, although it has also been reported from the West Indies. *Sesbania exasperata* is similar to *S. emerus,* but is larger in many dimensions, i.e., in flower length, in thickness of fruits and fruiting pedicels, in the length of the hypanthium teeth and cup. The stems are more noticeably 3-lined from the nodes in *S. exasperata* than in *S. emerus.*

PANAMÁ: San Jose Island, *Johnston 1146* (GH).

3. **Sesbania grandiflora** (L.) Pers., Syn. Pl. 2: 316. 1807.

Robinia grandiflora L., Sp. Pl. 722. 1753. TYPE: India, not seen.
Aeschynomene grandiflora (L.) L., Sp. Pl., (ed. 2) 1060. 1763.
Dolichos arboreus Forssk., Fl. Aegypt.-Arab. 134. 1775. TYPE: Yemen, *Forsskôl,* not seen.
Aeschynomene coccinea L. f., Suppl. Pl. 330. 1781. TYPE: "Nova Zeelandia," not seen.
Coronilla grandiflora (L.) Willd., Sp. Pl., (ed. 4) 1145. 1802. Non *C. grandiflora* Boiss. (1844).
Coronilla coccinea (L.f.) Willd., Sp. Pl. (ed. 4) 1146. 1802.
Sesban grandiflorus (L.) Poir. in Lam., Encycl. Méth. Bot. 7: 127. 1806.
S. coccineus (L.) Poir. in Lam., Encycl. Méth. Bot. 7: 127. 1806.
Sesbania coccinea (L.) Pers., Syn. Pl. 2: 316. 1807.
Agati grandiflora (L.) Desv., J. Bot. (Desvaux) 1: 120. *tab. 4.* 1813.
A. coccinea (L.) Desv., J. Bot. (Desvaux) 1: 120. 1813.
Agati grandiflora var. *coccinea* (L.) Wight & Arn., Prodr. Ind. Or. 1: 216. 1834.
Resupinaria grandiflora (L.) Raf., Sylva Tell. 116. 1838.
Emerus grandiflorus (L.) Kuntze, Rev. Gen. Pl. 180. 1891.

Small *tree* to 8 m tall, young parts hairy, soon becoming glabrous. *Leaves* alternate, even pinnate with (18–)20–40(–50) narrowly elliptic to oblong leaflets; leaflets ca. 7–10 mm wide, 25–35 mm long, rounded at the tip and base; petiole ca. 1 cm long; petiolules ca. 2 mm long, the rachis to 25 cm long; stipels minute; stipules narrowly triangular, to ca. 5 mm long, apparently deciduous. *Inflorescence* of 2–4 flowered axillary racemes, pedicels to 2 cm long, thin. *Flowers* large and showy, ca. 6–9 cm long; hypanthium ca. 10–18 mm long, not including the narrowed base, 15–18 mm wide (flattened out); teeth low to absent, the hypanthium rim variously erose; petals white, rosy white, or red; standard ca. 50–80 mm long, 40 mm wide, claw and basal auricles ca. 15 mm long; wing petals ca. 50–80 mm long, 20 mm wide, the claw ca. 20 mm long; keel petals upcurved, ca. 60 mm long with basal auricles, claw ca. ½ the length of the blade; stamens with the sheath to 80–90 mm long, 3 mm wide, strongly upcurved. *Fruits* long and narrow, to 50 cm long, ca. 0.6–0.9 cm wide, beaked, the stipe to 4 cm long; surface more or less flat or slightly indented between the seeds, smooth, dull; margins thickened and raised above the valve surface, also slightly indented between the seeds; seeds numerous.

Sesbania grandiflora (L.) Pers. is Old World in origin and is widely cultivated in the warmer parts of the world. Most of the Panamanian collections are from cultivated trees; Standley (1928) reports that it has also been found "wild." *Sesbania coccinea* (L.) Pers., considered here synonymous with *S. grandiflora,* was proposed for trees with dark red flowers.

CANAL ZONE: Cultivated, Culebra, *Pittier 2573* (US). "Planted but also wild," Balboa, *Standley 25513* (US). Cultivated, Balboa, *Standley 30824* (US). COCLÉ: Cultivated, Santa Clara, *Blum & Tyson 1883* (FSU, MO, SCZ). PANAMÁ: Universidad de Panama, *Carrasquilla 259* (DUKE, F, MO).

40. SOPHORA

Michael O. Dillon[85]

Sophora L.,[86] Sp. Pl. 373. 1753; Gen. Pl., ed. 5, 175. 1754. LECTOTYPE: *S. alopecuroides* L. (designated by Britton & Brown, 1913).

Trees, shrubs, or rarely perennial *herbs. Leaves* alternate, imparipinnate; leaflets alternate to subopposite; stipules linear to deltoid, caducous or absent; stipels linear, minute or absent. *Inflorescence* racemose or paniculate, terminal or axillary. *Flowers* ca. 1.0–4.5 cm long; calyx campanulate, often gibbous, the lobes 5, subequal or truncate, the upper lobes often connate; corolla white, yellow or blue violet, the standard broadly obovate or orbicular, erect or spreading, the wings oblong, oblique, the keel oblong, usually partially connate or overlapping; stamens 10, free or rarely connate basely into a ring, alternately subequal, the anthers versatile, ellipsoid, dorsifixed, ca. 1 mm long; ovary short stipitate, the ovules numerous, the style incurved, the stigma terminal, minutely capitate-penicillate. *Fruit* moniliform, terete or slightly compressed, somewhat tortulose, fleshy to woody, commonly indehiscent; seeds spherical or subellipsoid, red, yellow or brown, the hilum lateral or subapical; cotyledons thick. Chromosomes: $n = 8, 9, 11, 14, 18$.

Sophora contains about 80 species and has a worldwide distribution in tropical and temperate regions. Only one species, *Sophora tomentosa,* is found in Central America south of Mexico. This geographically widespread and morphologically variable taxon has been separated into four subspecies by recent authors (Brummitt & Gillett, 1966; Yakovlev, 1964), with the Panamanian material referable to subspecies *occidentalis.*

Literature:

Britton, N. L. & A. Brown. 1913. Illustrated Flora of the Northern United States., ed. 2, 2: 342.

Brummitt, R. K. & J. B. Gillett. 1966. Notes on the genus *Sophora* in Africa, including an Asian species found near Zimbabwe. Kirkia 5: 259–270.

Yakovlev, G. P. 1964. Novaiia systema roda *Sophora* L. i ego filogenez. Trudy Leningrad Khim.-farm. Inst. 17: 50–77.

1. **Sophora tomentosa** L.,[86] Sp. Pl. 373. 1753, non Dippel, 1893. TYPE: Ceylon, *Hermann* (BM, not seen).

1a. **Sophora tomentosa** subsp. **occidentalis** (L.) Brummitt, Kirkia 5: 265. 1966.—FIG. 45.

S. occidentalis L., Syst. Nat., ed. 10: 1015. 1759. TYPE: Jamaica, *P. Browne* (LINN, not seen; microfiche, MO).

Shrub, to ca. 3 m tall; stems puberulent to tomentose. *Leaves* 13–17-foliolate, the rachis 12–25 cm long, puberulent; leaflets opposite or subopposite, broadly

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[86] For complete synonymy see Rudd, 1972.

FIGURE 45. *Sophora tomentosa* L.—A. Habit (×½).—B. Fruits (×½).

elliptic or suborbicular, apices rounded to emarginate, the bases rounded, truncate or subcordate, 2.5–5.0 cm long, 1.5–4.0 cm wide, the upper surface puberulent, shiny; lower surface tomentulose; petiolules ca. 2 mm long, puberulent; stipules linear-deltoid, tomentulose, ca. 3 mm long, caducous; exstipellate. *Inflorescence* racemose, terminal, many flowered; bracts 3–5 mm long; bracteoles absent. *Flowers* 20–25 mm long; calyx 6–8 mm long, subtruncate, sericeous; corolla yellow, the standard 9–12 mm wide, narrowly obovate, the wings clawed, auriculate, the keel petals clawed, auriculate, fused distally. *Fruit* stipitate, subcoriaceous, cinereo-tomentulose, terete, torulose or moniliform, 1–15-seeded, 5–15 cm long, ca. 8 mm in diameter, abruptly constricted between the seeds or sometimes only slightly constricted; seeds sublustrous, light brownish, spherical or subellipsoid, 5–8 mm long, 5–6 mm in diameter. Chromosomes: $n = 9$.

Sophora tomentosa subsp. *occidentalis* is widespread throughout the West Indies, adjacent southern Texas, northeastern Mexico, the Yucatan, Belize, Panama and northern Colombia. In the Old World, it occurs on the Atlantic coasts of West Africa from Senegal to Nigeria and Sao Tome. In Panama, it is an infrequent element of the beach strand vegetation of the northern Caribbean coastal region, possibly restricted to calciferous soils.

Subspecies *tomentosa* is quite similar to subsp. *occidentalis,* the latter having leaflets with sparser pubescence of short, adpressed hairs, and the Old World subsp. *tomentosa* having leaflets with pubescence silky, curved and matted into a short tomentum.

BOCAS DEL TORO: Isla Colón, *Wedel 504* (GH, MO). Old Bank Island, *Wedel 2039* (GH, MO, US). Careening Cay, *Wedel 2807* (GH, MO, US). Nances Cay, *Wedel 2864* (GH, MO, US). COLÓN: Playa Langosta, *Correa et al. 3006* (MO). Near Portobelo, *Croat 14126* (F, MO). SAN BLAS: Isla Soskatupa, *Duke 15475* (MO, US).

41. STIZOLOBIUM

W. G. D'Arcy[87]

Stizolobium, P. Br., Civ. Nat. Hist. Jam. 299. 1756. TYPE: *S. pruriens* (L.) Med.

Labradia Swendiatavr, Arznuymitt. 1: 164. 1801. Not seen, fide Index Kewensis. LECTOTYPE: *L. pruriens* (L.) Med.
Mucuna sect. II. *Stizolobium* (P. Br.) DC., Prodr. 2: 405. 1825.
Carpopogon Roxb., Fl. Indica 3: 283. 1832. LECTOTYPE SPECIES: *C. niveum* Roxb.
Mucuna subgenus III. *Stizolobium* (P. Br.) Bauer, Fl. British India 2: 186. 1879.

Climbing or trailing *vines,* puberulent to cinereous. *Leaves* pinnate trifoliolate, the leaflets mucronate; petiolules pubescent; petioles often elongate; stipels linear; stipules caducous. *Inflorescences* axillary racemes, sometimes elongate, the flower buds narrow, the calyx with unequal teeth, the upper pair connate, the lowermost teeth longest; standard short, the wings longer than the standard, the keel tubular, apically cucullate, indurated, about as long as the wings; stamens diadelphous, the vexillary stamen free, the other 9 with the filaments connate into a tube above halfway, the free portion alternately thick and short, narrow and long; ovary pubescent, the style glabrate, the stigma minute. *Legume* oblong,

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narrow, several seeded, striate, densely tomentose, usually with stinging hairs, falsely septate, dehiscent; seeds faboid, plump to subglobose, the short hilum surrounded by an elevated elliptical caruncle, the testa thin.

Stizolobium includes about 8 species ranging across the Old World tropics to Australia. At least two species are naturalized in the Neotropics.

Stizolobium has been included in *Mucuna* by many writers, usually with hesitation, but the differences between *Stizolobium* and typical elements of *Mucuna* are manifest. Removal of *Stizolobium* from *Mucuna* still leaves *Mucuna* a heterogenous group (Verdcourt, 1971), at least when Old World species are considered. Most evident characters for separation are in the seeds. In *Mucuna* the seeds are large, globose to discoid vs. reniform to faboid (*Stizolobium*), the hilum is narrow and circumferential around more than ½ the seed vs. narrowly elliptical around less than ¼ of the seed. The legumes are seldom more than 3 times as long as wide vs. several times longer than wide. There are some floral differences as well. In *Mucuna* anthers are sometimes barbate, anthers are dorsifixed, and there is different connation of the filaments. Vegetatively, the eophylls of *Mucuna* are alternate and reduced vs. opposite, simple and cordate, foliaceous, and in *Mucuna* germination is hypogeous vs. epigeal in *Stizolobium* (Moldenke, 1933). *Mucuna* comprises mostly high climbing forest vines while *Stizolobium* comprises vines on the ground or on fence-rows, often of disturbance. In seeds of *Mucuna* the putamen is resistant to sea water decay, hence seeds are frequently found in beach drift, but seeds of *Stizolobium* have a less resistant putamen and the seeds are seldom found in beach drift (Standley & Steyermark, 1946).

Literature:

Burkill, I. H. 1935. A Dictionary of the Economic Products of the Malay Peninsula. 2 Vols. London.

Moldenke, N. 1933. Tropical American Plants. Phytologia 1: 4–18.

Piper, C. V. 1917. The Cowhage and related species. Proc. Biol. Soc. Wash. 30: 51–52.

1. **Stizolobium pruriens** (L.) Medic., Vorles. Churpffälz. Phys.-Ocon. Ges. 2: 399. 1787.—FIG. 46.

Dolichos pruriens L., in Stickman, Dios. Herb. Amb. 23. 1754; Syst. Nat. ed. 10: 1162, 1759. TYPE: Indonesia, *Rumphius,* Herb. Amb. 5, *tab. 142. 175,* not seen, fide Verdcourt 1971.
Mucuna pruriens (L.) DC., Prodr. 2: 405. 1825.
M. purita Wight in Hook., Bot. Misc. 2: 348. 1831.
Stizolobium pruritum (Wight) Piper, Proc. Biol. Soc. Wash. 30: 54. 1917.

Vine sprawling on ground or shrubs, occasionally high climbing, mostly 2–3 m long; stems fine puberulent with white or brownish stiff, curved reflexed or appressed hairs, terete but drying minutely striate. *Leaves* trifoliolate, the leaflets mostly 5–12 cm long, thin, about equal, apically obtuse, mucronate, basally obtuse to truncate, the lateral leaflets oblique, pubescent with soft hairs, densely pubescent to glabrate, mostly more so beneath, the petiolules 3–4 mm long, pilose, sometimes with a few long (1 mm) coarse hairs, petioles exceeding the leaflets, sometimes twice as long, puberulent as on the stems; stipels minute,

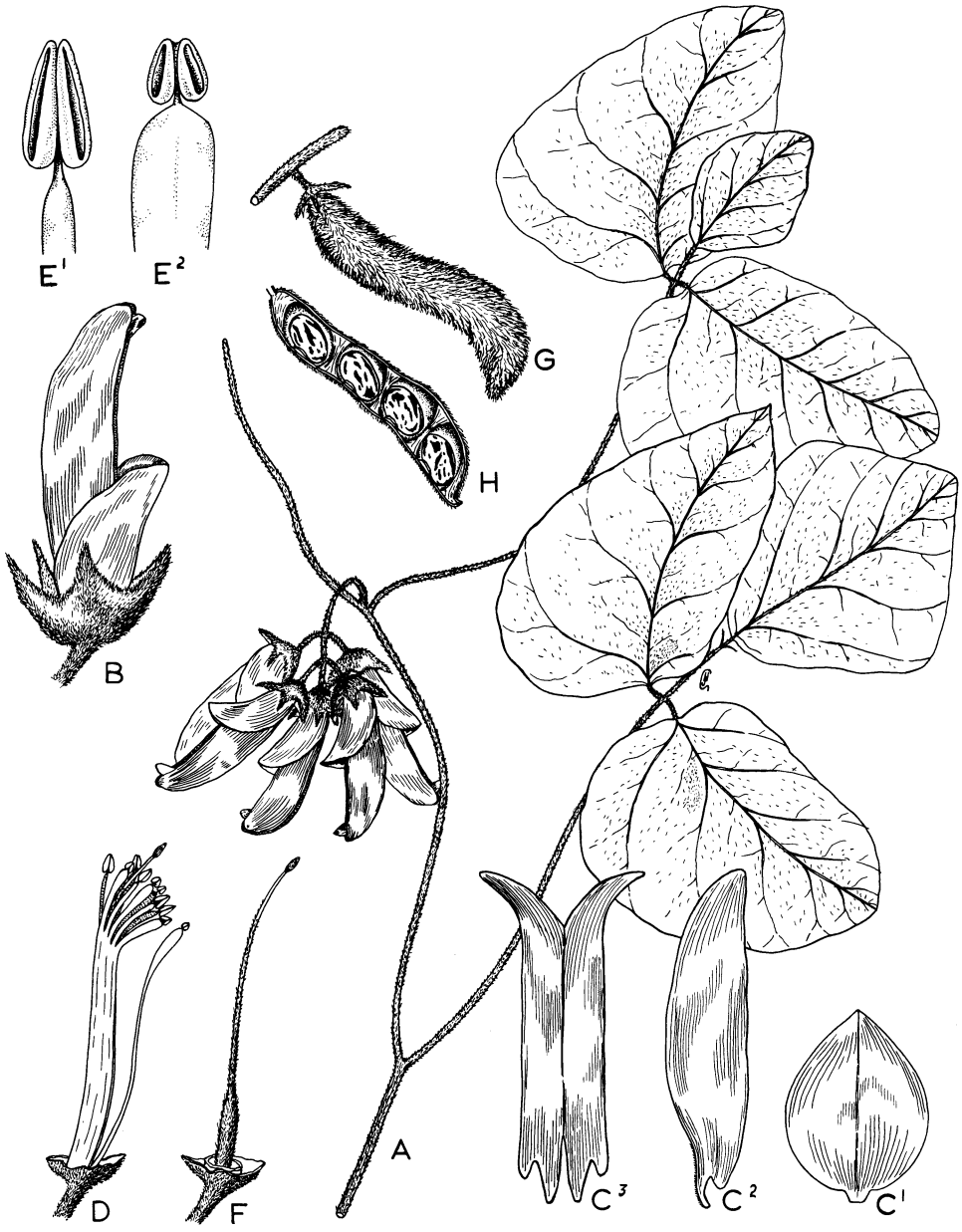

FIGURE 46. *Stizolobium pruriens* (L.) Medic.—A. Habit (×½). [After *Allen 16675A.*]—B. Flower (×1).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petals (×1).—D. Stamens (×1).—E. Stamens.—E¹. Large anther (×10).—E². Small anther (×10).—F. Pistil (×5). [After *Allen 975.*]—G. Fruit (×½).—H. Fruit opened to show seeds (×½). [After *Ebinger 81A.*]

scale-like 1–3 mm long; stipules drying dark, narrowly ovoid, apically linear, ca. 4 mm long, mostly pilose with ascending hairs, mostly caducous. *Inflorescences* axillary, racemes to 20(–30) cm long, mostly 5–15 flowered, the branches grey silver pubescent, the pedicels short, ca. 4 mm long, tomentose, paired on short shoots, the bracts not seen, not elongating in fruit. *Flowers* ca. 4 cm long, the calyx campanulate, the limb ca. 1 mm across, greyish or silvery velutinous, the teeth linear lanceolate, ca. 7 mm long, the lowermost longest, the upper pair united into a narrowly deltoid lip; corolla purplish and white, the standard 15–20 mm long, the tip slightly upcurved and obtuse, ovate, the wings ca. 30 mm long, much exceeding the standard, narrow, the keel slightly longer than the wings, tubular, narrow, the apex cucullate and indurated, enclosing the anthers; ovary canescent, the style glabrous, the stigma minute. *Legume* oblong to fusiform, often irregularly curved, 4–9 cm long, 10–15 mm thick, densely tomentose with stinging hairs, orange, yellow or blackish brown, mostly striate under the hairs, tardily dehiscent with false septa between the seeds; seeds several, faboid, 1–1.5 cm long, plump, variously colored, shiny, with a narrowly elliptical, elevated caruncle around the short lateral hilum, the testa hard but thin.

In fruit, this species can be confused with no other member of the Panamanian flora, for the densely woolly pods with stinging hairs often alert the observer before the plant is seen, and the faboid seeds with elevated caruncle around the hilum will separate the species from members of *Mucuna* which also have stinging hairs on the pods.

Some varieties of this species are cultivated in the Old World for forage. The pods are similar to the typical variety but lack stinging hairs. *Stizolobium pruriens* is widespread in the Neotropics but is probably native to the Paleotropics. The brittle hairs are mechanically irritating and also bear a proteolytic enzyme which is irritating. The English common name "Cow-Itch" is a corruption of the Hindu name "Kewach" (Burkill, 1935), and does not imply potential for injuring cattle. In Spanish the plant is known as "Pica-Pica" (Standley, 1928).

CANAL ZONE: W end of Gatun Lake dam, *Blum & Tyson 1999* (FSU, MO, SCZ). W edge of Cocolí, *Croat 9180* (F, MO, SCZ). Pipeline Road, 1.2 mi NW of Gamboa gate, *Croat 12736* (MO). Farfan, *D'Arcy 9628* (MO). Cocolí, *Dwyer 7229* (GH, MO, US). Madden Dam Area, *Dwyer 8377* (MO). Gamboa, *Greenman & Greenman 5164* (MO). Near Fort Clayton, *Greenman & Greenman 5185* (MO). Hills E of Curundú, *Harvey 5185* (F). Farfan Beach, *Lewis & Dwyer 58* (MO). 1 km S of Madden Dam, 80 m, *Nee 8907* (GH, MO, SCZ). Between Miraflores and Pedro Miguel, *Pittier 2496* (US). Paraíso, *Pittier 2518* (US). Balboa, *Standley* 27132 (US). Gatún, *Standley 27249* (US). Gamboa, *Standley 28453* (US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29004* (US). Río Pedro Miguel near East Paraíso, *Standley 30034* (US). Miraflores Locks, *Stern et al. 81A* (GH, MO, US). Punta Bruja, *Stevens 544* (US). Farfan Beach, *Tyson et al. 3161* (MO). Gamboa near prison, *Tyson & Lazor 6084* (FSU, PMA). CHIRIQUÍ: La Estrella, corregimiento de Bugaba, *Gonzales* 14 (MO). Las Vueltas, 1–100 m, *Koster 110* (MO). Puerto Armuelles, 20 m, *Liesner 139* (MO). COLÓN: Camino de Sardinilla, *Taylor 39* (PMA). DARIÉN: Choco village, Piji Vasal, *Folsom 4574* (MO). LOS SANTOS: 1 mi W of Tonosí, *Croat 2986* (MO). PANAMÁ: Bejuco, *Allen 975* (GH, MO, US). Cerro Cantratista, *Buitrago 30* (MO, PMA). Between Goofy Lake and Panamerican Highway, *Correa & Dressler 442* (A, MO, PMA, SCZ). Base of highway to Cerro Jefe, *D'Arcy 13440* (K, MO, SCZ). Between Panama and Chepo, *Dodge et al. 16675* (GH, MO). Chepo highway W of Río Pacora, *Duke 5893* (MO, WIS). Without other locality, *Kennedy et al. 2013* (MO, US). Taboga Island, *Macbride 2797* (US). Matías Hernández, *Pittier 6810* (GH, US). Near Panamá, *Sargent 7* (A). 2 km entrada camino a Cerro Azul, *Taylor 1* (PMA). Camino después de divisar lago de Sardinilla, *Taylor 43* (PMA). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 5194* (FSU).

42. STYLOSANTHES

Michael O. Dillon[88]

Stylosanthes Swartz, Prodr. Veg. Ind. Occ. 108. 1788. LECTOTYPE: *S. procumbens* Swartz.

Astyposanthes Herter, Revista Sudamer. Bot. 7: 209. 1943. Based on *Stylosanthes* Swartz.

Perennial *herbs* or rarely subshrubs, 0.1–1.5 m tall; stems erect, ascending or sprawling procumbent, diffusely branched, suffruticose, terete, finely striate, unarmed. *Leaves* alternate, pinnately trifoliolate, the rachis below terminal leaflet 1–4 mm long; leaflets elliptic to lanceolate, 5–30(–40) mm long, 2–15 mm wide, apices obtuse to acute, occasionally mucronate, basally attenuate, the costas prominent; petioles 1.5–9.0 mm long; stipules amplexicaul, bidentate, pubescent, adnate with the petiole base, 3–11 nerved; exstipellate. *Inflorescence* spicate, terminal or axillary, 1–several flowered, each flower surrounded by a series of bracts and bracteoles, the outermost bracts similar to stipules and giving rise to 1–3 reduced leaflets, similar to cauline leaflets except for size, the bracts enclosing a smaller outer bracteole, usually 3 nerved, ciliate along the margin, within this a densely ciliate axis rudiment sometimes present; within this 1 or 2 inner bracteoles, deeply cleft, the apices usually long ciliate. *Flowers* 5-merous, the calyx 4–15 mm long, tubular, 5 lobed, unequal; corolla papilionaceous, yellow or yellow orange and purple striate; stamens 10, monadelphous, the filaments coalescent into a tube, splitting on vexillar side after anthesis; 5 versatile anthers alternating with 5 subbasifixed ones; ovary subsessile, the 2(3) ovules campylotropous, the placentation marginal, the style long, filiform, the stigma minute, terminal. *Fruit* a loment, biarticulate, distally fertile, proximally abortive or fertile, reticulate or muricate, beaked; seeds ovate or lenticular, compressed, light brown to black, lustrous, strophiolate, Chromosomes: $n = 10$.

Stylosanthes is composed of approximately 50 species ranging throughout tropical and subtropical America, and tropical Africa and Asia. Various species are used as fodder crops, and at least one species, *S. guyanensis,* has been employed as a cover planting to inhibit soil erosion. Hutchinson and Dalziel (1937) have reported several folk uses for *S. erecta* Beauv. in Africa including herbal smoke, aphrodisiac, decoction used in baths, and as a charm against injury in battle. No local names or uses have been recorded for the species found in Panama.

Stylosanthes hamata (L.) Taub. was reported in error from Panama (Mohlenbrock, 1957), based on *Shafer 36* (NY) from Antigua. No representatives of this taxon from Panama have been seen by the present author.

Literature:

Mohlenbrock, R. H. 1958. A revision of the genus *Stylosanthes*. Ann. Missouri Bot. Gard. 44: 299–355.

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a. Inflorescence 5 to 20 flowered; beak of loment minute, 0.1–0.5 mm long, inflexed; leaflets 10–30 mm long ..... 1. *S. guyanensis*
aa. Inflorescence 2 to 5 flowered; beak of loment 1.5–2.5(–4.0) mm long, strongly to weakly hooked; leaflets to 15 mm long.
  b. Leaflets punctate, hispidulous abaxially; distal articulation of loment ca. 2 mm long, beak ca. 1.5 mm long, strongly coiled ..... 3. *S. viscosa*
  bb. Leaflets never punctate, scarcely setose to glabrous; distal articulation greater than 2 mm long, beak 1.5–3.5(–5.5) mm long, uncinate to coiled ..... 2. *S. humilis*

1. **Stylosanthes guyanensis** (Aubl.) Swartz,[89] Kongl. Vetensk. Acad. Handl. 11: 296. 1789.—FIG. 47.

Trifolium guyanense Aubl., Hist. Pl. Guiane 776. 1775. TYPE: Guiana, *Aublet* (BM, not seen).

Suffruticose *herbs,* erect or rarely scandent, to 1 m tall, glabrous to puberulent or pilose, often hispid or setose, the trichomes viscid. *Leaflets* pinnately trifoliolate or rarely a few unifoliolate, linear lanceolate to elliptic, 10–30(–40) mm long, 2–5 mm wide, the terminal leaflet slightly larger, apically acute, mucronate, puberulent to sericeous with tuberculate based trichomes, nerves 2–8 pairs, prominent; petioles 1–10 mm long, canaliculate, puberulent to setose, the rachis 0.5–1.5 mm long; stipular sheath pilose to setose, 2–15 mm long, 3- to many-nerved, the teeth subulate, 2–10 mm long. *Inflorescence* spicate, mostly 5–20 flowered; bracts usually subfoliaceous, unifoliate, spinulose toothed, the sheaths glabrous to bristly, 3–7 mm long, 3 to 9 nerved, the outer bracteole 1, lanceolate, 2.5–3.0 mm long, acuminate, glabrous to pilose; axis rudiment none; inner bracteole 1, 2–3 mm long, acuminate, glabrous to pilose. *Flowers* yellow; calyx tube 4–8 mm long, glabrous to sparsely pubescent, the lobes 3–5 mm long, obtuse to acute, ciliate or sometimes pilose; standard 4–8 mm long, 3–5 mm wide, suborbiculate, the wings 3.5–5.0 mm long, auriculate, spurred within at the base, the keel petals 3.5–5.0 mm long, falcate. *Fruit* a loment, 1.5–2.5 mm wide, ca. 3 mm long, reticulate, glabrous, ovoid, plump, the beak minute, 0.1–0.5 mm long, strongly inflexed, only the distal articulation fertile. Chromosomes $n = 10$.

Stylosanthes guyanensis is a most variable species occupying a wide range of altitudes and habitats. Numerous subspecies, varieties and forms have been proposed; however, intergradations occur between almost all of these. Mohlenbrock (1957) recognized two subspecies within *S. guyanensis*: ssp. *guyanensis* occurs from Central America through South America into northern Argentina and also in the Antilles, while ssp. *dissitiflora* is limited to a small area in southwestern Mexico, between 3,500–5,000 feet. The latter, not occurring in Panama, is easily distinguished by its small, purplish leaflets and inflorescence of only 1–4 flowers.

CANAL ZONE: Drowned forest of Río Puente near junction with Río Chagres, *Dodge et al. 16835* (GH, MO). K-2 Road, *Dwyer 2877* (FSU). Cocolí road to Contractors Hill, *Dwyer 7229* (GH, MO). Ancón Hill, *Greenman & Greenman 5125* (MO). Forest Preserve, *Hjerting & Rahn 589* (US). Las Cruces Trail in Government Forest, *Hunter & Allen 753* (GH, MO). Empire to Mandinga, *Piper 5129* (US). Ancón Hill, *Piper 5130* (US). Between Corozal & Ancón, *Pittier 2165* (NY, US). Sosa Hill, Balboa, *Standley 26443* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29159* (US). Summit, *Standley 30068* (US). Pipeline Road NW of Gamboa, *Wilbur & Teeri 13389* (DUKE). 0.5 m from Summit Garden, *Wilbur & Weaver 11207* (DUKE, MO). Ancón Hill, *Williams 28* (NY). CHIRIQUÍ: David to Concepción, 60 m, *Burt & Koster 137* (MO). Volcán to Cuesta de

[89] For additional synonyms see Mohlenbrock (1958).

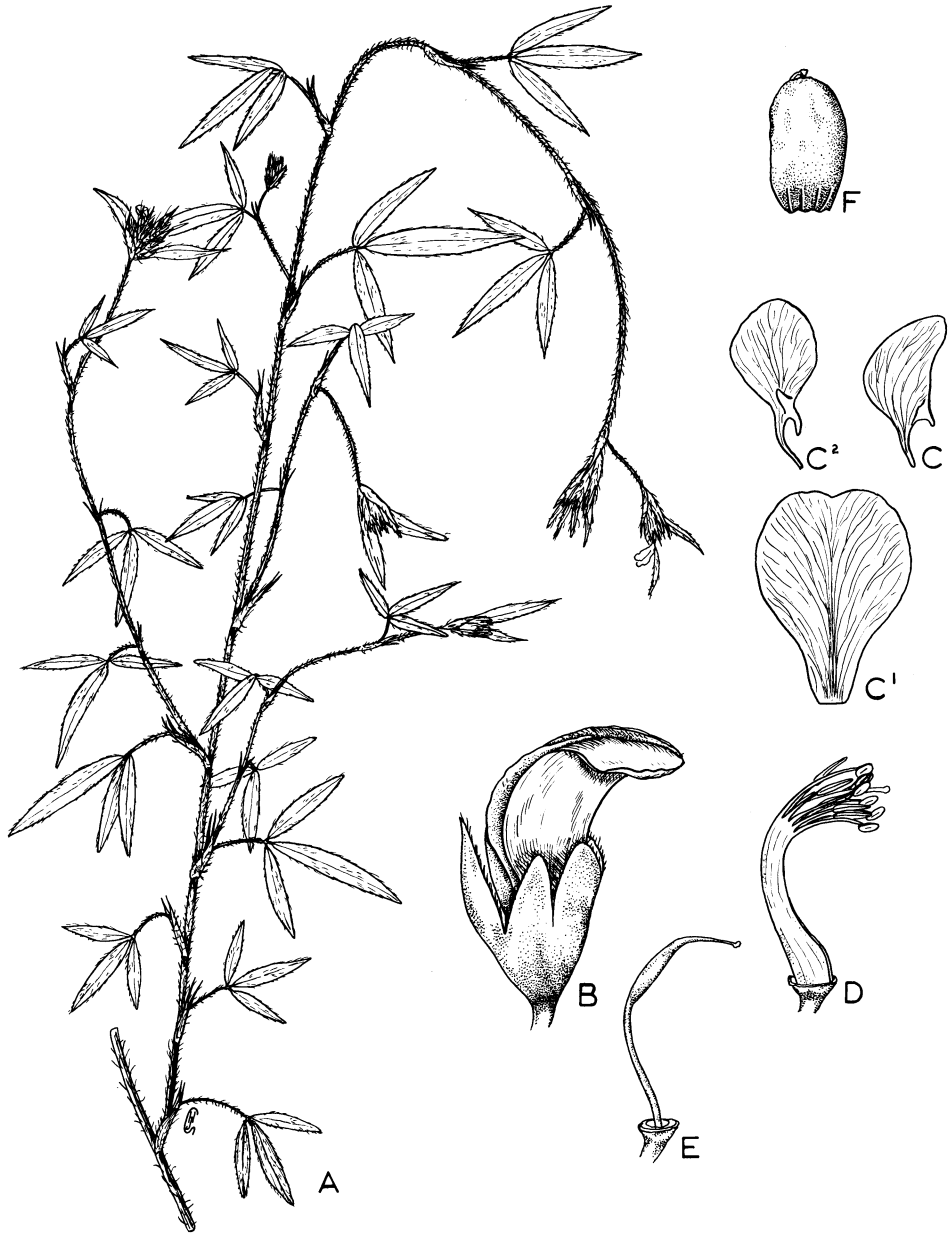

FIGURE 47. *Stylosanthes guyanensis* (Aubl.) Sw.—A. Habit (×½). [After *Allen 16835.*]—B. Flower (×6).—C. Corolla.—C^1. Standard (×4).—C^2. Wing petal (×4).—C^3. Keel petal (×4).—D. Stamens (×6).—E. Pistil (×6). [After *Greenman 5125.*]—F. Fruit (×12). [After *Hunter & Allen 753.*]

Piedras, 980 m, *Burt & Koster 160* (MO). Road to Cerro Punta, ca. NW of Hato de Volcán, *Correa 1371* (MO, PMA). La Popa above Boquete, 4500 ft, *D'Arcy & D'Arcy 6366* (MO). E side of Cerro Pando, near Río Chiriquí Viejo, 600 ft, *D'Arcy & D'Arcy 6613* (F, GH, MO, NY). Lava fields near town of Volcán, 4600 ft, *Duke 9206* (MO, US). Cerro Horqueta, ca. 1500 m, *Duke et al. 13648* (MO).

Llanos Francia, *Dwyer & Lallathin 8716* (MO). Between Santiago and San Félix, *Folsom & Collins 6921* (MO). 311 km W of Panama City, from Boquete to 3 m N, 3300–4200 ft, *Lewis et al. 637* (GH, MO). Alto Boquete, 1125 m, *Partch 69-52* (MO). Boquete, 5500 ft, *Terry 1264* (F, GH, MO, US). 5 mi NE of El Hato del Volcán towards Volcán de Chiriquí, *Wilbur et al. 11857* (DUKE). 6 m W of San Lorenzo, *Wilbur et al. 15393* (DUKE). COCLÉ: Natá, 50 m, *Allen 838* (MO, NY, US). 3 mi NE of Antón, *D'Arcy & Croat 4112* (MO, PMA). Penonomé, Llanos, *Ebinger 1099* (F). 2 m E of Río Hondo along Panamerican Highway, *Gentry 2915* (MO). Penonomé, *Williams 148, 167* (both NY, US). HERRERA: Between Las Minas and Pesé, *Burch et al. 1336* (F). Near Ocú, 100–200 m, *Burt & Koster 87* (MO). Chepo de Las Minas, *Folsom et al. 7062* (MO). 10 mi S of Ocú, *Tyson et al. 2820* (MO, SCZ). PANAMÁ: Near Chepo, 0–100 m, *Burt & Rattray 14* (MO). Near El Valle, 450 m, *Burt & Rattray 28* (MO). Road to El Valle close to Interamerican Highway, 0–100 m, *Burt & Rattray 38A* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5090* (MO). Playa near Río Mar, *Ebinger 507* (F). 7 m W of Chepo, *Gentry & Tyson 1633* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 75* (GH, MO). Río Tocumen, N of Chepo Road, *Hunter & Allen 222* (F, GH, MO, NY). Cerro Campana, *Lewis et al. 3071* (COL, MO, UC). Without exact locality, *Maurice 790* (US). Taboga Island, *MacBride 2818* (F, GH, US). Pacora-Chepo highway, *McDaniel 8181* (FSU, DUKE). Sabanas N of Panama City, *Paul 572* (US). Between Olá and Corteza, *Pittier 5098* (F). Road to Chepo, sea level, *Semple Pa-4* (US). Las Sabanas, *Standley 25837* (MO, US). Savanna E of Río Tocumen, *Standley 26510* (US). Juan Franco Race Track, *Standley 27726* (US). Taboga Island, *Standley 28013* (US). Between Matías Hernández and Juan Diaz, *Standley 32077* (US). Between Cerro Azul and Galaria Barleta, *Taylor 4* (MO, PMA). Ca. 9 km SE of El Valle de Antón, *Wilbur et al. 11166* (DUKE, GH, MO, US). 10 km from Interamerican Highway leading to El Valle de Anton, *Wilbur et al. 15593* (DUKE). VERAGUAS: Ca. 5 mi NE of La Mesa, *Blum & Tyson 631* (FSU, MO, SCZ). Near La Pena, 0–100 m, *Burt & Rattray 84* (MO). Without exact locality, *Duke 6179, 6198* (both MO). Savanna 10 m W of Santiago, *Duke 13647(3)* (NY). 270 km W of Panama City, between Santiago & San Félix, *Folsom & Collins 6910* (MO). Santiago-Santa Fé Road, 18 km S of Santa Fé, 400 m, *Nee 8164* (MO).

2. **Stylosanthes humilis** H.B.K., Nov. Gen. Sp. Pl. 6: 506. 1823. TYPE: Venezuela, *Humboldt & Bonpland,* not seen. Non *S. humilis* Rich. ex Hemsl.

Astyposanthes humilis (H.B.K.) Herter, Revista Sudamer. Bot. 7: 209. 1943.

Herbs, often suffruticose; stems ascending to prostrate, to 0.5 m tall, branched, puberulent to hirsute. *Leaflets* lanceolate to elliptic, mucronate, acute, the adaxial surface and the margins sparsely setose to glabrous, 3–4 pairs of conspicuous nerves; terminal leaflet 5–15(–20) mm long, 2–4 mm wide; petioles 2.5–5.0 mm long, canaliform, setaceous, the rachis 1.5–4.0 mm long; stipular sheath 3–5 mm long, short bristly, 5–7 nerved, the teeth subulate, 2.5–3.5 mm long. *Inflorescence* spicate, 3–4 flowered; bracts 1–3 foliolate, the sheath 2.5–4.5 mm wide, bristly, 5–9 nerved, the teeth 2–3 mm long; outer bracteole 2.5–3.0 mm long, the apex ciliate; axis rudiment none; inner bracteole 1, 2.0–2.5 mm long, the apex ciliate. *Flowers* yellow; calyx tube 4–5 mm long, the lobes acute, ca. 1.5 mm long; standard suborbiculate, spurred within at the base, 3–4 mm long; wings 3–4 mm long, clawed and auriculate at the base; keel petals 3.0–3.5 mm long, falcate. *Fruit* a loment, 1.5–2.5(–4.0) mm long, 1.5–2.5 mm wide, reticulate nerved, usually puberulent, rarely pilose, only the distal articulation fertile, the beak strongly uncinate to coiled, 1.5–3.5(–5.5) mm long. Chromosomes $n = 10$.

Stylosanthes humilis is quite variable in size and shape of the leaflets, and in the size of the loments. The species ranges from central Mexico through Panama to Colombia, Venezuela, and Brazil; it also occurs in the Antilles and is adventive in Malaysia and Australia.

In Panama, this species generally occurs at elevations below 150 m, and it is

distinguished by its glabrate, apunctate leaflets and the elongate beak of the terminal articulation.

CANAL ZONE: Cocolí Road to Contractors Hill, *Dwyer 7213* (MO). La Boca, *Mori & Kallunki 3687* (MO). Corozal, *Standley 27403* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29191* (US). Albrook Air Force Base, *Tyson & Lazor 6013* (FSU, PMA). CHIRIQUÍ: Near David, site 64, *Burt & Koster 133* (MO). Road to Divala, site 74, *Burt & Koster 149* (MO). Frances Arriba School, *Lewis et al. 655* (GH, K, MO, UC, US). David airport, *Lewis et al. 753* (GH, MO). 5 km S of Las Lomas, *McCorkle C-25* (FSU, SCZ). David, *Rattray 3* (MO). COCLÉ: Near Divisa, *Burt & Koster 96* (MO). Aguadulce, *Pittier 4837, 4983* (both US). COLÓN: 0.7 m NE of bridge over Río Piedras on road from Portobelo, *Nee & Mori 3650* (MO). PANAMÁ: Between Panama and Chepo, *Dodge et al. 16700* (MO). Río Mar, *Godfrey 2321* (FSU, SCZ). Las Sabanas, *Heriberto 297* (US). 7 mi S of Campana, *McDaniel 8339* (DUKE, FSU). Las Sabanas, *Standley 25882, 25914* (both US). Near Punta Paitilla, *Standley 26293* (US). Corozal Road, *Standley 26794* (US). Vicinity of Juan Franco Race Track, *Standley 27730* (US). Río Tocumen, *Standley 29474* (US). Las Sabanas, *Standley 41178* (US). VERAGUAS: Hills W of Soná, *Allen 1054* (GH, MO, US). Davisa/Santiago, 0–100 m, *Burt & Rattray 75, 78, 79* (all MO). Panamerican Highway 0.5 km W of Highway 50 turnoff to Ocú, 30 m, *Nee 8002* (MO). 2 km NW of Atalaya, *Nee 8244* (DUKE, MO, US).

3. **Stylosanthes viscosa** (L.) Swartz, Prod. Veg. Ind. Occ. 108. 1788.

Hedysarum hamatum β viscosa L., Plant. Jamaic. Pug. 20. 1759. TYPE: Jamaica, *Sloane* (BM, not seen).

Herbs, stems ascending and spreading or prostrate and matted, much branched, to 1 m long, densely pubescent with viscid trichomes. *Leaflets* lanceolate to elliptic, to 15 mm long, 4 mm wide, acute to obtuse, the abaxial surface punctate, reddish, hispidulous, 2–4 pairs of conspicuous nerves; petioles 2.5–5.0 mm long, hispidulous, viscid, the rachis 1–2 mm long; stipular sheath 3.5–5.5 mm long, 3–5 nerved, the teeth subulate, hispidulous, viscid. *Inflorescence* spicate, 2–5 flowered; outer bracts usually trifoliolate, the inner bracts unifoliolate, the sheath equaling or slightly exceeding the teeth, hispidulous, viscid, 5–7 nerved; outer bracteole 1, 2.5–3.0 mm long, the apex ciliate; axis rudiment none; inner bracteole 1, 2.5–3.0 mm long, the apex ciliate. *Flowers* yellow, calyx tube 3–7 mm long, glabrous to puberulent; standard suborbiculate, 4–7 mm long, the wings 4–5 mm long, auriculate, spurred within at the base, the keel petals 3–4 mm long, falcate. *Fruit* a loment, 2–4 mm long, ca. 2 mm wide, the distal articulation fertile, reticulate nerved, puberulent, beak ca. 1.5 mm long, strongly uncinate to coiled.

Stylosanthes viscosa ranges from western Mexico through central and northern South America to the eastern coast of Brazil. This species is frequently collected in Panama, and it is distinctive with its highly punctate leaf undersurface appearing reddish.

COCLÉ: 3 mi NE of Antón, *D'Arcy & Croat 4111* (MO). E of Natá, *Duke 12386 (3)* (NY). Penonomé, *Ebinger 1099a* (F, MO). Road to El Valle, *Ebinger 1099b* (MO). Aguadulce, *McDaniel & Cooke 14764* (FSU); *Pittier 4983* (GH). Río Hato Military Reserve, *Tyson & Blum 2558* (FSU, MO, SCZ). HERRERA: Hills between Las Minas and Pesé, 9–1200 m, *Burch et al. 1336* (F, MO). Ocú, ca. 5 m S, *Stern et al. 1689* (MO, US). 10 mi S of Ocú, *Tyson et al. 2852* (FSU, SCZ). LOS SANTOS: Las Cruces to Macaracas, 100–200 m, *Burt & Koster 102* (MO). PANAMÁ: Road to El Valle near Interamerican Highway, 0–100 m, *Burt & Rattray 38* (MO). Near beach at Nueva Gorgona, *Duke 4537* (MO). Playa near Río Mar, *Ebinger 507* (F, MO). 7 m W of Chepo, *Gentry & Tyson 1633* (SCZ). VERAGUAS: Without exact locality, *Bristan 795* (MO). La Mesa, *Tyson 6049* (FSU, SCZ).

43. TEPHROSIA

Peter S. White[90]

Tephrosia Pers.,[91] Syn. Pl. 2: 328. 1807. Nomen conserv. contra *Needhamia* Scop., *Reineria* Moench. LECTOTYPE: *T. villosa* (L.) Pers. (*Cracca villosa* L.)

Needhamia Scopoli, Introd. 310. 1777. Nomen rejic. contra *Tephrosia*. TYPE: *Vicia littoralis* Jacq. = *Tephrosia littoralis* (Jacq.) Pers.

Reineria Moench., Suppl. Meth. Bot. Pl. 44. 1802. Nomen rejic. contra *Tephrosia*. TYPE: *R. reflexa* Moench = *Tephrosia reflexa* (Moench.) DC.

Cracca L., Sp. Pl. 752. 1753; Gen. Pl., ed. 5. 1754. Nomen rejic. contra *Cracca* Benth. TYPE: *Cracca villosa* L. Not *Cracca* Hill, Brit. Herb. 285. 1756. TYPE: not designated. Nor *Cracca* Medic., Vorl. Chrupf. Phys.-Ökon. Ges. 2: 359. 1787. TYPE: *Cracca benghalensis* Medic. = *Vicia benghalensis* L. Nor *Cracca* Benth., *in* Benth. et Oerst. Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1853: 8. 1853. Nomen conserv. contra *Cracca* L. TYPE: *Cracca glandulifera* Benth.

Perennial *herbs* or *shrubs*, erect or trailing; base woody; roots usually heavy; pubescence usually close and dense. *Leaves* alternate, odd pinnate; leaflets (1–)3–41, almost always hairy, at least beneath; secondary veins parallel, distinctively sharply ascending, ca. 30° to the midrib; rachis usually grooved above; estipellate but tufts of hairs sometimes present in the axils; stipulate. *Inflorescence* terminal or axillary, sometimes apparently leaf opposed but actually terminal and overtopped by the adjacent axillary branch, racemose, elongate, the flowers in clusters of 2–6 or more at the nodes, each cluster usually with a primary bract at the base and each pedicel with a secondary bract at the base. *Flowers* red, purple, or white, petals clawed, the standard hairy outside, often densely so, the wings about as long as the standard and usually basally adnate to the keel; stamens usually diadelphous, the vexillary stamen frequently fused to the stamen tube above, free at the base; ovary sessile, slender, usually hairy, the style bearded above in many species, or glabrous. *Fruit* flat, linear or oblong, straight or slightly curved, sessile, often obliquely contracted distally and beaked on the upper side by the persistent style base, continuous within or slightly septate, the valves usually coiling in dehiscence; seeds several to many, circular to oblong, flattened.

Tephrosia is a genus of 250–400 species in temperate and tropical regions of North and South America, Africa, southern Asia, and Australia. It reaches its highest diversity in dry open habitats of Mexico. The four species reported from Panama are also characteristic of open habitats. Many species produce rotenone and related compounds which are used as fish poisons and insecticides, and at least several species have been cultivated in the New World tropics for these purposes. *Tephrosia* has also been planted as a cover crop and green manure. Chromosomes: $2n = 22$ (Wood, 1949).

The history of the names *Tephrosia* Pers., *Cracca* L., *Cracca* Benth., and *Cracca* Medic. may be confusing as presented in the synonymy above and is explained more fully below (see also Wood, 1949). In *Species Plantarum* (1753), Linnaeus described six species in the genus *Cracca* L. He subsequently (1759)

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[91] For more complete synonymy see Wood (1949). Only the above names relate directly to Panamanian plants.

submerged this genus in *Galega*. Soon it was recognized that *Galega* was a heterogeneous catchall of species, and segregate genera were proposed, one of which was *Tephrosia* Pers. (1807). At this point *Tephrosia* included all the original six *Cracca* L. species plus some other elements. Some of the included elements were later seen as extraneous to *Tephrosia* and were removed to other genera, leaving *Tephrosia* Pers. taxonomically equivalent to the original *Cracca* L. Other species were placed in *Tephrosia* by several workers.

A new use of the name *Cracca* occurred when Bentham (1853) used the name for some of the original discordant elements in *Galega*. Confusion was heightened when Otto Kuntze, recognizing the priority of *Cracca* L., transferred all *Tephrosia* Pers. species to *Cracca* L. For the species of *Cracca* Benth., Kuntze proposed the genus *Brittonamra* Kuntze.

Yet a third use of the name was *Cracca* Medic. (1787) which was resurrected by Alefield in 1862 for species of *Vicia* L. Thankfully, this use of the name was more or less ignored, although Alefield introduced further confusion by proposing the name *Benthamantha* Alef. for the species of *Cracca* Benth. Except for *Cracca* Medic., these names were all in current use. *Tephrosia* Pers. and *Cracca* L. were in use for one group of plants; *Cracca* Benth., *Brittonamra* Kuntze and *Benthamantha* Alef. were in use for a second group of plants. Resolution occurred when *Tephrosia* Pers. and *Cracca* Benth. were conserved. *Tephrosia* Pers. is conserved against *Needhamia* Scopol. (1777) and *Reineria* Moench. (1802). *Cracca* L. is rejected against *Cracca* Benth., and is unavailable for rejection against *Tephrosia* Pers. because *Cracca* Benth. (1853) is of a later date than *Tephrosia* Pers. (1807). Hill, in his *British Herbal* (1756), had also published *Cracca* (=*Vicia* L.). Like the later *Cracca* Medic. (1787; TYPE: *Vicia benghalensis* L.), this use of *Cracca* was more or less ignored.

Cracca Benth. has been confused taxonomically with *Tephrosia* (=*Cracca* L.) but in *Cracca* Benth. the leaflets are stipellate, the wing petals free, the fruit septate, and the flowers often yellowish. *Tephrosia* is distinctive in the sharp angle of the secondary veins of the leaflets, the hairiness on the outside surface of the standard, and the often bearded style.

Literature:

Wood, C. E., Jr. 1949. The American barbistyled species of *Tephrosia* (Leguminosae). Rhodora 51: 193–231; 233–302; 305–364; 369–384; pls. 1152–1155.

a. Low or trailing, weak, herbaceous plants; inflorescences often appearing leaf opposed; style glabrous or only ciliate at the apex; leaflets 1–3 cm long, 0.1–0.3 cm wide ---- 4. *T. tenella*

aa. Upright, stout herbs or shrubs; inflorescence evidently axillary or terminal; style barbate above; leaflets 2–8 cm long, 0.5–2.0 cm wide.

b. Leaflets 5–13, oblong with cuneate base, thick; leaves and hypanthium silvery silky; calyx lobes 3–6 mm long ---- 2. *T. nitens*

bb. Leaflets 15–41, narrowly elliptic, the base thinner; leaves and hypanthium with usually yellowish to brownish hairs; calyx lobes less than 3 mm long.

c. Lateral lobes of calyx obliquely and abruptly acute or acuminate, unlike the lower lobe in shape ---- 3. *T. sinapou*

cc. Lateral lobes of calyx acute to acuminate, symmetrically tapered and approximately the same shape as the lower lobe ---- 1. *T. multifolia*

1. **Tephrosia multifolia** Rose, Contr. U.S. Natl. Herb. 1: 320. 1895. TYPE: Mexico, *Palmer 1364* (US, holotype; isotypes GH, NY).

Cracca multifolia (Rose) Rose, Contr. U.S. Natl. Herb. 12: 270. 1909.
C. arcuata Rydb., No. Amer. Flora 24: 166. 1923. TYPE: Mexico, *Nelson 4193* (US, holotype; isotype GH).
C. heydeana Rydb., No. Amer. Flora 24: 166. 1923. TYPE: Guatemala, *Heyde & Lux* (D. Smith dist. no. *6111*) (NY, holotype; isotypes GH, US).
Tephrosia heydeana (Rydb.) Standley, J. Wash. Acad. Sci. 17: 167. 1927.
T. arcuata (Rydb.) Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 213. 1929.

Shrubs or erect *herbs* to 2.5 m tall, much branched; stems, leaves, and inflorescence pubescent, pilose, or velvety. *Leaves* to 35 cm long; leaflets (15–)21–31(–40), linear, oblong or narrowly elliptic, 2–6 cm long, 0.5–1.2 cm wide, the middle leaflets often the longest, rounded to somewhat acute basally and apically, mucronulate, paler green and more densely pubescent beneath, the main secondary veins 10–15 on each side, these and the midrib slightly raised beneath; petiole 1.5–3.0 cm long; rachis grooved, 5–25 cm long. *Inflorescences* terminal and axillary, to 20 cm long; peduncle 2–9 cm long, the nodes 20–50, buds to 7 per node; primary bracts 5–10 mm long; secondary bracts 4 mm long; pedicels 4 mm long, slender. *Flowers* drying to 15 mm long; calyx strigose, 3–6 mm long, the lower and 2 lateral teeth subequal, narrowly triangular to acuminate, the upper teeth connate, shorter, the teeth approximately equaling the tube; petals clawed, apparently white to pink, the standard circular to oblong, ca. 15 mm long, the claw to 3 mm long, densely covered with brown appressed hairs on the back, the wings narrow, oblong, ca. 15 mm long, the claw to 3 mm long, slightly adherent to the keel; keel narrow, oblong, to 5 mm wide, the claw to 3 mm long; staminal tube 10–15 mm long, the vexillary stamen connate in part, basally free; ovary silky, linear, ovules 8–10, the style hairy above. *Fruit* 5–6 cm long, 5 mm wide, widest toward the tip, flattened, slightly upcurved, velvety, the style base persistent, calyx persistent but somewhat torn, the 2 valves twisting on dehiscence; seeds 6–10, brown, oblong, 3 mm long.

Tephrosia multifolia is found from Mexico southward throughout Central America, but is apparently absent from South America. It has been collected in open habitats in three provinces of Panama.

Tephrosia multifolia is similar in appearance and apparently closely related to *T. sinapou*. The most easily differentiated character separating the two is the shape of the lateral calyx lobes which are symmetrical and narrowly triangular in *T. multifolia* and oblique, asymmetrical, and abruptly acute in *T. sinapou*. The latter also tends to have narrower leaflets with more secondary veins, pubescence more densely velvety and browner in color, and the calyx larger and heavier in appearance. Both species are cultivated for use as fish poisons and insecticides.

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5125* (US). CHIRIQUÍ: Near Las Lomas, 0–100 m, *Burt & Koster 129* (MO). Boquete, *Davidson 591* (F, GH, MO, US). Between Hato del Jobo and Cerro Vaca, 700–1000 m, *Pittier 5419* (GH, NY, US). HERRERA: Near Las Minas, 320 m, *Burt & Koster 92* (MO). VERAGUAS: Tienda Santa Ana (La Yeguada), *Escobar et al. 291* (MO). El Embalsadero, 8 mi W of Santiago, *Tyson 6085* (FSU, MO, SCZ).

FIGURE 48. *Tephrosia nitens* Seem.—A. Habit (×⅔).—B. Flower (×2).

2. **Tephrosia nitens** Benth. ex Seem., Bot. Voy. Herald 107. 1853. TYPE: Panama, *Seemann 1036* (K, not seen; photo F, MO, NY; possible isotype at GH).—FIG. 48.

Cracca nitens (Benth. ex Seem.) Kuntze, Rev. Gen. Pl. 1: 175. 1891.
Tephrosia nitens var. *lanata* Micheli in Dur. and Pitt., Bull. Bot. Soc. Belgique 30(1): 286. 1891. TYPE: Costa Rica, *Pittier & Tonduz 3809* (holotype US; isotype B, not seen; photo F, MO).
Tephrosia albida Brandegee, Univ. Calif. Publ. Bot. 10: 406. 1924. TYPE: Chiapas, Mexico, *Purpus 9136* (US, not seen).

Erect *herb* or sparsely branched *shrub* to 3 m tall; stems strigose to villous. *Leaves* usually 5–10 cm long, leaflets 5–13, ascending, 2–8 cm long, 0.5–2.0 cm wide, the terminal leaflet largest, oblong, retuse, the base cuneate, thick, glabrate above, silvery silky beneath; petiolules 2–3 mm long; petiole grooved, 3–5 mm long; rachis grooved, 1–5 cm long; stipules narrow to triangular, deciduous to apparently persistent, to 8 mm long. *Inflorescences* terminal and axillary, to 50 cm long, flowers 5–7 per node, apparently never all maturing fruit, nodes to 50 per inflorescence; bracts narrow, deciduous; pedicels to 8 mm long. *Flowers* drying 1.5–2.0 cm long; calyx 6–9 mm long, the lobes long acuminate, subequal, 4–7 mm long; petals white to rose purple, the standard oblong to circular, 15–20 mm long, 15 mm wide, silky on the back, often notched at the tip, the claw to 3 mm long, the wings oblong, to 2 cm long and 4 mm wide, the claw to 4 mm long, the keel to 15 mm long, the claw to 4 mm long; staminal tube 10–15 mm long, the vexillary stamen connate in part, free at the base; ovary silky, to 15 mm long and 1 mm wide, the margins thickened. *Fruit* linear, flattened, 5–6 cm long, 0.5 cm wide, evenly tapered to the persistent style base, not septate but the flat surface often indented between the seeds, pubescent; seeds 9–13, nearly circular, compressed, ca. 2.5 mm across, dark brown.

Tephrosia nitens is found from southern Mexico to Brazil. This is a distinctive and attractive species both in flower and in leaf. All but one of the Panamanian collections seen are from Taboga Island, which is the type locality. Chromosomes: $2n = 22$ (Wood, 1949).

PANAMÁ: Taboga Island, *Allen 110* (GH, MO, NY), *1276* (GH, MO, US); *Killip 3174* (US); *Macbride 2830* (F, US); *McDaniel & Cooke 12903* (FSU); *Miller 2026* (US); *Pittier 3571* (NY, US); *Standley 27999* (US). Cerro Campana, ca. 2500 ft, *Tyson 6439* (MO, SCZ).

3. **Tephrosia sinapou** (Buchoz) A. Chev., Compt. Rend. Hebd. Séances Acad. Sci. 180: 1522. 1925. (As *T. singapou*.)

Galega sinapou Buchoz, Hist. Univ. Regne Vég., *pl. 994*. 1775. TYPE: Buchoz diagnostic plate.
G. sericea Lam., Encycl. Méth. Bot. 2 (part 2): 596. 1788. TYPE: not established. Not *Galega sericea* Thunb. (1800), nor *G. sericea* Buch.-Ham. (1822), nor *Tephrosia sericea* (Thunb.) Pers. (1807), nor *T. sericea* Baker (1871).
G. toxicaria Swartz, Prod. Veg. Ind. Occ. 108. 1788. TYPE: West Indies, *Swartz*, not seen.
Tephrosia toxicaria (Swartz) Pers., Syn. Pl. 2: 329. 1807.
T. emarginata H.B.K., Nov. Gen. Sp. Pl., (ed. folio) 6: 361; (ed. quarto) 6: 461. 1824. TYPE: Venezuela, (P, not seen; microfiche MO; probable isotype B, not seen).
T. schiedeana Schlecht., Linnaea 12: 299. 1838. TYPE: Mexico, (NY, not seen; isotype GH).
Orobus sericeus Sess. et Moc., Natureleza (Madrid) II, 1: app. 118. 1889. TYPE: Mexico, not seen.
Cracca toxicaria (Swartz) Kuntze, Rev. Gen. Pl. 1: 175. 1891.
C. schiedeana (Schlecht.) Standley, Contr. U.S. Natl. Herb. 23: 474. 1922.

Shrubs or erect perennial *herbs* to 1 m tall; stems usually ridged and densely velvety with yellowish-brownish pubescence. *Leaves* to 30 cm long; petioles 2–5 cm long; rachis 10–25 cm long; leaflets 17–41, most often 25–35, narrowly elliptic to linear, mucronate, 4–6 cm long, 0.5–1.5 cm wide, pubescent above, more densely pubescent and paler beneath; leaflets with the 15–20 pairs of main side nerves sometimes obscured by pubescence beneath; petiolules ca. 2 mm long; stipules linear, to 15 mm long, apparently persistent. *Inflorescences* terminal and axillary, to 30 cm long, the peduncle 2–8 cm long, the nodes 15–25 or more, the buds 2–6 per node; bracts linear, to 8 mm long; pedicels 2–5 mm long. *Flowers* drying to 20 mm long; calyx densely hairy, 5–8 mm long, the lobes about equaling the tube, the lower lobe symmetrically tapered, narrow triangular, the lateral lobes unlike the lower lobe, abruptly and obliquely narrowed to an acute or sometimes acuminate tip; petals apparently white to pink, the standard circular to oblong, ca. 15 mm long, densely hairy on the back, the claw to 3 mm long, the wings narrow, to 15 mm long, the claw 3 mm long, slightly adherent to the keel, the keel narrow, oblong, to 17 mm long, the claw to 4 mm long; staminal tube 10–15 mm long, the vexillary stamen adnate to the tube for part of the length, basally free; ovary silky, linear, the ovules 10–13, the style hairy above. *Fruit* more or less straight, linear, to 5 cm long and 5 mm wide, hairy; calyx persistent, but somewhat torn; seeds 8–13, oblong, 3.0–3.5 mm long, brown, apparently often faintly mottled.

This plant is similar in appearance to *T. multifolia* (see above under *T. multifolia*). *T. sinapou* is found in Mexico, Central America, the West Indies, and South America. *T. sinapou* has been cultivated for use as a fish poison apparently throughout the New World tropics.

The type of *Galega sericea* Lam. is possibly one of two collections in the Lamarck Herbarium (P-LAM, not seen; microfiche, MO). Lamarck (Encycl. 2 [part 2]: 596) also lists a variety "beta" and refers to having seen a Jussieu specimen. This latter may be the collection that bears the name "*Galega sericea*" in the Jussieu Herbarium (P-JU; microfiche, MO).

The plates in Buchoz's (also spelled Bu'choz and Buch'oz) work are not indexed. They are numbered as follows: "mille" (Arabic numerals, lower left corner); "Cent." (Arabic numerals, lower right corner); "Dec." (Arabic numerals, upper right corner); and "Pl." (Roman numerals, upper left corner). There is no "Cent." zero nor a "Dec." zero; hence, plate 994, on which the name *Tephrosia sinapou* is based, is numbered as "Cent. 10," "Dec. 10.," "Pl. IV." This system can be confusing in trying to locate a particular plate.

DARIÉN: El Real, *Duke 4941* (MO). Puerto St. Dorothea, *Dwyer 2274* (GH, MO, SCZ). SAN BLAS: Ailigandí River, *Duke & Bristan 338* (MO, NY).

4. **Tephrosia tenella** A. Gray, Pl. Wright. 2: 36. 1853. TYPE: "San Pedro, Sonora," now Arizona, *Wright 966* (GH holotype; isotypes MO, US).

Weak, thin stemmed, trailing *herbs* with sparse pubescence. *Leaves* 2–8 cm long; leaflets 5–13, rarely to 21, linear to linear oblong, 1–3 cm long, 1.0–2.5 mm wide, rounded and mucronate at the tip, acute at the base, the secondary veins ascending and inconspicuous; rachis to 6 cm long, grooved, loosely strigose;

petiolules ca. 0.5 mm long; petioles 0.5–2.0 cm long, grooved, strigose, estipellate but tufts of hairs present in the axils; stipules subulate, ca. 1–3 mm long. *Inflorescence* opposite the leaves or axillary, to 15 cm long, loosely hairy, the nodes distant, 1–2 flowers or fruits per node; bracts ca. 2 mm long, subulate; pedicels 3–5 mm long. *Flowers* drying to 10 mm long, the calyx 4–5 mm long, the tube campanulate and somewhat longer than the narrowly triangular lobes; standard circular to reniform, 10–12 mm long, puberulent, the claw to 3 mm long, the wings oblong, to 11 mm long and 5 mm wide, longer than the keel, the claw ca. ½ the length of the blade, slightly adherent to the keel, the keel to 7.5 mm long, ca. 3.5 mm wide; staminal tube ca. 5.5 mm long, vexillary stamen united briefly to the tube and basally dilated to ca. 1 mm wide; ovary narrowly oblong, short appressed hairy, the style to 3 mm long, glabrous except ciliate towards the apex. *Fruit* linear oblong, flattened, 3–5 cm long, ca. 0.5 cm wide, pubescent, the valves twisting on dehiscence; calyx persistent; seeds 3–8, oblong, ca. 3 mm long.

This species has been reported from the southern United States, Mexico, Central America, and the West Indies. The taxonomy of the glabrous styled Tephrosias awaits monographic study. Several names have been used in this group, at least some of which refer to distinct species. Only a more detailed study than that possible here will elucidate the relationship of this taxon to *Tephrosia ascendens* (1837); *T. brandegei* (1923); *T. corallicola* (1951); *T. curtissii* (1962); *T. leptostachya* (1825); *T. littoralis* (1807); *T. vicioides* (1838); and *T. wallichii* (1831).

Tephrosia tenella apparently sometimes behaves as an annual. It is unique among Panamanian Tephrosias in this regard.

COCLÉ: Olá, 100–350 m, *Pittier 5044* (GH, US). HERRERA: Ocú, *Ebinger 1079* (MO, SCZ, US).

44. TERAMNUS

W. G. D'Arcy[92]

Teramnus P. Br., Civ. Nat. Hist. Jam. 290. 1756. TYPE: *T. uncinatus* (L.) Swartz.

Twining *vines,* mostly pubescent. *Leaves* pinnate trifoliolate, the leaflets mostly broadly or narrowly ovate, mucronate; stipels subulate; stipules narrow, striate. *Inflorescences* axillary racemes; peduncles slender, often elongate, several flowered; bracteoles 2, subtending the calyx or just below the top of the pedicel; pedicels short, pubescent. *Flowers* inconspicuous; calyx tubular, lobed about ½ way down, the lobes subulate, subequal or the upper pair fused and longer; standard emarginate, glabrous, exserted slightly from the upper calyx lobes; stamens pseudomonadelphous, the alternating anthers reduced and sterile; ovary linear, pubescent, the style incurved, glabrous, the stigma capitate. *Legume* linear, mostly straight, sometimes compressed, with a small but prominent often upturned beak, mostly pubescent, explosively dehiscent by 2 valves; seeds numerous, separated by valvular tissue, plump, lenticular.

Teramnus is distinguished by its small flowers with subulate-toothed calyx and glabrous standard. The anthers, only 5 fertile, are also distinctive. The genus

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includes about 8 species of both Old and New World tropics. Only three species are known in the Neotropics, all three of which occur in Panama. These are mainly plants of recent disturbance, although they may persist as weeds around gardens.

Teramnus rhombifolius Beurling, Kongl. Vetensk. Acad. Nya Handl. 1854: 120. 1855, was described from a collection taken near Portobelo by Billberg. This collection has not been located, and the species cannot be determined from the original description. It may be synonymous with either *T. uncinatus* or *T. labialis*.

a. Leaflets densely sericeous beneath; fruits densely long villous, the beak more than 2.5 mm long ---------- 2. *T. uncinatus*
aa. Leaflets sparsely pubescent beneath, sometimes appressed pubescent; fruits with thin, short pubescence, the beak mostly less than 2.5 mm long.
b. Leaflets mostly ovate, only 1.5 times longer than wide; calyx wide 5 subequal teeth ---------- 1. *T. labialis*
bb. Leaflets mostly narrow, 2 or more times longer than wide; calyx with the longer upper pair of teeth fused to near the top or higher ---------- 3. *T. volubilis*

1. **Teramnus labialis** (L.f.) Spreng., Syst. Veg. 3: 235. 1826.

Glycine labialis L.f., Suppl. Pl. 325. 1781. LECTOTYPE: East Indies, herb Linn (LINN 901.15, not seen; microfiche MO).

Twining *vines* climbing on herbs and shrubs, the stems hispid, glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate, apically acute or obtuse, mucronate, basally rounded, mostly 2–6 cm long, 1.5–2.5 cm wide, mostly copiously pubescent on both sides, more so beneath, the hairs sometimes appressed; petiolules 1–2 mm long, hispid; stipels subulate, the stipules subulate, sparingly long hispid. *Inflorescences* axillary racemes, mostly short, 2–5(–12) cm long, peduncle slender, retrorsely pilose, glabrescent in fruit; bracteoles ca. 2 mm long, about as long as the calyx tube. *Flowers* inconspicuous, white or pinkish; calyx tubular, ascending hispid, the tube ca. 2 mm long, the teeth subequal, about equalling the tube, the standard exserted about 1 mm from the calyx teeth. *Legume* linear, somewhat compressed, 3–5 cm long, mostly 5–6 mm wide, sericeous; seeds tan with dark mottling, plump lenticular, 4 mm long.

This species is similar vegetatively to *Teramnus volubilis,* but the leaves are usually smaller and broader. The calyx is different.

Teramnus labialis is widespread in the Caribbean region, and it is naturalized in the Old World. It appears to be uncommon in Panama.

CANAL ZONE: Albrook site, U.S. Army Tropic Test Center, *Dwyer 7118* (GH). CHIRIQUÍ: Near Cuesta de Piedras, 730 m, *Burt & Koster 161* (SCZ). LOS SANTOS: Monagre Beach 5 mi SE of Chitré, *Tyson et al. 3009* (SCZ).

2. **Teramnus uncinatus** (L.) Swartz, Nov. Gen. Sp. Pl. 105. 1788.—FIG. 49.

Dolichos uncinatus L., Sp. Pl., ed. 2. 1019. 1763. TYPE: not seen.
Calopogonium phaeophlebium Donnell Smith, Bot. Gaz. 52: 46. 1911. TYPE: Mexico, *Heyde & Lux 3742,* not seen.

Long twining *vines,* mostly on shrubs and herbs; stems brownish to greyish sericeous with elongate and shorter hairs, the shorter hairs reflexed, glabrescent.

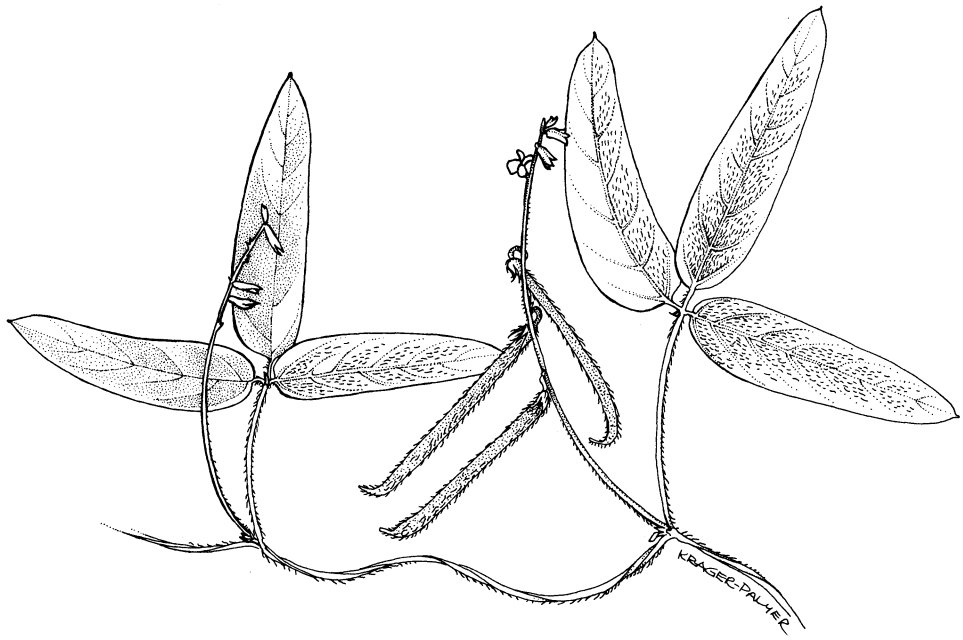

FIGURE 49. *Teramnus uncinatus* (L.) Sw. Habit (×3/5). [After *Nee 9490.*]

Leaves pinnate trifoliolate; leaflets ovate, mostly 4–8 mm long, 1.5–3.5 mm wide, the lateral leaflets slightly smaller, apically obtuse, mucronulate, basally obtuse, discolorous, sparingly sericeous above, densely so beneath; petiolules ca. 2 mm long, tomentose; rachis mostly 3–5 mm long, petiole mostly 2–3 cm long; stipels subulate, about as long as the petiolules; stipules narrow, sericeous, ca. 2 mm long. *Inflorescences* weak axillary racemes, to 15 cm long; peduncle pilose; bracteoles 1–2 mm long, subtending the calyx; bracts 1–2 mm long, narrow; pedicels 1–2 mm long, relatively stout, mostly well spaced. *Flowers* small, inconspicuous, purplish or whitish; calyx sericeous, tubular, the tube ca. 2 mm long, the 5 teeth subulate, subequal, ca. 2 mm long, enclosing most of the corolla; standard obovate. *Legume* linear, straight or slightly curved, somewhat compressed, 4–7 cm long, partitioned between the seeds sericeous to hispid 2–4 mm wide, the beak 2–3 mm long, abruptly upturned; seeds ca. 3 mm long, reddish brown, plump, rectangular, lustrous.

This species may be recognized by its copious pubescence, the leaves being densely sericeous beneath. The flowers are similar to those of *T. labialis* but the foliage of the two species is quite different.

Teramnus uncinatus ranges through the Neotropics, and it is common in recent disturbance. In Panama it occurs mainly in the lowlands.

CANAL ZONE: Barro Colorado Island: *Croat 13151* (MO, SCZ). Near Fort Clayton, *Greenman & Greenman 5184* (MO). La Boca, *Mori & Kallunki 3681* (MO). ½ mi W of Summit Garden, *Nee 9490* (MO). Ancón, *Piper 5162* (NY, US). Empire to Mandinga, *Piper 5772* (US). Ancón Hill, *Standley 26324* (US). Sosa Hill, Balboa, *Standley 26412* (US). Gamboa, *Standley 28338* (MO, US). Old Las

Cruces trail between Fort Clayton and Corozal, *Standley 29074* (US). Summit, *Standley 30119* (US). Darién Station, *Standley 31574* (US). Obispo, *Standley 31767* (US). Balboa, *Standley 32122* (US). CHIRIQUÍ: David-Concepción, *Burt & Koster 139* (MO). Quebrada Guanabano, 0–100 m, *Croat 22508* (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 373* (GH, MO, US). El Almendro, *Lezcano 34* (O, PMA). Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 23* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5240* (FSU, MO, PMA, SCZ). COLÓN: Near Salamanca, 8 mi E of Transisthmian Highway, 100 m, *Gentry 6717* (MO). Sardinilla, *Taylor 40* (PMA), *45, 46* (both MO, PMA). Camino a Palmas Bellas Mata, *Taylor 56, 62* (both PMA). Sardinilla, *Taylor 80* (PMA). DARIÉN: Santa Fé, *Duke 9495* (NY). HERRERA: 4 mi S of Los Pozos, *Tyson 2689* (FSU, MO, SCZ). LOS SANTOS: Las Tablas-Chitré, 0–100 m, *Burt & Rattray 62* (MO). 12 mi S of Macaracas, *Tyson et al. 3066* (MO, SCZ). PANAMÁ: Calzada Larga, *Carrasco 43* (F, MO, PMA). Chilibre, *Dwyer 11975* (MO, US). Juan Díaz, *Lara 41* (F, MO, PMA). Tumba Muerto road, near Panamá, *Standley 29799* (US). Road to Cerro Azul ca. 1 mi from Chepo road, *Wilbur 24104* (DUKE). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 70* (MO).

3. **Teramnus volubilis** Swartz, Nov. Gen. Sp. Pl. 105. 1788. TYPE: Jamaica, *Swartz,* not seen.

Slender twining *vine*; stems retrorsely pilose. *Leaves* pinnately trifoliolate, leaflets narrowly ovate or oblong, mostly 2.5–5 cm long, 0.5–1.5 cm wide, apically obtuse, mucronate, basally rounded, glabrate above, mostly appressed pubescent beneath; petiolules ca. 1 mm long, ascending pilose; stipels acicular, about as long as the petiolules; stipules ca. 2 mm long. *Inflorescences* several flowered axillary racemes, mostly 5–15 cm long; peduncles slender, pilose; bracteoles ca. 2 mm long, inserted on the pedicel just below the calyx; pedicels slender, ca. 2 mm long, minutely retrorsely pubescent. *Flowers* inconspicuous, white or pale violet; calyx tubular, ascending appressed pubescent, the tube ca. 2 mm long, the teeth about as long as the tube, the upper pair connate to near the top, the lower 3 teeth shorter; standard, emarginate, exserted ca. 1.5 mm from the upper calyx teeth. *Fruit* linear, mostly 1.5–3 cm long, ca. 2 mm wide, coiling and turning black on dehiscence; seeds ellipsoidal to subquadrate, dull olive buff, ca. 2 mm long, the hilum broadly elliptical, lateral on 1 edge.

This species is similar to *Teramnus labialis* but differs in leaf shape, longer pedicels and in the upper calyx teeth being fused for all or most of their length. It is possible that the two species intergrade.

Teramnus volubilis ranges throughout the Caribbean area, but appears to be somewhat rare.

CANAL ZONE: Barro Colorado Island, *Croat 13222* (MO). Near Fort Clayton, *Greenman & Greenman 5184* (MO). CHIRIQUÍ: Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 25* (MO). COLÓN: Camino de Gatún despues de la entrada de Fort Gulick, *Taylor 56* (PMA). DARIÉN: El Real, Rio Tuira, *Stern et al. 756* (MO). PANAMÁ: El Llano, *Gentry 2647* (MO). Without other locality, *Klawe P-13* (US).

45. TRIFOLIUM

W. G. D'Arcy[93]

Trifolium L., Sp. Pl. 764, 1753; Gen. Pl., ed. 5. 337. 1754. TYPE: *T. pratense* L.

Annual or perennial *herbs*. *Leaves* mostly trifoliolate, the leaflets minutely toothed at the apex. *Inflorescences* axillary or pseudo terminal, disposed as

[93] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

heads, umbels or as short racemes on ascending peduncles. *Flowers* small; calyx tubular, glabrous or pubescent, the 5 teeth usually bristle tipped, equal or nearly so; keel petals shorter than the wing petals, some or all of the petals connate and adnate to the staminal sheath; stamens diadelphous, some or all of the filaments apically expanded, the anthers alike; ovary small, few-ovulate, the styles short, curved, glabrous, the stigma minute, capitate. *Fruits* small, mostly enclosed in the calyx, mostly indehiscent, thin; seeds few (or 1).

This genus includes some 300 species of temperate and subtropical regions. Many species are important fodder plants. They are also important sources of honey. "Clover." "Trébol."

a. Upper calyx lobes shorter than the others; petioles pubescent; leaflets mostly less than 10 mm long; inflorescence mostly less than 10 mm across; flowering pedicels less than 2 mm long, the peduncle long hairy ---------- *T. dubium*
aa. Upper calyx lobes longer than the others; petioles glabrate; leaflets mostly much more than 10 mm long, inflorescence mostly more than 15 mm across; flowering pedicels more than 3 mm long, the peduncle glabrate ---------- *T. repens*

1. **Trifolium dubium** Sibth., Fl. Oxon. 231. 1794. TYPE: not seen.—FIG. 50.

T. filiforme var. *dubium* (Sibth.) Fiori & Paoletti, Flor. Ital. 4: 140. 1907.

Annual *herbs* to 2 dm; stems lightly pilose. *Leaves* pinnately trifoliolate, the leaflets obovate lanceolate, 5–15 mm long, 3–5 mm wide, apically rounded or retuse and dentate, cuneate basally, the secondary veins prominent, diverging from the midvein at about 30°; petioles usually shorter than the leaflets, pilose to glabrate; stipules usually ovate, 3–5 mm long, fused to the petiole along much of its length. *Inflorescences* numerous, compressed racemose, the peduncles pubescent, 15–20 mm long; bracts minute. *Flowers* subsessile, ca. 3.5 mm long; calyx narrow campanulate, 1–2 mm long, the teeth linear, the lowermost tooth the longest, about equal to the tube in length, with few hairs at the apex; corolla white, standard obovate, ca. 3 mm long, minutely serrulate toward the apex, cuneate at the base, the wing petals subcircular, ca. 3 mm long, the lower margin constricted sharply at the base, the auricle uncinate, ca. 0.7 mm long, the claw ca. 1 mm long, the keel petals oblong, ca. 2.5 mm long, shorter than the wing petals; stamens diadelphous, the filaments united for ½ their length; ovary stipitate for ca. 1.5 mm, oblong rotund, 1–4-ovulate, glabrous, the style slightly curved, ca. 0.5 mm long. *Fruits* small, somewhat compressed, usually 1-seeded.

This species is native to Europe and western Asia and is naturalized in North America. Apparently common in Costa Rica, it also occurs in Panama, the West Indies and sporadically in South America. "Little Hop Clover."

CHIRIQUÍ: Cerro Punta, entrada a finca San Román, 1500–2300 m, *Beliz 224* (MO). Bajo Grando, 1–3 km E of town of Cerro Punta, *Nee 10032* (MO). Río Chiriquí Viejo, *G. White 56* (MO). Roadside woods halfway between Cerro Punta and Bambito, 5600 ft, *Wilbur et al. 10900* (MO).

2. **Trifolium repens** L., Sp. Pl. 767. 1753. TYPE: Europe (LINN 930.16, not seen).

Glabrate perennial *herb,* rooting at the nodes. *Leaves* trifoliolate, the leaflets obcordate, 8–15 mm long, 10–20 mm wide, the venation conspicuous, parallel,

FIGURE 50. *Trifolium dubium* Sibth.—A. Habit (×1 1/5).—B. Stipule (×3 3/5).—C. Flower (×9 3/5).—D. Corolla (×6).—D1. Standard.—D2. Wing petal.—D3. Keel petal.—E. Androecium (×9 3/5).—F. Pistil (×9 3/5). [After *White 56.*]

ascending and produced into conspicuous, small, apical teeth; petiolules short, ca. 1 mm long; petiole elongate, many times longer than the leaflets, glabrate; stipules membranaceous, 10–14 mm long, sheathing the stem, apically caudate. *Inflorescences* axillary, globose heads 15–30 mm across; petiole elongate, to 40 cm long, usually exceeding the peduncles, glabrate; pedicels slender, 3–5 mm

long. *Flowers* fragrant, white (Panama), pink, red or yellow, soon turning brown; calyx glabrous, ca. 10-veined, ca. 5 mm long, the teeth subulate, the uppermost much longer and nearly as long as the tube; corolla exserted 7–8 mm from the calyx tube, the petals more or less smooth (not sulcate), the standard ca. 10 mm long, subentire, the wings with the claw narrowly orbicular, ca. 3.5 mm long, slightly auricled, the keel ca. 7 mm long, slightly shorter than the wings, oblong; stamens diadelphous, the filaments united less than ½ way, mostly expanded just below the anthers; ovary stipitate to about halfway up, glabrous, the style curved in the upper ½. *Fruit* linear, 4-seeded, compressed between the seeds, enclosed in the calyx.

This species is an important fodder plant widely cultivated in Europe. It is also cultivated and naturalized in upland Chiriqui where it may be found along roadsides. "White Clover."

CHIRIQUÍ: Finca Collins near Boquete, *Blum & Dwyer 2533A* (MO). Río Chiriquí Viejo N of Volcan City, 5200–5600 ft, *Duke 9008* (MO). Boquete trail past Cerro Respinga, 200–2500 m, *Gentry 5953* (MO). Bajo Grando, 1–3 km E of town of Cerro Punta, *Nee 10031* (MO). Cerro Punta, *Rojas 15* (MO). Bambito, 5600 ft, *Tyson 5678* (MO).

46. ULEX

W. G. D'Arcy[94]

Ulex L., Sp. Pl. 741. 1753; Gen. Pl., ed. 5. 329. 1754. TYPE: *U. europaeus* L.

Spiny *shrubs,* the spines consisting of sharp pointed shoot axes. *Leaves* mostly alternate, linear, mostly indurate, spine-like (trifoliolate in juveniles). *Inflorescences* solitary in the leaf axils or clustered and paniculate, racemose or umbellate; pedicels surmounted by a pair of bracteoles subtending the flowers. *Flowers* yellow, calyx persistent, 2-lipped to near the base, the upper lip 2-denticulate, the lower lip 3-denticulate; corolla yellow, persistent; stamens monadelphous, the anthers oblong to linear (in the same flower); style slightly curved. *Legume* broad or narrow, pubescent, dehiscent, about as long as the calyx; seeds 1–6.

Literature:

Rothmaler, W. 1941. Revision der Genisteen. 1. Monographien der Gattungen um *Ulex*. Bot. Jahrb. Syst. 72: 69–116.

1. **Ulex europaeus** L., Sp. Pl. 741. 1753. TYPE: Europe, herb. Linnaeus (LINN 915.1, not seen; microfiche MO).—FIG. 51.

Densely branched *shrub* to 2 m tall, eventually becoming a *tree* to 7 m tall, with a well defined, bare trunk; twigs conspicuously sulcate, long pilose, the leaves and flowers borne on short shoots (phyllodes) to 5–10 cm long, each ending in a sturdy, sharp, spine, the tip sclerified. *Leaves* (adult), linear, mostly 5–10 mm long, stiff and sharp pointed, ciliate and sparingly pubescent with short bent hairs, becoming glabrous upwards; stipules wanting. *Inflorescences* epeduncu-

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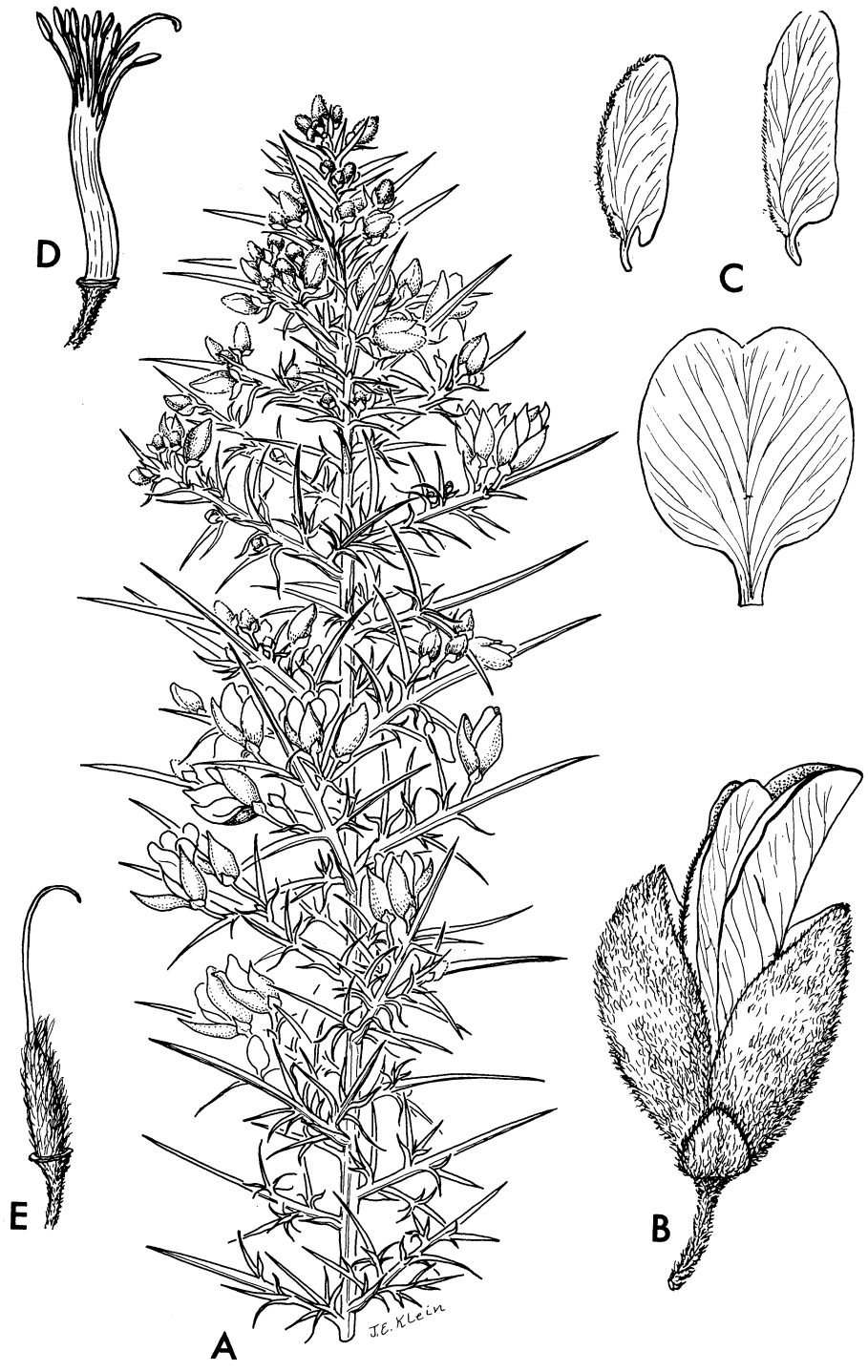

FIGURE 51. *Ulex europaeus* L.—A. Habit (×⅔).—B. Flower (×2⅔).—C. Corolla (×2).—D. Androecium (×2⅔).—E. Pistil (×2⅔). [After *White 5.*]

late, solitary flowers in the leaf axils, clustered to form a racemose panicle; pedicels 6–8 mm long, tomentose, subtended by a minute tomentose basal bract, surmounted by a pair of tomentose, deltoid or ovate bracteoles, 2–3 mm wide and 3 mm long. *Flowers* showy yellow, the calyx yellow, ca. 12 mm long, 2-lobed to the base, cucullate, the lobes minutely denticulate, spreading pilose overall; corolla yellow, ca. 15 mm long, not much exceeding the calyx, the standard 15 mm long, 11 mm wide, retuse, the wings 15 mm long, basally ciliate, oblique with the costa abaxially pubescent, the keel 11 mm long, oblique, uncinate; stamens monadelphous, the filaments fused to a high level, the anthers oblong to linear (within the same flower) 1–2 mm long; style glabrous, somewhat curved near the apex, the stigma a median crest. *Legume* 12–20 mm long, villous; seeds 3–4, brownish, somewhat trigonous.

This species is native to western Europe where it is planted for fodder and hedges. In Panama it was collected only once, in flower in March 1938. The species is naturalized in upland Costa Rica and many other countries. "Furze," "Gorse" (English), "Tojo," "Hiniesta espinosa" (Spanish).

CHIRIQUÍ: Cerro Pando, near upper Río Chiriquí Viejo, *White 5* (MO).

47. VIGNA

James A. Lackey[95] & W. G. D'Arcy[96]

Vigna Savi, Nuovo Giorn. Lett. 8: 113. 1824. Based on *Dolichos luteolus* Jacq. = *Vigna luteola* (Jacq.) Benth.

Vines or *herbs,* rarely shrubby, mostly with sturdy rootstocks, lacking uncinate hairs. *Leaves* pinnate or subdigitate trifoliolate, rarely 1-foliate, mostly entire; stipels, nervate, mostly blunt; glabrate stipules sometimes produced below the insertion, sometimes bilobate. *Inflorescences* axillary or terminal, pseudoracemes or subcapitate, the rachis contracted, the nodes glandular; bracts and bracteoles caducous; pedicels 1–2 per node, mostly shorter than the calyx. *Flowers* yellowish or white, sometimes with some purple or violet; calyx 2 lipped, the upper lip emarginate, the lowest tooth of the lower lip longest; standard orbicular, auriculate, sometimes appendaged on the dorsal face, the wings about equalling the standard and keel, the keel apically curved up to 1 spiral, often oblique; vexillary stamen free, the anthers uniform; style apically thickened and barbate on the inner face, caducous, sometimes with a curved beak. *Legume* linear to oblong, turgid or compressed, straight or curved, not septate; seeds reniform or quadrate, the hilum short or long, a well developed aril sometimes present.

Vigna embraces about 150 species of tropical regions of both hemispheres. In Panama most species have flowers at least partly yellow, but in other countries some species have violet or purple flowers. A number of species of *Vigna* are important food plants for man, e.g. *V. unguiculata,* and species are sometimes cultivated for cattle fodder.

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Vigna radiata (L.) R. Wilczek was reported (as *V. aureus* Roxb.) by Standley (1928), but no specimens have been seen of this species from Panama. The species is commonly used in Panamanian restaurants for bean sprouts (English) or frijoles nacidos (Spanish), but inquiries amongst Chinese merchants indicate that all such beans are imported and none are grown in Panama. It is likely however, that the species has been cultivated or has grown to maturity from refuse from time to time. *Vigna radiata* is an erect herb which has distinctive, large, 5–15 mm long stipules.

a. Style coiled 3–5 revolutions.
  b. Leaflets linear to narrowly lanceolate ---- 5. *V. linearis*
  bb. Leaflets broadly lanceolate to ovate.
    c. Seeds 8–15; pedicels of mature flowers and fruits 2–6 mm long; calyx teeth lanceolate ---- 1. *V. adenantha*
    cc. Seeds 17 or more; pedicels of mature flowers and fruits 6–13 mm long; calyx teeth broad ---- 2. *V. caracalla*
aa. Style erect or sigmoid.
  d. Inflorescences pseudoracemose.
    e. Leaflets lobed ---- 4. *V. lasiocarpa*
    ee. Leaflets not lobed.
      f. Seeds 7–8; stipules with small lobes below the point of attachment; bracteoles about twice the calyx length ---- 3. *V. juruana*
      ff. Seeds 9–13; stipules not produced below the point of attachment; bracteoles about half the calyx length ---- 8. *V. peduncularis*
  dd. Inflorescence subumbellate.
    g. Seeds 6–9; flowers 10–19 mm long.
      h. Upper calyx lobe partially united ---- 6. *V. longifolia*
      hh. Upper calyx lobe completely united.
        i. Leaflets obovate, apically blunt rounded, or emarginate fleshy ---- 9. *V. retusa*
        ii. Leaflets ovate, apically pointed, not fleshy ---- 7. *V. luteola*
    gg. Seeds 12–20 or more; flowers (15) 20–27 mm long.
      j. Plants with long spreading hairs; pods ca. 4 mm wide ---- 11. *V. vexillata*
      jj. Plants glabrate; pods ca. 8 mm wide ---- 10. *V. unguiculata*

1. **Vigna adenantha** (G. F. Meyer) Maréchal et al., Taxon 27: 202. 1978.

Phaseolus adenanthus G. F. Meyer, Prim. Fl. Esseq. 239. 1818. TYPE: Cultivated, Hamburg [from Guyana], *Meyer* (?GOET, not seen).

Twining *vine,* perennial; stems often stout, glabrous or hirsute with tawny mostly reflexed hairs. *Leaves* pinnate trifoliolate; leaflets slightly thick, ovate, apically acute, basally obtuse or rounded, the major veins prominent, mostly 6–9 cm long, 4–7 cm wide, glabrate or inconspicuously pilose, mostly inconspicuously ciliolate on margins and major veins beneath, sometimes barbulate at the base; petiolules 1–4 mm long, tomentose; petioles often exceeding the terminal leaflet, sparingly pubescent, drying angled, the rachis 2–4 cm long; stipels ovate, glabrous, thin, ca. 1 mm long; stipules 3–5 mm long, acute, striate, glabrate. *Inflorescences* 15–35 cm long, erect, mostly longer than the leaves, the nodes enlarged, mostly clustered at the apex but a few sterile nodes sometimes distributed lower down; peduncle basally stout, narrowing upwards, glabrate; bracteoles ovate, nervate, mostly ca. 4 mm long, but sometimes exceeding the calyx; bracts ovate acuminate; pedicels shorter than the calyx. *Flowers* purplish or pink; calyx open campanulate, ca. 4 mm long, the upper teeth fused into an emarginate lip, the lower teeth about as long as the tube, narrow, standard suborbicular, 1.5–2.5

cm long, the keel forming 3 spirals. *Legume* linear, sometimes curved, 7–12 cm long, 8–10 mm wide, glabrate or pubescent, turgid, beaked; seeds ovoid, 3–5 mm long, brown.

For a lengthy list of synonyms see Maréchal et al. 1978. Only this name has been used for Panamanian plants.

BOCAS DEL TORO: Changuinola to 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 931* (MO). Chiriquí Lagoon, *Wedel 1068, 1242* (both MO, US). Water Valley, *Wedel 1515* (MO, US), *2751* (GH, MO, US). CANAL ZONE: Chagres, *Fendler 71* (MO). Ancón Hill, *Greenman & Greenman 5085* (MO). Near Bohio, 10–20 m, *Maxon 4771* (US). Frijoles, *Pittier 2691* (US). Grounds of Fort San Lorenzo, *Porter et al. 5000* (MO). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29215* (US). Summit, *Standley 30116* (US). Curundú, *Tyson & Lazor 7147* (PMA). CHIRIQUÍ: Las Lajas, *Burt & Koster 163* (MO). Near Río Fonseca, *Burt & Koster 169* (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 509* (F, MO). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 540* (MO). Panamerican Highway at Río Chico bridge ½ mi S of Natá, *Nee 10774* (MO). Penonomé, 50–1000 ft, *Williams 393* (US). DARIÉN: Puerto Indio (Sambú), *Hammel 1104* (MO). Sambú River, *Pittier 5532* (US). HERRERA: Near Cupampa, 0–100 m, *Burt & Koster 85A* (MO). Ocú, *Stern et al. 1748* (MO). Las Minas, *Stern et al. 1799* (MO). LOS SANTOS: 5 mi S of Pocrí, *D'Arcy & Croat 4208B* (MO). PANAMÁ: Panamá Viejo, 5–10 m, *Dodge* 18 Jan. 1935 (MO); *Dwyer 2178* (MO). Vera Cruz, *Lewis et al. 2992* (DUKE, MO). Savanas, *Macbride 2661* (US). Tumba Muerto Road near Panamá, *Standley 29801* (US). Juan Díaz, *Standley 30499* (US). Between Matías Hernández and Juan Díaz, *Standley 31968* (US). La Capitana, *Taylor 25* (PMA). 2 km entrada camino Cerro Azul, Galera Barleta, *Taylor 95* (PMA).

2. **Vigna caracalla** (L.) Verdc.,[97] Kew Bull. 24: 552. 1970.

Phaseolus caracalla L., Sp. Pl. 725. 1753. TYPE: ?India, not located.

Twining *vine,* sometimes somewhat woody below; stems sparsely appressed pubescent, glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate, mostly 8–15 cm long, 4–9 cm wide, apically short acuminate, basally obtuse, truncate or rounded, glabrate; petiolules stout, 3–6 mm long, tomentose; petioles stout, drying angled, about as long as the terminal leaflet; stipels ovate, glabrous, striate, 2–4 mm long; stipules deltoid, striate, ciliate. *Inflorescences* 5–30 cm long, the enlarged nodes, distributed along the upper portion of the peduncle; bracteoles ovate, striate, 2–2.5 mm long; bracts ovate, striate, caducous; pedicels slender, expanded below, to 9 mm long, glabrous. *Flowers* pale lavender or purple, sometimes partly white; calyx broadly campanulate, basally cupular, to 13 mm long, the lobes short, rounded; standard to 5 mm long, curled back, the keel in 4 spirals. *Legume* linear oblong, falcate, compressed, slightly turgid around the seeds, 8–15 cm long, ca. 1 cm wide, maturing buff colored, minutely pilose; seeds compressed globose, ca. 8 mm across, black, the hilum white, conspicuous.

BOCAS DEL TORO: Water Valley, *Wedel 1473* (MO). CANAL ZONE: Near Salamanca Hydrographic Station on gorge of Río Pequení, *Dodge et al. 17066* (MO).

3. **Vigna juruana** (Harms) Verdc., Kew Bull. 24: 540. 1970.

Phaseolus campestris sensu Benth. in Mart., Fl. Bras. 15(1): 189. 1859, non Benth. 1837 (=*Macroptilium longepedunculatum* (Benth.) Urban).

Phaseolus juruanus Harms, Notizbl. Königl. Bot. Gart. Berlin 7: 506. 1921. TYPE: Brazil, *Ule 5533* (B, holotype, if extant; isotype K, not seen).

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[97] For a list of synonyms see Piper, 1926. Only these names have been used for Panamanian plants.

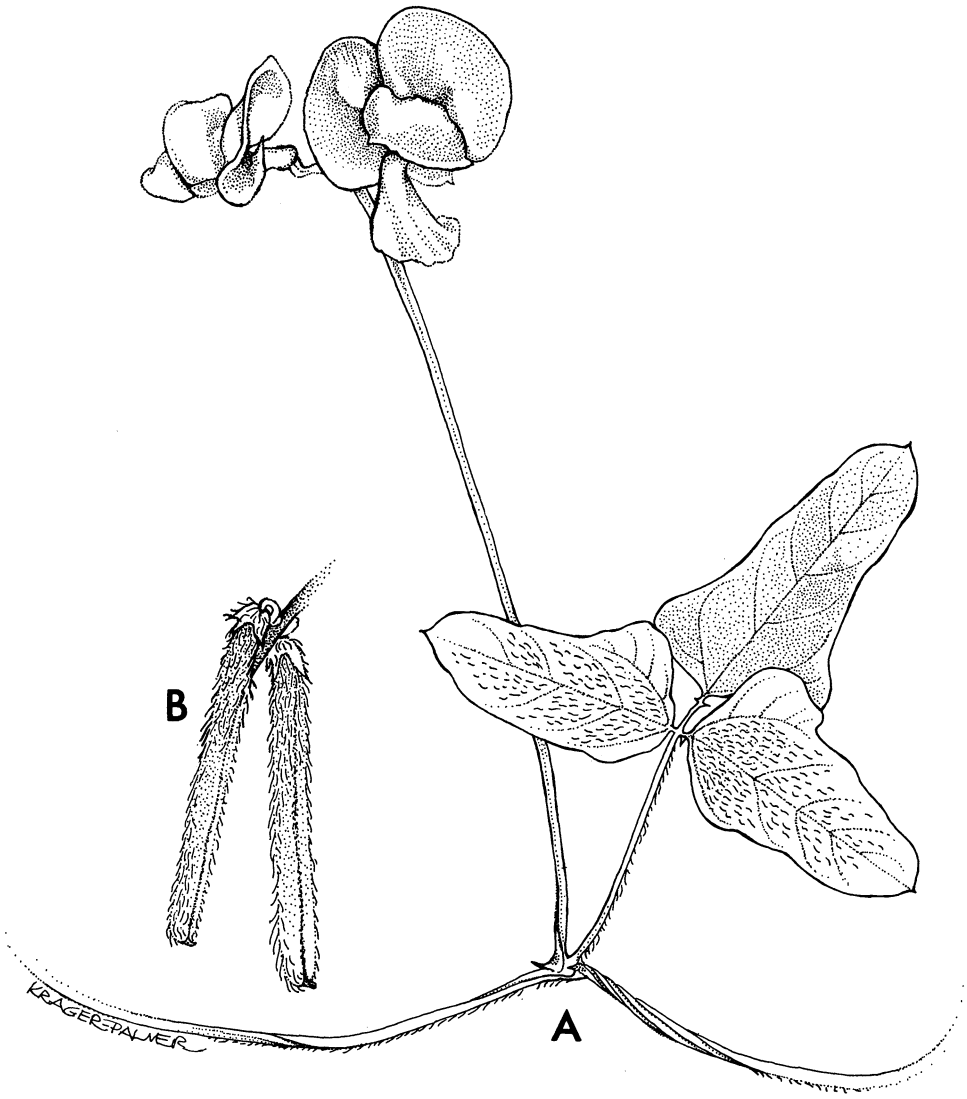

FIGURE 52. *Vigna lasiocarpa* (Benth.) Verdc.—A. Habit (×⅔). [After *Allen 1059.*]—B. Fruit (×⅔). [After *Dwyer 3558.*]

Slender *vine,* stems with long, sparse sturdy tawny hairs. *Leaves* pinnate trifoliolate, the leaflets ovate, mostly 4–10 cm long, 3–6 cm wide, apically acuminate, basally rounded or obtuse, thin, drying concolorous, with inconspicuous, scattered hairs on both sides, petiolules 3–4 mm long, drying angled, hispidulous; petioles often exceeding the terminal leaflets; stipels ovate, 1–2 mm long, glabrous, glandular; stipules linear lanceolate, 3–5 mm long, ciliate. *Inflorescences* 5–20 cm long, axillary; peduncle terete, retrorsely hispidulous pilose with tawny hairs, the rachis tomentose with whitish, somewhat curly hairs, ca. 2 mm long, the nodes prominent; bracteoles and bracts linear ascending pilose, ca. 4 mm

long, deciduous; pedicels ca. 1 mm long, ca. 2 per node. *Flowers* yellow, the calyx cupular, 2–3 mm long, the 5 teeth obtuse deltoid, sparingly ascending pubescent; standard orbicular ca. 1 cm long, the keel spiralled. *Legume* linear, turgid, 3–4 cm long, 4–6 mm across maturing black, ascending pilose with tawny hairs; seeds subglobose, shiny, 3–4 mm long.

This species is wide ranging and is reportedly common in South America and Africa. It is known in Panama by only one collection taken in Central Panama about halfway across the Canal.

Vigna juruana is similar to *V. longifolia,* but it differs in having smaller flowers and fruits, in being much less pubescent, especially on the stems, and in having ovate instead of narrow leaflets.

CANAL ZONE: Gamboa, *Tyson 4584* (FSU, SCZ).

4. **Vigna lasiocarpa** (Benth.) Verdc., Kew Bull. 24: 539. 1970.—FIG. 52.

Phaseolus pilosus H.B.K., Nov. Gen. Sp. Pl. 6: 453: 1823. TYPE: not *Vigna pilosa* Baker (1874).
P. hirsutus Benth., Comm. Legum. Gen. 76. 1837. SYNTYPES: Brazil, *Martius, Poeppig,* neither seen. not *Vigna hirsuta* Feay (1872).
P. lasiocarpus Benth., Comm. Legum. Gen. 76. 1837. SYNTYPES: Brazil, *Sieber, Martius,* neither seen.

Sturdy herbaceous *vine*; stems tomentose with yellowish spreading hairs. *Leaves* ovate, often shallowly trilobate, apically obtuse or rounded, mucronate, basally obtuse or rounded, mostly densely whitish tomentulose, more so beneath; petiolules tomentose; petiole and rachis pilose, the rachis short; petiole mostly shorter than the leaflets; stipels 1–2 mm long, elliptical or spatulate, ciliate but otherwise glabrate; stipules subulate, 4–6 mm long. *Inflorescences* few flowered congested pseudoracemes; peduncles mostly 12–30 cm long, slender, tomentulose; bracteoles 2, 6–8 mm long, subtending the calyx, subulate, caducous; bracts deltoid, ca. 2 mm long; pedicels stout, densely sericeous, 4–5 cm long. *Flowers* yellow, the calyx sericeous, campanulate, 6–9 mm long, the teeth slightly shorter than the tube; standard deeply emarginate, 1.5–3 cm long, the keel spiralled. *Legume* linear, 5–8 cm long, 5–8 mm wide, maturing black, pilose with subappressed tawny hairs, scarcely compressed between the seeds; seeds nearly black, shiny, 3–4 mm long, compressed subglobose, the hilum elevated and surrounded by an aril.

CHIRIQUÍ: Las Lajas near beach, *Burt & Koster 162* (MO). Río Fonseca, *Koster 113* (MO). David airport, 25 ft, *Lewis et al. 769* (MO). COCLÉ: Between Aguadulce and Antón, 15–50 m, *Woodson et al. 1217* (GH, MO). DARIÉN: Isla Pedro Gonzales, *Dŭke 10400* (MO). LOS SANTOS: Las Tablas-Pedasí, 0–100 m, *Burt & Rattray 59* (MO). Between Tonosí and Macaracas, *Oliver et al. 3538* (MO). PANAMÁ: Wet ditch in sugar plantation just NE of Tocumen, *D'Arcy 13431* (K, MO, SCZ). Tocumen Airport, *Dwyer 2882* (MO). Swamp between Río Jagua and El Condor Hill, *Hunter & Allen 470* (GH, MO). El Capitano 4 mi E of Chepo, *Tyson 5352* (MO, FSU, DUKE). VERAGUAS: Hills W of Soná, *Allen 1059* (MO, US).

5. **Vigna linearis** (H.B.K.) Maréchal et al., Taxon 27: 202. 1978.

Phaseolus linearis H.B.K., Nov. Gen. Sp. Pl. 6: 443. 1823. TYPE:
P. elongata Rose, Contr. U.S. Natl. Herb. 8: 311. 1905. SYNTYPES: Mexico, *Nelson 2692, 2848* (?US, neither seen).

Ascending or scandent perennial *herb* or *vine*; stems wiry, retrorsely tawny strigose, glabrescent, often reclining; roots fleshy. *Leaves* pinnate trifoliolate; leaflets linear oblong, mostly 3–5 cm long, 4–7 mm wide, but sometimes wider and slightly 3-lobate, apically obtuse, rounded or minutely retuse, basally truncate, coriaceous, minutely ciliolate on the margins and the lower costa, sometimes with a few coarse hairs at the very base, otherwise glabrous, the costa prominent, elevated beneath, the minor venation prominent arising at right angles to the costa, the major lateral veins anastomosing to form a crenate submarginal vein; petiolules ca. 1 mm long, tawny strigose; petioles slender, glabrate, the rachis short, to 5 mm long; stipels ovate, striate, glabrate, 1–2 mm long; stipules ovate lanceolate, striate, tawny ciliate, ca. 4 mm long. *Inflorescences* few flowered; peduncle slender, 10–15 cm long, glabrate or pubescent with short, appressed tawny hairs; nodes enlarged, mostly near the apex; bracteoles linear lanceolate, glabrate, striate, slightly shorter than the calyx; bracts ovate, striate, glabrous, about as long as the bracteoles; pedicels ca. 2 mm long. *Flowers* red purple; calyx open campanulate, the tube 3–4 mm long, glabrate, the upper teeth deltoid, short, the lower 3 teeth linear, longer than the tube, pubescent; standard 2.5 cm long, the keel forming a spiral (Standley & Steyermark). *Legume* linear, flat, 6–9 cm long, 5 mm wide, glabrous.

This species is quite similar to *Macroptilium gracile* but differs in the lower calyx teeth being narrow, puberulent and longer than the tube, and in having wider and mucronulate rather than pointed leaves.

Vigna linearis ranges from Mexico through Central America and South America to Paraguay. It grows mainly in open rocky or savannah areas. In Panama it has been collected only in savannah area of pronounced dry season.

COCLÉ: Penonomé, 50–1000 ft, *Williams 603* (NY). PANAMÁ: Cerro Campana, 2000 ft, *Clewell 3021* (SCZ). Burned over area SW of Chepo, *D'Arcy 5185* (MO, SCZ). Taboga Island, *Miller 2040* (US). Between Matías Hernández and Juan Díaz, *Standley 32065* (US).

6. **Vigna longifolia** (Benth.) Verdc., Kew Bull. 24: 541. 1970.

Phaseolus longifolius Benth., Comm. Legum. Gen. 75. 1837. TYPE: Brazil, *Schott*, not seen.
P. ovatus Benth., Comm. Legum. Gen. 75. 1837. SYNTYPES: Brazil, *Martius, Schott*, neither seen.
P. schottii Benth., Comm. Legum. Gen. 75. 1837. TYPE: Brazil, *Schott*, not seen.
P. trichocarpus C. Wright, Anales Acad. Ci. Méd. Habana 5: 337. 1868. TYPE: Cuba, *Wright 2341* (MO, isotype).

Slender twining *vine*; stems pilose with long weak yellowish hairs, drying grooved. *Leaves* pinnate trifoliolate; leaflets narrowly ovate to oblong lanceolate, mostly 5–8 cm long, 1–3 cm wide, apically acute or slightly and gradually acuminate, mucronate, basally rounded, glabrate but mostly ciliolate on the margins and costa; petiolules ca. 2 mm long, densely pilose; petioles shorter than the leaves, drying angled, pilose as the stems; stipels ovate, glabrous, ca. 2 mm long; stipules acute, ca. 6 mm long, produced ca. 3 mm below the point of insertion, ciliate. *Inflorescences* contracted pseudoracemes on elongate, erect axillary peduncles, peduncles 3–20 cm long, sparingly long pilose, drying angled; bracteoles and bracts subulate, caducous; pedicels shorter than the calyx in flower, somewhat longer in fruit. *Flowers* yellow; calyx campanulate, sparingly pilose with white hairs, 3–4 mm long, the lobes rounded; standard deeply emarginate, the

keel apically recurved and bent to one side. *Pod* oblong, compressed, 3–4 cm long, 7–8 mm wide, maturing black with shaggy tawny hairs, non septate; seeds compressed globose, 3–4 mm long, shiny black with a white hilum.

CANAL ZONE: BARRO COLORADO ISLAND: *Aviles 56* (MO); *Bailey & Bailey 299* (F); *Bangham 506* (A, F); *Croat 5717, 8250* (both MO), *13238* (MO, NY); *Foster 1219* (DUKE); *Shattuck 245* (GH, MO), *909* (MO); *Starry 257* (MO): *Wetmore & Abbe 190* (GH, MO); *Woodworth & Vestal 473* (GH), *535* (F, GH), *564* (F, GH). Juan Mina, *Bartlett & Lasser 16497* (MO). Gatún Lake, *Duke 8308* (NY). Frijoles, *Ebinger 975* (MO). Gamboa, *Tyson et al. 4583* (MO, SCZ). CHIRIQUÍ: David airport, 25 ft, *Lewis et al. 771* (MO). DARIÉN: Río Pirre, *Duke & Bristan 8308* (MO). PANAMÁ: Road to Areriosa from Espina, *Folsom 3452* (MO). Arenoso, lower Río Trinidad, *Seibert 632* (F, MO, NY).

7. **Vigna luteola** (Jacq.) Benth.[98]—FIG. 53.

Dolichos repens L., Syst. Nat., ed. 10. 1163. 1759. Based on *Dolichos maritimus minor,* P. Br.
Dolichos 5. *Maritimus, minor* P. Br., Civ. Nat. Hist. Jam. 1756.
Phaseolus marinus Burm. in Rumph., Index Alt. Herb. Amboin. 18. 1769. [not seen]. Based on Rumph. Index Alt. Herb. Amboin. 5: 391, *tab. 141, fig. 2,* 1750.
Dolichos luteolus Jacq., Hort. Bot. Vindob. 1: 39, *tab. 90.* 1770 [1771]. TYPE: Amer. Trop., *Jacquin,* Herb. Linnaeus (LINN 900.4, not seen; microfiche MO).
D. luteus Swartz, Prodr. Veg. Ind. Occ. 105. 1788. TYPE: Jamaica, *Swartz,* not seen. (fide Maréchal et al. 1978; Backer, Fl. Java 1: 642. 1963.)
(*Vigna glabra* Savi, Bull. Sci. Nat. Géol. 6: 62. 1825. Renaming of *Dolichos luteolus* Jacq.). 293, no. 5.
Phaseolus maritimus Hassk., N. Schlüss. Rumph., Index Alt. Herb. Amboin. 278. 1864.
Vigna repens (L.) Kuntze, Rev. Gen. Pl. 212. 1891, non Baker 1876.
Phaseolus luteolus (Jacq.) Gegnep, in Lecomte, Fl. Gen. Ind. 2: 229. 1916.
Vigna marina (Burm.) Merrill, Interpret. Rumph., Index Alt. Herb. Amboin. 285. 1917.

Large scrambling and twining *vine*; stems tough, glabrous or hirsute, drying sulcate. *Leaves* pinnate trifoliolate; leaflets ovate, apically acute or obtuse, mucronate; basally obtuse, mostly 3–6 cm long, 1–3 cm wide, the costa and proximal portion of the 2 basal lateral veins prominent, other venation inconspicuous, glabrous or somewhat pilose, drying concolorous; petiolules 1–2 mm long, glabrate; petioles slender, drying angled, glabrate, or somewhat pubescent above, shorter than the terminal leaflet; stipels ovate, ca. 1 mm long, glabrous, not striate. *Inflorescences* to 20 cm long, peduncle narrowing upwards, glabrate; bracteoles and bracts ovate, ca. 1 mm long, membranaceous and costate, ciliolate to erose; pedicels to 5 mm long, pubescent upwards, condensed at the apex of the peduncle. *Flowers* yellow; campanulate, the tube 3–6 mm long, glabrous, the teeth ciliate, shorter than the tube, the upper pair united, the others acuminate, the lowermost tooth narrow, slightly longer, glandular; standard 1.5 cm long, emarginate, the keel apically expanded and bent. *Legume* linear, 4–7 cm long, 5–8 mm wide, turgid, pubescent, maturing black; seeds ovoid, dark, 5–6 mm long, the hilum invaginated, white.

This species is distinct in its small ovate leaflets and in its minute, costate bracts and bracteoles, and in Panama in being glabrate overall.

Vigna luteola is the name traditionally used for this species, and *V. repens* is the only other name which has been used for the species in the New World in recent times. However, it is likely that the plant should be correctly called *Vigna*

[98] For further synonyms see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

FIGURE 53. *Vigna luteola* (Jacq.) Benth.—A. Habit (×½). [After *Wedel 2718.*]—B. Flower (×1½).—C. Stamens (×2).—D. Pistil (×2). [After *Duke 4340.*]—E. Fruit (×½). [After *Johnston 757.*]

marina (Burm.) Merrill which is based on *Phaseolus marinus* Burman. The figure on which this name is based appears to represent the species discussed here, and as the name was published a year earlier than the Jacquin name employed here, it would appear to be a later synonym of Jacquin's name. Adams, Flr. Pl. Jamaica 1972, recognizes only *V. luteola,* and makes no mention of *Dolichos luteus* which

is based on a Jamaican plant. However, Maréchal et al. and others have interpreted the Burman plate to represent the species treated here as *Vigna retusa* (E. Mey.) Walp., so until a consensus is formed on this point, we are using the traditional, if incorrect, name *V. luteola*.

BOCAS DEL TORO: Santa Catalina, *Blackwell 2701* (MO), *2716* (MO). Runway at Bocas, *Lazor et al. 2372* (MO, SCZ, FSU). Lower Changuinola River, *Stork 137* (US). Chiriquí Lagoon, *Wedel 1170* (GH, MO), *1371* (GH, MO, US). Water Valley, *Wedel 1740* (GH, MO, US). Old Bank Island, *Wedel 1873* (GH, MO, NY, US), *2008* (GH, MO, US). Sheperd Island, *Wedel 2718* (GH, MO). Isla Colón, *Wedel 2831* (GH, NY, US). CANAL ZONE: Just E of Gatún locks, *Duke 4339* (MO). Toro Point, Fort Sherman, *Duke 4340* (MO). Chagres, *Fendler 68* (GH, MO). Cristobal, *Greenman & Greenman 5214* (MO). Fort Sherman, *Standley 31178* (US); *Tyson 2254* (MO, FSU, SCZ), *3522* (MO, SCZ, FSU). Gamboa, *Tyson et al. 4584* (MO). CHIRIQUÍ: Boquete, 1200–1500 m, *Woodson & Schery 736* (GH, MO, US). COLÓN: Río Piedras, road to Portobelo, *Blum et al. 2527* (FSU, MO, SCZ). Miguel de la Borda, *Croat 9838* (MO). María Chiquita, *Croat 11370* (MO); *Dwyer & Kirkbride 7813* (GH, MO, US); *Ebinger 454* (MO, GH). Mouth of Río Piedras, *Lewis et al. 3168* (MO, DUKE). Colón, *Macbride & Featherstone 7* (F, GH, US). Porvenir, *Montgomery 205* (MO). Colón, *Rose 22069* (GH, US). PANAMÁ: Without other locality, *Hayes* (GH). Manzanillo Island, *Hayes 700* (NY). San Jose Island, *Johnston 757* (MO). SAN BLAS: Narganá, *Croat 16852* (MO). Puerto Obaldía, *Croat 16871* (MO). Shoreline opposite Ailigandí, *D'Arcy & Hammel 12211* (MO). Isla Mosquito, *Duke 8855* (MO, US). Soskatupu, *Elias 1694* (MO). Isla Pino near Mulatupo, *Elias 1712* (MO).

8. **Vigna peduncularis** (H.B.K.) Fawc. & Rendle,[98] Fl. Jamaica 4: 68. 1930.

Phaseolus peduncularis H.B.K., Nov. Gen. Sp. Pl. 6: 447. 1823. TYPE: Colombia, not seen.
P. pascuorum Benth., Ann. Wiener Mus. Naturgesch. 2: 137. 1838. TYPE: Brazil, *Martius*, not seen.

Slender twining *vine*, stems glabrate, drying angled or furrowed. *Leaves* pinnate trifoliolate; leaflets rhombic or deltoid, often broad, mostly 5–7 cm long, 3–6 cm wide, apically acute or slightly acuminate, mucronulate, basally obtuse or rounded, the lateral leaflets oblique, the terminal leaflet slightly larger, membranaceous, glabrate or sparingly pilose, often ciliolate and with a small tuft at the base; petiolules 2–5 mm long, pilose dorsally; petiole often longer than the terminal leaflet; stipels ca. 2 mm long, spatulate, striate; stipules 4–6 mm long, striate, ellipsoidal. *Inflorescences* elongate axillary pseudoracemes, 20–40 cm long, the flowers evenly disposed near the top of the peduncle; peduncle erect, glabrate, drying striate; rachis puberulent with curled hairs; bracteoles elliptical, ca. 2 mm long, ciliate, otherwise glabrous, caducous; pedicels ca. 2 mm long, glabrate but glaucous with reduced trichomes, angled. *Flowers* lavender and white; calyx open campanulate, ca. 4 mm long, curly pubescent, the lobes rounded; standard suborbicular, ca. 1.5 cm long, the keel basally ciliolate; stem with ascending apical hairs. *Legume* 4–5 cm long, linear, compressed, slightly compressed between the seeds, ca. 3 mm wide, dark brown, glabrous or pilose with short appressed white or brown hairs; seeds mottled brown, shiny, oblong, 3–4 mm long.

BOCAS DEL TORO: RR station at Milla 7.5, *Croat & Porter 16387* (MO). Changuinola Valley, *Dunlap 48* (F). Isla Potrero, Changuinola Valley, *Dunlap 346* (F, US). Changuinola, *Dwyer 4466* (MO). Hillside above Almirante, *Gentry 2715* (MO). Western Panama, *Stork 48* (US). Water Valley, *Wedel 589, 756* (both MO). Sheperd Island, *Wedel 2673, 2178* (both MO). Isla Colón, *Wedel 2928* (MO). CANAL ZONE: BARRO COLORADO ISLAND: *Busey & Croat 249* (MO); *Croat 5256* (F, MO, SCZ), *6401, 6671* (both MO), *6794, 7032* (both MO, SCZ), *7727, 9102, 10262* (all MO), *10398* (NY), *11844* (MO, SCZ), *13124, 17036* (both MO); *Kenoyer 382* (US); *Netting* 3/24/34 (MO); *Shattuck 74* (MO, US); *Standley 40857* (US). Fort Sherman, *Blum & Dwyer 2114* (MO, SCZ). Gatún, *Cowell 320* (NY).

NW of Escobal, *Croat 12474* (F, MO, SCZ). Río Indio, 70–100 m, *Dodge & Allen 17369* (MO). Madden Dam, *Dwyer 3046* (MO). Chagres, *Fendler 69* (MO). Between Transisthmian Highway and Madden Dam, *Gentry 6689* (F, MO). Peña Blanca in Gatun Lake, *Hladik 108* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 717* (MO). Summit, *Johansen* May 1924 (US). Boy Scout Road ½ km SW of Madden Dam, 90 m, *Nee & Dwyer 9227* (MO). Old Fort San Lorenzo, *Piper 5961* (US). Las Sabanas, *Pittier 6866* (US). Boy Scout Road, Madden Dam area, *Porter et al. 4008* (MO). Corozal, *Standley 27349* (US). Gamboa, *Standley 28368* (US). Mount Hope Cemetery, *Standley 28851* (US). Near Summit, *Standley 29517* (US). Summit, *Standley 29529* (US). Between France Field and Catival, *Standley 30210, 30335* (both US). Summit, *Tyson et al. 2744* (MO, SCZ). COCLÉ: Forest around Limón, 5 hours walk N of Alto Calvario, N of El Copé, 800–1000 m, *Folsom 5811* (MO). Panamerican Highway 178 km W of Panama City, 0–100 m, *Folsom 6888* (MO). COLÓN: Miguel de la Borda, *Croat 9838* (MO). Road to Mosquera from Palmas Bellas, *Mori & Kallunki 1956* (MO). Santa Rita hills, *Smith & Smith 3429* (US). DARIÉN: Río Indio, 70–100 m, *Dodge & Allen 17369* (MO). 1–3 mi SE of Santa Fé on Panamerican Highway, *Duke 4122* (MO). Road from El Real to Pinogana, *Duke 5143* (MO). Ridge ca. 2 mi NW of Yaviza, *Duke 6531* (MO). Agua Fria, 8 mi N of Santa Fé, *Duke 10107* (MO). Near Refugio, 30 m, *Duke 10290* (NY). Above Ailigandí, *Duke & Bristan* 341 (MO, NY). Pablo Othon's pasture [El Real], *Duke & Bristan 289* (MO, NY). Manene, *Kirkbride & Bristan 1606* (MO). Juan Díaz, *Standley 30603* (US). El Real, *Stern et al. 797* (MO). PANAMÁ: Cerro Penon 3 km S of Alcalde Díaz, 350–440 m, *Nee 8881* (MO). Near Matías Hernández, *Standley 28874, 28972* (both US). SAN BLAS: Puerto Obaldía, *Croat 17005* (MO, SCZ). 3–4 hours up Río Mulatupo on foot, *Kirkbride 223* (MO). VERAGUAS: Above Santa Fé, slopes of Cerro Tute, *Gentry 6208* (MO).

9. **Vigna retusa** (Meyer) Walp., Repert. Bot. Syst. 1: 778. 1842.

Scytalis retusa E. Meyer, Comm. Pl. Afr. Austr. 147. 1836. TYPE: South Africa, ?herb. Meyer (?B, if extant, not seen).

Vigna marina (Burm.) Merrill, Interpret. Rumph. Index Alt. Herb. Amboin. 285. 1917. Based on *Phaseolus marinus* Rumphius, Index Alt. Herb. Amboin. 5: 391, *tab. 141, fig. 2*. 1750. TYPE: Molucca Is., not seen.

Twining or scrambling perennial *herb* or *vine*; stems pubescent or glabrate, soon glabrescent, drying terete but minutely striate. *Leaves* pinnate trifoliolate; leaflets obovate, apically rounded or emarginate, basally obtuse, mostly 2.5–7 cm long, 1.5–4 cm wide, the costa and basal lateral veins prominent, ?succulent, glabrous or with a very few small scattered hairs; petiolules glabrous to sericeous, drying somewhat angled, 1–2 mm long; petioles and rachis glabrate, drying angled, or deeply sulcate, mostly glabrous; stipels oblong, rounded, 1 mm long, glabrous, often caducous; stipules acute, ca. 2 mm long, ciliate. *Inflorescences* 4–20 cm long, the peduncle slender, glabrous or sparingly pubescent; bracteoles and the bracts ovate, acute, thin with conspicuous costa, ca. 2 mm long; pedicels clustered at the tip of the peduncle, 2–5 mm long, glabrous or puberulent. *Flowers* yellow; calyx campanulate, the tube ca. 2 mm long, glabrous but apically ciliate, the teeth deltoid, the upper pair connate; standard ca. 1.5 cm long, emarginate; lowermost narrow, slightly longer, ca. 2 mm long. *Legume* linear, turgid, 5–6 cm long, ca. 5 mm across, black after dehiscence; seeds subglobose, 3–4 mm across, the hilum white, ca. 1 mm long.

This species is closely related to *Vigna luteola* from which it may not be specifically distinct. Both species have seaside habitats and similar floral characteristics. *Vigna retusa* differs conspicuously in its obovate rounded leaves. It is a species of the Old World, but specimens resembling Old World material have been seen from Brazil (Bahia) and from Panama.

PANAMÁ: San José Island, *Erlanson 2* (GH, NY, US); *Johnston 757* (GH, US).

10. **Vigna unguiculata** (L.) Walp., Repert. Bot. Syst. 1: 779. 1842.

Dolichos unguiculatus L., Sp. Pl. 725. 1753. TYPE: not seen.
Vigna sinensis (L.) Savi ex Hassk., Cat. Pl. Hort. Bogor 279. 1844.
Dolichos sinensis L., Index Alt. Herb. Amboin. 23. 1754. Based on *Dolichos sinensis* Rumph., Index Alt. Herb. Amboin. 5: 375, *tab. 134*. 1747.

Coarse erect or clambering *herbs* or *vines*; stems glabrous, drying terete or strongly angled. *Leaves* pinnate trifoliolate; leaflets ovate or lanceolate, the lateral leaflets strongly oblique, apically acute, acuminate or obtuse, basally obtuse, truncate or cordate, mostly 5–11 cm long, 1.5–5 cm wide, drying slightly discolorous, glabrous except at the very base; petiolules ca. 3 mm long, pubescent; petiole and the rachis glabrous, drying angled, the petiole mostly exceeding the terminal leaflet; stipels elliptical, rounded, glabrous, the lateral pair 2 mm long, the terminal pair shorter; stipules large, ovate, acuminate, nervate, 7–16 mm long above insertion, produced into 2 oblong auricles to 5 mm long below insertion. *Inflorescence* 7–30 cm long, the few flowers congested at the apex; peduncle glabrous, erect; bracteoles 4–7 mm long, exceeding the calyx tube, glabrous, nervate, cucullate; bracts 2–3 mm long, glabrous, nervate, cucullate; pedicels stout, 1 mm long. *Flowers* various colors; calyx tubular campanulate, glabrous, 6–8 mm long, the upper pair fused, deltoid, the lower teeth acuminate, ca. 2 mm long; standard 1.5–2 cm long. *Legume* linear, straight or curved, slightly compressed, mostly 10–40 cm long, ca. 1 cm wide; seeds of various colors.

This species is distinct in its glabrous stems leaves and foliage, in its large stipules which are produced below the insertion, and in its large bracteoles which are longer than the bracts or the calyx tube. The pods occasionally grow to great length, over 1 m long, but are mostly much shorter.

Vigna unguiculata is a crop plant in Panama, cultivated in the lowlands. It is called "cowpea" (English) or "frijol chiricana" (Spanish).

COLÓN: Trail above Río Indios along Caribbean Sea, *Sullivan 129* (MO). PANAMÁ: Roadside ditch halfway up Cerro Azul, 100–500 m, *D'Arcy 13442* (MO). Colegio courtyard, Panama City, *D'Arcy 13457* (K, MO, SCZ). Cultivated, SE side of Madden Lake near Puente Natural, *Nee & Hansen 14058* (MO, WIS). Cultivated, Cía. Selecta de Alimentos, Vía Bolivar, Panama, *Taylor 117* (F).

11. **Vigna vexillata** (L.) A. Rich.,[99] Hist. Fis. Polit. Nat. Cuba 11: 191. 1845.

Phaseolus vexillatus L., Sp. Pl. 724. 1753. TYPE: Type not seen.

Slender twining *vines*; stems mostly retrorsely pilose with long tawny hairs; roots tuberous. *Leaves* pinnate trifoliolate; leaflets mostly narrowly ovate, mostly 5–9 cm long, 2–3.5 cm wide, apically acute, mucronulate, basally obtuse or rounded, thin, pilose with white hairs, mostly glabrescent but remaining ciliate on the margins and the major veins beneath; petiolules 2–3 mm long, tawny pilose; petioles retrorsely hispid, shorter than the terminal leaflet; stipels subulate or narrowly acuminate, mostly ca. 2 mm long; stipules acute, striate, 4–8 mm long, hispid, auriculate. *Inflorescences* axillary, few flowered, 20–30 cm long; peduncle erect, retrorsely pubescent, the flowers congested at the apex; bracts and brac-

[99] For synonyms see Maréchal et al., 1978. Only this name has been used for Panamanian plants.

teoles caducous; pedicels 1–2 mm long. *Flowers* blue or lavender turning white or yellow; calyx short pubescent, 9–13 mm long, campanulate, the 5 teeth acuminate subulate, about as long as the tube; standard 2–2.5 cm long, the keel incurved. *Legume* linear, 7–10 cm long, ca. 5 mm wide, slightly compressed, maturing black, densely pilose, somewhat glabrescent; seeds oblong, 4–5 mm long, dark, shiny, the hilum white.

BOCAS DEL TORO: Almirante, *Barrus 406* (GH). Between Almirante and Ojo de Agua, 3–6 km W of Almirante, 30–200 m, *Croat 38208* (MO). Changuinola Valley, *Dunlap 255* (US), *277* (F, US), *278* (GH, NY, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2071* (MO). Water Valley, *Wedel 1782A* (MO). Isla Colón, *Wedel 2847* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 5625, 6872* (both MO); *Ebinger 77* (GH, MO). Frijoles, *Croat 9056* (MO, SCZ), *10369* (MO). NW of Escobal, *Croat 12448* (MO). Curundú, *D'Arcy 13429* (MO, SCZ). Vera Cruz, *Duke 6064* (MO, US). West Ft. Kobbe towards Vera Cruz, *Duke & Mussell 6565* (MO). Albrook, *Dwyer 6565* (SCZ). Near Fort Clayton, *Greenman & Greenman 5183* (MO). Gamboa, *Kennedy et al. 2326* (MO). Between Frijoles & Monte Lírio, 30 m, *Killip 12168* (US). Balboa, *Standley 25644, 25576* (both US). Gamboa, *Standley 28450* (US). Río Pedro Miguel, near East Paraiso, *Standley 30040* (US). Miraflores locks area, *Tyson 1598* (FSU, MO). Fort Kobbe road, *Woodson et al. 1414* (GH, MO). CHIRIQUÍ: Corotu, 6 km SW of Puerto Armuelles, *Busey 400* (F, GH, MO). San Bartolo Arriba W of Puerto Armuelles, 125 m, *Croat 26718* (MO). Near Río Fonseca, 0–100 m, *Koster 112* (MO). Puerto Armuelles, *Liesner 24* (MO), *91* (MO, NY). COLÓN: *Cotterman & Klawe p-11* (MO, US). DARIÉN: El Real, *Croat 15444* (MO). Road to Pinogana from El Real, *Croat & Porter 15556* (MO). Pablo Othon's pasture [El Real], *Duke & Bristan 284* (MO). 10 mi S of El Real on Río Pirre, *Duke 5481* (MO). Yaviza, *Stern et al. 144* (MO, US). El Real, *Stern et al. 286* (GH, MO, US); *Tyson et al. 4647* (DUKE, F, FSU, GH, MO, NY, SCZ). PANAMÁ: Corozal road near Panama, *Standley 26871* (US). Entrada esclusa Gatún, *Taylor 59* (MO). First bend of Río Pasiga, *Gentry 2380* (MO).

48. WILLARDIA

Peter S. White[100]

Willardia Rose, Contr. U.S. Natl. Herb. 1: 97. 1891. TYPE: *Coursetia mexicana* S. Wats. = *Willardia mexicana* (S. Wats.) Rose.

Shrubs or small *trees*. *Leaves* alternate, imparipinnate; leaflets entire, petioluled, estipellate; stipules caducous or lacking. *Inflorescences* racemes or panicles in uppermost axils, equalling or exceeding the leaves; bracts small, caducous; flowers usually paired on bracteolate branches of the short, bracteolate pedicels. *Flowers* usually bluish or lilac; hypanthium broadly cup shaped, abruptly contracted into a stipe, shallowly 5-lobed or teeth nearly obsolete; petals 5, about the same length, short clawed, free except the keel petals connate for part of the length, standard orbicular; stamens 10, the vexillary stamen fused with the staminal tube except at its base, the anthers uniform; ovary slender, flat, nearly sessile, ovules several, the style short, incurved, glabrous, the stigma small, capitate. *Fruit* a dehiscent legume, linear to oblong, flat, often resinous or with resin ducts near the margin, continuous within; seeds reniform, flattened.

Willardia is a genus of six species of Mexico and Central America. It is often confused with *Lonchocarpus* when in flower or leaf. However, *Willardia* has dehiscent fruits (sometimes tardily so), fruits often with resin ducts, wing petals free from the keel, and the hypanthium narrowed at the base. *Lonchocarpus* fruits are indehiscent and the legume is often flattened into a wing, lacks resin

[100] Uplands Field Lab., Great Smoky Mts. National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

ducts, the wing petals are often adherent to the keel, and the hypanthium does not narrow above the juncture with the pedicel.

Literature:

Hermann, J. 1947. Studies in *Lonchocarpus* and related genera I: A synopsis of *Willardia*. J. Wash. Acad. Sci. 37: 427–430.

a. Fruits 5.5–8.0 cm long; leaflets 1.5–5.0 cm long, 0.7–2.0 cm wide; flowers to 11 mm long ---------- 1. *W. schiedeana*

aa. Fruits to 3.5 cm long; leaflets 1.0–2.5 cm long, 0.5–1.0 cm wide; flowers to 9.5 mm long ---------- 1a. *W. schiedeana* var. *lindsayi*

1. **Willardia schiedeana** (Schlecht.) Hermann, J. Wash. Acad. Sci. 37: 429. 1947.—FIG. 54.

Robinia schiedeana Schlecht., Linnaea 12: 306. 1838. TYPE: Mexico, *Schiede 621* (B, not seen; photo F, MO).
Lonchocarpus schiedeanus (Schlecht.) Harms, Feddes Repert. Spec. Nov. Regni Veg. 17: 324. 1921.
L. salvinii Harms, Feddes Repert. Spec. Nov. Regni Veg. 17: 323. 1921. TYPE: Guatemala, *Salvin* 1873–1874 (B, not seen; photo MO; isotype F; fragment US).
L. calderonii Standley, J. Wash. Acad. Sci. 15: 476. 1925. TYPE: El Salvador, *Calderon 2022* (US).

Small to medium-sized *trees*, branchlets glabrous or with a few hairs, warty with light colored lenticels and rough with raised leaf scars. *Leaves* usually alternate, sometimes nearly opposite, 10–15 cm long; leaflets ca. 11, narrowly elliptic to ovate, retuse, 1.5–5.0 cm long, 0.7–2.0 cm wide, glabrous; rachis grooved above, estipellate; stipules caducous; petiolules prominent, 2–3 mm long, grooved above; petioles 2–3 cm long, glabrous. *Inflorescence* racemose or paniculate, axillary on new wood with or before the leaves, showy, the flowers borne along upper ⅔, as long as or just exceeding the leaves; bracts minute; flowers 2 at a node of the inflorescence; pedicels 2–4 mm long, articulated with the branches which are ca. 3 mm long and 2-bracteolate at the articulation with the stipe of the hypanthium. *Flowers* lavender or blue; petals of equal length, 8.5–11.0 mm long when in bloom, the standard to 11 mm long, appressed hairy on lower outside, sagittate at the clawed base, retuse, the wings free, the keel petals coherent on the lower margin towards the tip; staminal sheath with odd stamen united along its entire length, free at the very base for ca. 1 mm; ovary linear, glabrous, the stigma capitate, only about 2 times the diameter of the style. *Fruit* linear, 5.5–8.0 cm long, ca. 1 cm wide, flat, abruptly contracted into a stipe, glabrous; seeds reniform, compressed.

This species is found from Mexico southward to Panama. It is apparently at least locally frequent in deciduous forests of the Pacific slope. In Panama it is known from lowland Chiriquí.

CHIRIQUÍ: Remedios, 0–150 m, *Allen 3659* (MO, NY, US); *Tyson et al. 4216* (MO).

1a. **Willardia schiedeana** var. **lindsayi** (Standley) Hermann, J. Wash. Acad. Sci. 37: 429. 1947.

Lonchocarpus lindsayi Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 17: 195. 1937. TYPE: Panama, *Lindsay 446* (F, fragment US).

This variety differs from typical material in the following characters: smaller leaflets (to 2.5 cm long and 1 cm wide), a slightly smaller corolla (not over 9.5 mm long), and shorter fruits (to 3.5 cm long). It is known only from the type locality in lowland central Panama.

CANAL ZONE: Bejuco, *Lindsay 399* (F), *446* (F, fragment US).

49. ZORNIA

Michael O. Dillon[101]

Zornia J. F. Gmelin, Syst. Nat. 2: 1076. 1791. TYPE: *Z. bracteata* Walt. ex J. F. Gmelin.

Myriadenus Desvaux, J. Bot. (Desvaux) 1: 121. 1813. TYPE: *Ornithopus tetraphyllus* L. = *Zornia myriadenia* Benth.

Annual *herbs* or suffruticose perennials to 2 m tall; stems diffusely branched, prostrate and spreading to upright and ascending. *Leaves* digitately 2- or 4-foliolate; leaflets often pellucid-punctate, exstipellate; stipules subfoliaceous, paired, peltate, auriculate, 3- to 11-nerved, often punctate. *Inflorescence* spicate, rarely racemose, terminal or axillary, interrupted to congested, 1- to several-flowered; bracts paired, lateral, stipuliform, 3- to 15-nerved, sometimes punctate, enclosing a sessile flower; bracteoles absent. *Flowers* 5-merous; calyx subhyaline, the tube short, 5-lobed, usually 5- to 10-nerved, ciliate, the 2 upper lobes connate nearly to the apex, the 2 lateral lobes much shorter, the lowest oblong or lanceolate, subequal to the upper lip; corolla yellow, orange yellow, or rarely white, frequently purple striate, the standard suborbicular, clawed, to 17 mm long, the wings obliquely obovate or oblong, shorter than standard, usually clawed and auriculate, the keel incurved, subrostrate, smaller than the wings; stamens 10, monadelphous, the filaments connate into a closed tube, splitting dorsally, persistent, the anthers alternately longer, subbasifixed, and short, versatile; ovary sessile, the ovules 2–several, campylotropous, the style filiform, persistent basally, the stigma minute, terminal. *Fruit* a loment of 2–15 articles, compressed, the upper suture nearly straight, the lower deeply sinuate, articulations glabrous to puberulent or pilose, smooth or echinate, usually reticulate, indehiscent; seeds black or dark brown, orbicular to subreniform, estrophiolate. Chromosomes: $n = 10$.

Zornia is a genus of about 75 species (Mohlenbrock, 1961) from tropical and subtropical regions of the world. More than half its species are found in the Western Hemisphere from the southern United States to central Argentina. Only two species are recognized from Panama.

In Panama, *Zornia* appears to be of little economic importance other than as a weed in cultivated areas. However, in Africa *Zornia diphylla* Pers. is used as fodder primarily for horses (Dalziel, 1937). Dalziel also notes, ". . . is said to form a slight lather with water, and therefore used as a poor man's soap . . ." and ". . . in Nigeria the plant is mixed with butter or shea butter, etc., to rub on the body for feverish chills, etc."

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FIGURE 54. *Willardia schiedeana* (Schlecht.) Hermann.—A. Habit (×7/10).—B. Flower (×2 1/5).—C. Wing petal.

Literature:

Mohlenbrock, R. H. 1961. A monograph of the leguminous genus, *Zornia*. Webbia 16: 1–141.

a. Lower leaflets lanceolate to lance-ovate, to 24 mm long, to 12 mm wide; stipules 5–9-nerved; bracts of inflorescence lanceolate to lance-ovate, to 12 mm long, to 8 mm wide, peltate with auricle attenuate to falcate; fruit usually 5–7-articulate ---------- 1. *Z. reticulata*

aa. Lower leaflets ovate to elliptic, rarely lanceolate, to 14 mm long, to 6 mm wide; stipules 3–5-nerved; bracts of inflorescence ovate, to 10 mm long, to 5 mm wide, attached basally or subauriculate; fruit usually 2–4-articulate ---------- 2. *Z. thymifolia*

The two species occurring in Panama tend to intergrade, and a number of collections are not clearly assignable between the two species. A more intensive study may lead to an understanding of this pattern and a better means of separation. Collections of dubious assignment are placed under *Z. reticulata* and marked with an asterisk.

While Mohlenbrock (1961) cited a Panamanian collection, *Pittier 4846* (NY, US), as *Zornia curvata* Mohlenbrock, this collection appears too close to *Z. reticulata* to allow distinction. This specimen is also cited under his description of *Z. reticulata* and may indicate his actual intentions, since these sheets are annotated as *Z. reticulata* by Mohlenbrock.

1. **Zornia reticulata** J. E. Smith in Rees,[102] Cycl. 39(2). 1819. TYPE: LINN, not seen; neotype (designated by Mohlenbrock 1961): Jamaica: St. Catherine, *Harris 12070* (US).—FIG. 55.

Perennial *herb*, stems prostrate to erect, to 75 cm long, branched, pilose to glabrous. *Leaves* 2-foliolate; lower leaflets broadly lanceolate to ovate-lanceolate, acute, to ca. 20 mm long, ca. 8 mm wide, the upper leaflets lanceolate to linear, acute, to 20 mm long, ca. (2–)3–5(–8), punctate or epunctate, villous to glabrous below, glabrate above, exstipellate; stipules peltate, glabrous to villous, punctate or epunctate, 5- to 9-nerved, attenuate at each end. *Inflorescence* spicate, usually crowded, many flowered; bracts lanceolate to lance-ovate, acute to acuminate, to 12 mm long, 8 mm wide, the auricle to 3.5 mm long, often falcate, glabrous to densely villous, 5- to 9-nerved. *Flowers* yellow, mostly concealed by bracts. *Fruit* 4- to 7-articulate, usually included in bracts, articles 2.0–2.4 mm long, ca. 2 mm wide, usually reticulate, pilose to villous, bristles retrorsely hairy, 0.2–0.4 mm long, eglandular.

Zornia reticulata is widely distributed from the southern United States through Central and South America to Paraguay. In Panama, it is a common element in grasslands and disturbed sites, usually at lower elevations. It is a most variable species, with leaflets varying as to size and pubescence. This species is distinguished from the following species by its more robust, erect habit; larger leaves and leaflets; and the bracts of the inflorescence peltate and usually having a falcate auricle.

Collections of dubious assignment are cited below with an asterisk (*); see generic discussion above.

CANAL ZONE: Sosa Hill, *Duke 4654* (GH, MO). Parańaiso, *Killip 3384* (US). Farfan Beach, *Lewis et al. 305* (DUKE, F, GH, MO, NY, SCZ, US).* Corozal, *Standley 27383* (US). CHIRIQUÍ: near Horconcitos, *Burt & Koster 170* (MO). David to Concepción, *Burt & Koster 136* (MO).* Boquete, *Davidson 702* (F, GH, MO, US). Cerro Colorado, *Folsom 4909* (MO). Rio Las Guias, *Folsom & Collins 6861* (MO). David airport, *Lewis et al. 754* (GH, MO, US). 5 mi S of Boquete, *McDaniel 6798* (FSU, MO). Vicinity of Boquete, *Stern et al. 1162* (GH, MO); *Woodson & Schery 783* (MO, US). COCLÉ: Río Hato Airstrip, *Blum & Dwyer 2466* (FSU, GH, MO, SCZ); *Burch et al. 1138* (F, GH, MO, NY, US). 4–6 mi E of Natá, *Duke 12379* (NY).* Penonomé, *Ebinger 997* (F, MO, US). Aguadulce, *Pittier 4846* (NY, US). Penonomé, *Williams 124* (NY, US). Without other locality, *Williams 125* (NY, US). COLÓN: 4 km E of Buena Vista, *Nee 7792* (MO). Ft. Sherman, *Dwyer 7226* (MO).* LOS SANTOS: Chitré to Los Tablas, *Burt & Rattray 50* (MO).* Between Tonosí & Macaracas,

[102] For synonymy see Mohlenbrock, 1961.

FIGURE 55. *Zornia reticulata* J. E. Smith.—A. Habit (×½). [After *Ebinger 1162.*] B. Flower (×3½).—C. Corolla.—C^1. Standard (×3).—C^2. Wing petal (×3).—C^3. Keel petal (×3).—D. Stamens (×4).—E. Pistil (×4). [After *Davidson 702.*]—F. Fruit (×4). [After *Skutch 2942.*]

Oliver et al. 3550 (MO).* 12 mi S of Macaracas, *Tyson et al. 2934* (MO, SCZ). HERRERA: El Portrero to Las Minas, *Burt & Koster 89* (MO).* PANAMÁ: Cerro Campana, *Dwyer et al. 4717* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5097* (MO). Las Sabanas, *Heriberto 141* (US); *Paul 537* (US). Pacora to Chepo, *McDaniel 8182* (DUKE, FSU). Alcalde Díaz, *Nee 8302* (MO). Tapia to Pacora, *Piper 5123* (US). Laguna de Portala, *Pittier 4625* (US). Las Sabanas, *Standley 25890* (US). Juan

Franco Race Track, near Panamá, *Standley 27823* (US). VERAGUAS: W of Soná, *Allen 1052* (MO). Divisa to Santiago, *Burt & Rattray 76* (MO).* 5 km S of Santa Fé, *Nee 8127* (MO). 2 km NW of Atalaya, *Nee 8238* (MO). 5 mi W of Rincon, *Wilbur et al. 15387* (DUKE).

2. **Zornia thymifolia** H.B.K., Nov. Gen. Sp. Pl. 6: 514. 1823. TYPE: Mexico: *Humboldt* (B-Willd. 13772, not seen; MO, microfiche).

Hedysarum clandestinum Willd. ex Steud., Nom. Bot., ed. 1. 730. 1840, nomen nud.

Perennial *herb*; stems prostrate, spreading, to 30 cm long, branched, puberulent to glabrous. *Leaves* 2-foliolate; lower leaflets lanceolate to ovate, obtuse to acute, glabrous to sericeous above, sparsely to densely sericeous below, usually punctate, exstipellate; stipules peltate, 3- to 5-nerved, attenuate above, obtuse to acute below, usually punctate, glabrous. *Inflorescence* spicate, congested, several flowered; bracts ovate, acute, ciliate, glabrous to puberulent, punctate, 5- to 7-nerved, ca. 10 mm long, ca. 5 mm wide, attached basally or nearly so, auricle oblique. *Flowers* yellow. *Fruit* 2- to 4-articulate, the articles ca. 2 mm long, ca. 2 mm wide, reticulate, glabrous or rarely puberulent, the bristles glabrous or retrorsely hairy, eglandular.

Zornia thymifolia is relatively common throughout Mexico and Central America to Panama, usually found in rocky grassland at mid and high elevations. In Panama, this species is apparently confined to old lava fields around the volcano Barú, Chiriqui Province. This species is also quite variable for overall habit size, and size and shape of the leaflets. The fruits are variable for pubescence, with some individuals from a given collection (e.g. *Tyson 5830*) either pubescent and with retrorsely hairy bristles, or completely glabrous with bristles lacking pubescence.

The species is distinguished from *A. reticulata* by its smaller habit and leaflet size, and the bracts of the inflorescence attached basally or if peltate, then the auricle small, obtuse and oblique.

Mohlenbrock (1961) has designated a neotype (*Pringle 726,* F) for this species; however, Humboldt's specimen is extant in the Willdenow Herbarium (B) (#13772) under the name *Hedysarum clandestinum* and is most certainly the holotype for this species.

CHIRIQUÍ: Llano de Volcán, *Allen 4852* (GH, MO). Camino a Cerro Punta, 5 km NW del Hato de Volcán, *Correa 1361* (DUKE, MO). Ca. 3 km NE of El Hato del Volcán, *Davidse & D'Arcy 10342* (MO), *10348* (MO). Lava fields near the town of Volcán, *Duke 9155* (MO, OS), *9220* (MO). El Hato (Volcán), *Ebinger 780* (GH, MO, US). Boquete, *Lewis et al. 397* (GH, MO, US). Frances Arriba School ca. 14 mi N of David, *Lewis et al. 651* (DUKE, F, GH, MO, NY, SCZ, US). Llanos del Volcán, *Seibert 339* (GH, MO). 3 mi N of El Volcán, *Tyson 5830* (DUKE, FSU, MO, SCZ). NE of El Hato del Volcán, *Wilbur et al. 17206* (DUKE).

Index of Latin Names

Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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