



Flora of Panama. Part IX. Family 184. Compositae

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FLORA OF PANAMA¹

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

Part IX

FAMILY 184. COMPOSITAE²

Mostly *herbs*, sometimes *shrubs*, *trees* or *vines*, variously pubescent or glandular, sometimes glabrous; stems terete, sometimes winged or flattened into cladodes, sometimes fistulose. *Leaves* alternate, verticillate, or opposite, sometimes basal, rarely reduced to scales, spines, or wanting, simple or 2- to many-foliolate, entire or variously toothed, lobed or dissected; petioles present or wanting; the leaf bases sometimes decurrent or clasping; stipules wanting but pseudostipules sometimes present. *Inflorescences* cymose, racemose, paniculate, umbellate, or of solitary heads, the heads sometimes in indefinite aggregates; peduncles mostly present but sometimes wanting and the heads then often in glomerules; bracts often present; pedicels mostly present, sometimes bracteolate. *Heads* of 1-many florets (flowers) situated on a receptacle (torus), basally enclosed in an involucre and sometimes interspersed with paleas (chaff), the floret arrangement radiate, disciform, discoid, or ligulate, the outer or inner florets sometimes sterile; involucre bracts few-many in 1-several similar, differentiated, or evenly graded series, free or connate, valvate or overlapping, those of the innermost series sometimes enfolding the florets; receptacle depressed, flat, globose, conical, or obsolete; paleas characteristic of some groups, flat or enfolding the florets, sometimes reduced to hairs or short scales, or wanting; outer florets, when differing

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² The treatment for this family was coordinated by W. G. D'Arcy, Missouri Botanical Garden, who also wrote the introductory material including family description, discussion of morphology, conspectus of the family, and key to the genera. Authorship for tribes or subtribes is indicated at the beginning of the taxon. Except for editorial decisions agreed upon in the interest of uniformity of terminology and format, each author is solely responsible for his treatment.

from the inner (disc) florets, often with a straplike, entire, or denticulate corolla (ligule), the androecium usually wanting, the style branches 2, mostly slender, glabrate, the ovary fertile or not, sometimes 3-angled; inner (disc) florets mostly with tubular, variously expanded, 4-5-lobed corollas, sometimes somewhat zygomorphic, the anthers mostly oblong, marginally connate, introrse with sterile tips, basally blunt or tailed, the style branches 2, pubescent, glabrate or glandular, the ovary terete or compressed, often with an apical nectary. *Fruit* usually an achene, rarely baccate or drupaceous, or a utricle formed by fusion of the achene with paleas, bracts or other parts, the pericarp mostly hard; pappus usually present, of bristles, awns, or scales; sometimes with a distinct carpodium.

The Compositae vies with the Orchidaceae and Gramineae as the largest vascular plant family, with some 30,000 species and over 1,000 genera. It is also one of the most easily recognized and widespread of flowering plant groups. The family is well represented in temperate regions with large numbers of species in most dry areas. In the New World, diversity is especially great in Mexico and Peru, and upland Panama hosts many species related to groups from these regions. In the lowlands there are many widespread weeds. Many species from the forests have been recently elucidated.

In Panama the tribes Eupatorieae and Heliantheae together constitute more than half the species present. The Eupatorieae includes many species with special adaptations such as epiphytism, scandent habit, and perhaps tolerance to shade that permit survival in forests. A number of species are trees. The tribe is mainly New World in distribution. Of the 83 Panamanian species, 24 are now known as endemics. Panamanian members of the Heliantheae are often widespread weeds of disturbed or open situations and many derive from groups better represented in Mexico.

Although contiguous with other countries having a rich development of Compositae, Panama is not always a corridor in a continuum of species linking neighboring areas. For example, 37 species of *Baccharis* have been reported for Colombia but only 2 are known in Panama, and Gibson (personal communication) has identified 20 species of *Vernonia* in Guatemala but only 6 species are known in Panama.

In spite of its large number of species and widespread occurrence, members of this family are of relatively little economic importance. In Panama a number of species are cultivated for ornament and some of these are sold as cut flowers in markets. *Pluchea carolinensis* (salvia) is widely cultivated as a medicinal, and *Lactuca sativa* (lettuce) is grown for salads. Many species are noxious weeds of cultivation and pastures.

The major tribal categories in the Compositae are fairly well agreed upon with the majority of workers accepting 12 or 13 tribes. There is some disagreement as to the placement of particular genera, and proposals have recently appeared (e.g., Robinson & Brettell, 1973a, 1973b, 1973c) to base distinct tribes on some of the genera of anomalous placement. The genus *Liabum* is here treated with the Senecioneae, *Isocarpus* with the Eupatorieae, *Schistocarpus* with the Senecioneae, and *Trichospira* with the Heliantheae. *Jaegeria* and *Sabazia* are treated in subtribe Galinsoginae of the Heliantheae instead of in subtribe Helianthinae where they

have often been placed. The traditional tribe Helenieae has long been subject to question, and genera occurring in Panama which were earlier referred to the Helenieae are treated here in the Tribe Tageteae. They are not closely related to other genera usually placed in the Helenieae and they are perhaps not closely related to other tribes.

No tribe can be considered ancestral to the rest of the family but several tribes have been proposed as primitive stocks: Vernonieae (Augier & Du Merac, 1951), Senecioneae (Small, 1917–1919), Heliantheae (Cronquist, 1955), and Cardueae (Leonhardt, 1949).

The 13 tribes commonly recognized in the family are often identified by the Roman numerals used by Bentham (1873a) and are employed here. Tribes IX (Calenduleae) and X (Arctoteae) do not occur in Panama. The arrangement of Panamanian genera into tribes is indicated in the following conspectus. The characters employed are merely synoptical and should not be relied upon for the determination of plants. An artificial key to genera follows. Each tribe is provided with a separate key to its constituent genera.

Chromosome numbers cited in the text are reported either in literature indicated or in the series of general compilations (Cave, 1956–1964; Darlington & Janaki Ammal, 1945; Darlington & Wylie, 1955; Keil & Stuessy, 1975; Moore, 1968–1970; Ornduff, 1965–1967; Powell & Turner, 1963; Turner & King, 1964; Turner & Flyr, 1966).

REED, cited occasionally as repository for plant specimens, indicates the private herbarium of Clyde F. Reed, 10105 Harford Rd., Baltimore, Md. U.S.A.

Unless otherwise indicated, all illustrations are of Panamanian collections.

MORPHOLOGY

Plants of the *Compositae* display a range of specialized morphology not found in other families, and terminology is often particular to the family. A hand lens or dissecting microscope is useful in examining these plants and some features must be studied with a compound microscope. Literature citations in the following survey of terminology refer mainly to good illustrations of *Compositae* structures.

Pubescence and glands.—Characteristic hair (trichome) types (Fig. 1) are found in several groups of *Compositae*. In the Vernonieae hairs are sometimes sturdy, elongate and single-celled. In the Eupatorieae and Astereae hairs are usually many-celled and uniseriate or moniliform, with the basal or apical cell sometimes slightly differentiated. Arachnoid hairs, too fine to be seen in cellular detail under magnifications less than $\times 45$, occur and may form tomentum in the Inuleae, Senecioneae, and Cardueae. A specialized “verrucose hair” occurs in many genera of the Heliantheae. This hair consists of a multicellular basal rosette, one or two sturdy, distinctly verrucose, erect cells and an apex of one or two smooth, acicular cells. The basal rosette of cells is sometimes calcified giving the leaf a punctate appearance, and the sometimes calcified rugose and apical cells may result in a scabrous leaf surface. Large multiseriate hairs occurring in *Trixis*, *Hieracium*, *Pectis*, etc. may be termed bristles. Branched hairs occur on *Hieracium*. For a discussion of the double hairs (Zwillingshaare) found on the ovaries of many genera and especially of some primitive elements see Hess (1938).

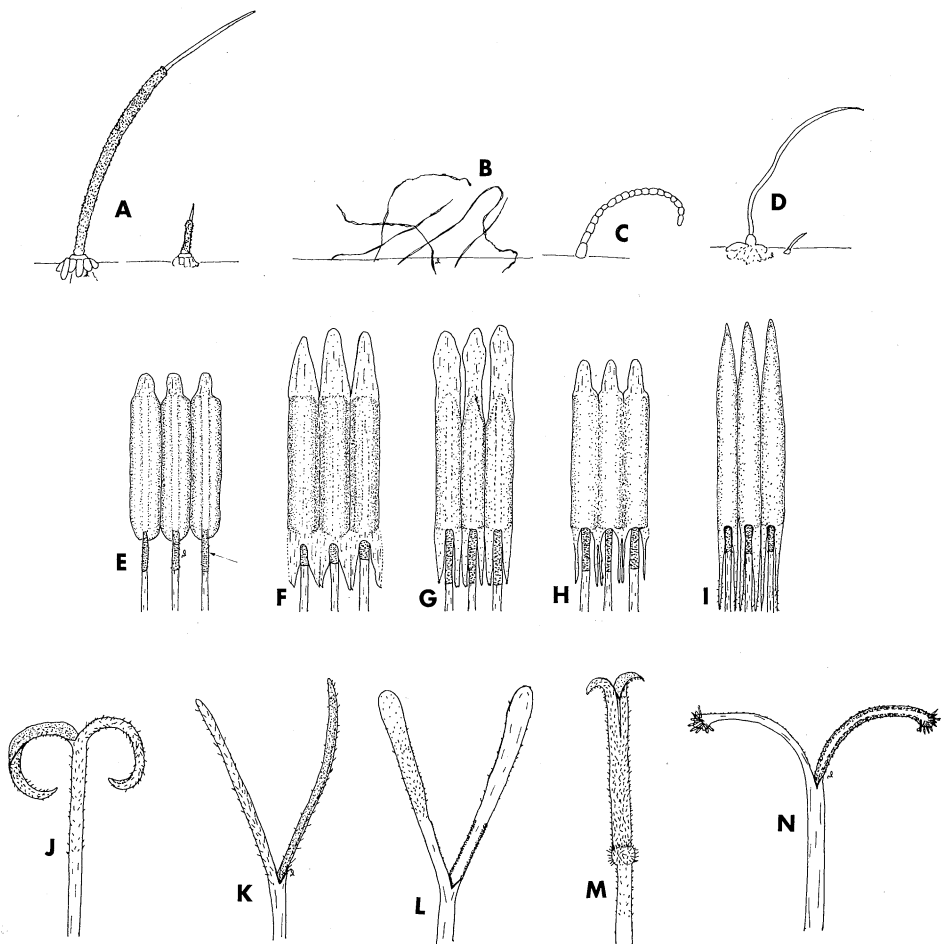


FIGURE 1. Commonly used diagnostic characters in Compositae.—A–D. Hair on leaves.—A. Verrucose hairs of Heliantheae, *Wedelia calycina*. [After Tyson 6624 (MO).]—B. Arachnoid hairs, *Gnaphalium americanum*. [After Croat & Porter 15619 (MO).]—C. Uniseriate, moniliform hair, *Fleischmannia pratensis*. [After D'Arcy & D'Arcy 6335 (MO).]—D. Long unicellular hair in Vernonieae, *Pseudelephantopus spicatus*. [After Croat 4168 (MO).]—E–I. Stamens in dorsal view. Note apical appendages, anther bases, and anther collars (arrow).—E. Anther bases obtuse, *Fleischmannia pratensis*. [After D'Arcy & D'Arcy 6335 (MO).]—F. Anther bases sagittate, auricles united, *Taraxacum officinale*. [After D'Arcy & D'Arcy 6459 (MO).]—G. Anthers sagittate with crumpled tails, *Pterocaulon virgatum*. [After Allen 1325 (MO).]—H. Anthers tailed (fimbriate), *Gnaphalium americanum*. [After Croat & Porter 15619 (MO).]—I. Anther tails with hairs, anther appendages not demarcated, *Onoseris onoserioides*. [After Croat 22223 (MO).]—J–N. Style branches.—J. Lactuoid type, *Taraxacum officinale*. [After D'Arcy & D'Arcy 6459 (MO).]—K. Vernonioid type, *Vernonia canescens*. [After Croat 8686 (MO).]—L. Eupatorioid type, *Fleischmannia pratensis*. [After D'Arcy & D'Arcy 6335 (MO).]—M. Carduoid type, *Cirsium mexicanum*. [After Busey 541 (MO).]—N. Senecioid type approaching Helianthaeoid type. Note truncate, penicellate apex and rudimentary appendage, *Senecio megaphyllus*. [After Webster et al. 17222 (MO).]

Conspicuous, often pellucid oil glands of various shapes are arranged characteristically on leaves and involucre in the Tageteae (Figs. 90, 93). In *Sigesbeckia* (Fig. 70), *Hieracium* (Fig. 107), and *Sonchus* (Fig. 109), large globose glands are displayed on bristles. In *Baccharis*, a coating of glandular material may make the leaf shiny. With the aid of a lens, punctate glands in the leaf surface or globose glandular materials on the surface may be observed in many species. Laticifers, completely internal to the epidermis, are visible with effort as irregular areas of differentiated surface in the leaves of *Critonia daleoides*. The sap of this species is clear. In the Lactuceae a network of laticifers invisible without special techniques yields copious milky sap.

Leaf arrangement.—In Panama leaves are opposite or rarely verticillate in most Eupatorieae, Tageteae, many Heliantheae, and in *Liabum* and *Schistocarpha* (both Senecioneae), but are alternate in all other groups. Plants with leaves in basal rosettes belong to groups with alternate leaves. In plants with opposite leaves, it is not unusual for some leaves and branches in the region of the inflorescence to be alternate. The converse obtains in *Trichospira* where leaves in the inflorescence are opposite and in the rest of the plant alternate. Both *Verbesina* and *Ambrosia* are known in Panama only by alternate-leaved species but opposite-leaved species occur in nearby countries. *Decachaeta* is the only genus in the Eupatorieae with entirely alternate leaves.

Involucral bracts (phyllaries).—These are mostly numerous and in most groups are overlapping in several graded series. Except in the Eupatorieae this is referred to as imbricate, but in the Eupatorieae the terms eximbricate, subimbricate, and imbricate are used to refer to degrees of overlapping. Good examples of these conditions are *Ageratina anisochroma* (Fig. 12), *Bartlettina* (Fig. 16), and *Chromolaena odorata* (Fig. 18), respectively. In some species of Tageteae, Senecioneae, Mutisieae, and Lactuceae the bracts do not overlap but are valvate, touching only at the margins (Fig. 110), or they may sometimes be marginally connate for part of their length. A whorl of short bracts at the base of the involucre (Fig. 110) may be referred to as either outer involucral bracts or as calyculate bracts. Commonly one or more subinvolucral bracts may be found on the pedicel, sometimes in a different phyllotaxy from the rest of the plant. In the Elephantopodinae the involucral bracts are decussate, and in these genera with their heads fused into a common receptacle, a series of subinvolucral bracts (Fig. 10) forms a pseudoreceptacle around the glomerule.

Paleas (chaff) and receptacle (torus).—Convention refers to bracts external to the outermost whorl of florets as involucral bracts and those internal to it as paleas. Although artificial, this distinction causes little difficulty. The two structures are homologous with leaves but the paleas are usually considerably more modified. Paleas are best developed in the Heliantheae and Mutisieae but isolated species or genera of the Eupatorieae, Astereae, Senecioneae, and Lactuceae and perhaps other tribes also have paleas. In the Heliantheae the paleas frequently enfold the ovary (Fig. 53c, 76c) and may be bent over the corolla in bud or occasionally are apically modified into awns or cusps. The paleas of *Eclipta*, *Cirsium* and *Liabum* are narrowed into bristles or awns. In many genera paleas are reduced to hairs or low scales which may persist on the

receptacle. In some genera, low hairs or spicules on the receptacle are referred to as paleas although they may consist of enations of the receptacle, or remains of carpodia and are not homologous with the bracts noted above. Aged receptacles may be fimbriate (fringed), pilose, foveate (pitted), verrucose (warty or knobby), alveolate (honeycombed), spiculiferous, muricate (spiny), or naked (lacking paleas). The receptacle tissue may be completely sclerified or include parenchyma.

Corollas.—Corollas (Hoffman 1894: 99, 101; Solbrig 1963b: 451; Bentham 1873b: tab. 8) are considered to be either ligulate (rays) or tubular (disc), although the tubular form includes modifications to campanulate, funnellform, etc., and ligulate corollas usually consist of a tube and a straplike ligule. When extremely narrow, corollas are termed filiform or capillary (Fig. 34E). The outline made by the top of the corollas and paleas is referred to as the disc. In the Lactuceae all corollas have a 5-lobed ligule. In other groups, ligulate corollas are confined to the outer whorls of florets on the head or are lacking. In the Mutisieae (Figs. 104, 106), ligulate corollas have a 4-lobed ligule and a short, opposing lobe at the top of the tube (bilabiate). In the Astereae, Inuleae, Heliantheae, Tageteae, Senecioneae and Anthemidae, ligules are 2–3-lobed or entire (Figs. 34B, 48B, 81A, 93B, 98B), and an opposing lobe is seldom present. In *Zinnia* (Fig. 58C) and *Heliopsis* (Fig. 57C) (Heliantheae) the corolla consists of a ligule persistent on the achene and a tube is lacking, and in *Melampodium* also the tube may be obsolete. Ligulate corollas are lacking in all Panamanian taxa of Vernonieae, Eupatorieae, and Cardueae and only tubular corollas are present. Tubular corollas consist of a basal tube, an expanded limb, and 4–5 apical lobes. They are mostly actinomorphic but sometimes one suture of the limb is deeper than the others and in other cases two sutures are deeper, producing slightly bilabiate corollas. In the Eupatorieae attention has been drawn to the systematic importance of cell outline in the corolla lobes; bulging cells can often be seen at $\times 10$ – $\times 50$ magnifications but sinuous walls are visible only under a compound microscope after the special preparation of the tissue described by King & Robinson (1970).

Sexual condition.—Sexual condition of the florets is of great systematic utility. In the Vernonieae, Eupatorieae, and Cardueae (Panama) and in a few genera in other groups, all florets are alike, perfect, and have tubular corollas. Such heads are termed discoid. All florets of the Lactuceae are also perfect and have only ligulate corollas. These heads are termed ligulate. In the above mentioned groups all florets are fertile, producing mostly viable achenes. In most other groups, the outer florets are pistillate, lack stamens, and only rarely produce staminodes. The outer florets may have tubular or ligulate corollas and the heads are termed radiate or disciform depending on whether the ligules are elongate (exceeding the stigmas and pappus) or short and inconspicuous. The ovaries may be fertile or sterile. Florets toward the center of such heads are morphologically perfect with tubular corollas and functional stamens. The ovaries may be fertile or sterile. Variations in the above conditions occur in a few groups. Some Mutisieae have two peripheral whorls of pistillate florets, the outer with ligulate corollas and the inner with tubular corollas. Whorls internal to these have perfect florets with

tubular corollas. In a few cultivated plants, e.g., some strains of *Dahlia*, *Chrysanthemum*, and *Tagetes*, proliferation of pistillate, often abortive, florets with ligulate corollas may supplant normal florets with tubular corollas.

Stamens.—Stamens (Fig. 1, Hoffman, 1894: 104; Bentham, 1873b: tab. 9) are usually of the same number as the corolla lobes. Filaments are usually compressed and the anthers are connate or coherent into a narrow tube. The anther apex is usually sterile and differentiated into a distinct, hyaline appendage. In *Piquiera*, *Eclipta*, and *Eleutheranthera* the appendage is much reduced or wanting. In the Mutisieae and in *Youngia* (Lactuceae) the anther apex is sterile but not demarcated on the dorsal (outer) side, appearing as a homogeneous continuation of the thecas. Anther bases may be blunt, auriculate, sagittate, or with variously elaborated tails. The auricles of adjacent anthers are sometimes united. In some cases short auricles appear to be derived from longer but crumpled tails. Tails are present in most taxa of Inuleae and Mutisieae. The order in which tribes are usually treated roughly follows the degree of elaboration of the anther bases.

A ring or region of specialized cells near the top of the filaments, the anther collar (Figs. 1, 12–33), acts as a hinge to permit straightening of the filaments at anthesis when the style pushes through the anther tube with much of the pollen. Characteristics of the anther collar have been used systematically in the Eupatorieae and Senecioneae. Exothecial cells of the anthers, visible under a compound microscope after special preparation, have also been of systematic use in the Eupatorieae (King & Robinson, 1970).

Styles.—The style (Hoffman, 1894: 107, 109, 110; Bentham 1873b: tab. 10; Solbrig, 1963b: 443; Gleason, 1952: 324) is typically a 2-branched shaft which may have an expansion (node) near the base (Figs. 12D, 75E). The basal expansion occasionally acts as a nectary and sometimes it is stipitate above the ovary by a slender pedicel. The base of the shaft is frequently immersed in a cupular nectary on the ovary apex (Fig. 34). In some species the branches do not separate and the shaft is entire. In most cases the dorsal (abaxial) surface is pubescent and the ventral (adaxial) surface is more or less flat. The stigmatic region is on the edge or ventral surface in a configuration characteristic of the tribe. Not always correlated with stigmatic position, several shapes of style branch are common (Fig. 1):

Lactucoid: Branches slender, longitudinally uniform, and sparingly pubescent.

The apex is acute or obtuse. This type occurs in the Lactuceae and in pistillate florets of other tribes.

Vernonioid: Branches elongate, longitudinally uniform, and often copiously pubescent. This type occurs in the Vernonieae.

Eupatorioid: Branches elongate, gradually expanded near the apex, minutely pubescent, papillose, or smooth. It is stigmatic at the margins near the base, and distal portions of the branches may be referred to as appendages. This type occurs in only the Eupatorieae (Figs. 11–33).

Senecioid: Branches often short, truncate, the apex with a fringe of papillae or hairs (penicillate). This type occurs in some species of Senecioneae, Anthemideae, and Inuleae.

Helianthoid: Branches are short, pilose near the apex, and sometimes with a

triangular or filiform appendage at the tip. This type occurs in several genera of Astereae, Inuleae, and Heliantheae (Fig. 54C), and intergrades with the Senecioid type.

Carduoid: Branches short and smooth, the shaft has an annulus of hairs or thickening near the apex. The type occurs in the Cardueae.

Ovaries.—Taxonomic characters of the ovary are usually expressed in terms of the achene, and younger stages may be misleading. Wings in some *Verbesina* species do not develop until after anthesis, while in *Wulffia* the awn (pappus) is deciduous soon after anthesis. In many groups a cupular nectary (Figs. 33E, 75D, E) is present at the apex of the ovary and in some genera, e.g., *Ayapana*, it is conspicuous. This is distinct from the expanded style base which resembles a nectary in some groups (Figs. 12D, 75E). The nectary may be stipitate. It may envelop the basal enlargement of the style shaft or end below it, in which case the stylar expansion appears stipitate. The nectary and style shaft are adnate only at the base. In several tribes; Vernonieae, Eupatorieae, Inuleae, Tageteae, and Anthemideae, the ovaries are characteristically terete, often ribbed, while in the Astereae and Heliantheae they are often compressed laterally (radially) or dorsiventrally (tangentially).

Fruits.—The usual dispersal unit in the Compositae is the achene, which consists of pericarp, endosperm and embryo, and sometimes includes a pappus, persistent nectary, and carpopodium. The pericarp (rind) is usually hard but is soft and fleshy in *Wulffia*. The exocarp is sometimes transparent. The achene may be apically narrowed into a beak (Fig. 108) which subtends the pappus, and the top of the beak may be expanded in a flange (Fig. 108). All structures surmounting the achene except the nectary are referred to as pappus. This may consist of hairs, bristles, scales (squamellae), awns or rarely glands, and sometimes these elements are fused in a corona or annulus (Fig. 66). Bristles or hairs are usually strigulose (barbellate, scabrid) and are especially fine and numerous in the Senecioneae and Lactuceae. Stout bristles are sometimes basally flattened or expanded. Scales may be lacerate (Fig. 9C). In the Heliantheae awns are common. While the pappus is of great utility in identifying Compositae, it is not unusual to find epappose (calvous) achenes in individuals or species of normally pappose groups. The carpopodium (hypophyses) is sometimes conspicuous (Figs. 19E, 106C), and the cellular arrangement has been given taxonomic weight in the Eupatorieae. A stipe arising above the carpopodium occurs in some species of *Verbesina*. In *Unxia* (Fig. 54) a notch appears on the achene at the carpopodium site.

Frequently, the achene is united with enveloping bracts or paleas or with adjacent florets, and the compound structure falls together. This compound fruit may be termed a utricle in the same sense as the term is used in the Chenopodiaceae and Urticaceae. It has also been known as an involucre fruit or fruiting involucre. The utricle may be flat and winglike or samaroid as in *Delila* (Fig. 45), covered with hooks or spines and burlike as in *Acanthospermum* (Fig. 47), or the bract may be tightly fused to and hardly distinguishable from the achene as in *Melampodium* (Fig. 52). In *Sclerocarpus* (Fig. 69) the surrounding bract is adnate to the achene apex but sometimes breaks free during dispersal.

Several achenes (or heads) may be held in glomerules with associated bracts to form a burlike utricle in members of the Vernoniaeae (Fig. 10B).

In a number of Panamanian *Compositae* the fruit is fleshy and bird-dispersed. The inulin-rich pericarp of *Wulffia* is soft and fleshy and this baccate fruit is technically a drupe. In *Clibadium* and *Milleria* (Fig. 46) parts of the involucre are fleshy or even juicy and form a baccate structure. The baccate condition is best noted in fresh material and may pass unnoticed when dry.

Achene shape is sometimes indicative of tribe; thus the Heliantheae and Cardueae have generally larger achenes than those of other tribes and in the Lactuceae, Tageteae, and Mutisieae, fruits are often long and thin. Achenes are often compressed in the Astereae and Heliantheae and sometimes in the Lactuceae, but are mostly oblong and cylindrical in the Vernoniaeae, Eupatorieae, Inuleae, and Senecioneae. Winged achenes occur only in the Heliantheae.

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Much literature in the text is listed either with the appropriate genera, or if the same citation occurs in two different genera, its reference will be found here.

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CONSPECTUS OF THE PANAMANIAN COMPOSITAE³

- a. Heads with staminate or perfect florets towards the middle, the corollas tubular, 5-lobed; sometimes with pistillate florets towards the outside, the corollas tubular or ligulate; sap not milky.
- b. Anther tips with sterile, tongue-like, often hyaline appendages.
- c. Florets all alike, perfect, corollas tubular, not yellow; anthers not tailed; receptacle naked.
- d. Leaves alternate; style branches slender, terete, hairy all over, the style shaft apically hairy; anthers auricled; hairs often 1-celled.....
- Tribe I. Vernonieae p. 856
- e. Heads all distinct.....
- Subtribe A. Vernoniinae
- | | |
|------------------------|---------------------|
| 1. <i>Centratherum</i> | 4. <i>Struchium</i> |
| 2. <i>Piptocarpha</i> | 5. <i>Vernonia</i> |
| 3. <i>Pollalesta</i> | |
- ee. Heads fused in glomerules in a common receptacle.....
- Subtribe B. Elephantopodinae
- | | |
|-----------------------------|-----------------------|
| 6. <i>Elephantopus</i> | 8. <i>Rolandra</i> |
| 7. <i>Pseudelephantopus</i> | 9. <i>Spiracantha</i> |
- dd. Leaves mostly opposite (except sometimes in the region of the inflorescence); style branches gradually expanded near the tips, papillose or short-hairy, the style shaft often glabrous; anthers obtuse or rounded; hairs multicellular, often moniliform.....
- Tribe II. Eupatorieae p. 888
- | | | |
|------------------------------|---------------------------|--------------------------|
| 10. <i>Adenostemma</i> | 18. <i>Condylidium</i> | 26. <i>Koanophyllon</i> |
| 11. <i>Ageratina</i> | 19. <i>Critonia</i> | 27. <i>Mikania</i> |
| 12. <i>Ageratum</i> | 20. <i>Decachaeta</i> | 28. <i>Neomirandea</i> |
| 13. <i>Austroeupeatorium</i> | 21. <i>Fleischmannia</i> | 29. <i>Piqueria</i> |
| 14. <i>Ayapana</i> | 22. <i>Gongrostylus</i> | 30. <i>Sciadocephala</i> |
| 15. <i>Bartlettina</i> | 23. <i>Hebeclinium</i> | 31. <i>Stevia</i> |
| 16. <i>Brickellia</i> | 24. <i>Heterocondylus</i> | 32. <i>Tuberostylis</i> |
| 17. <i>Chromolaena</i> | 25. <i>Isocarpha</i> | |
- cc. Florets often not all alike, corollas often yellow; anthers sometimes tailed; receptacle naked or with paleas.
- f. Leaves mostly not spiny; involucre bracts not spiny; anthers tailed or not; style shaft without an apical ring.
- g. Leaves alternate; style branches flattened-fusiform, sometimes apically appendaged or rounded; anthers tailed or not; receptacle mostly naked; pappus mostly of bristles.
- h. Anthers obtuse; style branches often appendaged; achene often compressed; hairs multicellular.....
- Tribe III. Astereae p. 1004
- | | |
|---------------------------|-----------------------|
| 33. <i>Archibaccharis</i> | 36. <i>Conyza</i> |
| 34. <i>Aster</i> | 37. <i>Erigeron</i> |
| 35. <i>Baccharis</i> | 38. <i>Lagenifera</i> |
- hh. Anthers tailed; style branches rounded; achene plump; hairs arachnoid.....
- Tribe IV. Inuleae p. 1033
- | | |
|------------------------|------------------------|
| 39. <i>Blumea</i> | 42. <i>Pluchea</i> |
| 40. <i>Gnaphalium</i> | 43. <i>Pterocaulon</i> |
| 41. <i>Helichrysum</i> | 44. <i>Tessaria</i> |
- gg. Leaves alternate or opposite; style branches flattened-fusiform, sometimes apically appendaged; anthers not tailed; receptacle with paleas or naked; pappus of bristles, awns, or scales.
- i. Pappus of awns, stiff bristles, or scales; style branches often appendaged.
- j. Involucre without transparent margins; leaves mostly opposite, often 3-nerved from the base or trifoliate.
- k. Receptacle mostly with paleas enfolding the achenes; involucre bracts mostly unequal, overlapping; leaves mostly eglandular; hairs often verrucose.....
- Tribe V. Heliantheae p. 1053
- l. Florets few; central florets abortive; receptacle naked.....
- Subtribe A. Milleriinae
- | | |
|--------------------|---------------------|
| 45. <i>Delilia</i> | 46. <i>Milleria</i> |
|--------------------|---------------------|

³ Adapted in part from Benthams (1873a).

- 1." Florets many; central florets abortive; receptacle mostly with paleas Subtribe B. Melampodiinae
 47. *Acanthospermum* 51. *Melampodium*
 48. *Baltimora* 52. *Polymnia*
 49. *Clibadium* 53. *Unxia*
 50. *Ichthyothere*
- 1.'" Heads discoid and unisexual, or radiate and central florets abortive Subtribe C. Ambrosiinae
 54. *Ambrosia* 55. *Parthenium*
- 1.'" Heads radiate, the corollas of the ray florets without a tube, persistent Subtribe D. Zinniinae
 56. *Heliopsis* 57. *Zinnia*
- 1.'" Achenes laterally compressed; pappus often of awns Subtribe E. Helianthinae
 58. *Eclipta* 68. *Sigesbeckia*
 59. *Eleutheranthera* 69. *Simsia*
 60. *Garcilassa* 70. *Spilanthes*
 61. *Lasianthaea* 71. *Tithonia*
 62. *Melanthera* 72. *Verbesina*
 63. *Montanoa* 73. *Viguiera*
 64. *Oyedaea* 74. *Wedelia*
 65. *Rumfordia* 75. *Wulffia*
 66. *Salmea* 76. *Zexmenia*
 67. *Sclerocarpus*
- 1.'" Achenes dorsiventrally compressed; involucre bracts biseriate Subtribe F. Coreopsidinae
 77. *Bidens* 81. *Hidalgia*
 78. *Chrysanthellum* 82. *Synedrella*
 79. *Cosmos* 83. *Trichospora*
 80. *Dahlia*
- 1.'" Pappus of plumose awns or bristles Subtribe G. Galinsoginae
 84. *Calea* 87. *Sabazia*
 85. *Galinsoga* 88. *Tridax*
 86. *Jaegeria*
- kk. Receptacle naked; involucre bracts equal, mostly valvate; leaves with oil glands; glabrate Tribe VI. Tageteae p. 1220
 89. *Dyssodia* 91. *Porophyllum*
 90. *Pectis* 92. *Tagetes*
- jj. Involucre with hyaline, transparent, brownish margins; leaves alternate, with a strong midvein Tribe VII. Anthemideae p. 1241
 93. *Chrysanthemum*
- ii. Pappus of soft, silky, hairlike bristles; style branches not appendaged Tribe VIII. Senecioneae p. 1244
 94. *Emilia* 97. *Neurolaena*
 95. *Erechtites* 98. *Schistocarpa*
 96. *Liabum* 99. *Senecio*
- ff. Leaves and involucre bracts spiny; anthers tailed; style shaft with an apical ring Tribe XI. Cardueae p. 1272
 100. *Cirsium*
- bb. Anther tips sterile but not differentiated into hyaline, tongue-like appendages; anthers mostly tailed Tribe XII. Mutisieae p. 1276
 101. *Chaptalia* 103. *Jungia* 105. *Onoseris*
 102. *Gerbera* 104. *Lycoseris* 106. *Trixis*
- aa. Heads with only perfect florets, the corollas ligulate, 5-denticulate; sap milky Tribe XIII. Lactuceae p. 1292
 107. *Hieracium* 109. *Sonchus* 111. *Youngia*
 108. *Hypochoeris* 110. *Taraxacum*

KEY TO THE GENERA

1. Leaves opposite (reduced leaves or bracts sometimes alternate near the inflorescence).
2. Leaves compound or deeply lobed.
3. Leaves and involucre with conspicuous oil glands 92. *Tagetes*
- 3.' Leaves and involucre without glands.
4. Leaves simple with pointed lobes; achene subglobose or prismatic; pappus of fine bristles or wanting.
5. Achenes subglobose; pappus wanting 52. *Polymnia*
- 5.' Achenes oblong, prismatic, or 5-ribbed; pappus of bristles.
6. Pappus bristles fine, strigose; achene glabrous or pubescent; trees or shrubs; paleas absent 28. *Neomirandea*
- 6.' Pappus bristles basally flattened or stout, plumose; achene copiously ascending-pilose; paleas present 88. *Tridax*
- 4.' Leaves compound or if simple the lobes rounded; achene linear or compressed; pappus of barbed awns or wanting.
7. Heads large, the involucre more than 1 cm across; inner involucre bracts with broad, hyaline margins; trees or cultivated herbs 80. *Dahlia*
- 7.' Heads smaller, the involucre mostly less than 1 cm across; involucre bracts with herbaceous margins; herbs, sometimes cultivated.
8. Vines climbing by hooked petioles; achene oblong; outer involucre bracts 5, slender, spreading 81. *Hidalgia*
- 8.' Herbs or vines lacking hooked petioles; achene linear; outer involucre bracts various.
9. Achene with a distinct beak; leaves deeply dissected, more than 3 cm long 79. *Cosmos*
- 9.' Achene without a distinct beak; leaves trifoliate, or less than 3 cm long 77. *Bidens*
- 2.' Leaves simple, not deeply lobed.
10. Fruit a simple, dry achene, not spiny, falling free from the head and involucre parts.
11. Pappus of 1-5 stalked knobs.
12. Corolla pilose near the lobes; heads with more than 10 florets; involucre bracts 10-20; anther appendages wider than long 10. *Adenostemma*
- 12.' Corolla generally puberulent outside; heads usually with fewer than 10 florets; involucre bracts 7-8; anther appendages longer than wide 30. *Sciadocephala*
- 11.' Pappus of bristles, scales, awns, or wanting, not of stalked knobs.
13. Pappus of numerous (more than 10) bristles or scales; paleas mostly wanting.
14. Involucre bracts fewer than 10.
15. Heads discoid; florets all alike, all with stamens.
16. Heads more than 15 mm tall, with 5 involucre bracts and numerous florets 91. *Porophyllum*
- 16.' Heads less than 10 mm tall, with 4 involucre bracts and 4 florets 27. *Mikania*
- 15.' Heads radiate; outer florets lacking stamens 90. *Pectis*
- 14.' Involucre bracts more than 10.
17. Involucre bracts 10-15 mm tall, oblong, blunt, with conspicuous dark, glandular streaks 89. *Dyssodia*
- 17.' Involucre bracts not as above.
18. Pappus plumose, the bristles (scales) basally broad 88. *Tridax*
- 18.' Pappus not plumose (sometimes strigulose or barbellate).
19. Leaves strongly discolored, green or brown and glabrate above, whitish, sometimes tomentose, beneath.
20. Florets yellow or white; leaves broad, felty-tomentose beneath 96. *Liabum*
- 20.' Florets violet or white; leaves narrow, glabrous beneath.
21. Principal leaves more than 5 cm long; involucre manifestly pubescent; corolla tube slender, strongly expanded about halfway up 11. *Ageratina*
- 21.' Principal leaves less than 5 cm long; involucre glabrate; corolla gradually broadening upward 12. *Ageratum*
- 19.' Leaves concolorous, similar on both sides.

22. Receptacles paleaceous; corollas yellow or white; verrucose hairs often present.
23. Pappus bristles basally flat and broad; achenes pubescent 84. *Calea*
- 23.' Pappus bristles slender; achenes glabrous 98. *Schistocarpha*
- 22.' Receptacles naked; corollas white, pink, purplish, not yellow; hairs not of verrucose type, mostly moniliform.
24. Heads with fewer than 6 florets.
25. Leaves copiously glandular beneath; small herbs 18. *Condylidium*
- 25.' Leaves eglandular beneath; shrubs 19. *Critonia*
- 24.' Heads with more than 6 florets.
26. All involucre bracts deciduous in age; involucre tubular, 5–8 mm tall, 2–3 times longer than broad, the bracts appressed, overlapping, the tips of the outermost differentiated and appearing as brown or green spots on the yellowish, striate involucre 17. *Chromolaena*
- 26.' At least some involucre bracts persistent; involucre not as above.
27. Anther appendages shorter than wide, often inconspicuous.
28. Style branches with prominent, fusiform knobs at the tips; outer involucre bracts with more than 7 fine, elevated ribs; inner involucre bracts more than twice as long as the achene; vines 22. *Gongrostylus*
- 28.' Style branches sometimes expanded apically but without knobs (expansion in only 2 dimensions); outer involucre bracts without fine, elevated ribs; inner involucre bracts only slightly exceeding the achene; herbs or shrubs 26. *Koanophyllon*
- 27.' Anther appendages as long as wide or longer, mostly prominent.
29. Pedicels glabrous; involucre bracts narrow with broad, hyaline margins, glabrous; achene weakly 10-ribbed 16. *Brickellia*
- 29.' Pedicels and inflorescence branches pubescent, mostly tomentose; involucre bracts mostly not as above; achene 2–6-ribbed.
30. Corolla slender, strongly expanded about halfway up; pappus bristles easily deciduous 11. *Ageratina*
- 30.' Corolla gradually expanded upwards, the limb not sharply demarcated; pappus bristles persistent.
31. Heads large; involucre bracts more than 2 mm wide; receptacle more than 2 mm across; achenes more than 2.2 mm long.
32. Pedicels stout; achenes more than 2.5 mm long 24. *Heterocondylus*
- 32.' Pedicels slender; achenes less than 2.5 mm long 15. *Bartlettia*
- 31.' Heads smaller; involucre bracts less than 2 mm wide; receptacle less than 2 mm across; achenes mostly less than 2.2 mm long.
33. Most leaves less than 6 cm long (excluding petiole) 21. *Fleischmannia*
- 33.' Leaves more than 6 cm long.
34. Receptacle hemispherical, hairy; corolla lobes pilose 23. *Hebeclinium*
- 34.' Receptacle flat or weakly convex, glabrous; corolla lobes glabrous or pilose.
35. Leaves subsessile, the blade expanded abruptly (not always widely) above the short petiole; nectary large and conspicuous on the achene apex 14. *Ayapana*

- 35.' Leaves petiolate, the blade basally acuminate; nectary mostly not prominent.
- 36. Involucral bracts 1 mm wide or less ----- 21. *Fleischmannia*
- 36.' Involucral bracts 1-2 mm wide.
- 37. Leaves copiously pubescent above; achene glandular --- 13. *Austroeupatorium*
- 37.' Leaves glabrate above; achene eglandular.
- 38. Corolla lobes pilose; heads with more than 20 florets ----- 15. *Bartlettina*
- 38.' Corolla lobes glabrous; heads with 8-12 florets ----- 19. *Critonia*
- 13.' Pappus of fewer than 8 bristles, scales, awns, or wanting; paleas mostly present.
- 39. Leaves copiously glandular beneath.
- 40. Heads discoid; florets bright yellow.
- 41. Large herbs or shrubs; leaves broad, pubescent; paleas conspicuous ----- 63. *Montanoa*
- 41.' Small herbs; leaves narrow, glabrate; paleas wanting ----- 90. *Pectis*
- 40.' Heads discoid; florets white or purplish.
- 42. Heads with 3-5 perfect florets; involucral bracts 3-5 ----- 31. *Stevia*
- 42.' Heads with more than 5 florets; involucral bracts 5.
- 43. Involucre longer than the disc; florets fewer than 12 ----- 59. *Eleutheranthera*
- 43.' Involucre shorter than the disc; florets mostly more than 12.
- 44. Heads purplish; disc nearly flat; paleas wanting ----- 12. *Ageratum*
- 44.' Heads whitish; disc strongly convex or conical; paleas present ----- 25. *Isocarpha*
- 39.' Leaves eglandular beneath.
- 45. Outer involucral bracts 5, linear-spathulate, widely-spreading with conspicuous, stalked glands; verrucose hairs not present ----- 68. *Sigesbeckia*
- 45.' Involucral bracts not as above; verrucose hairs often present.
- 46. Paleas linear, apically barbed ----- 58. *Eclipta*
- 46.' Paleas broader or wanting, not apically barbed.
- 47. Heads discoid; florets all alike.
- 48. Achenes with 2-3 prominent, ciliate angles.
- 49. Heads solitary on long peduncles, sometimes in loose, ill-defined aggregates; heads more than 6 mm across ----- 70. *Spilanthes*
- 49.' Heads in small, many-headed inflorescences; heads less than 6 mm across ----- 66. *Salmea*
- 48.' Achenes terete, ribbed, or compressed, but not with 2-3 ciliate angles.
- 50. Heads with more than 15 involucral bracts; florets often more than 20.
- 51. Heads in well-defined inflorescences; paleas wanting.
- 52. Involucral bracts narrow, persistent; pedicels slender; erect, terrestrial plants ----- 12. *Ageratum*
- 52.' Involucral bracts broad, the inner series deciduous; pedicels stout; epiphytes on mangroves ----- 32. *Tuberostylis*
- 51.' Heads solitary or in loose, ill-defined aggregates; paleas present.
- 53. Achene compressed with definite angles; pappus of 2-8 caducous, strigose bristles; involucral bracts with blunt tips ----- 62. *Melanthera*
- 53.' Achene mostly without definite angles; pappus of scales or wanting; involucral bracts with narrow tips ----- 73. *Viguiera*
- 50.' Heads with fewer than 15 involucral bracts; florets mostly fewer than 15.
- 54. Pappus of two stout awns; leaves strongly discolorous, glabrous and drying dark above, grey tomentose beneath ----- 83. *Trichospira*

- 54.' Pappus of low scales or wanting; leaves concolorous, pubescent or glabrate.
55. Paleas present; corollas evenly pubescent 60. *Garcilassa*
- 55.' Paleas wanting; corollas pilose on the tube, glabrate above 29. *Piqueria*
- 47.' Heads radiate; florets differentiated.
56. Achenes dimorphic, the innermost linear with 2(3) stout awns, the outermost flat with lacinate margins 82. *Synedrella*
- 56.' Achenes all alike, or if differentiated, the awns small and weak.
57. Heads small, less than 6 mm across; pappus mostly minute or wanting.
58. Herbs or shrubs more than 60 cm tall.
59. Heads white; heads in small clusters on pedicels mostly shorter than the heads; shrubs or large herbs.
60. Involucre biseriate; inflorescence of 10-30 heads 50. *Ichthyothere*
- 60.' Involucre multiseriate; inflorescence of 10-800 heads 49. *Clibadium*
- 59.' Heads yellow; heads mostly solitary on pedicels often much longer than the heads; tall herbs with slender branches 48. *Baltimora*
- 58.' Herbs less than 60 cm tall or sprawling.
61. Outer bracts short with prominent white margins; leaves narrowly spatulate, serrate near the apex 78. *Chrysanthellum*
- 61.' Outer bracts without white margins; leaves ovate or elliptical.
62. Petioles conspicuously long-pilose, the hairs eglandular; pedicels obscure, the heads subtended by a pair of large, foliaceous bracts; receptacle weakly convex 53. *Unxia*
- 62.' Petioles glabrate or if pilose, the hairs gland-tipped; pedicels evident, foliaceous bracts mostly wanting; receptacle conical or convex.
63. Achenes sharply 2-3-angled, conspicuously ciliate 70. *Spilanthes*
- 63.' Achenes eciliate, mostly plump, not angled.
64. Involucre with conspicuous, stout hairs; involucre bracts 1-2-seriate, narrow, but basally expanded; pedicel hairs eglandular 86. *Jaegeria*
- 64.' Involucre sparsely pilose; involucre bracts 2-many-seriate, broad, not basally expanded; pedicel hairs often gland-tipped.
65. Heads with 3-8 ray florets; florets each enclosed by an involucre bract and 2-3 paleas 85. *Galinsoga*
- 65.' Heads with 8-17 ray florets; florets not usually enclosed by involucre bracts 87. *Sabazia*
- 57.' Heads larger, more than 6 mm across; pappus mostly present.
66. Achene angles or wings ciliate, not pubescent overall.
67. Achene with prominent, sturdy awns, sometimes winged 76. *Zexmenia*
- 67.' Achene with weak, small awns or none, not winged 70. *Spilanthes*
- 66.' Achene not ciliate, sometimes minutely strigose.
68. Pappus of prominent, persistent awns; achene winged only apically or not at all.
69. Upper leaves alternate, most leaves lobed; heads large (involucre more than 2 cm across) 71. *Tithonia*
- 69.' All leaves opposite, not lobed; heads smaller.
70. Involucre bracts with slender, awnlike tips.
71. Achene sharply angled; ray florets fertile 61. *Lasianthaea*

- 71.' Achene only slightly angled; ray florets sterile 73. *Viguiera*
- 70.' Involucral bracts with blunt tips; ray florets sterile.
72. Achene evenly canescent or pilose with long hairs 69. *Simsia*
- 72.' Achene glabrate 64. *Oyedaea*
- 68.' Pappus various but not of prominent, persistent awns; if awns present, then the achene conspicuously winged.
73. Involucral bracts broadly rounded or truncate.
74. Achene smooth; corolla of the ray floret a sessile ligule (without a tube), persistent on the achene 57. *Zinnia*
- 74.' Achene tuberculate (actually enfolded by an adnate involucral bract); corolla of the ray floret with a tube, falling before the achene matures 51. *Melampodium*
- 73.' Involucral bracts pointed.
75. Outer involucral bracts ca. 5, foliaceous, often wide-spreading from the base; corolla tube of ray florets elongate.
76. Ray florets fertile; corolla of disc florets without black hairs; achenes falling free; verrucose hairs wanting; inflorescence a panicle 65. *Rumfordia*
- 76.' Ray florets abortive; corolla of disc florets with black hairs near the apex; achenes enveloped by and falling with the palea; verrucose hairs present; inflorescence of solitary or loosely aggregated heads 67. *Sclerocarpus*
- 75.' Outer involucral bracts more than 5, not wide-spreading except sometimes at the tips; corolla tube of ray florets mostly shorter than the achenes or wanting.
77. Ray corolla lacking a tube, persistent on the achene; pappus wanting 56. *Heliopsis*
- 77.' Ray corolla with a tube, falling before the achene matures; pappus present or not.
78. High-climbing vine; achene epappose, unbeaked 75. *Wulffia*
- 78.' Terrestrial herbs; achene with pappus often present, a small beak sometimes present.
79. Bracts narrow, straight 73. *Viguiera*
- 79.' Bracts broad, curved 74. *Wedelia*
- 10.' Fruit not falling as a simple, dry achene, either baccate or the achene united with the involucral bracts or palea and falling as a coalesced unit (utriculate), sometimes with hooks or spines.
80. Fruit thin with broad wings (flat, compressed bracts) 45. *Delilia*
- 80.' Fruit plump, wingless.
81. Fruit achenelike with prominent hooks or spines (formed on the enveloping involucre); heads sessile 47. *Acanthospermum*
- 81.' Fruits without hooks or spines; heads pedunculate.
82. Fruit baccate or drupaceous, the fleshy or soft-leathery tissues formed by the pericarp or involucre.
83. High-climbing vines; fruits free from the subtending, conspicuous, pointed paleas; ray florets numerous, showy 75. *Wulffia*
- 83.' Erect, slender herbs or shrubs; fruits enclosed in a fleshy involucre; ray florets solitary or inconspicuous; paleas obscure or wanting.
84. Ray floret yellow, solitary; outer 2 involucral bracts fused and enveloping the achene and inner bracts 46. *Milleria*
- 84.' Ray florets white, several; outer involucral bracts separate, open apically 49. *Clibadium*
- 82.' Fruit dry, formed by coalescence of the achene with involucral bracts or paleas.
85. Ligules copiously pubescent beneath; disc corollas apically black-pilose;

- foliaceous bracts below the heads (upper leaves) alternate 67. *Sclerocarpus*
- 85.' Ligules glabrate beneath; disc corollas without black hairs; leaves and bracts all opposite 51. *Melampodium*
- 1.' Leaves alternate or restricted to a basal rosette.
86. Leaf tips and involucre spiny 100. *Cirsium*
- 86.' Leaves and involucre not spiny.
87. Involucre of numerous, broad, colored, strawlike, persistent bracts; cultivated ornamental with large (more than 3 cm across) showy heads 41. *Helichrysum*
- 87.' Involucre not as above; heads mostly smaller.
88. Heads ligulate; florets perfect; corollas 5-denticulate, yellow or white; achenes conspicuously sulcate, often linear; pappus mostly of silky bristles; sap milky.
89. Pedicels tomentose; tawny hairs over 5 mm long conspicuous on leaves or stems; leaves mostly denticulate, not incised 107. *Hieracium*
- 89.' Pedicels glabrate; tawny hairs over 5 mm long lacking (gland-tipped bristles sometimes present); leaves often incised.
90. Leaves mostly cauline; pappus of both fine hairs and bristles 109. *Sonchus*
- 90.' Leaves in a basal rosette; pappus of bristles or fine hairs but not of both.
91. Heads less than 7 mm tall; inflorescence a many-headed, scapose panicle 111. *Youngia*
- 91.' Heads more than 10 mm tall; inflorescence few-(or 1-)headed.
92. Leaves glabrate; inflorescences unbranched; paleas wanting 110. *Taraxacum*
- 92.' Leaves copiously pubescent; inflorescences branched; paleas present 108. *Hypochoeris*
- 88.' Heads radiate or discoid; florets mostly bisexual; corollas variously colored; achenes sometimes ribbed but seldom sulcate, seldom linear; pappus various; sap clear.
93. Anther tips sterile but not differentiated into distinct, hyaline, ligular appendages; anthers bases tailed, always present.
94. Scapose herbs, leaves restricted to a basal rosette; heads single.
95. Heads conspicuously radiate, the rays showy; heads more than 30 mm across; cultivated plant, not fruiting in Panama 102. *Gerbera*
- 95.' Heads inconspicuously radiate or disciform; heads less than 20 mm across; native plants fruiting in Panama 101. *Chaptalia*
- 94.' Leafy stemmed herbs, shrubs or vines, the stems leafy; peduncles borne on leafy stems, mostly in inflorescences.
96. Leaves subentire or inconspicuously denticulate; heads solitary or in few-headed (less than 10) inflorescences.
97. Heads solitary, large; involucre multiseriate, more than 20 mm long; florets orange or red 104. *Lycoseris*
- 97.' Heads in several-headed inflorescences, smaller; involucre 1-2-seriate, less than 20 mm long; florets yellow 106. *Trixis*
- 96.' Leaves prominently lobed; heads in many-headed inflorescences.
98. Erect herb or shrub; leaves glabrate above and lanate beneath; involucre bracts more than 10 mm long 105. *Onoseris*
- 98.' Woody vine; leaves tomentose on each side; involucre bracts less than 10 mm long 103. *Jungia*
- 93.' Anther tips sterile and differentiated into ligulate, hyaline appendages; anther bases mostly obtuse, rarely wanting.
99. Heads radiate, disciform, or unisexual; florets of at least 2 kinds.
100. Involucral bracts with distinct, brownish or yellowish, sometimes hyaline borders.
101. Leaves less than 12 mm wide; heads less than 15 mm across; creeping native plants 78. *Chrysanthellum*
- 101.' Leaves more than 12 mm wide; heads more than 25 mm across; erect cultivated plants 93. *Chrysanthemum*
- 100.' Involucral bracts sometimes scarious-margined but without distinct borders.
102. Leaves compound, deeply divided or strongly 3-nerved from near the base.

103. Heads unisexual, the two sexes in different-appearing heads (non-functional parts present but much reduced).
104. Leaves deeply dissected, the segments narrow; staminate and pistillate heads on the same plant 54. *Ambrosia*
- 104.' Leaves not dissected; staminate and pistillate heads on different plants (dioecious).
105. Heads discoid; involucre less than 10 mm tall 35. *Baccharis*
- 105.' Heads disciform or radiate, the outer florets often few and inconspicuous; involucre more than 15 mm tall 104. *Lycoseris*
- 103.' Heads perfect, both sexes present and functional in each head.
106. Involucre of valvate, weakly connate bracts, sometimes with an outer series of short, free bracts; pappus of numerous silky bristles.
107. Leaves entire; florets yellowish or whitish; woody vine 99. *Senecio*
- 107.' Leaves toothed or lobed; florets pinkish or whitish; herb 95. *Erechtites*
- 106.' Involucre of several-seriate, overlapping, free bracts; pappus of awns, scales, or wanting, not of bristles.
108. Involucre more than 20 mm across; peduncles elongate, conspicuously thickened and fistulose apically 71. *Tithonia*
- 108.' Involucre smaller; peduncles not conspicuously thickened apically or fistulose.
109. Inflorescence well-defined, composed of 10-800 heads; heads, exclusive of rays, less than 8 mm tall.
110. Leaves dissected; herbs to 1 m tall.
- 110a. Ligules 5, less than 1 mm long, inconspicuous; outer involucre of 5 ovate bracts 55. *Parthenium*
- 110a.' Ligules 8 or more, more than 2 mm long; involucre of numerous lanceolate bracts 93. *Chrysanthemum*
- 110.' Leaves serrate or subentire, unlobed; shrubs or trees mostly over 1 m tall 49. *Clibadium*
- 109.' Inflorescence ill-defined, composed of a few aggregated heads; heads more than 10 mm tall.
111. Disc florets with black hairs near the apex; involucre bracts in 2 unlike series, the outer foliaceous, the inner shorter 67. *Sclerocarpus*
- 111.' Disc florets without black hairs; involucre bracts numerous in several graded series.
112. Achene apically depressed between the awns; pappus of two stout, basally flattened, strigose awns 69. *Simsia*
- 112.' Achene apically round or flat; pappus of awns and scales, of scales, or wanting, not of awns alone 73. *Viguiera*
- 102.' Leaves simple, toothed or lobed, the sinuses not extending halfway to the midvein, mostly not 3-nerved from near the base, mostly pinnately veined with a single midvein or digitate with more than 3 veins.
113. Pappus of silky or strigose bristles.
114. Heads large, the involucre more than 3 cm across; achene and pappus bristles together more than 20 mm long 104. *Lycoseris*
- 114.' Heads smaller; achene shorter.
115. Heads radiate, the peripheral florets pistillate and the ligules manifestly exceeding the style branches, pappus and disc florets.
116. Leaves reduced to scales or spines; midvein of involucre bracts slightly enlarged apically 34. *Aster*
- 116.' Plants with normal, broad leaves, not spiny; midvein of involucre bracts not enlarged apically.
117. Achenes compressed; herbs; ray florets white, bluish, or purplish 37. *Erigeron*

- 117.' Achenes terete; mostly shrubs or trees; all florets yellow or orange 99. *Senecio*
- 115.' Heads disciform, the peripheral florets perfect (*Archibaccharis*) or the ligules not exceeding the style branches, pappus, and disc florets.
118. Achene compressed 2(3)-ribbed; anthers tailless.
119. Herbs; plants perfect, both staminate and pistillate florets functional in each head 36. *Conyza*
- 119.' Shrubs or vines; plants dioecious, one sex not functional on each plant 33. *Archibaccharis*
- 118.' Achene plump, sometimes 5-ribbed; anthers mostly tailed.
120. Leaves scabrous above; receptacles paleaceous; verrucose hairs present 97. *Neurolaena*
- 120.' Leaves soft or smooth on both sides; receptacles naked; hairs not of verrucose type.
121. Involucre of an inner series of narrow, similar bracts more than 6 mm long and an outer (calyculate) series of minute, similar bracts.
122. Leaves entire; florets yellowish or whitish; woody vine 99. *Senecio*
- 122.' Leaves toothed or lobed; florets pinkish or whitish; herb 95. *Erechtites*
- 121.' Involucre of graded bracts in several series, the innermost mostly 6 mm long, often broad.
123. Stems conspicuously winged; achene (with pappus) more than 6 mm long 43. *Pterocaulon*
- 123.' Stems wingless or obscurely so; achene (with pappus) less than 6 mm long.
124. Involucral bracts narrow, acicular; leaves, including petiolar region, saliently dentate 39. *Blumea*
- 124.' Involucral bracts obtuse; leaves entire or serrate, entire in the petiolar region.
125. Heads glomerate, the pedicels obscure or wanting; leaves less than 10 mm wide, wooly beneath 40. *Gnaphalium*
- 125.' Heads with evident pedicels; leaves more than 10 mm wide, puberulent or glabrate beneath.
126. Leaves with stalked glands beneath; nectary of the staminate disc florets small 42. *Pluchea*
- 126.' Leaves sometimes glandular-punctate but without stalked glands; nectary of the solitary staminate disc floret much larger than the ovary 44. *Tessaria*
- 113.' Pappus of awns, glands, scales, or wanting.
127. Pappus present, of awns or scales.
128. Achene prominently winged 72. *Verbesina*
- 128.' Achene not or only indistinctly winged.
129. Shrubs; inflorescence well-defined and many-headed (10–800 heads) 49. *Clibadium*
- 129.' Herbs; inflorescence an ill-defined aggregate of solitary heads 61. *Lasianthaea*
- 127.' Pappus wanting or rudimentary, not of scales or awns.
130. Plants scapose or creeping; leaves basally narrowed or sessile; receptacle flat or convex.
131. Ray florets yellow; outer involucral bracts with whitish or yellowish margins; achene apex glandular 78. *Chrysanthellum*
- 131.' Ray florets not yellow; outer involucral bracts without whitish margins; achene with a glandular apical peg 38. *Lagenifera*
- 130.' Plants erect; leaves petiolate, basally obtuse or truncate; receptacle hemispherical 93. *Chrysanthemum*

- 99.' Heads discoid; florets all alike, all tubular, all perfect; corolla equally 4-5-lobed or with 1 deep sinus and thus zygomorphic.
132. Involucre cylindrical of numerous, valvate, slightly connate bracts in one series; leaves often saliently toothed; pappus of fine, weak, white, silky bristles 94. *Emilia*
- 132.' Involucre mostly campanulate to funnelform of overlapping, marginally free bracts in several graded series; leaves serrate to entire; pappus various but not as above.
133. Paleas present; achenes mostly compressed (not in *Neurolaena*).
134. Leaves 3-nerved from near the base; herbs.
135. Leaves eglandular; pappus of minute scales 60. *Garcilassa*
- 135.' Leaves glandular beneath; pappus of strigose awns 59. *Eleutheranthera*
- 134.' Leaves 1-nerved; shrubs or vines.
136. Achenes prominently winged 72. *Verbesina*
- 136.' Achenes unwinged.
137. Leaves glabrous above; herbs less than 80 cm tall; heads sessile, solitary, or paired on a leafy rhachis; pappus of stout awns 83. *Trichospira*
- 137.' Leaves pubescent above; herbs or shrubs over 80 cm tall; heads in open, pedunculate, many-sided inflorescences; pappus of strigulose bristles.
138. Leaves with numerous, minute glands beneath; heads bisexual; verrucose hairs present 97. *Neurolaena*
- 138.' Leaves eglandular; heads functionally unisexual; verrucose hairs wanting 33. *Archibaccharis*
- 133.' Paleas wanting; achenes various.
139. Heads united into glomerules in a common involucre of indurate bracts, this sometimes subtended by foliaceous bracts as well, the glomerules mostly appearing as sessile fascicles; herbs.
140. Leaves mostly basal on the lower one half of the stem, the lower surfaces with long, stout hairs; glomerules on mostly leafless peduncles with outer bracts (leaves) appressed to the glomerules, glomerules wanting on upper leaves.
141. Glomerules sessile on an elongate spike; glomerules narrow, ellipsoidal 7. *Pseudelephantopus*
- 141.' Glomerules mostly terminal, a few sessile ones present; glomerules as broad as tall, globose, or campanulate 6. *Elephantopus*
- 140.' Leaves mostly cauline, the lower surfaces whitish-lanate beneath the long hairs; glomerules mostly on leafy stems, the outer bracts (leaves) foliaceous, not appressed to the glomerule.
142. Involucral bracts glabrous or with a few long hairs; heads narrow, ellipsoidal 8. *Rolandra*
- 142.' Involucral bracts pilose; heads oblong 9. *Spiracantha*
- 139.' Heads all distinct, not in a common involucre, if appearing in a sessile fascicle, the heads distinct; herbs, vines, or shrubs.
143. Heads on elongate peduncles, subtended by serrate subinvolucral bracts resembling the leaves (glandular-punctate) 1. *Centratherum*
- 143.' Heads sessile or nearly so, bracts, when present, subentire.
144. Heads in sessile glomerules on leafy or leafless branches.
145. Leaves narrow, chartaceous, basally narrowed; herbs; pappus of low, connate scales 4. *Struchium*
- 145.' Leaves broad, coriaceous, basally rounded; woody vines; pappus of strigose bristles (awns) 2. *Piptocarpha*
- 144.' Heads individually sessile or pedicellate but not in sessile glomerules.
146. Achenes with a few, flat, elongate, awnlike, twisted, strap-like bristles; head with few (to 6) florets 3. *Pollalesta*

- 146.' Achenes with many strigose bristles and sometimes short hairs or scales; heads mostly with many florets.
 147. Leaves often with pointed lobes; style branches glabrate, lacking conspicuous hairs; achenes glabrate towards the base, eglandular.
 148. Involucral bracts drying with prominent, contrasting veins, eglandular; leaves 1-nerved 97. *Neurolaena*
 148.' Involucral bracts with obscure venation, minutely glandular; leaves 3-5-nerved from a point well above the base 20. *Decachaeta*
 147.' Leaves unlobed or the lobes rounded; style branches pilose; achenes pilose or hispid, sometimes glandular 5. *Vernonia*

I. VERNONIEAE

Vernonieae Cass., Jour. Phys. 88: 203. 1819. TYPE: *Vernonia* Schreb.

Vernoniaceae Bessey, Ann. Missouri Bot. Gard. 2: 163. 1915. TYPE: *Vernonia* Schreb.

Perennial *herbs* or *shrubs*, rarely *trees*, pubescence often of 1-celled, elongate hairs. *Leaves* mostly alternate, sometimes in a basal rosette, entire, subentire, or sometimes dentate or dissected, sessile or petiolate. *Inflorescences* various, in one subtribe the heads separate, in the other subtribe the heads united in glomerules with a common receptacle, these sometimes arranged in spikes or racemes. *Heads* discoid, florets mostly all perfect, all fertile, mostly all alike and tubular, but the outer florets differentiated in some genera; involucral bracts in evenly graded overlapping series; receptacle mostly flat, naked; corollas white, pink, purplish, rarely blue, never yellow, mostly tubular, equally 3-5-dentate but sometimes with one deeper suture; anthers appendaged, basally obtuse or auriculate (caudate-sagittate in *Piptocarpha*); style branches slender, elongate, uniformly pubescent, inconspicuously stigmatic near the base of the ventral surfaces: *Achenes* often ribbed, mostly terete or nearly so; pappus mostly of strigose bristles, sometimes of scales or coroniform.

This tribe may be recognized by its usually alternate leaves, its involucre of similar imbricate bracts in graded series, and its slender, pubescent style branches. It includes two subtribes which differ markedly in the appearance of the inflorescences; the Vernoniinae having open, distinct, and usually pedicellate heads, and the Elephantopodinae having the heads united into glomerules which are tightly enveloped by subinvolucral bracts. The tribe is best represented in the New World but there are numerous species of *Vernonia* in Africa. Augier & Du Merac (1951) argued that the Vernonieae is a primitive tribe stemming from tropical South America.

- a. Heads separate from each other; heads often with many florets (Vernoniinae).
 b. Pappus a ring (corona) shorter than the achene; achene glabrous, copiously glandular 4. *Struchium*
 bb. Pappus of strigose bristles or of scales longer than the achene; achene eglandular or sparingly glandular, sometimes pubescent.
 c. Inner involucral bracts awn-tipped; outer involucral bracts leaf-like, widely spreading; pappus easily deciduous 1. *Centratherum*

- cc. Involucral bracts awnless, indurate, and scalelike, mostly appressed to the head; pappus persistent.
- d. Heads with 1-6 florets; leaves tomentose beneath with stellate or dendritic hairs.
 - e. Leaves coriaceous, concolorous; involucre broad, the bracts apically puberulent with arachnoid hairs 2. *Piptocarpha*
 - ee. Leaves chartaceous, discolorous; involucre narrowly tubular, the surface of the bracts apically glabrous but ciliate with long, transparent hairs 3. *Pollalesta*
- dd. Heads with more than 6 florets; leaves glabrate or pubescent beneath, mostly with simple hairs 5. *Vernonia*
- aa. Heads in glomerules and united into a common receptacle; heads with few (1-5) florets (Elephantopodinae).
 - f. Leaves distinctly petiolate, conspicuously white-tomentose beneath, distributed throughout the stem; heads with 1 floret; corollas 4-lobed; pappus of scales.
 - g. Glomerules sessile, globose, ebracteate; achene glandular, yellowish; pappus a continuous crown to 0.3 mm high 8. *Rolandra*
 - gg. Glomerules usually pedunculate, capitate, bracteate; achene eglandular, grayish; pappus of 10 deciduous scales at least 0.5 mm long 9. *Spiracantha*
 - ff. Leaves obscurely petiolate, not conspicuously white-tomentose, reduced or absent above; heads with 4 florets; corollas 5-cleft; pappus of bristles.
 - h. Glomerules broad, several bracteate, many-headed; involucral bracts in 2 series, membranous throughout; pappus of straight bristles 6. *Elephantopus*
 - hh. Glomerules narrow, ebracteate, several-headed; involucral bracts in 4 series, green at tip, hyaline at base, on nerve, and margins; pappus of bristles, at least two of which are spirally twisted or doubly bent 7. *Pseudelephantopus*

A. VERNONIINAE

THOMAS S. ELIAS^{4,5}

Vernoniinae Less., *Linnaea* 5: 136. 1830. "Vernonieae." TYPE: *Vernonia* Schreb.

1. CENTRATHERUM

Centratherum Cass., *Bull. Soc. Philom.* 1817: 31. 1817. TYPE: *C. punctatum* Cass.

Ampherephis H.B.K., *Nov. Gen. Sp. Pl.* 4: 31. 1818.
Sphixia Schrank, *Pl. Rar. Hort. Monac. tab.* 80. 1819.
Amphibecis Schrank, *Syll. Ratisb.* 1: 86. 1824.
Crantzia Vell., *Fl. Flum. Ic.* 8, *tab.* 153. 1827 (1835).
Decaneurum DC., *Arch. Bot. (Paris)* 2: 516. 1833.
Phyllocephalum Blume, *Bijdragen.* 888. 1826.
Rolfinkia Zenk., *Pl. Ind.* 13, *tab.* 14. 1837.
Wightia Spreng. ex. DC., *Prod.* 5: 67. 1836.

Herbs to *subshrubs*, often diffusely branched; branches terete, glabrescent to villous. *Leaves* alternate, petiolate; blades lanceolate, ovate, elliptic or obovate, acute to subacuminate at the apex, cuneate at the base, marginally serrate, rarely entire, pubescent. *Inflorescences* axillary to terminal; involucre broadly hemispherical to broadly campanulate. *Heads* discoid with many florets; involucral

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⁵Based in part on a preliminary manuscript prepared in 1963 by James A. Duke, Plant Taxonomy Laboratory, United States Department of Agriculture, Agricultural Research Service, Beltsville, Maryland 20705. This contribution by Dr. Duke is gratefully acknowledged.

bracts in several series, the outer bracts foliaceous, the inner bracts erect, appressed, membranous to scarious; receptacle flat to subconvex, naked; florets regular, corolla narrowly tubular, 5-lobed, purplish to bluish; stamens 5, the anthers sagittate, obtuse at the base, exserted; ovary oblong, compressed, style slender, the branches exserted. *Achenes* 8–10-costate, oblong to cylindric; pappus of few to many bristles, the bristles short, caducous.

Centratherum is a small pantropical genus of about eight species with only one reported in Panama.

1. *Centratherum punctatum* Cass., Dict. Sci. Nat. 7: 384. 1817.—FIG. 2.

Apherephs aristata H.B.K., Nov. Gen. Sp. Pl. 4: 32, *tab.* 314. 1818.

Baccharoides punctatum Kuntze, Rev. Gen. Pl. 320. 1891.

Herbs or low *subshrubs* to 5 dm tall, upright, sometimes from runners, single-stemmed or many-branched, lignescent; branches terete, ascending, often striate, villous to tomentose. *Leaves* lanceolate to ovate to obovate, acute at the apex, cuneate at the base, marginally entire to pauciserrate (4–6 pairs of teeth), 1.5–5(–6) cm long, 0.5–4 cm broad, glandular punctate and villosulous on both surfaces, lateral veins ascending, 3–6 pairs, inconspicuous. *Inflorescences* sessile, solitary, terminating the branches. *Heads* discoid with many florets; involucre broadly hemispherical, the outer involucral bracts 6–15, foliaceous, curved and spreading, the inner involucral bracts scarious, 4–6-seriate, narrowly deltoid, apically acute to obtuse, spinescent, the awns 1–4 mm long, awns and involucral bracts ciliolate; receptacle flat, alveolate, naked; corolla tube narrowly cylindric, expanding slightly at the apex, purple, 5–7 mm long, 5-lobed, the lobes linear to lanceolate, 1–2 mm long; stamens 5, the anthers 1–1.5 mm long, apically acute, obtusely sagittate at base; styles 6–7 mm long, bilobed, the lobes puberulous, 1–2 mm long, acute. *Achenes* narrowly turbinate, weakly ribbed, 1–2 mm long, ultimately epappose; pappus of deciduous filiform scales 1–2 mm long, antrorsely puberulent.

Locally common in rocky or gravelly savanna-like areas, this species can be found near sea level but occurs more frequently from 600–1200 m altitude. This species appears to be very close to *Centratherum intermedium* of Brazil. In fact, the distinction between the two species is less than satisfactory.

CANAL ZONE: Ancón Hill, *Greenman & Greenman* 5120 (MO). CHIRIQUÍ: Between Boquete and David, *Ebinger* 743 (MO). Boquete, Llanos Francia, 4 mi from Boquete toward Dolega, *Dwyer & Hayden* 7582 (GH, MO). Llanos Francia, *Dwyer & Lallathin* 8710 (MO). Frances Arriba School, ca. 14 mi N of David, *Lewis et al.* 653 (GH, MO, NY, US). 5 mi S of Boquete, *McDaniel* 6799 (MO); *Allen* 4690 (MO). 8 km N of David, *Partch* 69–145 (MO). Boquete, *Stern et al.* 1218 (MO). Vic. of Boquete, *Woodson & Schery* 790 (MO). COCLÉ: S of El Valle, *Allen* 2857 (MO). Río Hato airstrip, *Burch et al.* 1137 (GH, MO, NY, US); *Tyson & Blum* 2557 (MO). Between Las Margaritas and El Valle, *Woodson et al.* 1262, 1772 (both MO, NY). HERRERA: 10 mi S of Océ, *Tyson et al.* 2873 (MO). PANAMÁ: Hills near Campana, *Allen* 1307 (MO, NY). Vic. of Pacora, *Allen* 1115 (MO). Camino de Burunga, Nuevo Emperador, *Austin*

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FIGURE 2. *Centrantherum punctatum* Cass.—A. Habit ($\times \frac{3}{8}$). [After *Dwyer* 8710 (MO).] —B. Floret ($\times 8\frac{1}{2}$). [After *Lutelyn* 1478 (MO).]



23 (MO). Road between Goofy Lake in Cerro Azul and main hwy., *Correa & Dressler* 431 (MO). Savanna near Río Pacora and Chepo Hwy., *Duke* 5905 (MO). Road toward top of Cerro Campana, *Duke* 5917 (MO). Road from Pan-Am Hwy. to Coronado Beach, *Duke* 11794 (MO). Cerro Campana, *Ebinger* 923 (MO). Río Tocumen, *Hunter & Allen* 242 (MO, NY). SE slope of Cerro Campana, *Lewis et al.* 3122 (MO, NY). Nuevo Emperador, *Peralta* 27 (MO). Sabana de Tortuga, *Pittier* 3339 (NY). Penonomé and vic., *Williams* 90 (NY). Near Arraiján, *Woodson et al.* 1397 (MO, NY).

2. PIPTOCARPHA

Piptocarpha R. Brown, Trans. Linn. Soc. London 12: 121. 1817 (1818). TYPE: *P. brasiliensis* Cass.

Carphobolus Schott, Spreng. Syst. 4: Cur. Post. 409. 1827.
Monanthemum Griseb., Fl. Brit. W. Ind. 354. 1861.

Shrubs, frequently scandent or climbing; branches pubescent with stellate or lepidote trichomes. *Leaves* alternate, petiolate; blades large, ovate to lanceolate, entire to subentire, pinnately veined, glabrous above, often tomentose beneath. *Inflorescences* usually aggregated in axillary corymbs, umbels or sessile clusters, or in terminal panicles. *Heads* with 3–20 florets; involucre campanulate, cylindrical-campanulate to turbinate, involucre bracts imbricate in few to several series, the outer bracts smaller, obtuse, the inner bracts often caducous with the achenes; receptacle convex, naked; florets regular, narrow tubular, 5-lobed; stamens 5, sagittate, the auricles subcaudate, style slender, stigma bifid, the branches usually pubescent. *Achenes* 10-costate, glabrous or rarely pilose, truncate; pappus of bristles in two series, the inner series filiform, long, equal, the outer series linear, shorter, unequal or occasionally lacking.

This small neotropical genus is centered in Brazil, extending northward into the West Indies and Central America. A single species is reported from Panama.

1. **Piptocarpha chontalensis** Baker in Mart., Fl. Bras. 6(2): 132. 1873. TYPE: Nicaragua, *Tate* 162 (not seen).—FIG. 3.

P. costaricensis Klatt, Bull. Soc. Roy. Bot. Belgique 31(1): 184. 1892.

Shrubs to 20 m tall, scandent; branches terete or striate, cinereous-tomentose. *Leaves* petiolate; petioles sulcate, 5–20 mm long; blades oblong to broadly ovate, acute to short-acuminate at the apex, obliquely rounded to subcordate at the base, marginally entire to sparsely denticulate, 6–18 cm long, 4–10 cm broad, plane, lustrous and glabrous above, with short-stalked, stellate, cinereous trichomes beneath, lateral veins ascending, 6–8 pairs. *Inflorescences* axillary, in dense pedunculate corymbs subtended by reduced leaves; heads subsessile in few-headed glomerules. *Heads* discoid with 6 florets, involucre ovoid, involucre bracts 4–7-seriate, subequitant, the bracts usually less than 15, ovate to deltoid, acute to obtuse at the apex, often glandular, the inner often coiling and falling with the achene; corolla salverform, white, 6–8 mm long, 5-lobed, the lobes linear-deltoid, 1.5–3 mm long, recoiled; stamens 5, the anthers 2–3 mm long, apically acute, basally caudate-sagittate; styles 6–7 mm long, the branches 1.5–2.5 mm long, apically acute, antrorsely puberulent. *Achenes* 2.5–3.2 mm long, 10-costate, glabrous or glandular; pappus white, biseriate, the inner bristles 5.5–7 mm long, the outer series much shorter, unequal, usually less than 1 mm long.

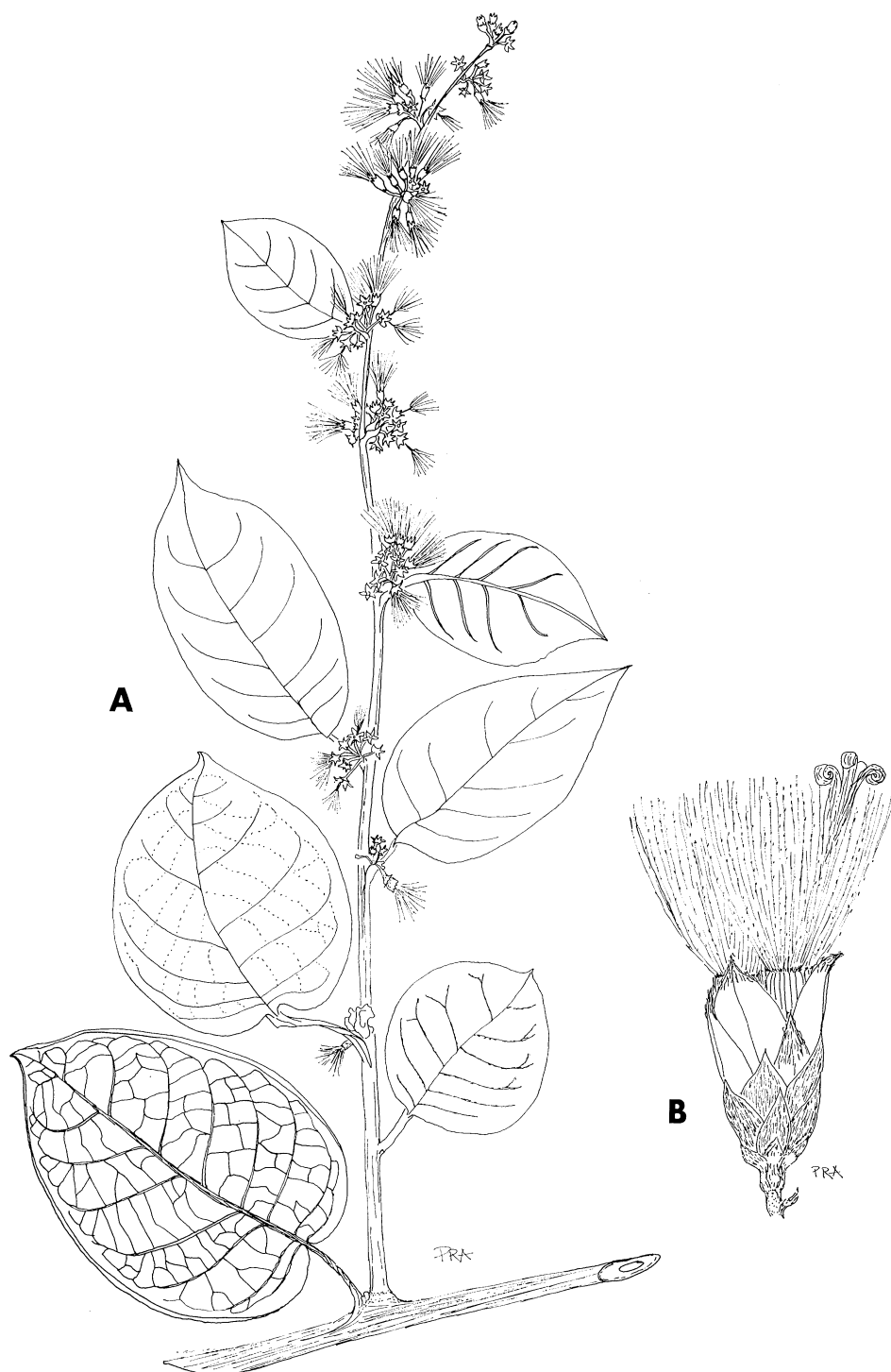


FIGURE 3. *Piptocarpha chontalensis* Baker.—A. Flowering branch ($\times \frac{3}{8}$). [After Skutch 4270, Costa Rica (MO).]—B. Head ($\times 4\frac{1}{2}$). [After Molina & Molina 25646, Honduras (MO).]

Primarily a lowland species, *Piptocarpha chontalensis* can often be recognized in the field by its large leaves, scandent or climbing habit, and white heads. This species extends into Costa Rica and Nicaragua.

COCLÉ: Vic. of La Mesa, N of El Valle de Antón, 1000 m, *Allen* 2372 (NY, MO). DARIÉN: Headwaters of Río Chico, 170–250 m, *Allen* 4628 (MO). Manené to mouth of Río Cuasí, *Kirkbride & Bristan* 1390 (MO, NY). Caña, 335 m, *Williams* 720 (NY). PANAMÁ: Cerro Jefe, *Duke* 9447 (MO).

3. POLLALESTA

Pollalesta H.B.K., Nov. Gen. Sp. Pl. 4: 46. 1820. TYPE: *P. vernonioides* H.B.K.

Oliganthes Cass., Bull. Sci. Soc. Philom. Paris. 10. 1817.

Odontoloma H.B.K., Nov. Gen. Sp. Pl. 43. 1820.

Dialesta H.B.K., Nov. Gen. Sp. Pl. 4: 45. 1820.

Adenocyclus Less., *Linnaea* 4: 337. 1829.

Shrubs or small *trees*, usually diffusely branched; branches terete, often tomentose. *Leaves* alternate, petiolate; blades often large, lanceolate to elliptic, usually cuneate at the base, acute to acuminate at the apex, entire, glabrate to densely tomentose. *Inflorescences* terminal, usually aggregated in dense corymbiform panicles. *Heads* with 1–6 florets; involucre cylindric to narrowly campanulate, involucre bracts few, imbricate in several series, multiseriate, membranous to scarious; receptacle subconvex, naked; corolla tubular, 5-lobed; stamens 5, the anthers basally sagittate; style slender, bilobed. *Achenes* truncate, 8–10-costate; pappus variable, often caducous, often in two series, the outer series small, more or less united into a cup, the inner series of 0–15 linear, aristate, bristles.

Pollalesta is a small genus confined to the New World and ranges from Costa Rica and Panama to Colombia, Venezuela, Ecuador, Peru and northern Brazil. A single species is reported from Panama.

Literature:

Aristeguieta, L. 1963. El género *Oliganthes* de Madagascar y su equivalente americano *Pollalesta*. Bol. Soc. Venez. Ci. Nat. 23(103): 255–288.

1. **Pollalesta discolor** (H.B.K.) Aristeguieta, Bol. Soc. Venez. Ci. Nat. 23(103): 275. 1963.—FIG. 4.

Dialesta discolor H.B.K., Nov. Gen. Sp. Pl. 4: 45. 1820. TYPE: Colombia, *Humboldt & Bonpland* s.n. (not seen).

Oliganthes discolor (H.B.K.) Schultz-Bip., *Linnaea* 20: 502. 1847.

Large *shrub* to small *tree*; branchlets subterete, often obscured by the densely scurfy indument. *Leaves* petiolate; petioles 5–25 mm long; blades elliptic to ovate, acute to acuminate at the apex, rounded to obliquely attenuate at the base, marginally entire, 6–18 cm long, 3.5–6 cm broad, plane and glabrous to strigillose above, lanulose and resinous beneath, lateral veins ascending, 5–12 pairs, immersed above, prominulous beneath. *Inflorescences* shortly pedunculate in dense corymbs, these aggregated in irregular corymbiform panicles. *Heads* with 2 florets; involucre cylindric to narrowly campanulate, the involucre bracts fewer than 10, equitant, imbricate, 4–6 mm long, the outer bracts squamiform, lanulose, the

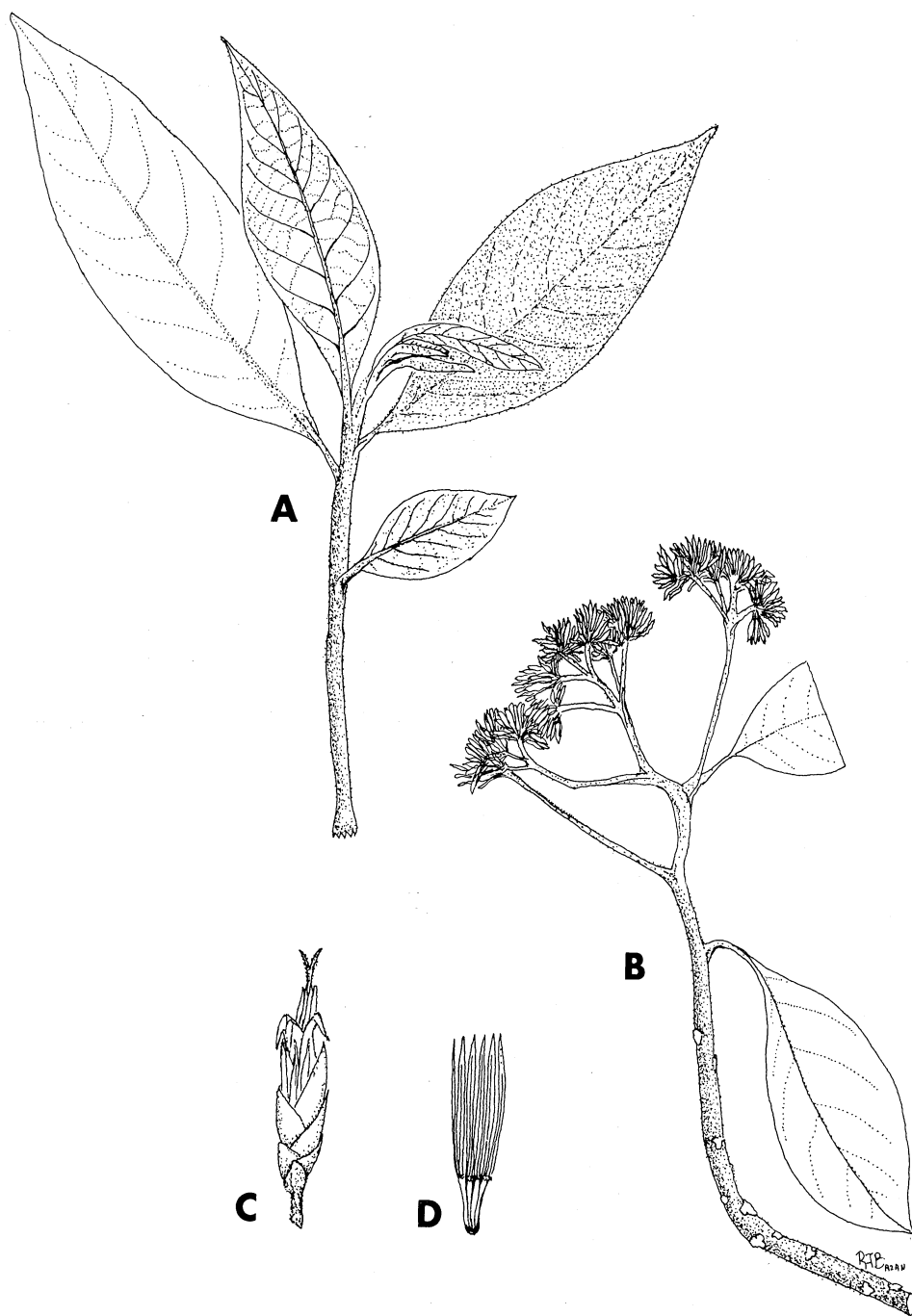


FIGURE 4. *Pollalesta discolor* (H.B.K.) Aristeguieta.—A. Leafy branch ($\times \frac{7}{10}$).—B. Flowering branch ($\times \frac{7}{10}$).—C. Head ($\times 3\frac{1}{2}$).—D. Achene ($\times 3\frac{1}{2}$). [After Tyson 6433 (MO).]

inner bracts obovate, scarious, often with a green mid-portion or purple tip, 4–5 mm long; corolla tubes cylindric, white, 4–5 mm long, 5-lobed, the lobes linear-deltoid, 1.5–2.5 mm long; stamens 5, the anthers 2 mm long, apically acute, acutely sagittate at base; styles 5–6.5 mm long, bilobed, the branches 1–2 mm long, apically acute, antrorsely puberulent. *Achenes* narrowly turbinate, 1.8–2.2 mm long, 8–10-costate, very sparsely puberulent; pappus biseriate, the inner series of 5–8 narrowly oblong bristles 3–3.5 mm long, apically lacerate, the outer series of 5–10 bristles, 0.2–0.4 mm long.

Pollalesta discolor occurs from Costa Rica to Colombia and Venezuela. The trees, with white heads, often reach 13 m in height.

CHIRIQUÍ: Jaramillo, Boquete, 4500 ft, *Davidson 1276* (MO). PANAMÁ: 3 mi from Interam. Hwy. on Cerro Campana dirt road, *Correa & Dressler 392* (MO). Road to Cerro Campana, 2000 ft, *Tyson 6433* (MO). VERAGUAS: Hills W of Sona, *Allen 1036* (MO).

4. STRUCHIUM

Struchium P. Browne, Civ. Nat. Hist. Jam. 312, *tab. 34, fig. 2*. 1756. TYPE: *S. herbaceum* St.-Hilaire.

Athenaea Adanson, Fam. 2: 121. 1763, not Sendtn. (Solanaceae), nom. cons.
Sparganophorus (Vaillant) Crantz, Inst. Rei Herb. 1: 261. 1766.

Annual *herbs*, single-stemmed or sparingly branched; branches erect. *Leaves* alternate, simple, petiolate, subentire to variously dentate, pinnately veined. *Inflorescences* single or glomerate, whitish to purplish. *Heads* discoid; involucre hemispheric, the involucre bracts numerous, imbricate in several series, marginally scarious, acuminate to subspinescent at the apex; corolla tubular to salverform, 3–4-lobed, the lobes valvate; anthers oblong, sagittate to acute at the base; style slender, bifid, the branches hirtellous. *Achenes* angular, costate, turbinate; pappus coroniform.

A monotypic genus of lowland areas, *Struchium* ranges from Southern Mexico, the West Indies and Central America to tropical South America, and is reportedly adventive in Africa.

1. *Struchium sparganophorum* (L.) Kuntze, Rev. Gen. Pl. 366. 1891.—FIG. 5.

Ethulia sparganophora L., Sp. Pl., ed. 2. 1171. 1763.

Struchium herbaceum P. Browne ex St.-Hilaire, Expos. Fam. 1: 406. 1805.

Ethulia struchium Swartz, Prod. Veg. Ind. Occ. 3: 1297. 1806.

Sparganophorus struchium Poir. in Lam., Encycl. Meth. 7: 302. 1806.

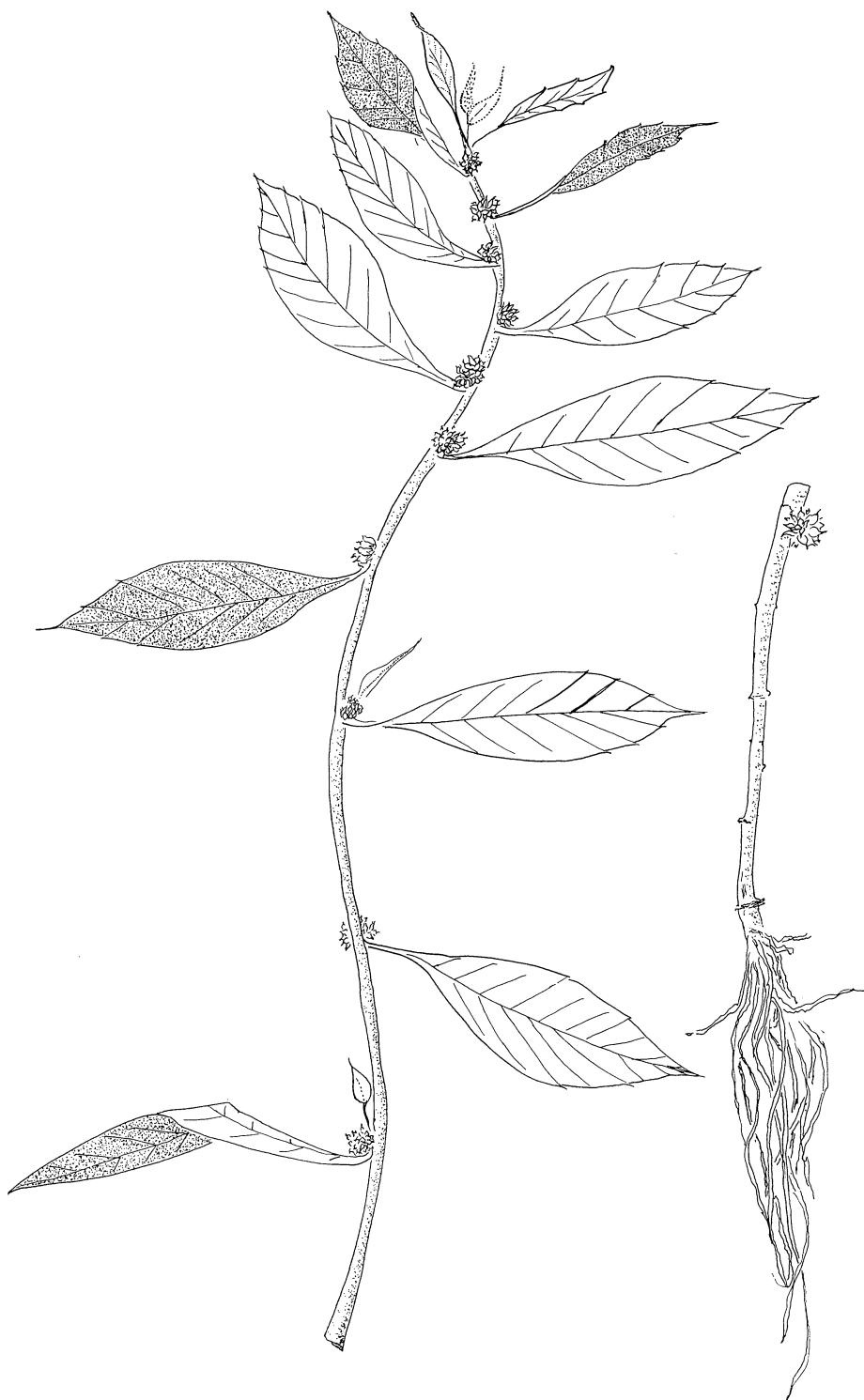
S. fasciatus Poir. in Lam., Encycl. Meth. 7: 302. 1806.

Struchium americanum Poir. in Lam., Encycl. Meth. 7: 475. 1806.

Annual *herbs* to 1 m tall; stems puberulent to glabrous, striate. *Leaves* cauline, narrowly to broadly elliptic, denticulate, at least apically, acute to attenuate at the apex, cuneate at the base, 3–12 cm long, 1–4 cm broad, sparsely strigillose and subglandular above, more so beneath, lateral veins 7–12 pairs; petioles

→

FIGURE 5. *Struchium sparganophorum* (L.) Kuntze. Plant in flower ($\times \frac{3}{8}$). [After Wedel 2074 (MO).]



ascending, canaliculate to narrowly winged, 1–20 mm long. *Inflorescences* sessile, often glomerate in the axils. *Heads* with ca. 50 florets; involucre hemispheric, 3–5 mm long, 3–4-seriate, the bracts acuminate to subspinescent, ciliolate; corolla 1–2 mm long, purple, salverform, 3–4-lobed, the lobes ca. 0.2 mm long; stamens 3–4, the anthers oblong, 0.5–1 mm long, apically acute, basally circinate-sagittate; style 1.5–2 mm long, bifid for less than half its length, the branches acute. *Achenes* narrow, arcuately turbinate, 3–4-angled, 1.3–2 mm long, glabrous; pappus a cartilaginous corona, half as long as the achene, the corona shallowly lobed or entire.

The pappus of *Struchium sparganophorum* is unusual in the Compositae, being composed only of a fused ring or corona, devoid of bristles.

BOCAS DEL TORO: Old Bank Lagoon, Wedel 2074 (MO). Water Valley, Wedel 1673 (MO). CANAL ZONE: Chagres, Fendler 142 (MO). DARIÉN: Near Refugio, 15–20 mi N of Santa Fé, Duke 10294 (MO). Manené to mouth of Río Cuasí, Kirkbride & Bristan 1525 (MO). Marraganti, Williams 992 (NY). PANAMÁ: Cerro Campana, Lewis et al. 1999 (GH, MO, US).

5. VERNONIA

Vernonia Schreb., Gen. Pl. 2: 541. 1791, nom. cons. TYPE: *V. noveboracensis* (L.) Willd.

Seneciodes Post & Kuntze, Lex. Gen. Phan. 2: 515. 1903.

Eremosis (DC.) Gleason, Bull. New York Bot. Gard. 4: 227. 1906.

Annual or perennial *herbs*, *shrubs*, or *trees*, rarely scandent, unbranched to much-branched; branches usually ascending, variously pubescent to glabrous. *Leaves* alternate, simple, usually cauline; blades various, often narrowly lanceolate to broadly ovate or elliptic. *Inflorescences* terminal or upper axillary, composed of scorpioid cymes or becoming paniculate or corymbiform or rarely reduced to solitary heads. *Heads* discoid with 1–many florets; involucre narrowly campanulate to subcylindric to broadly hemispheric, the involucre bracts in few to many series, closely to laxly imbricate, the inner series often longer, persistent and spreading at maturity; receptacle flat or subconvex; corolla regular, usually pink, purple, or white, 5-lobed; stamens 5, the anthers sagittate at the base, rounded or subacute at the apex, appendaged. *Achenes* more or less cylindric, ribbed or ribless; pappus of slender bristles or scales, biseriate, the inner series capillary, terete to slightly flattened, the outer series very short.

This large genus of perhaps 550–600 species inhabits primarily tropical regions of both the Old and New Worlds. In the New World, *Vernonia* is most abundant in South America, but extends northward through Central America into temperate North America. Six species are recognized from Panama including the naturalized Old World species, *V. cinerea*. *Vernonia scorpioides* is known from British Honduras, Honduras, Nicaragua, and tropical South America and therefore is suspected to occur in Panama.

Literature:

Gleason, H. A. 1906. A revision of the North American Vernonieae. Bull. New York Bot. Gard. 4: 144–243.

- Gleason, H. A. 1922. *Vernonia* and *Eremosis*. In North American Flora 3: 52–101.
- Jones, S. B., Jr. 1973. Revision of *Vernonia* sect. *Eremosis* (Compositae) in North America. *Brittonia* 25: 86–115.

- a. Heads with 13–36 florets.
 - b. Heads pedunculate, the peduncles 5–12 mm long; inflorescences corymbose, the axes equal, strongly dichotomizing; achenes ribless; leaves with 2–4 pairs of lateral veins; bristles of the inner pappus deciduous 3. *V. cinerea*
 - bb. Heads sessile, subsessile, or short-pedunculate; inflorescences paniculate or corymbose, the axes unequal, sometimes monopodial; achenes ribbed; leaves with 5–20 pairs of lateral veins; bristles of the inner pappus persistent.
 - c. Heads subtended by foliaceous bracts 10–15 mm long; heads with 24–36 florets; involucre 6–8 mm tall, 6–7-seriate 5. *V. seemanniana*
 - cc. Heads without foliaceous bracts or with only subulate bracts; heads with 18–27 florets; involucre 3–6 mm tall, 4–6-seriate.
 - d. Inflorescence a sparsely or freely branched cyme; leaves broadly elliptic to broadly ovate.
 - e. Leaves broadly elliptic to broadly ovate, 10–30 cm long, 5–13 cm broad, subauriculate at the base, plane and glabrous to glabrescent above; inflorescences with the individual cymes usually recurved and with 22–46 heads 1. *V. brachiata*
 - ee. Leaves broadly lanceolate to ovate-elliptic, 3–15 cm long, 1–5 cm broad, rounded to obtuse at the base, rugose to rarely bullate and scabrous to strigillose above; inflorescences with the individual cymes spreading and with 18 heads or fewer 2. *V. canescens*
 - dd. Inflorescence a much-branched corymb or panicle; leaves lanceolate 4. *V. patens*
- aa. Heads with 3–4 florets 6. *V. triflosculosa*

1. ***Vernonia brachiata*** Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 67. 1852. TYPE: Costa Rica, *Oersted s.n.* (not seen).—FIG. 6.

Cacalia brachiata (Benth.) Kuntze, Rev. Gen. Pl. 969. 1891.

Herbs or small *shrubs* to 3 m tall; branches herbaceous, striate, becoming angular, glabrous or nearly so. *Leaves* subsessile; blades broadly elliptic to broadly obovate, acute to short acuminate at the apex, subauriculate at the base, 10–30 cm long, 5–13 cm broad, marginally entire to serrulate, glabrous to glabrescent above and beneath, lateral veins ascending, 10–14 pairs. *Inflorescences* terminal, leafless, 10–30 cm high, in long, freely branched cymes, the individual cymes 10–25 cm long with 22–46 heads, straight or more often recurved, peduncles 1.4–3.8 cm long, the bracts not foliaceous, linear, to 3 mm long. *Heads* with 18–22 florets, involucre broadly campanulate, 3–4 mm high, 4–5-seriate, the involucre bracts loosely imbricate, ciliate, the outer bracts narrowly ovate to lanceolate, acute to subcuspidate, with a thickened midrib, the inner bracts oblong to oblanceolate, acute to subacute, scarious, purple-tipped; receptacle flat, alveolate, naked; corolla tubular, 4–5 mm long, 5-lobed, the lobes lanceolate; stamens 5, anthers 2–2.5 cm long, apically acute, broadly sagittate; styles 4–4.5 mm long, the 2 branches 1–2 mm long, antrorsely puberulous. *Achenes* narrowly cylindric, 2–3 mm long, faintly ribbed, puberulous; pappus biseriate, the inner bristles filiform, 4–5 mm long, persistent, the outer bristles linear, to 0.3–0.6 mm long, persistent.



Previously known in Central America only from Costa Rica, this attractive species can now be reported with certainty from western Panama. The very large leaves coupled with the long, often arching, many-headed cymes easily separate this taxon from the other Panamanian species of *Vernonia*.

BOCAS DEL TORO: Changuinola Valley, Lincoln Creek, *Dunlap* 425 (NY). CHIRIQUÍ: Corotú, 6 km W of airport of Puerto Armuelles, 100–200 m, *Liesner* 10 (MO). 8 mi from Paso Canoas to Cañas Gordas, *Liesner* 221 (MO).

2. *Vernonia canescens* H.B.K., Nov. Gen. Sp. Pl. 4: 35, *tab.* 317. 1820.

V. bullata Benth. in Örst., Vidensk. Middel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 67. 1852.

Cacalia bullata (Benth.) Kuntze, Rev. Gen. Pl. 969. 1891.

C. canescens (Benth.) Kuntze, Rev. Gen. Pl. 969. 1891.

Shrubs or coarse *herbs* to 3 m tall, erect, sparsely to many-branched; branches lignescent, striate, often densely pubescent above, glabrescent. *Leaves* short petiolate; petioles terete to canaliculate, 3–12 mm long; blades broadly lanceolate to ovate-elliptic, acute to acuminate at the apex, rounded to obtuse at the base, 4–12 cm long, 2–5 cm broad, marginally entire to remotely denticulate, often rugose to rarely bullate, scabrous to strigillose above, densely strigillose and glandular-punctate beneath, lateral veins ascending, 8–12 pairs. *Inflorescences* terminal in sparsely branched, short-pendunculate cymes, the cymes frequently arranged in large, spreading panicles or corymbs. *Heads* with 21–24 florets, sessile; involucre broadly campanulate, 4–6 mm high, 5–6-seriate, loosely imbricate, sparsely villous, the outer bracts triangular-subulate, spinose-tipped, the inner bracts lanceolate, acuminate at the apex, scarious; receptacle flat, alveolate, naked; corolla salverform, 3.5–5 mm long, 5-lobed, the lobes narrowly triangular, 2–2.5 mm long; stamens 5, anthers 2–2.2 mm long, apically acute, basally obtusely sagittate; styles 3–5.5 mm long, the 2 branches 1.5–2 mm long, antrorsely puberulous. *Achenes* narrowly turbinate, faintly ribbed, 1–2.5 mm long, antrorsely puberulent; pappus white, biseriate, the inner bristles linear, 3–5 mm long, the outer series subulate, 0.4–1.1 mm long.

This species ranges from southern Mexico southward throughout Central America to tropical South America. In Panama, *Vernonia canescens* is a common small shrub. Specimens have been collected from Chiriquí Province with bullate leaves. Bentham segregated the bullate-leafed populations into *V. bullata*; however, the presence of a continuous gradation from the rugose to the bullate condition warrants the inclusion of *V. bullata* within the specific delimitations of *V. canescens*.

CANAL ZONE: France Field, *Blum & Dwyer* 2117 (MO). Within 5 mi N of Gamboa gate, *D'Arcy* 6008 (MO). Albrook, *Dwyer & Robyns* 81 (MO); *Dwyer* 4469, 7318 (both MO). Chagres, *Fendler* 160 (MO). Ancón Hill, *Greenman & Greenman* 5124 (MO); *Celestine* 70 (NY, US); *Williams* 26 (NY). Near Miraflores, *Greenman & Greenman* 5202 (MO). Between Summit and Gamboa, *Greenman & Greenman* 5234 (MO). Las Cruces Trail, *Hunter & Allen* 690 (MO). Madden Forest Preserve, *Lewis et al.* 5364 (MO). Navy Reservation N of Gamboa,

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FIGURE 6. *Vernonia brachiata* Benth.—A. Flowering branch ($\times \frac{3}{8}$).—B. Achene ($\times 13$). [After *Liesner* 221 (MO).]

Robyns 65-44 (MO). Balboa, *Standley* 29314 (MO). 1 mi N of Summit, *Tyson et al.* 2769, 2774, 2779 (all MO). Curundú, *Tyson* 3477 (MO). BARRO COLORADO ISLAND: *Busey* 302 (MO); *Croat* 7079 (MO), 7219 (MO, NY), 7259, 7480, 8264 (all MO), 8392 (MO, NY), 9398 (MO); *Shattuck* 774 (MO); *Wetmore & Abbe* 208 (MO); *Woodworth & Vestal* 346 (MO). CHIRIQUÍ: Central Valley of Río Chiriquí Viejo, *Allen* 1344 (MO, NY). NW of Boquete, Cerro Horqueta, *Dwyer et al.* 522 (F, GH, MO, NY, US). Río Chiriquí Viejo Valley, near El Volcán, *White* 178 (MO). COCLÉ: Penonomé, *Williams* 592 (NY). COLÓN: Santa Rita, *Gómez-Pompa et al.* 3215, 3294 (both MO). HERRERA: Vicinity of Ocú, *Stern et al.* 1747 (MO). 10 mi S of Ocú, *Tyson et al.* 2802 (MO). LOS SANTOS: Loma Prieta, *Duke* 11835, 11890 (both MO). 16 mi S of Macaraacas, at Quebrada Bejuco, *Tyson et al.* 2915 (MO). PANAMÁ: Taboga Island, *Allen* 129 (MO). Trail between Cañazas and foot of Cordillera Central headwaters of Río Cañazas, *Allen* 187 (MO). Along road to Cerro Campana, *Correa & Dressler* 849 (MO). Cerro Azul, *Duke* 9342 (MO); *Kant* 45 (MO). Cerro Jefe, *Duke* 9385, 15240 (both MO). Isla del Rey, *Duke* 9523 (MO). Isla Saboga, *Duke* 10351 (MO). San José Island, *Erlanson* 71 (NY, US). 1 mi E of Charné, *Lazor* 2207 (MO). Cerro Campana, *Porter et al.* 4301, 4892 (both MO). Río Piriquete, near Capira, *Saldana* 13 (MO). VERAGUAS: Carretera a Santa Fé, *Cisneros* 10 (MO).

3. *Vernonia cinerea* (L.) Less. *Linnaea* 4: 291. 1829.

Conyza cinerea L., Sp. Pl. 862. 1753.

Seneciodes cinereum (L.) Kuntze in Post & Kuntze, Lex. Gen. Phan. 515. 1904.

Herbs to 1 m tall, erect, unbranched to freely branched; branches striate, cinereous-puberulent above, glabrescent below. *Leaves* petiolate; petioles narrowly winged, 0.5-2.0 mm long; blades narrowly elliptic to deltoid, obtuse to acute at the apex, cuneate at the base, 2-5(-8) cm long, 0.5-3.0 cm broad, marginally entire to serrate, sparsely hirtellous above, glandular-punctate and hirtellous below, lateral veins ascending, 2-5 pairs. *Inflorescences* terminal, in dichotomously branched corymbs; peduncles 5-12 mm long; bracts often foliaceous, linear, to 1.5 cm long. *Heads* with 13-23 florets; involucre campanulate, the involucre bracts laxly 3-4-seriate, the outer bracts subulate, the inner bracts narrowly lanceolate, attenuate, puberulent; receptacle flat, alveolate, naked; corolla tubular, 3-4 mm long, 5-lobed, the lobes lanceolate, to 0.5 mm long; stamens 5, the anthers 0.6-0.8 mm long, apically acute, obtusely sagittate at the base; styles 3-4 mm long, with 2(3) branches to 0.5 mm long, rarely glabrous. *Achenes* subcylindric, ribless, 1.4-2.2 mm long, antrorsely puberulent; pappus biseriate, the inner bristles linear, 3-5 mm long, deciduous, the outer bristles subulate, to 0.5 mm long, persistent.

This species is readily distinguished in the field from the rest of the genus by the more delicate appearance of the inflorescences and the pedunculate heads. Found principally in disturbed areas such as clearings, road and railway margins, and in lawns, *Vernonia cinerea* is native of tropical areas of the Old World. It has become a pantropical weed through introductions into tropical America. It extends northward into Mexico and in the United States into the Florida Keys and hammocks of extreme southern Florida.

CANAL ZONE: Balboa, *D'Arcy & D'Arcy* 6020 (MO); *Dwyer* 2600 (MO). Atlantic side, just E of Gatun Locks, *Duke* 4299b, 4302 (both MO). Fort Sherman site, U.S. Army Tropic Test Center, *Dwyer* 7193 (MO). Howard Air Force Base, SE of Kobbe Beach, *Oliver & MacBryde* 1876 (GH, MO, NY, US). Balboa Station, *Porterfield s.n.* (NY). Farfan Beach area, *Tyson et al.* 3181 (MO). BARRO COLORADO ISLAND: *Aviles* 90 (MO); *Croat* 4067, 6879 (both MO); *Ebinger* 131, 132 (both MO); *Netting s.n.* (MO); *Shattuck* 563 (MO); *Starry* 275 (MO). PANAMÁ: Bohío Soldada, *Cowell* 238 (NY). Morro Island, *D'Arcy & D'Arcy* 6809 (MO). Taboga Island, *Dwyer* 2786 (MO).

4. *Vernonia patens* H.B.K., Nov. Gen. Sp. Pl. 4: 41. 1818.

V. lanceolaris DC., Prodr. 5: 37. 1836.

V. pacchenis Benth., Pl. Hartw. 134. 1844.

V. aschenborniana Schauer in Ness & Schauer, Linnaea 19: 714. 1847.

Cacalia lanceolaris (DC.) Kuntze, Rev. Gen. Pl. 970. 1891.

C. patens (H.B.K.) Kuntze, Rev. Gen. Pl. 970. 1891.

Vernonia salamana Gleason, Bull. Torrey Bot. Club 46: 242. 1919.

Shrub or small *tree* to 8 m tall, freely branched; branches erect, striate, lignescent, puberulous to tomentulose on the younger stems, glabrescent. *Leaves* short petiolate; petioles terete, 2–10 cm long; blades lanceolate to narrowly oblong, acute to acuminate at the apex, cuneate to obtuse at the base, 3–15 cm long, 1–3 cm broad, marginally entire to serrulate, rugose and nearly glabrous to sparsely pubescent above, puberulent to strigillose beneath, lateral veins weakly ascending, 8–20 pairs. *Inflorescences* in terminal much-branched corymbs or panicles, the cymes becoming scorpioid. *Heads* with 21–27 florets, sessile to subsessile, foliar bracts absent; involucre broadly campanulate, 4–5 mm high, 5–6-seriate, closely imbricate, oblong to suborbicular, obtuse to apiculate at the apex, glabrous to puberulent, ciliate, pale green with brown midrib or tip; corolla salverform, 5–6 mm long, 5-lobed, the lobes triangular, 1.5–2.5 mm long; stamens 5, the anthers 1.8–2.3 mm long, apically acute, basally obtusely sagittate; styles 5–6 mm long, the 2 branches 1.5–2.5 mm long, antrorsely puberulent. *Achenes* narrowly turbinate to subcylindric, obscurely ribbed, 1.3–1.8 mm long, minutely puberulent; pappus fulvous, biseriate, the inner bristles linear, 4.0–5.5 mm long, the outer series subulate, 0.3–0.8 mm long.

This species is relatively common, extending from southern Mexico to tropical South America. Generally found near sea level, *Vernonia patens* also occurs up to approximately 1500 m elevation in thickets and disturbed areas.

BOCAS DEL TORO: Region of Almirante, *Cooper 530* (NY). CANAL ZONE: Miraflores Annex, *Blum 2175* (MO). Monkey Hill and vic., *Cowell 12, 16* (both NY). Gaillard Highway, 1 mi NW of Summit Gardens, *Croat 8884* (MO). Chagres, Isthmus of Panama, *Fendler 150* (MO). Culebra Cut, *Hunter & Allen 782* (MO, NY). Hills between Río Grande and Pedro Vidal, *Pittier 2701* (NY, US). Across railroad tracks from Summit Garden, *Tyson 6396* (MO). Ancón Hill, *Williams 18* (NY). BARRO COLORADO ISLAND: *Croat 4562, 7229, 7472, 8248, 8367, 8665, 8778, 14089* (all MO); *D'Arcy 3987* (MO, NY); *Ebinger 95* (MO); *Gentry 447* (MO). CHIRIQUÍ: Burica Peninsula, San Bartolomé, *Busey 531* (MO). Palo Santo, 3 mi N of Volcán, *Croat 13550* (MO, NY). Las Lagunas, 2 mi SW of El Volcán, *Tyson 855* (MO). COCLÉ: Penonomé, *Williams 69* (NY). COLÓN: Santa Rita, *Gómez-Pompa et al. 3004, 3211* (both MO). Río Piedras, *Stern et al. 722* (MO). DARIÉN: Vic. of Pinogana, *Allen 4307* (MO). Marragantí, *Wilson 642* (NY). HERRERA: Between Ocú and Chitré, *D'Arcy & Croat 4140* (MO, NY). Vic. of Ocú, *Stern et al. 1681, 1727* (both MO). PANAMÁ: Vic. of Arraiján, *Allen 1629* (MO, NY). Vic. of Santa Fé near Río Santa María, *Allen 4425* (MO). Isla Chepillo, *Duke 10319* (MO). Isla Espirita Santo, *Duke 10449* (MO). Río Pacora just below confluence with Río Corso, *Duke 11990* (MO). Cerro Jefe, near Río Indio, *Duke 15241* (MO). Cerro Jefe, *Dwyer et al. 7266* (MO). Cerro Campana, *Porter et al. 4321* (MO, UC). Cerro Azul, *Slater & Harrington 1* (MO). E slope of Cerro Jefe, *Tyson 3714* (MO). VERAGUAS: Vic. of Santa Fé near Río Santa María, *Allen 4425* (MO). Cañazas, *Tyson 3636* (MO).

5. *Vernonia seemanniana* Steetz in Seem., Bot. Voy. Herald 139. 1854. TYPE: Panama, *Seeman s.n.* (not seen).

Cacalia seemanniana (Steetz) Kuntze, Rev. Gen. Pl. 971. 1891.

Shrubs to 3 m tall, scandent, becoming woody at the base; branches terete, densely tomentose. *Leaves* petiolate; petioles terete, 4–10 mm long; blades ovate-lanceolate to elliptic, acute to short-acuminate at the apex, rounded at the base, 5–12 cm long, 2–5 cm broad, entire, subcoriaceous, glabrous above except for the puberulent young leaves, strigose below, occasionally resinous, lateral veins ascending, 6–12 pairs, prominently reticulate. *Inflorescences* terminal, in spreading dichasial cymes, the secondary branches strongly monopodial. *Heads* with 24–36 florets, subsessile, bracts foliaceous, 5–20 mm long, 2–5 mm broad, narrowly elliptic; the involucre broadly campanulate, 6–8 mm tall, 6–7-seriate, the involucre bracts ciliate, pubescent, the outer bracts minute, deltoid, acute, the inner bracts lanceolate to oblong, obtuse to acute, recurved; receptacle flat, alveolate, naked; corolla tubular, 4 mm long, 5-lobed, the lobes narrowly lanceolate; stamens 5, the anthers ca. 2.5 mm long, apically acute, basally acutely sagittate; styles 4–5 mm long, 2–3-lobed, the branches to 2 mm long, hispidulous. *Achenes* broadly cylindric, ribbed, 1–2 mm long, antrorsely hispidulous; pappus biseriate, the inner scales filiform, 4–5 mm long, persistent, the outer scales subulate, 0.5–1.0 mm long, persistent.

First described from Veraguas Province, *Vernonia seemanniana* is also known from the Province of Coclé. Although a poorly known species, this taxon is characterized by the many-floreted heads surrounded by long foliaceous bracts.

COCLÉ: Hills N of El Valle de Antón, *Allen & Allen 4179* (MO).

6. ***Vernonia triflosculosa*** H.B.K., Nov. Gen. Sp. Pl. 4: 40. 1820. TYPE: Mexico, not seen.

V. triantha Schauer in Nees & Schauer, Linnaea 19: 714. 1847.

Cacalia triflosculosa (H.B.K.) Kuntze, Rev. Gen. Pl. 2: 971. 1891.

Vernonia luxensis Coult., Bot. Gaz. (Crawfordsville) 20: 41. 1895.

V. dumeta Klatt, Bull. Soc. Roy. Bot. Belgique 35: 277. 1896.

Eremosis triflosculosa (H.B.K.) Gleason, Bull. New York Bot. Gard. 4: 233. 1906.

Shrubs or small *trees* to 8 m high, lignescent, freely branched to form a rounded crown; branches erect to slightly spreading, striate, sparsely pubescent, cinereous, glabrescent. *Leaves* short-petiolate; petiole 0.8–1.5 cm long, canaliculate above; blades narrowly elliptic to broadly oblanceolate, acute to short-acuminate at the apex, acute to attenuate at the base, 5–12 cm long, 1–3 cm broad, marginally entire to minutely denticulate, plane and glabrous above, glabrate beneath, lateral veins ascending, 4–8 pairs, prominent beneath. *Inflorescences* terminal, forming a large hemispheric compound corymb. *Heads* with 3–4 florets, sessile to subsessile; involucre cylindric to narrowly campanulate, 2.5–6 mm long, 4–6-seriate, the outer involucre bracts subrotund, obtuse or apiculate at the apex, scarious, the inner involucre bracts oblong to ovate, acute to acuminate at the apex, scarious; receptacle subconvex, alveolate, naked; corolla narrowly cylindric, 5–6 mm long, 5-lobed, the lobes subulate, 1–1.5 mm long; stamens 5, the anthers 2–2.5 mm long, apically acute, basally obtusely sagittate; styles 5–6 mm long, the branches 1–2 mm long, apically acute, antrorsely puberulous. *Achenes* narrowly turbinate,

8–10-ribbed, antrorsely puberulent, 2.5–3 mm long; pappus weakly biseriate, white, the inner bristles capillary, 4.5–6 mm long, the outer bristles subulate to capillary, less than 1 mm long, persistent.

The only species of *Vernonia* in Panama with only three or four florets per head, *Vernonia triflosculosa* is known from a single collection in western Panama. The Panamanian specimen belongs to subspecies *triflosculosa* which extends from Panama throughout Central America to southern Mexico. Subspecies *palmeri* (Rose) Jones is restricted to western Mexico and is characterized by narrowly lanceolate leaves as opposed to broadly lanceolate to oblanceolate leaves of subspecies *triflosculosa*. Until recently, this species has been placed in the genus *Eremosis*.

CHIRIQUÍ: Boquete, Davidson 642 (F, MO, US).

B. ELEPHANTOPODINAE

PHILIP BUSEY⁶

Elephantopodinae Less., *Linnaea* 5: 135. 1830. "Elephantopeae." TYPE: *Elephantopus* L.

Lychnophorinae Benth. in Benth. & Hook. f., *Gen. Pl.* 2: 171. 1873. "Lychnophorieae." TYPE: *Lychnophora* Mart.

6. ELEPHANTOPUS

Elephantopus L., *Sp. Pl.* 814. 1753; *Gen. Pl.*, ed. 5. 355. 1754. TYPE: *E. scaber* L.

Orthopappus Gleason, *Bull. New York Bot. Gard.* 4: 237. 1906. TYPE: *E. angustifolius* Swartz.

Erect, perennial *herbs*; stems generally solitary. *Leaves* basal or cauline, alternate, basally attenuate, pinnately veined; petioles indistinct. *Inflorescences* solitary, terminal, bracteate panicles, spikes, or racemes, the heads in glomerules, the glomerules many-headed, hemispheric, subtended by 1 or more bracts. *Heads* with 2–4 florets; involucral bracts 8, similar, in 2 decussate series; receptacle convex, naked; flowers perfect, zygomorphic; corolla tubular-funnelform, the tube slender, the limb 5-parted, deeply so on the adaxial side; anthers 2-celled, sagittate at the base, apically appendaged; style branches slender, terete, slightly flattened adaxially at the base, strigulose throughout. *Achenes* obovoid, slightly flattened, 10-ribbed or -angled, strigulose or hispidulous; pappus in 1 series, occasionally scale-like, or usually of 5-many straight, equal, puberulent bristles.

A genus of 25 species centered around the Caribbean but ranging throughout the tropics and warmer temperate regions of both hemispheres; absent from Europe.

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Literature:

Clonts, J. A. 1972. A revision of the genus *Elephantopus*, including *Orthopappus* and *Pseudelephantopus* (Compositae). Ph.D. thesis, Mississippi State University.

- a. Inflorescence paniculate; pappus bristles fewer than 10.
 - b. Leaves less than $3\frac{1}{2}$ times longer than wide, densely soft-puberulent beneath 3. *E. mollis*
 - bb. Leaves more than 7 times longer than wide, not densely soft-puberulent beneath 2. *E. dilatatus*
- aa. Inflorescence spicate, simple or sparingly branched; pappus bristles more than 20 1. *E. angustifolius*

1. ***Elephantopus angustifolius*** Swartz, Nov. Gen. Sp. Pl. Prodr. 115. 1788.
Based on Sloane, Voy. Isl. Madera 1: 256, pl. 148, fig. 4. 1707.—FIG. 7E.

Orthopappus angustifolius (Swartz) Gleason, Bull. New York Bot. Gard. 4: 237. 1906.

Perennial subacaulescent *herbs*, mostly 30–120 cm tall with a short rootstock. *Leaves* crowded near the base forming a rosette, oblanceolate-oblong, basally long-attenuate, apically rounded-acute, sparsely crenate, 5–50 cm long, 1–3.5 cm wide, at least $3\frac{1}{2}$ times longer than wide, coriaceous, green throughout, appressed-pubescent with somewhat silvery strigose trichomes, the trichomes 0.3–0.6 mm long on the lamina above (longer on the veins), 0.5–1.0 mm long beneath, inconspicuously veined above; petioles obscure, expanded and clasping at the base. *Inflorescence* solitary, spicate, simple or sparingly branched, of many glomerules each subtended by one or more lanceolate bracts to 8 mm long; peduncles appressed-pubescent; glomerules with ca. 20 heads, hemispheric, to 1.2 cm high and 2.5 cm wide. *Heads* with 4 florets; involucral bracts 8, similar, in 2 decussate series, minutely sericeous, the outer 4 ovate, 3–6 mm long, the inner 4 lanceolate-oblong, 6–10 mm long; corolla white to lavender, the tube slender, ca. 6 mm long, the limb ca. 2.0 mm long, deeply divided on the adaxial side, 5-parted, the lobes linear, ca. 1.6 mm long; anthers ca. 1.2 mm long, basally sagittate, the apical appendages 0.08–0.1 mm long; style branches slender, 0.5–0.8 mm long. *Achenes* obovoid, slightly flattened, 10-ribbed, 1.9–2.2 mm long, 0.5–0.6 mm wide, dark-brown, strigulose or hispidulous; pappus of 25–40 straight bristles in 1 series, the bristles 6.0–7.5 mm long, gradually dilated at the base to 0.12 mm wide, appressed-puberulent.

Elephantopus angustifolius was placed in a separate genus, *Orthopappus*, primarily on the basis of the large number of pappus bristles in this species. However, there are various degrees of this tendency in other species of *Elephantopus*, and the segregation of *E. angustifolius* in a separate genus is not justified.

Elephantopus angustifolius is of occasional occurrence in open savannas from Vera Cruz and the West Indies south through Central and South America to northern Argentina and Uruguay. Although formerly known from a number of localities in Panama, it has in recent years been collected from only two localities,

Cerro Campana and Tocumen. It has been collected throughout the year, but principally in the dry season, from November to March.

CANAL ZONE: Ancón Hill, *Greenman & Greenman 5115* (MO). Cerro Ancón, *Heriberto 47* (US). Ancón Hill, *Standley 25184* (US). Ancón Hill, *Standley 26319* (MO, US). CHIRIQUÍ: Between El Boquete and Caldera, 300–700 m, *Pittier 3338* (US). COCLÉ: Between Porto Posada and Penonomé, *Williams 157* (NY). PANAMÁ: Isla Taboga, *Allen 1274* (GH, MO). Between Panama and Chepo, *Dodge et al. 16657* (MO). Cerro Campana, *Duke 5964* (GH, MO). Tocumen, *Dwyer 4400* (FSU). Cerro Campana, *Ebinger 943* (GH, MO, US); *Lazor 3347* (FSU). Taboga Island, *Macbride 2840* (GH, US). Sabanas, *Paul 344* (US). Tocumen, *Standley 26501, 29400* (both US). Arraiján, *Woodson et al. 1389* (GH, MO, NY, US).

2. ***Elephantopus dilatatus*** Gleason, Bull. New York Bot. Gard. 4: 240. 1906.

TYPE: Costa Rica, Buenos Aires, bords du Río Ceibo, *Pittier 3733* (US, isotype).

Perennial *herbs* mostly to 40 cm tall; stems creeping at the base, rooting at the nodes, enclosed in an overlapping series of persistent leaf sheaths, the sheaths pilose. *Leaves* clustered, terminal, oblanceolate-oblong, basally long-attenuate, apically acute, serrate, 7–18 cm long, 0.6–2.2 cm wide, at least 7 times longer than wide, coriaceous, green throughout, darker above, strigulose to appressed-pubescent beneath, the trichomes 0.2–1.3 mm long on both surfaces, resin-dotted beneath, the midrib prominent on both surfaces but the primary lateral veins obscure above; petioles pilose, indistinct from the lamina, expanded, clasping. *Inflorescence* solitary, terminal, corymbose-paniculate, the branches subtended by oblong leaflike bracts to 6 cm long, peduncles appressed-pubescent; glomerules several to many, 10–15-headed, hemispheric, to 8 mm high and 15 mm across, subtended by 2 or 3 ovate bracts; bracts obtuse at base, acute to acuminate, 5–8 mm long, the venation usually apparent but not conspicuous beneath. *Heads* with 4 florets; involucre bracts 8, in 2 decussate series, strigulose, resin-dotted, the outer 4 lanceolate, 3.0–4.5 mm long, the inner 4 lanceolate-oblong, 5.0–8.0 mm long; corolla lavender, the tube slender, ca. 3.5 mm long, the limb ca. 2.0 mm long, deeply divided on the adaxial side, 5-parted, the lobes linear, ca. 1.4 mm long; anthers ca. 1.2 mm long, basally sagittate, the lobes slightly convex, ca. 0.14 mm long, the apex forming a 25° angle, the apical appendage rounded, ca. 0.18 mm long; style branches slender, terete, slightly flattened adaxially, 0.5–1.0 mm long, strigulose throughout. *Achenes* obovoid, slightly flattened, 10-ribbed, 2.2–3.0 mm long, 0.6–0.8 mm wide, dark-brown in the sulci when mature, pale on the ribs, strigulose and resin-dotted abaxially; pappus in 1 series of 5(–8) straight bristles, 3.0–3.5 mm long, abruptly or gradually dilated to 0.3 mm wide at the base, appressed-puberulent.

Elephantopus dilatatus is similar to the Brazilian *E. riparius* Gardn. which differs chiefly in having much shorter bracts (less than 4 mm long) subtending the glomerules. *Elephantopus dilatatus* is known from Costa Rica, Panama, and the Chocó of Colombia (*Duke 9971*, OS). It occurs chiefly in riverine habitats and has been collected in Panama only in December and January.

CANAL ZONE: Quebrada La Palma and Cañon of Río Chagres, 70–80 m, *Dodge & Allen 17383* (MO, NY). COLÓN: Ca. 2–3 mi up the Río Guanche, ca. 10–20 m, *Kennedy & Foster 2140* (MO, PMA, US). PANAMÁ: Between Cerro Azul and Cerro Jefe, *Dressler 3269* (DUKE, FSU, MO).

3. **Elephantopus mollis** H.B.K., Nov. Gen. Sp. Pl. 4: 26. 1820. TYPE: Caracas, *Herb. Humboldt & Bonpland* 627 (P, not seen, IDC 6209. 91. I, 1).—FIG. 7A–D.

E. carolinianus var. *mollis* (H.B.K.) Beurl., Bidr. Portobellensis Fl. 134. 1854.

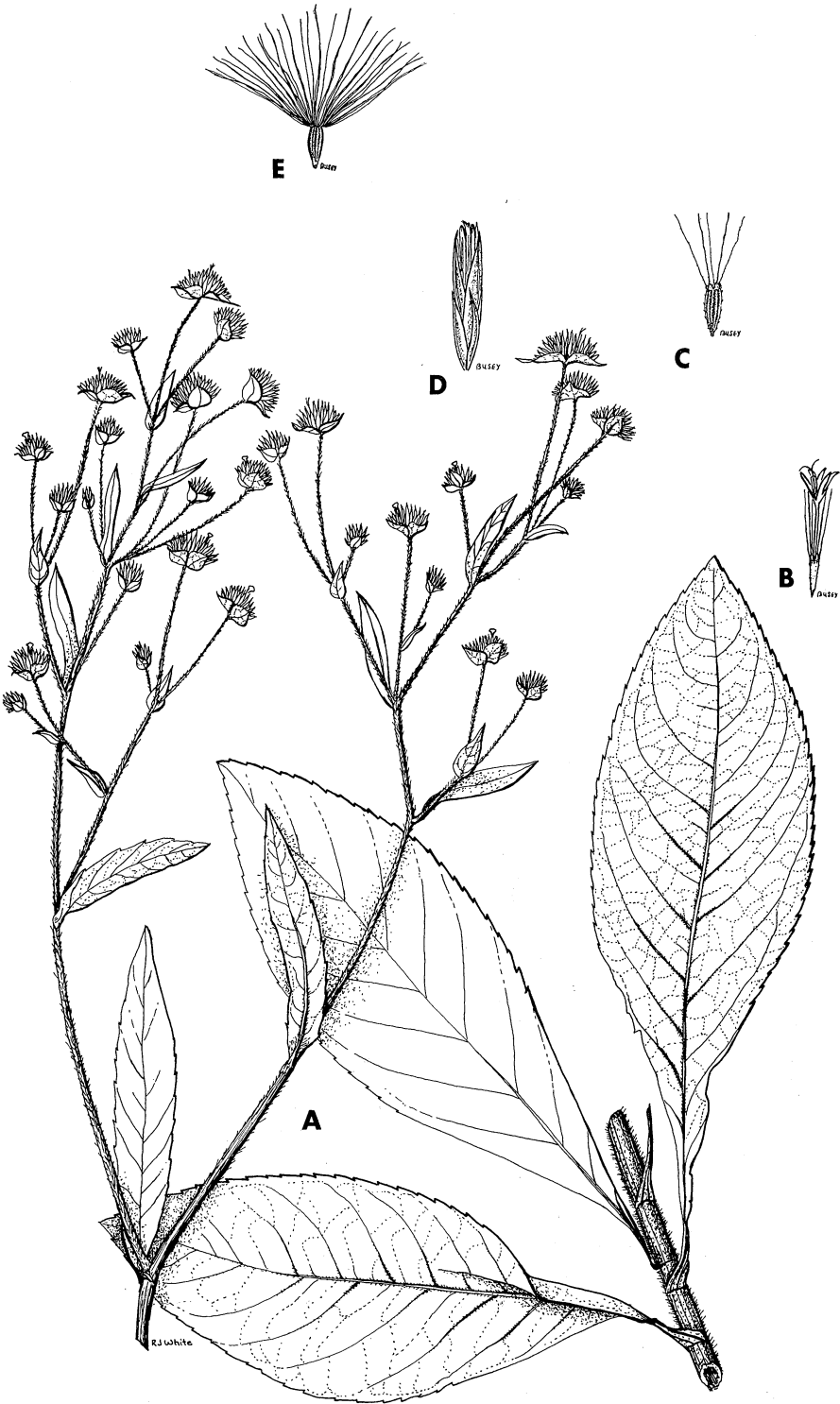
E. hypomalacus Blake, Contr. Gray Herb. 52: 20. 1917. TYPE: Costa Rica, *Holway* 314 (GH, not seen).

Coarse perennial *herbs* mostly 30–150(–200) cm tall, occasionally from a creeping rootstock; stem erect, leafy, usually hollow, villous, the trichomes to 1.5 mm long. *Leaves* cauline, rarely basal, more or less oblanceolate, basally attenuate, apically acute, crenate, mostly 7–22 cm long, 2–7 cm wide, less than $3\frac{1}{2}$ times longer than wide, chartaceous, green throughout, darker above, resin-dotted and densely soft-puberulent beneath, the trichomes to 0.5 mm long, slightly longer on the veins, above muricate and sparsely appressed-pubescent, somewhat obscurely veined above; petioles broadly expanded at the base, clasping. *Inflorescence* solitary, terminal, a much-branched corymbose panicle, the branches subtended by oblong leaflike bracts to 6 cm long; peduncles appressed-pubescent; glomerules many, with ca. 40 heads, hemispheric, to 10 mm high and 20 mm across, subtended by 2 or 3 ovate bracts; bracts obtuse at base, slightly acuminate, 6–12 mm long, the venation arcuate-ascending, conspicuous beneath, obscure above. *Heads* with 4 florets; involucre bracts 8, in 2 decussate series, minutely sericeous towards the apex, usually resin-dotted, the outer 4 lanceolate, 4.5–5.0 mm long, the inner 4 lanceolate-oblong, acuminate, 5.5–7.5 mm long; corolla white or occasionally pinkish, the tube slender, 3.0–4.0 mm long, ca. 0.15 mm wide, the limb ca. 2.0 mm long, deeply divided on the adaxial side, 5-parted, the lobes linear, ca. 1.2 mm long, ca. 0.18 mm wide; anthers ca. 1.0 mm long, ca. 0.18 mm wide, basally sagittate, 0.12–0.15 mm long, the apical appendage ca. 0.1 mm long; style branches slender, terete, somewhat flattened adaxially, ca. 0.7 mm long, strigulose throughout, but less densely on the adaxial surfaces. *Achenes* obovoid, slightly flattened, 10-ribbed, 1.9–2.7 mm long, ca. 0.7 mm wide, brown in the sulci when mature, pale on the ribs, strigulose and resin-dotted; pappus in 1 series of 5(–8) straight bristles, 3.5–4.7 mm long, abruptly or somewhat gradually dilated at the base, to 0.25 mm wide, the dilated portion 0.2–0.6 mm long, the bristles appressed-puberulent, often ciliate at the base.

At high elevations *Elephantopus mollis* assumes a dwarfed, rosette-type habit, and such forms have been mistaken for the Old World *E. scaber* L. The latter is distinguished by its stiff, coriaceous, oblong-oblanceolate leaves that are not soft-puberulent beneath. In Mexico, *E. mollis* overlaps with and perhaps intergrades with the temperate *E. tomentosus* L. The latter is distinguished by leaves

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FIGURE 7. *Elephantopus*.—A–D. *E. mollis* H.B.K.—A. Habit ($\times \frac{1}{2}$). [After Busey 329 (MO).]—B. Floret ($\times 2\frac{1}{2}$). [After Porter et al. 4642 (MO).]—C. Achene ($\times 2\frac{1}{2}$). [After Johnston 1061 (MO).]—D. Head ($\times 2\frac{1}{2}$). [After Croat 13016 (MO).]—E. *E. angustifolius* Swartz. Achene ($\times 2\frac{1}{2}$). [After Woodson et al. 1389 (MO).]



that are appressed-pubescent beneath with trichomes ca. 1 mm long, and by achenes that are at least 4 mm long.

The soft-puberulence on the undersides of the leaves of *Elephantopus mollis* is a distinctive character and, when used to separate *E. mollis* from related taxa, is well correlated with achene size and geographic distribution. Thus, it is useful to recognize this taxon at the species level. Earlier workers have, however, considered *E. mollis* at infraspecific levels under other names, e.g., *E. scaber* var. *tomentosus* (L.) Baker sensu Baker in Mart., Fl. Bras. 6(2): 173, and *E. tomentosus* var. *carolinianus* (Raeusch. not Willd.) Schultz-Bip. sensu Schultz-Bip., Linnaea 20: 516. 1847. Furthermore, *E. mollis* demonstrates throughout its range all degrees of variation in the abruptness of dilation of the pappus bristles, and the segregation of forms with very gradually dilate pappus bristles, as *E. hypomalacus* Blake, is unjustified.

Elephantopus mollis is pantropical. In Panama it is widespread, particularly in more protected habitats along roadsides, in pastures, and on forest margins. It flowers almost exclusively from December to March. Names for this species include "yerba de caballo" (Colombia), "lengua de vaca" (Puerto Rico), and "cucha-cara" (Peru).

BOCAS DEL TORO: Almirante, *Blum* 1310 (FSU, MO). Changuinola Valley, *Dunlap* 319 (GH, US). CANAL ZONE: 15 mi from Gamboa, *Blum* 2046 (FSU, MO). 10 km N of Gamboa, *Busey* 329 (DUKE, ENCB, FSU, MO, PMA, US, WIS). Cerro de Ancón, *Celestine* 88 (US). Pipeline Road, *Correa & Haines* 542 (DUKE, FSU, MO). Barro Colorado Island, *Croat* 7787, 13155 (both MO). Madden Forest, *Croat* 8936 (MO). Near Summit, *Croat* 9070 (MO). Chagres, *Fendler* 163 (MO, US). Ancón Hill, *Greenman & Greenman* 5093 (MO). Gatún, *Hayes* 677 (NY). W of Thatcher Ferry Bridge, *Lazor* 2187 (MO). Ancón, *Macbride & Featherstone* 15 (US); *Piper* 5581 (US). *Standley* 26341 (US). Balboa, *Standley* 26975 (US). Corozal, *Standley* 27381 (US). Gamboa, *Standley* 28509 (US). Mount Hope Cemetery, *Standley* 28765 (US). Between Ft. Clayton and Corozal, *Standley* 29045 (US). Balboa, *Standley* 29247, 32101 (both US). Between France Field and Catival, *Standley* 30282 (US). Near Ft. Sherman, *Standley* 31047 (US). Obispo, *Standley* 31655 (US). Pipeline Road, *Wilbur & Weaver* 11261 (DUKE); *Wilbur & Teeri* 13355 (DUKE). 1 mi SW of Cocolí, *Wilbur et al.* 12916 (DUKE). CHIRIQUÍ: 17.5 km N of Paso de Canoa, *Busey* 618 (DUKE, ENCB, GH, MO, PMA, NY, OS, US). Boquete, 4000 ft, *D'Arcy & D'Arcy* 6469 (C, F, MO). Bajo Mono, Boquete, 3800 ft, *Davidson* 600 (GH, MO). Volcán, 4600 ft, *Duke* 9200 (MO). Near Volcán, 600–750 m, *Graham s.n.* (GH). 1 mi S of Volcán, *Lazor & Correa* 2759 (FSU, MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 626 (GH, MO, US). 14 mi N of David, 1200 ft, *Lewis et al.* 688 (GH, MO). 2.2 mi E of El Hato del Volcán, *Luteyn* 809 (DUKE, MO). Alto Boquete, 1125 m, *Partch* 69–84 (MO). 2.5 mi W of El Hato del Volcán, *Wilbur et al.* 15103 (DUKE). COCLÉ: 3 mi NE of Antón, *Croat* 9619 (MO). Near El Valle de Antón, *Croat* 13289 (MO). Cerro Pilón near El Valle, 700–900 m, *Duke* 12115 (MO, OS). 3–4 mi N of El Valle, *Gentry & Dwyer* 3604 (MO). S of El Valle, 600 m, *Gentry* 6804 (MO). About 2 mi W of Natá, *McDaniel & Tyson* 14703 (FSU). Foot of Cerro Pilón, 2000 ft, *Porter et al.* 4642 (MO). Ca. 3 mi N of El Valle, 650 m, *Wilbur et al.* 15679 (DUKE). COLÓN: 5–7 mi SW of Portobelo, *Wilbur & Weaver* 11172 (DUKE). DARIÉN: Manené, *Kirkbride & Bristan* 1593 (MO). HERRERA: Near Ocu, 100 m, *Allen* 4050 (GH, MO). LOS SANTOS: 16 mi S of Macaracas at Quebrada Bejuco, *Tyson et al.* 3099 (MO). PANAMÁ: 7 mi N of Cerro Azul, 2600 ft, *Blum et al.* 1847 (FSU). Beyond Goofy Lake, *Correa & Dressler* 549 (DUKE, FSU, MO, OS). 2 mi above Goofy Lake, *Croat* 13016 (MO). Cerro Jefe to La Eneida, *Duke & Dressler* 8240 (MO). Cerro Azul, *Duke* 9362 (MO, OS); *Dwyer & Gentry* 9523 (MO, NY). Capira, trail between Lidice and Aguacate, 200 m, *Foster* 2144 (DUKE). Llanos de Panamá Viejo, *Heriberto* 291 (GH, NY, US). Near Chepo, 30 m, *Hunter & Allen* 34 (MO), 60 (GH, MO, NY). San José Island, *Johnston* 1061 (GH, MO, US). 2–3 mi S of Goofy Lake, 2000–2200 ft, *Lewis et al.* 241 (MO). Chimán, *Lewis et al.* 3362 (MO). Sabanas, *Macbride* 2631 (US). Sabanas N of Panama City, *Paul* 420 (US). Near Bella Vista, *Piper* 5392 (US). Cerro Azul, *Porter et al.* 4077 (DUKE, MO, NY). Nuevo San Francisco, *Standley* 30785 (US). Between

Las Sabanas and Matías Hernández, *Standley* 31874 (US). 9 km SE of El Valle de Antón, *Wilbur et al.* 11164 (DUKE). VERAGUAS: Hills W of Soná, 500 m, *Allen* 1026 (GH, MO, US). Montijo, 8 mi S of Santiago, *Tyson* 6037 (FSU, MO).

7. PSEUDELEPHANTOPUS

Pseudelephantopus Rohr, *Skr. Naturhist.-Selsk.* 2: 213. 1792. "PseudoElephantopus." TYPE: *Elephantopus spicatus* Juss.

Distreptus Cass., *Bull. Soc. Philom.* 1817: 66. 1817. TYPE: *Elephantopus spicatus* Juss.

Spirochaeta Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 24: 166. 1851. TYPE: *S. funckii* Turcz.

Chaetospira Blake, *Jour. Wash. Acad. Sci.* 25: 311. 1935. TYPE: *Spirochaeta funckii* Turcz.

Erect, perennial *herbs*; stems solitary, branched. *Leaves* cauline, alternate, pinnately veined; petioles indistinct. *Inflorescences* several, terminal, racemose-spicate, the heads clustered in the axils of leaflike bracts, the clusters 1–several-headed, obconic. *Heads* with 4 florets; involucral bracts 8, similar, in 4 decussate pairs, abaxially bicolored; receptacle naked, convex, bearing minute protuberances at the base of the achenes, florets bisexual, zygomorphic; corolla tubular-funnel-form, the tube slender, the limb 5-cleft, deeply divided on the adaxial side; anthers 2-celled, sagittate at the base, apically appendaged; style bifid, the branches slender, flattened and stigmatic adaxially, strigulose abaxially. *Achenes* \pm obovoid, slightly flattened, 10-ribbed, hispidulous or strigulose primarily on the ribs; pappus in 1 series of 5–10 unequal or subequal bristles, doubly bent or spiralled toward the apex, glabrous on the surfaces, ciliolate.

A neotropical genus of 2 species, both of which are known from Panama. Cronquist (1971) gives reasons supporting the spelling *Pseudelephantopus*.

Pseudelephantopus is conspicuously different from all members of *Elephantopus* in the general construction and appearance of the inflorescence. The heads of *Pseudelephantopus* are not densely held in a tight glomerule, and the subtending bracts are not highly specialized as in *Elephantopus*, but are leaflike. Furthermore, *Pseudelephantopus* differs cytologically. *Pseudelephantopus spicatus* has been reported (Cronquist, 1971) to have $2n = 28$, in contrast to *Elephantopus*, which has $2n = 22, 44$ (Federov, 1969).

Literature:

Cronquist, A. 1971. *Compositae*. Pp. 350–353 in I. L. Wiggins & D. M. Porter, *Flora of the Galapagos*. Stanford Univ. Press, Stanford, California.

- a. Principal pappus bristles conspicuously doubly bent; achenes more than 5 mm long 1. *P. spicatus*
 aa. Pappus bristles curled or loosely spiralled; achenes less than 5 mm long 2. *P. spiralis*

1. **Pseudelephantopus spicatus** (Juss.) C. F. Baker, *Trans. Acad. Sci. St. Louis* 12: 55. 1902.—FIG. 8A–C.

Elephantopus spicatus Juss. in Aublet, *Hist. Pl. Guiane* 2: 808. 1775. Based on Sloane, *Voy. Isl. Madera* 1: 256, pl. 150, fig. 3–4. 1707.

Distreptus spicatus Cass. in *Levr., Dict. Sci. Nat.* 13: 367. 1819.

Erect, mostly perennial *herbs* or *subshrubs* 10–60(–120) cm tall, often arising from a creeping rootstock; stem striate, sometimes hollow, the branching dichot-

omous, ascending, the branches to 30 cm long, strigose, with trichomes 1.0–1.8 mm long. *Leaves* cauline, the lower oblanceolate, basally attenuate, acute at apex, sinuate or more commonly sparsely serrate, 4–21 cm long, 2–6 cm wide, chartaceous, strigose and resin-dotted beneath, merely hispid above, the pubescence at first dense, becoming sparse with age, the trichomes 0.8–1.8 mm long, the leaves becoming shorter and more oblong-elliptic upwards and merging into the bracts of the inflorescence, venation somewhat obscure above; petioles indistinct, winged, the blades essentially sessile. *Inflorescences* several racemose-spicate branches, the nodes with \pm elliptic, leaflike bracts to 3 cm long, generally 5–20 mm apart; clusters of heads subsessile, solitary in the axils, scorpioid, conical, to 15 mm high and 10 mm across, loose, few-headed, the individual heads overlapping but distinguishable; bracteoles oblong, to 2 cm long. *Heads* with 4 florets; involucre bracts 8, similar, in 4 decussate pairs, the outer pairs progressively shorter, the inner 2 pairs subequal, oblong-oblanceolate, boat-shaped, 8–10 mm long, 1.5–2.0 mm wide, mucronate, keeled, glabrescent, green towards the apex, hyaline basally, on the keel, and along the margins; corolla white or lavender, the tube slender, 5–6 mm long, the limb 3–4 mm long, deeply divided on the adaxial side, 5-cleft, the lobes ca. 2 mm long; anthers ca. 1.5 mm long, basally sagittate, the lobes ca. 0.15 mm long, the apical appendage rounded, ca. 0.16 mm long; style branches flattened and stigmatic adaxially, ca. 1.2 mm long, strigulose on the abaxial side of the branches and for ca. 0.4 mm on the shaft apex. *Achenes* narrowly obovoid, slightly flattened, 10-ribbed, 5.5–7 mm long, ca. 1 mm wide at the apex, tapered to the base, hispidulous principally on the ribs, the trichomes ca. 0.2 mm long, usually resin-dotted principally between the ribs; pappus in 1 series of 6–10 bristles, with the 2 lateral bristles longest, 4–6 mm long, gradually dilated to 0.3 mm wide at the base, and conspicuously doubly bent for about 1 mm, and with 2 abaxial bristles longer than the others, 3–5 mm long, generally straight, the remaining 1–3 pairs shorter and less conspicuous, the bristles generally lacerate at the base.

Pseudelephantopus spicatus ranges throughout tropical Mexico, the West Indies, south throughout Central America and northern South America, including Peru; it is also reported from Chile. The species has been introduced to East Asia and the Pacific, and has recently been collected in West Africa. It is extremely common in pastures and clearings throughout Panama, and flowers almost exclusively between December and April.

In Panama this species is usually called “chicoria” or “suela consuela,” but is also called “escobilla blanca.” Elsewhere (El Salvador) *Pseudelephantopus spicatus* is called “oreja de perro” or “oreja de chucho.” A syrup from the plant is used to cure coughs; it is also used to make brushes and brooms. According to the information on *Duke 10849* (San Blas), *P. spicatus* is called “candeabsurguit” and is “taken by [the] Cuna in the belief that it is vitamin rich.” Information from *Lazor & Correa 3383* (Darién) indicates the species may be believed to be useful in worming cattle.

BOCAS DEL TORO: Talamanca Valley, *Carleton 107* (GH, US). Almirante, *Cooper 143* (GH, US). Changuinola Valley, *Dunlap 294* (US). Near Changuinola, *Lewis et al. 831* (GH, MO, NY). Near Chiriquicito, *Lewis et al. 2100* (ENCB, GH, MO). CANAL ZONE: Barro



FIGURE 8. *Pseudelephantopus*.—A—C. *P. spicatus* (Juss.) C. F. Baker.—A. Habit ($\times \frac{1}{2}$). —B. Achene ($\times 5$).—C. Head ($\times 5$). [After Busey 457 (MO).]—D. *P. spiralis* (Less.) Cronq. Achene ($\times 5$). [After Croat 7510, Colombia (MO).]

Colorado Island, *Bailey & Bailey* 116 (GH). Ft. San Lorenzo, *Burch et al.* 1023 (GH, MO, NY). Barro Colorado Island, *Croat* 4084, 4161, 4168, 6911, 8565 (all MO). Madden Forest, *Croat* 12894 (MO). Río Azote Caballo, 66–70 m, *Dodge et al.* 16858 (MO). Las Cruces Trail, *Dwyer* 1962 (MO). Chagres, *Fendler* 175 (MO, US). Madden Forest, *Flórez* 56 (DUKE,

MO). Ancón, *Greenman & Greenman 5004* (GH, MO). Gatún, *Hayes 476* (GH, NY, US). Pedro Miguel, *Heriberto 45* (GH, NY). Near Arraiján, *Lewis et al. 5185* (MO). Ancón, *Macbride & Featherstone 14* (US). Empire to Mandinga, *Piper 5504* (GH, US). Near Madden Dam, *Porter et al. 4030* (MO, US). Gamboa, *Porterfield s.n.* (NY). Balboa Station, *Porterfield s.n.* (NY). Sosa Hill, *Standley 26456* (GH, US). Near Summit, *Standley 29533* (GH, US). Darién Station, *Standley 31579* (US). Near Gatún Station, *Tyson 2277* (MO). Ft. San Lorenzo, *Tyson & Blum 3694* (FSU, MO). Near Cocolí, *Wilbur et al. 12904* (DUKE, MO). CHIRIQUÍ: San Bartolo Límite, *Busey 457* (ENCB, MO). Rabo de Puerco, *Liesner 35* (MICH, MO, NY). Quebrada Melliza, *Liesner 427* (F, MO). Río Fonseca, *McCorkle C-72* (FSU). COCLÉ: Río Grande, *Burch et al. 1173* (GH, MO, NY). El Valle de Antón 1000–2000 ft, *Lewis et al. 2592* (DUKE, GH, MO). El Cope, 1500 ft, *Tyson 5203* (DUKE, FSU, MO). COLÓN: Santa Rita, *Kennedy 2766* (F, MO, NY, UC, MICH). DARIÉN: Río Piñas, *Duke 10567* (MO, OS). Río Pirre, *Kennedy 2873* (C, F, MO, NY). Yaviza, *Lazor & Correa 3383* (FSU). LOS SANTOS: Río Pedregal, *Lewis et al. 2977* (MO). PANAMÁ: Isla Taboga, *Allen 1299* (GH, MO). Isla del Rey, *Duke 9503* (MO, OS). Tocumen, *Dwyer 4118 A* (MO). San José Island, *Johnston 971* (GH). Chimán, *Lewis et al. 3313* (MO). Old Panama, *Porterfield s.n.* (NY). Taboga Island, *Standley 27095, 27835* (both US), Saboga Island, *Tyson & Loftin 5146* (DUKE). Chilibre, *Tyson & Lazor 6107* (FSU). SAN BLAS: Permé, *Cooper 257* (NY, US). Río Ailigandí, *Duke 10849* (MO, OS). Ailigandí, *Lewis et al. 68* (GH, MO).

2. *Pseudelephantopus spiralis* (Less.) Cronq., Madroño 20: 255. 1970.—FIG. 8D.

Distreptus spiralis Less., Linnaea 6: 690. 1831. TYPE: Jamaica, *Herb. Thunberg 20920* (UPS, not seen, IDC 1036. 878. I, 4).

Spirochaeta funckii Turcz., Bull. Soc. Imp. Naturalistes Moscou 24: 167. 1851. TYPE: Venezuela, La Guayra, *Funck 358*, Galeotti Herb. 380 (G-Delessert Herb. 28530, not seen, MO, US, photos).

Chaetospira funckii (Turcz.) Blake, Jour. Wash. Acad. Sci. 25: 311. 1935.

Pseudelephantopus funckii (Turcz.) Philipson, Jour. Bot. 76: 301. 1938.

Erect, perennial stoloniferous *herbs* 10–80 cm tall; stem sometimes hollow, the branches few, ascending, generally with one branch distinctly dominant, the branches to 35 cm long, hispid, with trichomes 1.3–2.5 mm long. *Leaves* cauline, the lower obovate to oblanceolate, basally cuneate, acute or sometimes rounded at apex, sinuate and sparsely serrate, 2–7(–14) cm long, 1.2–2.0(–4.5) cm wide, chartaceous, resin-dotted beneath when young, merely punctate later, hispid or sometimes strigose on both surfaces, the pubescence at first yellowish, later whitish, persistent, the trichomes 2.0–3.5 mm long, shorter in depauperate individuals, the leaves becoming abruptly shorter, oblong-elliptic upwards; venation somewhat obscure above; petioles winged, basally broadly expanded, apically constricted. *Inflorescences* several racemose-spicate branches or solitary, the flowering nodes with oblong bracts mostly to 1.5 cm long, 2–10 mm apart; clusters of heads subsessile, solitary in the axils, generally overlapping, capitate, obconic, to 9 mm high and 12 mm across, dense, 5–10-headed, the individual heads overlapping and \pm distinguishable. *Heads* with 4 florets; involucre bracts 8, similar, in 4 decussate pairs, the outer pairs progressively shorter, the inner 2 pairs subequal, oblong-lanceolate, boat-shaped, 7–8 mm long, 1–2 mm wide, mucronate, not keeled, scabridulous and somewhat greener toward the apex, hyaline basally and along the margins; corolla blue-violet, the tube slender, ca. 3.5 mm long, the limb ca. 2.5 mm long, deeply divided on the adaxial side, 5-parted, the lobes ca. 1 mm long; anthers ca. 1.2 mm long, basally sagittate, the lobes ca. 0.15 mm long, apically appendaged; style branches flattened and stigmatic adaxially, ca. 1.0 mm long, minutely strigulose on the abaxial side of the branches and slightly

below the dichotomy. *Achenes* obovoid, slightly flattened, 10-ribbed, 2.5–3.3 mm long, ca. 0.8 mm wide, strigulose, the trichomes 0.1 mm long, usually resin-dotted; pappus in 1 series of 5–10 bristles of approximately equal length, curled or loosely spiralled toward the apex, usually slender throughout, rarely to 0.3 mm wide at the base.

Pseudelephantopus spiralis occurs in fields and waste areas, particularly near streams and marshes from Costa Rica and the Lesser Antilles throughout northern South America and along the eastern slope of the Andes to Bolivia and northern Argentina. Although rare in Panama, this species is common in Colombia, where it is called “suelta con suelta.”

DARIÉN: Manené, *Kirkbride & Bristan 1570* (MO, PMA). VERAGUAS: Mouth of Río Concepción, *Lewis et al. 2775* (MO, OS, PMA).

8. ROLANDRA

Rolandra Rottb., Collect. K. Medic (Copenhagen) 2: 256. 1775. TYPE: *Echinops fruticosus* L. = *Rolandra fruticosa* (L.) Kuntze.

Decumbent perennial *herbs* or *subshrubs*. *Leaves* cauline, alternate, conspicuously white-tomentose beneath, not basally attenuate, venation pinnate; petioles distinct. *Inflorescences* several, solitary, terminal and axillary glomerules; glomerules many-headed, globose, ebracteate. *Heads* with 1 floret; involucre bracts coriaceous, 2(3), alternate; receptacle obsolete; florets bisexual, actinomorphic; corolla tubular-campanulate, the tube slender, the limb 4-parted; anthers basally sagittate, apically appendaged; style branches short, strigulose abaxially. *Achenes* obovoid, slightly flattened, glabrous, smooth but resin-dotted, obscurely 5-nerved; pappus in 1 series, a short, continuous crown of scales.

The genus is monotypic.

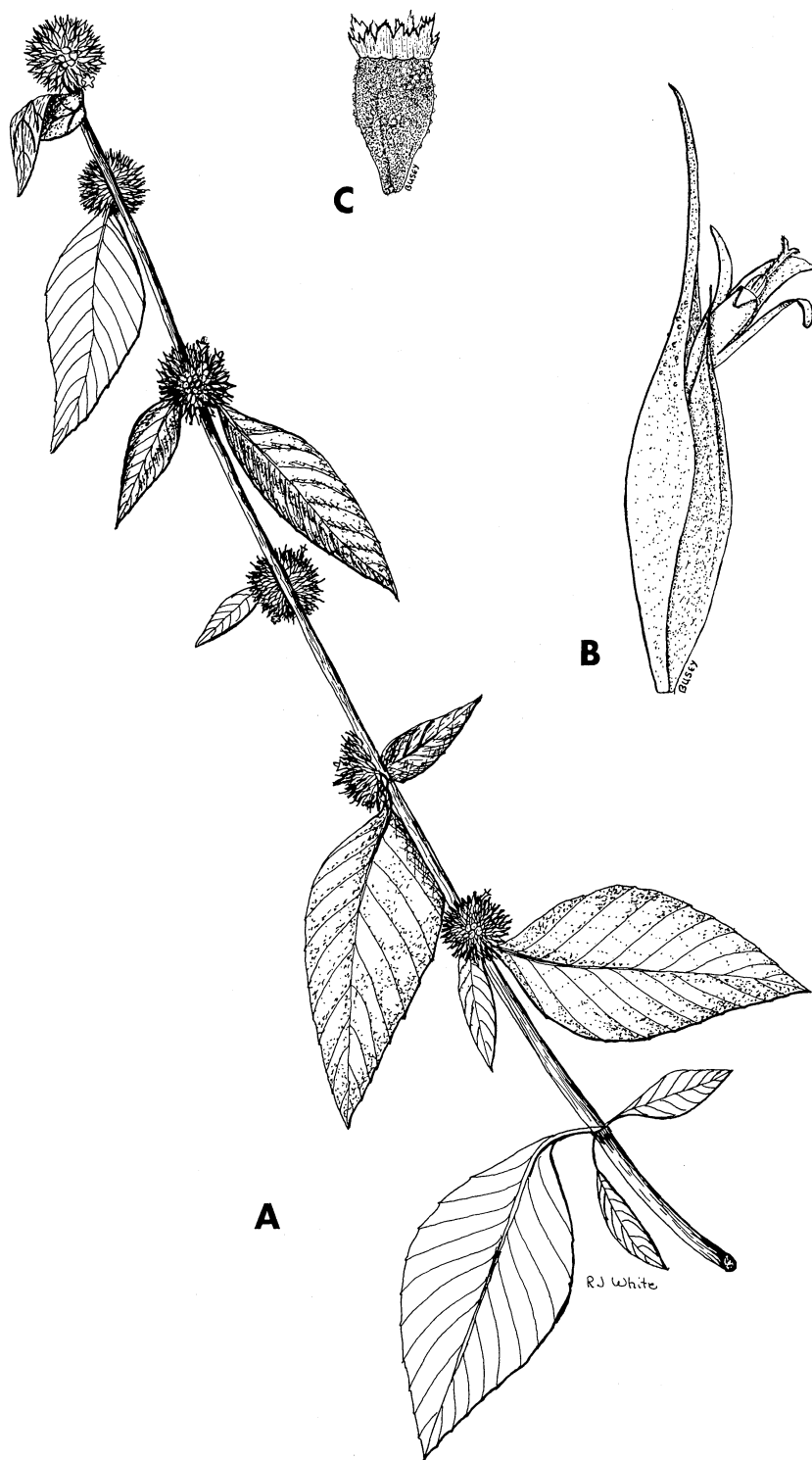
1. *Rolandra fruticosa* (L.) Kuntze, Rev. Gen. Pl. 1: 360. 1891.—FIG. 9.

Echinops fruticosus L., Sp. Pl. 815. 1753. TYPE: not seen.

Rolandra argentea Rottb., Collect. K. Medic (Copenhagen) 2: 256. 1775. Based on Sloane, Voy. Isl. Madera 1: 47, pl. 7. 1707.

Echinops nodiflorus Lam., Encycl. Meth. 2: 337. 1786. TYPE: Guyana, Cayenne, (P-LA, not seen, IDC 6207. 366. I, 6).

Decumbent perennial *herbs* or *subshrubs* to 150 cm long, sparingly branched; stems solid, to 7 mm in diameter, brown, white-sericeous. *Leaves* distributed along the stem, lanceolate-elliptic, basally rounded-obtuse, apically somewhat acuminate, sparsely serrulate, 4–11 cm long, 1.5–5 cm wide, ± scarious, muricate-scabridulous above and sparsely sericeous when young, beneath conspicuously white-tomentose, secondary veins 9–12 pairs, prominent beneath, sunken above; petioles 5–15 mm long. *Inflorescences* dense glomerules, upper-axillary and terminal; glomerules 300–400-headed, essentially ebracteate, globose, 10–15 mm in diameter. *Heads* with 1 floret; involucre bracts mostly 2, alternate, lanceolate, boat-shaped, laterally compressed and somewhat keeled, coriaceous, more or less resin-dotted abaxially towards the apex and apically ciliolate, glabrescent, the outermost 5.0–6.5 mm long, with a sharp acumen ca. 1 mm long, the innermost



largely enclosed by the outer bract, ca. 4 mm long, a third, elongate, ca. 2 mm long, vestigial involucre bract sometimes present below the major ones; corolla white, the tube slender, 1.7 mm long, the limb 1.8 mm long, 4-parted, the lobes lanceolate, equal, 1.5 mm long, 0.5 mm wide at the base; anthers 1.0 mm long, basally sagittate, the lobes 0.08 mm long; style branches 0.2 mm long, flattened adaxially, strigulose abaxially. *Achenes* obovoid, slightly flattened, smooth, obscurely 5-nerved, 1.5 mm long, 0.8 mm across at the widest point, vitreous-yellow to -brown, resin-dotted throughout; pappus in 1 series, a continuous crown of many persistent somewhat lacerate, united hyaline scales 0.15–0.30 mm long.

Rolandra fruticosa ranges from Honduras southward, and from Puerto Rico and the Lesser Antilles throughout northern South America to Brazil; introduced to Japan and Java. In Panama it is widespread in grazed areas and moist thickets, principally from the Caribbean slope and moister aseasonal climates. It flowers principally from December to April. According to information on *Duke 10845* (San Blas, MO) *R. fruticosa* is called “niagurgin” and is “taken in teas by [the] Cuna in belief that it will increase their ability to make ‘molasses’ rapidly.”

BOCAS DEL TORO: Isla Colón, *Wedel 55* (GH, MO). CANAL ZONE: 15 mi N of Gamboa, *Blum 2042* (FSU, MO). Barro Colorado Island, *Busey 298* (ENCB, MO, PMA). Cerro de Ancón, *Celestine 65* (US). Barro Colorado Island, *Croat 4150, 4352, 7483, 7784, 8589* (all MO). Pipeline Road near Gamboa, *Croat 4694* (MO). Madden Forest, *Croat 8948* (MO). Far end of Pipeline Road, *Croat 12782* (MO, NY). Ft. Sherman, *Duke 4360* (MO). Chagres, *Fendler 143* (MO, US). Barro Colorado Island, *Foster 1441* (DUKE). Gatún Station, *Hayes 605* (NY). Gatún, *Heriberto 107* (US). Ancón Hill, *Piper 5574* (GH, NY, US). Near Old Ft. Lorenzo, *Piper 5969* (US). Between Río Grande and Pedro Vidal, *Pittier 2706* (NY, US). Barro Colorado Island, *Shattuck 419* (MO). Balboa, *Standley 25459* (US). Swampy woods near Ft. Randolph, *Standley 28607* (US). Between France Field and Catival, *Standley 30311* (US). Barro Colorado Island, *Standley 40988* (US). N of Summit, *Tyson et al. 2782* (FSU, MO, NY). Ca. 8.5 mi NW of Gamboa, *Wilbur & Teeri 13419* (DUKE). CHIRIQUÍ: El Nancito, 700 ft, *Tyson 6392* (FSU, MO). COCLÉ: Between La Mesa and El Valle de Antón, *Wilbur & Luteyn 11686* (DUKE). Penonomé, *Williams 153* (NY, US). COLÓN: Río Chagres above Gamboa, *Allen 4137* (MO). La Represa, *Chan 41* (MO). Guasimo, *Croat 9976* (MO). Isla Grande, *D'Arcy 4024* (MO). Santa Rita Ridge, *D'Arcy & D'Arcy 6178* (MO). Santa Rita, N of Agua Clara rain gauge, *Kennedy 2766* (F, MICH, MO, NY, UC). Near Escobal, *McCorkle C-182* (FSU). Near Portobelo, *Nee & Mori 3646* (MO). Santa Rita, *Wilbur & Weaver 10827* (MO); *Wilbur et al. 15050* (DUKE). DARIÉN: Río Congo, *Bristan 653* (MO). HERRERA: Between Las Minas and Pesé, 900–1200 ft, *Burch et al. 1345* (MO, PMA). Near Las Minas, *Stern et al. 1767* (US). PANAMÁ: Cerro Jefe, 2700 ft, *Blum & Duke 2203* (FSU, MO). Cerro Azul, *Busey & Croat 254* (C, DUKE, ENCB, F, FSU, GH, K, LE, MO, NY, OS, P, PMA, UC, US, WIS). Near Cerro Azul, *D'Arcy & D'Arcy 6239* (MO). Cerro Azul, *Duke 9364* (MO, OS). Isla del Rey, *Duke 10414* (MO, OS). Cerro Azul, *Dwyer 1869* (MO). Near Goofy Lake, 2000 ft, *Dwyer 2073* (MO). Cerro Campana, 2600–2800 ft, *Lewis et al. 1949* (GH, MO). Bellevista, *Macbride 2739* (MO, US). Cerro Azul, *Porter et al. 4072* (MO). Cerro Jefe, *Porter et al. 5057* (MO). Cerro Azul, 2000 ft, *Tyson 2050* (MO). Cerro Jefe, 3000 ft, *Tyson et al. 4439* (FSU, MO). Cerro Azul, *Tyson & Lazor 6088* (FSU). Cerro Jefe, 2700–3000 ft, *Wilbur & Teeri 13634* (DUKE). SAN BLAS: Río Ailigandí, *Duke 10845* (MO). Ailigandí River, *Lewis et al. 82* (GH, MO, US). VERAGUAS: Río Concepción, *Lewis et al. 2792* (MO).

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FIGURE 9. *Rolandra fruticosa* (L.) Kuntze.—A. Flowering stem ($\times \frac{7}{10}$).—B. Head ($\times 13\frac{1}{2}$). [After *Croat 7784* (MO).]—C. Achene ($\times 13\frac{1}{2}$). [After *D'Arcy & D'Arcy 6239* (MO).]

9. SPIRACANTHA

Spiracantha H.B.K., Nov. Gen. Sp. Pl. 4: 28. 1820. TYPE: *S. cornifolia* H.B.K.

Erect or decumbent perennial *herbs*. *Leaves* cauline, alternate, conspicuously white-tomentose beneath, not basally attenuate, venation pinnate; petioles distinct. *Inflorescences* many terminal or pedunculate bracteate clusters of glomerules, the clusters capitate, subtended by leaflike, spine-tipped bracts; glomerules many, each a compact unit of several heads, each head tightly held by a broad, spine-tipped bract. *Heads* with 1 floret; involucre bracts membranous, 6, in 2 series; receptacle obsolete; florets bisexual, actinomorphic; corolla tubular-funnelform, the tube slender, the limb 4-parted; anthers basally sagittate, apically appendaged; style branches stigmatic adaxially, essentially naked. *Achenes* turbinate, semiterete, glabrous, smooth, obscurely 5-nerved, apically resin-dotted; pappus in more than 1 series of many slender scales.

The genus is monotypic.

The bract subtending and enclosing the head in *Spiracantha* is similar to the involucre bracts of *Rolandra*. The latter coriaceous bracts contrast strongly with the paleaceous involucre bracts of *Spiracantha*. In view of the fact that the two genera are otherwise similar and closely related, it is possible these organs are not homologous in *Rolandra* and *Spiracantha*.

1. **Spiracantha cornifolia** H.B.K., Nov. Gen. Sp. Pl. 4: 29. 1820. TYPE: Venezuela, ad portum Zapote, *Herb. Humboldt & Bonpland* 1367 (P, not seen, IDC 6209. 91. I, 4).—FIG. 10.

Erect or partially decumbent *herbs* 30–150(–200) cm long; stems loosely branched, purplish on exposed areas, sericeous, the trichomes to ca 1.4 mm long. *Leaves* distributed along the stem, \pm elliptic, basally obtuse, apically acute and sharply mucronate, serrulate, 2.5–11 cm long, 1–4 cm wide, chartaceous, sericeous above, beneath conspicuously white-tomentose, secondary veins 6–10 pairs, prominent beneath, sunken above; petioles 5–15 mm long, expanded-deltoid and basally clasping. *Inflorescences* capitate clusters; peduncles 1–10 cm long; clusters ca. 1.5 cm tall, 2.5–4 cm across, containing 20–25 subsessile glomerules, several of the lower glomerules arising from and tightly enclosed by a leaflike bract; bract ovate, to 2 cm long, membranous, with a sharp mucro ca. 1.5 mm long; the glomerules compact, 3–11-headed, 5–8 mm high, 5 mm across, with a strigulose bract subtending each head; bract ovate, keeled, with a sharp, horizontally directed mucro ca. 1.5 mm long. *Heads* with 1 floret; involucre bracts membranous, about 6, \pm imbricate, linear, 4–4.5 mm long, conspicuously lanate at the base; corolla blue-violet, the tube slender, 1.4 mm long, the limb 1.6 mm long, 4-parted, the lobes equal, 1.0 mm long; anthers 0.9 mm long, basally sagittate, the appendage ca. 0.3 mm long; style branches 0.3 mm long, glabrate. *Achenes* turbinate, semiterete, smooth, 2 mm long, 0.7 mm across at the widest point, smooth, obscurely 5-nerved, vitreous-gray, resin-dotted in a ring around the top; pappus in 2 series, the outer series of 10 or more hyaline, minutely strigulose scales of different lengths, 0.5–1.0 mm long, the inner series considerably shorter, the scales linear-lanceolate, readily deciduous.

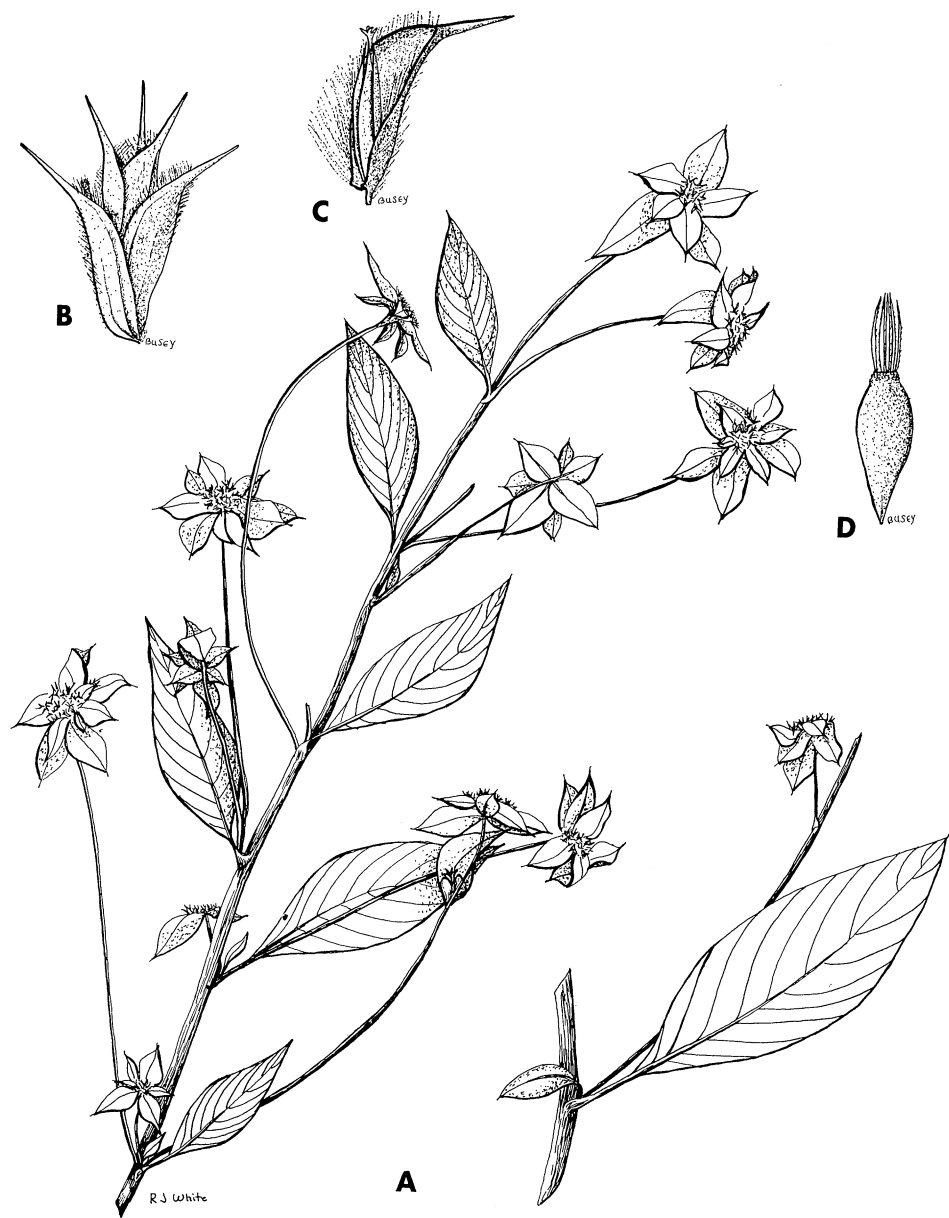


FIGURE 10. *Spiracantha cornifolia* H.B.K.—A. Habit ($\times \frac{1}{2}$). [After Busey 327 (MO).]—B. Glomerule ($\times 5$). [After Dwyer et al. 4349 (MO).]—C. Head and bract ($\times 5$).—D. Achene ($\times 10$). [After Lewis et al. 5438 (MO).]

Ranging from British Honduras to Venezuela, in Panama *Spiracantha cornifolia* is mainly restricted to central Panama, often on thin soil. It flowers principally from December to April. The glomerules do not fall apart but are disseminated intact.

CANAL ZONE: Albrook Forest, *Blum & Dwyer* 2093 (FSU, MO). France Field, *Blum & Dwyer* 2120 (MO). Barro Colorado Island, *Busey* 309 (FSU, MO). 10 km N of Gamboa, *Busey* 327 (C, DUKE, ENCB, MO, OS, PMA, US, WIS). Near Albrook, *Correa* 118 (DUKE, FSU). Barro Colorado Island, *Croat* 7460, 7776, 8246, 11998 (all MO). Madden Forest, *Croat* 8944 (MO). Pipeline Road 2.5 mi from Gamboa, *Croat* 9341 (MO). 15 mi NW of Gamboa, *Croat* 12771 (MO). Albrook, *Dwyer & Robyns* 38 (MO). Arraiján, *Dwyer et al.* 4349 (MO). Barro Colorado Island, *Ebinger* 11 (DUKE, MO). 11 mi NE of Balboa, *Eyerdam* 12064 (US). 5–10 mi N of Gamboa, *Gentry* 2655 (MO). Ancón, *Greenman & Greenman* 5049 (GH, MO). Pipeline Road, 5.9 mi from Gamboa turnoff, *Kennedy* 2345 (MO). Near Gamboa, *Lazor & Tyson* 5660 (MO). Madden Forest, *Lewis et al.* 5310 (DUKE, MO, NY). Barro Colorado Island, *Luteyn* 773 (DUKE). Between Rodman Marine Base and Chorrera, *Nowicke et al.* 3595 (MO). Chiva-Chiva Trail near Pueblo Nuevo, *Piper* 5760 (US). Summit, *Standley* 26906 (US). Gatún Station, *Tyson* 3519 (MO). Ft. Clayton, *Tyson* 3659 (FSU, MO). 12 mi S of Colón, *Tyson et al.* 4488 (FSU, MO). Pipeline Road N of Gamboa, *Wilbur & Weaver* 11244 (DUKE, MO). 1 mi SW of Cocolí, *Wilbur et al.* 12877 (DUKE, GH, MO). Playa Venado, *Wilbur & Teeri* 12980 (DUKE). 6 mi NW of Gamboa, *Wilbur & Teeri* 13356 (DUKE, GH, MO, NY). Near Summit, *Wilbur & Teeri* 13383 (DUKE). COCLÉ: Río Grande, *Burch et al.* 1178 (GH, MO, US). COLÓN: Between Transisthmian Hwy. and Salamanca, 100 m, *Gentry* 6726 (MO). DARIÉN: Río Sabana, *Duke* 15452 (OS). HERRERA: Between Chitré and Divisa, *Burch et al.* 1365 (MO). PANAMÁ: Isla del Rey, *Duke* 9574 (DUKE, MO, OS). Cerro Azul, *Dwyer* 2410 (ENCB, MO). Near Cerro Jefe, *Dwyer* 7138 (GH, MO). San José Island, *Johnston* 170 (GH); 1199 (GH). Cerro Campana, *Lewis et al.* 3117 (DUKE, MO). Ca. 16 mi N of Gamboa, *Lewis et al.* 5438 (MO). Sabanas N of Panama City, *Paul* 622 (US). Near Juan Franco Race Track, *Standley* 27709 (US). Between Matías Hernández and Juan Díaz, *Standley* 32043 (US). Cerro Campana, 2300 ft, *Tyson* 4021 (FSU, MO). 4 mi E of Chepo, *Tyson* 5354 (DUKE, FSU, MO). Near Goofy Lake, *Wilbur & Weaver* 11107 (DUKE). Cerro Azul, *Wilbur & Teeri* 13597 (DUKE).

II. EUPATORIEAE⁷

R. M. KING⁸ AND H. ROBINSON⁸

Eupatorieae Cass., Jour. Phys. 88: 202. 1819. TYPE: *Eupatorium* L.

Herbs, vines, shrubs or small *trees*, terrestrial or epiphytic. *Leaves* opposite, alternate or whorled, simple or rarely compound, usually petiolate. *Heads* discoid with 1–ca. 300 florets; involucre bracts in 1–8 series, usually separate, commonly imbricated, herbaceous or coriaceous; receptacle flat to hemispherical or conical, glabrous or hairy, mostly without paleas; florets perfect and fertile, cells without raphids; corollas tubular to campanulate or funnelform, rarely irregular, white, blue, pink, red or purple, never yellow, lobes 5(4), glabrous to glanduliferous or hairy; stamens 4–5, the thecae rounded or hastate at base, never tailed, the exothecial cells usually quadrate with thickenings on both lateral and transverse walls, the appendage vestigial to elongate, flat and often hollow; style base with or without enlargement, glabrous to hirsute, immersed in nectary, the style branches well-developed, sometimes glanduliferous, the stigmatic surface of two

⁷ Assisted by National Science Foundation Grant BMS 70-00537 (R. M. King, Principal investigator).

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distinct lines restricted to lower half of lateral margins, rarely on inner surface and reaching nearer tip, the appendages flattened to terete, papillose or smooth, filiform or clavate. *Achenes* prismatic or flattened, 2–10-ribbed (usually 5 or 10), setiferous or glanduliferous, the base usually forming a distinct symmetrical or asymmetrical carpodium; pappus of scales, awns, bristles, or coroniform to completely lacking, in two genera forming glanduliferous knobs, persistent or deciduous, rarely in more than one series. *Pollen* spherical, usually ca. 18–25 μ in diameter, tricolporate, rarely almost smooth, usually short-spinose, never lophorate, with rather simple wall structure.

The tribe is very diversified with more than 100 genera and more than 2,000 species. Most of the genera and species are confined to the New World. The most commonly recognized distinguishing features of the tribe are the usually elongate sometimes expanded style appendages and the exclusively homogamous flowers in the heads. Leaves are mostly opposite.

The taxonomy of the Eupatorieae has been extensively revised at the generic level and some of the revisions are cited in the following text. The need for revision has been exceptionally great because the previously emphasized characters have proven particularly unreliable. The revisions have been aided by the use of distinctive microscopic floral characters (King & Robinson, 1970) which are particularly well-developed in the tribe.

As this treatment went to press, Williams (1975) presented a treatment of the Eupatorieae in Guatemala and adjacent regions differing from that presented here.

Literature:

- King, R. M. & H. Robinson. 1969. Studies in the Compositae-Eupatorieae, XI. Typification of genera. *Sida* 3: 329–342.
- & ———. 1970. *Eupatorium*, a composite genus of Arcto-tertiary distribution. *Taxon* 19: 769–774.
- Williams, L. O. 1975. Tropical American plants, XVII. *Fieldiana, Bot.* 36: 77–110.
- a. Heads with 3–5 involucre bracts and usually an equal number of florets.
- b. Anther appendages minute or lacking; anther filament with hairs or papillae; walls of achenes sparsely punctate internally (not visible without special techniques) 29. *Piqueria*
- bb. Anther appendages distinct, as long as wide or longer; anther filaments without hairs or papillae; walls of achenes densely minutely punctate internally.
- c. Plants scandent; heads with 4 florets and 4 principal involucre bracts; corollas glabrous inside, lobes smooth 27. *Mikania*
- cc. Plants erect herbs or subshrubs; heads with 5 florets and 5 equal involucre bracts; corollas with hairs inside, lobes papillose inside 31. *Stevia*
- aa. Heads with more than 5 involucre bracts.
- d. Pappus lacking or of a few scales, knobs, or irregular projections.
- e. Pappus with 3–5 knobs bearing glands on tips.
- f. Anther appendages as long as wide or longer; style shaft glabrous; glands of pappus in discrete clusters on tips of knobs 30. *Sciadocephala*
- ff. Anther appendages not as long as wide; style shaft often with numerous hairs; glands of pappus in elongate clusters on tips and outer surfaces of knobs 10. *Adenostemma*
- ee. Pappus of scales, projections, or lacking, not bearing glands.

- g. Receptacle not conical; shrubs epiphytic on mangroves 32. *Tuberostylis*
- gg. Receptacle conical; terrestrial herbs or subshrubs.
 - h. Paleas lacking; style branches filiform; style base not enlarged, glabrous 12. *Ageratum*
 - hh. Paleas present; style branches short and tapering; style base distinctly enlarged, sometimes with hairs or papillae 25. *Isocarpha*
- dd. Pappus of 10 or more capillary bristles.
 - i. Involucral bracts not spreading when old or dry, all bracts deciduous leaving old receptacles completely bare 17. *Chromolaena*
 - ii. At least outer involucral bracts spreading when old or dry, persistent.
 - j. Anther appendages shorter than wide.
 - k. Tips and base of style much enlarged; vines 22. *Gongrostylus*
 - kk. Tips and base of style not or only gradually enlarged; not vines.
 - l. Receptacle glabrous; leaves opposite 26. *Koanophyllon*
 - ll. Receptacle hairy; leaves alternate 20. *Decachaeta*
 - jj. Anther appendages as long as wide or longer.
 - m. Style base with numerous hairs.
 - n. Achenes with 10 ribs, with many stiff hairs; pappus bristles flattened on outer surface, with pointed apical cells 16. *Brickellia*
 - nn. Achenes with 5 ribs, with only glands; pappus bristles not flattened on outer surface, with blunt apical cells 13. *Austroeupatorium*
 - mm. Style base glabrous.
 - o. Inner surface of corolla lobes mamilllose or papillose with bulging cells, appearing granulose.
 - p. Involucre usually eximbricate with 2–3 series of subequal bracts; pappus often deciduous; corolla tube slender; corolla lobes usually longer than wide, smooth on outer surface 11. *Ageratina*
 - pp. Involucre usually subimbricate with 3 or more series of distinctly unequal bracts; pappus not normally deciduous; corolla tube short and broad; corolla lobes not longer than wide, papillose on outer surface 21. *Fleischmannia*
 - oo. Inner surface of corolla lobes smooth, without bulging cells.
 - q. Plants epiphytes or growing in deep humus; cells of corolla broad and quadrate 28. *Neomirandea*
 - qq. Plants not epiphytes; cells of corolla narrow with sinuous walls.
 - r. Style base with distinct enlargement above the nectary; base of achene contorted or with prominent upper margin; inner bracts of involucre not noticeably deciduous.
 - s. Involucral bracts 15, in 5 ranks of 3; corolla with distinct campanulate limb 18. *Condylidium*
 - ss. Involucral bracts not in 5 distinct ranks of 3; corolla narrowly funnelform.
 - t. Scandent shrubs; inflorescence with mostly thyrsoid branches; style branches with short papillae 24. *Heterocondylus*
 - tt. Erect herbs; inflorescence with mostly cymose branches; style branches with long hairlike papillae 14. *Ayapana*
 - rr. Style base not enlarged; base of achene not noticeably contorted and without prominent upper margin; inner bracts of involucre deciduous.
 - u. Heads usually with 4–12 florets; corolla usually glabrous; areoles of leaves with laticifers 19. *Critonia*
 - uu. Heads with 20–120 florets; corolla with few to many hairs or glands on outer surface; areoles of leaves without laticifers.
 - v. Receptacle highly convex, composed of highly sclerified cells, central part easily broken off; style branches filiform 23. *Hebeclinium*
 - vv. Receptacle slightly convex with parenchymatous core and sclerified surface; style branches narrowly linear to somewhat clavate 15. *Bartlettia*

10. ADENOSTEMMA

Adenostemma J. R. & G. Forster. Char. Gen. Pl. 89. 1776. TYPE: *A. viscosa* J. R. & G. Forster.

Lavenia Swartz, Prodr. Veg. Ind. Occ. 112. 1788. TYPE: *L. erecta* Swartz.

Small to large perennial *herbs*, creeping or erect with usually procumbent bases, with few or no branches, with few to many glandular hairs on stems, leaves, and involucre bracts; stems usually fistulose. *Leaves* opposite with short to long petioles; blades narrowly elliptical to broadly ovate or hastate, the base slightly to strongly cuneate, trinervate, the apex acute to slightly acuminate. *Inflorescence* very laxly cymose, the branches elongate. *Heads* discoid with 10–60 florets; involucre of 10–30 mostly eximbricate bracts with often fused basal margins, in 2 slightly overlapping series, spreading when mature; receptacle convex, covered with discrete oval deeply concave scars, glabrous; corollas narrowly funnelform or with narrow tube and broadly campanulate limb, usually with hairs or glands on outer surface, hairs often moniliform, the lobes 4–5, nonpapillose, the cells of the limb fragile with thin straight or laxly sinuous walls; anther collars usually enlarged below, with few to many quadrate cells, the walls ornamented, the exothecial cells quadrate to very short, the anther appendage distinctly shorter than wide; style base glabrous, not enlarged, the style shaft usually with some hairs, the style appendages fleshy, rounded apically, usually broadly clavate, of smooth, thin-walled cells usually distorted when dry. *Achene* slightly curved, slightly 3–4-angled without distinct ribs; carpopodium forming a prominent somewhat asymmetrical knob with a stout vascular basal point, the cells subquadrate with firm thin walls; pappus of 3–4 terete clavate knobs (5 in Guatemalan species), the knobs with tips and upper outside surface covered with an elongate mass of viscid glands. *Pollen* with short spines.

Adenostemma is a genus of about 20 species occurring primarily at low elevations in Central America, the West Indies, South America, Asia, and Africa. An important characteristic of the genus is its achenes which have a sticky pappus allowing for easy distribution by animals. The genus seems to have the most successful distribution mechanism in the tribe since it occurs widely in Asia, Africa, and the Pacific where there are many distinct species.

Literature:

- Grierson, A. J. C. 1972. Critical notes on the Compositae of Ceylon. Ceylon Jour. Sci., Biol. Sci. 10: 42–60.
- King, R. M. & H. Robinson. 1974. Studies in the Eupatorieae (Asteraceae). CXXVII. Additions to the American and Pacific Adenostemmatinae. *Adenostemma*, *Gymnocoronis* and *Sciadocephala*. Phytologia 29: 1–20.
1. **Adenostemma platyphyllum** Cass., Dict. Sci. Nat. 25: 363. 1822. TYPE: Peru, *J. Jussieu*, perhaps Jussieu herb. no. 9119 as *Lavenia spathulatum* (P, not seen, US, microfiche).—FIG. 11.

Erect perennial *herb* up to 1 m tall, unbranched or branched at base; stems terete to weakly ribbed, glabrate. *Leaves* opposite; blades broadly ovate, up to

18 cm long and 13 cm wide, the base somewhat rounded and abruptly broadly decurrent on the petiole, strongly trinervate from near base with strongly ascending secondary veins remote from margin, the margin bluntly serrate or dentate to subentire, not angular, the apex bluntly short-acute or slightly acuminate, the surfaces with very few small hairs, the veins sparsely glandular-haired below; petioles up to 8 cm long, broadly winged above, the wings narrow or lacking in basal half. *Inflorescence* laxly and usually profusely cymosely branched, ultimate branches 1–3 cm long, usually densely glandular-puberulous. *Heads* 5–6 mm high and 5–7 mm wide with ca. 10–25 florets; involucre bracts ca. 10–20, eximbricate, in 2 series, oblong to slightly obovate, mostly 3–4 mm long, reaching only to the level of the corolla tubes, apically rounded with little or no scarious margin; corolla white often with a lavender limb, ca. 2.5 mm long, narrowly funnel-form with a short tube and rather cylindrical limb, few to many glands on outer surface, the hairs restricted to near bases of the lobes, the lobes 5; anther collars broad below with many subquadrate cells; style shaft with many hairs, the style branches becoming exerted ca. 2 mm, very broadly clavate. *Achenes* 2.0–2.5 mm long, covered with glanduliferous tubercles; carpopodium prominently oblique toward inner side, fitting into deep, inwardly directed pits of receptacle; pappus usually of 3 glutiniferous knobs. *Pollen* 18–20 μ in diameter.

Adenostemma platyphyllum Cass. is distributed widely at lower elevations in South America from northernmost Argentina through Bolivia to southern Peru. To the north the species occurs in the coastal lowlands of Ecuador, Colombia, Panama, and Venezuela. The species is most distinct in its nonangular leaf margins, its very broad style branches, its longer corolla limb, and its short involucre. Close relatives include *A. berterii* DC. of the Greater Antilles with its more pointed involucre bracts and slightly sharper leaf tips. These and many other species in the genus have been identified with *A. lavenia* (L.) O. Kuntze of Ceylon, but the latter species has been interpreted much too broadly.

DARIÉN: Without precise locality, *Duke & Bristan s.n.* 1966 (MO). PANAMÁ: Without precise locality, "On road-sides" *Seemann 1026* (BM, not seen; US, photo).

11. AGERATINA

Ageratina Spach, Hist. Veg. Phan. 10: 286. 1841. TYPE: *Eupatorium aromaticum* L.

Batschia Moench, Meth. 567. 1794, not *Batschia* Gmelin, 1791 (Boraginaceae); nor *Batschia* Mutis ex Thunb., 1792 (Menispermaceae); nor *Batschia* Vahl, 1794 (Leguminosae). TYPE: *B. nivea* Moench = *Eupatorium ageratoides* L.f.

Ageratiopsis Schultz-Bip. ex Benth. & Hook., Gen. Pl. 2: 246. 1873, nom. nud. TYPE: *Eupatorium ageratoides* L.f.

Mallinoa Coult., Bot. Gaz. (Crawfordsville) 20: 47. 1895. TYPE: *M. corymbosa* Coult.

Kyrstenia Neck. ex E. L. Greene, Leaflet Bot. Observ. Crit. 1: 8. 1903. TYPE: *Eupatorium aromaticum* L.

Sparingly to densely branched perennial *herbs* or *shrubs*. *Leaves* usually opposite, rarely subopposite or alternate, short- to long-petiolate; blade deltoid to narrowly elliptical, toothed or lobed to entire, serrate in most species. *Inflores-*



FIGURE 11. *Adenostemma platyphyllum* Cass.—A. Habit ($\times \frac{2}{5}$).—B. Head ($\times 5$).—C. Style ($\times 11$).—D. Achene ($\times 11$).

cence laxly to densely corymbose. *Heads* discoid with 10–60 florets; involucre of ca. 30 rather narrow usually acute subimbricate bracts in 2–3 series, spreading at maturity; receptacle glabrous or with minute scattered hairs, usually slightly convex; corolla with a broad to very narrow basal tube and a narrowly to broadly campanulate limb, the lobes 5, slightly to distinctly longer than wide, densely

papillose on the inner surface, smooth with glands or hairs on the outer surface, the cells of the limb mostly narrow with sinuous walls; anther collars mostly narrow, with many quadrate cells below, elongate cells above, the walls with little or no ornate thickening, the exothecial cells in the outer valve usually longer than wide, the anther appendage large, longer than wide; style usually with distinct basal enlargement, glabrous, the style appendages usually densely long-papillose. *Achenes* prismatic or often fusiform, usually 5-ribbed, usually with bristles or glands or both; carpopodium distinct without a distinct upper rim, short- to long-cylindrical, the cells moderately large quadrate to oblong in many series with thin and beaded walls; pappus of 5–40 slender scabrous usually easily deciduous bristles, the zone of basal cells often fragile, the apices often enlarged, the apical cells acute. *Pollen* with short spines, often deformed and nonfunctional.

Ageratina is a large genus of approximately 230 species ranging from the eastern United States to Mexico, Central America, the West Indies, and western South America. Two species, *A. adenophora* (Spreng.) R. M. King & H. Robinson and *A. riparia* (Regel) R. M. King & H. Robinson, have become widely adventive in warmer parts of the Old World. Seven species have been collected in Panama.

Ageratina and a number of related genera such as *Oxylobus* form a distinct element in the tribe that is cytologically notable for its base numbers of $x = 17$ and $x = 16$ (King & Robinson, 1970, 1972).

Literature:

- King, R. M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XIX. New combinations in *Ageratina*. *Phytologia* 19: 208–229.
- & ———. 1972. Studies in the Eupatorieae (Asteraceae). LXXXV. Additions to the genus *Ageratina* with a key to the Costa Rican species. *Phytologia* 24: 79–104.
- & ———. 1974. Studies in the Eupatorieae (Asteraceae). CXXVIII. Four additions to the genus *Ageratina* from Mexico and Central America. *Phytologia* 28: 494–502.
- a. Corolla with short-stalked glands on outer surface, without hairs; involucrel bracts without distinct striations; pappus spreading with age, not fragile at base 1. *A. anisochroma*
- aa. Corolla without distinct glands on outer surface, with few to many hairs; involucrel bracts bicostate; pappus fragile at base and easily deciduous.
- b. Involucrel bracts with glands on outer surface, with few or no hairs.
- c. Leaves sessile, petioles ca. 1 mm long; involucrel bracts obtuse to sharply acute 3. *A. chiriquensis*
- cc. Leaves distinctly petiolate, petioles mostly 1–4 cm long; involucrel bracts with attenuate tips 5. *A. ixiocladon*
- bb. Involucrel bracts without glands on outer surface, with many hairs.
- d. Leaves with narrowly acuminate tips; heads with 10–15 florets 4. *A. croatii*
- dd. Leaves with tips obtuse to acute, not or scarcely acuminate; heads with 19–55 florets.
- e. Leaves membranaceous; corolla tube distinctly longer than limb; inflorescence not densely branched 6. *A. molinae*
- ee. Leaves papyraceous; corolla tube about as long as limb or shorter; inflorescence compactly corymbosely branched.

- f. Leaf blades with cuneate bases, lower surface sparsely puberulous; heads with 19–28 florets; involucral bracts with only narrow scarious margins 7. *A. whitei*
- ff. Leaf blades with rounded to slightly cordate bases, lower surface often densely hirtellous; heads with 25–55 florets; inner involucral bracts with broad scarious margins 2. *A. aschenborniana*

1. ***Ageratina anisochroma*** (Klatt) R. M. King & H. Robinson, *Phytologia* 19: 218. 1970.—FIG. 12.

- Eupatorium anisochromum* Klatt, Bull. Soc. Roy. Bot. Belgique 31: 186. 1892 (1893). TYPE: Costa Rica, environs de la laguna du Barba, *Pittier 1940* (GH, not seen).
E. durandii Klatt, Bull. Soc. Roy. Bot. Belgique 31: 189. 1892 (1893). TYPE: Costa Rica, Poás, *Pittier 387* (GH, not seen).
E. adpersum Klatt, Leopoldina Bot. Beibl. 1895: 1. 1895. TYPE: Costa Rica, bridge of Cariblanco road to Sarapiquí, *Biolley 7422* (GH?, not seen).
E. polanthum Klatt, Leopoldina Bot. Beibl. 1895: 3. 1895. TYPE: Costa Rica, cuesta de Tarrazú, *Tonduz 7797* (BR, holotype; US, isotype).

Subshrub or *shrub* to 2 m tall, with few to many branches; stems yellowish with small red maculae, becoming brown below, terete, sparsely to densely hirtellous. *Leaves* opposite; blades ovate to narrowly lanceolate, subcoriaceous, up to 11 cm long and 4 cm wide, in some forms mostly 2 cm long, the base narrowly cuneate, the margins closely to rather remotely serrate, the apex narrowly acute to slightly acuminate, in small forms shortly acute, the upper surface usually dark green, glabrous, the lower surface very pale, smooth with scattered glandular punctations, 2–3 pairs of strongly ascending secondary veins in basal third or fourth; petioles very short to scarcely distinct, 1–5 mm long. *Inflorescence* broadly corymbose-paniculate with corymbose branches, the ultimate branches 1–5 mm long, densely puberulous. *Heads* 4–5 mm high with ca. 17 florets; involucral bracts ca. 10, eximbricate, biseriate, broadly oblong to ovate, 2.5–3.0 mm long, mostly 1 mm wide, not costate, obtuse to short-acute, the outer surface puberulous with small scattered glandular punctations; corolla white or lavender, ca. 2.3 mm long, the tube slender, ca. 1 mm long, with glands and often with numerous short stiff biseriate hairs, the limb broadly funnelform, the lobes as long as the limb, triangular, 1½ times as long as wide, only low papillae on inner surface and only glands on outer surface; anther thecae ca. 0.5 mm long, with truncate to short-hastate bases; style base slightly enlarged, the style appendages strongly papillose. *Achenes* broadly prismatic, ca. 1 mm long, with short bristles on ribs; carpodium short-cylindrical to rounded, with subquadrate cells; pappus bristles ca. 25, persistent and spreading at maturity, mostly ca. 2.2 mm long, with very slender tips, without distinct series of shorter bristles.

Ageratina anisochroma is known only from Nicaragua, Costa Rica, and western Panama. The species is named after the distinctive difference in color of the upper and lower surfaces of the leaves. The species is also distinct in the structure of the involucral bracts, the shape of the corolla, the less strongly papillose corolla lobes, and the nondeciduous nature of the pappus.

CHIRIQUÍ: 8 mi NE of El Volcán, 8100–8400 ft, *Tyson 844* (FSU, MO). W slope of El Barú, 7000–8000 ft, *Tyson & Loftin 5996* (MO, US). Valley of the upper Río Chiriquí Viejo, *White 59* (MO).

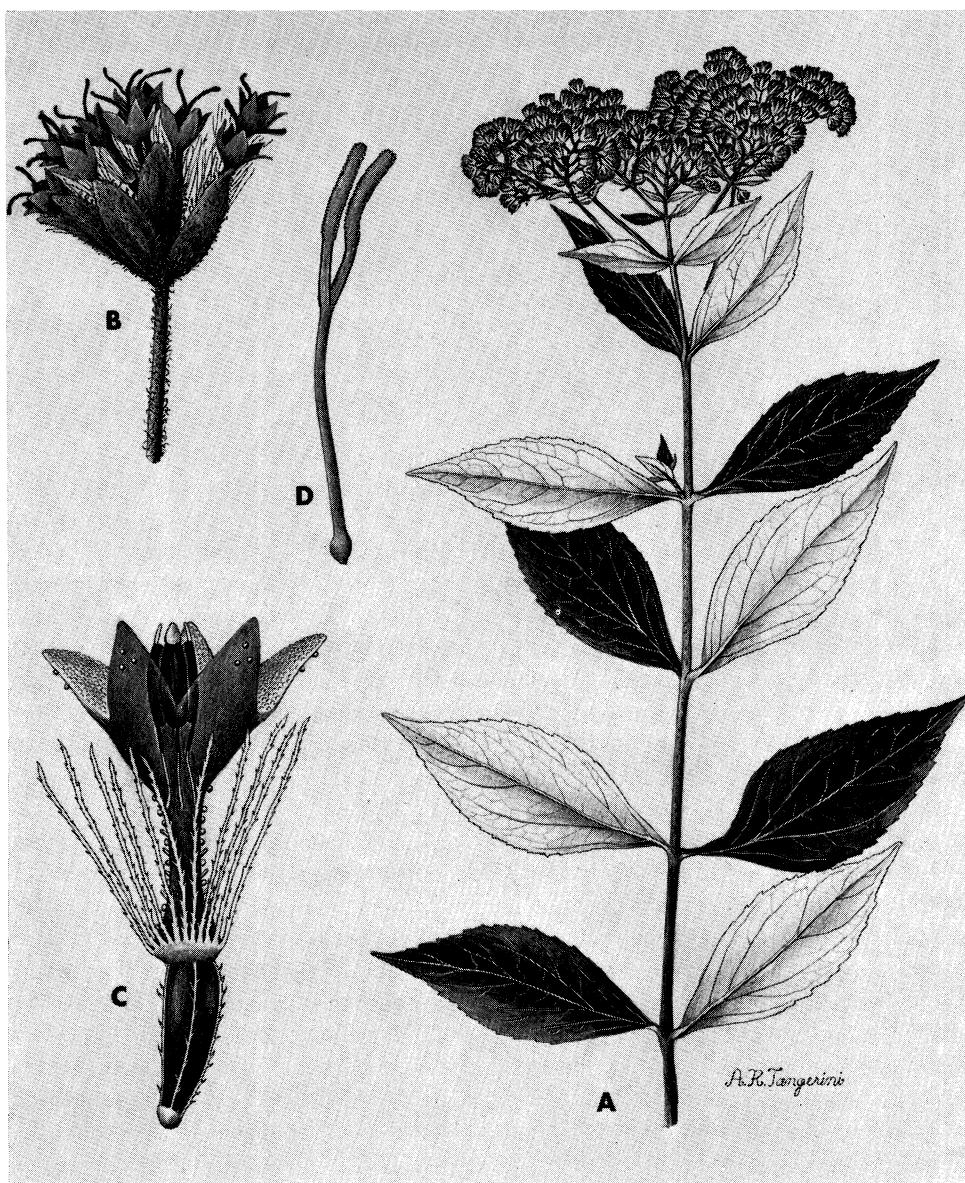


FIGURE 12. *Ageratina anisochroma* (Klatt) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$). —B. Head ($\times 4\frac{3}{5}$).—C. Floret with achene ($\times 16$).—D. Style ($\times 14$).

2. *Ageratina aschenborniana* (Schauer) R. M. King & H. Robinson, *Phytologia* 19: 212. 1970.

Eupatorium aschenbornianum Schauer, *Linnaea* 19: 720. 1847. TYPE: Mexico in valle Toluccana, *Aschenborn 106* (B, destroyed, US, photo).

E. vulcanicum Benth. ex Örsted, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 78. 1852. TYPE: Costa Rica, Irasú, *Örsted 56* (C).

E. donnell-smithii Coult., Bot. Gaz. (Crawfordsville) 16: 95. 1891. TYPE: Guatemala, Aceituna, *Donnell Smith 2374* (US).

Kyrstenia donnell-smithii (Coult.) E. L. Greene, Leaf. Bot. Observ. Crit. 1: 9. 1903.

Ageratina vulcanica (Benth. ex Ørsted) R. M. King & H. Robinson. Phytologia 19: 218. 1970.

Shrub to 1.5 m tall, with few to many branches; stems pale to dark brown, terete, sparsely to densely hirsute. *Leaves* opposite; blades broadly ovate, to 10 cm long and 6 cm wide, the base usually slightly cordate to broadly rounded, rarely slightly cuneate, the margins crenulate-serrate to crenate, the apex broadly acute to short-acuminate, the upper surface minutely puberulous, more so on the veins, the lower surface densely puberulous to hirtellous, often densely hirsute on veins, the veins trinervate from at or near base; petioles slender, to 3.5 cm long. *Inflorescence* corymbose-paniculate with corymbose branches, the ultimate branches mostly 1–5 mm long, rarely to 12 mm, densely puberulous or hirtellous. *Heads* 5–6 mm high with 25–55 florets; involucre bracts 17–20, eximbricate, biseriate, narrowly oblong to linear, 3.0–4.5 mm long, bicostate, the apices obtuse to sharply acute, the scarious margins of inner bracts very broad, the outer surface puberulous to prominently pilose; corolla white, 2.5–4.0 mm long, the tube slender, 1.0–2.0 mm long, glabrous, the limb cylindrical to narrowly campanulate, the lobes triangular, 0.3–0.4 mm long, without hairs inside and with few to many hairs on outer surface; anther thecae ca. 0.7 mm long. *Achenes* fusiform, 1.5–1.8 mm long with many bristles mostly on the ribs; carpodium cylindrical with mostly oblong cells; pappus bristles ca. 20, fragile at base, mostly 3.0–3.5 mm long, scarcely to distinctly broadened distally, with few or no distinct shorter bristles.

Ageratina aschenborniana is common from central Mexico southward through Central America to western Panama. The species is rather distinct in the rounded to cordate bases of the leaf blades and in the often very large number of flowers in the heads. *Ageratina vulcanica* has been regarded as a distinct species, but more careful analysis shows an erroneously low flower number cited for *A. vulcanica* and a slightly greater range of flower number in *A. aschenborniana*. There is some variation in the material from Panama, Costa Rica, and Nicaragua with some specimens having more hirsute involucre bracts, larger corollas, and more broadly tipped pappus bristles. The differences do not seem entirely correlated, however, and the variants are not worthy of taxonomic status.

CHIRIQUÍ: Vic. of "New Switzerland" central valley of Río Chiriquí Viejo, *Allen 1371* (F, MO). Trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m, *Allen 1580* (F, MO). Cerro Copete, E spur of Chiriquí Volcano, 8000–8500 ft, *Allen 4865* (MO). On way to Lerida, Volcán de Chiriquí, 4400 ft, *Maurice 870* (US). Vic. of Bambito, *Croat 10623* (MO). 1 mi N of El Hato del Volcán, *Croat 10694* (MO). Forested hill N of Audubon Cabin, *Croat 13626* (MO). Vic. of Las Nubes, 2.7 mi NW of Río Chiriquí Viejo, W of Cerro Punta, 2200 m, *Croat 22355* (MO). Along Río Chiriquí Viejo, just above Guadalupe, *Croat & Porter 16030* (MO). Slope of Cerro Respinga above town of Cerro Punta, 8400 ft, *D'Arcy & D'Arcy 6548* (MO). Boquete, Bajo Chorro, 6000 ft, *Davidson 154* (F, MO, US). Boquete, Volcán de Chiriquí, 8000 ft, *Davidson 940A* (GH, MO). Ca. 1 mi W of Cerro Punta, 1740 m, *McDaniel 10025* (FSU). Nueva Suiza, *Partch 69-10* (MO). Pastures around El Boquete, 1000–1300 m, *Pittier 2859, 2900* (both US). Vic. of Cerro Punta, 6800 ft, *Ridgway & Solis 2402* (MO). Valley of the upper Río Chiriquí Viejo, vic. of Monte Lirio, 1300–1900 m, *Seibert 134* (MO, US). Cerro Punta, ca. 2150 m, *Tyson 1024* (FSU, US). W slope of El Barú, 6000–7000 ft, *Tyson & Loftin 5951* (MO, US). Vic. of Finca Lérica, 1750 m, *Woodson & Schery 211* (US). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson &*

Schery 462 (MO). Vic. of Casita Alta, Volcán de Chiriquí, ca. 1500–2000 m, *Woodson et al.* 861 (MO, US).

3. *Ageratina chiriquensis* (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 213. 1970.

Eupatorium chiriquense B. L. Robinson, *Proc. Amer. Acad. Arts* 54: 238. 1918. TYPE: Panama, Chiriquí Volcano, *Maxon* 5360 (US).

Small *shrub* to 0.5 m tall, with many branches; stems pale to dark brownish, terete, puberulous, the internodes usually short. *Leaves* opposite; blades narrowly ovate, papyraceous, to 2–3 mm long and 1.4 mm wide, the base rounded, the margins serrate, the apex acute, the upper surface glabrous, the lower surface slightly paler, sparsely puberulous on veins, the veins somewhat trinervate from near the base; petioles mostly 1–2 mm long. *Inflorescence* corymbose, the ultimate branches 3–7 mm long, usually densely stipitate-glandular. *Heads* 5–7 mm high with ca. 26 florets; involucre bracts ca. 20, eximbricate, biseriate, narrowly oblong to linear, mostly 3.5–5.5 mm long, bicostate, the apices obtuse to sharply acute, the outer surface with scattered short- to long-stipitate glands; corolla white to pale lavender, 4.0–4.5 mm long, the tube slender, 1.5–2.0 mm long, glabrous, the limb cylindrical to narrowly campanulate, the lobes short-triangular, 0.5–0.7 mm long, glabrous on inner surface and with few to many hairs on outer surface; anther thecae ca. 1 mm long. *Achenes* fusiform, 1.7–2.0 mm long, with few to many short bristles mostly on the ribs; carpodium cylindrical with mostly oblong cells; pappus bristles ca. 20, rather fragile at base, mostly 3.5–4.0 mm long, slightly broadened distally, often with partial series of much shorter bristles.

Ageratina chiriquensis is endemic to the region of Chiriquí. The nearly sessile leaves distinguish the species from all other species of *Ageratina* in the area, including the closely related *A. ixiocladon*.

CHIRIQUÍ: Summit of Chiriquí Volcano, 3600 m, *Killip* 3599 (US); 3374 m, *Maxon* 5360 (US). Side of Barú Mtn., 2900 m, *McCorkle c-153* (FSU). Upper belt of Chiriquí Volcano, N slope, 3000–3374 m, *Pittier* 3089 (US), El Barú, above 11000 ft, *Tyson & Loftin* 6157 (MO, US), 6177 (FSU, MO). Volcán de Chiriquí, *Sapper s.n.* (US); ca. 2500–3380 m, *Woodson et al.* 1077 (MO, US), 1083 (MO).

4. *Ageratina croatii* R. M. King & H. Robinson, *Phytologia* 29: 347. 1975. TYPE: Panama, Chiriquí, *Croat* 26432 (US).

Coarse *herbs* or *subshrubs* to 1 m high, with few branches; stems yellowish-brown, terete, somewhat densely puberulous above. *Leaves* opposite; blades papyraceous, ovate, mostly 5–8 cm long and 1.5–4.0 cm wide, the base short-cuneate to rounded, trinervate, the margins closely doubly serrate, the apex narrowly acuminate, the upper and lower surfaces with puberulence mostly on the veins, the secondary veins few, strongly ascending; petioles slender, 10–25 mm long. *Inflorescence* somewhat lax, broadly corymbose-paniculate, the ultimate branches 1.5–5.0 mm long, densely puberulous. *Heads* ca. 4 mm high with 10–15 florets; involucre bracts ca. 15, eximbricate, in 2 series, linear-lanceolate, 3.5–4.0 mm long and 0.4–0.5 mm wide, bicostate, the tips short-acute with a short fringe of marginal hairs, nonscarious, the lateral margins narrowly scarious, the outer surface sparsely puberulous; corolla white?, ca. 2.3 mm long, the tube narrow, ca.

1 mm long, with few hairs, the limb narrowly funnelform, with few hairs, the lobes short-triangular, ca. 0.3 mm long and wide, glabrous on inner surface and with numerous hairs on outer surface, without glands; anther thecae ca. 0.5 mm long. *Achenes* fusiform, ca. 1.3 mm long, with many short bristles on the ribs, without glands; carpopodium cylindrical, ca. 0.1 mm long, on a slender stipe, the cells mostly narrowly oblong; pappus of ca. 20 slender fragile scabrous bristles, mostly 2.5 mm long, the tips scarcely broader, the apical cells minutely apiculate, distinct series of very short bristles present.

The species is known only from the type collection. *Ageratina croatii* is distinct among the related group of species in Panama by the narrowly acuminate leaves, by the reduced number of florets in the head, and by the short lobes of the corolla. Closest relationship may be to *A. costaricensis* R. M. King & H. Robinson which also has a lax inflorescence and trinervate leaves. The latter species, however, has less acuminate leaves, larger heads, and longer corolla lobes.

CHIRIQUÍ: Las Nubes near Cerro Punta, ca. 2000 m, *Croat* 26432 (US).

5. ***Ageratina ixioclodon*** (Benth. in Ørsted) R. M. King & H. Robinson, *Phytologia* 19: 223. 1970.

Eupatorium ixioclodon Benth. in Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 77. 1852. TYPE: Costa Rica, Irazú, *Ørsted* 51 (C).

Subshrub or *shrub* to 3.6 m tall, with few to many branches; stems pale to dark brownish, terete, usually puberulous, sometimes glanduliferous. *Leaves* opposite; blades ovate, papyraceous, to 12 cm long and 6 cm wide, the base rounded to cuneate, the margins serrulate to crenate, the apex slightly to slenderly acuminate, the surfaces minutely puberulous on the veins, the lower surface slightly paler with rather prominent dark fine reticulations and scattered glandular punctations or short stipitate glands, usually 2 pairs of strongly ascending secondary veins from near base; petioles slender, mostly 1–4 cm long. *Inflorescence* broadly corymbose-paniculate with corymbose branches, the ultimate branches mostly 2–5 mm long, minutely puberulous. *Heads* 4–6 mm high with 19–30 florets; involucre bracts ca. 20, eximbricate, biseriate, linear to linear-lanceolate, 3.5–5.5 mm long, bicostate, the apices long attenuate, the outer surface with scattered glands and few or no hairs; corolla white to lavender, 2.5–3.5 mm long, the tube slender, 1.0–1.5 mm long, glabrous, the limb cylindrical to narrowly campanulate, the lobes triangular, 0.3–0.4 mm long, with few or no hairs on inner surface and numerous hairs on outer surface; anther thecae 0.4–0.9 mm long. *Achenes* fusiform, ca. 2 mm long, with short to long bristles mostly on the ribs; carpopodium cylindrical with mostly oblong cells; pappus bristles ca. 25, somewhat fragile at base, mostly 3.5–4.0 mm long, broadened distally, without distinct series of shorter bristles.

Ageratina ixioclodon is known only from Costa Rica and adjacent western Panama. The name has at various times been applied to material of a number of species in at least three eupatorium genera. The present concept is based on observation of the type material. The species is one of a closely related series having glands rather than hairs on the involucre bracts.

CHIRIQUÍ: Slopes of Las Cumbres, near Cerro Punta, *Croat 13728* (MO). Boquete, Bajo Chorro, 6000 ft, *Davidson 138* (MO). Volcán de Chiriquí, 8000 ft, *Davidson 940* (F, US); 11200 ft, *Terry 1319* (F). W slope of El Barú, 8000–9000 ft, *Tyson & Loftin 6116* (MO), *6116B* (US).

6. ***Ageratina molinae*** R. M. King & H. Robinson, *Phytologia* 24: 93. 1972. TYPE: Honduras, cloud forest above San Juancito, Morazán, *Williams & Molina 13767* (US).

Small erect or decumbent *shrubs* to 1 m high, with few to many branches; stems yellowish to purple-tinged, terete, puberulous. *Leaves* opposite; blades membranaceous, ovate to rhomboid, to 4.5 cm long and 3.5 cm wide, the base very short-cuneate to subtruncate, trinervate, the margins serrate to subentire, the apex short-acuminate, the surface sparsely short puberulous, the veins hirtellous; petioles slender, 0.5–3.0 cm long. *Inflorescence* laxly corymbose-paniculate with laxly corymbose branches, the ultimate branches slender, 2–9 mm long, puberulous. *Heads* ca. 5 mm high with 19–28 florets; involucre bracts 16–18, eximbricate, biseriate, narrowly lanceolate, 3.5–4.0 mm long, bicostate, mostly long acute, scarcely attenuate, the outer surface puberulous, without glands; corolla white, 3.0–3.5 mm long, the tube very slender, 1.5–2.0 mm long, glabrous, the limb short campanulate, ca. 1.0 long, the lobes triangular, scarcely longer than wide, glabrous on inner surface and with numerous simple hairs on outer surface; anther thecae ca. 0.5 mm long. *Achenes* fusiform, ca. 1 mm long, with scattered long bristles on the ribs and surface; carpodium cylindrical with narrowly oblong cells; pappus bristles ca. 25, somewhat fragile at base, mostly 1.7–2.0 mm long, not distinctly broadened distally, shorter series of bristles lacking.

The species is distributed through southern Central America from El Salvador and Honduras to Costa Rica and western Panama. The most distinctive character of the species is the very small limb of the corolla which is shorter than the tube. The plants have a resemblance to *Fleischmannia microstemon* in their membranaceous somewhat rhomboid leaves and their moderately lax inflorescences, but differ in the eximbricate involucre and long narrow corolla tube.

CHIRIQUÍ: Llanos del Volcán, ca. 1300 m, *Allen 1543* (F, MO, US).

7. ***Ageratina whitei*** R. M. King & H. Robinson, *Phytologia* 28: 496. 1974. TYPE: Panama, Chiriquí, *White & White 118* (MO).

Shrubs to 1.7 m high, with few to many branches; stems brownish, terete to slightly hexagonal, sparsely minutely puberulous. *Leaves* opposite; blades subcoriaceous, narrowly ovate, mostly 3–5 cm long and 1.0–2.5 cm wide, the base cuneate or sometimes slightly acuminate, the margins closely crenate-serrate, the apex slightly acuminate, sharp, the upper and lower surfaces sparsely minutely puberulous, the veins more densely appressed-puberulous, the secondary veins few, pinnate; petioles slender, 3–7 mm long. *Inflorescence* a lax broad corymbose-paniculate with densely corymbose branches, the ultimate branches 1–6 mm long, appressed-puberulous. *Heads* ca. 5 mm high with 25–29 florets; involucre bracts ca. 20, eximbricate to slightly subimbricate, in ca. 3 series, lanceolate to linear,

1.5–4.0 mm long and 0.5–0.7 mm wide, bicostate, sharply acute, without distinct scarious margins above, the outer surface sparsely appressed-puberulous, without glands; corolla pink, 3.5–4.0 mm long, the tube narrow, 1.0–1.5 mm long, the limb narrowly campanulate, with few hairs on outer surface, the lobes narrowly triangular, ca. 0.6–0.7 mm long, with many simple hairs on outer surface, without glands, glabrous on inner surface; anther thecae 0.8 mm long. *Achenes* fusiform, ca. 1 mm long, scabrid with mostly short bristles on the ribs and without glands; carpodium cylindrical, 0.2–0.3 mm long, the cells mostly narrowly oblong; pappus of ca. 25 slender fragile densely scabrous bristles, mostly 3.0–3.5 mm long, the tips not broadened, the apical cells sharply acute, without distinct series of shorter bristles.

Ageratina whitei is known only from the type collection. The species seems most closely related to *A. tonduzii* (Klatt) R. M. King & H. Robinson of Costa Rica which has similar narrowly cuneate pinnately veined leaves, elongate cylindrical carpodia, puberulous involucre bracts, 25–29 florets per head, and pink corollas. The Costa Rican species is most distinct in the much longer narrowly elliptical leaves up to 10 cm long. The leaves of *A. whitei* are similar to those of *A. ixiocladon* but that species has glands rather than hairs on the involucre bracts and usually has a few hairs on the inner bases of the corolla lobes.

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White & White 118* (MO).

12. AGERATUM

Ageratum L., Sp. Pl. 2: 839. 1753. TYPE: *A. conyzoides* L.

Carelia G. Pontedera ex P. C. Fabricius, Enum. 85. 1759. TYPE: *A. conyzoides* L.

Annual *herbs* to perennial *subshrubs*, with few to many branches, the base often decumbent with numerous adventitious roots. *Leaves* opposite or alternate, petiolate; blades elliptical or lanceolate to deltoid or ovate, the margins entire to dentate or shallowly lobed, the undersurface usually with obvious sessile or sunken glandular-punctations, usually trinervate from the base. *Inflorescence* cymose to subcorymbose, sometimes subumbellate. *Heads* discoid with 20–125 florets; involucre bracts 30–40, eximbricate, equal or subequal, in 2–3 series, lanceolate, coriaceous; receptacle conical, glabrous or paleaceous; corolla funnelform or with distinct basal tube, the lobes 5, about as long as wide, papillose on inner surface, sometimes hispidulous on outer surface, the cells of the limb elongate with sinuous walls; anther collars slender, the walls of the cells with distinct annular thickenings, the anther appendage large, longer than wide; style base without enlarged node, glabrous, the style appendages linear, usually strongly and densely papillose. *Achenes* 4–5-ribbed, glabrous or with short bristles on the ribs; carpodium distinct, large, usually asymmetrical; pappus lacking or coroniform or of 5–6 free flattened sometimes awn-like scales. *Pollen* with short spines.

The genus *Ageratum* contains 43 species and ranges from Mexico and Central America to the West Indies and South America. Two species, *A. conyzoides* and *A. houstonianum*, are widely adventive in warmer parts of the Old World. Six species have been collected in Panama.

Literature:

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- King, R. M. & H. Robinson. 1972. Studies in the Eupatorieae (Asteraceae). LXXXVII. Additions to the genus, *Ageratum*. Phytologia 24: 112–117.
- Robinson, B. L. 1913. II. Revisions of *Alomia*, *Ageratum* and *Oxylobus*. Contr. Gray Herb. 42: 438–491.

- a. Stems puberulous to hirtellous with short hairs, often becoming glabrous; petioles usually 2–5 mm long.
- b. Leaf blades narrowly elliptical to narrowly lanceolate, with narrowly cuneate bases 1. *A. chiriquense*
- bb. Leaf blades ovate to ovate-lanceolate, with rounded to shortly cuneate bases 6. *A. panamense*
- aa. Stems sparsely to densely pilose with long hairs; petioles usually 10–30 mm long.
- c. Involucral bracts without scarious or irregular margins, glabrous; achenes glabrous 5. *A. oliveri*
- cc. Involucral bracts with scarious and often toothed margins, with few to many hairs on outer surface; achenes often scabrid or with short bristles on the ribs.
- d. Pappus lacking 4. *A. microcarpum*
- dd. Pappus of larger scales or awns.
- e. Corolla less than 2 mm long, not as long as the awned pappus scales; style branches very slender with papillae forming nearly $\frac{1}{2}$ the width 2. *A. conyzoides*
- ee. Corolla over 2 mm long, as long as or longer than the awned pappus scales; style branches slightly broader distally, with small pointed papillae forming less than $\frac{1}{4}$ the width 3. *A. houstonianum*

1. ***Ageratum chiriquense*** (B. L. Robinson) R. M. King & H. Robinson, Phytologia 24: 113. 1972.

Alomia chiriquensis B. L. Robinson, Contr. Gray Herb. 61: 4. 1920. TYPE: Panama, between Cerro Vaca and Hato del Loro, Chiriquí, Pittier 5389 (US).

Erect perennial *herbs* or *subshrubs* to 0.6 m tall; stems purplish, terete, slightly striate, solid to slightly fistulose, obscurely puberulous, becoming glabrous. *Leaves* mostly opposite or ternate; blades narrowly elliptical or narrowly lanceolate, to 9 cm long and 1.7 cm wide, the base narrowly cuneate, the margins subentire to somewhat remotely serrate in the distal half, the apex usually narrowly acute to slightly acuminate, sometimes short acute, the upper surface dark green, shiny with elongated areolae, bullate, scabrid with many scattered hairs, the lower surface pale and fleshy with immersed glandular-punctations, densely short-pilose on the veins; petioles indistinct, usually 5 mm long. *Inflorescence* with few or no long branches, ending in rather compact corymbose to subumbellate clusters, branches densely puberulous, the ultimate branches mostly 2–9 mm long, not noticeably enlarged above. *Heads* ca. 6 mm high with mostly 50–100 florets; involucral bracts 20–25, eximbricate, in 2 series, mostly 3–4 mm long, oblong-lanceolate to linear-lanceolate, bicostate, without evident scarious margins, the apex somewhat callose, narrowly acute, the outer surface rather densely hirtellous, with prominent glandular-punctations; receptacle naked; corolla and style branches bluish; corolla 3.0–3.5 mm long, narrowly funnelform, with scattered

distinct capitate glands on outer surface of tube, limb and lobes, the tube somewhat broad and indistinct, the lobes ca. 0.5 mm long, with papillae only on the inner surface; style branches slightly broader distally, prominent, with minute papillae. *Achenes* ca. 1.2–1.5 mm long, glabrous; carpodium asymmetrical; pappus lacking or of a few vestigial broad lobes.

The species is apparently endemic to the Chiriquí region of Panama. It is most distinct among the Panamanian members of the genus by the very narrowly cuneate short-petiolate bases of the leaves. The superficially similar *A. benjamin-lincolnii* R. M. King & H. Robinson (*Alomia guatemalensis* B. L. Robinson) of Guatemala differs most obviously by the presence of paleas on the receptacle.

CHIRIQUÍ: Boquete Lookout, 4000 ft, *D'Arcy & D'Arcy* 6323 (MO). Lava fields near the town of Volcán, ca. 4600 ft, *Duke* 9139 (MO). Between El Hato (Volcán) and Cerro Punta, *Ebinger* 796 (MO, US). Between Cerro Vaca and Hato del Loro, 850–1100 m, *Pittier* 5389 (US). Llanos Francia, 3300 ft, *Stern et al.* 1174 (MO).

2. ***Ageratum conyzoides* L., Sp. Pl. 2: 839. 1753. TYPE:** America (Herb. Linn. 979.1 or 979.2, not seen, US, microfiche).

A. hirtum Lam., *Encycl. Méth.* 1: 54. 1783. TYPE: Cape of Good Hope, *Sonnerat* (P, not seen, US, microfiche).

A. humile Salisb., *Prodr. Stirp.* 188. 1796. TYPE: England, Chapel Allerton, *Salisbury?* (K?, BM?, not seen).

A. hirsutum Lam. in *Poiret, Encycl. Méth. Bot. Suppl.* 1: 242. 1810. TYPE: *Lamarck*, *Illust. tab.* 672, *fig.* 2.

A. album Willd. ex Steud., *Nom. Bot.*, ed. 1. 18. 1821, nom. nud.

Cacalia mentrasto Vell., *Fl. Flum.* 339. 1825. TYPE: Vellozo, *Fl. Flum.* 8, *tab.* 69. 1831. Vellozo types at the "Cabinet d'Histoire naturelle de Rio de Janeiro" not known to exist.

Ageratum cordifolium Roxb., *Fl. Ind.* 3: 415. 1832. TYPE: India, Bengal, perhaps Wallich Cat. 3177/287 (K, not seen; G, not seen, US, microfiche).

Annual or short-lived perennial erect *herbs* or *subshrubs* to 1.5 m tall, sparingly branched; stems becoming brownish to slightly reddish, terete, slightly striate, usually fistulose, sparsely to densely long-pilose, usually also slightly puberulous. *Leaves* mostly opposite; blades ovate to broadly ovate, to 10 cm long and 7 cm wide, the base rounded to cuneate, strongly trinervate from the base, the margins usually crenate, the apex short-acute to narrowly rounded or obtuse, the upper surface dull green, sparsely long-pilose, the lower surface slightly paler green, prominently glandular-punctate, sparsely pilose on the veins and veinlets; petioles to 2.5 mm long. *Inflorescence* cymose to subcymose with compact corymbose to subumbellate branches, the branches somewhat densely puberulous with few to many longer hairs, the ultimate branches 3–10 mm long, often slightly enlarged distally. *Heads* ca. 4.0–4.5 mm high with ca. 50 florets; involucral bracts 25–30, eximbricate, in 2 series, mostly 3–4 mm long, oblong-lanceolate, prominently bicostate, with prominent antrorsely angular or lacerate scarious margins, the apex shortly to very sharply acute, usually not scarious near tip, the outer surface with usually few long hairs; receptacle naked; corolla white or blue, ca. 1.7 mm long, narrowly funnellform, with few hairs on the outer surface, the tube narrow, ca. 1 mm long, with scattered small short-stalked glands, the lobes 0.2–0.3 mm long, with papillae moderately developed inside, at tip and on margins, 1–2 hairs on outer surface; style branches extremely slender, sometimes short, with crowded blunt papillae

forming nearly $\frac{1}{2}$ the width. *Achenes* ca. 1.2 mm long, with sparse short bristles usually restricted to the ribs; carpopodium asymmetrical; pappus of 5 large free scales, the scales usually lanceolate with long slender awns, to 2 mm long with awns.

Ageratum conyzoides is native in Central and South America and has become widely adventive in most tropical and many subtropical parts of the world. The species has been confused with *A. houstonianum* and differences are discussed under that species. The recent monograph by Johnson (1971) noted the unreliability of the pappus structure in this species and reduced to synonymy the species *A. latifolium* Cav., having awnless pappus scales. This latter species has been omitted from the present synonymy as further studies are required. Use of other characters such as corolla size and style branch structure show that some of the awnless material probably is *A. conyzoides* and some is *A. houstonianum* and still other material does not seem to be obviously either of these.

BOCAS DEL TORO: Changuinola, *Lazor et al.* 2380 (FSU). Bocas del Toro, *Lazor et al.* 2413 (FSU). SW of Bocas del Toro at Maccaw Hills, Isla Colón, 0–120 m, *von Wedel* 427 (MO). Isla Colón, *von Wedel* 2931 (MO, US). CANAL ZONE: Balboa, *Macbride & Featherstone* 31 (F, US). Near Gatún, *Standley* 27309 (US). Vic. of Summit, *Standley* 30089 (US). CHIRIQUÍ: Boquete Lookout, 4000 ft, *D'Arcy & D'Arcy* 6324 (MO). Boquete, *D'Arcy & D'Arcy* 6349 (MO). Concepción, *King* 5286 (US). Alto Boquete, 1125 m, *Partch* 69–90 (MO). Vic. of San Félix, 0–120 m, *Pittier* 5432 (US). COCLÉ: El Valle, *Dwyer* 1839 (FSU, MO, US); *King* 5327 (US). El Valle de Antón and vic., 500–700 m, *Seibert* 473 (MO). DARIÉN: Puerto St. Dorotea, *Dwyer* 2227 (MO). PANAMÁ: Isla Taboga, 0–350 m, *Allen* 1277 (F, MO). 7 mi N of Cerro Azul on road to Cerro Jefe, 2600 ft, *Blum et al.* 1757 (FSU). Cerro Campana, *Croat* 12097 (MO). Cerro Azul, 2000 ft, *D'Arcy & D'Arcy* 6217 (MO). Goofy Lake to ca. 8 mi S of Goofy Lake toward Cerro Jefe, *Dwyer* 7055 (MO). SW facing slopes of Cerro Azul, *King* 5248 (US). Cerro Campana, *Lazor* 3324 (FSU). Altos del Río Pacora, 2500 ft, *Lewis et al.* 2283 (MO). Chimán, *Lewis et al.* 3366 (MO, UC). Taboga Island, *Longfield* 488 (US); *Standley* 27975 (US). Cerro Azul, 2000 ft, *Tyson* 2057 (FSU), 2059A (MO); ca. 2200 ft, *Tyson* 6285 (FSU, MO, US); 2100 ft, *Tyson* 6320 (FSU, MO). Cerro Jefe, *Tyson et al.* 4298 (FSU, MO).

3. *Ageratum houstonianum* Miller, Gard. Dict., ed. 8. 1768. TYPE: Mexico, Veracruz, *Houston* (BM, not seen).—FIG. 13.

A. mexicanum Sims, Bot. Mag. 52: 2525. 1825. TYPE: Seed from Mexico, *Bullock* (K?, not seen).

Carelia houstoniana (Miller) Kuntze, Rev. Gen. Pl. 1: 325. 1891.

Ageratum wendlandii Vilm., Fl. Pl. Terre., ed. 4, suppl. 2. 1894. TYPE: Unnumbered figure, Fl. Pl. Terre., ed. 4, suppl. 2. 2. 1894 (Johnson, 1971).

Annual or short-lived perennial erect *herbs* or *subshrubs* to 0.9 m tall, sparingly branched; stems greenish to slightly reddish, terete, slightly striate, usually broadly fistulose, long-pilose and minutely puberulous. *Leaves* mostly opposite; blades broadly ovate to deltoid, to 10 cm long and 8 cm wide, the base usually truncate or slightly cordate, strongly trinervate, the margins crenate to serrate-crenate, the apex short-acute to narrowly rounded or obtuse, the upper surface dull green, sparsely long-pilose, the lower surface scarcely paler, sparsely long-pilose on the veins and veinlets, glandular punctations often lacking; petioles to 4 cm long. *Inflorescence* cymose to subcorymbose with densely corymbose to subumbellate branches, the branches densely puberulous with few to many longer hairs, the ultimate branches 1–8 mm long, not or scarcely enlarged distally. *Heads* 4.5–6.5 mm high with 50–75 florets; involucre bracts 20–30, eximbricate, in 2 series,

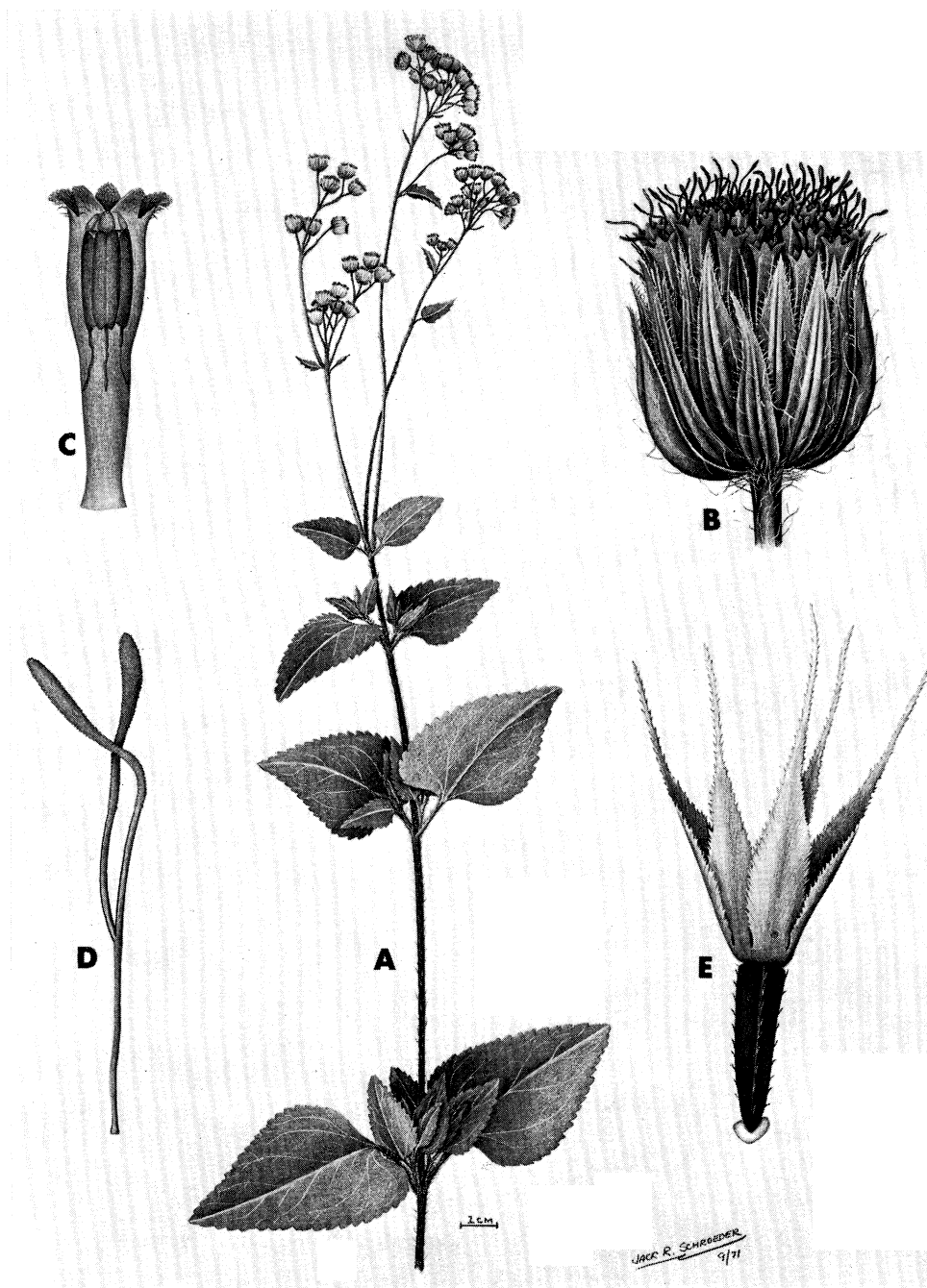


FIGURE 13. *Ageratum houstonianum* Miller.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times \frac{47}{10}$).—C. Corolla ($\times 14$).—D. Style ($\times 14$).—E. Achene ($\times 11\frac{4}{5}$).

mostly 3.5–5.0 mm long, oblong-lanceolate to lanceolate, prominently bicostate, with scarious margins which are sometimes irregular above, the apex usually very sharply acute, rarely scarious near tip, the outer surface sparsely to densely pilose; receptacle naked; corolla and style branches usually bluish; corolla 2.3–3.0 mm long, narrowly funnelform, the somewhat tubular base ca. 1 mm long with a few minute glands, the limb usually glabrous, the lobes 0.3–0.4 mm long, papillae within, at the tip and on margins, many short hairs on outer surface; style branches slightly enlarged distally and usually very prominent, papillae small and somewhat pointed. *Achenes* ca. 1.2 mm long, with sparse short bristles usually restricted to the ribs; carpopodium asymmetrical; pappus of 5 large free scales, the scales usually lanceolate with a long slender apical awn, 2.0–2.5 mm long with awns.

Ageratum houstonianum is native in central and southern Mexico and southward into northern Central America. The species has become widely distributed in tropical and subtropical parts of the world, mostly escaping from cultivation. The species has been distinguished from *A. conyzoides* in previous treatments by the more pilose and more entire involucre bracts (Robinson, 1913; Grierson, 1972) and by the more truncate or cordate leaves (Johnson, 1971). However, these characters represent only weak trends. Material of *A. houstonianum* also tends to have a denser, less cymose inflorescence and less glandular-punctate leaf undersurfaces. Still, the most reliable differences are in the structure of the florets. The corollas of *A. houstonianum* are larger with more hairs on the lobes. Also, the corollas of *A. houstonianum* are as long as or longer than the awned pappus scales, while those of *A. conyzoides* are distinctly shorter. The style branches of *A. houstonianum* are thicker with smaller, more pointed papillae, and are usually very long exerted and bluish. The style branches of *A. conyzoides* are much more slender with nearly half the thickness being papillae, and the branches are often very short. The most obvious result of the basic differences of the species is that heads of *A. houstonianum* show mostly long, colored style branches while those of *A. conyzoides* show mostly exposed tips of pappus awns.

BOCAS DEL TORO: Along railroad near station at Milla 10, *Croat & Porter 16329* (MO). Almirante, *Gentry 2697* (MO). Bank of Río Changuinola and Río Tararia, ca. 1 mi N of Changuinola Banana Farm, *Lazor et al. 2432* (FSU, MO). 1.5 mi SE of Banana Plantation on Río Changuinola, *Lazor et al. 2454* (FSU, MO). Abandoned field in Changuinola, *Lazor et al. 2596* (FSU). Farm 8 of Changuinola Banana Plantation, United Fruit Company, *Lazor et al. 2587* (FSU, MO). Changuinola to 5 mi S at junction Ríos Changuinola & Terebé, 100–200 ft, *Lewis et al. 944* (MO, US). CANAL ZONE: Near Miraflores, *Greenman & Greenman 5200* (MO). Balboa, *Macbride & Featherstone 41* (F); *Standley 25665* (F, US), 30832 (US). CHIRIQUÍ: Boquete, *D'Arcy & D'Arcy 6346* (MO). 1 mi S of Volcán on the Cerro Punta Trail, *Lazor & Correa 2760* (FSU, MO). PANAMÁ: Sabanas N of Panama City, *Paul 589* (US). Juan Díaz, *Standley 30530* (US). Chepo, *Tyson 6769* (MO).

4. *Ageratum microcarpum* (Benth. in Ørsted) Hemsl., Biol. Cent. Amer., Bot. 2: 82. 1881.

Coelestina microcarpa Benth. in Ørsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 72. 1852. SYNTYPES: Costa Rica, *Ørsted* (C, not seen, US, photo).

Alomia microcarpa (Benth. in Ørsted) B. L. Robinson, Proc. Amer. Acad. Arts 49: 452. 1913.

Annual or short-lived perennial erect *herbs* or *subshrubs* to 1.2 m tall, with few to many branches; stems becoming brownish to slightly reddish, terete,

slightly striate, sometimes broadly fistulose, sparsely to densely long-pilose, sometimes also slightly puberulous. *Leaves* mostly opposite; blades ovate, to 7 cm long and 4.5 cm wide, the base usually truncate to slightly cordate, strongly trinervate from the base, the margins closely serrate to serrate-crenate, the apex short-acute to slightly acuminate, the upper surface dull green, pilose with numerous long hairs, sometimes also sparsely puberulous, the lower surface slightly paler with glandular punctations and numerous long slender hairs; petioles to 3.5 cm long. *Inflorescence* corymbose to slightly cymose with compact corymbose branches, the branches densely whitish-puberulous to hirtellous, the ultimate branches 3–8 mm and rarely to 17 mm long. *Heads* 4–5 mm high with ca. 60–75 florets; involucral bracts ca. 25, eximbricate, in 2 series, ca. 4 mm long, oblong-lanceolate, prominently bicostate, with prominent often antrorsely lacerate scarious margins, the apex sharply acute, not scarious near tip, the outer surface pilose to hirtellous with numerous slender hairs; receptacle naked; corolla and style branches usually bluish; corolla ca. 2.3 mm long, the tube slender, ca. 1 mm long with numerous small but distinct stipitate glands, the limb and the upper tube usually with a few short hairs, the lobes ca. 0.3 mm long with many papillae inside and near the tip outside, a few short hairs on outer surface; style branches slightly enlarged distally and usually very prominent, papillae small and somewhat pointed. *Achenes* ca. 1.2 mm long, sparsely scabrid to essentially glabrous; carpodium somewhat asymmetrical; pappus totally lacking.

Ageratum microcarpum is native in Central America from Honduras southward and in parts of northern South America. Though separated generically as *Alomia* in most treatments, the species is actually closely related to *A. conyzoides* and *A. houstonianum*. The species differs from its relatives by the complete lack of pappus, by the weakly scabrous or glabrous achenes and by the more numerous, more prominent glands on the corolla tube.

CHIRIQUÍ: Pasture above Boquete, 5200 ft, *D'Arcy & D'Arcy 6412* (MO).

5. *Ageratum oliveri* R. M. King & H. Robinson, *Phytologia* 28: 491. 1974.
TYPE: Panama, Cerro Jefe, *Croat 13062* (MO, holotype; US, isotype).

Annual or short-lived perennial erect *herbs* or *subshrubs* to 1 m tall, with few branches; stems becoming brownish to slightly reddish, terete, slightly striate, usually broadly fistulose, sparsely to densely long-pilose, usually also slightly puberulous. *Leaves* mostly opposite; blades broadly ovate, to 9 cm long and 8 cm wide, the base of lower leaves usually slightly cordate, strongly trinervate from just above the base, the margins crenate to serrate-crenate, the apex shortly but distinctly acuminate, the upper surface yellowish- to dark green, smooth, pilose with numerous long hairs, the lower surface distinctly paler and fleshy with immersed glandular punctations, coarsely pilose only on veins and major veinlets; petioles to 4 cm long. *Inflorescence* cymose to subcymose with compact, corymbose to subumbellate branches, the branches densely short-puberulous, the ultimate branches 1–9 mm long, not noticeably enlarged distally. *Heads* ca. 5 mm high with ca. 60–75 florets; involucral bracts 20–25, eximbricate, in 2 series, mostly 3–4 mm long, lanceolate, bicostate, without evident scarious margins, the apex

sharply acute, the outer surface glabrous; receptacle naked; corolla and style branches blue; corolla 2.3–2.7 mm long, narrowly funnelform, the somewhat broad tube ca. 1 mm long with a very few minute glands on the outer surface, the limb glabrous, the lobes ca. 0.5 mm long with papillae inside and at the tip outside, a few short hairs on the outer surface; style branches not or only slightly broadened distally, long-exserted, with minute somewhat pointed papillae. *Achenes* ca. 1.5 mm long, glabrous; carpopodium asymmetrical; pappus completely lacking or forming a lobed serrulated coroniform rim to 0.3 mm high.

Ageratum oliveri seems endemic to the Cerro Azul–Cerro Jefe area of central Panama. The species has the habit and pilose stems of *A. houstonianum* but the upper and lower leaf surfaces, the lack of scarious margins on the involucre bracts, and the glabrous achenes with coroniform pappus all place the species in the section *Coelestina*. Notable species characters are the shortly acuminate, usually slightly cordate leaves and the glabrous involucre.

PANAMÁ: 7 mi N of Cerro Azul on road to Cerro Jefe, 2600 ft, *Blum et al.* 1771 (FSU). Cerro Jefe along main road before turnoff to summit, *Croat* 13062 (MO, US). Goofy Lake to ca. 8 mi S of Goofy Lake toward Cerro Jefe, *Dwyer* 7055 (MO). Cerro Jefe, *Gentry* 2867 (MO). Along road to Cerro Azul, 1600 ft, *Tyson* 6328 (FSU, MO).

6. *Ageratum panamense* B. L. Robinson, Contr. Gray Herb. 104: 4. 1934, new name for *A. rivale* B. L. Robinson.

A. rivale B. L. Robinson, Contr. Gray Herb. 61: 3. 1920, not *A. rivale* Ses. & Moc., 1889. TYPE: Panama, vic. of El Boquete, Chiriquí, *Maxon* 5240 (US, holotype; GH, isotype).

Erect to decumbent perennial *herb* or *subshrub* to 1.3 m tall, with few to many branches; stems becoming brownish to reddish, terete, slightly striate, solid to slightly fistulose, sparsely to somewhat densely puberulous or hirtellous. *Leaves* mostly opposite; blades ovate to ovate-lanceolate, to 7 cm long and 3 cm wide, the base rounded to short-cuneate, trinervate from just above the base, the margins somewhat closely serrate-crenate to serrulate, the apex acute or obtuse to narrowly rounded, not acuminate, the upper surface usually dark green, scarcely bullate, rather shiny, pilose with numerous long hairs, the lower surface pale to reddish, fleshy with immersed glandular punctations, coarsely pilose mostly on veins and veinlets; petioles mostly 2–5 mm long, rarely to 1 cm long in lower leaves. *Inflorescence* with few or no long branches, ending in compact corymbose to subumbellate clusters, the branches densely whitish puberulous, the ultimate branches 3–30 mm long, not noticeably enlarged distally. *Heads* 5–7 mm high with ca. 50–100 florets; involucre bracts 20–30, eximbricate, in 2 series, mostly 4–6 mm long, broadly to narrowly lanceolate, bicostate, without distinct scarious margins, with short marginal hairs more numerous near tip, the apex sharply acute, the outer surface nearly glabrous or with a few short hairs; receptacle naked; corolla and style branches usually bluish; corolla 2.5–3.5 mm long, narrowly funnelform, the tube rather broad and indistinct, glabrous or with a few minute glands, the limb glabrous, the lobes ca. 0.5 mm long with papillae on inner surface and on the slight outer tip, 1–2 short hairs on outer surface; style branches very slender, not or only slightly enlarged distally, prominent, with minute pointed

papillae. *Achenes* 1.5–2.5 mm long, glabrous; carpopodium slightly asymmetrical; pappus coroniform or of irregular broad scales to 0.4 mm long, sometimes with a single awn to 2.5 mm long.

As delimited here the species is apparently endemic to western and central Panama. *Ageratum panamense* is notable for the nonpilose stems and the short petioles. The recent monograph by Johnson (1971) placed the species in the synonymy of the obscure *A. riparium* B. L. Robinson of Costa Rica. The original description and key characters of the latter, however, indicate a plant with significant differences: acuminate leaves, petioles 1 cm long, lower leaf surface not much paler, corolla tubes slender, and achenes sometimes hispid on the basal angles. A more closely related species, *A. petiolatum* (Hook. & Arn.) Hemsl., (including *A. reedii* R. M. King & H. Robinson) of Nicaragua and Costa Rica differs by the longer leaf petioles and by the narrower, more pilose involucre bracts.

CHIRIQUÍ: Boquete region Alto Lino, 4200 ft, *Maurice* 874 (US). Alto Boquete, *Correa* 427 (MO). Cerro Pando, ca. 6000 ft, *D'Arcy & D'Arcy* 6502 (MO). Boquete, *Davidson* 590 (F, MO, US). Boquete, roadway at Hotel Dos Ríos, ca. 4000 ft, *Dwyer & Hayden* 7568 (MO). Río Caldera S of El Boquete, 1250 m, *Killip* 3612 (US). Road to Cerro Punta, ca. 25 mi N of Concepción, *King* 5289 (US), 4.3 km S of Volcán along drainage to Las Lagunas, *Lazor & Correa* 2829 (FSU, MO). Vic. of Boquete, from Boquete to 3 mi N, 3300–4200 ft, *Lewis et al.* 313 (MO, US). Vic. of El Boquete, 1000–1300 m, *Maxon* 5240 (US). Pastures around El Boquete, 1000–1300 m, *Pittier* 2905 (US). Llanos del Volcán, 1120–1200 m, *Seibert* 342 (MO, US). Nueva California, 4000 ft, *Tyson* 5717 (FSU, MO). Río Chiriquí Viejo valley, near El Volcán, *White* 222 (MO, US). Vic. of Boquete, 1200–1500 m, *Woodson & Schery* 734 (MO). Finca Lerida to Boquete, ca. 1300–1700 m, *Woodson et al.* 1102 (MO), 1147 (MO, US). COCLÉ: El Valle de Antón, *Maurice* 777 (US). El Valle, *Dwyer* 1826 (MO). El Valle de Antón, *Hunter & Allen* 377 (MO). El Valle de Antón and vic., 500–700 m, *Seibert* 472 (MO, US). Between Las Margaritas and El Valle, *Woodson et al.* 1767 (MO, US). PANAMÁ: Finca Indio, Cerro Azul region, *D'Arcy & D'Arcy* 6245 (MO).

13. AUSTROEUPATORIUM

Austroeupatorium R. M. King & H. Robinson, *Phytologia* 19: 433. 1970. TYPE: *Eupatorium inulaefolium* H.B.K.

Erect perennial *herbs* or *subshrubs*, with few branches. Lower *leaves* opposite, upper leaves often subopposite or alternate, with short petioles; blades ovate to narrowly oblong, the margins usually crenulate to serrulate. *Inflorescence* a flattened corymbose panicle. *Heads* discoid with 9–23 florets; involucre bracts 12–18, mostly unequal, subimbricate, in 2–3 series, spreading at maturity; receptacle glabrous, plane or slightly convex; corolla narrowly funnelform with somewhat narrow tube, glands on outer surface, the cells of the corolla narrow with sinuous walls, the lobes without papillae or stomata; anther collars narrow with mostly quadrate or short-oblong cells, the walls with prominent annular thickenings, the exothecial cells quadrate, the anther appendage longer than wide; style base densely hirsute, not inflated, the style appendages linear, covered with short papillae. *Achenes* prismatic with 5 ribs, usually with glands, without bristles; carpopodium distinctly enlarged, sometimes elongate, the cells enlarged with thin walls; pappus of 30–40 slender scabrous bristles in one series, persistent, the apical cells often enlarged and blunt. *Pollen* with short spines.

The genus contains about 11 species found mainly in South America. One species has been collected in Panama and is also adventive in some parts of the Old World.

Literature:

King, R. M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XXVI. A new genus *Austroeupatorium*. Phytologia 19: 433–435.

1. *Austroeupatorium inulaefolium* (H.B.K.) R. M. King & H. Robinson, Phytologia 19: 434. 1970.—FIG. 14.

- Eupatorium inulaefolium* H.B.K., Nov. Gen. Sp. Pl. 4: 85. ed. fol. 1818. TYPE: Colombia, near Mariquita, *Humboldt & Bonpland* (P, not seen, US, photo).
E. molle H.B.K., Nov. Gen. Sp. Pl. 4: 85. ed. fol. 1818. TYPE: Colombia, near Mariquita, *Humboldt & Bonpland* (P, not seen, US, microfiche).
E. suaveolens H.B.K., Nov. Gen. Sp. Pl. 4: 86. ed. fol. 1818. TYPE: Colombia, near Sant-Anna, Mariquita and Ibague, *Humboldt & Bonpland* (P, not seen, US, microfiche).
E. paranense Hook. & Arn., Companion Bot. Mag. 1: 241. 1836. SYNTYPES: Brasil, Paraná, *Tweedie*. Argentina, Buenos Aires, *Tweedie* (both K, not seen).
E. pallidum Hook. & Arn., Companion Bot. Mag. 1: 241. 1836. SYNTYPES: Argentina, Buenos Aires, *Tweedie*. Argentina, San Isidro, *Tweedie* (both K, not seen).
E. pallescens DC., Prodr. 5: 154. 1836. TYPE: Brasil, Minas Geraes, *Vauthier* 273 (G-DC, not seen, US, photo).
E. decemflorum DC., Prodr. 5: 154. 1836. TYPE: Peru, *Poeppig* (G-DC, not seen, US, microfiche).
E. silphifolium Mart., Flora 20, Beibl. 2: 105. 1838. TYPE: Brasil, Rio de Janeiro, *Martius* herb. no. 140 (NY).
E. ramosissimum Gardn., London Jour. Bot. 6: 441. 1847. TYPE: Brasil, margins of woods near Villa de Arrayas, *Goyaz, Gardner* 4206 (BM, not seen).
E. horsfieldii Mig., Fl. Bat. 2027. 1856. TYPE: Java, *Horsfield* (U, photo US).
E. cinereum Griseb., Fl. Brit. W. Ind. 359. 1861. TYPE: Trinidad, *Crueger* (GOET, not seen; K, not seen).

Erect perennial *herbs* or *subshrubs* to 3 m tall, with few branches; stems brownish, terete, slightly striate, densely puberulous to tomentulose. *Leaves* mostly opposite; blades narrowly ovate to lanceolate, to 15 cm long and 6 cm wide, the base rounded to cuneate and abruptly narrowed, the margins slightly serrulate to crenate-serrate, the apex narrowly acuminate, the upper surface smooth to slightly bullate, sparsely to densely puberulous, the lower surface densely puberulous to tomentellous with numerous glandular punctations, the venation prominently trinervate from near the base; petioles short, to 15 mm long, becoming winged distally. *Inflorescence* broadly and densely corymbose, the ultimate branches short and tomentellous, to 3 mm long. *Heads* 6–7 mm high with 8–15 florets; involucre bracts 12–15, subimbricate, in ca. 3 series, suborbicular to broadly oblong, 1.5–6.0 mm long, short-acute to rounded with scarious tips and margins, weakly 2–4 costate, the exposed outer surfaces puberulous; corolla white, 4.0–4.5 mm long, the slender tube ca. 1.5 mm long, some glands on tube and lobes, the lobes short, about as broad as long, sometimes with 1–2 small hairs. *Achenes* 1.8–2.0 mm long, glabrous or with a few glands; carpodium short and broad, the cells large and thin-walled in ca. 7 rows; pappus of 30–40 slender bristles, 3.5–4.0 mm long, the apical cells blunt, not broadened. *Pollen* 18–20 μ in diameter.



FIGURE 14. *Austro eupatorium inulaefolium* (H.B.K.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 4\frac{3}{8}$).—C. Corolla ($\times 9\frac{1}{8}$).—D. Achene ($\times 9\frac{1}{8}$).—E. Style ($\times 9\frac{1}{8}$).

Austro eupatorium inulaefolium has not been previously reported from Panama but it is widely distributed in South America and is adventive in the Eastern Hemisphere in Indonesia and Ceylon. One of the distinctive characters of the species is the very large, broad carpodium with large, thin-walled cells. A few species of South America, *A. mapirens* (Hieron.) R. M. King & H. Robinson and *A. monardifolium* (Uslp.) R. M. King & H. Robinson, seem very close but

reportedly differ by the under surface of the leaves being very short-puberulous or nearly glabrous between the vein reticulations.

PANAMÁ: 1 mi W from Su-Lin Motel along dirt road to Cerro Campana, *Correa & Dressler* 366 (MO). Roadside on way to Cerro Campana, *Croat* 12021 (MO). SW facing slopes of mts. E of Chica, *King* 5266 (US).

14. AYAPANA

Ayapana Spach, Hist. Veg. Phan. 10: 290. 1841. TYPE: *A. officinalis* Spach = *A. triplinervis* (Vahl) R. M. King & H. Robinson.

Lepidesmia Klatt, Bull. Herb. Boissier 4: 479. 1896. TYPE: *L. squarrosa* Klatt.

Tamayoa Badillo, Bol. Soc. Venez. Ci. Nat. 9: 139. 1944. TYPE: *T. paraguayensis* Badillo.

Erect perennial *herbs*, unbranched or basally branched. *Leaves* mostly opposite, sessile or winged to base; blades narrowly ovate to elliptical entire to serrulate, pinnately or trinervately veined. *Inflorescence* laxly paniculate with corymbose to subcymose branches. *Heads* discoid with 5–40 florets; involucre of 15–35 lanceolate subimbricate bracts, in 2–5 series, spreading when mature, the innermost bracts deciduous; receptacle convex, glabrous (paleaceous in one species); corolla narrowly funnelform or tubular, internally glabrous, with glands externally on the lobes, the cells of the corolla elongate with sinuous walls, the lobes short-triangular; anther collars slender, the cells mostly elongate with transverse annular thickenings in the walls, the exothecial cells subquadrate, the anther appendage triangular or oblong, longer than wide; style base with distinct enlarged node, the style branches without glands, the appendages tapering, often strongly curled, with prominently projecting papillae. *Achenes* prismatic, 5-ribbed, with few to many bristles mostly on the ribs; carpopodium enlarged and sharply delimited, the cells thick-walled, in many series, the basal series of cells greatly enlarged; pappus of ca. 18–30 slender scabrous sometimes fragile bristles (reduced to short bristles or scales in one species, *A. squarrosa*), the bristles not enlarged distally, the apical cells sharply pointed. *Pollen* with short sharp spines.

Ayapana contains 11 species ranging from Costa Rica into South America and the West Indies. The greatest concentration of species is in the Andean region. One species, *A. squarrosa* (Klatt) R. M. King & H. Robinson, has been incorrectly placed in a distinct genus (*Lespidesmia*) and even transferred to the tribe Heliantheae by previous writers because of the combination of reduced style appendages, paleaceous receptacle and reduced pappus. Three species of *Ayapana* have been collected in Panama.

A related genus, *Polyanthina*, has been found in Costa Rica and Colombia and may be expected at higher elevations in western Panama. The single species, *P. nemorosa* (Klatt) R. M. King & H. Robinson, has the winged or sessile leaf bases and the distinctive carpopodium found in *Ayapana* but differs by the heads having 200–300 slender florets, the receptacle being pubescent and the style branches being linear and scarcely papillose.

Literature:

King, R. M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XXX. The genus, *Ayapana*. Phytologia 20: 210–212.

- a. Leaves narrowly acuminate at tip; florets whitish; corolla with short broad lobes ----- 2. *A. elata*
 aa. Leaves obtusely acute to rounded at tip; florets reddish or purplish; corolla with lobes distinctly longer than wide.
 b. Leaves sessile or very shortly petiolate; heads with ca. 25 florets ----- 3. *A. stenolepis*
 bb. Leaves usually with narrow petioliform bases; heads with 30–40 florets ----- 1. *A. amygdalina*

1. **Ayapana amygdalina** (Lam.) R. M. King & H. Robinson, *Phytologia* 20: 211. 1970.—FIG. 15.

- Eupatorium amygdalinum* Lam., *Encycl. Méth.* 2: 408. 1788. TYPE: Peru, J. Jussieu, Herb. Jussieu no. 8393 (P, not seen, US, microfiche).
E. loniceroides H.B.K., *Nov. Gen. Sp.* Pl. 4: 91. ed. fol. 1818. TYPE: Colombia, between Popayán and Pindamon, *Humboldt & Bonpland* (P, not seen, US, microfiche).
E. salzmännianum DC., *Prodr.* 5: 159. 1836. TYPE: Brasil, Bahia, *Salzmann* (G-DC, not seen, US, photo).
E. dodoneaeefolium DC., *Prodr.* 5: 161. 1836, not *E. dodoneaeefolium* Hook. & Arn. TYPE: Peru, Poeppig 1832 (G-DC, not seen, US, microfiche).
E. subobtusum DC., *Prodr.* 5: 161. 1836. TYPE: Brasil, Bahia, *Blanchet 1409* (G-DC, not seen, US, photo).
E. oxychlaenum DC., *Prodr.* 5: 162. 1836. TYPE: Brasil, Minas Geraes, *Vauthier 280* (G-DC, not seen, US, microfiche).
E. ixodes Benth., *Jour. Bot. (Hooker)* 2: 41. 1840. TYPE: British Guiana, savannahs of the Rupunoony, *Schomburgk 79* (NY).
E. barclayanum Benth., *Bot. Voy. Sulphur* 112. 1845. TYPE: Panama, Isle of Taboga, Bay of Panama, *Belcher et al.* (BM, not seen).
Bulbostylis elegans Gardn., *London Jour. Bot.* 5: 467. 1846. SYNTYPES: Brasil, Serra da Batalha, Pernambuco, *Gardner 2899*. Brasil, Rio Clara, Minas Geraes, *Gardner 4843* (both BM, not seen).
B. tomentosa Gardn., *London Jour. Bot.* 5: 468. 1846. TYPE: Brasil, Diamond District, Minas Geraes, *Gardner 4844* (BM, not seen).
B. microcephala Gardn., *London Jour. Bot.* 5: 468. 1846. TYPE: Brasil, Serra de Araripe, Ceará, *Gardner 1734* (BM, holotype, not seen; US, isotype).
B. glandulosa Gardn., *London Jour. Bot.* 5: 469. 1846. TYPE: Brasil, Minas Geraes, *Gardner s.n.* (BM, not seen).
B. micrantha Gardn., *London Jour. Bot.* 6: 449. 1847, nom. nud. TYPE: Brasil, Coyaz, *Gardner 3269* (BM, not seen).
Eupatorium glandulosissimum Malme, *Kongl. Svenska Vetenskapsakad. Handl.* 32 (5): 40. 1899. TYPE: Brasil, Buriti, Serra da Chapada, Matto Grosso, *Malme 1744* (S).

Coarse perennial *herbs* or *subshrubs* mostly 1.5–2.0 m high, unbranched or mostly branched at base; stems becoming brownish to reddish, terete or somewhat hexagonal, glabrate to densely puberulous or stipitate glandular. *Leaves* slightly to distinctly imbricated, sessile or very short-petiolate, oblong to obovate, mostly 5–10 cm long and 2–3 cm wide, the lower leaves to 16 cm long and 5.5 cm wide, the base cuneate, sometimes with slight auricles, the margins entire to crenate-serrate, the apex rounded to short-acute, the upper surface obscurely and the lower surface more prominently glandular punctate, the surfaces glabrate to densely hirsute or stipitate glandular, the venation pinnate with ascending secondary veins. *Inflorescence* openly corymbose-paniculate with corymbose to subcymose branches, the branches glabrate to densely stipitate glandular, the ultimate branches 1–20 mm long. *Heads* 7–10 mm high with 30–40 florets; involucre bracts usually partly reddish, ca. 30–40, subimbricate, in 4–5 series, 1–9 mm long, mostly narrowly oblong to linear with little or no scarious margin, the apex short-acute or apiculate to long-attenuate, the outer surface puberulous to densely stipitate

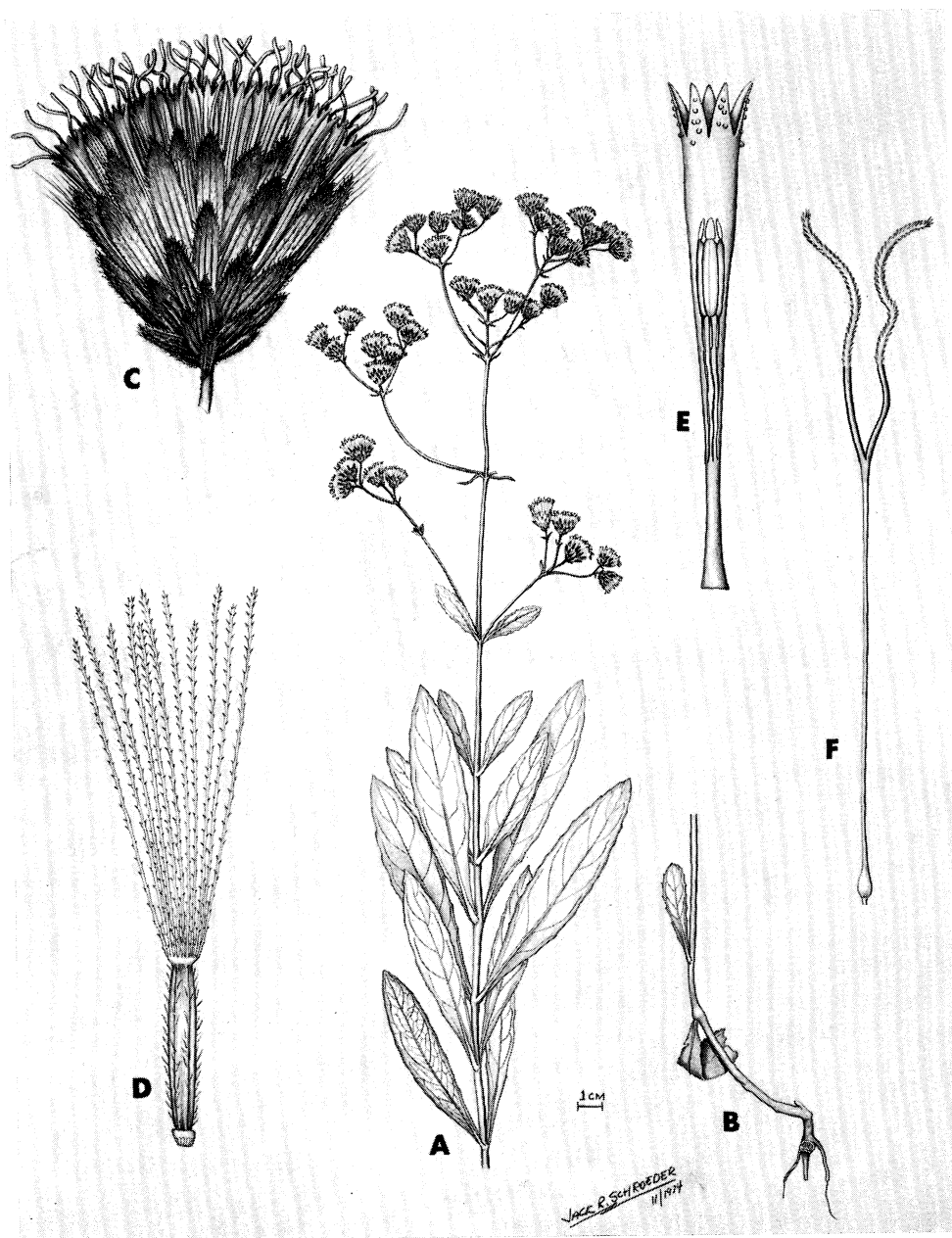


FIGURE 15. *Ayapana amygdalina* (Lam.) R. M. King & H. Robinson.—A. Habit ($\times \frac{2}{5}$).—B. Base of plant ($\times \frac{2}{5}$).—C. Head ($\times 4\frac{7}{10}$).—D. Achene ($\times 12\frac{3}{10}$).—E. Corolla ($\times 12\frac{3}{10}$).—F. Style ($\times 12\frac{3}{10}$).

glandular; corolla reddish, 6–8 mm long, narrowly funnelform, glabrate below, the lobes 0.5–1.0 mm long, longer than wide, with glands and sometimes a few hairs on outer surface. *Achenes* 1.5–2.3 mm long, with numerous bristles mostly on the ribs; pappus of 20–25 slender bristles.

Ayapana amygdalina is distributed from Nicaragua south to Bolivia and Brazil. The species is rather uniform through much of the range, with glabrate stems, leaves, and inflorescence and with short-acute or apiculate involucre bracts. Much of the variation occurs in Brasil where some plants are densely stipitate glandular and many have long-attenuate involucre bracts.

On Taboga Island this species has the common name of "Colindre", *Standley 28011* (US).

CANAL ZONE: Sabanas along Río Azote Caballo, 66–70 m, *Dodge et al. 16841* (F, MO). Road to Corozal, *Gervais 147* (US). Ancón hill, *Greenman & Greenman 5097* (MO); *Piper 5571*, 5582 (both US). Sabana de Marcelito, near El Vigia, *Pittier 2383* (US). Ancón hill, *Standley 26343* (US). CHIRIQUÍ: 12 mi N of Puerto Armeulles, ca. 100 m, *Croat 21877* (MO). COCLÉ: Picacho de Ola, 350–600 m, *Pittier 5059* (US). PANAMÁ: Isla Taboga, 0–350 m, *Allen 1278* (F, MO). Hills above Campana, 600–800 m, *Allen 1313* (MO). Road to Cerro Campana, *Correa & Dressler 835* (MO). Cerro Jefe, 2900 ft, *Dwyer et al. 7291* (MO). Cerro Campana, *Dwyer et al. 4706* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 74* (MO). SW slopes of mts. just E of Chica, *King 5267* (US). SE slope of Cerro Campana, *Lewis et al. 3136* (MO). 7 mi S of Campana, 3–30 m, *McDaniel 8312* (FSU, US). Taboga Island, *Miller 2029* (US). Sabanas, N of Panama City, *Paul 626* (US). Taboga Island, *Pittier 3589* (US). Cerro Campana, *Porter et al. 4324* (MO). Near the big swamp E of the Río Tocumen, *Standley 26644* (US). Taboga Island, *Standley 28011* (US). SE slope of Cerro Jefe, 2700 ft, *Tyson 3549* (MO). Cerro Campana, 1500 ft, *Wilbur & Weaver 11311* (F, MO, US).

2. *Ayapana elata* (Steetz) R. M. King & H. Robinson, *Phytologia* 27: 235. 1973.

Eupatorium elatum Steetz in Seem., Bot. Voy. Herald 148. 1854. TYPE: Panama, *Seemann 448* (BM, not seen, US, photo).

E. sprucei B. L. Robinson, Proc. Amer. Acad. Arts 55: 33. 1919. TYPE: Peru, River Huallaga, *Spruce 4167* (GH, holotype; B, isotype, destroyed, US, photo).

Coarse perennial *herbs* to 3 m tall, unbranched or branching from base; stems greenish or pale brownish, mostly hexagonal, slightly striate, rather densely minutely puberulous. *Leaves* usually laxly imbricate, opposite, narrowly elliptical to lanceolate, to 25 cm long and 7 cm wide, the base petioliform with narrow wing, auriculate at base, becoming wider and indistinct above, the margins entire to serrulate, sometimes somewhat crenate-serrate below the middle, the apex narrowly and sharply acuminate, the upper surface glabrate with sparse small hairs, the lower surface glandular-punctate and puberulous with short hairs, the venation pinnate with secondary veins ascending. *Inflorescence* paniculate with laxly subcymose branches, the ultimate branches mostly 3–7 mm long, densely puberulous. *Heads* ca. 5 mm high with 20–25 florets; involucre bracts ca. 25, subimbricate, in ca. 3 series, 1.0–4.5 mm long, ovate to oblong with broadly scarious margins, the apex rounded to obtusely acute, the outer surface with few glandular punctations, puberulous on exposed parts; corolla white to greenish, ca. 3 mm long, narrowly funnelform, glabrate, the lobes ca. 0.2 mm long and wide, densely glanduliferous on outer surface. *Achenes* ca. 1.5 mm long, with numerous bristles mostly on the ribs; pappus of ca. 35 slender bristles.

Ayapana elata is known primarily from Costa Rica, Panama, and Peru. The species may occur in Colombia but is obviously not common there. The species is not as remarkably disjunct as the related *A. stenolepis*.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 455A* (F, US). CANAL ZONE: Barro Colorado Island, *Croat 8378* (MO). Chagres, *Fendler 157* (MO, US). Militar Reserva Fuerta

Sherman and adjacent Canal Zone S-1 between Gatún and Piña, 0–170 m, *Liesner 1349* (MO). Barro Colorado Island, *Shattuck* (F); *Woodworth & Vestal 600* (F). CHIRIQUÍ: 10–11 mi W of Puerto Armuelles in vic. of San Bartolo Limite, 300–500 m, *Croat 22015* (MO). COCLÉ: El Valle, *Croat 14265* (MO). La Mesa above El Valle, 900 m, *Croat 22975* (MO). 2 mi N of Cerro Pilón, 900 m, *Liesner 713A* (MO). PANAMÁ: Road to Cerro Campana, *Correa & Dressler 843* (MO). Cerro Campana, *Croat 14214* (MO); *Dwyer et al. 4839* (MO). 2 mi up Cerro Campana, *Lazor 2228* (FSU, MO).

3. *Ayapana stenolepis* (Steetz) R. M. King & H. Robinson, *Phytologia* 32: 284. 1975.

Eupatorium stenolepis Steetz in Seemann, Bot. Voy. Herald 148. 1853. TYPE: Panama, Veraguas, *Seemann 1135* (BM).

E. pyramidale Klatt, Abh. Naturf. Ges. Halle 15: 324. 1882. TYPE: Bolivia, Prov. Chiquitos, Santa Cruz, *d'Orbigny 680* (GH; G, not seen, US, photo).

Ayapana pyramidalis (Klatt) R. M. King & H. Robinson, *Phytologia* 20: 212. 1970.

Coarse perennial *herbs* or *subshrubs* to 1 m tall, branching mostly from the base; stems becoming pale brown, terete, striate, densely hirtellous with minutely gland-tipped hairs. *Leaves* usually crowded and much imbricated, opposite, oblong-elliptical to oblanceolate, 4–12 cm long and 0.7–2.0 cm wide, the base sessile, usually narrowly cuneate and somewhat petioliform, the margins entire or subentire, the apex obtuse with a mucro, the upper and lower surfaces obscurely glandular-punctate and densely hirtellous with minutely gland-tipped hairs, the venation pinnate with ascending secondary veins. *Inflorescence* paniculate with somewhat densely corymbose branches, the branches densely hirtellous with minutely gland-tipped hairs, the ultimate branches 1–8 mm long. *Heads* 7–8 mm high with 21–25 florets; involucre bracts ca. 25, subimbricate, in 2–3 series, 2–6 mm long, linear with little or no scarious margin, the apex attenuate with many nonglandular hairs, the outer surface covered with stipitate glands; corolla reddish to lavender, ca. 5 mm long, narrowly funnelform, glabrate, the lobes 0.5–0.7 mm long, longer than wide, sparsely glanduliferous on outer surface. *Achenes* 1.2–1.5 mm long, with numerous bristles mostly on the ribs; pappus of ca. 25 slender bristles.

The Bolivian material closely matches that from Panama and there are no known collections of the species from areas between. Material of *Eupatorium amygdalinum* var. *revolutum* Baker of Brazil may be the same species.

HERRERA: Vic. of Las Minas, La Peña, *Stern et al. 1781* (MO, US). VERAGUAS: Santiago, *Seemann 1135* (BM).

15. BARTLETTINA

Bartlettina R. M. King & H. Robinson, *Phytologia* 22: 160. 1971, new name for *Neobartlettia* R. M. King & H. Robinson.

Neobartlettia R. M. King & H. Robinson, *Phytologia* 21: 294. 1971, not *Neobartlettia* Schlechter (Orchidaceae). TYPE: *Eupatorium tuerckheimii* Klatt.

Shrubs or small *trees*, laxly branching. *Leaves* opposite with long slender petioles; blades ovate to lanceolate, the base cuneate to truncate, never cordate, the surface often with glandular punctations. *Inflorescence* mostly laxly corymbose-paniculate. *Heads* discoid with 20–150 florets; involucre bracts 20–50,

subimbricate to imbricate, unequal, in 3–5 series, spreading at maturity, the innermost bracts deciduous; receptacle convex, glabrous or with short hairs, corolla tubular, narrowly funnelform above, the inner and outer surfaces smooth, the cells of the corolla mostly narrow with sinuous walls, the lobes short-triangular with hairs or glands on outer surface; anther collars very elongate with numerous quadrate or short-rectangular cells below, the cell walls inornate, the exothecial cells quadrate or wider than long, the anther appendage oblong-ovate to long-triangular; style without basal enlargement, glabrous, the style appendages slender or very narrowly clavate at tip, nearly smooth or short-papillose. *Achenes* prismatic with 5 ribs, usually glabrous or with sparse bristles; carpopodium somewhat enlarged with smaller cells near the base, the larger upper cells continuous into enlarged bases of the ribs, the cell walls thin; pappus of 30–40 slender bristles in 1–2 series, scabrous, persistent, the apical cells acute.

Bartlettina is a genus of 20 species ranging from Mexico and Central America to northern South America and Brazil. The center of speciation is in Central America. Three species have been collected in Panama.

Literature:

King, R. M. & H. Robinson. 1971a. Studies in the Eupatorieae (Asteraceae). XXXVI. A new genus, *Neobartlettia*. *Phytologia* 21: 294–297.

——— & ———. 1971b. Studies in the Eupatorieae (Asteraceae). LXI. Additions to the *Hebeclinium* complex with *Bartlettina*, a new generic name. *Phytologia* 22: 160–162.

- a. Leaf blades trinervate from the base; heads large and prominent with 40–50 involucre bracts and 60–75 florets; involucre bracts with 4–8 distinct costae; corollas with only glands on outer surface 2. *B. platyphylla*
- aa. Leaf blades somewhat trinervate from the basal fourth or fifth; heads smaller with 20–25 involucre bracts and 20–25 florets; involucre bracts with only a few indistinct costae; corollas with few to many hairs on outer surface.
 - b. Leaf blades broadly ovate with abruptly short-acuminate tips and truncate or short-cuneate bases; corollas 5–6 mm long with numerous hairs covering upper part; pappus bristles extremely slender in distal half; stems mostly fistulose 1. *B. maxonii*
 - bb. Leaf blades ovate or narrowly ovate with narrowly acuminate tips and cuneate to narrowly cuneate bases; corollas 4–5 mm long with hairs mostly restricted to the outer surface of lobes; pappus bristles often as thick or thicker in distal half as near base; stems with pith mostly solid 3. *B. prionophylla*

1. ***Bartlettina maxonii*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 22: 161. 1971.

Eupatorium maxonii B. L. Robinson, *Proc. Amer. Acad. Arts* 54: 251. 1918. TYPE: Panama, El Boquete, Chiriquí, *Maxon 4942* (US, holotype; GH, US, isotypes).

Neobartlettia maxonii (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 21: 296. 1971.

Shrub 3–4 m tall, freely and divaricately branched; stems grayish-brown, terete to subquadrangular, slightly striate, densely minutely puberulous, the stems mostly fistulose. *Leaves* opposite; blades broadly ovate, to 14 cm long and 11 cm wide, the base truncate or short-cuneate, the margins sharply serrate, sometimes with a dentation near basal third, the apex abruptly short-acuminate, the surface minutely and sparsely puberulous with scattered glandular punctations, the

venation somewhat trinervate from the basal third; petioles slender, to 8 cm long. *Inflorescence* corymbose-paniculate, the ultimate branches 2–7 mm long, minutely puberulous; receptacle glabrous. *Heads* ca. 10 mm high with 20–25 florets; the base of the involucre with 1–3 small linear-lanceolate bracts; involucre bracts ca. 23, subimbricate, in ca. 3 series, ovate to oblong with short-acute tips, the outer surface with 2–6 somewhat indistinct costae, minutely puberulous, often with glandular punctations; corolla lavender, 5–7 mm long, the upper corolla covered with many fine hairs, the lobes short, broader than long. *Achenes* ca. 1.5 mm long, glabrous; pappus of ca. 40 fine bristles.

Bartlettina maxonii is endemic to western Panama. The species seems closely related to *B. prionophylla* which grows in the same general area but at distinctly higher elevations.

CHIRIQUÍ: El Boquete, 1000–1300 m, *Maxon 4942* (US, GH).

2. ***Bartlettina platyphylla*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 22: 161. 1971.—FIG. 16.

Eupatorium platyphyllum B. L. Robinson, *Proc. Amer. Acad. Arts* 35: 339. 1900. TYPE: Mexico, near Chicharras, Chiapas, *Nelson 3765* (GH, not seen; US).

Neobartlettia platyphylla (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 21: 296. 1971.

Shrubs or small *trees* to 5 m tall, with few branches; stems brownish to reddish-brown, terete, scarcely striate, hirtellous in younger parts, the pith solid. *Leaves* opposite; blades broadly ovate, to 15 cm long and 12 cm wide, the base truncate or short-cuneate, the margins serrate to slightly doubly serrate, the apex narrowly short-acuminate, the surface glabrate, sparsely glandular-punctate, the venation trinervate from the base; petioles slender, to 9 cm long. *Inflorescence* pyramidally corymbose-paniculate with large heads usually contiguous when pressed, the ultimate branches 0.5–2.5 cm long, hirtellous; receptacle glabrous. *Heads* 15–20 mm high and ca. 10 mm wide with 60–75 florets; involucre bracts ca. 40–50, imbricate, in 4–5 series, broadly ovate to oblong with rounded sometimes erose or reflexed tips, the outer surface glabrous, with 4–8 distinct costae, a few linear deciduous inner bracts; corolla white, mostly 6–8 mm long, with only a few capitate glands on outer surface of lobes. *Achenes* ca. 2 mm long, usually completely glabrous; pappus of ca. 60 fine bristles in 2 series.

The species ranges from central Mexico south to Panama. It has often been confused with the superficially similar looking genus *Schistocarpha* of the Heliantheae.

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m, *Allen 1583* (F, MO, US). Palo Santo, 3 mi N of Volcán, *Croat 13584* (MO). 1 mi E of Cañas Gordas, near Costa Rican border on road to Volcán, 800–1200 m, *Liesner 277* (MO). Vic. of El Boquete, 1000–1300 m, *Maxon 5051* (US). El Boquete, 1000–1300 m, *Pittier 2941* (US). Las Lagunas, 2 mi SW of El Volcán, 4200 ft, *Tyson 863* (FSU).

3. ***Bartlettina prionophylla*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 22: 161. 1971.

Eupatorium prionophyllum B. L. Robinson, *Proc. Amer. Acad. Arts* 36: 484. 1901. TYPE: Costa Rica, banks of Río Toros, *Pittier 1705* (GH, not seen).

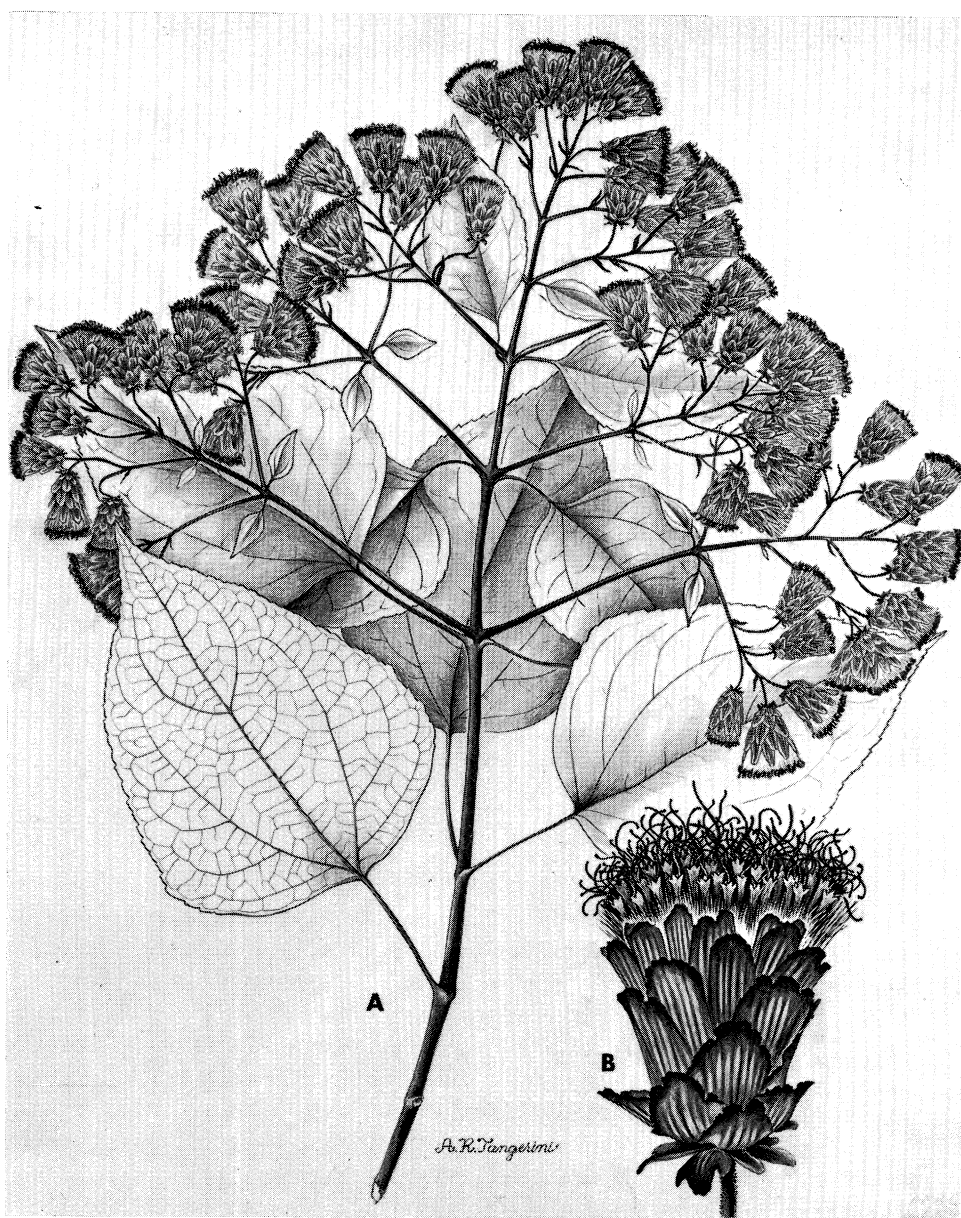


FIGURE 16. *Bartlettina platyphylla* (B. L. Robinson) R. M. King & H. Robinson.—A. Habit ($\times \frac{2}{5}$).—B. Head ($\times 2\frac{1}{5}$).

Neobartlettia prionophylla (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 21: 296. 1971.

Shrub or small *tree* 2–3 m tall, laxly branched; stems brownish, mostly terete, slightly striate, densely minutely puberulous, the pith usually solid. *Leaves* opposite; blades ovate to narrowly ovate, to 11 cm long, usually to 6 cm wide,

rarely to 8 cm wide, the base short- to long-cuneate, the margins sharply and irregularly serrate, sometimes doubly serrate, the apex gradually sharply acuminate, the surface minutely and sparsely puberulous, with scattered glandular punctations, the veins sometimes rather trinervate with 1–2 pairs of ascending secondary veins in the basal fourth; petioles slender, to 5 cm long. *Inflorescence* corymbose-paniculate, sometimes pyramidal, the ultimate branches 3–7 mm long, minutely puberulous; receptacle glabrous. *Heads* ca. 8 mm high with 22–32 florets; the base of the involucre with 1–3 small linear-lanceolate bracts; involucral bracts ca. 23, subimbricate, in ca. 3 series, ovate to oblong with short-acute tips, the outer surface with 2–4 indistinct costae, minutely puberulous, often with glandular punctations; corolla lavender, 4–5 mm long, hairs usually mostly on outer surface of lobes, the lobes about as long as broad. *Achenes* 1.5–2.0 mm long, glabrous; pappus of 30–40 bristles mostly in 1 series, distal halves of the bristles often as wide or wider than the base.

As presently delimited, the species is known only from Costa Rica and Panama.

CHIRIQUÍ: Slopes of Las Cumbres near Cerro Punta, Croat 13724 (MO). Bajo Chorro, Boquete, 6500 ft. Davidson 266 (F, GH, MO, US).

16. BRICKELLIA

Brickellia Elliott, Sketch Bot. South Carolina and Georgia 2: 290. 1824 (1822), nom. cons. TYPE: *B. cordifolia* Elliott.

Kuhnia L., Sp. Pl., ed. 2. 1662. 1763. TYPE: *K. eupatorioides* L.

Coleosanthus Cass., Bull. Soc. Philom. 1817: 76. 1817. TYPE: *C. cavanillesii* Cass.

Rosalesia La Llave & Lexarza, Nov. Veg. Desc. 1: 14. 1824. TYPE: *R. glandulosa* La Llave in La Llave & Lexarza = *Brickellia cavanillesii* (Cass.) A. Gray.

Clavigera DC., Prodr. 5: 127. 1836. TYPE: *C. corymbosa* DC.

Bulbostylis DC., Prodr. 5: 138. 1836. TYPE: *Coleosanthus cavanillesii* Cass.

Ismaria Raf., Sylva Tell. 117. 1838. TYPE: *I. glandulosa* Raf.

Small to robust usually erect perennial *herbs* or *subshrubs*. *Leaves* opposite to alternate, sessile to petiolate; blades linear to broadly ovate, rarely trilobate, the margins subentire to coarsely serrate, teeth sometimes spiculiferous. *Inflorescence* paniculate to corymbose or racemose, rarely monocephalic. *Heads* discoid with 4–62 florets; involucre of 20–50 obtuse to long-acute subimbricate bracts, in 3–5 series; receptacle glabrous, usually flat; corolla narrowly tubular, usually constricted above, the lobes usually oblong-ovate, smooth, outer surface usually with glands, the cells of the corolla narrow with sinuous walls; anther collar with mostly oblong cells and with prominent annular thickenings, the exothecial cells subquadrate or wider than long, the anther appendage longer than wide, mostly oblong-ovate; style base with distinct enlarged node and dense contorted pubescence, the style appendage usually with very elongate thickened tips (slender in one species). *Achenes* prismatic with ca. 10 ribs, few to many bristles mostly between the ribs; carpopodium distinct, slightly to distinctly asymmetric, the cells small, mostly quadrate; pappus of 15–40 bristles, with flattened outer surface and scabrous to plumose lateral margins.

Brickellia contains about 100 species ranging from the southern United States to Mexico, Central America, and South America. The great majority of the species

are Mexican with only one species, *B. diffusa*, occurring in Panama and South America.

Literature:

Robinson, B. L. 1917. A monograph of the genus *Brickellia*. Mem. Gray Herb. 1: 3–151.

1. *Brickellia diffusa* (Vahl) A. Gray, Pl. Wright. 1: 86. 1852.—FIG. 17.

Eupatorium diffusum Vahl, Symb. Bot. 3: 94. 1794. TYPE: South America, *Forsskål* (C, not seen).

Bulbostylis diffusa (Vahl) DC., Prodr. 7: 268. 1838.

Eupatorium trichosanctum A. Rich. in R. de la Sagra, Fl. Cub., Fanerog. 3: 41. 1853. TYPE: Cuba, Jagua, *Ossa* (P, not seen).

Coleosanthus diffusus (Vahl) Kuntze, Rev. Gen. Pl. 1: 328. 1891.

Erect sparingly branched annual *herb* to 2 m tall; stems yellowish to slightly reddish, terete, scarcely striate, glabrous. *Leaves* opposite; blades deltoid to broadly ovate, to 10 cm long and 11 cm wide, the base broadly rounded to truncate, prominently acuminate and trinervate, the margins closely serrate-dentate, the apex shortly and abruptly apiculate, the upper surface with sparse short coarse pubescence, the lower surface densely covered with numerous oblong or reniform glands; petioles slender, to 6 cm long. *Inflorescence* a lax profusely branching elongate panicle with paniculate branches, the ultimate branches 4–20 mm long, glabrous. *Heads* ca. 7 mm high, slender, with mostly 8–14 florets; involucre bracts ca. 20, subimbricate, in 3–4 series, lanceolate to linear-lanceolate, 1–7 mm long, the apex sharply acute, the margins scarious, the outer surface bicostate, glabrous; corolla whitish, 4–5 mm long, slender, narrower above, glabrous except for a few glands on the lobes, the lobes minute; style branches filiform, tapering to the tip. *Achenes* 1.5–2.0 mm long, densely covered with small bristles; carpodium prominent; pappus of 30–40 bristles with minutely scabrellous margins. *Pollen* mostly 20–25 μ in diameter, micropapillose.

The species is both the most widely distributed and most atypical member of the genus *Brickellia*. The genus is mostly restricted to the western United States, Mexico, and Central America, but *B. diffusa* occurs in Mexico southward to Peru and Brazil and also in the Greater Antilles. The genus and its relatives are generally characterized by the very broadly clavate style branches, but *B. diffusa* has filiform style branches with stigmatic lines sometimes reaching very near the tip. The species does retain most of the characteristic features of *Brickellia* including the appressed involucre bracts, the constricted corolla, the large and prominently tomentose style node, the ten-ribbed achene, and the flattened outer surfaces of the pappus bristles.

CANAL ZONE: Chiva-Chiva trail, Red tank to Pueblo Nuevo, *Piper* 5741 (US). Balboa, *Standley* 29298 (US). CHIRIQUÍ: Distrito Guanábano, Quebrada Guanabano, 0–100 m, *Croat* 22502 (MO). Quebrada Merida, 4 mi S of Puerto Armuelles, 0–100 m, *Liesner* 383 (MO). Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner* 59 (MO). DARIÉN: Isla Pedro Gonzales, *Duke* 10396 (MO, OS). Above Paca, *R. S. Williams* 710 (US). PANAMÁ: Juan Díaz, *Standley* 30631 (US). Nuevo San Francisco, *Standley* 30717 (MO, US).



17. CHROMOLAENA

Chromolaena DC., Prodr. 5: 133. 1836. TYPE: *C. horminoides* DC.

Heterolaena Schultz-Bip. ex Benth. & Hook., Gen. Pl. 2: 245. 1873. TYPE: *Eupatorium odoratum* L.

Osmia Schultz-Bip., Pollichia 22–24: 251. 1866. TYPE: *Eupatorium odoratum* L.

Eupatorium sect. *Cylindrocephala* DC., Prod. 5: 141. 1836. TYPE, present designation: *E. odoratum* L. = *Chromolaena odorata* (L.) R. M. King & H. Robinson.

Sparingly to densely branched *herbs* or *shrubs*. *Leaves* opposite; blades triangular to elliptical, the margins subentire to highly lobed. *Inflorescence* laxly to densely corymbose. *Heads* discoid with 10–45 florets; involucre of 18–45 ovate to lanceolate densely imbricate very unequal bracts, in 4–6 series, the bracts all deciduous at maturity; receptacle elongate, the upper surface flat to slightly convex, glabrous, paleae sometimes present; corolla tubular to narrowly funnelform with a scarcely constricted base, the outer surface mostly smooth with few to many short-stalked glands and often with rather stiff hairs, without stomates, the tips of the lobes usually capped with a group of thick-walled often prominently projecting cells, the inner surface of the lobes usually papillose with densely projecting cells, the cells inside corolla throat narrow with sinuous walls, with upper ends sometimes projecting; anther collar with numerous quadrate cells below, elongate cells above, usually with prominent ornate banding on walls, bands transverse in elongate cells and oblique or vertical in many shorter cells, the exothecial cells mostly about as long as wide, the anther appendage longer than wide, entire or toothed at the tip; style base not enlarged, glabrous, the surface cells of style appendages smooth to long-projecting. *Achenes* prismatic, 5- or rarely 3-ribbed, with bristles mostly on the ribs, sometimes with glands; carpopodium short-cylindrical, rarely narrowed below, the cells small, often wider than high with usually thickened walls; pappus of ca. 40 slender scabrous persistent bristles, the apical cells usually pointed. *Pollen* spinose, modified “type II” present in many species.

Chromolaena is a large and complex genus of more than 130 species. The greatest concentration of species is in Brazil where most of the closely related genera occur. Only the three most widely distributed species are found in Panama.

Literature:

King, R. M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae). XXIX. The genus *Chromolaena*. Phytologia 20: 196–209.

- a. Inner involucre bracts with highly differentiated, expanded, often lavender-colored tips; leaves lanceolate to linear 1. *C. ivaefolia*
- aa. Inner involucre bracts with differentiated tips; leaves ovate to broadly elliptical.

←

FIGURE 17. *Brickellia diffusa* (Vahl) A. Gray.—A. Habit ($\times \frac{3}{5}$).—B. Heads ($\times 2\frac{1}{5}$).—C. Receptacle ($\times 8\frac{3}{10}$).—D. Achene cross section ($\times 16\frac{7}{10}$).—E. Florets ($\times 5\frac{3}{5}$).—F. Stamens ($\times 13\frac{9}{10}$).—G. Style with bases of branches ($\times 5\frac{3}{5}$).—H. Pappus bristle ($\times 11\frac{1}{10}$). [After Martius, Flora Brasiliensis 6(2): plate 102. 1876.]

- b. Leaf blades deltoid to rhombic-ovate with prominent petioles, the lower surface with numerous red glands 3. *C. odorata*
bb. Leaf blades broadly elliptical with short petioles, glabrous 2. *C. laevigata*

1. ***Chromolaena ivaefolia* (L.) R. M. King & H. Robinson**, *Phytologia* 20: 202. 1970.

Eupatorium ivaefolium L., *Syst. Nat.*, ed. 10. 2: 1205. 1759. TYPE: Jamaica, cultivated, Swartz? (LINN = 978.28, not seen, US, microfiche).

Osmia ivaefolia (L.) Schultz-Bip., *Pollichia* 22-24: 250. 1866.

Small *shrubs* or woody *herbs* to $\frac{1}{2}$ m tall, unbranched; stems reddish-brown, terete, pubescent. *Leaves* opposite; blades narrowly elliptical, to 6 cm long and 2 cm wide, the base narrowly cuneate, the margins nearly entire, the apex narrowly acute to acuminate, the surfaces pubescent, the venation trinervate from near the base, the veins often prominent; petioles 1-5 mm long. *Inflorescence* a corymbose-panicle, sometimes multistratose, to 10 cm tall, the ultimate branches pubescent. *Heads* ca. 8 mm high with ca. 25 florets; involucre bracts ca. 30, imbricate, with 4-5 costae, the upper portions pubescent, the outer bracts oblong with rounded apices, the inner bracts with expanded and rounded usually lavender apices; receptacle naked; corolla violet, tubular, ca. 4 mm long. *Achenes* ca. 2 mm long, prismatic, 4-5-ribbed, the ribs bearing many short bristles; pappus of ca. 30 scabrous bristles, ca. 4.5 mm long, the apical cells acute.

Chromolaena ivaefolia ranges from the United States in the north through the West Indies and Mexico to Argentina and Bolivia in the south. The colored tips of the involucre bracts are distinctive.

CHIRIQUÍ: Pastures around El Boquete, 1000-1300 m, *Pittier* 2903 (US). Llanos Francia, 3300 ft, *Stern et al.* 1176 (MO).

2. ***Chromolaena laevigata* (Lam.) R. M. King & H. Robinson**, *Phytologia* 20: 202. 1970.

Eupatorium laevigatum Lam., *Encycl. Méth.* 2: 408. 1788. TYPE: America, *J. Jussieu*, Jussieu Herb. no. 8394 (P, not seen, US, microfiche).

E. psiadiaefolium DC., *Prodr.* 5: 144. 1836. TYPE: Brasil, in siccus ad Corcovado, *Lhostky* (G-DC, not seen, US, microfiche).

Shrubs or woody *herbs* to 2 m tall with few branches; stems reddish-brown, terete with slight striations, essentially glabrous. *Leaves* opposite; blades elliptical, to 10 cm long and 4 cm wide, the base cuneate to acuminate, the margins serrate to distal $\frac{1}{2}$ to $\frac{2}{3}$, the apex acute to short-acuminate, the surfaces glabrate, the venation trinervate from at or near the base, the veins prominent; petioles mostly 3-5 mm long. *Inflorescence* a corymbose panicle to 10 cm wide and 5 cm high, the ultimate branches 1-5 mm long, glabrous. *Heads* ca. 1 cm high with 15-20 florets; involucre bracts ca. 25-30, glabrate, imbricate, oblong, with 4-5 costae, the apex rounded; receptacle naked; corolla pale lavender, ca. 5 mm long, tubular. *Achenes* ca. 3.5 mm long, prismatic, 5-ribbed, the ribs with short bristles; pappus of ca. 25-30 scabrous bristles, ca. 5 mm long, the apical cells acute.

Chromolaena laevigata ranges widely from Mexico south to Argentina but is not known from the West Indies.

CHIRIQUÍ: Llanos del Volcán, ca. 1300 m, *Allen 1554* (F, MO, US). Vic. of Boquete, 3300–4200 ft, *Lewis et al. 621* (MO). Cerro Vaca, 900–1136 m, *Pittier 5300* (US). COCLÉ: El Valle de Antón, 600–800 m, *Allen 2861* (MO, US). PANAMÁ: Campana, 600–800 m, *Allen 1308* (F, MO, US). Cerro Campana, *Duke 6006* (MO); *Lewis et al. 3098, 3079* (both MO); *Tyson 6443* (FSU, MO). VERAGUAS: 1–2 mi above Santa Fé, *Gentry 3052* (MO).

3. *Chromolaena odorata* (L.) R. M. King & H. Robinson, *Phytologia* 20: 204. 1970.—FIG. 18.

Eupatorium odoratum L., *Syst. Nat.*, ed. 10. 2: 1205. 1759. TYPE: Jamaica, Plukenet, *Phytographia* 177, fig. 3.

E. conyzoides Mill., *Gard. Dict.*, ed. 8. 1768. (*Eupatorium* no. 14). TYPE: Jamaica, *Sloane*, cat. no. 124 (BM, not seen).

E. floribundum H.B.K., *Nov. Gen. Sp. Pl.* 4: 92. ed. fol. 1818. TYPE: "Peru", River Catamayo, Loxa, *Humboldt & Bonpland* (P, not seen, US, microfiche).

E. divergens Less., *Linnaea* 5: 138. 1830. TYPE: Mexico, near Hacienda de la Laguna, *Schiede & Deppe* (B, destroyed).

E. graciliflorum DC., *Prodr.* 5: 145. 1836. TYPE: Mexico, near Acapulco, *Haenke* (G-DC, not seen, US, microfiche).

Osmia odorata (L.) *Schultz-Bip.*, *Pollichia* 22–24: 250. 1866.

O. divergens (Less.) *Schultz-Bip.*, *Pollichia* 22–24: 252. 1866.

O. graciliflorum (DC.) *Schultz-Bip.*, *Pollichia* 22–24: 252. 1866.

Eupatorium klattii Millsp., *Publ. Field Columbian Mus., Bot. Ser.* 2: 105. 1900. TYPE: Cuba, shore of Santiago Bay, *Millsbaugh 1126* (F, not seen).

Woody *herbs* or reclining *shrubs* to 3 m tall, much branched; stems reddish-brown, terete, finely striate, glabrous to hirsute. *Leaves* opposite; blades deltoid to rhombic-ovate, to 9 cm long and 5 cm wide, the base cuneate to subtruncate, the margins entire to serrate, the apex narrowly acuminate, the upper surface glabrous, rarely pubescent, the lower surface with numerous short-stalked to sessile red glands, the venation prominently trinervate from near the base; petioles to 2 cm long. *Inflorescence* a broad panicle to 8 cm wide and 4 cm high with corymbose branches, the ultimate branches usually pubescent. *Heads* ca. 1 cm high with ca. 25 florets; involucre bracts ca. 15, glabrous to sparsely pubescent, imbricate, with 3–4 costae, the outer bracts oblong with rounded to truncate apices, the inner bracts narrow, short-acute; receptacle naked; corolla white, lavender, pink or light bluish, ca. 6 mm long, tubular. *Achenes* ca. 4 mm long, prismatic, 4–5-ribbed, ribs with short bristles; pappus of ca. 30 scabrous bristles, ca. 6 mm long, the apical cells acute.

Chromolaena odorata is widely distributed in the Americas from the southeastern United States south to Argentina. The species has been widely introduced into tropical parts of the Old World.

BOCAS DEL TORO: Bocas del Toro, *Carleton 173* (US). Almirante, *Cooper 130* (F). Banks of the Changuinola River, *Dunlap 416* (F). Peak behind waterfall on Quebrada N of Río Terebe ca. halfway between Quebrada Huron and Puerto Palenque, 400–800 ft, *Kirkbride & Duke 494* (MO). Changuinola to 5 mi S at junction of Ríos Changuinola and Terebe, 100–200 ft, *Lewis et al. 938* (MO). Water Valley, *von Wedel 864* (MO). Vic. of Chiriquí Lagoon, Water Valley, *von Wedel 1852* (MO, US). Vic. of Chiriquí Lagoon, Old Bank Island, *von Wedel 1861* (MO, US). CANAL ZONE: Vic. of Fort Clayton Test Center, *Blum 2052* (FSU, MO). Ancón, Cerro de Ancón, *Celestine 77* (US). Gamboa, *Heriberto 77* (US). Río Chagres, below the spillway of Gatún, *Busey & Mahler 340* (MO). Empire Range, *Correa & Gonzalez 519* (FSU). Barro Colorado Island, *Croat 4209* (MO), 4386 (F, MO), 4612, 6919, 7068, 7173, 7476, 7481 (all MO), 7789 (F, MO). 1 mi N of Summit Gardens, *Croat 12893* (F, MO). Barro Colorado Island, *Dressler 3426* (MO). Ancón Hill, *Greenman & Greenman 5107, 5128, 5140* (all MO). Between Summit and Gamboa, *Greenman & Greenman 5238* (MO). Road between Gamboa

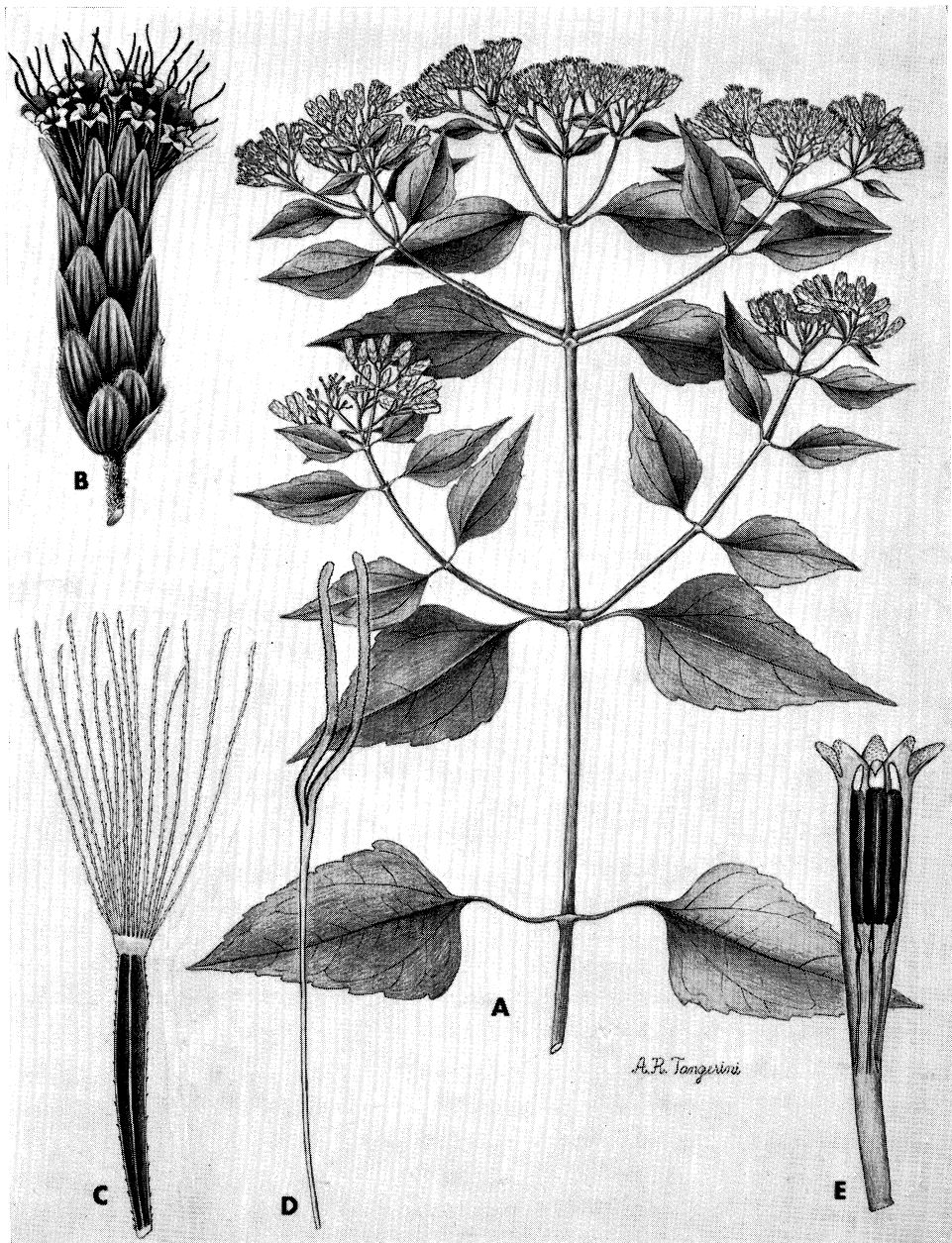


FIGURE 18. *Chromolaena odorata* (L.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5\%$).—C. Achene ($\times 10\%$).—D. Style ($\times 10\%$).—E. Corolla ($\times 10\%$).

and Summit Gardens, *Kennedy* 2263 (MO). Balboa, *Macbride & Featherstone* 25 (F, US). 1–3 mi from Gorgona, 40–150 m, *Maxon* 4731 (US). Río Grande near Culebra, 50–100 m, *Pittier* 2129 (US). Between Corozal and Ancón, 10–30 m, *Pittier* 2205 (US). Barro Colorado Island, *Shattuck* 686 (MO). Cerro Gordo, near Culebra, *Standley* 26027 (US). Near Gatún, *Standley* 27246 (US). Frijoles, *Standley* 27614 (US). Gamboa, *Standley* 28448 (US). Near

Fort Randolph, *Standley* 28606 (US). Mount Hope Cemetery, *Standley* 28787 (US). Old Las Cruces trail, between Fort Clayton and Corozal, *Standley* 29146 (US). Las Cascadas Plantation, near Summit, *Standley* 29588 (US). Vic. of Summit, *Standley* 30117 (US). Vic. of Fort Sherman, *Standley* 31214 (US). Quebrada Melgada, 70–75 m, *Steyermark* 17473 (MO). Farfan Beach area, *Tyson & Blum* 2613 (FSU, MO). Curundu, *Tyson* 6061 (FSU), 6468 (MO); *Tyson & Lazor* 6061 (FSU). Barro Colorado Island, *Wetmore & Abbe* 36, 146 (both F); *Woodworth & Vestal* 348, 495 (both F, MO). CHIRIQUÍ: Quebrada Manzanillo, 9 km S by SW of Puerto Armuelles, *Busey* 729 (MO). Quebrada del Medio, 2 km N of Punta de Burica, 40–80 m, *Busey* 749 (MO). 1 mi W of airport at Puerto Armuelles, near sea level, *Croat* 21888 (MO). 4 km N of Burica, *McCorkle c-139* (FSU). Vic. of San Felix, 0–120 m, *Pittier* 5199 (US). Cerro Vaca, 900–1136 m, *Pittier* 5302 (US). COCLÉ: Vic. of El Valle, 800–1000 m, *Allen* 81 (MO). Río Hato airstrip, *Burch et al.* 1147 (MO). 3 mi NE of Antón, *D'Arcy* 4104 (MO). 2.5 mi S of El Valle, 680–700 m, *McDaniel* 8236 (FSU). Aguadulce, vic. of Puerto Aguadulce, *McDaniel & Cooke* 14808 (FSU). COLÓN: East Santa Rita Ridge, *Correa & Dressler* 608 (MO, US), 613 (FSU, MO, US), 649 (MO). Miguel de La Borda, *Croat* 10040 (F, MO). East Santa Rita Ridge, *Dwyer* 8402, 9339, 9354 (all MO). DARIÉN: Boca Grande tide gage, 50 ft, *Duke* 1554 (OS, REED). Ca. 6 mi upstream from Morti Abajo, 100 m, *Duke* 10156 (MO, REED), Isla Taboga, *Duke* 10358 (MO). Isla Casaya, *Duke* 10381 (MO). Isla Pedro Gonzales, *Duke* 10398 (MO). Isla Espiritu Santo, *Duke* 10452 (MO). Corredo, *Duke* 15205 (REED). Near helipad at Hydro Camp on Río Morti, 229 ft, *Duke* 15406 (FSU, MO). Río Sabana, *Roi Leopold III* 223 (MO). HERRERA: Road from La Avena to Pesé, ca. 200 ft, *Burch et al.* 1318 (F, MO). Between El Potrero and Las Minas, *D'Arcy* 4137 (MO). 10 mi S of Océ, *Tyson & Blum* 2805 (FSU, MO). LOS SANTOS: 3 mi S of Carreta, *Burch et al.* 1235 (US). Vic. of Bella Vista, *Piper* 5321, 5342, 5388 (all US). PANAMÁ: Isla Taboga, 0–350 m, *Allen* 1293 (F, MO). Cerro Jefe, 10–13 mi S of Goofy Lake, *Duke* 8020 (OS). Isla del Rey, *Duke* 9545 (MO). San José Island, *Duke* 12509 (MO, OS). Goofy Lake to ca. 8 mi S of Goofy Lake, *Dwyer* 7061 (MO). Chagres, *Fendler* 1850 (MO). Chimán, *Lewis et al.* 3334 (MO). Vic. of Panamá, *Macbride* 2610, 2617 (both F, US). Pearl Islands, Saboga Island, *Miller* 1978 (US). Bella Vista, *Standley* 25313 (US). Las Sabanas, *Standley* 25873 (US). Near Punta Paitilla, *Standley* 26285 (US). Corozal Road, near Panamá, *Standley* 26808 (US). Tobaga Island, *Standley* 27102 (US). Vic. of Juan Franco Race Track, near Panamá, *Standley* 27675 (US). Tobaga Island, *Standley* 27852 (US). Río Tapia, *Standley* 28054, 28215 (both US). Saboga Island, Pearl Islands, *Tyson & Loftin* 5127 (FSU). SAN BLAS: Sasardi, ca. 20 m, *Duke* 10146 (MO, OS). VERAGUAS: Hills W of Soná, ca. 500 m, *Allen* 1046 (MO). 3.9–5 mi N of Santa Fé, *Gentry* 3007 (MO). Puerto Mutis, 12 mi S of Santiago, *Tyson* 6030 (FSU). La Mesa, *Tyson* 6069 (FSU, MO).

18. CONDYLIDIUM

Condylidium R. M. King & H. Robinson, *Phytologia* 24: 380. 1972. TYPE: *Eupatorium iresinoides* H.B.K.

Perennial *herbs* or *subshrubs*, erect to decumbent, laxly branching. *Leaves* opposite; blades ovate, the base rounded to truncate, abruptly and narrowly decurrent into the petiole wing, the margins bluntly serrate to subentire, the apex short-acuminate; petioles distinct, short, winged to near the base. *Inflorescence* with laxly cymose and widely divergent branches. *Heads* discoid with 5–6 florets; involucre bracts 15 in 5 ranks, subimbricate, in 3 progressively longer series, widely spreading at maturity; receptacle glabrous, flat to slightly convex; corolla with a short distinct tube, the limb narrowly campanulate, the lobes slightly longer than wide, often with glands on outer surface, the margin often with a few short hairs, the corolla cells elongate with sinuous walls; anthers with lower part of filament short, the anther collar nearly as long as lower filament, the cells of the collar mostly subquadrate with only slight ornate thickening on the walls, the anther appendage slightly longer than wide; style base enlarged and densely short-hirsute, the style appendage linear and densely covered with elongate

papillae. *Achenes* prismatic with 5 ribs bearing numerous short bristles; carpodium contorted and tapering with a sigmoid vascular trace, the smaller subquadrate thick-walled cells below, the upper cells more elongate; pappus with 30–40 slender scabrellous bristles in one series, persistent, the apical cells pointed. *Pollen* with short spines.

Condylidium contains two closely related species with one widely distributed in Central America, the West Indies and South America.

Literature:

King, R. M. & H. Robinson. 1972. Studies in the Eupatorieae (Asteraceae). CII. A new genus, *Condylidium*. *Phytologia* 24: 380–381.

1. ***Condylidium iresinoides*** (H.B.K.) R. M. King & H. Robinson, *Phytologia* 24: 381. 1972.—FIG. 19.

Eupatorium iresinoides H.B.K., *Nov. Gen. Sp. Pl.* 4: 83. ed. fol. 1818. TYPE: Colombia, near Ibagué, *Humboldt & Bonpland* (P, not seen, US, microfiche).

E. glumaceum DC., *Prodr.* 5: 181. 1836. TYPE: Cuba, Havana, *Ossa* (G-DC, not seen, US, microfiche).

F. wagneri Hieron., *Bot. Jahrb. Syst.* 40: 375. 1908. TYPE: Venezuela, without locality, *Wagner 178* (B, destroyed, US, photo).

E. macrum Standley & Steyerl., *Publ. Field. Mus. Nat. Hist., Bot. Ser.* 23: 184. 1944. TYPE: Guatemala, Chiquimula, near Jocotán *Steyermark 31534* (P).

Erect sparingly branched perennial *herbs* or *subshrubs* to 2 m tall; stems mostly yellowish, terete, scarcely striate, hirtellous. *Leaves* opposite; blades ovate to ovate-lanceolate, to 11 cm long and 5 cm wide, the base rounded to cuneate, rather abruptly decurrent at petiole, the margins subentire to serrate-dentate, the apex somewhat narrowly acuminate, the upper surface sparsely puberulous, the lower surface densely puberulous to tomentellous, with glandular punctations, the veins prominently trinervate from near base; petioles to 2.5 cm long, becoming narrowly winged distally. *Inflorescence* a lax panicle with laxly cymose branches, the branching divaricate, often appearing regularly dichotomous, the branches densely hirtellous; heads in small clusters of 3–6 with ultimate branches of inflorescence to 3 mm long. *Heads* 4–5 mm high with 5–6 florets; involucre bracts 15, subimbricate, in 5 ranks and 3 series, 0.5–3.5 mm long, suborbicular to narrowly lanceolate, 2–4 costate, mostly glabrous with slightly puberulous tips, the margins scarious, the acute tips often with minute apicules; corolla white, 2.5–3.5 mm long, the tube distinct, 1.0–1.5 mm long; the limb narrowly campanulate, the lobes about as long as wide, with glands and usually a few short submarginal hairs on outer surface. *Achenes* 1.5–2.0 mm long with sparse short scattered bristles; carpodium very prominent on one side; pappus of ca. 30 bristles, mostly 2.5–3.5 mm long. *Pollen* 18–20 μ in diameter.

Condylidium iresinoides is widely distributed, occurring from Guatemala to Venezuela and southward along the Andes to Bolivia with records from the Lesser Antilles and Cuba. The species can usually be distinguished by the rather regularly dichotomous appearance of the branches of the inflorescence. The five-ranked involucre bracts are particularly evident in older, spreading involucre.

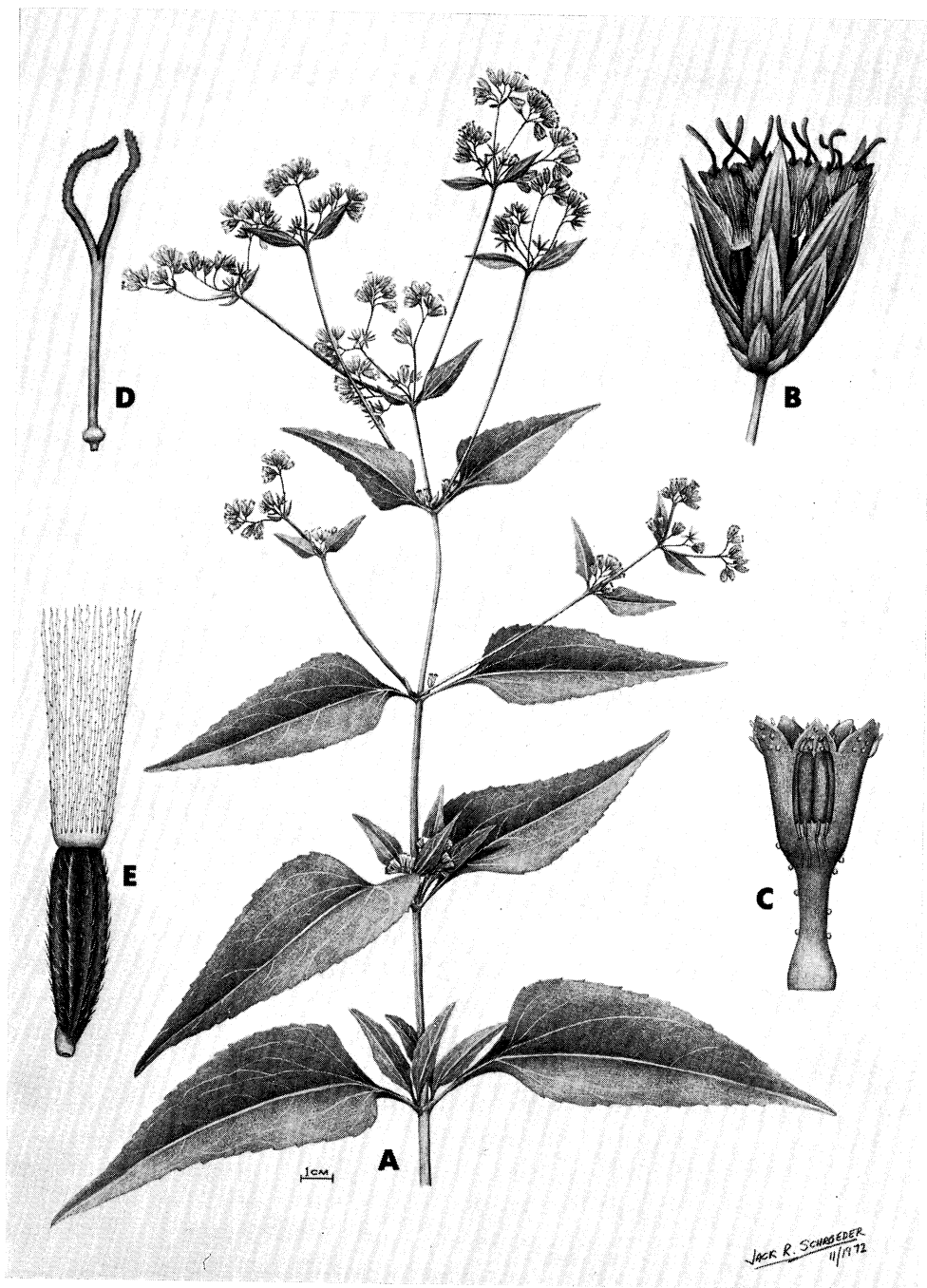


FIGURE 19. *Condylidium iresinoides* (H.B.K.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 7\frac{1}{2}$).—C. Corolla ($\times 22$).—D. Style ($\times 17$).—E. Achene ($\times 22$).

CANAL ZONE: Near the sea beneath Thatcher Bridge, *D'Arcy & D'Arcy 6084* (MO). Near beach at Fort Kobbe, *Duke 4224* (MO, US). COCLÉ: Vic. of El Valle, 600–1000 m, *Allen 1167* (F, MO, US). Hills S of El Valle de Antón, 600–800 m, *Allen 2862* (MO, US). 3 mi NE of Antón, *Croat 9628* (MO). El Valle, *Ebinger 1102* (MO, US). 8 mi SE of Antón, *King 5270* (US). W slopes of El Valle, *King 5322* (US). Llano Bonito, N of Las Margaritas, 400–500 m, *Seibert 518* (MO, US). DARIÉN: Río Cucunati at Puente Quemado, *Duke 8814* (OS). PANAMÁ: Taboga Island, 300 m, *Allen 116* (MO). Hills above Campana, 600–800 m, *Allen 1305* (F, MO). Cerro Campana, *Croat 12025* (MO). Morro Island, *D'Arcy & D'Arcy 6783* (MO). Interam. Hwy. 4 mi NW of Bejuco, *Duke 4564* (MO, US). Cerro Campana, *Duke 5969* (MO), 8673 (MO, OS, US). Road from Pan-Am. Hwy. to Coronado Hwy., *Duke 11795* (MO, US). Taboga Island, *Dwyer 2810* (MO, US). La Campana, Cerro Campana, *Ebinger 926* (MO). Taboga Island, near sea level, *Gentry 5729* (MO). E of Chica, *King 5263* (US). Taboga Island, *Standley 27016*, 27850 (both US). W slope of Cerro Campana, 2500 ft, *Tyson et al. 2394* (MO, US). Isla Taboga, ca. 0–186 m, *Woodson et al. 1479* (MO, US). SAN BLAS: Hills SE of Puerto Obaldia, *Croat 16740* (MO).

19. CRITONIA

Critonia P. Browne, Civ. Nat. Hist. Jam. 490. 1756. TYPE: *Eupatorium dalea* L. *Wikstroemia* Spreng., Kongl. Vetensk. Acad. Handl. 1821: 167. 1821; not *Wikstroemia* Schrad. (Theaceae), nom. rej.; nor *Wikstroemia* Endlich. (Thymelaeaceae), nom. cons. TYPE: *W. glandulosa* Spreng. = *Critonia dalea* (L.) DC.

Very coarse perennial *herbs* to small *trees* or woody *vines*, sparingly branched; stems often fistulose. *Leaves* opposite, distinctly petiolate; blades elliptical to broadly ovate, the base cuneate to subtruncate or hastate, without glandular punctations, internally with distinct laticifers beside the veins or in centers of areoles; petioles sometimes winged. *Inflorescence* paniculate, the branches opposite and usually spreading at 90° angles. *Heads* discoid with 4–12 florets, usually sessile or short stalked in clusters of 2–12; involucre bracts ca. 20–25, imbricate to subimbricate, in 4–6 series, stramineous, usually glabrous and striate, the outer series short-ovate to orbicular, persistent, the inner series elliptical to narrowly oblong, easily deciduous; receptacle flat to slightly convex, glabrous; corolla narrowly funnelform, glabrous, rarely a few glands on the lobes, the lobes 5, narrowly oblong to long-triangular, smooth, the corolla cells elongate with slightly sinuous walls; anther filament short, inserted above lower third of corolla, the anther collars slender, usually with distinct quadrate cells with cell walls inornate or with slight annular thickenings, the exothecial cells mostly subquadrate, the anther appendages large, usually longer than wide; style base without enlargement, glabrous, the style appendages filiform to narrowly spatulate, smooth to slightly mamillate. *Achenes* prismatic with 5 often prominent ribs, with or without bristles; carpodium a narrow rim or short cylinder, the cells small, quadrate to rounded, the cell walls with confluent thickenings; pappus of 25–35 scabrous coarse persistent bristles with crowded bases, the tips slightly enlarged and more closely scabrous, the apical cells usually acute.

Critonia contains about 33 species ranging from Mexico to Central America, the West Indies, and South America. Most of the species are found in Central America and the West Indies. Three species are known from Panama. The laticifers of the leaves, although completely included in the leaf tissue, are sometimes very prominent and easily seen in living material.

Literature:

King, R. M. & H. Robinson. 1971. Studies in the Eupatorieae (Asteraceae). XLVIII. The genus *Critonia*. *Phytologia* 22: 46-51.

- a. Heads with 5 florets; leaf blades narrowly elliptical with prominent laticifers in areoles; lower secondary veins short, not parallel to the leaf margin; achenes with very small carpopodium; pappus bristles 25-30 2. *C. daleoides*
- aa. Heads with 8-12 florets; leaf blades usually ovate with laticifers not prominent in areoles; lower secondary veins long, parallel to the leaf margin; achenes with broad carpopodium; pappus bristles 35-40.
- b. Vines; mature heads mostly 1.0-1.2 cm high; pappus bristles in 1-2 series with sharply angled bases, the tips distinctly broadened 1. *C. billbergiana*
- bb. Usually shrubs or small trees; heads mostly 0.8-1.0 cm high; pappus bristles in 1 series with terete bases, the tips not or only slightly broadened 3. *C. morifolia*

1. ***Critonia billbergiana*** (Beurl.) R. M. King & H. Robinson, *Phytologia* 22: 48. 1971.—FIG. 20.

Eupatorium billbergianum Beurl., Kongl. Svenska Vetenskapsakad. Handl. 1854: 134. 1856.
TYPE: Panama, near Porto Bello, *Billberg 300* (S).

Sparsely branching woody *vines*; stems greenish to pale brownish, terete, scarcely striate, glabrous. *Leaves* opposite; blades ovate, to 11 cm long and 5 cm wide, the base cuneate to somewhat rounded, parallel to the long basal secondary veins, the margins remotely serrulate to subentire, the apex slightly short-acuminate, the surface usually glabrous, sometimes sparsely pilose below on veins, the venation subpinnate to trinervate, the second pair of secondary veins most prominent; petioles to 2 cm long. *Inflorescence* pyramidally paniculate with the lowest branches in the axils of normal leaves, the branches densely corymbose with branchlets bearing few heads, glabrous to puberulous, the ultimate branches 0-4 mm long. *Heads* 9-12 mm high with 8-9 florets; involucre bracts 20-25, imbricate to subimbricate, in 4-5 series, 1-6 mm long and 1.5 mm wide, ovate to oblong-lanceolate with narrowly rounded apex, the innermost bracts acute, coriaceous, the outer surface glabrous; corolla whitish, 5-7 mm long, tubular or with a narrowly funnelform limb, glabrous, the lobes ca. 0.5 mm long, narrowly triangular; style branches slightly broadened distally. *Achenes* 3-4 mm long with 5-6 narrow ribs, numerous hairs on upper part, glabrous below, the achene base scarcely narrowed with broad carpopodium; pappus of ca. 40 crowded bristles partially in second series, 5-7 mm long, the bases of the bristles with distinct margins and flattened outer surfaces, the tips slightly but distinctly enlarged.

Critonia billbergiana is known from British Honduras, Guatemala, Honduras, Costa Rica, and Panama. The plants seem to be strictly vines and have less branched inflorescences and distinctly larger heads than either of the other Panamanian species.

BOCAS DEL TORO: Water Valley, vic. of Chiriquí Lagoon, *von Wedel 1817* (MO). CANAL ZONE: Chagres, *Fendler 154* (MO). Cerro Galera, 350-400 m, *Gentry 6622* (MO). Pipeline road 5-6 mi N of Gamboa, *Gentry 6672* (MO). COLÓN: Portobelo, *Billberg 300* (S). PANAMÁ: Cerro Azul, *Dwyer 3071* (MO). Cerro Campana, *Dwyer et al. 4714* (MO). Madden Lake, *Gentry & Tyson 5033* (MO). 2-3 mi S of Goofy Lake, 2000-2200 ft, *Lewis et al. 265, 285* (both MO). SAN BLAS: Isla Soskatupa, *Duke 8944* (MO, REED).

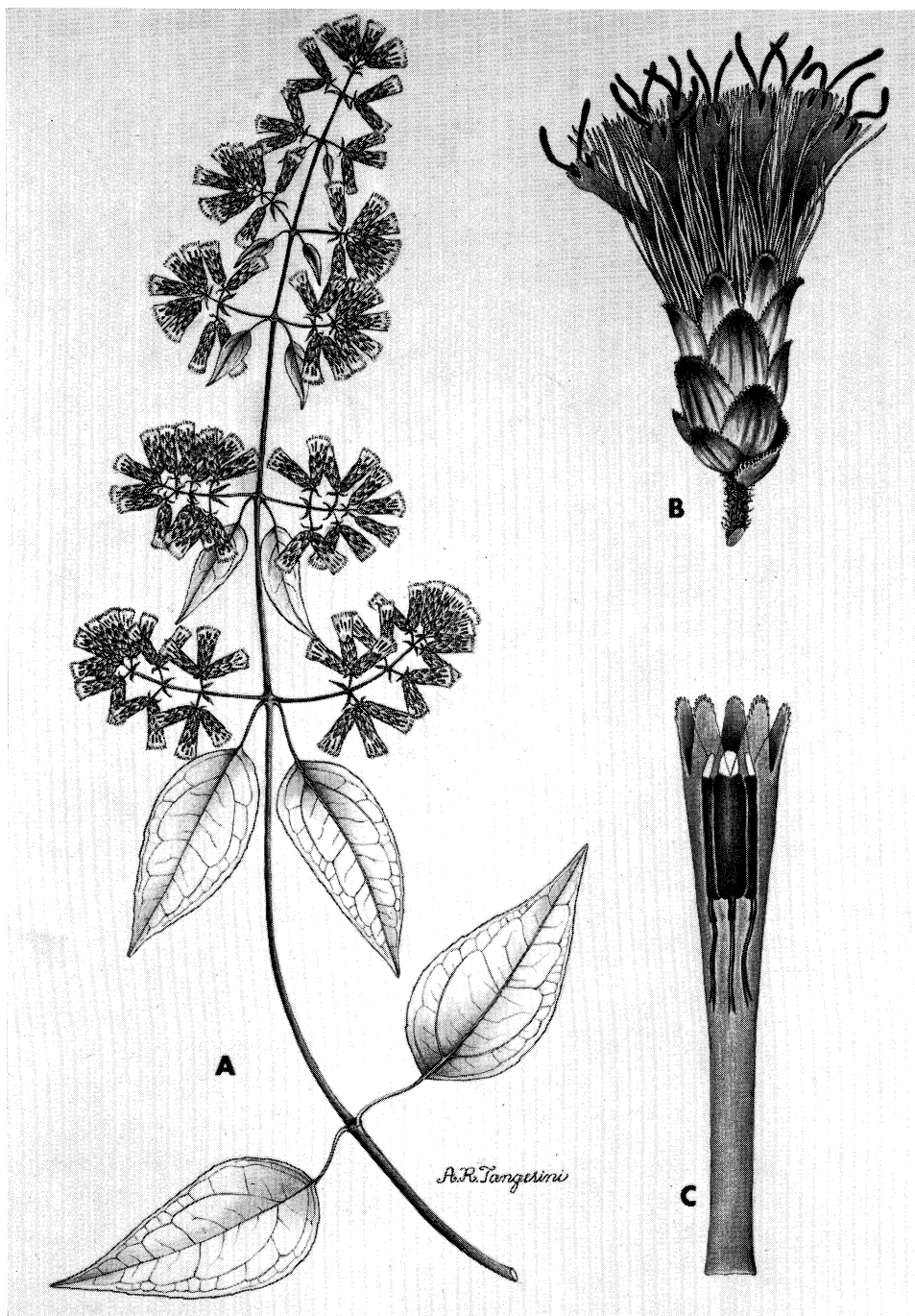


FIGURE 20. *Critonia billbergiana* (Beurl.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5$).—C. Corolla ($\times 12\frac{1}{2}$).

2. ***Critonia daleoides*** DC., Prodr. 5: 141. 1836. TYPE: Mexico, Tampico, Tamaulipas, *Berlandier* 1827 (G-DC, not seen, US, microfiche).

Eupatorium daleoides (DC.) Hemsl., Biol. Cent. Amer., Bot. 2: 94. 1881.

Shrubs to 8 m tall, with few to many branches; stems dark near tips, becoming pale in older parts, terete to slightly hexagonal, slightly striate, glabrous to very sparsely pilose. *Leaves* opposite; blades narrowly elliptical, to 23 cm long and 5 cm wide, the base narrowly cuneate with short spreading secondary veins, the margins closely serrate, the apex narrowly acute to slightly acuminate, the surfaces glabrous, a few hairs on the veins below, the veins pinnate, the laticifers in the areoles prominent; petioles short, 0.5–1.5 cm long. *Inflorescence* pyramidally paniculate with densely corymbose branches, the branches puberulous or short-pilose, the ultimate branches 0.1 mm long. *Heads* 6–7 mm high with 5 florets; involucre bracts ca. 20, imbricate to subimbricate, in 4–5 series, 1–5 mm long, to 1.5 mm wide, ovate to oblong-elliptical with rounded apex, papery with usually 4 slender costae, glabrous on outer surface; corolla white, 4.0–4.5 mm long, broadly tubular with narrowly funnelform limb, glabrous, the lobes 0.5–0.7 mm long, twice as long as wide; style branches slightly broadened distally. *Achenes* ca. 2.5 mm long, with broad pale ribs, densely setiferous, the achene base very narrow with minute carpodium; pappus of ca. 25–30 slender bristles, 3–4 mm long, the tips slightly but distinctly broadened.

Critonia daleoides is distributed throughout Central America and extends north into central Mexico. The species is a member of the typical element of the genus which is otherwise restricted to the West Indies. The characters in common with the West Indian relatives are the more prominent laticifers in the leaves, the smaller number of florets per head, and the broader ribs and smaller carpodium of the achene.

CHIRIQUÍ: Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m, *Allen* 1489 (F, MO). 5.5 mi S of Cerro Punta, 1700 m, *Graham* 272 (MICH). Vic. of El Boquete, 990 m, *Maurice* 753 (US). Vic. of El Boquete, 1000–1300 m, *Maxon* 5150 (US). 0.5 mi N of El Hato del Volcán, 1350 m, *McDaniel* 10069 (FSU). Cerro Vaca, 900–1136 m, *Pittier* 5296 (US). Vic. of Boquete, 3500 ft, *Stern et al.* 1941 (MICH, MO). COCLÉ: Vic. of El Valle, 800–1000 m, *Allen* 75 (MO, US). Vic. of El Valle, 600–1000 m, *Allen* 1173 (F, MO). Hill S of El Valle de Antón, 600–800 m, *Allen* 2851 (MO, US). El Valle, *Harvey* 5167 (F). 2 mi S of El Valle, 600 m, *McDaniel* 8247 (FSU, US).

3. ***Critonia morifolia*** (Miller) R. M. King & H. Robinson, *Phytologia* 22: 49. 1971.

Eupatorium morifolium Miller, Gard. Dict., ed. 8. 1768. (*Eupatorium* no. 10). TYPE: America, *Houston* (BM?, not seen).

E. populifolium H.B.K., Nov. Gen. Sp. Pl. 4: 87. ed. fol. 1818. TYPE: Mexico, near Mazatlan, *Humboldt & Bonpland* (P, not seen, US, microfiche).

E. critonioides Steetz in Seem., Bot. Voy. Herald 145. 1853. SYNTYPES: Panama, Volcán Chiriquí, *Seemann*. Panama, Veraguas, *Seemann* (both BM, not seen).

E. megaphyllum Baker in Mart., Fl. Bras. 6(2): 322. 1876. TYPE: Brazil, Caldas, Minas Geraes, *Regnell* 692 (S, lectotype, not seen; B, islectotype, destroyed, US, photo).

E. sartorii Schultz-Bip. ex Klatt, *Leopoldina* 20: 91. 1884, nom. nud. pro syn.

Erect to subscandent *shrubs* or small *trees* to 6 m high, with few to many branches; stems pale-brownish, often paler in older parts, terete to slightly

hexagonal, distinctly striate, pubescence flocculose, becoming glabrous. *Leaves* opposite; blades ovate to broadly ovate, to 25 cm long and 15 cm wide, the base cuneate to truncate, parallel to the long basal secondary veins, the margins usually closely serrate to crenulate, the apex slightly to sharply short-acuminate, the surfaces with sparse weak puberulence, becoming glabrous, flocculose below on veins, the venation subpinnate with 2 pairs of secondary veins in the basal $\frac{1}{4}$, the second pair usually more ascending; petioles to 8 cm long. *Inflorescence* pyramidally paniculate with densely corymbose branches and branchlets, the branches puberulous to flocculose, the ultimate branches 0–2 mm long. *Heads* 8–10 mm high with 8–12 florets; involucre bracts ca. 25–30, imbricate to subimbricate, in 5–6 series, 1–6 mm long and 1.0–1.5 mm wide, ovate to narrowly oblong, the apex rounded, the surface papyraceous to coriaceous with ca. 4 usually broad or indistinct costae, glabrous to finely puberulous; corolla whitish, 4–5 mm long, tubular, glabrous, the lobes ca. 0.5 mm long, narrowly oblong; style branches filiform, not broadened distally. *Achenes* 2.0–3.0 mm long, with narrow ribs, nearly glabrous to sparsely puberulous, the achene base slightly to greatly narrowed with a distinct broad carpodium; pappus of 35–40 slender bristles, mostly 4.5–5.5 mm long, the bases not or scarcely angled, mostly terete, the tips not or scarcely broadened.

The species is widely distributed from Mexico through Central America and south to Argentina. A similar species, *Critonia sexangularis* (Klatt) R. M. King & H. Robinson, is reported from Guatemala south to Costa Rica but is not known from Panama. This latter species can be distinguished by its much more sharply angled stems.

BOCAS DEL TORO: Quebrada Huron, 300–400 ft, *Kirkbride & Duke 453A* (MO, REED). CANAL ZONE: 6 mi N of Gamboa, *Tyson 3488* (FSU). CHIRIQUÍ: Distrito Baru along ridge above Brazo Seco near Costa Rican Border, 100–200 m, *Croat 22555* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 462* (MO). Between Concepción and El Volcán, *White 313* (MO). COCLÉ: Road to La Mesa above El Valle, *Croat 14410* (MO). El Valle to La Mesa, 2000 ft, *Tyson et al. 3974* (MO). DARIÉN: Río Sambú between Sambú and Río Venado, *Duke 931A* (US). Manené, *Kirkbride & Bristan 1568* (MO).

20. DECACHAETA

Decachaeta DC., Prodr. 5: 133. 1836. TYPE: *D. haenkeana* DC.

Glandular pubescent to glabrous *shrubs* or *subshrubs*, sparingly branched. *Leaves* alternate (opposite in one species); blades elliptical to ovate or suborbicular, sometimes slightly lobed; petioles short to long. *Inflorescence* a many-headed thyrsoid panicle. *Heads* discoid with 4–30 florets; involucre bracts 10–15, in 3–4 series, imbricate, unequal, oblong or oblong-lanceolate to suborbicular, the apex rounded or obtuse to acutely pointed, the outer surface green to light yellow or brown, with 0–5 costae, pubescent, with either glabrous or ciliate margins; receptacle highly convex, with a dense tuft of hair; corolla narrowly tubular to narrowly funnelform, white, 5-lobed, glabrous or with glandular punctations, the lobes about as long as wide, composed of large thin-walled cells, smooth except at extreme tips on outer surface; anther collars long and narrow with mostly

subquadrate cells below, the cell walls thin, not ornamented, the exothecial cells quadrate, the anther appendage extremely short and broad with a reflexed margin; style base not enlarged, glabrous, the style branches only slightly broadened distally, mamilllose. *Achenes* prismatic, 5-ribbed with bristles mostly on the ribs; carpopodium slightly to well developed, composed of 5-6 tiers of rather thick-walled cells; pappus of 10-30 slender deciduous bristles, somewhat to distinctly enlarged apically, scabrous or partly barbellate, the apical cells acute. *Pollen* minutely papillose.

Decachaeta contains seven species which are mostly found in Mexico and Guatemala. One species is found farther south in Costa Rica and Panama. The name of the genus is in reference to the reduced number of pappus bristles in the type species. Actually, all members of the genus have a somewhat reduced number of bristles for the tribe, averaging between 20 and 25. The type species tends to have the fewest bristles, usually 15-18, but there seems to be no justification for the generic name or the separate status long enjoyed on this basis. The lower counts are probably usually the result of loss of some of the fragile pappus bristles.

The form of the inflorescence, the reduced anther appendage, and the reduced spines on the pollen have led to the suggestion that species of *Decachaeta* and members of some related genera might be wind-pollinated (Grashoff & Beaman, 1970, see under *Koanophyllon*).

Literature:

King, R. M. & H. Robinson. 1969. Studies in the Eupatorieae (Compositae).

XVI. A monograph of the genus *Decachaeta* DC. Brittonia 21: 275-284.

——— & ———. 1971. Studies in the Eupatorieae (Asteraceae). XXXVII.

The genus *Hebeclinium*. Phytologia 21: 298-301.

1. *Decachaeta thieleana* (Klatt) R. M. King & H. Robinson, Brittonia 21: 281. 1969.—FIG. 21.

Eupatorium myriocephalum Klatt, Leopoldina 25: 104. 1889, not *Eupatorium myriocephalum* Gardn., 1847. TYPE: Costa Rica, Ojo de Agua, Hoffmann 389 (GH, isotype).

E. thieleanum Klatt, Bull. Soc. Roy. Bot. Belgique 31: 191. 1892 (1893). TYPE: Costa Rica, Taillis du Rodeo de Pacaca, 900 m, Pittier 1603 (GH, lectotype).

E. myrianthum Klatt, Leopoldina, Bot. Beibl. 3: 1895. TYPE: Costa Rica, Pittier 1603 (GH, lectotype).

Erect *herb* or *shrub* to 4 m tall, sparingly branched; the leaves, involucre bracts, corolla, and styles bearing short-stalked capitate glands; stems terete, faintly striate, brown. *Leaves* alternate; blades broadly ovate with a large dentation on each side, to 17 cm long and 15 cm wide, the lower leaves as much as 25 cm long and 24 cm wide, the margins serrate, the apex short-acuminate, the second or third pair of the secondary veins usually prominent and strongly ascending from near the basal fourth of blade; petioles 3-7 cm long, not winged. *Inflorescence* a thyrsoid panicle, to 25 cm long and 10 cm wide. *Heads* numerous, 5-6 mm high with ca. 25 florets; involucre bracts ca. 15, oblong-lanceolate, with a few costae, the apex usually obtusely pointed, pubescent;



FIGURE 21. *Decachaeta thieleana* (Klatt) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5\frac{3}{10}$).—C. Corolla ($\times 13\frac{1}{2}$).

receptacle highly convex, with a dense tuft of hairs; corolla white, 3.5 mm long, narrowly funnelform, the lobes broadly triangular, ca. 0.4 mm long and wide. *Achenes* ca. 1.8 mm long with some short bristles on the upper part; pappus of 25–30 bristles, ca. 3 mm long, the tips not dilated.

Decachaeta thieleana is known only from Costa Rica and Panama. The somewhat aceriform leaves are a useful distinction.

CHIRIQUÍ: Paso Ancho to Monte Lirio, 1500–2000 m, *Allen* 1473 (F, MO, US). Lerida, 4400 ft, *Maurice* 871 (US). Vic. of Nueva Suisa, *Croat* 13506, 13788 (both MO). Bajo Chorro, 6000 ft, *Davidson* 425 (F, MO). Florida State University Tropical Biology Station, 2.5 mi S of Cerro Punta, 5500 ft, *Kazlovsky* K-3, (MO). Vic. of El Boquete 1000–1300 m, *Maxon* 4994 (US). Río Ladrillo and vic., 1200–1300 m, *Pittier* 3057 (US). Chiriquí Viejo Valley, *White* 97 (MO).

21. FLEISCHMANNIA

Fleischmannia Schultz-Bip., *Flora* 33: 417. 1850. TYPE: *F. rhodostyla* Schultz-Bip. = *F. arguta* (H.B.K.) B. L. Robinson.

Sparingly branched *herbs* or *subshrubs*. *Leaves* opposite, rarely subopposite or alternate; blades elliptical to rhomboidal or broadly cordate-ovate, the margins usually serrate or crenate, rarely serrulate (leaves dissected into long narrow segments in one species); petioles slender. *Inflorescence* laxly branching with laxly cymose to densely corymbose branches. *Heads* discoid with 10–50 florets; involucre of 20–30 narrow obtuse to acuminate subimbricate usually unequal bracts, in 2–4 series, spreading at maturity; receptacle usually glabrous, sometimes with minute scattered hairs, usually flat; corolla with a short basal tube, the limb narrowly funnellform, the outer surface above or on the lobes often with short hairs or glands, the lobes short, broadly triangular, with projecting cells on outer surface and along margins, the cells of much of the inner surface of lobes and limb with upper ends projecting as papillae, the cells of the limb mostly narrow with sinuous walls; anther collar usually slender, with elongate cells showing distinct transverse thickenings throughout, without distinct short cells below, the exothecial cells mostly quadrate or wider than long, the anther appendage broadly ovate or oblong; style without basal enlargement, glabrous, the cells of style appendage linear, densely long-projecting. *Achenes* prismatic, usually with bristles or scabrae on the ribs or upper surfaces, usually without glands; carpodium distinct with prominent upper rim, rounded with thick-walled usually quadrate cells; pappus of 5–40 slender sometimes slightly fragile bristles, the apical cells pointed.

Fleischmannia contains about 70 known species ranging from the southeastern United States and Mexico through Central America and the West Indies to Argentina in South America. In South America the genus is concentrated in the Andes. One species, *F. microstemon*, has become adventive in West Africa. Eleven species are found in Panama.

The genus shows a superficial resemblance to some members of the genus *Ageratina* but the two are not closely related. Basic differences occur in many details of the corollas, the anther collars, the achenes, and the pappus. *Fleischmannia* is also cytologically distinct with base numbers of $x = 4$ and $x = 10$ (Baker, 1967).

Literature:

Baker, H. G. 1967. The evolution of weedy taxa in the *Eupatorium microstemon* species aggregate. *Taxon* 16: 293–300.

King, R. M. & H. Robinson. 1970. Studies in the Eupatorieae (Compositae).
XVIII. New combinations in *Fleischmannia*. Phytologia 19: 201–207.

- a. Leaves with primarily pinnate venation, the margin distinctly doubly crenate 1. *F. allenii*
- aa. Leaves prominently trinervate from the base, the margin simply crenate or serrate.
 - b. Heads about 3 mm high; corollas about 2 mm long.
 - c. Perennial; leaf tips acuminate; branches of inflorescence with heads in small corymbose clusters; involucre bracts rounded to short-acute 4. *F. hymenophylla*
 - cc. Annual; leaf tips acute; branches of inflorescence with heads in lax cymes; involucre bracts acute to narrowly long-acuminate.
 - d. Leaves narrowly elliptic with narrowly cuneate bases 6. *F. misera*
 - dd. Leaves rhomboid-ovate 10. *F. sinclairii*
 - bb. Heads about 4–6 mm high; corollas usually 2.5–3.5 mm long.
 - e. Leaves narrowly elliptic to linear-lanceolate with narrowly cuneate bases; receptacle slightly convex or conical 9. *F. sideritidis*
 - ee. Leaves ovate to rhombic with short-cuneate to rounded or cordate bases; receptacle usually flat.
 - f. Annual; achenes with ribs usually yellow to maturity; inflorescence often lax 5. *F. microstemon*
 - ff. Perennial; achenes evenly darkening without persistently yellow ribs; inflorescence with compact corymbose branches.
 - g. Leaves with broadly rounded or cordate bases, without glandular punctations.
 - h. Erect shrubby herbs with densely pubescent leaves; stem leaves acute to scarcely acuminate; ribs of achenes bearing many short bristles 11. *F. tysonii*
 - hh. Subscandent herbs with very sparsely pubescent leaves; stem leaves rather abruptly short-acuminate; ribs of achenes sparsely scabrous to glabrous 2. *F. chiriquensis*
 - gg. Leaves with broadly cuneate to truncate bases, with glandular punctations.
 - i. Inflorescence a broad flat-topped corymbose panicle; base of involucre abrupt with compact lower bracts 3. *F. croatii*
 - ii. Inflorescence a series of rather compact glomerulate corymbose branches; base of involucre with loose lower bracts.
 - j. Involucre bracts glabrous or with sparse appressed puberulence, lateral margins narrowly scarious; leaves glabrous below except on larger veins; heads with 20–25 florets; style branches thickened 7. *F. panamensis*
 - jj. Involucre bracts prominently puberulent to pilose, lateral margins broadly scarious; leaves puberulous below; heads with 15–20 florets; style branches usually slender 8. *F. pratensis*

1. ***Fleischmannia allenii*** R. M. King & H. Robinson, Phytologia 28: 73. 1974.
TYPE: Panama, vic. of "New Switzerland," Chiriquí, *Allen 1347* (MO, holotype; US, isotype).

Erect perennial coarse *herbs* or *subshrubs* to 1.5 m tall, rarely branching; stems greenish to brown with dense reddish puberulence, slightly ribbed. *Leaves* opposite; blades papyraceous, broadly elliptical, to 15 cm long and 9 cm wide, the base cuneate to narrowly acuminate, the margins distinctly bi- to tri-crenate, the apex acute to scarcely acuminate, the upper surface sparsely puberulous, the lower surface with glandular punctations, puberulous on veins, the venation mostly pinnate; petioles slender, to 5 cm long. *Inflorescence* a broad corymbose panicle with densely corymbose branches, the ultimate branches 2–4 mm long, densely puberulous. *Heads* ca. 5 mm high with 20–25 florets; involucre bracts ca. 28–30, subimbricate to imbricate, unequal, in 3–4 series, mostly 4-seriate,

short-acute with scarious margins, the outer surface puberulous, the inner bracts with more scarious tips; corolla lavender, ca. 3 mm long, with many sharp-pointed hairs above and on lobes; style branches slightly thickened. *Achenes* scarcely constricted above, black when mature with black ribs, glabrate to sparsely bristly above and on the ribs; pappus of ca. 30 scabrous contiguous bristles.

The species is apparently endemic to the Chiriquí region. *Fleischmannia allenii* has distinctive leaf venation and margins. The species may be closely related to *F. plectranthifolia* (Benth.) R. M. King & H. Robinson of Costa Rica but the latter has more rounded leaf bases and lacks glandular punctations. The corollas of *F. allenii* have hairs that are sharper and that cover more of the outer surface than in other related species.

CHIRIQUÍ: Vic. of 'New Switzerland,' central valley of Río Chiriquí Viejo, *Allen 1347* (MO). Vic. of Methodist Camp near Nueva Suissa, *Croat 13516* (MO). Hill N of Audobon Cabin, *Croat 13652* (MO). Ca. 2 mi W of Cerro Punta, 1630 m, (FSU). Bajo Mona, mouth of Quebrada Chiquero, along Río Caldera, 1500–2000 m, *Woodson et al. 1013* (MO).

2. ***Fleischmannia chiriquensis*** R. M. King & H. Robinson, *Phytologia* 28: 74. 1974. TYPE: Panama, Cerro Respinga, Chiriquí, *Gentry 5928* (MO).

Flexuous perennial *herbs* or *vines* to 3 m tall; stems greenish to slightly reddish, terete, finely striate, weakly pilose to glabrescent. *Leaves* opposite; blades papyraceous, broadly ovate, to 6 cm long and 5 cm wide, the base broadly cordate, the margins closely and bluntly serrate-crenate, the apex abruptly short-acuminate, the surfaces sparsely pilose, puberulous on veins, without glandular punctations, the veins prominently trinervate from the base; petioles slender, to 2.5 cm long. *Inflorescence* a broad corymbose panicle with compact corymbose branches, the ultimate branches 2–4 mm long, densely puberulous. *Heads* ca. 5 mm high with 20–25 florets; involucre bracts ca. 20, subimbricate, unequal, in ca. 3 series, mostly bicostate, mostly short-acute with rather broad scarious margins, the outer surface pilose to sparsely puberulous, the inner bracts with more rounded more scarious usually minutely apiculate tips; corolla lavender, 3.0–3.5 mm long, with many short hairs on outer surface of lobes; style branches slightly thickened distally. *Achenes* slightly constricted above, black when mature with black ribs, sparsely scabrid or with short bristles on the ribs; pappus of 27–30 scabrous contiguous bristles.

Fleischmannia chiriquensis is known only from the Cerro Punta area of Chiriquí Province. The species is most closely related to *F. tysonii* of Volcán Chiriquí but it also superficially resembles *F. plectranthifolia* (Benth.) R. M. King & H. Robinson of Costa Rica. The latter species is distinguished by the more elongate, usually noncordate leaves having 5–7 veins prominently concentrated at the base. The inner involucre bracts of the latter species are also much more pointed and the achene ribs are sometimes yellow.

CHIRIQUÍ: Above Cerro Punta, 6300 ft, *D'Arcy 5372* (MO). Slope of Respinga above town of Cerro Punta, 8400 ft, *D'Arcy* & *D'Arcy 6545* (MO). Along Boquete trail, Cerro Respinga, E of town of Cerro Punta, ca. 2000–2500 m, *Gentry 5928* (MO).

3. **Fleischmannia croatii** R. M. King & H. Robinson, *Phytologia* 28: 76. 1974.
TYPE: Panama, vic. of Las Nubes, Chiriquí, *Croat* 22400 (MO).

Erect perennial coarse *herbs* or *subshrubs* to 1.5 m tall; stems brownish-green, terete, finely striate, weakly but densely hirsute. *Leaves* opposite; blades papyraceous, ovate, to 7 cm long and 4.5 cm wide, the base subtruncate, the margins crenate-serrate, the apex shortly but distinctly acuminate, the upper surface sparsely pilose, the lower surface with glandular punctations, sparsely long-pilose mostly on veins, the veins prominently trinervate from the base; petioles slender, to 5 cm long. *Inflorescence* a broad dense flat-topped corymbose panicle with long ascending lateral branches, the ultimate branches 1–4 mm long, hirtellous. *Heads* ca. 6 mm high with ca. 20 florets; the base of the involucre abrupt with compact lower bracts; involucral bracts 20–25, subimbricate, unequal, in ca. 3 series, bicostate, mostly short-acute, the scarious margins narrow, the outer surface prominently puberulous; corolla lavender, 3.5–4.0 mm long, the lobes with many sharp hairs and a few glands on outer surface; style branches not thickened. *Achenes* only slightly constricted above, black when mature with black ribs, sparsely scabrid on the ribs; pappus of 25–30 scabrous contiguous bristles.

The species is in the series including *F. pratensis*, *F. panamensis*, and *F. granatensis* but is easily distinguished by the massively broad corymbose inflorescence and by the abrupt base of the involucre with compact outer bracts.

CHIRIQUÍ: Vic. of Las Nubes, 2.7 mi. NW of Río Chiriquí Viejo, W of Cerro Punta, 2,200 m, *Croat* 22400 (MO).

4. **Fleischmannia hymenophylla** (Klatt) R. M. King & H. Robinson, *Phytologia* 19: 203. 1970.

Eupatorium hymenophyllum Klatt, Bull. Soc. Roy. Bot. Belgique 31: 190. 1892 (1893). TYPE: Costa Rica, bords du Río San Pedro entre Général et Buenos Aires, *Pittier* 3709 (BR, not seen).

E. valerianum Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1474. 1938. TYPE: Costa Rica, colinas de San Pedro de San Ramón, *Brenes* 20498 (F).

Fleischmannia valeriana (Standley) R. M. King & H. Robinson, *Phytologia* 19: 206. 1970.

Erect sparsely branching perennial *herbs* to 2 m tall; stems greenish to reddish, terete, finely striate, with dense reddish puberulence. *Leaves* opposite; blades papyraceous, ovate, to 9 cm long and 4 cm wide, the base rounded to short-cuneate, the margins closely and often sharply serrate, the apex usually narrowly acuminate, the upper surface sparsely puberulous, the lower surface with glandular punctations, puberulous on veins, the veins prominently trinervate from above the base; petioles slender, to 2.8 cm long. *Inflorescence* a lax corymbose panicle with branches bearing heads mostly in small clusters, the ultimate branches 1–6 mm long, densely puberulous. *Heads* ca. 3 mm high with 20–25 florets; involucral bracts 20–25, subimbricate, unequal, in ca. 3 series, bicostate, with narrow scarious margins, the outer surface finely puberulous, the outer bracts short-acute, the inner bracts with broader rounded or slightly mucronate, pale but firm tips; corolla lavender, ca. 2 mm long, with numerous short hairs on outer surface; style branches slender. *Achenes* broadest in upper fourth, distinctly constricted above,

black when mature with black ribs and with numerous bristles above; pappus of ca. 30 scabrous contiguous bristles.

Fleischmannia hymenophylla is known only from Costa Rica and Panama. The species has a distinctively lax corymbose inflorescence with small heads. *Eupatorium valerianum* of Costa Rica seems to be conspecific, having about 20 florets per head rather than about 10 as originally described.

CHIRIQUÍ: Valley of the upper Río Gariche, 1050–1100 m, *Seibert* 332 (MO). COCLÉ: Vic. of El Valle, 600–1000 m, *Allen* 1206 (F, MO, US). SW of Cerro Pilón, *Croat* 22917 (MO). La Mesa, above El Valle, 600–800 m, *Duke* 15163 (OS). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2547 (MO).

5. ***Fleischmannia microstemon*** (Cass.) R. M. King & H. Robinson, *Phytologia* 19: 204. 1970.—FIG. 22.

Eupatorium microstemon Cass., *Dict. Sci. Nat.* 25: 432. 1822. TYPE: Jardin du Roi, Paris, origin unknown, *Cassini* (P, not seen).

E. guadalupense Spreng., *Syst. Veg.* 3: 414. 1826. TYPE: Guadeloupe, *Bertero* (TO?, not seen; PP, not seen).

E. paniculatum Schrad., *Ind. Sem. Hort. Götting.* 2. 1832, ex *Linnaea* 8 litt.: 26. 1833, not *E. paniculatum* Miller, 1768.

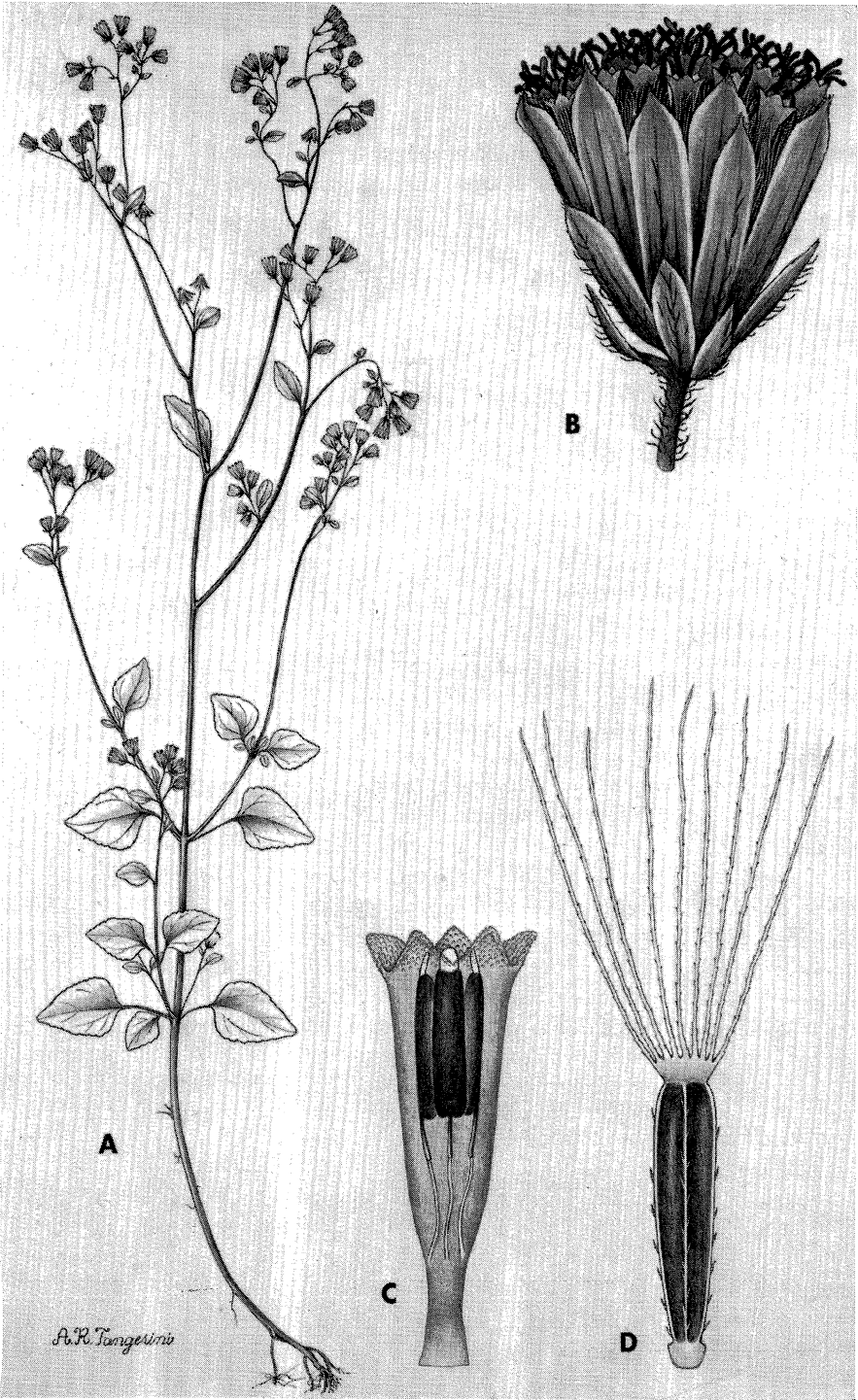
E. bimatum Standley & L. O. Williams, *Ceiba* 3: 64. 1952. TYPE: Honduras, El Zamorano, Morazán, *Standley* 13132 (F).

Ageratina bimatra (Standley & L. O. Williams) R. M. King & H. Robinson, *Phytologia* 19: 212. 1970.

Erect annual *herb* to 1 m tall, sparsely branched; stems yellowish-green to brown, terete, finely striate, glabrescent. *Leaves* mostly opposite, alternate above; blades membranaceous, broadly rhombic-ovate, to 3.7 cm long and 3.0 cm wide, the margins crenulate, the apex short-acute, the upper surface with sparse coarse hairs, the lower surface with glandular punctations, with puberulous veins, the veins prominently trinervate at the base; petioles slender, to 2.5 cm long. *Inflorescence* a lax panicle with loosely cymose branches, the ultimate branches 2–7 mm long, slender, puberulous. *Heads* ca. 4 mm high with 20–35 florets; involucre bracts 15–22, subimbricate, unequal, in ca. 3 series, mostly bicostate, the outer 2 series usually narrowly acute, sparsely short-hirsute, the 2nd series with hairs only along the median line, the inner bracts broad and mostly scarious at the tip, often with a short mucro; corolla lavender or white, ca. 2 mm long, without hairs on lobes; style branches thick. *Achenes* scarcely constricted above, usually with yellow ribs and blackish sides, the ribs and upper lateral surfaces usually scabrid; pappus of 25–30 slender scarcely contiguous bristles. Chromosome number $n = 4$.

Fleischmannia microstemon is a weedy species at lower elevations ranging from Yucatán through Central America into northern South America and the West Indies. Baker (1967) has studied the reproductive biology of the species and suggested derivation from *F. sinclairii*. The differences in leaf texture, inflorescence, involucre bract shape, head size, and the shape and color of the achene all indicate that the two species are not so closely related and that none of the material with a chromosome number of $n = 4$ belongs to *F. sinclairii*.

The species is known by the common name “cucursapi” in Panama, *Duke* 14418 (FSU).



BOCAS DEL TORO: Bocas del Toro, *Carleton* 92, 70 (both US). Above RR stop at Milla, *Croat & Porter* 16293 (MO). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al.* 2003 (MO, REED, UC, US). Water Valley, *von Wedel* 723 (MO), 1440, 2742 (both MO, US). CANAL ZONE: Barro Colorado Island, *Standley* 31443 (US). DARIÉN: Vic. of Boca de Cupe, ca. 40 m, *Allen* 884 (MO, F). Las Delicias, *Carleton* 62 (US). Río Pirre, ca. 10 mi S of El Real, *Duke* 5446 (MO). Río Pirre near crossing of trail from El Real to Tucutí, *Duke* 5196 (MO). PANAMÁ: 7 mi N of Cerro Azul, 2600 ft, *Blum et al.* 1826 (FSU). 11 mi S of Goofy Lake, *Correa & Dressler* 263 (MO). 3 mi above Goofy Lake near Cerro Azul, *Croat* 11579 (MO). Cerro Azul, *Croat* 17333 (MO). Ca. 13 mi W of Chepo, *D'Arcy & D'Arcy* 6038 (MO). Cerro Azul, 2000 ft, *D'Arcy & D'Arcy* 6219B (MO). Pan-Am. Hwy., near Jenine, Río Cañita, *Duke* 3827 (MO). Pan-Am. Hwy. ca. $\frac{1}{2}$ way between El Llano and Río Mamoni, *Duke* 5592 (MO). Piria, ca. 150 m, *Duke* 14418 (FSU, MO). Cerro Azul, *Dwyer* 2650, 2850 (both MO). Cerro Jefe, ca. 1000 m, *Gentry* 6752 (MO). S slopes of Cerro Azul, *King* 5244 (UC, US). Cerro Jefe, *Kirkbride & Crebbs* 7 (MO). 5 mi SW of Cerro Brewster, *Lewis et al.* 3511 (MO). Cerro Azul, 2000 ft, *Tyson* 2054 (MO); ca. 2100 ft, 6325 (FSU, MO). SAN BLAS: Opposite Achituppu, *Lewis et al.* 136 (MO). Around Obaldía, 0–50 m, *Pittier* 4369 (US).

6. *Fleischmannia misera* (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 204. 1970.

Eupatorium miserum B. L. Robinson, *Proc. Amer. Acad. Arts* 54: 258. 1918. TYPE: Colombia, falls of the Truando, Chocó, *Schott* 2 (F, photo US).

Erect short-lived perennial *herb* to 4 dm tall, laxly and usually sparsely branched; stems yellowish-green to brown, terete, finely striate, densely minutely puberulent. *Leaves* and lower bracts of inflorescence opposite; blades papyraceous, narrowly elliptical, to 4.5 cm long and 1.0 cm wide, the base narrowly cuneate, the margins serrulate beyond widest part, the apex narrowly acute, the upper surface with sparse short coarse hairs, the lower surface sparsely puberulous and glandular punctate, the veins prominently trinervate from the base; petioles slender, to 1.5 cm long. *Inflorescence* a lax panicle with loosely cymose branches, the ultimate branches to 13 mm long, slender, minutely puberulous. *Heads* ca. 4 mm high with ca. 25 florets; involucre bracts ca. 25, subimbricate, unequal, in 2–3 series, mostly bicostate, narrowly acute with narrow scarious margins, the outer bracts with long-attenuate tips; corolla white to lavender, 1.5–2.0 mm long with short hairs on the lobes; style branches usually slender. *Achenes* narrowly oblong with nearly equal constrictions above and below, black when mature with black ribs, scabrid or with short bristles mostly on the ribs; pappus of ca. 25 slender scarcely contiguous to slightly noncontiguous bristles.

The species is known only from the limited area of southern Darién and along the immediately adjacent Pacific coast of Colombia. Relationship is close to *F. sinclairii* from which it differs primarily by the narrower leaves and by a supposedly perennial habit. The similar looking *F. haughtii* R. M. King and H. Robinson of adjacent Colombia differs by the nonglandular-punctate, more membranous leaves, the glabrous achenes, and the pappus only $\frac{1}{2}$ to $\frac{3}{4}$ as long as the corolla.

DARIÉN: Río Sambú, 0–5 mi above Río Venado, *Duke* 9263 (MO, OS). Manené to the mouth of the Río Cuasí, *Kirkbride & Bristan* 1463 (MO, REED).

←

FIGURE 22. *Fleischmannia microstemon* (Cass.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5\frac{1}{10}$).—C. Corolla ($\times 29$).—D. Achene ($\times 25$).

7. **Fleischmannia panamensis** R. M. King & H. Robinson, *Phytologia* 28: 80. 1974. TYPE: Panama, near La Mesa, Coclé, *Croat 13354* (MO).

Erect, branching, coarse perennial *herbs* or *subshrubs* to 2 m tall; stems mostly brownish, terete, finely striate, glabrescent, densely puberulous on the younger parts. *Leaves* opposite; blades papyraceous, broadly rhombic-ovate, to 8 cm long and 6.5 cm wide, the margins shallowly to deeply crenate, the apex broadly acute, rarely slightly acuminate, the upper surface with coarse hairs, the lower surface glandular punctate, the veins prominently trinervate from the base; petioles slender, to 3.5 cm long. *Inflorescence* a corymbose panicle with densely corymbose branches, the ultimate branches 1–4 mm long, puberulous. *Heads* ca. 5 mm high, with ca. 15–20 florets; involucre bracts ca. 18–20, subimbricate, unequal, in 2–3 series, bicostate, short-acute with very narrow scarious margins, glabrous to finely puberulous, the inner bracts with more scarious rounded to mucronate tips; corolla purple to lavender, ca. 3 mm long, without hairs on lobes; style branches rather thick. *Achenes* scarcely constricted above, black with black ribs when mature, sparsely bristled above and on the ribs; pappus of ca. 20–22 scarcely contiguous bristles.

Fleischmannia panamensis is known only from middle elevations in central Panama. The species looks like a coarse *F. microstemon* but is more closely related to the widely distributed *F. pratensis*. *Fleischmannia panamensis* is distinct by its narrower, nearly glabrous, outer involucre bracts with only narrow scarious margins, by the corolla lobes lacking hairs, and by the somewhat thicker style branches.

COCLÉ: Near La Mesa, *Croat 13354* (MO). Cerro Caracoral, ca. 1000 m, *Duke 15085* (OS). La Mesa, above El Valle, 900 m, *Liesner 749* (MO). PANAMÁ: Cerro Campana, *Busey 859* (MO); *Croat 14201* (MO); *Kennedy et al. 2063* (MO); *Lazor 3322* (FSU, MO); Cerro Pilón, 900–1173 m, *Liesner 759* (MO). Cerro Campana, *Porter et al. 4254* (MO).

8. **Fleischmannia pratensis** (Klatt) R. M. King & H. Robinson, *Phytologia* 19: 205. 1970.

Eupatorium pratense Klatt, Bull. Soc. Roy. Bot. Belgique 31: 193. 1892 (1893). TYPE: Costa Rica, savanes de Boruca, *Pittier 4756* (US, lectotype).

E. roseum Klatt, Bull. Soc. Roy. Bot. Belgique 31: 194. 1892 (1893). TYPE: Costa Rica, clairières du Rodeo de Pacaca, *Pittier 3324* (BR, GH).

E. pacacanthum Klatt, Leopoldina, Bot. Beibl. 3. 1895. TYPE: Costa Rica, *Pittier 3324* (BR, GH).

Erect to reclining perennial *herb* or *subshrub* to 1.5 m tall; stems greenish to brown or reddish, terete, finely striate, densely puberulous. *Leaves* mostly opposite, some upper leaves often alternate; blades papyraceous, rhomboidal to narrowly ovate, to 5.5 cm long and 3.5 cm wide, the base truncate to broadly cuneate, the margins usually bluntly serrate-crenate, the apex short-acute to short-acuminate, the upper surface coarsely to finely pilose, the lower surface sparsely to rather densely short-pilose, puberulous on veins, with glandular punctations, the veins prominently trinervate from base; petioles slender, to 3 cm long. *Inflorescence* a broad corymbose panicle with very densely corymbose branches, the heads in glomerate clusters, the ultimate branches 1–3 mm long, puberulous.

Heads 4–5 mm high with 20–25 florets; involucre bracts ca. 20, subimbricate, unequal, in ca. 3 series, bicostate, with broad scarious margins, usually with prominent scattered puberulence on outer surface, the outer bracts with short-acute tips, the inner bracts with broad usually rounded more scarious tips; corolla lavender to white, ca. 2.5 mm long, often with short hairs on the outer surface of the lobes; style branches slender. *Achenes* slightly constricted above, black with black ribs when mature, usually scabrid or with short bristles primarily or exclusively on the ribs; pappus of ca. 25 closely scabrous often basally thickened and usually contiguous bristles.

This species has been called *F. pycnocephala* (Less.) R. M. King & H. Robinson in Panama. The type of true *F. pycnocephala* proves to represent another species that is more common in Mexico, having yellowish ribs on the achenes, more slender noncontiguous pappus setae, corollas without hairs, leaves usually with more obscure glands or no glands, and generally thicker style branches. *Fleischmannia pratensis* has a somewhat overlapping range with *F. pycnocephala* extending from central Mexico southward through Central America into northern South America.

The type of *Eupatorium pycnocephala* Less. from Patlanta, Veracruz, collected by Schiede, is presumed destroyed at Berlin, but a duplicate from the herbarium at Halle (HAL) has been seen. Its most significant feature, the color of the achene, is that of the northern species and the name seems best retained for that entity. However, other characters of the type specimen show some features, such as a few short hairs on the corolla lobes and thicker pappus bristles, that are rare or lacking in other material of the species. The uniquely intermediate nature of the type may indicate hybridization and both species occur in the general area of the type locality.

The type of *Eupatorium pacacanum* from Costa Rica is a variant of *F. pratensis* having minute, scarcely visible stipitate glands instead of prominent glandular punctations on the undersurface of the leaf and having less closely contiguous pappus bristles. Both characters seem to occur independently in a few other specimens of *F. pratensis* and the plants can be regarded as nothing more than a form.

CHIRIQUÍ: Llanos del Volcán, ca. 1300 m, *Allen 1555* (F, MO, US). San Bartolo Limite, 20 km W of Puerto Armuelles, 400–600 m, *Busey 529* (MO). Above Boquete past Princesa Janca coffee finca, *D'Arcy & D'Arcy 6335* (MO). Between El Hato and Lagunas de Volcán, *D'Arcy & D'Arcy 6624* (MO). Bajo Chorro, Boquete, 6000 ft, *Davidson 49* (F, MO, US), 138 (F). Burica Peninsula, 12 mi W of Puerto Armuelles, 400–500 m, *Liesner 194* (MO). 0.5 mi N of El Hato del Volcán, *McDaniel 10074* (FSU). Alto Boquete, *Partch 69-51, 69-78* (both MO). El Boquete, 1000–1300 m, *Pittier 2856* (US). Cerro Vaca, 900–1136 m, *Pittier 5303* (US). Cerro Punta, 1500–2000 m, *Seibert 254* (MO, US). Vic. of Callejón Seco, Volcán de Chiriquí, 1700 m, *Woodson & Schery 498* (MO). Vic. of Bajo Chorro, 1900 m, *Woodson & Schery 639* (MO). Finca Lerida to Boquete, ca. 1300–1700 m, *Woodson et al. 1137* (MO). COCLÉ: Club Campestre, ca. 700 m, *Duke 13267* (MO, US). Cerro Pilón near El Valle, 700–900 m, *Duke 12094* (MO). Ridge S of El Valle, ca. 600 m, *Gentry 6810* (MO). El Valle, *Miller 1829* (US). HERRERA: Vic. of Las Minas, La Peña, *Stern et al. 1770* (MO, US). LOS SANTOS: 17.8 mi S of Macaracas, 1100 ft, *Lewis 1604* (MO). Between Tonosí and Guanico, *Stern et al. 1878* (MO, US). 12 mi S of Macaracas, *Tyson et al. 3071* (MO). PANAMÁ: Alto Llano, 4400 ft, *Maurice 872* (US). Cerro Azul, *Croat 13024* (MO). Cerro Jefe, *D'Arcy 3976* (MO). Finca del Indio, Cerro Jefe, *D'Arcy 5221* (MO). Goofy Lake, *Dwyer 4142* (MO). Cerro Jefe, ca. 1000 m, *Gentry 6765* (MO). Cerro Jefe, 2700 ft, *Tyson 3371* (MO).

9. **Fleischmannia sideritidis** (Benth. in Örsted) R. M. King & H. Robinson, *Phytologia* 19: 206. 1970.

Eupatorium sideritidis Benth. in Örsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 77. 1852. TYPE: Costa Rica, Ujaras, Örsted (C, not seen, photo US).

Erect to decumbent perennial *herbs* to 60 dm tall, rarely branching above base; stems slender, greenish-brown to reddish, terete, finely striate, minutely puberulous. *Leaves* and lower bracts of inflorescence opposite; blades papyraceous, narrowly elliptical to lanceolate, to 7.5 cm long and mostly 1 cm wide, rarely to 1.7 cm wide, the base narrowly cuneate, the margins with 3–6 remote serrations in distal half, the apex narrowly acute, the upper surface sparsely puberulous, the lower surface with glandular punctations, with minute hairs only on veins, the veins prominently trinervate from near base; petioles indistinct, to 1 cm long. *Inflorescence* a lax panicle with lax rather cymose branches, the ultimate branches 2–15 mm long, densely minutely puberulous. *Heads* ca. 5 mm high with ca. 20–25 florets; receptacle rather convex or conical when fresh; involucre bracts ca. 20, subimbricate, unequal, in 2–3 series, mostly bicostate, short- to long-acute with narrow scarious margins, the outer surface glabrous to finely puberulous, the inner bracts with more scarious tips, the apices acute or with a short mucro; corolla lavender, ca. 2.5 mm long, usually with short hairs on lobes; style branches thick. *Achenes* only slightly constricted above, black when mature, often with slightly yellow ribs, scabrous above and on the ribs; pappus of ca. 25 slender bristles with broadened usually contiguous bases.

Fleischmannia sideritidis is known only from Costa Rica and Panama. The Costa Rican plants have generally more pointed involucre bracts than the Panamanian plants. A somewhat similar species found in Guatemala, El Salvador, Honduras, and Nicaragua is *F. imitans* (B. L. Robinson) R. M. King & H. Robinson. It has larger heads containing more florets and more subequal involucre bracts.

CANAL ZONE: Unnamed quebrada entering lake, Río Indio, 70–80 m, *Dodge & Allen* 17293 (MO). Banks of Quebrada La Palma and Cañon of Río Chagres, 70–80 m, *Dodge & Allen* 17366 (F, MO). Between Peluca Hydrographic Station and Quebrada Peluca, *Steyermark & Allen* 17240 (MO). COCLÉ: Vic. of El Valle, 800–1000 m, *Allen* 83 (MO, US). La Mesa, above El Valle, 600–800 m, *Duke* 15164 (OS). Bismark above Penonomé, *Williams* 286 (US). COLÓN: Ca. 2–3 mi up the Río Guanche, 10–20 m, *Kennedy & Foster* 2128 (MO). PANAMÁ: Cerro Jefe, *D'Arcy* 3979 (MO). Between Cerro Azul and Cerro Jefe, *Dressler* 3268 (FSU, MO, US). VERAGUAS: 5 mi NW of Santa Fe, 700–1000 m, *Croat* 23174 (MO).

10. **Fleischmannia sinclairii** (Benth. in Örsted) R. M. King & H. Robinson, *Phytologia* 19: 206. 1970.

Eupatorium sinclairii Benth. in Örsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 79. 1852. TYPE: Costa Rica, Cartago, Örsted (C, not seen).

Erect annual *herb* to 1 m tall, sparsely branched; stems yellowish-green to brown, terete, finely striate, minutely puberulous. *Leaves* and many bracts of inflorescence opposite; blades of leaves papyraceous, rhombic, to 5 cm long, basal leaves to 3 cm wide, the margins crenulate above widest part, the apex broadly acute to slightly acuminate, the upper surface with coarse hairs, the lower

surface sparsely puberulous and glandular punctate, the veins prominently trinervate from base; petioles slender, to 2.0 cm long. *Inflorescence* a lax panicle with loosely cymose branches, the ultimate branches to 12 mm long, slender, puberulous. *Heads* ca. 4 mm high with ca. 25 florets; involucre bracts ca. 25, subimbricate, unequal, in 2–3 series, mostly bicostate, narrowly acute with narrow scarious margins, the outer bracts with long attenuate tips; corolla usually lavender, ca. 2 mm long, with short hairs on lobes; style branches usually slender. *Achenes* narrowly oblong with nearly equal constrictions above and below, black when mature, ribs black, scabrid above and on the ribs; pappus of ca. 25 slender scarcely contiguous bristles. Chromosome number $n = 10$.

Fleischmannia sinclairii is a delicately branched species distributed from central Mexico through Central America to Panama. The small heads with the sharply pointed, evenly puberulous involucre bracts distinguish the species from all but the closest relative, *F. misera*. A species of similar appearance, *F. capillipes* (Benth. ex Ørsted) R. M. King & H. Robinson, ranging from Mexico to Nicaragua, differs by the subequal, eximbricate involucre bracts and the pappus of usually ten bristles.

CANAL ZONE: Ancón, *Celestine* 75 (US). Barro Colorado Island, *Croat* 8824, 14941 (both MO). Madden Forest Road 1, *Croat* 8934 (MO). Pipeline Road, 2½ mi from gate, *Croat* 9367 (F). Guillard Hwy. near Paraíso, *Croat* 10140 (MO). Road to LaPita signal station near Summit, *Croat* 13957 (MO). Albrook Site, *Dwyer* 6580 (MO). Albrook, *Dwyer & Robyns* 87 (MO). Chagres, *Fendler* 158 (MO, US). Balboa Heights, *Greenman & Greenman* 5057 (MO, US). Madden Forest Preserve, Las Cruces Trail, *Lewis et al.* 5333 (MO, UC). Empire to Mandinga, *Piper* 5501 (US). Culebra, 50–150 m, *Pittier* 2147 (US). Valley of Masambi, road to Las Cascadas Plantation, 20–100 m, *Pittier* 2670 (F, MO, US). Boy Scout Road, Madden Dam Area, *Porter et al.* 4027 (MO, UC). Ancón Hill, *Standley* 26318 (US). Summit, *Standley* 26943 (US). Old Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29075 (US). Las Cascadas Plantation, near Summit, *Standley* 29596 (US). Vic. of Summit, *Standley* 30001 (US). Obispo, *Standley* 31717 (US). Pueblo Nuevo, *White* 300 (MO). Ancón Hill, 600 ft, *Williams* 29 (US). CHIRIQUÍ: Ca. 14 mi N of David, 1200 ft, *Lewis et al.* 667 (MO, UC, US). COCLÉ: Vic. of Olá, 100–350 m, *Pittier* 5056 (US). COLÓN: Río Chagres, region above Gamboa, 25 m, *Allen* 4120 (MO). Peluca, ca. 27 km from Transisthmian Hwy. on road to Nombre de Dios, *Kennedy* 2636 (MO). DARIÉN: Teotuma, ca. 100 m, *Duke* 10065 (MO). Agua Fria, ca. 8 mi N of Santa Fe, 50 m, *Duke* 10096 (MO, REED, US). Río Sabana, ca. 4 mi above Santa Fe, 25 m, *Duke* 10205 (MO, OS). Near Punta Garachine, *Duke* 10476 (MO, OS). Boca Grande Tide Gage, 50 ft, *Duke* 15542 (FSU, REED). Hydro Camp Pico Pendejo on Río Sabana, 50 ft, *Duke* 15444 (MO, OS). Mouth of Lara River, *Tyson & Loftin* 3857 (FSU, MO). HERRERA: 4 mi S of Los Pozos, *Tyson* 2656 (FSU, MO). LOS SANTOS: Loma Prieta, 800–900 m, *Duke* 11878 (MO, OS). PANAMÁ: Río Las Lajas, ca. 20 m, *Allen* 1610 (F, MO, US). Sabanas, N of Panama City, *Paul* 601 (US). Road to Cerro Campana, *Correa & Dressler* 845 (FSU, MO, US). Between Capira and Potrero, 80–130 m, *Dodge & Hunter* 8621 (MO). Isla del Rey, *Duke* 9549 (MO, OS, US). 10–15 km from Bayano crossing on trail to Santa Fe, *Gentry* 3826 (MO). Sabanas near Chepo, 30 m, *Hunter & Allen* 29 (F, MO). Río Tocumen, N of Chepo Road, *Hunter & Allen* 215 (F, MO). Cerro Campana, road to Sulín, ca. 650 m, *Kennedy et al.* 2037 (MO). Cerro Campana, *Lazor* 2215 (FSU, MO). Chimán, *Lewis et al.* 3319 (MO). Río Tapia, *Standley* 28121 (US). Near Matías Hernández, *Standley* 28928 (US). VERAGUAS: La Mesa, *Tyson* 6066 (FSU).

11. ***Fleischmannia tysonii*** R. M. King & H. Robinson, *Phytologia* 28: 82. 1974.
TYPE: Panama, W slope of El Barú, Chiriquí, *Tyson & Loftin* 6116 (US).

Erect perennial *shrub* to 2 m tall; stems greenish to brown, terete, finely striate, densely hirtellous with brownish to reddish hairs. *Leaves* opposite; blades

papyraceous, broadly ovate, to 9 cm long and 7 cm wide, the base broadly rounded or cordate, the margins bluntly serrate-crenate to doubly serrate-crenate, the apex acute to scarcely acuminate, the upper surface pilose, the lower surface densely pilose, tomentose on veins, without glandular punctations, the veins prominently trinervate from at or near base; petioles slender, to 2.5 cm long. *Inflorescence* a broad corymbose panicle with compact corymbose branches, the ultimate branches 2–4 mm long, hirtellous. *Heads* 5–6 mm high with 20–25 florets; involucre bracts ca. 20, subimbricate, unequal, in 3–4 series, bicostate, mostly short-acute to minutely mucronate with broad often prominent scarious margins, the outer surface pilose to puberulous, the inner bracts with more rounded more scarious minutely fimbriate tips; corolla lavender to purple, ca. 3 mm long, with few to many short hairs on outer surface of lobes; style branches slightly thickened distally. *Achenes* slightly constricted above, black with black ribs when mature, with many bristles almost exclusively on the ribs; pappus of 22–25 scabrous slender noncontiguous bristles.

Fleischmannia tysonii is apparently endemic to the Volcán Chiriquí. Closest relationship is to *F. chiriquensis* from the nearby Cerro Punta area. The present species is distinct by the shrubby rather subscandent habit, by the densely pubescent leaves, by the noncontiguous pappus bristles, and by the many short bristles on the ribs of the achene.

CHIRIQUÍ: 8 mi NE of El Volcán, 8100–8400 ft, *Tyson* 843 (FSU, MO). W slope of El Barú, 7000–8000 ft, *Tyson & Loftin* 5982 (FSU). W slope of El Barú, 8000–9000 ft, *Tyson & Loftin* 6116 (US, FSU), 6117 (FSU, MO).

22. GONGROSTYLUS

Gongrostylus R. M. King & H. Robinson, *Phytologia* 24: 387. 1972. TYPE: *Eupatorium costaricense* Kuntze.

Sparingly branched slender *vines* with terete subglabrous stems. *Leaves* opposite with short distinct petioles; blades ovate, the base rounded, the margins serrate, the veins trinervate from near base. *Inflorescence* terminal and axillary, corymbose-paniculate, the ultimate branches often long and slender. *Heads* discoid with ca. 20 florets; involucre bracts subimbricate, in 3–4 very unequal series, narrowly lanceolate to linear; receptacle slightly convex, glabrous; corolla narrowly funnelform, the lobes triangular with glands on outer surface; anther collars elongate with short-oblong to elongate cells, the cell walls with transverse annular thickenings, the anther appendage short, only half as long as wide; style base with nodulose enlargement, densely hirsute, the style appendages narrow and slightly mamillate below, greatly enlarged and smooth apically. *Achenes* prismatic with 5 ribs, glabrous; carpopodium large, forming a distinct short cylinder, the basal row of cells greatly enlarged, numerous upper rows of cells small and subquadrate, the cell walls thickened; pappus of ca. 30 scabrous bristles in 1 series, persistent, the bristles scarcely narrowed toward tips, the apical cells subacute. *Pollen* with short spines.

Gongrostylus is a monotypic tropical American genus readily distinguished among the Eupatorieae of Panama by the greatly enlarged tips of the style

branches. In spite of the difference in appearance, the genus is closely related to *Ayapana*, having the same distinctive carpodium structure and the same type of enlargement of the style base.

Literature:

King, R. M. & H. Robinson. 1972. Studies in the Eupatorieae (Asteraceae). CIV. A new genus, *Gongrostylus*. Phytologia 24: 387–388.

1. ***Gongrostylus costaricensis*** (Kuntze) R. M. King & H. Robinson, Phytologia 24: 388. 1972.—FIG. 23.

Eupatorium costaricense Kuntze, Rev. Gen. Pl. 1: 337. 1891. TYPE: Costa Rica, Angostura, 1600 m, Kuntze (K).

Somewhat woody, scandent, slender *epiphyte* with few branches; stems terete, striate, sparsely to coarsely hirsute. *Leaves* opposite; blades ovate, to 9.5 cm long and 4 cm wide, the base rounded with a slight acumination, trinervate, the margins with few sharp small teeth, the apex short- to rather long-acuminate, the surface sparsely short-hirsute; petioles short, distinct, 3–8 mm long. *Inflorescence* terminal and axillary, laxly corymbose, the ultimate branches 5–20 mm long, slender, puberulous. *Heads* 8–10 mm high with ca. 20 florets; involucre bracts ca. 25, subimbricate, in ca. 3 series, 2.5–10.0 mm long, ovate-lanceolate to linear-lanceolate, sharply acute, glabrous to slightly puberulous on outer surface, weakly bicostate; corolla 6.0–6.5 mm long, glabrous with glands on outer surface of lobes, the lobes very small, slightly longer than wide; enlarged style tips ca. 0.8 mm long and 0.3 mm wide. *Achenes* ca. 2 mm long, prismatic, glabrous; pappus mostly 4–6 mm long with ca. 30–35 bristles. *Pollen* ca. 20 μ in diameter.

Gongrostylus costaricensis has been known from two widely separated localities in Costa Rica and Ecuador. The new collections from Panama indicate a more continuous distribution.

SAN BLAS: Road from El Llano to Cartí-Tupile, continental divide to 1 mi from Divide, 300–500 m, Liesner 1296 (MO). VERAGUAS: 5–8 km beyond Escuela Agrícola Alto Piedra, 730–770 m, Croat 25925 (MO). Río Dos Bocas, 11 km beyond Agricultural School, 450–550 m, Croat 27537 (MO, US).

23. HEBECLINIUM

Hebeclinium DC., Prodr. 5: 136. 1836. TYPE: *Eupatorium macrophyllum* L.

Erect large *herbs* or *subshrubs*, sparingly branched. *Leaves* always opposite; blades broadly ovate to deltoid, usually serrate; petioles rather long. *Inflorescence* a corymbose panicle or lax cyme. *Heads* discoid with 20–80 florets; involucre of 25–40 bracts, in 3–5 series, the outer bracts persistent; receptacle hemispherical, often with center broken off, glabrous to densely hirsute, sclerified throughout (parenchymatous internally in one species); corolla narrowly tubular, 5-lobed, the outer surface of corolla glabrous below, the lobes usually longer than wide, usually with prominent multicellular uniseriate hairs and a few glands, the inner surface of some species with numerous hairs, the corolla cells narrow with sinuous walls; anther collar often slender, with many quadrate cells in lower part, the cell

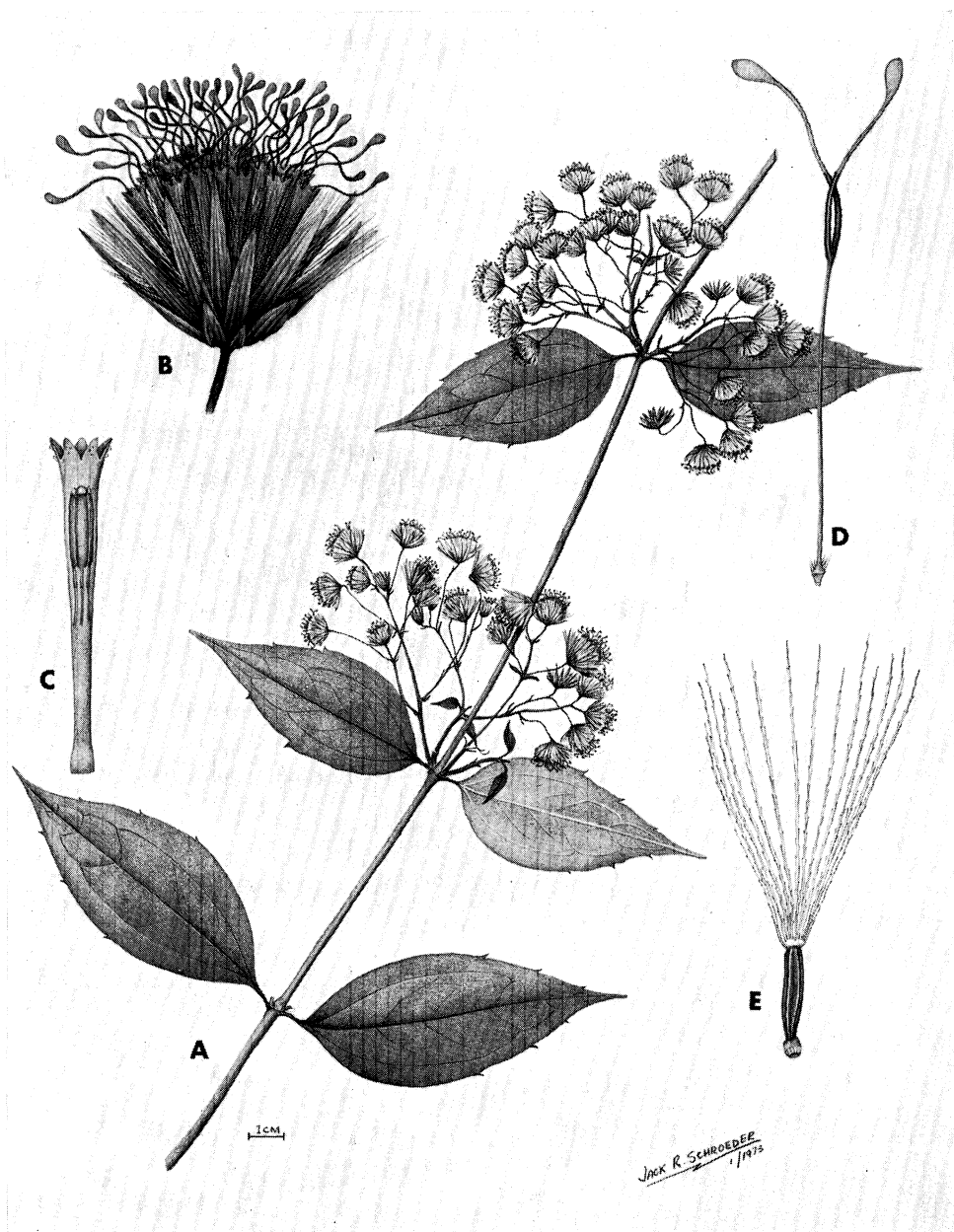


FIGURE 23. *Gongrostylus costaricensis* (Kuntze) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 2\frac{1}{5}$).—C. Corolla ($\times 6\frac{1}{10}$).—D. Style ($\times 6\frac{1}{10}$).—E. Achene ($\times 6\frac{1}{10}$).

walls rather thin with indistinct annular thickenings, the anther appendage ovate, longer than wide; style base not enlarged, glabrous, the style appendages narrow throughout, slightly mamilllose. *Achenes* prismatic, often slightly curved, 4–5-ribbed, bristles sometimes present; carpodium scarcely distinct, only a few

rows of short cells at lower margin, the area of longer upper cells merging with sides of achene and extending up ribs; pappus of ca. 30–40 scabrous bristles, the apical cells acute.

Hebeclinium contains about 18 species found mainly in northern South America. Three species have been collected in Panama. Members of the genus are distinguished primarily by the receptacle but the very slender style appendage is also a notable feature.

Hebeclinium has usually been recognized at the sectional level for members of “*Eupatorium*” having hairs on the receptacle. The concept contained many but not all members of the related generic series, *Hebeclinium*, *Bartlettina* and *Decachaeta*, where there seems to be a tendency toward pubescent receptacles. Section *Hebeclinium* suffered most by the inclusion of extraneous elements such as *Polyanthina* which is related to *Ayapana*, and *Urolepis* which is related to *Gyptis*.

Literature:

King, R. M. & H. Robinson. 1969. Studies in the Compositae-Eupatorieae, IX. A review of the genus *Eupatorium* section *Hebeclinium* in Colombia. *Sida* 3: 321–326.

——— & ———. 1971. Studies in the Eupatorieae (Asteraceae) XXXVII. The genus *Hebeclinium*. *Phytologia* 21: 298–301.

- a. Heads with 50–80 florets; inflorescence a corymbose-panicle; base of leaf blade usually truncate to cordate 2. *H. macrophyllum*
- aa. Heads with 20–40 florets; inflorescence a lax cyme; base of leaf blade cuneate.
 - b. Heads with 20–25 florets; leaf margins doubly serrate 3. *H. reedii*
 - bb. Heads with ca. 40 florets; leaf margins crenulate 1. *H. costaricense*

1. ***Hebeclinium costaricense*** R. M. King & H. Robinson, *Phytologia* 23: 407. 1972. TYPE: Costa Rica, near La Laguna, 6 to 8 km S of Villa Quesada, 1200 m, Alajuela, *Molina et al.* 17545 (F).

Shrubs or small *trees* to 7 m tall; stems terete, faintly striate, puberulous to hirtellous. *Leaves* opposite; blades papyraceous, broadly ovate, mostly 9–16 cm long and 6–9 cm wide, the base broadly cuneate, the margins slightly crenulate, the apex slightly acuminate, the veins hirtellous, the venation pinnate, the secondary veins ca. 5 pairs, ascending at ca. 45° angle; petioles mostly 3–4 cm long. *Inflorescence* a loose cyme, the ultimate branches 1–20 mm long, hirtellous. *Heads* mostly in clusters of 3, ca. 6 mm high with ca. 40 florets; involucre bracts ca. 40, imbricate, strongly unequal, in 4 series, narrowly oblong, the apices obtuse, the outer surface with ca. 3 striae, puberulous above; receptacle hemispherical, nonparenchymatous, pilose; corolla white, ca. 3.4 mm long, narrowly tubular, slightly funnelform above, glabrous below and within, the lobes oblong-ovate, ca. 0.4 mm long and 0.3 mm wide with cluster of hairs on outer surface. *Achenes* ca. 1.5 mm long, sparsely glanduliferous; pappus of ca. 27 bristles, ca. 2.5 mm long, the apex distinctly dilated, the apical cells acute to subacute.

The species is known only from Costa Rica and Panama.

COCLÉ: El Valle, behind Club Campestre, *Croat* 14270 (MO). N slope and summit of Cerro Pilón, 900–1173 m, *Croat* 22935 (MO). El Valle, Cerro Pilón, 3000 ft, *Duke* 14984 (MO). Cerro Caracoral, *Kirkbride* 1116 (MO). PANAMÁ: Near Summit of Cerro Campana, 1000 m, *Croat* 22831 (MO).

2. *Hebeclinium macrophyllum* (L.) DC., Prodr. 5: 136. 1836.—FIG. 24.

Eupatorium macrophyllum L., Sp. Pl., ed. 2. 1175. 1763. TYPE: America, Plumier sp. 10, pl. 129.

Ageratum guianense Aubl., Hist. Pl. Guiane 2: 800. 1775. TYPE: French Guiana, *Aublet* (BM?, not seen).

Eupatorium molle Swartz, Prodr. Veg. Ind. Occ. 111. 1788, nom. illeg., incl. sp. prior. TYPE: Jamaica, *Swartz* (S?, not seen).

Coleosanthus tiliaefolius Cass., Dict. Sci. Nat. 24: 519. 1822. SYNTYPES: Saint-Domingue, Herb. Desfontaines. Cayenne, Herb. Desfontaines (P?, FI?, not seen).

Eupatorium populifolium Mart., Flora 20, Beibl. 2: 105. 1837, not *E. populifolium* H.B.K., 1818. TYPE: Brasil, Rio de Janeiro, *Martius* 139 (M?, not seen).

E. dryadeum DC., Prodr. 7: 269. 1838, new name for *E. populifolium* Mart. TYPE: Brasil, *Martius* 139 (M?, not seen).

Ageratum coeruleum Sieber ex Baker in Mart., Fl. Bras. 6(2): 345. 1876, nom. nud. TYPE: Martinique, *F. Kohaut* 192 (B, destroyed).

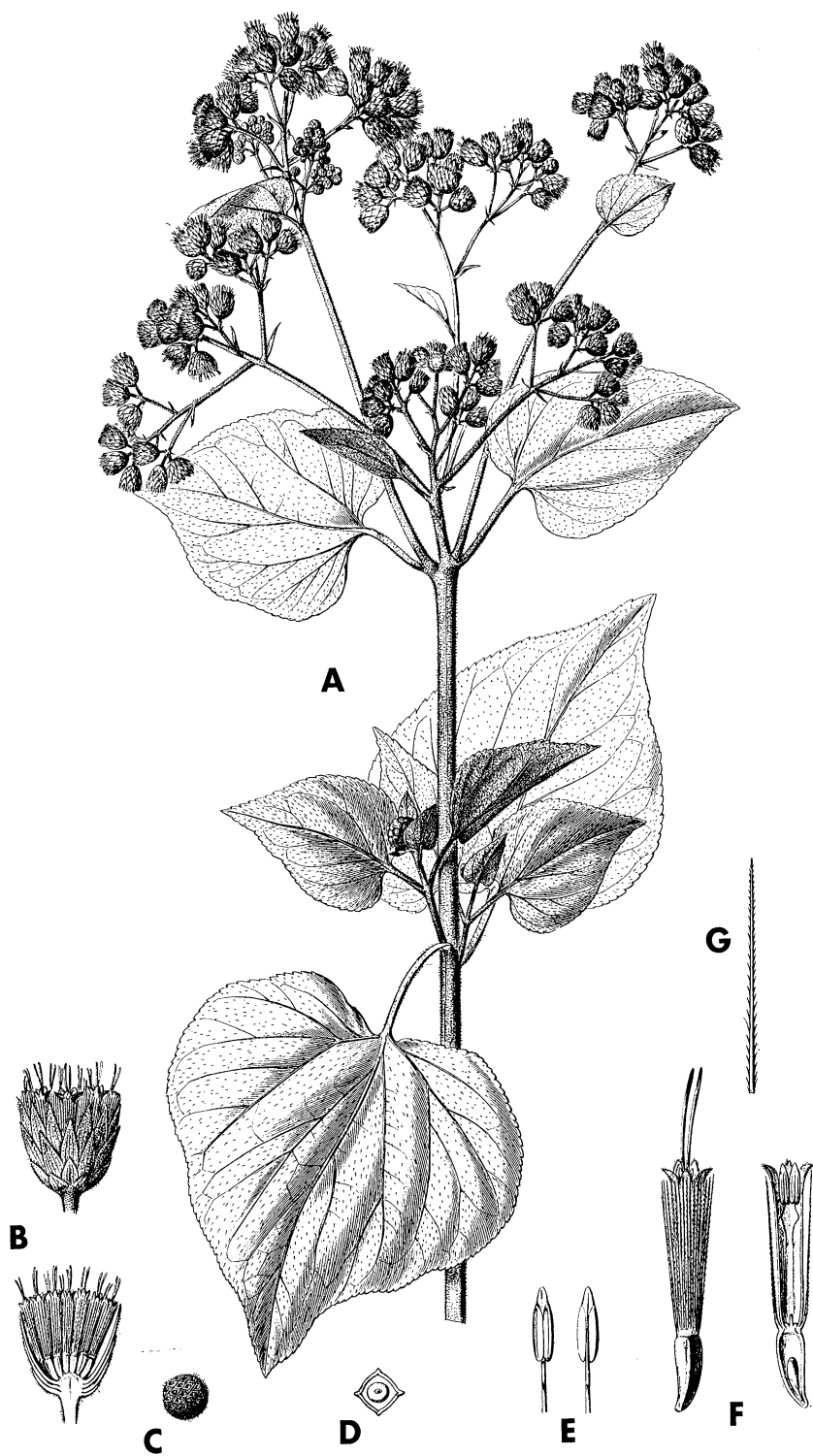
Erect *herbs* or small *shrubs* to 2.5 m tall; stems terete, faintly striate, densely tomentellous. *Leaves* opposite; blades thinly papyraceous, broadly ovate, to 15 cm long and 20 cm wide, the base usually truncate or cordate, the margins crenulate-dentate, the apex acuminate, the upper surface dark green, sparsely puberulous to nearly glabrous, the lower surface light green, densely tomentellous, the venation trinervate from base; petioles to 10 cm long. *Inflorescence* a loose many-headed corymbose panicle, the ultimate branches to 1 cm long, densely puberulous. *Heads* ca. 4.5 mm high with ca. 50–80 florets; involucre bracts green, ca. 30, imbricate, unequal, in 4–5 series, ovate to oblong-lanceolate, the outer surface with ca. 4–5 striae, densely puberulous, the inner bracts with more narrowly acute tips; receptacle hemispherical, without parenchyma, densely hirsute; corolla white or pink, narrowly tubular, ca. 3.5 mm long, the lobes ca. 0.2 mm long, about twice as long as wide with numerous hairs on outer surface. *Achenes* ca. 1.5 mm long, mostly glabrous with some glands above; pappus of ca. 30–35 slender somewhat scabrous bristles, the apical cells acute.

Hebeclinium macrophyllum is a common and widely distributed plant in the American tropics ranging from Mexico south to Argentina and east through the West Indies. The more narrowly acute, grayish-green involucre bracts give a distinctive appearance to the heads. In the Province of Panama the species has the common name “roble,” *Duke* 5819 (MO).

BOCAS DEL TORO: Almirante, *Blum* 1342 (MO). Bocas del Toro, *Carleton* 228 (US). Almirante, *Cooper* 172 (F). Changuinola Valley, *Dunlap* 286 (US). Changuinola near Chiriquí Land Company, *Dwyer* 5112 (US). Shepherd Island, *McDaniel* 5163 (FSU, MO). Swan Key, 2 km N of Isla Colón, *Tyson & Loftin* 6295 (FSU, MO, US). Water Valley, *von Wedel* 615 (MO). Water Valley, vic. of Chiriquí Lagoon, *von Wedel* 1544, 1576, 1680, 1774

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FIGURE 24. *Hebeclinium macrophyllum* (L.) DC.—A. Habit ($\times \frac{1}{2}$).—B. Heads ($\times 1\frac{1}{10}$).—C. Receptacle ($\times 3\frac{1}{5}$).—D. Achene cross section ($\times 5\frac{1}{5}$).—E. Stamens ($\times 11\frac{3}{10}$).—F. Florets ($\times 5\frac{1}{5}$).—G. Pappus bristle ($\times 11\frac{1}{10}$). [After Martius, Flora Brasiliensis 6(2): plate 92. 1876.]



(all MO, US). Vic. of Nievécita, 0–50 m, *Woodson et al.* 1820 (MO). CANAL ZONE: Barro Colorado Island, *Aviles* 5 (MO). Hills N of Frijoles, *Standley* 27626 (US). Vic. of Salamanca Hydrographic Station, Río Pequení, 80 m, *Woodson et al.* 1566 (MO, US). CHIRIQUÍ: Puerto Armuelles, *Davidson* 1080 (F). 20 km W of Puerto Armuelles, 400–600 m, *Busey* 535 (MO). Vic. of San Félix, 0–120 m, *Pittier* 5188 (US). DARIÉN: Río Pirre, 20 mi W of El Real, *Duke* 5191 (MO). Ca. 2 mi NW of Yaviza, *Duke* 6530 (MO). Quebrada Nigua, below Santa Fe, *Duke* 8828 (MO, OS). Tiotuma, ca. 100 m, *Duke* 10069 (MO). Agua Fria, 8 mi N of Santa Fé, 50 m, *Duke* 10118 (FSU, OS). Camp Tiotuma, 164 ft, *Duke* 15510 (OS, REED). 3 mi E of Santa Fe, *Tyson et al.* 4675 (MO). Boca de Cupe, *Williams* 717 (US). LOS SANTOS: Loma Prieta, 800–900 m, *Duke* 11836 (MO, OS), 11846 (MO). Vic. of headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al.* 2914 (MO). PANAMÁ: Cerro Azul, *Croat* 17329 (MO). Dam site, ca. 4 mi S of Cañita, *D'Arcy & D'Arcy* 6053 (MO). Road to Cerro Azul, 2000 ft, *D'Arcy & D'Arcy* 6218 (MO). Pan-Am. Hwy. near Jenine, Río Cañita, *Duke* 3858 (MO). Vic. of El Llano, *Duke* 5819 (MO). Cerro Jefe, 10–13 mi S of Goofy Lake, *Duke* 8007 (MO, OS). Cerro Jefe, *Duke* 9359 (MO, OS). Goofy Lake to 1.5 mi S of Goofy Lake, ca. 1800 ft, *Dwyer & Hayden* 8035 (MO, REED, US). Cerro Jefe, ca. 1000 m, *Gentry* 6747 (MO). Tributary of Río Chagres, 5 mi SW of Cerro Brewster, ca. 1000 ft, *Lewis et al.* 3524 (MO). Río Tapia, *Standley* 28283 (US). E slope of Cerro Jefe, 2700 ft, *Tyson* 3369, 3421 (both MO). Cerro Jefe, *Tyson et al.* 4297 (FSU, MO). Cerro Azul, near Finca Urano, ca. 2500 ft, *Tyson* 6509 (FSU).

3. ***Hebeclinium reedii*** R. M. King & H. Robinson, *Phytologia* 23: 406. 1972.

TYPE: Panama, Cerro Pirre, Darién, *Bristan* 464 (US, holotype; MO, isotype).

Erect *subshrubs* to 1–2 m tall?; stems terete, densely hirsute. *Leaves* opposite; blades papyraceous, broadly ovate, to 12 cm long and 8 cm wide, the base broadly cuneate, the margins doubly serrate, the apex distinctly short-acuminate, the upper surface with veins short-hirsute, the lower surface with veins and veinlets hirsute, the venation pinnate, the secondary veins with ca. 5 pairs, ascending at 45° angles; petioles 3–4 cm long. *Inflorescence* a loose cyme, the ultimate branches 1–20 mm long, short-hirsute. *Heads* mostly in clusters of 3, ca. 6 mm high, with 20–25 florets; involucre bracts ca. 40, imbricated, strongly unequal, in 4 series, narrowly oblong, the apices obtuse, the outer surface with ca. 3 striae, puberulous above; receptacle strongly convex, without parenchyma, pilose; corolla white, ca. 3 mm long, tubular below, narrowly funnelform above, glabrous below and within, the lobes triangular, ca. 0.4 mm long and wide with cluster of hairs on outer surface. *Achenes* ca. 2 mm long, glabrous; pappus with ca. 25 bristles, ca. 2.5 mm long, the apex distinctly dilated, the apical cells subacute.

Hebeclinium reedii is known only from the type locality in eastern Panama. The heads have fewer florets and less hemispherical receptacles than in most species of *Hebeclinium*.

DARIÉN: Cerro Pirre, *Bristan* 464 (MO, US).

24. HETEROCONDYLUS

Heterocondylus R. M. King & H. Robinson, *Phytologia* 24: 389. 1972. TYPE: *Eupatorium vitalbae* DC.

Erect or climbing *herbs*, *subshrubs* or *shrubs*, sparingly branched. Lower *leaves* opposite, the upper leaves often alternate; the blades ovate to narrowly oblong, entire to serrate; petioles short. *Inflorescence* few to many branched,

paniculate to cymose. *Heads* discoid with 20–80 florets; involucre bracts 15–30, imbricate to subimbricate, strongly unequal to subequal, in 3–5 series, spreading when mature; receptacle flat to slightly convex, glabrous; corolla narrowly funnelform, 5-lobed, the lobes triangular, usually distinctly longer than wide, smooth, glabrous or with a few glands, the corolla cells with mostly sinuous walls; anther collars often thickened above, the lower cells subquadrate or wider, the upper cells oblong to narrowly oblong, the cell walls with annulate thickenings, the anther appendage longer than wide; style base distinctly enlarged, glabrous or hirsute, the style branch broadly linear, smooth to short-papillose. *Achenes* with 5 ribs, the ribs with short bristles or glands, the lower part of achene long-tapered; carpodium distinct, somewhat asymmetrical with sinuous trace, stopper-shaped, the cells subquadrate, in many series, with distinctly thickened walls; pappus bristles 20–30 in one series, scabrous, the apices unenlarged to gradually dilated, the apical cells acute.

Heterocondylus is a genus of about 12 species found mainly in Brazil. Only one species reaches northern South America and Central America.

Literature:

King, R. M. & H. Robinson. 1972. Studies in the Eupatorieae (Asteraceae). CV. A new genus, *Heterocondylus*. *Phytologia* 24: 389–392.

1. *Heterocondylus vitalbae* (DC.) R. M. King & H. Robinson, *Phytologia* 24: 391. 1972.—FIG. 25.

Eupatorium vitalbae DC., Prodr. 5: 163. 1836. TYPE: Brasil, near Rio de Janeiro, Lund 1834 (G-DC, not seen, US, microfiche).

Campuloclinium surinamense Miq., Linnaea 17: 69. 1843. TYPE: Surinam, prope flumen Commewyne, Focke 662 (U, photo US).

Eupatorium ecuadorae Klatt, Ann. K. K. Naturhist. Hofmus. 9: 356. 1894. TYPE: Ecuador, Jameson (GH, sketch and fragment, not seen).

Scandent woody *herbs* or *shrubs* to 6 m tall with few branches; stems finely striate, terete, sparsely puberulous. *Leaves* and branches of inflorescence opposite; blades coriaceous, elliptic-ovate to ovate-lanceolate, to 12 cm long and 7 cm wide, the base rounded to slightly cuneate, the margins serrate, the apex sharply acute to slightly acuminate, glabrate with slight pubescence on veins, the veins prominently trinervate from base; petioles to 1.5 cm long. *Inflorescence* a loose panicle to 15 cm wide and 25 cm high, the ultimate branches mostly 1–2 cm long, densely puberulous. *Heads* ca. 1.2 cm high with 60–65 florets; involucre bracts ca. 20, subimbricate, subequal, the outer bracts ovate to oblong, apically acute, 5–8 mm long, the outer surface 4–8 costate, puberulous, the inner bracts mostly lanceolate, to 1 cm long, slightly deciduous, the apex narrowly acute, sometimes pink, the outer surface mostly glabrous; receptacle slightly convex; corolla white to pink or purple, ca. 8 mm long, narrowly funnelform, the tube narrow below, the lobes ca. 0.5 mm long, glabrous; style base glabrous. *Achenes* ca. 3.5 mm long, fusiform, 4–5 ribbed, ribs with short bristles; carpodium short and broad with distinct upper rim, stipitate; pappus of ca. 20 scabrous deciduous bristles, ca. 7 mm long, the tips slightly enlarged.

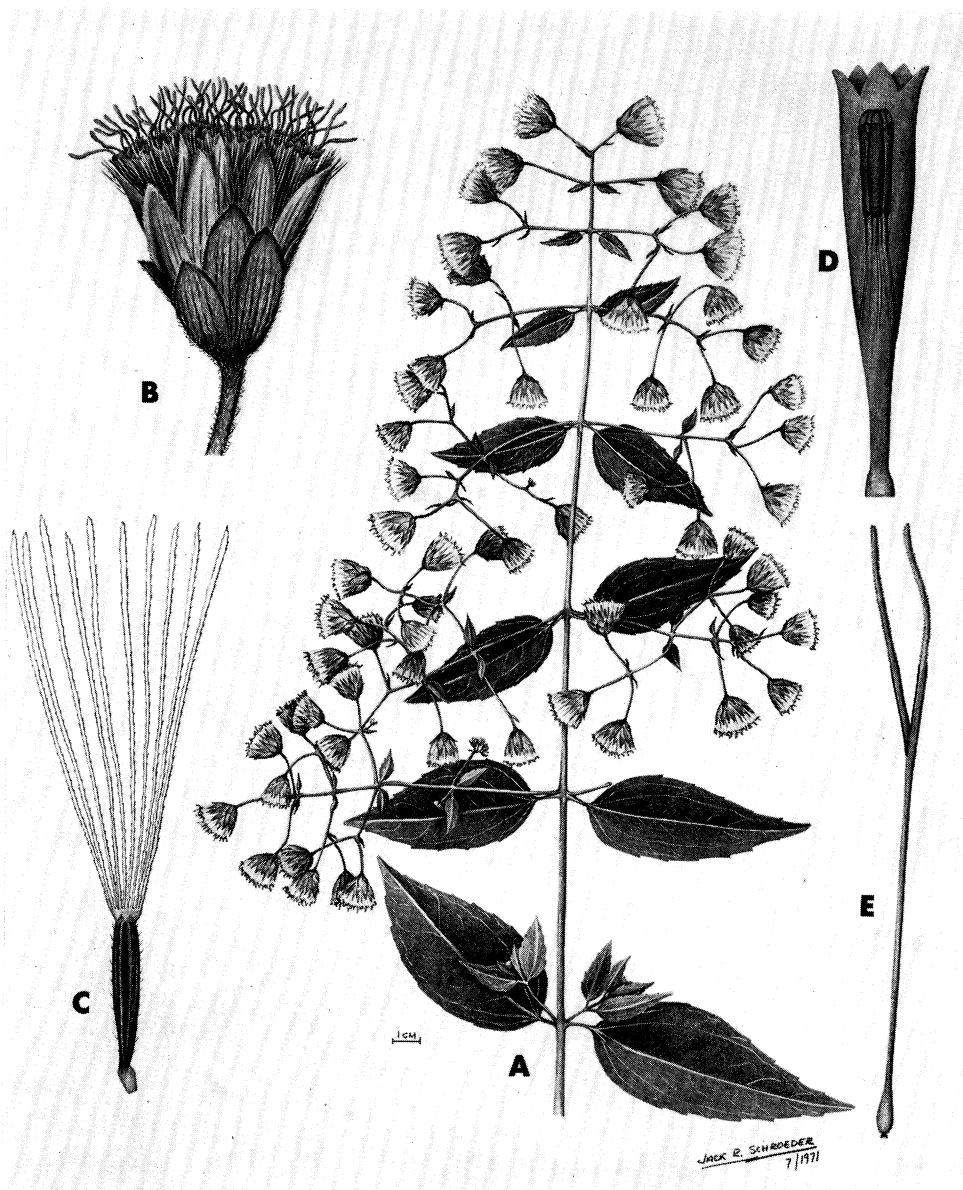


FIGURE 25. *Heterocondylus vitalbae* (DC.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{5}$).—B. Head ($\times 2\frac{1}{2}$).—C. Achene ($\times 6\frac{9}{10}$).—D. Corolla ($\times 6\frac{9}{10}$).—E. Style ($\times 6\frac{9}{10}$).

Heterocondylus vitalbae is widely distributed from Honduras south to Peru and Brazil. The moderately coarse plants with often slightly nodding heads present a distinctive appearance.

CANAL ZONE: Barro Colorado Island, Croat 7222, 7796, 8666, 8776 (all MO). 1 mi N of Summit Gardens, Croat 9095 (MO). Reservoir W of Cocoli, Croat 9166 (MO). Pipeline Road, Croat 9329, 9363 (both F). CHIRIQUÍ: 2–8 km N of Cañas Gordas (Costa Rica), 1000–1100 m,

Busey 658 (MO). 6 km S of Puerto Armuelles, *Busey* 692 (MO). Palo Santo, 3 mi N of Volcán, *Croat* 13543 (MO). Burica Peninsula, above Quebrada Yerbazales, 200 m, *Croat* 22588 (MO). Bajo Mono, Boquete, 4000 ft, *Davidson* 537 (F, MO). 14 mi N of David, 1200 ft, *Lewis et al.* 669 (MO, US). Burica Peninsula, 12 mi W of Puerto Armuelles, 400–500 m, *Liesner* 196 (MO). El Boquete, 1000–1300 m, *Pittier* 2901 (US). COCLÉ: Bismark above Penonomé, *Williams* 574 (US). DARIÉN: Caña and vic., 2000–6500 ft, *Williams* 748 (US). HERRERA: 10 mi S of Océ, *Tyson et al.* 2870 (FSU, MO). LOS SANTOS: Loma Prieta, 800–900 m, *Duke* 11902 (MO). Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al.* 2236 (MO). Between Sabanas and Río Yguana, *Macbride* 2639 (F, US). Vic. of Bella Vista, *Piper* 5348 (US). 16 mi S of Macaracas at Quebrada Bejucó, *Tyson et al.* 2926 (MO). PANAMÁ: Cerro Jefe, 2700 ft, *Blum & Duke* 2179 (MO). Road to Cerro Campana, *Correa & Dressler* 844, 847 (both MO). Cerro Jefe, 10–13 mi S of Goofy Lake, *Duke* 8008 (MO, OS). Cerro Jefe, *Duke* 9419 (MO, US). Cerro Campana, 3000 ft, *Duke* 10748 (MO, REED). Cerro Campana, 850 m, *Liesner* 628 (MO). Taboga Island, *Miller* 1860 (US). Cerro Campana, *Porter et al.* 4199, 4308 (both MO). Río Tapia, *Standley* 30655 (US). Cerro Jefe, 2700 ft, *Tyson* 3361 (MO). Cerro Azul, *Tyson* 5379 (MO). Cerro Jefe, *Wilbur & Weaver* 11344 (F, MO). VERAGUAS: Headwaters of Río Cañazas, 300–600 m, *Allen* 177 (MO, US). 2 mi W of Santa Fe, 400–800 m, *Liesner* 843 (MO).

25. ISOCARPHA

Isocarpha R. Brown, Trans. Linn. Soc. London 12: 110. 1817. TYPE: *Calea oppositifolia* L.

Erect perennial *herbs*, branching mostly from base, the bases sometimes creeping. *Leaves* opposite or alternate, sessile or with narrowly winged petioles, with or without basal auricles; blades slightly to strongly trinervate near base, the margins entire to slightly toothed, usually with numerous glandular punctations on surface. *Inflorescence* a lax panicle, sometimes leafy, the branches with heads single or in small clusters. *Heads* discoid, often becoming elongate and amentiform usually with more than 100 florets; involucre bracts eximbricate, in 1–2 series, lanceolate; receptacle highly conical, florets subtended by paleas resembling involucre bracts; corolla narrowly funnelform with a distinct tube, the glands on outer surface mostly on tube and lobes, the lobes 5, triangular, longer than wide, not papillose or with some papillae on inner surface near margin, the corolla cells elongate with sinuous walls; anther collar slender, the cells mostly short-oblong with walls prominently annulate, the exothecial cells subquadrate, the anther appendage longer than wide; style base with distinct enlargement, the style branches without glands, the appendages rather short and tapering, often strongly curled, laxly long-papillose. *Achenes* prismatic with 5 ribs, base narrowed with or without bristles; carpodium short, asymmetric, with small quadrate cells in few to many rows, the basal row not enlarged; pappus lacking. *Pollen* 18–20 μ in diameter, with short spines.

Isocarpha is a genus of about 12 species ranging from the southwestern United States through Mexico and Central America to the West Indies and South America. Only one species has been collected in Panama.

The genus *Isocarpha* has traditionally been placed in the tribe Heliantheae and the members of the genus show a number of the characters commonly used to distinguish that tribe, including, shorter and more laxly papillose style appendages, densely paleaceous receptacles, and a reduced pappus. Nevertheless, the genus is without close relatives in the Heliantheae and close relatives are

evident in the Eupatorieae. In the latter tribe the genus *Ayapana* has the same form of style appendage and one species of *Ayapana* has a reduced pappus. *Ayapana* is, in turn, related by carpopodium structure and the usually capillary pappus to other members of the Eupatorieae with larger style appendages. The proper relationship of *Isocarpha* is confirmed by the structure of the anther and the style base. The annulated cells of the collar, the exothecial cells with thickenings on all walls, the flat appendage composed of only two cell layers, the pollen 18–20 μ in diameter, and the papillose to hirsute style base of one species are all characters common in the Eupatorieae but unknown in the Heliantheae.

1. ***Isocarpha oppositifolia*** (L.) R. Brown, Trans. Linn. Soc. London 12: 110. 1817.—FIG. 26.

Calea oppositifolia L., Sp. Pl., ed. 2. 1179. 1763. TYPE: Jamaica, *P. Browne* (Herb. Linnaeus 984.2, not seen, US, microfiche).

Erect perennial *herbs* to 1 m tall; stems, leaves and branches of inflorescence bearing slender nonglandular puberulence and few to many glandular punctations; stems greenish to pale brown, terete to slightly hexagonal, scarcely striate, minutely puberulous. *Leaves* and all but upper bracts of inflorescence opposite; blades narrowly elliptical to lanceolate, to 9 cm long and 2.5 cm wide, the base narrowly cuneate and decurrent on petiole, the margins entire to slightly serrulate, the apex narrowly acute, the surface with dense puberulence, the hairs stiff and slender, the veins prominently trinervate from near base; petioles indistinct to ca. 5 mm long, usually slightly winged. *Inflorescence* with long branches bearing heads singly or in clusters of 2–6, usually in clusters of 3. *Heads* 8–10 mm high or higher when older, usually with more than 100 florets; involucral bracts ca. 15, subequal, lanceolate, ca. 4 mm long, puberulous and glandular-punctate on outer surface, bicostate with costae fused above into stout projecting tip; paleas very similar to involucral bracts but with wider scarious margins and more rounded or truncate tip, the fused costae abruptly projecting as mucro; corolla white, ca. 2 mm long, glands few, sometimes a few stiff short hairs on lobes, the lobes with papillae on inner surface near tip and on margins; anther appendages triangular to oblong, ca. 250 μ long and 150 μ wide. *Achenes* ca. 1.5 mm long, glabrous; carpopodium small but distinct with up to 25 layers of small cells on wider part; pappus lacking.

The species is widespread from the southwestern United States through Mexico and Central America to the West Indies and northern South America.

COCLÉ: Aguadulce, near sea level, *Pittier 4830* (US). HERRERA: Vic. of Chitré, ca. 20 m, *Allen 1088* (MO, US). 4 mi. S of Los Pozos, *Tyson 2641* (MO). LOS SANTOS: Monagre Beach, 5 mi. SE of Chitré, *Tyson et al. 3054* (MO).

26. KOANOPHYLLON

Koanophyllon Arruda da Camara, Discurso sobre utilidade da instituição de jardins nas principais provincias do Brazil, . . . p. 38? 1810.

Shrubs or small *trees* with few to many branches, the branches sometimes long and arching. *Leaves* opposite with short distinct petioles; blades broadly

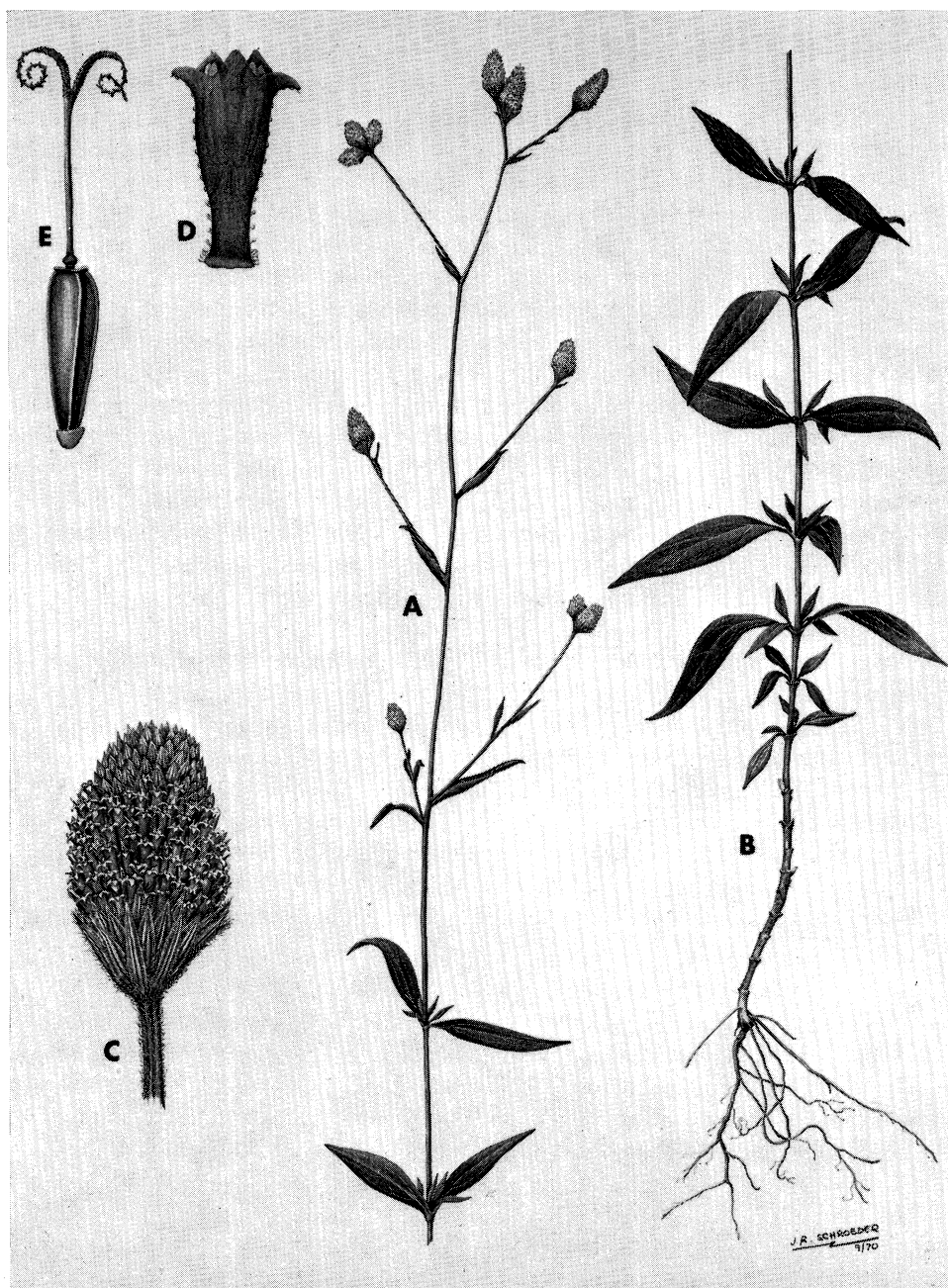


FIGURE 26. *Isocarpha oppositifolia* (L.) R. Brown.—A-B. Habit ($\times \frac{1}{5}$).—C. Head ($\times 2\frac{7}{10}$).—D. Corolla ($\times 14\frac{7}{10}$).—E. Achene and style ($\times 14\frac{7}{10}$).

lanceolate to elliptical (pinnately lobed in one species), the base acute to truncate or cordate, the lower surface with few to many glands, without laticifers in areoles. *Inflorescence* a lax corymbose or pyramidal panicle, the branches corymbose to spicate. *Heads* discoid with 6 to ca. 20 florets; involucre bracts 7–16, eximbricate to subimbricate, unequal to subequal, spreading at maturity, the innermost bracts sometimes deciduous; receptacle glabrous, flat to slightly convex; corolla tubular, the lobes short-triangular with inner and outer surfaces smooth, numerous capitate glands on outer surface, the cells of the corolla mostly narrow with sinuous walls; anther collar elongate, usually with numerous quadrate cells below, the cell walls usually inornate (one species with annular thickenings), the exothecial cells subquadrate to wider than long, the anther appendage usually wider than long, sometimes very short, the apical margin slightly to strongly recurved, the inner surface often with a median longitudinal groove; style base not enlarged, glabrous, the style appendage distinctly enlarged apically, smooth at tip, without glands. *Achenes* prismatic with 5 ribs and with bristles, glands few or none; carpodium short and distinct, usually narrowed below, the cells small and subquadrate in many series, the cell walls slightly thickened; pappus with long or short bristles or lacking, the bristles 15–40, scabrous, persistent, the apical cells acute. *Pollen* of Panamanian species all with extremely short spines.

The genus *Koanophyllon* contains 107 species and ranges from Paraguay and Brazil northward along the Andes, reaching the West Indies, Central America, Mexico, and the southwestern United States, with one species in Florida. Two species are sources of bluish or greenish dyes.

Grashoff & Beaman (1970) have noted the elongate many-headed inflorescences, the reduced anther appendages, the less spinose pollen, and the probability of wind pollination in various species of the Eupatorieae that are now placed in the genera *Koanophyllon*, *Decachaeta*, *Neohintonia* and *Critonia*.

Four species of *Koanophyllon* are found in Panama and two of these are endemic.

Literature:

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- & ———. 1972. Studies in the Eupatorieae (Asteraceae). LXXII. Notes on the genus *Koanophyllon*. *Phytologia* 23: 395–396.
- Robinson, B. L. 1926. *Eupatorium* L. Sp. Pl. 836. 1753. In P. C. Standley, *Trees and Shrubs of Mexico*. Contr. U. S. Natl. Herb. 23: 1432–1469.
- a. Leaf blades prominently trinervate with truncate or cordate bases; inflorescence with compact cylindrical branches 3. *K. solidaginoides*
- aa. Leaf blades totally pinnately veined with narrowly cuneate bases; inflorescence with broadly paniculate branches.
- b. Lower leaf surface with 50 or more glandular punctations per mm²; younger stems and petioles minutely puberulous; pappus bristles narrower at the tips 4. *K. wetmorei*
- bb. Lower leaf surface with 5–10 glandular punctations per mm²; younger stems and

petioles coarsely hirsute; pappus bristles often as broad near the tips as at the base.

- c. Heads 4–5 mm high with 8–10 florets; involucre bracts very broad, rounded to obtuse 1. *K. dukei*
 cc. Heads 5–6 mm high with 12–30 florets; involucre bracts narrowly ovate to lanceolate, sharply acute 2. *K. panamense*

1. ***Koanophyllon dukei*** R. M. King & H. Robinson, *Phytologia* 28: 68. 1974.
 TYPE: Panama, Chiriquí, *Kirkbride & Duke 1038* (MO).

Shrubs to 2 m tall with few to many branches; stems with slightly fleshy surface, usually grayish, slightly wrinkled, densely and coarsely hirsute on younger parts, glabrescent. *Leaves* opposite; blades papyraceous, elliptical to broadly elliptical, 8–16 cm long and 3.3–6.3 cm wide, the base narrowly cuneate, the margins sharply serrate to serrulate, the apex narrowly short-acuminate, the surface glabrate with slightly puberulous veins, sparsely glandular-punctate below with 5–10 glands per mm², the secondary veins pinnate, veinlets prominently closely reticulate; petioles slender, hirsute, 1–2 cm long. *Inflorescence* pyramidal with broadly paniculate branches, the ultimate branches 1–2 mm long, densely puberulous. *Heads* 4–5 mm high with 8–10 florets; involucre bracts ca. 15, subimbricate, unequal, in 2–3 series, broadly ovate to oblong, the apex rounded to obtusely acute, the outer surface mostly 3-striate, the outer bracts more puberulous with a marginal fringe of short hairs, the inner bracts easily deciduous, reaching level of base or sometimes to middle of mature corolla; corolla greenish-white, 2.0–2.5 mm long, glabrate, with distinct cluster of capitate glands on outer surface of lobes. *Achenes* 1.3–2.3 mm long, with a few glands or bristles, the bristles mostly on upper part of ribs, the achene base narrowed with a prominent small carpodium; pappus of ca. 30 stout closely contiguous bristles, many bristles with tips as wide as base.

Koanophyllon dukei is an endemic of the Chiriquí region in Panama. The species is distinguished from its Panamanian relatives by the smaller number of florets per head and by the broader more blunt involucre bracts. The smaller heads with fewer florets resemble those of the common *K. hylonomum* (B. L. Robinson) R. M. King & H. Robinson of Costa Rica but the latter has only minutely puberulous, less fleshy stems and dense glandular punctation on the lower leaf surface.

CHIRIQUÍ: Between Pinola and Quebrada Seco on Chiriquicito-Caldera trail, *Kirkbride & Duke 1038* (MO). Between Quebrada Seco and Quebrada nearer Caldera on Chiriquicito-Caldera trail, *Kirkbride & Duke 1008* (MO).

2. ***Koanophyllon panamense*** R. M. King & H. Robinson, *Phytologia* 28: 67. 1974. TYPE: Panama, vic. of El Valle de Antón, Coclé, *Allen 1997* (US, holotype; F, MO, isotypes).

Shrubs or small *trees* to 6 m high with few to many branches; stems with slightly fleshy surface, usually grayish, terete to slightly angular, densely and coarsely hirsute on younger parts, glabrescent. *Leaves* opposite; blades papyraceous to rather coriaceous, broadly to narrowly elliptical, mostly 12–22 cm long and 5–9 cm wide, the base narrowly cuneate, the margins serrate to serrulate,

the apex narrowly short-acuminate, the surface sparsely pilose mostly on veins, sparsely glandular-punctate below, 5–10 glands per mm², the secondary veins pinnate, veinlets prominently and closely reticulate; petioles often rather stout, 1–3 cm long. *Inflorescence* pyramidal, the branches broadly paniculate, the ultimate branches 2–5 mm long, laxly puberulous. *Heads* 5–6 mm high with usually 12–20 florets; involucre bracts ca. 20, subimbricate, somewhat unequal, in 2–3 series, broadly ovate to lanceolate, the apex sharply acute, the outer surface sparsely puberulous and sometimes glandular-punctate, 3–5-striate, the inner bracts easily deciduous, reaching to level of basal third or middle of mature corolla; corolla white, ca. 3 mm long, with a few capitate glands on outer surface of lobes. *Achenes* 2–3 mm long with many bristles mostly on ribs, the achene base narrow with a small short tapering carpodium; pappus of ca. 25–30 stout closely contiguous bristles, many bristles with tips as wide as base.

Koanophyllon panamense seems related to the sympatric *K. wetmorei* by the large number of flowers per head and by the rather sharply pointed lanceolate involucre bracts. However, in the less glandular-punctate lower leaf surfaces and the stouter pappus setae, the species is more like the widely distributed *K. pittieri* (Klatt) R. M. King & H. Robinson of Mexico and Central America with which it has been confused in the past. The species differs from both relatives in the coarsely hirsute younger stems and petioles.

One specimen has been seen from Costa Rica having 15–16 florets per head and coarsely hirsute stems as in *K. panamense*. The position of the Costa Rican specimen remains unresolved because of the presence of much broader blunter involucre bracts and the presence of generally denser glandular punctations on the lower leaf surface.

BOCAS DEL TORO: Water Valley, *von Wedel* 744 (MO). COCLÉ: Vic. of El Valle de Antón, 600 m, *Allen* 1997 (F, MO, US). El Valle de Antón, *D'Arcy & D'Arcy* 6733, 6741 (both MO). Club Campestre, ca. 700 m, *Duke* 13257 (FSU, MO). Between Pilon and El Valle de Antón, 700–900 m, *Duke & Dwyer* 13953 (MO). El Valle, *Dwyer* 1835 (F, MO). PANAMÁ: Cerro Campana, *Croat* 12073, 12159 (both MO). Cerro Campana, ca. 3000 ft, *Dwyer & Kirkbride* 7858 (MO). Cerro Campana, 2700–3000 ft, *Duke* 8643 (MO, OS, US). La Campana, Cerro Campana, *Ebinger* 933 (MO). Cerro Campana, *Gentry* 1826, 5780 (both MO). SW slopes of mtns. near Chica, *King* 5335 (US). Cerro Campana, 2900 ft, *McDaniel* 6868 (FSU).

3. *Koanophyllon solidaginoides* (H.B.K.) R. M. King & H. Robinson, *Phytologia* 22: 151. 1971.—FIG. 27.

Eupatorium solidaginoides H.B.K., Nov. Gen. Sp. Pl. 4: 99. ed. fol. 1818. TYPE: Ecuador, between Ticsan and Alausi, *Humboldt & Bonpland* (P, not seen, US, photo).

E. syringaeifolium Turcz., Bull. Soc. Imp. Naturalistes Moscou 24(1): 169. 1851. TYPE: Ecuador, ravines near Ibarra, *Jameson* 676 (US, isotype).

E. filicaule Shultz-Bip. ex A. Gray, Proc. Amer. Acad. Arts 21: 384. 1886. TYPE: Mexico, Tlacolula, *Ehrenberg* 1176 (B, destroyed; US, isotype).

E. decussatum Klatt, Bull. Soc. Roy. Bot. Belgique 35: 295. 1896. TYPE: Costa Rica, Río Virilla, near San Juan, *Tonduz* 9869 (BR).

Ophryosporus solidaginoides (H.B.K.) Hieron., Bot. Jahrb. Syst. 29: 4. 1900.

Eupatorium scoparioides L. O. Williams, Fieldiana, Bot. 36: 102. 1975. TYPE: Guatemala, Petén, abiertos de Poptún, *Molina* 11595 (F, holotype; US, isotype).

Shrubs or *subshrubs* often with long arching or subscandent branches; stems

slender, to 2 m long, terete, scarcely striate, minutely puberulous. *Leaves* opposite; blades rather membranaceous, ovate, 5–12 cm long and 3–6 cm wide, the base truncate to cordate, the margins serrate-crenate, the apex caudate-acuminate, the upper surface sparsely pilose, the lower surface with numerous glandular punctations, puberulous to subtomentellous on veins, the base prominently trinervate; petioles slender, 1–2 cm long. *Inflorescence* pyramidal, the branches compact, rather spicate, the ultimate branches 1–3 mm long, densely puberulous. *Heads* 4–6 mm high with 10–15 florets; involucre bracts ca. 15, sometimes purple tinged, eximbricate, mostly subequal, in 2–3 series, narrowly oblong or lanceolate, the apex narrowly acute, the outer surface minutely puberulous and glandular-punctate, a few outer bracts more densely puberulous, the inner bracts persistent; corolla white, 2–3 mm long, with scattered capitate glands, many glands on outer surface of lobes. *Achenes* 2–3 mm long with many bristles on sides and ribs, the base narrow with a small short tapering carpodium; pappus of ca. 30 slender scarcely contiguous bristles.

Koanophyllon solidaginoides is widely distributed from central Mexico south through Central America and the Andes to northern Peru with an isolated population in the Galapagos. The species is cited as a calciphile by B. L. Robinson in Standley (1926).

CHIRIQUÍ: Between Hato del Jobo and Cerro Vaca, 700–1000 m, *Pittier* 5294 (US).
PANAMÁ: Cerro Campana, ca. 750 m, *Kennedy et al.* 2065 (MO).

4. ***Koanophyllon wetmorei*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 28: 67. 1974.

Eupatorium hypomalacum var. *wetmorei* B. L. Robinson, *Contr. Gray Herb.* 104: 17. 1934.
TYPE: Panama, Barro Colorado Island, *Wetmore & Abbe* 77 (GH, holotype; F, isotype).

Shrubs or small *trees* 2–3 m tall with few to many branches; stems not fleshy, usually grayish-brown, terete to slightly ridged, densely minutely puberulous and sparsely glanduliferous. *Leaves* opposite; blades papyraceous, narrowly elliptical, mostly 12–20 cm long and 3.5–6.5 cm wide, the base narrowly cuneate, the margins serrulate to nearly entire, the apex slightly acuminate, long and narrow, the upper surface glabrate, the lower surface with a few hairs on veins and with many glandular punctations with 50 or more glands per mm², the secondary veins pinnate, the reticulations of veinlets not prominent; petioles usually slender, 1.0–3.5 cm long. *Inflorescence* pyramidal, the branches broadly paniculate, the bracts narrow or with narrow bases, the ultimate branches 1–5 mm long, minutely puberulous. *Heads* 5–6 mm high with 12–23 florets; involucre bracts ca. 20, subimbricate, unequal, in ca. 3 series, lanceolate, the apex sharply acute, the outer surface sparsely puberulous and often sparsely glandular with ca. 3 striations, the inner bracts easily deciduous, reaching to level of middle of mature corolla; corolla white, 3.0–3.5 mm long, mostly glabrous, distinct cluster of capitate glands on outer surface of lobes. *Achenes* ca. 2.5 mm long, with many short bristles on ribs and upper surfaces, the achene base narrow with small short tapering carpodium; pappus of 27–30 contiguous bristles, the apices mostly slender.

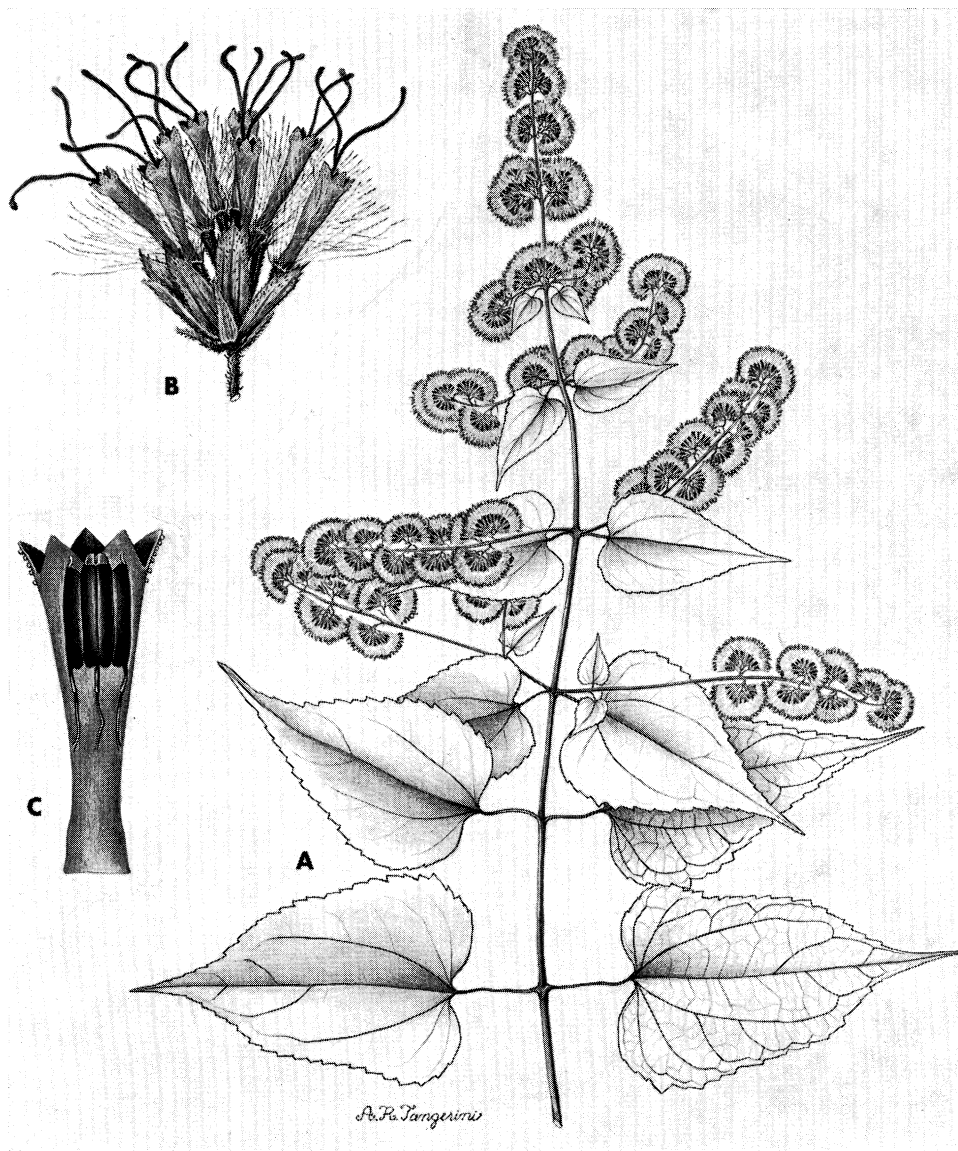


FIGURE 27. *Koanophyllon solidaginoides* (H.B.K.) R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 4\frac{1}{5}$).—C. Corolla ($\times 12\frac{3}{5}$).

Koanophyllon wetmorei is known only from Panama and adjacent Costa Rica. The species was originally described as a variety of *Koanophyllon hypomalacum* (B. L. Robinson) R. M. King & H. Robinson of Guatemala, but the latter differs by the leaves having obvious short whitish puberulence below and by the bracts of the inflorescence being short with prominently enlarged carnosse bases. The Panamanian material is actually more closely related to the geographically more closely associated species *K. pittieri* (Klatt) R. M. King & H. Robinson and *K.*

hylonomum (B. L. Robinson) R. M. King & H. Robinson, both occurring in Costa Rica. The relationship is particularly close to *K. hylonomum* which has similarly densely glandular-punctate lower leaf surfaces, but the latter species has smaller heads born in denser clusters, has shorter blunt involucre bracts, has only 10–11 florets per head, and has stouter pappus bristles.

A few specimens collected in southernmost Costa Rica seem to also belong to *K. wetmorei*, but these have less sharply pointed involucre bracts than the Panamanian plants.

BOCAS DEL TORO: Vic. of Chiriquí Lagoon, *von Wedel* 1317 (MO). Water Valley, vic. of Chiriquí Lagoon, *von Wedel* 1417 (MO). CANAL ZONE: Barro Colorado Island, *Croat* 7128 (F, MO), 8144 (MO), 9554, 13110 (both F, MO), 13273 (MO); *Brown* 177 (F); *Graham* 201 (MICH); *Shattuck* 655 (F, MO); *Wetmore & Abbe* 77 (F, GH), 87 (MO). PANAMÁ: Hills above Campana, 600–800 m, *Allen* 1321 (F, MO, US).

27. MIKANIA

Mikania Willd., Sp. Pl., ed. 4. 3(3): 1742. 1803. TYPE: *Eupatorium scandens* L. typ. cons.

Carelia A. L. Jussieu ex Cav., Anales Ci. Nat. 6. 1802 (1803), not *Carelia* G. Pontederia ex P. C. Fabricius 1759. TYPE: *C. satureiaefolia* Cav. = *Mikania amara* Willd.

Corynanthelium Kunze, Linnaea 20: 19. 1847. TYPE: *C. moronoa* Kunze.

Morrenia Kunze, Linnaea 20: 1847, nom. nud. pro syn. TYPE: *M. odorata* Kunze, nom. nud. *Moronoa* Kunze, error for *Morrenia*.

Willoughbya Neck. ex Kuntze, Rev. Gen. Pl. 371. 1891. TYPE: *Eupatorium scandens* L.

Vines or reclining weak *shrubs*, perennial, with few to many branches. *Leaves* opposite or rarely verticillate, distinctly petiolate; blades broadly ovate to linear, often cordate or hastate, sometimes dissected. *Inflorescence* paniculate with paniculate, racemose, spicate, corymbose or subcymose branches; pedicels present or lacking. *Heads* discoid with 4 florets; involucre of 4 subequal bracts, usually with a fifth distinct subinvolucre bract; receptacle flat, glabrous; corolla white or sometimes pink, funnellform to broadly campanulate, often with a distinct tube, 5-lobed, the lobes short to elongate, the corolla cells usually large or quadrate with straight walls, sometimes forming papillae on lower inside surface of the limb; anthers exserted, the anther collar with quadrate to short-oblong cells and inornate walls, the anther appendage as long as broad or longer; nectary usually elongate; the style base often stout, usually without a distinct enlargement, usually glabrous, sometimes papillose, the style appendages linear without enlarged tip, densely papillose, glanduliferous. *Achenes* prismatic, 4–10-ribbed, glabrous or with glands or bristles; carpodium short-cylindrical with mostly subquadrate cells; pappus of ca. 35–60 scabrous bristles in 1–2 series, the apical cells usually blunt.

Mikania is a genus of about 300 species ranging from the eastern United States through Mexico, Central America, and the West Indies into South America. A few species are credited to the eastern hemisphere. Fourteen species have been collected in Panama. A useful treatment of *Mikania* in Venezuela is presented by Aristeguieta (1964).

Literature:

Holmes, W. C. & S. McDaniel. 1976. Notes on *Mikania* (Compositae). II. Phytologia 33: 1–3.

Robinson, B. L. 1922. II. The Mikanias of northern and western South America. Contr. Gray Herb. 64: 21–116.

———. 1934a. II. The variability of two wide-ranging species of *Mikania*. Contr. Gray Herb. 104: 49–55.

———. 1934b. III. *Mikania scandens* and its near relatives. Contr. Gray Herb. 104: 55–71.

Steyermark, J. A. 1953. Compositae. In Contributions to the flora of Venezuela —Botanical exploration in Venezuela III. Fieldiana, Bot. 28: 620–678.

- a. Panicles with elongate racemose or spicate branches.
 - b. Leaves distinctly puberulous and glandular-punctate; heads 7–9 mm high; stems never fistulose 11. *M. psilostachya*
 - bb. Leaves with few hairs and not prominently glandular-punctate; heads 4–6 mm high; stems often fistulose.
 - c. Heads pedicellate 6. *M. houstoniana*
 - cc. Heads sessile 7. *M. leiostachya*
- aa. Panicles with paniculate or corymbose branches.
 - d. Stems and leaves densely villous; corollas broadly campanulate; stems never fistulose 2. *M. banisteriae*
 - dd. Stems and leaves puberulous to glabrous, not densely villous; corollas broadly campanulate to narrowly funnelform; larger stems often fistulose.
 - e. Leaf blades with cordate bases.
 - f. Heads 8–9 mm high; corolla lobes elongate, longer than the throat 3. *M. cordifolia*
 - ff. Heads 4–5 mm high; corolla lobes short, not as long as the throat.
 - g. Leaves, involucre bracts, and corollas with prominent reddish glandular punctations; corollas narrowly campanulate; style base densely papillose 1. *M. amblyolepis*
 - gg. Leaves, involucre bracts, and corollas with pale glands; corollas broadly campanulate; style base glabrous 9. *M. micrantha*
 - ee. Leaf blades with rounded to cuneate bases.
 - h. Style appendages hirsute with long papillae; style base papillose; inflorescence with regularly corymbose branches with heads almost all in groups of 3.
 - i. Leaves coriaceous, bases of blades mostly rounded to slightly cuneate, lower surface with slightly reticulate veins and few hairs or glands 14. *M. zonensis*
 - ii. Leaves papyraceous, bases of blades distinctly cuneate, lower surface with reticulate veins not prominent and with numerous hairs and glands 4. *M. guaco*
 - hh. Style appendages not hirsute, with short papillae; style base glabrous; inflorescence without regularly corymbose branches with heads not all in groups of 3.
 - j. Heads individually pedicellate; inflorescence an irregularly corymbose panicle 13. *M. tysonii*
 - jj. Heads sessile in pairs or clusters; inflorescence a regular panicle with paniculate branches.
 - k. Heads usually 10 or more in glomerate clusters; corollas slender below but without sharply demarcated tube 12. *M. tonduzii*
 - kk. Heads in pairs or clusters of 3–5; corollas with sharply demarcated tube.
 - l. Leaves oblong-ovate to oblong-lanceolate, tertiary veins closely and regularly transverse; heads ca. 5 mm high 8. *M. miconioides*
 - ll. Leaves narrowly to broadly ovate, tertiary veins not in a regular transverse pattern; heads 7–9 mm high.
 - m. Leaves caudate-acuminate, glabrous, with prominent included branched vein endings 10. *M. pittieri*
 - mm. Leaves acute to scarcely acuminate, sparsely puberulous, included vein endings not prominent 5. *M. hookeriana*

1. ***Mikania amblyolepis***⁹ B. L. Robinson, Contr. Gray Herb. 61: 11. 1920. TYPE: Colombia, Bolívar, Buena Vista, *Pennell 4002* (US, isotype).

Mikania panamensis B. L. Robinson, Contr. Gray Herb. 104: 41. 1934. TYPE: Panama, around Culebra, Canal Zone, 50–150 m, *Pittier 2191* (US).

Slender, sparingly branched *vines* with numerous reddish glands on leaves, branches of inflorescence, and involucre bracts; stems yellowish to reddish, mostly terete, slightly striate, slightly puberulous, usually fistulose. *Leaves* opposite; blades broadly ovate, to 6 cm long and 4.5 cm wide, the base cordate to deeply cordate, the margins with few to many blunt dentations, the apex bluntly acute to narrowly long-acuminate, the surface glabrous except for numerous reddish glandular punctations, strongly trinervate from the base; petioles slender, 1.0–3.5 cm long. *Inflorescence* a corymbose panicle with subcymose branches, the heads often in clusters of 3; ultimate branches to 2 mm long, short-puberulous and reddish glandular-punctate. *Heads* 4.5–5.0 mm high; subinvolucre bract narrowly elliptical to lanceolate, ca. 2 mm long, the subinvolucre and outer involucre bracts puberulous and reddish glandular-punctate; involucre bracts oblong with rounded somewhat fimbriate tips, ca. 4 mm long, ca. 1 mm wide; corolla white, 2.0–2.5 mm long, the tube short, 0.5–0.8 mm long, the limb narrowly funnelliform with scattered papillae on the lower inside surface, the lobes about as long as wide and partially recurved when old, the outer surface with scattered reddish glands, the corolla cells oblong, 25 μ or less wide; anther appendages firm, triangular-ovate; style bases densely papillose, the style appendages with short papillae. *Achenes* 4–5-ribbed, ca. 1.5 mm long, with many scattered yellowish glands; pappus of ca. 30 slender bristles in 1 series, the tips scarcely enlarged.

Mikania amblyolepis seems to be restricted to Panama and northern Colombia. The species can be distinguished readily from the related *M. micrantha* by the numerous reddish glandular punctations and the round-tipped involucre bracts. Other significant differences are the narrow limb of the corolla and the densely papillose base of the style.

CANAL ZONE: Around Culebra 50–150 m, *Pittier 2191* (US). Balboa, *Standley 25634, 29297, 30879* (all US). DARIÉN: Río Chico, from Yaviza at junction with Río Chucunaque to ca. 1 hour by outboard from junction, *Burch et al. 1084* (US). 0–4 mi up Río Sabana from Santa Fe, *Duke 4163* (MO). Summit Camp, between Sasardí and Mortí, ca. 400 m, *Duke 10035* (MO, FSU). Río Sabana, ca. 4 mi above Santa Fe, ca. 25 m, *Duke 10214* (MO, OS). 2 mi E of Santa Fe, *Tyson et al. 4820* (MO). PANAMÁ: 5–6 mi E of Chepo, *Duke 4053* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 50* (MO). Pearl Island, *Johansen 115* (US). SAN BLAS: Sasardí, ca. 20 m, *Duke 10130* (MO, OS). Eslogandi, ca. 200 m, *Duke 10194* (MO, OS).

2. ***Mikania banisteriae*** DC., Prodr. 5: 193. 1836. TYPE: Brasil, *Poeppig 135* (G-DC, holotype, not seen, US, microfiche; F, isotype not seen, US, photo).—FIG. 28.

M. ruiziana Poepp. in Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 53. 1845. TYPE: Peru, Cuchero, *Poeppig 1473* (W, not seen; B, destroyed, US, photo)

M. caudata Benth., Pl. Hartw. 201. 1845. TYPE: Colombia, in sylvis prope Guaduas, Bogotá, *Hartweg 1112* (K, not seen).

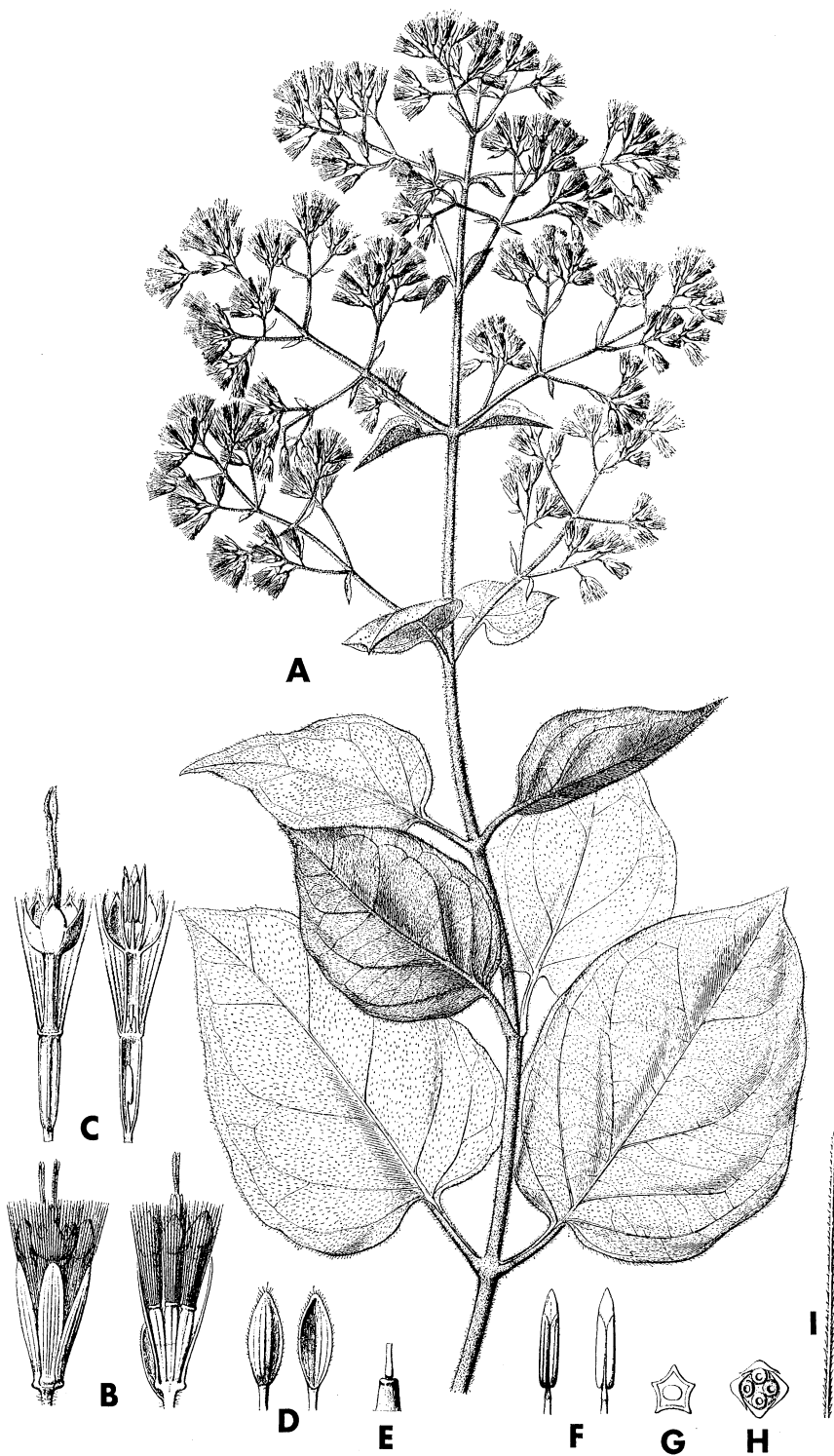
⁹ W. C. Holmes, Mississippi State University is credited for pointing out the priority of this name.

- M. ruiziana* Poepp. var. *lehmanniana* Hieron., Bot. Jahrb. Syst. 19: 45. 1894. TYPE: Colombia, near Dolores, Tolima, 1000–1800 m, *Lehmann* 7483 (K, not seen; F, not seen, US, photo).
Willoughbya ferruginea Rusby, Mem. Torrey Bot. Club 6: 58. 1896. TYPE: Bolivia, Guanai-Tipuani, *Bang* 1419 (NY, holotype, not seen; US, isotype).
Mikania antioquiensis Hieron., Bot. Jahrb. Syst. 28: 580. 1901. TYPE: Colombia, prope Santa Domingo, Cancan et Amalfi, 1500–2000 m, *Lehmann* 7971 (US).
M. antioquiensis Hieron. var. *subcuneata* B. L. Robinson, Contr. Gray Herb. 104: 32. 1934. TYPE: Peru, Iquitos, trail to San Juan, Loreto, *Mexia* 6492 (US).
M. ferruginea Rusby var. *subglabra* B. L. Robinson, Contr. Gray Herb. 104: 36. 1934. TYPE: Bolivia, San Carlos, Mapiri, *Buchtien* 1576 (US).
M. almagroi Cuatr., Anales Univ. Madrid 4, fasc. 2: 233. 1935. TYPE: Ecuador, San José, *Isern* 368 (MA, not seen).
M. skutchii Blake, Brittonia 2: 333. 1937. TYPE: Costa Rica, El General, 1130 m, *Skutch* 2514 (US).
M. canaquensis Badillo, Bol. Soc. Venez. Ci. Nat. 9: 132. 1944. TYPE: Venezuela, Canaguá, Mérida, *Badillo* 562 (VEN).
M. molinensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 296. 1946. TYPE: Venezuela, near El Molino, between Canaguá and Sta. Cruz de Mora, Mérida, *Badillo* 610 (VEN).
M. oniaensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 297. 1946. TYPE: Venezuela, along Río Onia, near Bolero, N. of Mesa Bolívar, Mérida, *Steyermark* 56736 (VEN).
M. kavanayensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 300. 1946. TYPE: Venezuela, Gran Sabana, between Mission of Santa Teresita de Kavanayén NW to Río Karuái, Bolívar, *Steyermark* 59374 (VEN, photo US).
M. ptaretepuensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 302. 1946. TYPE: Venezuela, Petaretepuí, Bolívar, *Steyermark* 59936 (VEN).
M. meridana Badillo, Bol. Soc. Venez. Ci. Nat. 10: 303. 1946. TYPE: Venezuela, Montaña de San Jacinto, Mérida, *Steyermark* 56667 (VEN).
M. bergantinensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 304. 1946. TYPE: Venezuela, Cerro San José, between Bergantín and Cerro Peonía, Anzoátegui, *Steyermark* 61540 (VEN).
M. banisteriae DC. f. *lehmanniana* (Hieron.) Steyerm., Fieldiana, Bot. 28: 657. 1953.
M. banisteriae DC. f. *subglabra* (B. L. Robinson) Steyerm., Fieldiana, Bot. 28: 657. 1953.

Coarse *vines* with few branches; stems and leaves densely yellowish-villous; stems brownish, terete, striate, not fistulose. *Leaves* opposite; blades broadly ovate to ovate-lanceolate, to 18 cm long and 10 cm wide, the base rounded to cordate, the margins entire or with remote denticulations, the apex acute to narrowly short-acuminate, the surface densely villous with stout hairs, without glandular punctations, pairs of secondary veins prominent near the base and near the basal fourth; petioles rather stout, to 2 cm long. *Inflorescence* a pyramidal panicle with paniculate branches, the ultimate branches 1–4 mm long, densely hirtellous. *Heads* 7–9 mm high; subinvolucral bract ovate to obovate, 2.5–4.0 mm long with few to many abaxial hairs; involucral bracts broadly oblong with rounded tips, 3–5 mm long and 1 mm wide, glabrate; corolla whitish or pinkish, 4.5–5.0 mm long, the tube 2 mm long, the limb abruptly broadly campanulate, the lobes triangular, 1.0–1.5 mm long, 0.7–1.0 mm wide, with a few apical hairs; anther appendages firm, oblong-ovate, 1½ times as long as wide; style base slightly thickened, glabrous, the style appendages with only short papillae. *Achenes* with 5 ribs, 3–4 mm long, with a few long hairs along the costae, the base of achene

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FIGURE 28. *Mikania banisteriae* DC.—A. Habit ($\times \frac{1}{2}$).—B. Heads ($\times 2\frac{1}{5}$).—C. Florets ($\times 3\frac{3}{4}$).—D. Subinvolucral bract ($\times 3\frac{3}{4}$).—E. Nectary and base of style ($\times 8\frac{3}{4}$).—F. Stamens ($\times 33$).—G. Achene cross section ($\times 11\frac{1}{4}$).—H. Head cross section ($\times 5\frac{3}{5}$).—I. Pappus bristle ($\times 11\frac{1}{4}$). [After Martius, Flora Brasiliensis 6(2): plate 71. 1876.]



slightly attenuated; carpopodium small; pappus of ca. 35–50 slender bristles, the tips of the bristles often slightly enlarged.

Mikania banisteriae is widely distributed from Costa Rica to the Amazon Basin of Brazil and reaches south to Bolivia. Many variations have been named as distinct species. The present broad concept follows mostly that of Steyermark (1953) with the exclusion of *M. monagasensis* Badillo of Venezuela (see Aristeguieta, 1964) and *M. lanuginosa* DC. of southeastern Brazil, and with the inclusion of *M. skutchii* Blake of Costa Rica. The excluded species listed above, as well as *M. eriophora* Schultz-Bip. and the doubtfully distinct *M. pyramidata* D.Sm. both of Mexico and northern Central America, can be distinguished from *M. banisteriae* by the leaves being distinctly trinervate from at or very near the base of the blade. In *M. banisteriae* the leaves are less strongly trinervate from higher on the blade, nearer the basal fourth.

PANAMÁ: Past Cerro Jefe toward La Eneida, *Croat* 13095 (MO). Cerro Azul, *Duke* 9380 (MO, US). Cerro Jefe, *Dwyer* 8494 (MO). Cerro Jefe, 2700–3000 ft, *Tyson et al.* 3277 (MO). VERAGUAS: 5 mi NW of Santa Fe, 700–1200 m, *Croat* 23191 (MO).

3. *Mikania cordifolia* (L.f.) Willd., Sp. Pl., ed. 3. 1746. 1804.

Cacalia cordifolia L.f., Suppl. Pl. 351. 1781. TYPE: Colombia, *Mutis* 1818 (US).

Mikania mollis H.B.K., Nov. Gen. Sp. Pl. 4: 105. ed. fol. 1818. TYPE: Peru, Guancabamba River, *Humboldt & Bonpland* (P, not seen, US, microfiche).

M. suaveolens H.B.K., Nov. Gen. Sp. Pl. 4: 106. ed. fol. 1818. TYPE: Colombia, near Guaruma, *Humboldt & Bonpland* (P, not seen, US, microfiche).

M. poeppigii Spreng., Syst. Veg. 3: 422. 1826. TYPE: Cuba, *Poeppig* (P?, not seen; W?, not seen).

M. gonoclada DC., Prodr. 5: 199. 1836. TYPE: Mexico, Tampico, Tamaulipas, *Berlandier* 137 (G-DC, not seen, US, microfiche).

M. convolvulacea DC., Prodr. 5: 199. 1836. TYPE: Santo Domingo, *Poiteau* (G-DC, not seen, US, microfiche).

Eupatorium marquezianum Gomez de la Maza, Dicc. Bot. Nom. Vulgares Cubanos & Puerto-Riquenos 54. 1889, new name for *Mikania mollis* H.B.K., not *Eupatorium molle* H.B.K.

Willoughbya cordifolia (L.f.) Kuntze, Rev. Gen. Pl. 1: 372. 1891.

Slender sparingly branched *vines*; stems yellowish-green to brownish, rather hexagonal, slightly striate, glabrate to minutely puberulous, the larger stems sometimes fistulose. *Leaves* opposite; blades broadly ovate 5–15 cm long and 3–12 cm wide, the base cordate to deeply cordate, the margins subentire to coarsely and bluntly dentate, the apex usually distinctly short-acuminate, the surface densely short-puberulous to glabrate with distinct glandular punctations below, the venation strongly trinervate from base; petioles slender, 2.0–5.5 cm long. *Inflorescence* a corymbose panicle with subcymose branches; heads often in clusters of 3; ultimate branches to 3 mm long, puberulous to glabrate. *Heads* ca. 8–9 mm high; subinvolucral bract broadly elliptical to obovate, 3.0–4.5 mm long, acute to short-acuminate, sparsely to densely puberulous; involucral bracts oblong-lanceolate with short to long-acute tips, 6–7 mm long, ca. 1 mm wide, the outer pair usually distinctly puberulous; corolla white, ca. 4 mm long, the tube narrow, 1.5–2.0 mm long, the limb narrowly campanulate, cleft to about middle into narrow lobes, scattered glands on outer surface, few to many papillae on the lower surface within, cells subquadrate and ca. 25 μ wide; anther appendages firm,

triangular, about twice as long as wide; style base glabrous, the style appendage with short papillae. *Achenes* 5-ribbed, 1.5–2.0 mm long, the sides sparsely puberulous; pappus of 50–60 slender bristles mostly in 1 series, slightly enlarged apically.

Mikania cordifolia is a widely distributed species ranging from the southern United States through Mexico, Central America, and the West Indies into South America. The species seems superficially just an enlarged form of *M. micrantha*. In addition to the size of the heads, however, *M. cordifolia* differs by the more hexagonal somewhat less fistulose stems, by the usually more pubescent subinvolucral bracts, by the narrower limb of the corolla, and by the deeply cut, elongate corolla lobes.

CANAL ZONE: Chagres, *Fendler 151* (MO, US). Las Cruces Trail, 75 m, *Hunter & Allen 704* (MO). Near old Fort Lorenzo, mouth of Río Chagres, *Piper 5903* (US). CHIRIQUÍ: Cerro Respinga above town of Cerro Punta, 8400 ft, *D'Arcy & D'Arcy 6564* (MO). Palo Santo, 3 mi N of Volcán, *Croat 13579* (MO). Boquete, Cerro Horqueta, 5000–6000 ft, *Dwyer & Hayden 7689* (MO, REED, US). Burica Peninsula, 6 km W of the airport of Puerto Armuelles, 100–200 m, *Liesner 3* (MO). COCLÉ: Near La Mesa, *Croat 13363* (MO). DARIÉN: Agua Fria, ca. 8 mi N of Santa Fe, ca. 50 m, *Duke 10114* (MO, OS). PANAMÁ: San José Island, *Johnston 1348* (MO, US). Pearl Islands, Trapiche Island, *Miller 1884* (US). Punta Paitilla, *Standley 30803* (US).

4. ***Mikania guaco*** H. & B., Pl. Aeq. 2: 84. 1809. TYPE: Colombia, Magdalena River between Mahates & Angostura, *Humboldt & Bonpland* (P, not seen, US, microfiche).

M. amara var. *guaco* (H. & B.) Baker in Mart., Fl. Bras. 6(2): 237. 1876.

Willoughbya guaco (H. & B.) Kuntze, Rev. Gen. Pl. 1: 372. 1891.

Mikania olivacea Klatt, Bull. Soc. Roy. Bot. Belgique 31: 195. 1892 (1893). TYPE: Costa Rica, forêts de Buenos-Aires, 2300 m, *Pittier 4433* (BR?, not seen; GH?, not seen).

Coarse sparingly branched *vines*; stems mostly brownish, terete, striate, glabrate, usually fistulose. *Leaves* opposite; blades broadly ovate, to 25 cm long and 15 cm wide, the base short-acute to acuminate, the margins entire, the apex broadly to narrowly short-acuminate, the upper surface sparsely puberulous and with minute spicules, the lower surface rather densely short-puberulous with numerous yellowish glandular punctations, the veins mostly pinnate; petioles slender, to 4.5 cm long. *Inflorescence* rather densely corymbose with almost all heads in clusters of 3, the ultimate branches ca. 0–1 mm long. *Heads* ca. 8–10 mm high; subinvolucral bract linear-lanceolate, to 2 mm long, short-puberulous; involucral bracts oblong with rounded tips, 5–6 mm long, ca. 1 mm wide, the outer pair puberulous; corolla whitish, ca. 6 mm long, the tube narrow, 2.5–3.0 mm long, the limb narrowly funnelform, the lobes short-triangular, about as long as wide, with scattered slender hairs on the outer surface, the cells subquadrate and ca. 25 μ wide; anther appendages firm, triangular, about twice as long as wide; style base slender, usually sparsely papillose, the style appendages hirsute with many long papillae. *Achenes* with 5 ribs or grooves, thickly corticated and terete when fully mature, ca. 4 mm long, the sides sparsely puberulous; pappus of ca. 50 slender bristles which are not or only slightly enlarged apically.

Mikania guaco is widely distributed in tropical America from Mexico to Brazil and is the most common representative of a group that has heads almost all in

groups of 3–5, style branches hirsute with long papillae, and achenes highly corticated when fully mature. A close relative, *M. parviflora* (Aubl.) Karst., distinguished by its broad subinvulcral bracts, seems to occur as close to Panama as the Chocó in Colombia. More distant geographically is *M. trinitaria* DC. of Venezuela, Guayana, and adjacent Brazil. The latter has large bracts as in *M. parviflora*, but also has a deeply cleft corolla with long narrow lobes.

BOCAS DEL TORO: Vic. of Chiriquí Lagoon, Bustimentos "lighthouse," von Wedel 2920 (MO, US). CANAL ZONE: Chagres, Fendler 153 (MO, US). Vic. of Fort Sherman, Standley 30989 (US). CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, upper valley of Río Chiriquí Viejo, 1500–2000 m, Allen 1578 (MO, US). 1 mi E of Cañas Gordas, near Costa Rican Border, 800–1200 m, Liesner 281 (MO). Pastures around El Boquete, 1000–1300 m, Pittier 2996 (US). DARIÉN: Río Sambú, 0.5 mi above Río Venado, Duke 9292 (MO, OS, US). Asnati, 200–300 m, Duke 10050 (MO). Helipad, Camp Cañasas, Upper Río Sabana tributary, 312 ft, Duke 15547 (OS, REED). Along the Sambú River, Pittier 5544 (US). PANAMÁ: San José Island, Johnston 1372 (MO, US), 1279 (US), 1319 (MO, US). Cerro Campana, 2700 ft, McDaniel 6901 (FSU, MO).

5. *Mikania hookeriana* DC., Prodr. 5: 195. 1836. TYPE: British Guiana, Schomburgk? (K, not seen; G-DC fragment, not seen, US, microfiche).

M. badieri DC., Prodr. 5: 194. 1836. TYPE: Guadeloupe, Badier (G-DC, not seen, US, photo). *M. platyphylla* DC., Prodr. 5: 195. 1936. TYPE: Peru, Poeppig (G-DC, not seen, US, microfiche).

M. gracilis Schultz-Bip. ex Miq., Stirp. Surinam. Sel. 187. 1850. TYPE: Surinam, Hostmann & Kappler 1017 (G, MO, not seen, US, photos).

M. imrayana Griseb., Fl. Brit. W. Ind. 363. 1861. TYPE: Dominica, Imray (K, not seen).

Willoughbya imrayana (Griseb.) Kuntze, Rev. Gen. Pl. 1: 372. 1891.

W. platyphylla (DC.) Kuntze, Rev. Gen. Pl. 1: 372. 1891.

Mikania badieri DC. var. *kittsiana* Urb., Symb. Antil. 5: 220. 1907. TYPE: St. Kitts, Belmont, Britton & Cowell 385 (US).

M. vitrea B. L. Robinson, Contr. Gray Herb. 61: 22. 1920. TYPE: Venezuela, Colonia Tovar, Aragua, Fendler 2349 (GH, not seen; G not seen, US, photo).

M. hookeriana DC. var. *badieri* (DC.) B. L. Robinson, Contr. Gray Herb. 104: 52. 1934.

M. hookeriana DC. var. *kittsiana* (Urb.) B. L. Robinson, Contr. Gray Herb. 104: 52. 1934.

M. hookeriana DC. var. *platyphylla* (DC.) B. L. Robinson, Contr. Gray Herb. 104: 52. 1934.

M. hookeriana DC. var. *cardiophylla* B. L. Robinson, Contr. Gray Herb. 104: 53. 1934. TYPE: Lesser Antilles, St. Vincent, H. H. & G. W. Smith 1890 (GH, not seen).

M. hookeriana DC. var. *crassicaulis* Steyermark, Fieldiana, Bot. 28: 658. 1953. TYPE: Venezuela, Ptari-tepui, Bolivar, Steyermark 60015 (F, not seen).

M. sanjacintensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 298. 1946. TYPE: Venezuela, Montaña de San Jacinto, N side of Río Chama, Mérida, Steyermark 56665 (VEN).

Coarse usually woody, sparingly branched *vines*; stems pale to dark brownish, terete, striate, slightly puberulous to sparsely hirsute, the larger stems often fistulose. *Leaves* opposite; blades usually ovate to broadly ovate, sometimes with prominent angles, to 15 cm long and 10 cm wide, the base rounded, the margins entire, the apex short-acute to slightly acuminate, the upper surface sparsely puberulous to glabrate, the lower surface brownish puberulous, glandular punctations not prominent, the venation with two pairs of prominent secondary veins in the basal quarter, the upper pair strongly ascending and giving a trinervate aspect, the tertiary veins not prominently and regularly transverse; petioles sometimes slender, 1–5 cm long. *Inflorescence* a panicle with paniculate branches, the branches puberulous; heads in pairs or groups of 3 congested near tips of short branches, sessile. *Heads* 8–9 mm high; subinvulcral bract 1.5–2.0 mm long,

thin with few or no hairs abaxially; involucre bracts oblong with rounded tips, ca. 4 mm long including the somewhat swollen bases, ca. 1 mm wide, somewhat puberulous and glandular-punctate on outer surface; corolla whitish, fragrant, 4.5–5.5 mm long, the tube distinct, 1.0–1.5 mm long, the limb narrowly campanulate, the lobes half again as long as wide with a few glands and short hairs near the tips, the cells oblong, 15–25 μ wide, the cell walls slightly sinuous; anther appendages firm, ovate-triangular, slightly longer than wide; style base glabrous, the style appendages with short papillae. *Achenes* with 4–5 ribs, ca. 3.5 mm long, the sides with a few short hairs and glands; pappus of 40–50 slender, sometimes sharply angled, bristles mostly in 1 series, the tips not or scarcely enlarged, the apical cells often acute.

Mikania hookeriana is distributed from southern Mexico south to Peru and Brazil. The sessile heads are one of the distinctive features of the species. The extensive synonymy of the species is discussed by B. L. Robinson (1934a). Also discussed by Robinson is the superficially similar and widely distributed *M. vitifolia* DC. The latter species differs most obviously by the pedicellate heads and the more acuminate and glandular-punctate leaves. Another species, *M. angularis* H. & B. of northern South America, is very close to *M. vitifolia* but has much longer corolla lobes. No specimens of *M. vitifolia* or *M. angularis* are known from Panama.

CANAL ZONE: Barro Colorado Island, *Bangham* 597 (US). Pipeline Road, *Gentry* 1794 (MO). COCLÉ: Hills N of El Valle de Antón, trail to La Mesa, ca. 1000 m, *Allen* 2688 (MO, US). Hills above El Valle de Antón, *D'Arcy & D'Arcy* 6753 (MO). COLÓN: Vic. of Camp Piña, 25 m, *Allen* 3671 (MO). Summit of Cerro Santa Rita, 1200–1500 ft, *Allen & Allen* 5098 (MO). PANAMÁ: 7 mi N of Cerro Azul on the road to Cerro Jefe, 2600 ft, *Blum et al.* 1764 (MO, US). 3 mi above Interam. Hwy. on road to Cerro Campana, *Croat* 12055 (MO). Approach to Cerro Jefe, *Croat* 15239 (MO). Cerro Jefe, *Duke* 9446 (MO, REED). Cerro Azul, *Dwyer* 2797A (MO, US). La Campana, Cerro Campana, *Ebinger* 940 (MO, US). Cerro Jefe, 2.5 mi beyond Finca Indio, *Gentry* 2125 (MO). Cerro Campana, ca. 1000 m, *Gentry* 5763 (MO). Near Cerro Campana, *Kirkbride & Hayden* 300 (MO). Cerro Campana, 2800 ft, *McDaniel* 6832 (FSU, MO). Cerro Azul, *Porter et al.* 4151 (MO). E slope of Cerro Jefe, 2700–3000 ft, *Tyson et al.* 3338 (MO). Cerro Azul to Cerro Jefe, *Tyson et al.* 4324 (MO). Slopes of Cerro Jefe beyond Cerro Azul, *Wilbur & Wilbur* 11366 (MO).

6. *Mikania houstoniana* (L.) B. L. Robinson, Proc. Amer. Acad. Arts 42: 47. 1906.

Eupatorium houstonianum L., Sp. Pl. 836. 1753. TYPE: Mexico, Veracruz, *Houston* (BM).

E. houstonis L., Syst. Nat., ed. 10. 1204. 1759. Citation including same description as in Hortus Cliffortianus and evidently a variant of the above name based on the same type.

E. fruticosum Mill., Gard. Dict., ed. 8. 1768. (*Eupatorium* no. 6). TYPE: Cultivated, seed from Veracruz, Mexico, *Houston* (BM, not seen).

Mikania houstonis (L.) Willd., Sp. Pl. 3: 1742. 1803.

Willoughbya houstonis (L.) Kuntze, Rev. Gen. Pl. 1: 373. 1891.

Coarsely herbaceous sparingly branched *vines*; stems yellowish to brown, terete, striate, glabrate to spreading-pubescent, the larger stems usually fistulose. *Leaves* opposite; blades ovate, to 13 cm long and 10 cm wide, the base rounded to slightly cuneate, the margins entire, the apex usually somewhat abruptly short-acuminate, the surface glabrate, obscurely glandular-punctulate beneath, 2–3 pairs of prominent secondary veins arching outward and upward from the basal fifth of

the blade, the tertiary veins sometimes regularly transverse, prominent beneath; petioles slender, 1–4 cm long. *Inflorescence* a panicle with elongate strictly racemose branches, the ultimate branches 1–3 mm long arising from axils of sub-involucral bracts. *Heads* 4–6 mm high; subinvolucral bract ovate-lanceolate, 1.5–2.0 mm long, minutely puberulous; involucral bracts oblong with rounded tips, 3.0–4.5 mm long, ca. 0.8 mm wide, the outer pair minutely puberulous; corolla white, fragrant, 2.5–3.0 mm long, the tube narrow, ca. 1.5 mm long, the limb narrowly campanulate with prominent undulations on the lower inside surface, the lobes about as long as wide with few glands outside, the cells of the corolla oblong, 15–20 μ wide, mostly with sinuous walls; anther appendages firm, ovate, ca. 1½ times as long as wide; style base thickened, glabrous, the style appendages with short papillae. *Achenes* with 5 ribs, ca. 2 mm long, glabrous; pappus of ca. 35–40 slender bristles mostly in 1 series, the apices slightly enlarged.

Mikania houstoniana is distributed from Mexico southward to Bolivia. The racemose branches of the inflorescence with short pedicels from the axils of sessile bracts are a distinctive feature of the species. This species and the closely related *M. leiostachya* Benth. have narrow and sinuous-walled cells in the corolla that are rather unusual in the genus.

BOCAS DEL TORO: Bocas del Toro, *Dunlap* 168 (US).

7. *Mikania leiostachya* Benth., Pl. Hartw. 201. 1845. TYPE: Colombia, in descensu a Guaduas ad Honda, Prov. Bogotá, *Hartweg* 1110 (K, not seen).

Coarsely herbaceous sparingly branched *vines*; stems yellowish to brown, terete, striate, glabrate to minutely puberulous, the larger stems usually fistulose. *Leaves* opposite; blades ovate, to 18 cm long and 11 cm wide, the base rounded to slightly cordate, the margins entire and slightly recurved, the apex abruptly shortly caudate-acuminate, the upper surface glabrate, the lower surface short-puberulous, without evident glandular-punctations, 2–3 pairs of prominent secondary veins arching outward and upward from basal fifth of the blade, the tertiary veins regularly transverse, prominent beneath; petioles slender, 1–3 cm long. *Inflorescence* a panicle with elongate strictly spicate branches. *Heads* 5–6 mm high; subinvolucral bract ovate, acute, ca. 1.5 mm long, minutely puberulous; involucral bracts oblong with rounded tips, 3.0–3.5 mm long, ca. 0.8 mm wide, the outer pair minutely puberulous; corolla white, fragrant, 2.5–3.0 mm long, the tube narrow, 1.0–1.5 mm long, the limb narrowly campanulate with prominent undulations on the lower inside surface, the lobes 1–2 times as long as wide with a few glands outside, the corolla cells oblong, 15–25 μ wide, mostly with sinuous walls; anther appendages firm, ovate, ca. 1½ times as long as wide; style base somewhat thickened, glabrous, the style appendages with short papillae. *Achenes* with 5 ribs, 1.5–2.0 mm long, glabrous; pappus of 35–40 slender bristles in 1 series, the apices slightly to distinctly thickened.

Mikania leiostachya is known from Central America and northern South America. The species is most distinctive in the strictly spiciform branches of the inflorescence. The sessile heads seem to be the only constant difference from the widely distributed *M. houstoniana* (L.) B. L. Robinson.

CANAL ZONE: Barro Colorado Island, *Croat* 7687, 7850, 13245, 13494 (all MO). Madden Forest Road 1, *Croat* 8947 (MO). 2 mi NE of Summit Gardens, *Croat* 13795 (MO). Fort Sherman: U.S. Army Tropic Test Center Site, Skunk Hollow, *Dwyer & Robyns* 145 (MO, US). Barro Colorado Island, *Foster* 1467 (MO), 2176 (US). Gatún Station, *Hayes* 309 (MO, US). Valley of Masambi, on the road to Las Casadas Plantation, 20–100 m, *Pittier* 2671 (US). Barro Colorado Island, *Woodworth & Vestal* 558 (MO). COLÓN: Lagarto, *Cowell* 256 (US). PANAMÁ: San José Island, *Johnston* 1329 (MO, US). Río Tocumen, *Standley* 29387 (US).

8. ***Mikania miconioides*** B. L. Robinson, Contr. Gray Herb. 61: 19. 1920. TYPE: Colombia, Santa Marta, *Smith* 631 (US, isotype).

Slightly woody, sparingly branched *vines*; stems yellowish to brown, terete to slightly hexagonal, striate, minutely puberulous, the larger stems usually fistulose. *Leaves* opposite; blades elliptical to oblong-lanceolate, to 19 cm long and 8 cm wide, the base short-acute, the margins entire to remotely serrulate, the apex abruptly short caudate-acuminate, the surface minutely puberulous or with scattered minute glandular punctations, 2 pairs of prominent subparallel secondary veins in basal fourth of blade strongly ascending and reaching almost to leaf tip, the bases of the veins more widely separated in more oblong leaves, the tertiary veins prominent and mostly transverse, often close; petioles 1–3 cm long. *Inflorescence* a panicle with paniculate puberulous branches. *Heads* usually in somewhat isolated pairs or in spreading apical groups of 3, mostly sessile, ca. 5 mm high; subinvolucral bract minute, ca. 0.5 mm long; involucral bracts oblong with broadly rounded tips, 3.0–3.5 mm long including slightly swollen bases, ca. 1 mm wide, distinctly puberulous and with pale glandular punctations; corolla whitish, 3.0–3.5 mm long, the tube distinct, 1.0–1.3 mm long, the limb narrowly campanulate, cleft $\frac{1}{4}$ – $\frac{1}{3}$ into short lobes, the outer surface with a few hairs or glands, the corolla cells oblong, 15–25 μ wide; anther appendages often thin, slightly longer than wide; style base glabrous, the style appendages with short papillae. *Achenes* 5-ribbed, 1.5–2.0 mm long, glabrous or with a few hairs or bristles near the top; pappus of ca. 30–35 slender flattened bristles in 1 series, the tips distinctly enlarged.

Mikania miconioides is known from Colombia, Panama, and Costa Rica. The species is most closely related to *M. sylvatica* Klatt of northern South America, but the latter has more coriaceous leaves with much shorter petioles and scarcely acuminate tips. The upper leaf surface also has the main veins more depressed.

BOCAS DEL TORO: N slopes of Cerro Horqueta, 6000–7000 ft, *Allen* 4926 (MO). CHIRIQUÍ: Cerro Horqueta, *Blum* 700 (MO). Cerro Horqueta, 7000 ft, *Blum & Dwyer* 2625 (MO). Boquete, Cerro Horqueta, 5000–6000 ft, *Dwyer & Hayden* 7705 (MO). Cerro Campana, *Gentry* 5782 (MO).

9. ***Mikania micrantha*** H.B.K., Nov. Gen. Sp. Pl. 4: 105. ed. fol. 1818. TYPE: Venezuela, near Caripe Cumanensium, *Humboldt & Bonpland* (P, not seen, US, microfiche).

M. orinocensis H.B.K., Nov. Gen. Sp. Pl. 4: 105. ed. fol. 1818. TYPE: Venezuela, Insulae Pararuma (Misiones del Orinoco), *Humboldt & Bonpland* (P, not seen, US, microfiche).

M. subcrenata Hook. & Arn., Companion Bot. Mag. 1: 243. 1836. TYPE: Argentina, woods of Tucumán, *Tweedie* 1189 (K, not seen).

M. umbellifera Gardn., London Jour. Bot. 4: 119. 1845. TYPE: Brasil, Organ Mts., ca. 4000 ft, *Gardner* 483 (BM, not seen).

M. subcymosa Gardn., London Jour. Bot. 6: 448. 1847. TYPE: Brasil, Goyaz, *Gardner* 3271 (US).

M. sinuata Rusby, Bull. New York Bot. Gard. 8: 127. 1912. TYPE: Bolivia, San Juan, *Williams* 207 (US).

Slender, sparingly branched *vines*; stems yellowish or brownish, terete to slightly 4-angled, slightly striate, glabrate to sparsely puberulous, mostly fistulose. *Leaves* opposite; blades ovate, 3–13 cm long and to 10 cm wide, the base cordate to deeply cordate, the margins subentire to coarsely dentate, the apex narrowly short-acuminate, the surface glabrate with numerous pale glandular punctations, strongly trinervate from the base; petioles slender, 1–6 cm long. *Inflorescence* a corymbose panicle with subcymose branches, heads often in clusters of 3; ultimate branches up to 2 mm long, usually glabrous. *Heads* 4–5 mm high; subinvolucral bract narrowly elliptical to narrowly obovate, ca. 2 mm long, short-acuminate, glabrous to short-puberulous; involucral bracts oblong with short-acuminate tips, ca. 3.5 mm long, ca. 1 mm wide, glabrous to short-puberulous; corolla white, 2.5–3.0 mm long, the tube narrow, 1.0–1.3 mm long, the limb broadly campanulate with partially to fully developed ridges of papillae inside, the lobes about as long as wide and strongly recurved when old, the outer surface with a few pale glands, the corolla cells mostly quadrate and less than 25 μ wide; anther appendages firm, triangular-ovate; style base glabrous, the style appendages with short papillae. *Achenes* 4–5-ribbed, 1.5–2.0 mm long with many scattered pale glands; pappus of 35–40 slender bristles mostly in 1 series, the tips usually slightly enlarged.

Mikania micrantha occurs in Mexico, Central America, the West Indies, and northern South America. The species is the most widely distributed member of the genus with representatives or close relatives as far away as Africa. The close relationship to *M. scandens* (L.) Willd. of the eastern United States has been discussed by B. L. Robinson (1934b), and the often colored corollas with less reflexed lobes of the latter species have been noted. Most of the subtle distinctions mentioned by B. L. Robinson seem to be derived from the larger cells in the corollae of *M. scandens*, these cells often being oblong and over 25 μ wide. Papillae on the inner surface of the corolla limb and enlarged tips on the pappus bristles are also rarer in *M. scandens*.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2720 (MO). Bocas del Toro, *Carleton* 77 (US). Almirante, *Cooper* 148 (US). Changuinola Valley, *Dunlap* 257 (US). Hill side above Almirante, *Gentry* 2699 (MO). Bocas del Toro, *Lazor et al.* 2392 (MO). Water Valley, *von Wedel* 592, 869 (both MO). Vic. of Chiriquí, *von Wedel* 1283 (MO, US). Water Valley, vic. of Chiriquí Lagoon, *von Wedel* 1713 (MO, US). Old Bank Island, vic. of Chiriquí Lagoon, *von Wedel* 1897 (MO, US). Isla Colón, vic. of Chiriquí Lagoon, *von Wedel* 2474 (MO, US). Shephard Island, vic. of Chiriquí Lagoon, *von Wedel* 2680 (MO). Johns Creek, vic. of Chiriquí, *von Wedel* 2771 (MO, US). Bocas del Toro, *Wedel* 329 (MO). CANAL ZONE: Barro Colorado Island, *Aviles* 6 (MO). France Field, *Blum & Dwyer* 2122 (MO). Gamboa, *Heriberto* 43 (US). Río Chagres, Gatún Dam, 0–5 m, *Busey & Mahler* 341 (MO). Barro Colorado Island, *Croat* 7115, 7244, 7346, 7464 (all MO). Cerro Luisa near Pedro Miguel, *Croat* 12382 (MO). Barro Colorado Island, *Croat* 12949, 13121 (both MO); near Coco Solo Weather Station, *Duke* 4283 (MO). Fort Sherman Site, U. S. Army Tropic Test Center, *Dwyer* 7173 (MO). Cerro Galera, 350–400 m, *Gentry* 6663 (MO). Between Summit and Gamboa, *Greenman & Greenman* 5263 (MO). Gamboa, *Kennedy et al.* 2327 (MO). Near Gamboa, *Kennedy & Steiner* 2457 (MO). Between Frijoles and Monte Lirio, 30 m, *Killip*

12165 (US). Fort San Lorenzo, Fort Sherman Military Reservation, *Maxon & Valentine* 7009 (US). Fort San Lorenzo, *McDaniel* 5176 (MO). Empire to Mandinga, *Piper* 5486 (US). Río Grande, near Culebra, 50–100 m, *Pittier* 2138 (US). Near Gatún, *Standley* 27294 (US). Balboa, *Standley* 29320 (US). Río Pedro Miguel, near East Paraíso, *Standley* 30017 (US). Darién Station, *Standley* 31607 (US). Quebrada Melgada, 70–75 m, *Steyermark* 17472, 17491 (both MO). Old Fort San Lorenzo, *Tyson* 1546 (MO). Barro Colorado Island, *Wetmore & Abbe* 137 (MO); *Wilson* 20 (MO); *Woodworth & Vestal* 472 (MO). CHIRIQUÍ: 2 km N of Punta de Burica, 40–80 m, *Busey* 763 (MO). Burica Peninsula, 2 mi SW of Puerto Armuelles, 0–200 m, *Croat* 22082 (MO). Boquete, Llanos Francia, 4 mi from Boquete toward Dolega, ca. 4500 ft, *Dwyer & Hayden* 7586 (MO). 4.1 mi from Boquete on the road to David, *Kirkbride* 92A (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner* 487 (MO). 5 mi S of Boquete toward David, 2800 ft, *McDaniel* 6794 (MO). Vic. of San Félix, 0–120 m, *Pittier* 5252 (US). Vic. of Puerto Armuelles, 0–75 m, *Woodson & Schery* 827 (MO). COCLÉ: Vic. of Natá, 50 m, *Allen* 840 (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2542 (MO). Boca del Toabre at confluence of Río Toabre and Río Coclé del Norte, *Lewis et al.* 5550 (MO). COLÓN: Near Achioté, *Correa & Dressler* 414 (MO, US). East Santa Rita lumber road, *Correa & Dressler* 650 (MO). 1 mi N of María Chiquita, *Croat & Porter* 11367 (MO). Road to Porto Bello between the Río Piedres and Portobelo, *Elias & Kirkbride* 1649 (MO). Portobelo, 0–20 m, *Pittier* 2457 (US). DARIÉN: Río Chico from Yaviza at junction with Río Chucunaque to ca. 1 hour by outboard from junction, *Burch et al.* 1084 (MO). Vic. of Piñas, *Duke* 10615 (MO). Camp Dubaganala helipad, 1371 ft, *Duke* 15494 (OS, REED). Camp Summit, Darién–San Blas border along Sea Level Canal, Route 17, 1000–1200 ft, *Oliver et al.* 3693 (MO). Along the Sambú River, *Pittier* 5545 (US). 3 mi E of Santa Fe, *Tyson et al.* 4653 (MO). HERRERA: 4 mi S of Los Pozos, *Tyson* 2653 (MO). 10 mi S of Océ, *Tyson et al.* 2825 (MO). LOS SANTOS: Between Tonosí and Macaracas, *Oliver et al.* 3572 (MO). PANAMÁ: Isla Taboga, 0–350 m, *Allen* 1265 (MO). Road past Cerro Jefe toward La Eneida, *Croat* 13071 (MO). Cerro Campana, *Duke* 5970 (MO). 10–15 km from Bayano crossing on trail to Santa Fe, *Gentry* 3824 (MO). Cerro Jefe, ca. 1000 m, *Gentry* 6751 (MO). Between Cañita and dam site, *Gentry & Tyson* 1709 (MO). 5 mi SW of Cerro Brewster, ca. 1000 ft, *Lewis et al.* 3467 (MO). Road from El Llano to Cartí Tupile, 3 mi above Pan-Am. Hwy., ca. 200 m, *Liesner* 707 (MO). Tobago Island, *Standley* 27053 (US), 27941 (US). Río Tapia, *Standley* 28268 (US). Río Tocumen, *Standley* 29484 (US). Tumba Muerto near Panamá, *Standley* 29730 (US). Juan Díaz, *Standley* 30459 (US). Between Las Sabanas and Matías Hernández, *Standley* 31841 (US). Cerro Jefe, 2700 ft, *Tyson* 3366 (MO). Coronado Beach, *Tyson* 5942 (MO). 6 mi E of Río Pacora, *Tyson* 6292 (MO). Road to Cerro Campana, ca. 1000 ft, *Tyson* 6419 (MO). SAN BLAS: Vic. of Puerto Obaldía, *Croat* 16985 (MO). Opposite Achituppu, *Lewis et al.* 94 (MO, US). VERAGUAS: Hills W of Soná, ca. 500 m, *Allen* 1027 (MO). Above Santa Fe on slope of Cerro Tuté, 1200–1400 m, *Gentry* 6269 (MO). El Embalsadero, 8 mi W of Santiago, *Tyson* 6095 (MO).

10. ***Mikania pittieri*** B. L. Robinson, Proc. Boston Soc. Nat. Hist. 31: 255. 1904.
TYPE: Costa Rica, Cuesta de los Borucas, *Pittier* 10540 (US).

M. nubigena B. L. Robinson, Contr. Gray Herb. 77: 57. 1926. TYPE: Costa Rica, Las Nubes, San José Prov., *Standley* 38509 (US, holotype; GH, isotype).

Sparingly branched herbaceous *vines*; stems greenish to brownish, terete, distinctly striate, often fistulose. *Leaves* opposite; blades ovate, 5–10 cm long and 2.0–4.5 cm wide, the base rounded, the margins entire to subentire, the apex caudate-acuminate, the surface glabrous without glandular punctations, 2 pairs of strongly ascending secondary veins in the basal fifth of the blade, the finer vein reticulations with prominent, included, branched vein endings; petioles slender, 1–2 cm long. *Inflorescence* a panicle with paniculate branches, the branches puberulous; ultimate branches 0–1 mm long. *Heads* 7–8 mm high; subinvolucral bract ovate-lanceolate, 1.5–2.0 mm long, glabrous outside; involucral bracts narrowly oblong with rounded tips, ca. 5 mm long, ca. 1 mm wide, glabrous on the

outer surface except on the somewhat pitted swollen base; corolla whitish, ca. 3 mm long, the tube 1.2–1.5 mm long, the limb narrowly campanulate with short lobes about as long as wide, few glands or hairs outside, usually a few hairs on the tube, the corolla cells quadrate to short-oblong, ca. 25 μ wide; anther appendages firm, rounded, about as long as wide; style base thickened, glabrous, the style appendages with short papillae. *Achenes* 5-ribbed, ca. 4 mm long, glabrous or with numerous small glands; pappus of 35–40 slender bristles in 1 series, tips distinctly enlarged.

Mikania pittieri is known from only Costa Rica and western Panama. The glabrous, caudate-acuminate leaves with the prominent included veinlets are the most distinctive feature of the species.

CHIRIQUÍ: Boquete, Bajo, Chorro, 6000 ft, *Davidson 167* (MO, US).

11. ***Mikania psilostachya* DC.**, Prodr. 5: 190. 1836. TYPE: Peru, *Poeppig 2344* (G-DC, not seen, US, microfiche; B, destroyed, US, photo).

M. scabra DC., Prodr. 5: 190. 1836. TYPE: French Guiana, Cayenne, *Patris* (G-DC, not seen, US, photo).

M. racemulosa Benth., Ann. Nat. Hist. 2: 109. 1839. TYPE: British Guiana, *Schomburgk 480* (US).

M. psilostachya DC. var. *scabra* (DC.) Baker in Mart., Fl. Bras. 6(2): 265. 1876.

M. psilostachya DC. var. *racemulosa* (Benth.) Baker in Mart., Fl. Bras. 6(2): 266. 1876.

M. karuaiensis Badillo, Bol. Soc. Venez. Ci. Nat. 10: 296. 1946. TYPE: Venezuela, Santa Teresita de Kavanayén, Gran Sabana, Bolívar, *Steyermark 59372* (VEN).

Sparingly branched, woody *vines*; stems brownish to slightly reddish, terete to slightly quadrangular, slightly striate, densely short-puberulous, never fistulose. *Leaves* opposite; blades ovate to elliptical, to 15 cm long and 8 cm wide, the base narrowly rounded to shortly cuneate, the margins usually remotely subserrulate, the apex sharply acute to slightly acuminate, the upper surface scabrid, the lower surface distinctly short- usually brownish-puberulous and prominently glandular punctate, 2–3 pairs of strongly ascending secondary veins arising in the basal half of the blade, smaller vein reticulations prominent; petioles ca. 1 cm long, petioles of the largest leaves to 3 cm long. *Inflorescence* a panicle with elongate, strictly spicate or racemose branches, the ultimate branches 0–6 mm long, minutely puberulous. *Heads* 7–9 mm high; subinvolucral bract situated at the base of the pedicel, linear-lanceolate, 1.5–2.0 mm long, densely puberulous abaxially; involucral bracts oblong-lanceolate with short-acute tips, ca. 5 mm long, ca. 1 mm wide, brownish-puberulous and sparsely glandular-punctate outside; corolla white, 4.0–5.0 mm long, the tube narrow, 1.0–1.5 mm long, the limb narrowly campanulate to tubular, cleft $\frac{1}{2}$ – $\frac{1}{3}$ of the length into short- or elongate-triangular lobes, few to many glands and hairs on the outer surface, the corolla cells oblong, 15–25 μ wide, often with sinuous walls; anther appendages firm, ovate-triangular, half again as long as wide; style base glabrous, the style appendages usually slightly tapering, with short papillae. *Achenes* 4–5-ribbed, 2.5–3.0 mm long, with many glands and scattered hairs; pappus of ca. 40 slender bristles mostly in 1 series, the tips gradually enlarged.

Mikania psilostachya occurs throughout most of northern South America reaching south to Brazil and Bolivia. The species reaches its northwestern limit in Panama. The presence of pedicels has been used to distinguish *M. scabra* but the character is variable. The Panamanian plants have short corolla limbs and deeply cut lobes that are different from the long-limbed and short-lobed corollas in typical *M. psilostachya* and *M. scabra*. Corollas similar to those in the Panamanian plants occur in some specimens from Brazil. The seemingly similar, deeply lobed corollas in the type specimen of *M. racemulosa* are different in having much longer basal tubes.

CANAL ZONE: Gaillard Hwy. near Gamboa, *Croat* 11952 (MO). COLÓN: María Chiquita, E of Río Piedras toward Portobelo, *Dwyer & Kirkbride* 7799 (MO). Santa Rita Ridge, 2–3 mi from Transisthmian Hwy., *Gentry* 1866 (MO). PANAMÁ: Cerro Azul, *Dwyer* 2631, 2794 (both MO). Cerro Jefe, *Dwyer* 8511 (MO). Cerro Azul, near Goofy Lake, *Ebinger* 980 (MO, US). Cerro Azul, 2000 ft, *Tyson* 2072, 2161 (both MO).

12. *Mikania tonduzii* B. L. Robinson, Proc. Boston Soc. Nat. Hist. 31: 256. 1904.

TYPE: Costa Rica, Tucurrique, 635 m, *Tonduz* 13274 (GH, not seen).

Coarse herbaceous to somewhat woody, sparingly branched *vines*; stems brownish, terete to slightly hexagonal, striate, minutely puberulous, usually fistulose. *Leaves* opposite; blades broadly ovate, to 15 cm long and 8 cm wide, the base broadly rounded, the margins entire, the apex abruptly narrow-acuminate, sometimes apiculate, the surface slightly puberulous to glabrate with small glandular punctations, 2–3 pairs of prominent secondary veins arching outward and upward from lower fifth of the blade, the tertiary veins regularly transverse; petioles slender, mostly 2–6 cm long. *Inflorescence* a panicle with glomerulate-corymbose secondary and tertiary branches, the branches minutely puberulous, the ultimate branches 0–1 mm long. *Heads* 7–8 mm high; subinvolucral bract linear-lanceolate, minute, 0.3–0.8 mm long, minutely puberulous; involucral bracts short-oblong with rounded tips, ca. 2.0–2.5 mm long including fused swollen bases, ca. 0.8 mm wide, whitish-puberulous and minutely glandular-punctate on the outer surface; corolla white, ca. 4.5 mm long, narrowly funnelform, the tube indistinct, the lobes short, about half again as long as wide with few glands and short hairs on outer surface, the corolla cells quadrate to short-oblong, 20–30 μ wide; anther appendages firm, rather oblong, slightly longer than wide; style base glabrous, the style appendages with short papillae. *Achenes* 5-ribbed, ca. 2 mm long, the sides with scattered, short, often distorted bristles; pappus of 40–50 slender slightly scabrous bristles in 1 series, the apices slightly to distinctly enlarged.

Mikania tonduzii is distributed from southern Mexico south to Panama. The species is rather distinct in the narrow corolla without a well demarcated tube. The closely related *M. globosa* Coult. of Guatemala, Honduras, and Mexico differs by the even more tightly clustered heads and by the broadly truncate involucral bracts with broad scarious margins.

CANAL ZONE: Barro Colorado Island, *Croat* 7972 (MO, US).

13. **Mikania tysonii** R. M. King & H. Robinson, *Phytologia* 28: 275. 1974. TYPE: Panama, top of Cerro Jefe, 3000 ft, *Tyson et al.* 4429 (US, holotype; MO, isotype).

M. wedelii Holmes & McDaniel, *Phytologia* 33: 1. 1976. TYPE: Panama, Bocas del Toro, *von Wedel* 2041 (MO).

Slender, decumbent to epiphytic *vines* or *subshrubs*, few to many branched; stems brown, terete to slightly hexagonal, usually glabrous, larger stems narrowly fistulose. *Leaves* opposite; blades elliptical to obovate, to 8 cm long and 3.5 cm wide, the base cuneate, the margins entire, the apex bluntly rounded to short-acuminate, the surface glabrous, usually with reddish glandular punctations, the surface of dried material finely wrinkled and sometimes hiding punctations, 2 pairs of parallel ascending secondary veins from near base; petioles slender, 0.5–1.5 cm long. *Inflorescence* a loose irregular, corymbose panicle, the ultimate branches 1.5–6.0 mm long, sparsely puberulous. *Heads* ca. 5 mm high; subinvolucral bract narrowly oblong, ca. 1.5 mm long, borne 0.5–2.0 mm below most heads; involucral bracts oblong with rounded tips, ca. 3.5 mm long, 1 mm wide, sparsely puberulous and usually with reddish glands outside; corolla white, 4–5 mm long, the tube short, indistinct, with glands on outer surface, the lobes about twice as long as wide; anther appendages firm, broadly oblong-ovate; style base slightly enlarged, glabrous, the style appendages with short papillae. *Achenes* with 4–5 ribs, 2–3 mm long, with many scattered glands, sometimes puberulous; pappus of ca. 50 slender bristles mostly in 1 series, the tips distinctly enlarged.

The species is endemic to Panama where it shows some variation of habit. The plants from central Panama are more shrubby and terrestrial while those from farther west are more scandent and epiphytic. All specimens share the indefinitely corymbose inflorescence, the narrow corollas with indistinct tubes, and the leaves with two pairs of veins from near the base. No close relatives are evident in Panama or the adjacent countries. A similar aspect is found in *Mikania lucida* Blake of Venezuela but that species can be distinguished by its smaller, short, thin anther appendages and usually smooth upper leaf surfaces.

BOCAS DEL TORO: Old Bank Island, vic. of Chiriquí Lagoon, *von Wedel* 2041 (MO). COCLÉ: La Mesa, 5 mi N of El Valle, 2500 ft, *Tyson et al.* 2445 (US). PANAMÁ: Top Cerro Jefe, 3000 ft, *Tyson et al.* 4429 (MO, US). Cerro Jefe, 2900 ft, *Dwyer & Gauger* 7378 (MO).

14. **Mikania zonensis** R. M. King & H. Robinson, *Phytologia* 28: 275. 1974. TYPE: Panama, Albrook, U.S. Army Tropic Test Center Site, Canal Zone, *Dwyer & Robyns* 115 (MO, holotype; US, isotype).

Coarse, sparingly branched *vines*; stems becoming dark brownish, terete, striate, glabrate, usually narrowly fistulose. *Leaves* opposite; blades elliptical-ovate, to 21 cm long and 8 cm wide, the base rounded to short-cuneate, the margin entire, the apex narrowly caudate-acuminate, the surface glabrate, 2 pairs of prominent, strongly ascending, secondary veins from near base, the vein reticulation slightly prominent; petioles slender, to 4 cm long. *Inflorescence* rather densely corymbose with almost all heads in clusters of 3, the ultimate branches 0–1 mm long. *Heads* ca. 8–9 mm high; subinvolucral bract minutely

lanceolate, ca. 1 mm long, puberulous distally; involucre bracts oblong with rounded tips, ca. 5 mm long and 1.5 mm wide, the outer surface striate and glandular-punctate, puberulous toward the tip; corolla whitish, ca. 5 mm long, the tubes narrow, ca. 2 mm long, glandular-punctate outside, the limb narrowly funnel-form, the lobes short-triangular, about as long as wide with scattered hairs outside, the corolla cells subquadrate to short-oblong, 20–30 μ wide; anther appendages firm, triangular, about twice as long as wide; style base slender, sparsely papillose, the style appendages hirsute with many long papillae. *Achenes* with 5 ribs or grooves, thickly corticated and nearly terete when fully mature, ca. 3.5 mm long; pappus of ca. 60 slender bristles, the tips not or only slightly enlarged.

Mikania zonensis is known only from the type collection in the Panama Canal Zone. The species is close to *M. guaco* but differs in the more elliptical, less decurrent, more coriaceous, and more glabrous leaf blades.

CANAL ZONE: Albrook Field: U. S. Army Tropic Test Center Site, *Dwyer & Robyns 115* (MO, US).

28. NEOMIRANDEA

Neomirandea R. M. King & H. Robinson, *Phytologia* 19: 306. 1970. TYPE: *Eupatorium araliaefolium* Less.

Small *shrubs* to small *trees* with few to many branches, growing in deep humus or epiphytic; stems and leaves usually somewhat fleshy. *Leaves* opposite or in whorls of 3, short- to long-petiolate; blades narrowly elliptical to orbicular, the bases cuneate to cordate, the margins entire to coarsely lobed and dentate. *Inflorescence* broadly corymbose-paniculate. *Heads* with 2–28 florets; involucre of ca. 9–15 subimbricate to imbricate bracts, in 3–4 series, the outer bracts spreading at maturity, the inner bracts deciduous; receptacle flat to slightly convex, glabrous or sometimes short-puberulous; corolla tubular to narrowly funnel-form with usually indistinct narrow tube, the lobes smooth, usually short (deeply cleft in four species), the outer surface with hairs or glands, the inner surface glabrous or with many hairs, the cells of the corolla usually subquadrate with straight walls, rarely with slightly sinuous walls; anther collar elongate with many quadrate or short-oblong cells in lower part, the cell walls without ornate thickenings, the exothecial cells mostly subquadrate or broader than long, the anther appendage ovate or oblong, longer than broad; style base glabrous, with or without prominent enlargement, the style appendages linear, smooth, scarcely broadened above, the tip rounded. *Achenes* prismatic with 5 ribs, glabrous or with few to many bristles; carpodium short with subquadrate rather thin-walled cells in few to many series; pappus of 30–57 scarcely scabrous bristles, the apical cells shortly to sharply acute. *Pollen* with short spines.

Neomirandea is a genus of approximately 24 species ranging from Mexico through Central America to Colombia and Ecuador in South America. The greatest number of species is found in the area of Costa Rica and western Panama. The genus is divided into two basic groups. The typical subgenus is characterized by an enlarged style base, the carpodium with small cells in many series, and the

corolla often with hairs on the inner surface. The subgenus *Critoniopsis* is characterized by style bases not enlarged, the carpopodium with larger cells in few series, and the corolla always glabrous inside. Eleven species have been collected in Panama.

Literature:

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- a. Leaf margins lobed or serrate, blades broadly ovate to deltoid or aceriform.
 - b. Leaf blades strongly dentate to lobed; corolla without internal hairs 9. *N. panamensis*
 - bb. Leaf blades ovate or broadly ovate, the margins serrate; corolla with internal hairs.
 - c. Involucral bracts ovate; heads with mostly 15–20 florets; corolla tube half as long as the limb 8. *N. homogama*
 - cc. Involucral bracts oblong to elliptical; heads with mostly 5–12 florets; corolla tube usually shorter than limb 11. *N. standleyi*
 - aa. Leaf margins entire to remotely serrulate, blades ovate to oblong.
 - d. Corolla with hairs inside; style node enlarged; florets white.
 - e. Heads with 18–28 florets; corolla with lobes less than half again as long as wide 2. *N. araliaefolia*
 - ee. Heads with ca. 5 florets; corolla deeply cleft, lobes twice as long as wide 10. *N. pseudopsoralea*
 - dd. Corolla without hairs inside; style node not enlarged; florets lavender or purple.
 - f. Outer involucral bracts orbicular, inner bracts prominently striate 3. *N. arthodes*
 - ff. Outer involucral bracts narrow, inner bracts not striate.
 - g. Heads with 5 florets 5. *N. croatii*
 - gg. Heads with 8–10 florets.
 - h. Leaves subsessile, the petioles 1–5 mm long; corolla with hairs or glands on outer surface.
 - i. Leaf blades with remotely serrulate margins, the lower surface sparsely puberulous; petioles narrow 7. *N. gracilis*
 - ii. Leaf blades with entire margins, the lower surface without hairs; petioles greatly thickened 1. *N. allenii*
 - hh. Leaves distinctly petiolate, the petioles 5–12 mm long; corolla glabrous.
 - j. Leaf tips blunt, rounded; corolla narrowly tubular with lobes ca. 1½ times as long as wide 4. *N. chiriquensis*
 - jj. Leaf tips sharply acuminate; corolla funnelform with lobes about as long as wide 6. *N. eximia*

1. ***Neomirandea allenii*** R. M. King & H. Robinson, *Rhodora* 74: 273. 1972.
 TYPE: Panama, region of El Valle de Antón, Coclé, *Allen 3643* (NY, holotype; F, MO, P, isotypes).

Epiphytic *shrubs* to 1.5 m tall; stems terete, minutely puberulous. *Leaves* opposite, subsessile; blades fleshy, broadly elliptical to obovate, to 9 cm long and

6 cm wide, the base short-cuneate to slightly rounded, the margins entire, rarely slightly serrulate, the apex obtusely acute to narrowly rounded, the surfaces with glandular punctations and without hairs, the venation pinnate, the secondary veins prominent; petioles ca. 3–5 mm long, greatly thickened, glabrous. *Inflorescence* a corymbose panicle, to 10 cm wide and 10 cm high; ultimate branches ca. 5 mm long, puberulous. *Heads* 8–9 mm high with ca. 10 florets; involucre bracts ca. 12, subimbricate, in 2–3 series, broadly lanceolate, mostly 2–3 mm long and 0.5 mm wide, the outer surface sparsely puberulous and with glandular punctations; receptacle glabrous; corolla pink or purple, ca. 5 mm long, narrowly funnel-form without hairs inside, the lobes about as long as wide with numerous glands on outer surface, the glands mostly long-stalked; style base not enlarged. *Achenes* prismatic, with few long-stalked glands and uniseriate multiseptate hairs, the glands and hairs more numerous at base and apex; carpodium with larger cells in a few series; pappus of ca. 30 scabrous bristles, mostly ca. 5 mm long, the apical cells of some bristles acute, few to many interspersed bristles with enlarged tips and blunt apical cells.

Neomirandea allenii is known from Panama and northern Colombia. The species is the most commonly collected member of the genus in Panama, being common at lower and medium elevations in the central part of the country. The species can usually be distinguished by the broad, nearly sessile leaves with thick petioles and by the many pappus setae with blunt, thickened apices.

COCLÉ: Region of El Valle de Antón, 1000 m, *Allen 3643* (F, MO, NY, P). Between Cerro Pilón and El Valle de Antón, 700–900 m, *Duke & Dwyer 13979* (MO). El Valle de Antón, ca. 2000 ft, *Dwyer & Correa 7990* (MO). Cerro Pilón, 3100 ft, *Dwyer & Lallathin 8973* (MO). 8 mi N of El Valle de Antón, *Luteyn & Kennedy 1671* (MO). DARIÉN: Headwaters of Río Tuquesa, ca. 350 m, *Croat 27224* (MO, US). PANAMÁ: Cerro Jefe, ca. 2900 ft, *Dwyer & Gauger 7384* (MO). Near Cerro Campana, *Kirkbride & Hayden 336* (MO). Cerro Jefe, 3000 ft, *Tyson et al. 4427, 4447* (both MO). VERAGUAS: Río Primero Brazo, 25 km beyond Agriculture School, *Croat 25519* (MO, US). Río Dos Bocas, 12 km beyond Santa Fe, *Croat 25886* (MO, US). 5–8 km beyond Escuela Agrícola Alto Piedra, 730–770 m, *Croat 25925* (MO).

2. *Neomirandea araliaefolia* (Less.) R. M. King & H. Robinson, *Phytologia* 19: 307. 1970.—FIG. 29.

Eupatorium araliaefolium Less., *Linnaea* 6: 402. 1831. TYPE: Mexico, sylvae Misanthiae, *Schiede & Deppe 1242* (B, destroyed; MO, isotype, US, photo).
E. omphaliaefolium Kunth & Bouché, Ind. Sem. Hort. Berol. adnot. no. 13. 1844; ex Walp., *Repert. Bot.* 6: 113. 1846. TYPE: Mexico (B, destroyed).
E. heterolepis B. L. Robinson, *Proc. Amer. Acad. Arts* 35: 335. 1900. TYPE: Guatemala, E portions of Vera Paz and Chiquimula, 1885, *Watson 65* (US, isotype).
E. altiscandens McVaugh, *Contr. Univ. Michigan Herb.* 9: 390. 1972. TYPE: Mexico, 21–24 km S of El Chante (ca. 25 km SE of Autlán), Jalisco, *McVaugh 23092* (MICH, holotype; US, isotype).

Epiphytic *shrubs* to 4 m tall; stems terete, with faint striations, glabrous. *Leaves* opposite; blades slightly fleshy, ovate to elliptical, to 16 cm long and 7 cm wide, the base broadly cuneate, the margins entire, the apex sharply acute, the surfaces glabrous, the venation pinnate, the secondary veins prominent; petioles to 6 cm long, glabrous. *Inflorescence* a corymbose panicle, to 12 cm wide and 12 cm high, the ultimate branches ca. 5 mm long, densely puberulous. *Heads* ca. 1

cm high, with ca. 18–28 florets; involucre bracts ca. 25–28, unequal, imbricate, in 3–4 series, the outer series ovate to narrowly oblong, mostly 2–4 mm long, scarcely puberulous, the inner series to 7 mm long, lanceolate with often irregularly lacinate margins, glabrous; receptacle minutely puberulous; corolla white, ca. 5 mm long, narrowly funnelform with hairs on inner surface, few hairs on outer surface, the lobes less than half again as long as wide; style base enlarged, glabrous. *Achenes* prismatic, densely puberulous; carpodium distinct, the cells small in many series; pappus of ca. 30–35 scabrous bristles, mostly ca. 5.5 mm long, the apical cells acute.

Neomirandea araliaefolia is widely distributed from Veracruz and Jalisco in Mexico southward to Panama. The species was the first member of the genus to be collected and described. The species seems to occur in two slightly different forms. The typical form is most common at lower elevations and has a more acute leaf base and scarcely lacinate inner involucre bracts. Specimens from Guatemala, Mt. Ovando in Chiapas, and from Panama have more abrupt leaf bases and lacinate inner involucre bracts.

CHIRIQUÍ: Vic. of "New Switzerland," central valley of Río Chiriquí Viejo, 1800–2000 m, Allen 1361 (F, MO, US).

3. ***Neomirandea arthodes*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 308. 1970.

Eupatorium arthodes B. L. Robinson, *Contr. Gray Herb.* 68: 8. 1923. TYPE: Costa Rica, La Palma 1550 m, *Tonduz* 12430 (US).

Epiphytic *shrubs* to 3 m tall; stems terete, scarcely striate, glabrous, narrowly fistulose. *Leaves* opposite; blades fleshy, broadly elliptical, to 12 cm long and 5 cm wide, the base cuneate, the margins entire, the apex sharply acuminate, the surfaces glabrous, the venation pinnate, the secondary veins somewhat prominent; petioles to 3.5 cm long, glabrous. *Inflorescence* a corymbose panicle, to 25 cm wide and 10 cm high, the ultimate branches ca. 5 mm long, scarcely puberulous. *Heads* ca. 1 cm high, with ca. 12 florets; involucre bracts ca. 20, imbricate, in ca. 4 series, strongly unequal, 1–7 mm long, the outer surface glabrous, mostly prominently striate, the outer bracts orbicular to broadly oblong, the inner bracts narrowly oblong, the apices rounded; receptacle sparsely minutely puberulous; corolla pink or lavender, ca. 6 mm long, narrowly funnelform, without internal hairs, glabrous on outer surface, the lobes ca. twice as long as wide; style base not enlarged, glabrous. *Achenes* prismatic with narrow bases, ca. 2.8 mm long, minutely scabrid on base and ribs; carpodium distinct, with lax cells in 4–5 rows; pappus of ca. 35–40 scabrous bristles, ca. 5 mm long, the apical cells subacute.

Neomirandea arthodes is known from Costa Rica and western Panama. The species is the only member of the subgenus *Critoniopsis* in Panama with broad outer involucre bracts.

BOCAS DEL TORO: Robalo Trail, N slopes of Cerro Horqueta, 6000–7000 ft, Allen 4927 (MO). CHIRIQUÍ: Vic. of Bajo Chorro, 1900 m, *Woodson & Schery* 606 (MO).

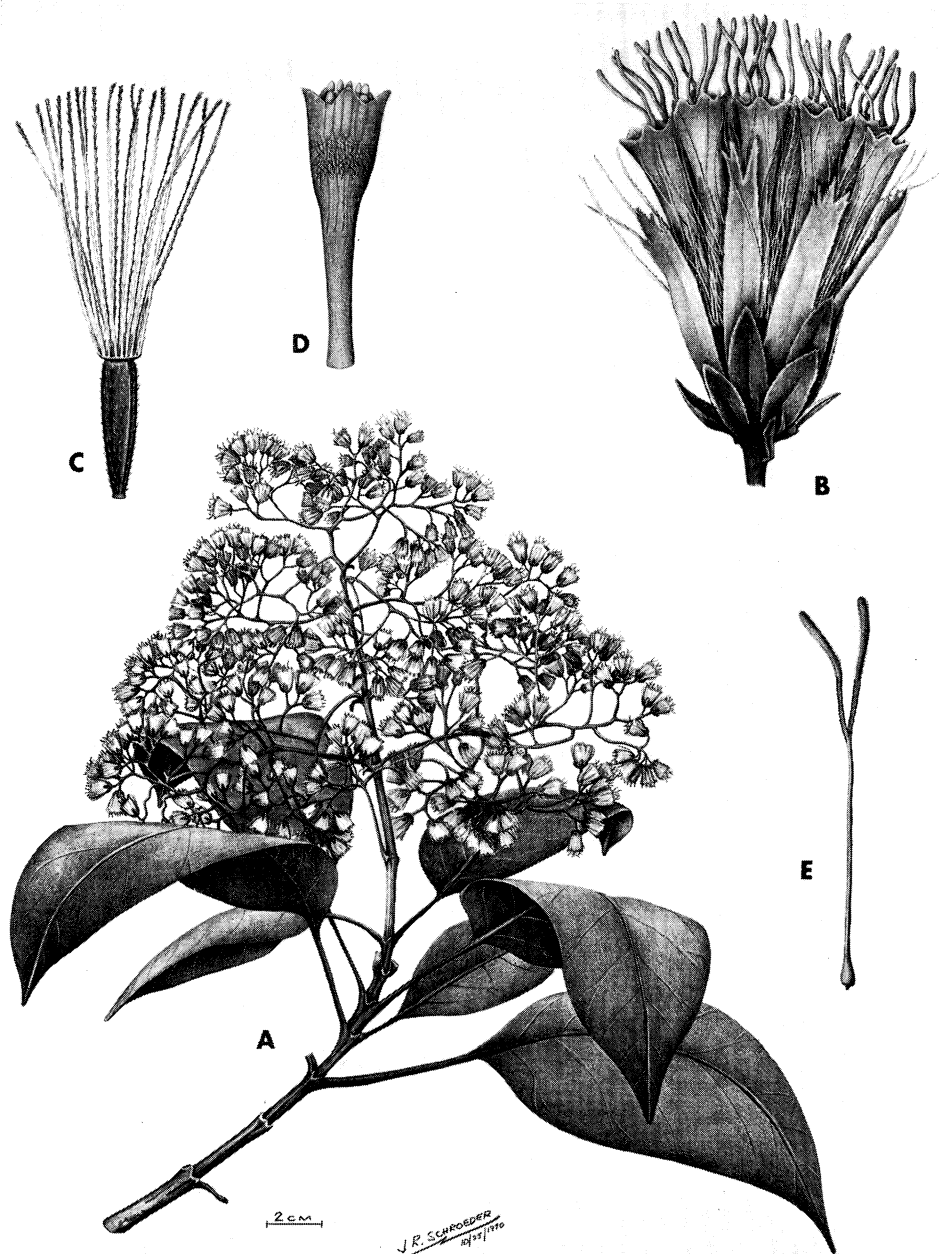


FIGURE 29. *Neomirandea araliaefolia* (Less.) R. M. King & H. Robinson.—A. Habit ($\times \frac{2}{5}$).—B. Head ($\times 5\frac{1}{2}$).—C. Achene ($\times 6\frac{1}{10}$).—D. Corolla ($\times 6\frac{1}{10}$).—E. Style ($\times 6\frac{1}{10}$).

4. ***Neomirandea chiriquensis*** R. M. King & H. Robinson, *Phytologia* 27: 245. 1973. TYPE: Panama, Boquete, Chiriquí, *Stern et al.* 1086 (MO).

Shrubs to 1.5 m tall; stems terete, glabrous. *Leaves* opposite; blades fleshy to coriaceous, broadly elliptical to obovate, 6–11 cm long and 2.5–6.5 cm wide, the base cuneate, the margins entire, the apex rounded to subacute, the surface with sparse glandular punctations, otherwise glabrous, the secondary veins obscure, strongly ascending; petioles rather slender, to 1 cm long, glabrous. *Inflorescence* a corymbose panicle, to 20 cm wide and 10 cm high, the ultimate branches 5–10 mm long, densely minutely puberulous. *Heads* ca. 7 mm high and ca. 3 mm wide with 8–10 florets; involucre bracts violet, ca. 15, subimbricate, in ca. 3 series, lanceolate to linear, 1.5–5.0 mm long and 0.7–1.0 mm wide, the apex with slight fringe, the outer surface glabrate; receptacle glabrous or minutely spiculiferous; corolla white at anthesis and becoming red-violet, ca. 4 mm long, narrowly funnelform, glabrous inside and outside, the lobes ca. half again as long as wide; style base not enlarged, glabrous. *Achenes* prismatic with narrow bases, ca. 2.5 mm long, mostly glabrous, a few spicules at upper end; carpodium distinct, the cells in 3–5 series; pappus of ca. 40 scabrous bristles, mostly ca. 3.5 mm long, the apices of many bristles somewhat enlarged, the apical cells subacute.

Neomirandea chiriquensis is known only from the type collection. In appearance the species seems rather like a *Clusia*. Closest relationship is probably to *N. allenii* which has somewhat similar leaf blades and similar enlarged tips on the pappus setae. The species differs in many details including the distinctly petiolate leaves, the longer more glabrous involucre bracts, and the totally glabrous corollas. The single specimen indicates a distribution to the west of that of *N. allenii* and at higher elevations.

CHIRIQUÍ: Boquete, Palo Alto, 5000 ft, *Stern et al.* 1086 (MO).

5. ***Neomirandea croatii*** R. M. King & H. Robinson, *Phytologia* 29: 352. 1975. TYPE: Panama, Las Nubes near Cerro Punta, Chiriquí, *Croat* 26452 (US).

Epiphytic slightly fleshy *shrubs* to 1 m high; stems terete, densely hirsute. *Leaves* opposite; blades slightly fleshy to coriaceous, broadly elliptical to slightly obovate, mostly 5.5–9.5 cm long and 3.0–6.5 cm wide, the base cuneate, the margins entire, the apex slightly short-acuminate, the upper surface sparsely hispidulous, the lower surface sparsely pilose, more densely pilose on primary vein, the secondary veins pinnate, prominent; petioles narrow, mostly 5–10 mm long. *Inflorescence* a broadly corymbose panicle, to 15 cm wide and 12 cm high, the branches puberulous, the ultimate branches 2–9 mm long. *Heads* ca. 9 mm high and 1.5–2.0 mm wide, mostly with 5 florets; involucre bracts 8–9, subimbricate, in ca. 3 series, linear-lanceolate with narrowly obtuse tips, 3–6 mm long and 0.8–1.0 mm wide, the outer surface minutely puberulous and very sparsely glanduliferous; receptacle flat, minutely puberulous; corolla lavender or purplish, ca. 7 mm long, narrowly funnelform, the inner surface glabrous, the tube and lower limb mostly glabrous on outer surface, the lobes ovate-oblong, ca. 0.8 mm long and 0.5–0.6 mm wide, with outer surface sparsely glanduliferous and minutely puberulous; style base not enlarged. *Achenes* prismatic, 2.5–3.0 mm

long, mostly glabrous, puberulous with short bristles near upper and lower ends; carpopodium a distinct rim; pappus of ca. 50 slightly scabrous bristles, with slightly enlarged tips, the apical cells acute.

Neomirandea croatii is known only from the type collection. The species has a superficial resemblance to *N. chiriquensis* from the same general region, but the latter is a glabrous species with more florets per head and with more obscure, more ascending secondary veins in the leaf.

CHIRIQUÍ: Las Nubes near Cerro Punta, ca. 2000 m, *Croat 26452* (US).

6. ***Neomirandea eximia*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 309. 1970.

Eupatorium eximium B. L. Robinson, *Contr. Gray Herb.* 73: 11, 1924. TYPE: Costa Rica, vic. of La Palma on road to La Hondura, 1500–1700 m, *Maxon & Harvey 7941* (US).

Small epiphytic *shrubs* 1–2 m tall; stems terete, faintly striate, glabrous. *Leaves* opposite; blades fleshy, elliptical, to 8 cm long and 3 cm wide, the base cuneate, the margins usually entire, the apex sharply acuminate, the surfaces glabrous, without evident glandular punctations, the lower surface somewhat paler, the primary vein distinct, the secondary veins usually totally obscure, strongly ascending; petioles to 1.2 cm long, glabrous. *Inflorescence* a loose corymbose panicle, to 12 cm high and 15 cm wide, the ultimate branches ca. 9–14 mm long, densely puberulous. *Heads* ca. 1 cm high with ca. 9 florets; involucre bracts purple-tinged, ca. 15, subimbricate, in ca. 3 series, 1.5–5.0 mm long, broadly lanceolate with narrowly rounded to subacute tips, the outer surface glabrate; receptacle glabrous; corolla lavender, ca. 4 mm long, narrowly funnelform, glabrous or with a few minute hairs on lobes, the lobes as long as wide to somewhat longer; style base not enlarged, glabrous. *Achenes* prismatic, 2.5–3.0 mm long, glabrous or with a few bristles; carpopodium a narrow rim, the cells in 3–5 series; pappus of ca. 40 slender, slightly scabrous bristles, ca. 4.5 mm long, the apical cells acute.

Neomirandea eximia is known only from Costa Rica and Panama. The species is common in parts of Costa Rica but seems comparatively rare and variable in Panama. Some Panamanian plants have a few bristles on the achene unlike populations in Costa Rica, and specimens from farthest east tend to have sparser inflorescences and more reduced, slightly serrulate juvenile or secondary leaves. The latter plants may indicate some introgression with the related *N. gracilis* of central Panama.

CHIRIQUÍ: Chiriquí Trail between Quebrada Hondo and Divide, *Kirkbride & Duke 937* (MO, REED). NW side of Cerro Punta beyond Las Nubes, ca. 7500 ft, *Wilbur et al. 13203* (F). VERAGUAS: Mts. 3.5–4.5 mi above Santa Fe, *Gentry 3076* (MO). 5 mi W of Santa Fe on road past Escuela Agrícola Alto Piedra, 800–1200 m, *Liesner 935* (MO, PMA).

7. ***Neomirandea gracilis*** R. M. King & H. Robinson, *Phytologia* 29: 353. 1975. TYPE: Panama, Valley of Río Bocas, Veraguas, *Croat 27701* (US).

Small epiphytic *shrubs* to 1 m tall; stems terete, puberulous, becoming glabrous below. *Leaves* opposite; blades papyraceous, oblong-elliptical, mostly 4–8 cm

long and 1.5–3.0 cm wide, the base short-cuneate, the margins distinctly remote-serrulate, the apex shortly acute, the upper surface sparsely punctate, the lower surface sparsely puberulous and densely glandular-punctate, the primary vein subpilose below, the secondary veins pinnate, not very prominent; petioles short, 1–2 mm long. *Inflorescence* a small corymbose panicle, 4.5 cm wide and 3.5 cm high, the branches puberulous and sparsely glanduliferous, the ultimate branches 1.5–6.0 mm long. *Heads* ca. 6 mm high and 1.5 mm wide with 8–9 florets; involucre bracts brown, ca. 12, subimbricate to eximbricate, in ca. 2 series, narrowly oblong with narrowly rounded tips, 1.5–2.5 mm long and ca. 0.4 mm wide, the outer surface sparsely puberulous and glanduliferous; receptacle glabrous; corolla lavender, ca. 4 mm long, narrowly funnelform, the inner surface glabrous, the outer surface puberulous and glanduliferous, the lobes very short-triangular; style base not enlarged. *Achenes* prismatic, ca. 1.7 mm long, puberulous and glanduliferous; carpodidium a distinct rim, the cells in 3–5 rows; pappus of ca. 32–35 slightly scabrous bristles with slightly enlarged tips, the apical cells acute.

Neomirandea gracilis is known only from the type collection. The species is related to *N. eximia* and occurs at the extreme eastern edge of the range of the latter. *Neomirandea gracilis* differs from *N. eximia* by the serrulate and nearly sessile oblong leaves, by the more sparing inflorescence, and by the numerous glands on the corolla lobes. Some material of *N. eximia* from Panama shows similar small inflorescences and some serrulation of the leaf margin which suggests introgression. A few specimens of *N. allenii* also show such tendencies and may indicate some past hybridization.

VERAGUAS: Valley of Río Dos Bocas, between Escuela Agrícola Alto Piedra and Calovébora, 15.6 kms NW of Santa Fe, 450–550 m, *Croat* 27701 (US).

8. ***Neomirandea homogama*** (Hieron.) H. Robinson & R. D. Brettell, *Phytologia* 28: 62. 1974.

Liabum homogamum Hieron., Bot. Jahrb. Syst. 28: 626. 1901. TYPE: Colombia, near La Conga, region Popayán, *Lehmann* 5972 (F, photo and fragment, US).

Eupatorium hitchcockii B. L. Robinson, Contr. Gray Herb. 73: 14. 1924. TYPE: Ecuador, valley of Pastaza River between Baños and Cashurco, Tungurahua, *Hitchcock* 21876 (US).

Neomirandea hitchcockii (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 308. 1970.

Coarse *herbs* or *shrubs* to 5 m tall, sometimes epiphytic; stems terete or grooved, subglabrous, fistulose. *Leaves* opposite; blades papyraceous to slightly fleshy, ovate to oblong-ovate, to 30 cm long and 20 cm wide, the base cuneate to truncate, the margins serrate to slightly dentate, the apex sharply acute to slightly short-acuminate, the surface glabrate, the venation pinnate with many pairs of secondaries often concentrated in basal fourth; petioles 4–6 cm long, glabrate to sparsely puberulous. *Inflorescence* a loose corymbose panicle, to 20 cm wide and 20 cm high, the ultimate branches 3–12 mm long, densely puberulous. *Heads* 9–11 mm high with 14–21 florets; involucre bracts ca. 20–25, imbricate, in 3–4 series, mostly 2–6 mm long, the apices obtusely acute to narrowly rounded, the outer surface minutely puberulous to glabrate, the outer bracts broadly ovate to sub-orbicular, the inner bracts broadly oblong to oblong-lanceolate; receptacle puberulous; corolla lavender to purple, 5–7 mm long, funnelform with narrow tube

as long as or longer than limb, with numerous hairs on inner surface, few hairs on outer surface, the lobes 0.8–0.9 mm long and 0.6 mm wide, with few nearly sessile glands and few short hairs on outer surface; style base enlarged, glabrous. *Achenes* prismatic, 3–4 mm long, glabrous; carpopodium distinct, with small cells in 8–10 series; pappus of ca. 40 slightly scabrous bristles, mostly 5–7 mm long, the apical cells acute.

Neomirandea homogama is known from Panama southward through Colombia to southern Ecuador. The species is one of a pair that have previously been distinguished primarily by geography and number of florets per head. The presence of both species in Panama and the greater variation in number of florets have resulted in some problems in delimiting the species, and the name *N. homogama* was at one point applied to the related *N. standleyi*. The two species are now recognized as very close relatives with nearly continuous if not slightly overlapping ranges. The more eastern *N. homogama* has larger heads with more prominent, often broadly ovate, outer involucre bracts and 14–21 florets per head. The corollas are generally narrower with tubes usually as long as the limb. The more western *N. standleyi* has smaller heads with usually oblong or elliptical outer involucre bracts that do not project as strongly on their basal margins. There are 5–12 florets per head and the corollas are more generally flaring with tubes distinctly shorter than the limbs. The distribution of characters suggests that two thoroughly distinct species exist with possibly some complications through hybridization.

BOCAS DEL TORO: Chiriquí trail between Quebrada Higuera and Gutierrez, *Kirkbride & Duke 750* (MO, REED, US). COCLÉ: La Mesa above El Valle, *Croat 14304* (MO).

9. *Neomirandea panamensis* R. M. King & H. Robinson, *Phytologia* 27: 247. 1973. TYPE: Panama, Cerro Horqueta, Bocas del Toro, *Allen 4954* (MO, holotype; US, isotype).

Coarse arborescent perennial *herbs* to 13 m tall; stems with short internodes, strongly striate, densely granulose-puberulous on younger parts. *Leaves* opposite; blades papyraceous, deltoid to aceriform, to 20 cm long and 20 cm broad, the base truncate to distinctly cordate, the margins with large angular lobes, serrate, the apices sharply short-acuminate, the upper surface sparsely puberulous mostly on veins, the lower surface densely puberulous on veins and veinlets, the venation strongly trinervate from at or near base; petioles to 15 cm long, in uppermost leaves sometimes with strongly toothed wing. *Inflorescence* a broad corymbose panicle, to 27 cm wide and 18 cm high, the ultimate branches to 1 mm long, densely granulose-puberulous. *Heads* ca. 6 mm high with 5 florets; involucre bracts ca. 15, imbricate, in 4–5 series, strongly unequal, broadly ovate to oblong, the tips rounded, the outer surface slightly puberulous; receptacle glabrous, corolla lavender, 3.5–4.0 mm long, narrowly funnelform, without hairs on inner surface, with glands on outer surface of tube and lobes, the lobes oblong-lanceolate, ca. 1 mm long and 0.3 mm wide; style base enlarged, glabrous. *Achenes* prismatic with short bristles on upper part; carpopodium short, the cells small, in ca. 8 series; pappus of ca. 45–55 slightly scabrous bristles, mostly 3.5–4.0 mm long, the apical cells acute.

Neomirandea panamensis is known only from the type collection. The species is distinct from all other Panamanian species of the genus by its aceriform leaves. The closest relatives seem to be two Costa Rican species that have similar leaves with variously winged petioles and have the combination of enlarged style bases and glabrous inner surfaces of the corollas. Of these latter species, *N. grosvenorii* R. M. King & H. Robinson differs by the consistently winged petioles, by the greater size of the heads and florets, and by the glabrous corolla tubes. The internodes of the stems also are much longer in the material seen. The other species, *N. burgeri* R. M. King & H. Robinson, has marked retrorsely toothed petiolar wings and a prominent horizontal rootstock. Less closely related is the common *N. angularis* (B. L. Robinson) R. M. King & H. Robinson of Costa Rica which has unwinged petioles, more pubescent lower leaf surfaces, and hairs inside the corolla.

BOCAS DEL TORO: Robalo Trail, N slopes of Cerro Horqueta. 6000–7000 ft, Allen 4954 (MO, US).

10. *Neomirandea pseudopsoralea* R. M. King & H. Robinson, Phytologia 30: 9. 1975. TYPE: Panama, road between Cerro Punta and Quebrada Iglesia, Chiriquí, Croat & Porter 16056 (MO, holotype; US, isotype).

Large epiphytic slightly fleshy *shrubs* to 12 m tall with rhizomes reaching the ground; stems terete, slightly striate, sparsely puberulous to glabrous. *Leaves* opposite; blades fleshy, broadly elliptical to slightly ovate, to 12 cm long and 6 cm wide, the base usually short-cuneate, the margins usually entire, the apex distinctly short-acuminate, the surface glabrous, the venation pinnate, the secondary veins not very prominent; petioles 1–5 cm long, glabrous. *Inflorescence* a pyramidal panicle, to 17 cm high and 13 cm wide, the ultimate branches mostly 1–3 mm long, densely puberulous. *Heads* 5–6 mm high with 4–5 florets; involucre bracts ca. 20–25, imbricate, in 4–5 series, strongly unequal, 0.5–4.5 mm long, mostly narrowly ovate to narrowly oblong, the outer surface essentially glabrous, the inner bracts usually deeply cleft at the tip; receptacle sparsely puberulous; corolla white, ca. 3.5 mm long, broadly funnelform, the limb densely hirsute inside, the tube and limb sparsely puberulous outside, the lobes 1.0–1.5 mm long and 0.3–0.4 mm wide, glabrous on outer surface; style base enlarged, glabrous. *Achenes* prismatic, glabrous to slightly scabrid on ribs; carpopodium short, the cells small, in 6–8 series; pappus of 35–40 slightly scabrous bristles, ca. 4–5 mm long, the tips distinctly thickened, the apical cells usually blunt.

Neomirandea pseudopsoralea is known only from western Panama. The species is related to *N. psoralea* (B. L. Robinson) R. M. King & H. Robinson of Costa Rica which has a similar habit. The Costa Rican species differs by the rose-colored corolla with broader lobes and by the inner involucre bracts lacking lacerate tips. The Panamanian species is more closely related to two other Costa Rican species, *N. biflora* R. M. King & H. Robinson and *N. turrialbae* R. M. King & H. Robinson which both differ by their longer heads and corollas and by their reduced number of florets per head.

CHIRIQUÍ: Road between Cerro Punta and Quebrada Iglesia, *Croat & Porter 16056* (MO). E of Guadeloupe, along the Río Chiriquí Viejo ca. 2 mi NE of Cerro Punta, ca. 6500 ft, *Wilbur et al. 13083* (MO). Vic. of Bajo Chorro, 1900 m, *Woodson & Schery 626* (MO).

11. ***Neomirandea standleyi*** (B. L. Robinson) R. M. King & H. Robinson, *Phytologia* 19: 308. 1970.

Eupatorium standleyi B. L. Robinson, *Contr. Gray Herb.* 77: 40. 1926. TYPE: Costa Rica, Alto de La Estrella, Cartago, *Standley 39288* (US).

E. brenesii Standley, *Publ. Field Mus. Nat. Hist., Bot. Ser.* 18: 1461. 1938. TYPE: Costa Rica, Alto de La Palma de San Ramón, *Brenes 3842* (F, photo US).

Coarse *herbs* or *shrubs* to 3 m tall, sometimes epiphytic; stems terete or somewhat grooved, essentially glabrous, fistulose. *Leaves* opposite; blades papyraceous to slightly fleshy, ovate to oblong-ovate, to 15 cm long and 12 cm wide, the base cuneate to truncate, the margins slightly to coarsely serrate, the apex sharply acute to narrowly short-acuminate, the upper surface essentially glabrous, the lower surface sparsely minutely puberulous, the venation pinnate with many pairs of secondary veins often concentrated in basal fourth; petioles to 7 cm long, glabrous to slightly puberulous. *Inflorescence* a loose sometimes elongate panicle with corymbose branches, to 30 cm wide and sometimes 40 cm high, the ultimate branches mostly 2–5 mm long, rather densely puberulous. *Heads* ca. 7 mm high with 5–12 florets; involucre bracts ca. 18–20, imbricate, in ca. 3 series, unequal, mostly 2–5 mm long, the apices obtusely acute to narrowly rounded, the outer surfaces minutely puberulous to glabrate, the outer bracts narrowly ovate or oblong to elliptical, the inner bracts oblong-lanceolate to lanceolate; receptacle slightly puberulous; corolla lavender, 4.5–5.0 mm long, funnellform, the tube usually 1.5–2.0 mm long, the limb with numerous hairs on inner surface, the lobes 0.7–0.8 mm long and ca. 0.7 mm wide, with few short hairs and few short-stalked glands on outer surface; style base enlarged, glabrous. *Achenes* prismatic, ca. 2 mm long, mostly glabrous with a few spicules at upper end; carpopodium short, the cells small, in ca. 6 series; pappus of 35–50 bristles, the tips not or scarcely enlarged, the apical cells acute.

Neomirandea standleyi is known only from Costa Rica and western Panama. The species is closely related to *N. homogama* and the distinctions are discussed under that species. The Panamanian material of the two species is easily distinguished on the basis of the involucre, but some specimens of *N. standleyi* from Costa Rica have more ovate outer bracts. In Costa Rica there is also the related species, *N. guevarii* R. M. King & H. Robinson, which has much larger involucre bracts than either *N. standleyi* or *N. homogama*.

CHIRIQUÍ: Bajo Mono, Robalo Trail, W slopes of Cerro Horqueta, 5000–7000 ft, *Allen 4821* (MO). Bajo Chorro, Boquete, 6000 ft, *Davidson 318* (F, MO). Río Chiriquí Viejo Valley, between El Volcán and Cerro Punta, *White 17* (MO, US).

29. PIQUERIA

Piqueria Cav., *Icon. Descr. Pl.* 3: 18. 1794. TYPE: *P. trinervia* Cav.

Erect sparsely branching perennial *herbs*. *Leaves* mostly opposite, usually short-petiolate to sessile; blades ovate to lanceolate with serrate to serrulate

margins, the veins trinervate from base. *Inflorescence* laxly to densely subcymose. *Heads* discoid with 3–5 involucre bracts and florets in equal numbers; involucre bracts equal, in 1 series, spreading when mature; receptacle flat, glabrous; corollas campanulate with a short densely-haired tube, the lobes 5, papillose on inner surface, smaller papillae on outer surface near tip; anther filaments with short to long papillae on lower part, the anther collars broad with cell walls densely covered with annulate thickenings, the exothecial cells subquadrate to broader than long, the anther appendage vestigial or lacking; style base not enlarged, glabrous, the style appendages distinctly enlarged at apex, densely long-papillose below. *Achenes* 5-ribbed with distinctly narrowed base, the lateral surfaces with unusually sparse, minute internal punctations; carpodium straight or contorted; pappus lacking. *Pollen* with prominent broad spines.

Piqueria contains seven species distributed from Mexico to Central America and the West Indies. One species has been collected in Panama.

Literature:

Robinson, B. L. 1906. Studies in the Eupatorieae. Revision of the genus *Piqueria*. Proc. Amer. Acad. Arts 42: 3–16.

1. ***Piqueria trinervia*** Cav., Icon. Descr. Pl. 3: 19. 1795. TYPE: Mexico, *Gomez Ortega?* (MA, not seen).—FIG. 30.

P. ovata D. Don in Loud., Hort. Brit. 337. 1830. TYPE: Mexico (LINN?, not seen).

Ageratum febrifugum Ses. ex DC., Prodr. 5: 104. 1836. nom. nud. pro syn.

Stevia febrifuga Moc. ex DC., Prodr. 5: 104. 1836. nom. nud. pro syn.

Piqueria trinervia Cav. var. *luxurians* Kuntze, Rev. Gen. Pl. 1: 355. 1891. TYPE: Costa Rica, Irazú, 3000 m, Kuntze (NY?, not seen).

P. luxurians (Kuntze) B. L. Robinson ex Volkens, Verh. Bot. Vereins Prov. Brandenburg 65: 118. 1923.

Erect short-lived perennial *herbs* to 1.5 m high, with few or no branches; stems often pale, terete to slightly quadrangular, puberulous on internodes along opposite surfaces above leaf axils and on upper surfaces of branches, glabrescent. *Leaves* opposite; blades ovate to broadly lanceolate, to 8 cm long and 3.5 cm wide, the base rounded and trinervate, the margins with many coarse serrations, the apex acute to slightly acuminate, the surface glabrous or sparsely puberulous mostly on veins; petioles short but distinct, 2–10 mm long. *Inflorescence* a lax to rather dense panicle with cymose to subcymose branches, the ultimate branches 1–4 mm long, partly puberulous. *Heads* 3.5–4.0 mm high with 3–4 florets and 3–4 involucre bracts, the florets fragrant; involucre bracts eximbricate in 1 series, broadly oblong-elliptical with truncate to emarginate tip and distinctly excurrent mucronate midvein, the margins scarious, the outer surface glabrate; corolla white, ca. 2 mm long with distinct, short, densely pubescent tube, the limb short and broadly campanulate, the lobes ca. 1 mm long and 0.6 mm wide, with a few glands on outer surface, the inner surface of limb and the bases of filaments with short hairs. *Achenes* ca. 2 mm long, glabrous; carpodium asymmetric with sigmoid trace; pappus lacking.



FIGURE 30. *Piqueria trinervia* Cav.—A. Habit ($\times \frac{2}{5}$).—B. Base of plant ($\times \frac{2}{5}$).—C. Head ($\times 4$).—D. Achene with style ($\times 2\frac{1}{2}$).—E. Corolla ($\times 2\frac{1}{2}$).

Piqueria trinervia is widely distributed in Mexico and Central America and occurs on the island of Hispaniola. Distinctive characters of the species include the restricted pubescence of the stems, the glabrous involucre bracts, and the contorted base of the achene.

CHIRIQUÍ: Volcán de Chiriquí, 10,400 ft, *Davidson 1016* (F, MO, US). Loma Larga to summit, Volcán de Chiriquí, ca. 2500–3380 m, *Woodson et al. 1044* (MO, US).

30. SCIADOCEPHALA

Sciadocephala J. Mattfeld, Notizbl. Bot. Gart. Berlin-Dahlem 14: 41. 1938. TYPE: *S. schultze-rhonhofiae* J. Mattfeld.

Small to medium-sized perennial *herbs*, procumbent to erect, the bases usually decumbent, with few or no branches, usually sparsely puberulous on stems, branches of inflorescence, involucre bracts, and corollas, hairs often reddish; stems fistulose. *Leaves* opposite, distinctly petiolate; blades narrowly ovate to elliptical or slightly obovate, the base cuneate to rounded or subtruncate, 2–5 pairs of secondary veins with basal pair often prominent and strongly ascending, the apex narrowly rounded or obtuse to slightly acuminate. *Inflorescence* monocephalic to laxly subcymose with few heads, the ultimate branches elongate. *Heads* discoid with ca. 9–15 florets; involucre of 6–14 eximbricate bracts, in 1–2 series, separated to base, spreading when mature, margin scarious; receptacle scarcely convex, covered with discrete oval scars separated by soft tissue, glabrous; corolla narrowly funnellform with sparse hairs on outer surface, the lobes 4, nonpapillose except on margins, cells of limb with thin somewhat sinuous walls; anther collars stout, not enlarged below, without quadrate cells, with prominent annular thickenings, the exothecial cells quadrate to broader than long, the anther appendage about as long as wide or longer; style base glabrous, not enlarged, style shaft without hairs, the style appendages long and narrow, rounded apically, somewhat soft with thin-walled cells. *Achene* narrowly prismatic, nearly terete, without distinct ribs; carpopodium only slightly asymmetrical, not enlarged, not sharply demarcated above, the cells quadrate; pappus of 5 terete clavate knobs, the knobs with a short globular mass of glutiniferous glands apically. *Pollen* with short spines.

Sciadocephala is a genus of 4 known species occurring mostly in lowland areas of northern South America. The glanduliferous knobs of the achene and the soft tissue between the areoles of the receptacle mark the genus as a close relative of *Adenostemma*. *Sciadocephala* was revised by King & Robinson (1974) but the one Panamanian species has been described since that treatment.

Literature:

King, R. M. & H. Robinson. 1974. Studies in the Eupatorieae (Asteraceae). CXXVII. Additions to the American and Pacific Adenostemmatinae. *Adenostemma*, *Gymnocoronis* and *Sciadocephala*. *Phytologia* 29: 1–20.

1. ***Sciadocephala dressleri*** R. M. King & H. Robinson, *Phytologia* 29: 343. 1975. TYPE: Panama, El Llano—Cartí hwy. *Dressler 4671* (MO, holotype; US, isotype).—FIG. 31.

Decumbent perennial *herb* to 0.5 m tall with few or no branches; stems terete with weak striations, reddish-puberulous. *Leaves* opposite; blades elliptical to slightly obovate, mostly 10–12 cm long and 5–6 cm wide, remotely subserrulate, the base narrowly cuneate, strongly trinervate from near base with strongly ascending secondary veins remote from margin, the apex obtuse to narrowly

rounded, the surfaces mostly glabrous, the veins sparsely puberulous below; petioles 7–25 mm long, distally indistinct from blade. *Inflorescence* laxly subcymose, the branches puberulous, the ultimate branches 1–2 cm long. *Heads* ca. 8–10 mm high and to 1 mm wide with ca. 9 florets; involucre bracts 7–8, eximbricate, in 1 series, narrowly oblong, mostly 2.5–3.5 mm long and to 3 mm wide, apically rounded to obtusely acute, sparsely puberulous on outer surface; corolla pale green, 5.0–5.5 mm long, narrowly funnelform, without distinct tube, sparsely puberulous on outer surface, the lobes 5, ca. 0.7 mm long and 0.5 mm wide; anther collars ca. 0.4 mm long, the thecae ca. 1.5 mm long, the appendage about as long as wide; style branches exerted to 4 mm, cream-colored. *Achenes* to 6 mm long, sparsely minutely puberulous; carpophodium not enlarged; pappus of 5 glutiniferous knobs 1.0–1.5 mm long, the glandular portions ca. 0.2 μ in diameter. *Pollen* ca. 30 μ in diameter.

Sciadocephala dressleri is known only from the type locality in central Panama. The species is most closely related to the type species of the genus, *S. schultze-rhönhofiae*, of western Ecuador. The Ecuadorian species differs primarily by its more erect habit and its more serrate, sharply pointed, elliptical leaf blades. In addition, the involucre bracts and corolla lobes of the type species are slightly more elongate.

PANAMÁ: El Llano–Cartí highway, ca. 12 km N of El Llano, *Dressler 4671* (MO, US).

31. STEVIA

Stevia Cav., *Icon. Descr. Pl.* 4: 32. 1797. TYPE: *S. serrata* Cav. (see King & Robinson, 1969).

Mustelia Spreng., *Nacht. 1, Bot. Gart. Halle* 28. 1801. TYPE: *M. eupatoria* Spreng.

Nothites Cass., *Dict. Sci. Nat.* 35: 163. 1825. TYPE: *N. latifolia* Cass. = *Stevia melissaefolia* (Lam.) Schultz-Bip.

Xetoligus Raf., *New Fl. Bot. N. Amer.* 4: 74. 1836. TYPE: *Stevia salicifolia* Cav.

Mostly erect annual or perennial *herbs* or *shrubs*, sparingly to densely branched. *Leaves* opposite or alternate, sessile to distinctly petiolate; blades linear to orbicular, the margins entire to serrate or dentate, rarely deeply lobed, the surface usually puberulous or stipitate-glandular, usually glandular punctate. *Inflorescence* diffuse with few long-pedunculate heads or dense in corymbose panicles. *Heads* discoid with 5 florets; involucre narrowly cylindrical; involucre bracts 5, eximbricate, in 1 series, linear to elliptical, easily torn from receptacle; receptacle glabrous; corolla narrowly funnelform or with somewhat expanded throat, usually with hairs or glands on outer surface and with hairs on inner surface, the cells of the limb elongate with sinuous walls, the lobes rarely to 2 mm long, shorter than throat and tube, oblong-ovate, sometimes zygomorphic with outer lobes longer, densely papillose on inner surface, smooth on outer surface; anther collars cylindrical to larger below, with many quadrate to short-oblong cells below, the cell walls with variably annulate thickenings, the exothecial cells subquadrate to short-oblong, the anther appendage mostly obovate with prominently crenulate distal margin; style base with distinct enlargement, glabrous, or in a few species papillose, the style appendages filiform, densely



FIGURE 31. *Sciadocephala dressleri* R. M. King & H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 4\frac{1}{2}$).—C. Stamen ($\times 23$).

long-papillose. *Achenes* fusiform to cylindrical, strongly 5-ribbed with few to many glands or bristles; carpopodium distinct, short, slightly asymmetric with a few rows of small quadrate to short-oblong cells; pappus with at least a crown of free to united scales, often with 1–30 awns or bristles; one of the achenes in each head often with more reduced pappus. *Pollen* with short spines, sometimes with complex furrows or cylindrical to dumbbell shaped.

The genus *Stevia* contains about 150–200 species (Grashoff, 1972) and ranges from the southwestern United States through Mexico, Central America, and South America to Argentina. Four species have been collected in Panama.

Literature:

- Grashoff, J. L. 1972. A systematic study of the North and Central American species of *Stevia*. Ph.D. dissertation, University of Texas. 608 pp. Microfilm 73-7556.
- King, R. M. & H. Robinson. 1967. Multiple pollen forms in two species of the genus, *Stevia* (Compositae). *Sida* 3: 165–169.
- & ———. 1968. Studies in the Compositae-Eupatorieae. VIII. Observations on the microstructure of *Stevia*. *Sida* 3: 257–269.
- Robinson, B. L. 1930a. Observations on the genus *Stevia*. *Contr. Gray Herb.* 90: 36–58.
- . 1930b. The *Stevias* of North America. *Contr. Gray Herb.* 90: 90–160.
- a. Shrub; leaves glabrous, the veins pinnate; corolla lobes glabrous on outer surface .. 2. *S. lucida*
- aa. Perennial herbs or subshrubs; leaves puberulous at least on veins, the veins weakly to strongly trinervate; corolla lobes with few to many hairs on outer surface.
- b. Pedicels and involucre bracts with few to many stipitate glandular hairs 1. *S. caracasana*
- bb. Pedicels and involucre bracts with only nonglandular hairs and glandular punctations.
- c. Leaves puberulous to subtomentose on lower surface; involucre bracts long-acute or slightly acuminate, scarcely scarious at tips; achenes without pappus awns 4. *S. triflora*
- cc. Leaves puberulous only on veins of lower surface; involucre bracts usually short-acute, often broadly scarious at tips; usually some achenes with 1–2 pappus awns 3. *S. ovata*

1. *Stevia caracasana* DC., Prodr. 5: 121. 1836. TYPE: Venezuela, near Caracas, Vargas 108 (G-DC, not seen, US, microfiche).

- S. elliptica* Hook. & Arn., Bot. Beech. Voy. 424. 1841. TYPE: Mexico, between San Blas and Tepic, Nayarit, *Sinclair* (K, holotype, not seen).
- S. hirtiflora* Schultz-Bip., *Linnaea* 25: 274. 1853. TYPE: Mexico, near Regla, Hidalgo, *Ehrenberg* 30 (P, holotype, not seen).
- S. elongata* var. *caracasana* (DC.) B. L. Robinson, *Contr. Gray Herb.* 90: 141. 1930.

Unbranched or sparingly branched rhizomatous perennial *herbs*; stems often brownish or purple, terete, slightly striate, densely puberulous. *Leaves* opposite; blades ovate, 3–10 cm long and 2–5 cm wide, the base cuneate or rarely subtruncate, usually abruptly decurrent onto petiole, the margins serrate to serrulate, the apex usually short-acute to obtuse, the surfaces with glandular punctations, the upper surface glabrous to sparsely short-pilose, the lower surface sparsely

puberulous to pilose along veins, glabrous or scarcely puberulous on areoles, the veins distinctly trinervate near base; petioles 5–10 mm long, winged distally, sometimes indistinct from lamina. *Inflorescence* usually laxly paniculate, the primary branches opposite, often spreading at more than 45°, densely corymbose terminally, densely puberulous to pilose with few to many stipitate glandular hairs, the ultimate branches mostly 0–3 mm long, rarely to 7 mm long; sub-involucral bracts sometimes broadly elliptical to ovate and prominent. *Heads* ca. 7–10 mm high; involucral bracts mostly narrowly oblong-lanceolate, mostly ca. 6 mm long and 1.2 mm wide, slightly striate, with some glandular punctations, puberulous, with few to many stipitate glandular hairs, the apex usually sharply acute, the margins scarcely scarious; corolla pink or pinkish, 5–6 mm long, hirsute mostly on lobes and limb, with scattered minute glandular punctations, the lobes equal, ca. 1 mm long. *Achenes* 3.5–4.0 mm long, short- to long-hispid; pappus a low, serrate crown of united scales 0.1–0.3 mm long, 4 achenes of head often bearing 3 barbellate basally winged awns alternating with scales.

Stevia caracasana is distributed from central Mexico southward through Central America to Colombia and Venezuela. The species is similar to *S. ovata* but can be distinguished by the stipitate glandular hairs on the branches of the inflorescence and on the involucral bracts. Fully developed specimens of the species can also be distinguished by the more thyrsoid paniculate inflorescences with shorter more spreading lateral branches.

CHIRIQUÍ: Pastures around El Boquete, 1000–1300 m, *Pittier* 2865 (US). COCLÉ: Picacho de Olá, 350–600 m, *Pittier* 5073 (US).

2. *Stevia lucida* Lag., Gen. Sp. Pl. Nov. 28. 1816. TYPE: Mexico, Ixmiquilpan and Zimapán (Cimmapan), Hidalgo, *Née* (MA, not seen).—FIG. 32.

S. glutinosa H.B.K., Nov. Gen. Sp. Pl. 4: 116. ed. fol. 1818. TYPE: Colombia, near Santa Fe de Bogotá and Suacha, *Humboldt & Bonpland* (P, not seen, US, microfiche).

S. fastigiata H.B.K., Nov. Gen. Sp. Pl. 4: 116. ed. fol. 1818. TYPE: Mexico, near city of Guanajuato, *Humboldt & Bonpland* (P, not seen, US, microfiche).

? *S. nitida* Walp., *Linnaea* 14: 320. 1840. TYPE: Mexico, without precise locality, *Karwinski* (LE?, not seen).

S. grandidentata Schultz-Bip. ex Klatt, *Leopoldina* 20: 75. 1884, not *S. grandidentata* Schultz-Bip., *Bull. Soc. Bot. France* 12: 81. 1865. TYPE: Mexico, Tehuacán, Puebla, *Liebmann* 126 (P, holotype, not seen).

S. oaxacana Schultz-Bip. ex Klatt, *Leopoldina* 20: 75. 1884, nom. nud.

Shrubs to 2 m tall with few to many branches, with stems, leaves, branches of inflorescence and involucral bracts vernicose; stems mostly brown, terete or slightly hexagonal, internodes often short, usually glabrous. *Leaves* opposite; blades oblong-ovate to lanceolate, to 16 cm long and 5 cm wide, somewhat conduplicate, the base cuneate or rarely subtruncate, the margins regularly serrate or crenate to remotely dentate, the apex shortly to narrowly acute or slightly acuminate, the surfaces densely glandular-punctate, the lower surface pale and more fleshy; the veins pinnate or with lower pair slightly more prominent; petioles to 2 cm long, wings not obvious. *Inflorescence* flat-topped, corymbose, with lower branches opposite or alternate, the branches puberulous, the ultimate branches 0–2 mm long. *Heads* mostly 9–11 mm high; involucral bracts narrowly oblong-elliptical, 5–6 mm long and 0.7–1.5 mm wide, glandular-punctate, the

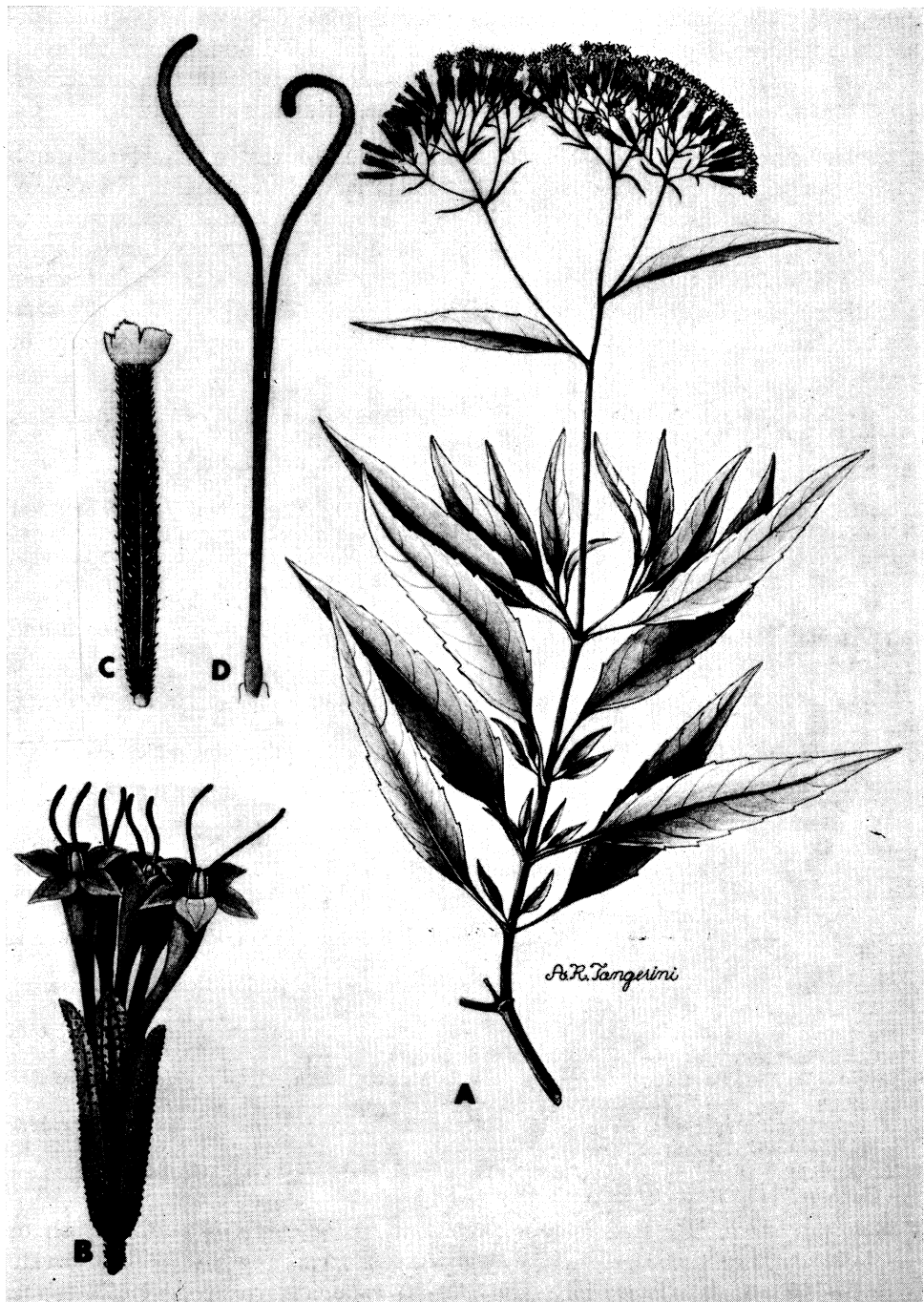


FIGURE 32. *Stevia lucida* Lag.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5$).—C. Achene ($\times 10$).—D. Style ($\times 10$).

apex usually acute and somewhat scarious; corolla pink, 5–6 mm long, glandular-punctate with hairs on lower parts, the lobes equal, 1.0–1.2 mm long, glabrous. *Achenes* 3.5–5.5 mm long, hispid, rarely with some glands; pappus a low crown of dentate to entire, united or separate scales, 0.2 mm high, without awns.

Stevia lucida is widely distributed from central Mexico southward through Central America to the northern Andes in Colombia and Venezuela. The species is one of the most distinct in the genus with glabrous vernicose leaves, stems, and involucre bracts. The species is the only member of the series *Fruticosae* in Panama, but the shrubby habit difference is not always evident in herbarium specimens. The Panamanian material of the species is all of the variety *oaxacana* (DC.) Grashoff which has the branches of the inflorescence subopposite or alternate.

CHIRIQUÍ: Llano del Volcán, 4500 ft, *Allen* 4854 (MO). Llano del Volcán, 1500–1600 m, *Allen & Fairchild* 3470 (MO). Volcán de Chiriquí, Potrero Muleto, 10400 ft, *Davidson* 1052 (F, US). Between El Hato and Cerro Punta, *Ebinger* 801 (F, MO, US). Barú Mtn., 2900 m, *McCorkle* C-152 (US). W slope of El Barú, 6000–7000 ft, *Tyson & Loftin* 5959 (FSU, MO). Top of El Barú above 1100 ft, *Tyson & Loftin* 6178 (FSU). Río Chiriquí Viejo valley, near El Volcán, *White* 207 (MO, US). NE of El Hato del Volcán, near Aguacate, 1800–1900 m, *Wilbur et al.* 10978 (MO, US). 5 mi NE of El Hato del Volcán towards Volcán de Chiriquí, *Wilbur et al.* 11870 (F, MO).

3. *Stevia ovata* Willd., Enum. Pl. Hort. Berol. 855. 1809. TYPE: Material and name perhaps from Lagasca (see below).

- S. ovata* Lag., Gen. Sp. Pl. Nov. 27. 1816. TYPE: Cultivated, originally from Mexico, *Née* (MA, not seen).
S. paniculata Lag., Gen. Sp. Pl. Nov. 27. 1816. TYPE: Cultivated, origin Mexico, *Née* (MA, not seen).
S. rhombifolia H.B.K., Nov. Gen. Sp. Pl. 4: 112. ed. fol. 1818. TYPE: Mexico, Mt. Sanctae Guadalupe near Mexico City, *Humboldt & Bonpland* (P, not seen, US, photo).
S. quitensis H.B.K., Nov. Gen. Sp. Pl. 4: 113. ed. fol. 1818. TYPE: Ecuador, between Quito and Mt. Burro Potrero, *Humboldt & Bonpland* (P, not seen, US, microfiche).
S. ternifolia H.B.K., Nov. Gen. Sp. Pl. 4: 115. ed. fol. 1818. TYPE: Mexico, Michoacán, *Humboldt & Bonpland* (P, not seen, US, microfiche).
S. fascicularis Less., Linnaea 5: 140. 1830. TYPE: Mexico, near Jalapa and near Hacienda de la Laguna, *Schiede & Deppe* 198 (W, not seen, US, photo).
S. nervosa DC., Prodr. 5: 117. 1836. TYPE: Mexico, near Villalpando to east of Guanajuato, *Mendez* (G-DC, not seen, US, photo).
S. uniaristata DC., Prodr. 5: 120. 1836. TYPE: Mexico, in mountains near León, west of Guanajuato, *Mendez* (G-DC, not seen, US, photo).
S. reglensis Benth., Pl. Hartw. 40. 1840. TYPE: Mexico, Regla, Hidalgo, *Hartweg* 808 (K, holotype, not seen; NY, P, isotypes, not seen; G, isotype, not seen, US, photo).
S. ehrenbergiana Schlechter, Linnaea 16: 370. 1842. TYPE: Mineral del Monte, *Ehrenberg* (B, destroyed; HAL, not seen).
S. benthamiana Hieron, Bot. Jahrb. Syst. 28: 561. 1901. TYPE: Ecuador, Guapulo bridge near Quito, *Hartweg* 1090 (P, not seen; NY, not seen; K, not seen, US, photo).

Sparingly branched rhizomatous perennial *herbs*; stems often brownish or purple, terete, slightly striate, densely puberulous. *Leaves* opposite; blades ovate to oblong-elliptical, 3–9 cm long and 1.5–5.0 cm wide, the base cuneate and decurrent onto petiole, the margins entire to serrate, the apex obtusely to sharply acute, the surfaces glandular punctate, the upper surface glabrate to sparsely puberulous, the lower surface puberulous on veins, glabrous or scarcely puberulous on areoles, the veins distinctly trinervate from near base; petioles 2–25 mm long,

winged and often distally indistinct from lamina. *Inflorescence* usually flat-topped and densely corymbose, the primary branches opposite, usually spreading at less than 45°, the branching sometimes diffuse, the branches densely puberulous to subtomentose, the ultimate branches 0–2 mm long, rarely to 8 mm long. *Heads* 6–8 mm high; involucre bracts narrowly oblong, mostly 4–5 mm long and 0.7–1.0 mm wide, glandular punctate, distinctly puberulous, the apex often short-acute or prominently scarious; corolla white or rarely slightly pink, 4.5–5.5 mm long, glandular punctate, with short hairs on tubes and few on limb, the lobes equal, 0.7–1.2 mm long with many multiseptate hairs on outer surface. *Achenes* ca. 3 mm long, sparsely short-hispid; pappus with a crown of separate to united scales ca. 0.3–1.0 mm high, subentire to dentate, with 0–4 barbellate, basally winged awns ca. 4 mm long, often alternating with scales.

Stevia ovata is distributed from northern Mexico southward through Central America to the Andes in Venezuela and Ecuador. Some of the Panamanian specimens have a diffuse habit with small lax corymbs or single long pedunculate heads. Such plants seem to occur sporadically in the species. Pappus awns are usually common in the species but sometimes are lacking from most heads. Still, awns have been seen in a few heads of almost every specimen examined.

CHIRIQUÍ: Boquete–Salta and Volcancitos, 5500 ft, *Davidson 1265* (F, MO). Volcán, ca. 4600 ft, *Duke 9152* (MO, OS, US). Boquete district, 4500 ft, *Terry 1275* (F, US). 3 mi N of El Volcán, 5000 ft, *Tyson 5859* (FSU, MO).

4. *Stevia triflora* DC., Prodr. 5: 115. 1836. TYPE: Mexico, San Felipe, Oaxaca, *Karwinski* (G-DC, not seen, US, microfiche; M, not seen, US, photo).

S. compacta Benth., Pl. Hartw. 197. 1845. TYPE: Colombia, near Río Negro between villages of Fusagasugá and Pandi, *Hartweg 1091* (K, holotype, not seen).

S. rhombifolia var. *stephanocoma* Schultz-Bip., Linnaea 25: 279. 1853. TYPE: Venezuela, Mérida, “Colombia,” *Moritz 1375* (P, holotype, not seen).

Sparingly branched rhizomatous perennial *herbs*; stems mostly brownish, never purple, terete, slightly striate, densely puberulous. *Leaves* opposite; blades ovate to narrowly ovate, 4–8 cm long and 2–5 cm wide, the base cuneate and decurrent onto petiole, the margins slightly to closely serrate or serrulate, the apex acute, the surfaces glandular punctate, the upper surface puberulous, the lower surface puberulous to tomentose on veins and areoles, the veins distinctly trinervate from near base; petioles usually 0.5 cm long, winged and sometimes distally indistinct from lamina. *Inflorescence* flat-topped, densely corymbose, the primary branches opposite, usually spreading at less than 45°, branches densely puberulous to subtomentose, the ultimate branches 0–2 mm long. *Heads* ca. 6–7 mm high; involucre bracts narrowly oblong-lanceolate, 4.5–5.5 mm long and 0.7 mm wide, slightly striate, minutely glandular-punctate, scarcely scarious on margins; corolla white, ca. 4.5 mm long, glandular punctate with few short hairs on tubes and lobes, the lobes equal, ca. 1.2 mm long. *Achenes* 2.5–3.0 mm long, sparsely hispid; pappus a fimbriate to subentire crown of united scales ca. 0.3 mm long, without awns.

Stevia triflora is distributed from central Mexico southward through Central America to the Andes in Ecuador. The species seems close to the common *S. ovata*

and is placed in synonymy by some authors. Some specimens, especially from Chiapas southward, are difficult to distinguish. The pubescence of the lower leaf surface and the complete lack of pappus awns seem the most useful characters. Plants thusly distinguished show a more sharply acute and less scarious tip on the involucre bracts than is seen in most specimens of *S. ovata*.

CHIRIQUÍ: Cerro Vaca, 900–1136 m, *Pittier 5297* (US). Valley of the upper Río Chiriquí Viejo, *White & White 106* (MO). PANAMÁ: Beyond Goofy Lake along road to Cerro Jefe, *Correa & Dressler 451* (MO).

32. TUBEROSTYLIS

Tuberostylis Steetz in Seem., Bot. Voy. Herald 142. 1853. TYPE: *T. rhizophorae* Steetz.

Creeping to scandent small *shrubs*, moderately branched; stems terete, frequently rooting at nodes. *Leaves* opposite, distinctly petiolate; blades slightly succulent, obovate to elliptical, the bases cuneate, the margins entire to crenulate, the apex obtuse to short-acuminate, the veins trinervate from near base. *Inflorescence* terminal on lateral branches or sessile at nodes, corymbose or in subglobose clusters. *Heads* discoid with ca. 10–20 florets; involucre of ca. 25–35 subimbricate bracts, in 4–5 series, very unequal, distinctly striate on outer surface, the outer bracts spreading when mature, the inner bracts deciduous; receptacle flat or slightly convex, glabrous; corolla narrowly tubular with slightly thickened base, the lobes 5, short, nonpapillose, with few or no glands, the corolla cells elongate with sinuous walls; anthers elongate, broad, with mostly short-oblong cells, the cell walls with weak annulate thickenings, the exothecial cells subquadrate, the anther appendage about as long as wide; style base not enlarged, glabrous, the style appendages linear, slightly mamillate. *Achenes* prismatic to cylindrical, covered with thick rind of hyaline cells when mature, glabrous; carpodium short, indistinct; pappus lacking. *Pollen* with short sharp spines.

Tuberostylis is a genus of 2 species distributed mostly along the Pacific coast of northern South America. One species has been collected in Panama.

1. **Tuberostylis rhizophorae** Steetz in Seem., Bot. Voy. Herald 142. 1853. TYPE: Panama, epiphytic on roots of mangrove trees, southern Darién, *Seemann 2201* (BM, not seen, US, photo).—FIG. 33.

Creeping, much branched, often epiphytic small *shrubs*; stems becoming dark brown, slender, slightly fleshy, glabrous. *Leaves* opposite, fleshy; blades obovate to rhomboidal, to 2.5 cm long and 1.8 cm wide, the base cuneate, abruptly narrowly decurrent, the margins slightly crenate in distal half or two-thirds, the apex rounded to obtuse, the surfaces glabrous, the veins obscurely trinervate near base; petioles to 2.5 cm long, with slender bases, becoming slightly but distinctly broader distally. *Inflorescence* terminal on lateral branches, slightly corymbose, the branches sparsely puberulous. *Heads* sessile or nearly sessile in clusters of 2–4, 8–9 mm high and ca. 3 mm wide with 10–12 florets; involucre bracts 25–30, imbricate, in ca. 5 series, 1–7 mm long, short-orbicular to oblong with rounded scarious tips, the outer surface glabrous with 3–5 striations; corolla white, ca. 3.5

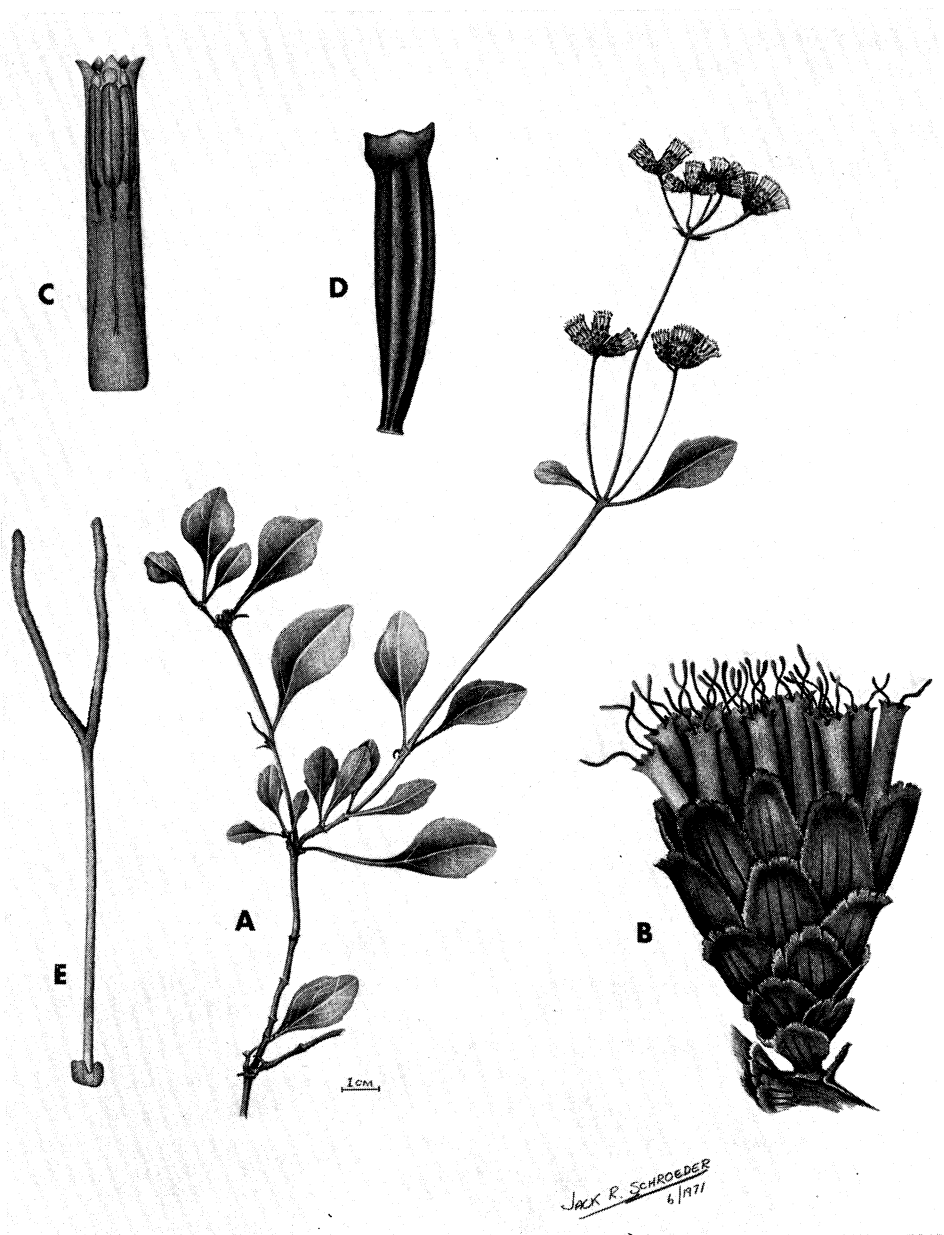


FIGURE 33. *Tuberostylis rhizophorae* Steetz.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5\%$).—C. Corolla ($\times 12\frac{3}{10}$).—D. Achene ($\times 12\frac{3}{10}$).—E. Style ($\times 12\frac{3}{10}$).

mm long, tubular, the lobes short, about as wide as long, glabrous; style branches scarcely broader distally, slightly mamillate. Achenes ca. 3 mm long, prismatic to cylindrical, becoming thickly corticated by layers of thin-walled whitish cells at maturity; carpodium not distinct; pappus lacking. Pollen ca. $23\ \mu$ in diameter.

The species was originally described from Panama but only one recent collection has been seen from the country. The species is most common in the mangrove areas along the Pacific coast of Colombia and the range extends south into Ecuador.

DARIÉN: Río Piñas, *Duke 10556* (MO).

III. ASTEREEAE

W. G. D'ARCY¹⁰

Astereae Cass., Jour. Phys. 88: 195. 1819. TYPE: *Aster* L.

Asteroideae Less., Linnaea 5: 142. 1830. TYPE: *Aster* L.

Mostly perennial, sometimes annual, *herbs* occasionally *shrubs*, rarely *trees*. *Leaves* mostly alternate, entire or toothed but seldom deeply dissected. *Inflorescences* various. *Heads* disciform or radiate with one to several marginal series of mostly fertile pistillate florets and few or numerous, fertile or sterile, staminate or hermaphrodite florets in the center, sometimes unisexual (when dioecious); involucre bracts imbricate in several similar or unlike series, mostly with a narrow hyaline margin, often apically erose; receptacle naked or rarely with persistent or deciduous paleas, alveolate, muricate, or smooth, flat to conical; ray florets mostly with an apically 3-dentate or entire ligule, or the ligule wanting and the apex truncate, erose, or denticulate, anthers lacking, styles mostly linear, sometimes dorsally grooved, mostly glandular; disc florets yellowish, campanulate-crateriform, apically 5-dentate, anthers apically appendaged, truncate, obtuse or minutely auricled basally, style branches flattened, glandular on the margins, mostly apically appendaged with deltoid to lanceolate glandular appendages, or if the appendages not apparent then the branches fusiform and dorsally glandular overall, rarely undivided (sterile florets). *Achene* mostly laterally flattened, the margins mostly thickened by nerves, glabrous or pubescent, sometimes stipitate or beaked; pappus mostly of fine strigose bristles in 1–3 series, rarely of scales or wanting, rarely supplanted by a glandular beak or rim, rarely plumose.

This tribe includes over 1400 species in over 90 genera of cosmopolitan distribution (Bentham, 1873). The laterally compressed achenes and usually radiate or disciform heads are conspicuous unifying features.

Literature:

Cuatrecasas, J. 1969. Prima Flora Colombiana 3. Compositae-Astereae. *Webbia* 24: 1–335.

¹⁰ Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.

- a. Heads radiate; ligules manifestly exceeding the stigmas, pappus, and inner or disc florets.
 - b. Pappus wanting, replaced by a sticky glandular peg; heads borne singly on scapes to 12 cm tall 38. *Lagenifera*
 - bb. Pappus of fine bristles; heads several to many on stems or branches often more than 12 cm tall.
 - c. Midvein of involucre bracts slightly enlarged apically; leaves reduced to scales or spines 34. *Aster*
 - cc. Midvein of involucre bracts not enlarged apically; leaves not reduced to scales or spines 37. *Erigeron*
- aa. Heads disciform; ligules absent or not exceeding the stigmas, pappus, and inner or disc florets.
 - d. Heads all alike, perfect, and fertile; pistillate (outer) florets cylindrical or broadening upward; staminate (inner) florets shallowly lobed, the limb indistinct or tubular; herbs 36. *Conyza*
 - dd. Heads structurally or functionally unisexual; pistillate (outer or all) florets cylindrical or narrowing upward; staminate (inner or all) florets deeply lobed (nearly halfway or more), the limb clearly expanded and campanulate or tubular; shrubs, trees, or woody vines.
 - e. Leaves coriaceous, 3(-7)-nerved from the base, the margins entire; plants functionally and structurally dioecious; receptacle muricate; pistillate florets inflated near the base and narrowing upward 35. *Baccharis*
 - ee. Leaves not coriaceous, pinnately nerved, the margins mostly callose-denticulate; plants functionally dioecious but at least the pistillate heads with florets of the opposite sex; receptacle smooth or alveolate; pistillate florets narrowing abruptly at the extreme base and not narrowing upward 33. *Archibaccharis*

33. ARCHIBACCHARIS

Archibaccharis Heering, Jahrb. Hamburg Wiss. Anst. Beih. 21(3): 40. 1904.

LECTOTYPE: *A. hieracifolia* Heering.

Hemibaccharis Blake, Contr. U. S. Natl. Herb. 20: 552. 1924. TYPE: *H. hieracioides* Blake.

Herbs or weak, often divaricate, scandent *shrubs* to 4(-10) m tall, mostly pubescent; stems often striate, sometimes fistulose. *Leaves* alternate, membranaceous or chartaceous, dentate in the upper portion or subentire with tooth-like, well spaced, callose mucros, pinnately veined, mostly pubescent, sometimes glandular, rarely scabrous; petioles mostly short or wanting. *Inflorescence* a panicle, often rounded, open or compact; reduced, leaflike bracts and scalelike bracteoles mostly present; pedicels filiform. Plants dioecious, perhaps sometimes polygamous; *heads* disciform, mostly with pistillate outer florets and hermaphrodite inner florets but only one sex fertile on a plant; involucre bracts imbricate, in several unequal and unlike series, the innermost lanceolate, glabrous with a slender midvein, the outer series broader, often pubescent with a broader midvein, the hyaline margins apically erose and flanking an indurated stramineous region; receptacle flat, naked, smooth or alveolate; outer florets slender or capillary, the corolla cylindrical, hardly expanded at the base, apically truncate, erose, denticulate or with a small ligule, often pubescent upwards, the style exerted, its branches slender, mostly elongate, glandular, the ovary compressed, pubescent, more so at the base, the pappus of fine strigose bristles in one series; inner florets with crateriform corollas, the corolla tube and base of the limb mostly pubescent, the limb tubular or campanulate, 5-lobed, sometimes deeply so, the lobes acute or ensiform with thickened margins, mostly glabrous, the anthers auricled on the

inner (ventral) side, the appendages lanceolate, the style sometimes pubescent, its branches elongate, fusiform, glandular-papillose dorsally, mostly exerted from the anther appendages, the ovary sterile, mostly shrunken, the pappus slightly expanded apically. *Achene* compressed, often pubescent.

Archibaccharis is distinct in being dioecious while having sterile florets of the opposite sex in at least the pistillate heads. The leaves of most species are also distinctive in the minute teeth of callose mucros which stand at a prominent angle to the leaf margin. The genus differs from *Baccharis* in mostly lacking coriaceous leaves, in possessing two kinds of florets in the heads, in the presence of flat, smooth, or alveolate receptacles, and in the absence of a conspicuous swelling at the base of the corolla of the outer (pistillate) florets. *Archibaccharis* is also closely related to *Conyza* and *Erigeron*. Two interesting features possessed by the genus are the minute auricles on the inner (ventral) surfaces of the anther bases and the tendency of the staminate florets to change from white to rose or purplish in age, colors unusual in disc florets in this tribe.

This is a genus of about 20 species ranging from Mexico to Panama. The three Panamanian species are all from middle and upper elevations.

Literature:

Jackson, J. D. 1975. Revision of the genus *Archibaccharis* Heering (Compositae-Astereae). *Phytologia* 32: 81–194.

- a. Styles of capillary outer florets exerted less than $\frac{1}{3}$ their length; inner florets mostly more than 3.5 mm long; leaves mostly more than 3 times as long as broad.
 - b. Capillary outer florets apically erose or truncate, without a defined ligule; veins 6 or more on each side of the midvein; limb of the inner crateriform florets divided less than halfway 1. *A. irazuensis*
 - bb. Capillary outer florets with a definite ligule ca. 1 mm long; veins ca. 5 on each side of the midvein; limb of the inner crateriform florets divided deeply 2. *A. panamensis*
- aa. Styles of capillary outer florets exerted half their length or more; inner florets mostly less than 3.5 mm long; leaves mostly less than twice as long as broad 3. *A. schiedeana*

1. ***Archibaccharis irazuensis*** (Blake) Blake, Jour. Wash. Acad. Sci. 17: 60. 1927.—FIG. 34 D–E.

Hemibaccharis irazuensis Blake, Contr. U. S. Natl. Herb. 20: 551. 1924. TYPE: Costa Rica, Pittier 14079 (US, not seen).

Shrub or woody *herb* to 2 m tall; stems smooth or striate, puberulent with weak, spreading, brownish, granular hairs, sometimes glabrescent. *Leaves* to 9 cm long, narrow, elliptic, ovate or lanceolate, basally rounded or narrowed, apically acuminate, the margins denticulate with toothlike, callose mucros, with 6 or more ascending pinnate veins on each side of the midvein, reticulate beneath, pubescent on both sides, more so beneath; petioles short or wanting. *Inflorescence* a flat or rounded terminal panicle to 10 cm across; peduncles and pedicels tomentose; bracts resembling small leaves, the bracteoles scalelike, 3–4 mm long. *Heads* disciform; involueral bracts imbricate in several unequal series, indurate, stramineous, the innermost narrowly lanceolate, 3–4 mm long, the outer series shorter, broader, and dorsally pubescent, the midvein prominent, the apices erose; outer florets 4–5 mm long, the corolla capillary, 1.5–3 mm long, apically erose or

truncate, manifestly pubescent, the style exerted for less than $\frac{1}{3}$ its length, its branches linear, somewhat flattened, dorsally papillose, not exceeding the pappus; inner florets 4–5 mm long, the corolla 3–5 mm long, the tube pubescent upwards, the limb basally pubescent, lobed halfway down or less, the lobes obtuse, marginally thickened, glabrous or slightly glandular at the tips, the anthers ca. 1.2 mm long, basally auricled, the appendages narrow, the style branches flattened-fusiform, dorsally papillose-pilose, the ovary shrivelled, the pappus apically expanded. *Achene* flattened, 3-angled, pubescent; pappus of fine strigose bristles in one series.

This species is known only from upland areas of Costa Rica and the Chiriquí mountains. It is closely related to *Archibaccharis serratifolia* (H.B.K.) Blake of Mexico and Guatemala which differs in its much denser, stouter pubescence and its usually much larger leaves.

CHIRIQUÍ: Boquete District, slope of Volcán de Chiriquí, 9500 ft, *Davidson* 991 (MO, US). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery* 463 (MO).

2. ***Archibaccharis panamensis*** Blake, Ann. Missouri Bot. Gard. 28: 472. 1941.

TYPE: Panama, *Allen* 751 (US, holotype; MO, isotype).—FIG. 34A–C.

Herb or *vine* to 3 m tall; stems evenly striate and pubescent with dense, short, weak, brownish spreading hairs. *Leaves* to 10 cm long, subsessile, elliptical, basally acute, apically slightly acuminate and mucronate, the margins subentire with toothlike, callose mucros, with ca. 6 ascending pinnate veins on each side of the midvein, obscure above, finely reticulate and lighter beneath, pubescent on both sides, above with short scattered hairs, beneath with weak, granular spreading hairs most plentiful on the veins. *Inflorescence* a terminal or axillary, congested or open panicle to 30 cm across; peduncle puberulent, the pedicels to 15 mm long, filiform; bracteoles scalelike. *Heads* white, disciform; involucre bracts imbricate in about 3 unequal series, stramineous, the innermost lanceolate, glabrous, 4 mm long, the outer series mostly herbaceous, shorter, broader, densely pubescent, apically erose; receptacle flat, ca. 1 mm across, naked, muricate; outer florets 4–5 mm long, the corolla 2–2.5 mm long, capillary, apically forming a short, clasping ligule 1 mm long that reaches the base of the style branches, the tube pubescent upwards, pilose at the base of the ligule, the style branches exerted, ca. 1 mm long, flattened, lanceolate, dorsally finely glandular; inner florets ca. 5 mm long, the corolla crateriform, the tube ca. 1 mm long, pubescent overall, the limb basally pubescent, divided nearly to the base into 5 ensiform, marginally thickened lobes, the anthers 0.7 mm long, basally minutely auricled, the appendages lanceolate, the style branches 0.8 mm long, exerted from the anther appendages, fusiform, densely glandular-papillose, the ovary reduced (sterile). *Achene* flattened, 3 angles thickened by veins, densely pubescent; pappus of fine strigose bristles in one series, sometimes apically enlarged.

Archibaccharis panamensis and *A. flexilis* (Blake) Blake of Guatemala are distinctive in the ligulate outer florets which partly envelop the style and in the deeply lobed corollas of the inner florets. *Archibaccharis panamensis* may not in fact be a distinct species, but the inflorescence of the type collection is a large



FIGURE 34. *Archibaccharis*.—A–C. *A. panamensis* Blake.—A. Habit of male plant ($\times \frac{1}{2}$). —B. Capillary outer floret ($\times 16$).—C. Inner staminate floret ($\times 16$). [After Allen 751 (MO).]—D–E. *A. irazuensis* (Blake) Blake.—D. Inner staminate floret ($\times 16$).—E. Outer capillary floret ($\times 16$). [After Woodson & Schery 463 (MO).]

open terminal panicle, while the inflorescences of material considered to be *A. flexilis* from further west is axillary and much smaller.

COCLÉ: Near El Valle, 800–100 m, *Allen 751* (MO, US).

3. ***Archibaccharis schiedeana*** (Benth.) J. D. Jackson, *Phytologia* 28: 297. 1974.

Baccharis scandens Less. in Cham. & Schlecht., *Linnaea* 5: 146. 1830, not Pers., *Syn. Pl.* 2: 424. 1807. TYPE: Mexico, *Schiede 318* (GH, not seen).

B. schiedeana Benth. in Örst., *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 1852: 83. 1852, new name for *B. scandens* Less.

Hemibaccharis torquis Blake, *Contr. U. S. Natl. Herb.* 20: 550. 1924. TYPE: Costa Rica, *Tonduz 1535* (US, not seen).

H. salmeoides Blake, *Contr. U. S. Natl. Herb.* 20: 5. 1926. TYPE: Guatemala, *von Tuerckheim III641* (MO).

Archibaccharis torquis (Blake) Blake, *Contr. U. S. Natl. Herb.* 23: 1508. 1926.

Shrub or woody *vine* festooning in thickets to 10 m tall, the branching divaricate; stems leafy, puberulent with weak granular hairs, drying evenly striate, fistulose. *Leaves* to 10 cm long, elliptical or ovate, basally acute or short-acuminate, apically acute or acuminate, mostly mucronate, the margins denticulate with toothlike, callose mucros, ca. 5 pinnate veins ascending on each side from near the base of the midvein, puberulent on both sides with short weak hairs and subsessile glands; petioles to 10 mm long, slender, tomentose. *Inflorescences* numerous, slightly congested ternately divided panicles or cymes, often round topped; peduncles tomentose; bracts similar to reduced leaves; pedicels to 8 mm long, filiform; bracteoles scalelike. *Heads* disciform, 4–5 mm tall, the staminate heads slightly shorter; involuclral bracts imbricate in several unequal series, indurate, stramineous, the innermost narrowly lanceolate, 4–5 mm long, the outer series shorter, broader and dorsally puberulent, the green midvein prominent, the apices erose, often purplish; outer florets 4 mm long, the corolla white, sub-cylindrical, narrowed upward, apically truncate, oblique or erose, glabrous or sparingly pubescent near the top, the style exerted for more than half its length, its branches ensiform, ca. 1 mm long, smooth; inner florets 2.5–4 mm long, the corolla white, crateriform, the tube pubescent upwards, the limb basally pubescent, deeply lobed, the lobes ensiform, marginally thickened, the anthers exerted, 1.5 mm long, basally auricled, the appendages narrow, the style scarcely exerted from the anther appendages, its branches flattened-fusiform, dorsally glandular papillose, the ovary much reduced in length, the pappus sometimes flattened basally or expanded apically. *Achene* a flattened wedge, the three angles thickened by prominent veins, copiously pubescent and with a ring of bristles at the base; pappus of fine strigose bristles in one series.

This species is distinct in its scandent habit, the small broad leaves, the often purplish-tipped involuclral bracts, and the short outer florets with long-exserted styles. The inner florets are mostly less than 3.5 mm long.

Archibaccharis schiedeana ranges from Panama to Mexico. It is known in Panama only from the Chiriquí mountains.

CHIRIQUÍ: Río Chiriquí Viejo N of Volcán, 5200–5600 ft, *Duke 9042* (MO). Pastures around Boquete, *Pittier 2855* (US). Volcán de Chiriquí, Boquete District, 5000 ft, *Terry 1363* (MO). Near Callejón Seco, Volcán de Chiriquí, 1700 m, *Woodson & Schery 481* (MO).

34. ASTER

*Aster*¹¹ L., Sp. Pl. 872. 1753; Gen. Pl., ed. 5. 373. 1754. TYPE: *A. amellus* L.

Leucosyris E. L. Greene, Fl. Francisc. 384. 1891. TYPE: *L. carnosa* (A. Gray) E. L. Greene.

Annual or perennial, mostly erect *herbs*, sometimes spreading by rhizomes; the stems often much branched, occasionally woody. *Leaves* alternate, mostly entire or nearly so and well spaced along the stems, usually becoming smaller upward, rarely reduced to thorns or scales, basal leaves when present often different and wider than those of the stem. *Inflorescence* mostly open-paniculate, occasionally racemose. *Heads* radiate, many flowered; involucre bracts in a few series, imbricate, mostly herbaceous at least near the tips, lanceolate or oblong with hyaline or scarious margins and sometimes subulate tips; receptacle slightly convex, naked; ray florets uniseriate or occasionally biseriate, the corollas exceeding the style and pappus, never yellow, apically dentate or entire, the style branches linear with margins generally thickened or papillose; disc florets perfect, the corollas mostly yellowish with a campanulate, 5-dentate limb, the anthers basally obtuse with ovate or oblong terminal appendages, the style branches oblong to subulate, dorsally papillose-pilose. *Achenes* somewhat flattened with 2–5 conspicuous nerves, glabrous or variously pubescent; the pappus in 1 or, less often, 2 series of fine, strigulose, white or buff bristles.

The genus *Aster* may be recognized by its solitary radiate heads with manifest ligules, by the flattened, laterally nerved achenes, and by the strigulose pappus. It is distinct from other genera in the usually broadened tips of the herbaceous portion of the involucre bracts. The sole Panamanian species is distinct from other members of the genus in its striking vegetative morphology, and it may warrant separation from *Aster*. At the same time, the structure of the involucre bracts and absence of pubescence argue against recognizing it as a member of the segregate genus *Leucosyris*.

When considered in the broad sense, this genus comprises 300 to 500 widely dissimilar species. Many workers consider that *Aster* will eventually be broken into many taxonomically acceptable segregate genera, but an overall consideration of the group is preferable to piecemeal fragmentation into heterodox units. In its full array the genus is nearly cosmopolitan in distribution with the greatest number of species in temperate regions. The type species is from southern Europe.

1. *Aster spinosus* Benth., Pl. Hartw. 20. 1839. TYPE: Mexico, *Hartweg 148* (K, not seen).—FIG. 35.

Leucosyris spinosa (Benth.) E. L. Greene, Pittonia 3: 244. 1897.

Erect wirey *herb* to 70 cm tall, woody at the base and spreading by rhizomes; stems green, drying with prominent angles, essentially leafless and bearing stout green spines. *Leaves* except those of seedlings and turoids reduced to linear scales to 10 mm long, or wanting. *Inflorescence* of numerous heads at the tips of slender

¹¹ Many other names have been published which may be considered synonyms of *Aster*, depending upon the circumscription of the genus. *Leucosyris* is the only such name which applies to Panamanian material.

branches. *Heads* radiate; involucre bracts imbricate in few series, oblong, 5–7 mm long and 1–1.5 mm wide with a broad herbaceous midvein expanding slightly at the tip, the margin slender, hyaline, erose at the rounded apex; receptacle slightly convex, weakly alveolate, 1.5–2 mm across; ray florets in 1 series, the corollas white, ca. 5 mm long, the ligule oblanceolate and apically notched or entire, ca. 0.6 mm wide, the tube ca. 2.5 mm long, the style branches ca. 1 mm long, linear but somewhat flattened with thickened, papillose margins; disc florets perfect, 9 mm long, the corolla yellow, 5 mm long, the tube sparingly pubescent, the anthers 1.25 mm long, slightly exserted, obtuse at the base, the apical appendage obtuse, style branches exserted, resembling those of the ray florets but broader and more conspicuously papillose on the dorsal surface. *Achene* smooth, glabrous, flattened, with three prominent rounded angles, 1.2 mm long; carpodium small and irregular in outline; pappus buff colored, uniseriate, strigulose, slightly exceeding the lobes of the disc florets.

This species is distinctive in its wiry, spiny stems which lack normal leaves. The numerous heads have white rays and yellow discs. It is a native of Texas and Mexico where it forms masses in ditches and other underdrained sites, spreading by underground rhizomes. In Panama it is known only from one collection. "Mexican devil-weed."

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White & White 108* (MO).

35. BACCHARIS

*Baccharis*¹² L., Gen. Pl., ed. 5. 370. 1754. TYPE: *B. halimifolia* L.

Dioecious *trees* or *shrubs*, rarely *herbs*, erect or sometimes scandent or decumbent, mostly glabrate and often resinous. *Leaves* alternate (in Panama), simple, coriaceous or subcoriaceous, the venation pinnate, digitate or with few parallel nerves running to the apex, in some species reduced to thorns or scales or wanting and the stems alate with leaflike, sometimes jointed tissue. *Inflorescences* mostly somewhat compacted panicles, rarely solitary, racemose or spicate, the pistillate inflorescence usually larger than the staminate. *Heads* discoid with many florets, the pistillate heads larger than the staminate; involucre bracts imbricate in several unequal and often unlike series, indurate, the margin sometimes hyaline, apically erose, the midvein obsolete near the base; receptacle flat, convex or conical, mostly naked but in the pistillate heads sometimes paleaceous, usually muricate or verrucose, sometimes alveolate; pistillate florets slender to capillary, the corolla inflated at the base and tapering upwards, apically truncate, erose, or with a minute ligule, shorter than the involucre, the style well exserted, linear-oblong to linear, papillose-stigmatic, the ovary fertile; staminate florets tubular, the corolla clearly differentiated into a campanulate limb divided half-way or more into 5 lobes, the anthers basally obtuse or auricled, the appendages narrow, the style branches various but without manifest appendages, the ovary reduced or rudimentary, sterile. *Achene* cylindrical or somewhat compressed or angled;

¹² Several synonyms are listed by Cuatrecasas, *Webbia* 24: 234. 1969. Only the name *Baccharis* has been used for Panamanian material.

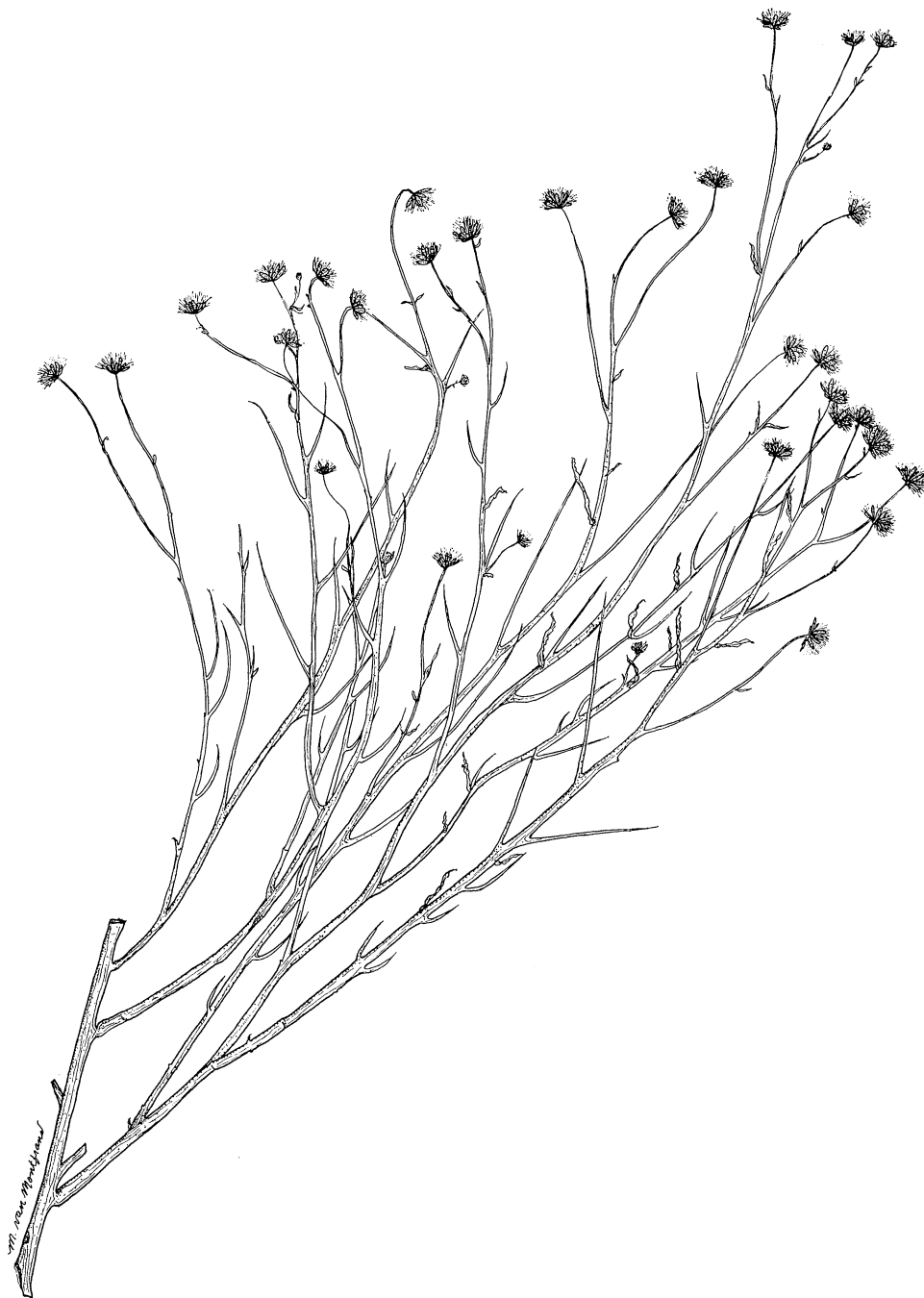


FIGURE 35. *Aster spinosus* Benth. Habit ($\times \frac{1}{2}$). [After White & White 108 (MO).]

pappus of fine, often strigulose bristles in 1 or 2 series, sometimes twisted or crinkled and expanded at the apex, colored in some species, that of the fertile achene exceeding the involucre, that of the staminate (sterile) achene not exceeding the styles.

The genus *Baccharis* may be distinguished in Panama by its coriaceous leaves and often resinous twigs and foliage, by its essentially unisexual heads (an occasional floret of the opposite sex may be present), by the basal enlargement of the pistillate corolla, and by the deeply divided staminate corollas.

Baccharis is a large American genus with some 400 species most abundantly represented in South America. In Colombia 32 species are recognized (Cuatrecasas, 1969) while in Panama there are but two. *Baccharis* is thought to have evolved from *Conyza* or some other member of the Astereae by suppression of the bisexual character. When the genus is revised for South America as a whole, several distinct genera may be separated from the present circumscription of *Baccharis*.

Aristeguieta (1964) records that some species are useful in reforestation in Venezuela, and in Colombia some species are used on a local scale as dyestuffs. The foliage of some species is toxic to livestock, but the plant is unpalatable. In the Old World, particularly in India and Australia the Caribbean species, *B. halimifolia* L., has become naturalized as a noxious woody seed.

- a. Plants glabrous except on emergent parts and petioles, young parts resinous; staminate involucre bracts more than 1.5 mm broad, the florets ca. 6 mm long, the limb lobed about halfway down, the sterile ovary longer than broad; pistillate receptacle with short to minute persistent paleas, usually blackening, the corollas inflated in the lower $\frac{1}{3}$ portion 1. *B. pedunculata*
- aa. Plants minutely puberulent with fine, arachnoid hairs, mostly not resinous; staminate involucre bracts less than 1.2 mm broad, the florets ca. 4 mm long, the limb lobed nearly to the base, the sterile ovary disclike, shorter than broad; pistillate receptacle with elongate, deciduous paleas, not blackening, the corollas inflated in the lower $\frac{1}{2}$ portion 2. *B. trinervis*

1. ***Baccharis pedunculata***¹³ (Miller) Cabr., Bol. Soc. Argent. Bot. 7: 240. 1959.—FIG. 36A.

Conyza pedunculata Miller, Gard. Dict., ed. 8. 1768. TYPE: not seen.

Baccharis cinnamomifolia H.B.K., Nov. Gen. Sp. Pl. 4: 65. 1820 (1818). TYPE: *Humboldt & Bonpland* (P).

B. splendens Heering, Schriften Naturwiss. Vereins Schleswig-Holstein 13: 48. 1906. TYPE: not seen.

Glabrate *shrub* to 4 m tall; branches ascending, sometimes with conspicuous leaf scars, drying with many longitudinal striations and angles, often dark and somewhat reddish; emergent parts resinous. *Leaves* to 12 cm long, entire, elliptical, basally obtuse or acute, apically acute, acuminate or rounded and mucronate, beneath with 3(–7) prominent, elevated, stramineous, parallel nerves and finely reticulate, above with more or less obscure venation or a series of pinnate veins, glabrous, often resinous; petioles to 20 mm long, pubescent on the ventral surface, sometimes sharply angled. *Inflorescence* a corymb or panicle of many heads, to 15

¹³ Other synonyms are listed by Cuatrecasas, Webbia 24: 269. 1969. Only the names listed have been used for Panamanian material.



FIGURE 36. *Baccharis*.—A. *B. pedunculata* (Miller) Cabr., Habit of female plant ($\times \frac{1}{2}$). [After D'Arcy & D'Arcy 6360 (MO).]—B. *B. trinervis* Pers. Flowering branch ($\times \frac{1}{2}$). [After D'Arcy 5217 (MO).]

cm long, overtopping the foliage; bracts small or scalelike; pedicels to 20 mm long, slender, drying strongly angled, ebracteolate. Pistillate *heads* discoid with campanulate involucre 4–5 mm long; involucre bracts loosely imbricate in several unequal series, the innermost narrowly oblong without distinct venation,

exceeding the pappus, the remainder obtuse or rounded with ciliate to erose margins, indurate, stramineous except for the short green midvein visible in the upper portion; receptacle 5–6 mm across, flat, muricate and short-paleaceous, becoming blackish; florets ca. 5 mm long, the corolla white, slender, tubular-corniculate, tapering from a broad base to the erose-margined apex, sparingly pubescent, the style exserted, its branches linear-obtuse, flattened, glandular papillose on the dorsal surface, the ovary glabrous except for a ring of short bristles near the base. Staminate *heads* discoid, smaller than the pistillate; receptacle flat, naked, often not blackening; florets 6 mm long, the corolla tube sparingly pubescent upwards, the limb ca. 2.5 mm long, lobed about halfway, the lobes acute or obtuse with thickened margins, the anthers 1.2 mm long, little exserted, basally slightly auricled, the appendages short-deltoid, the style densely glandular pilose upwards, its branches linear, papillose-pilose, the ovary (sterile) less than half as long as ovaries of the pistillate florets. *Achene* angled with a ring of short bristles at the base; pappus of fine, smooth or strigulose bristles in one series, buff colored.

This species is distinct by the black, flat disc with its short persistent paleas, and by the twigs and foliage being glabrate and resinous rather than puberulent.

Collections of *Baccharis pedunculata* from Panama have been taken in Coclé Province at middle elevations and from the Chiriquí mountains at middle and upper elevations. The species ranges from Costa Rica south and east to Peru and Venezuela.

CHIRIQUÍ: 1 mi S of Boquete, 4000 ft, *Allen* 4721 (MO). Bajo Mono-Robalo Trail, Cerro Horqueta, 5000–7000 ft, *Allen* 4827 (MO). Between Boquete and Monterey, *Croat* 15807 (MO). Las Cumbres, 3040 ft, *D'Arcy* 5305 (MO). Roadsides from Boquete to David above Río Cochea, *D'Arcy* & *D'Arcy* 6304 (MO). Above Boquete on road to La Popa, 4800 ft, *D'Arcy* & *D'Arcy* 6360 (MO). Boquete, *Davidson* 643 (US). Volcán de Chiriquí, Boquete District, 7000 ft, *Davidson* 890 (MO, US). Near Volcán, 4600 ft, *Duke* 9146 (MO, US); 9170 (MO). Llanos Francia, 4000 ft, *Dwyer* & *Lallathin* 8711 (MO, NY). Cuesta de Piedra (Cerro Punta), *King* 5292 (US). 7 mi N of El Hato del Volcán, *King* 5299 (US). Ca. 2 mi S of Boquete, *King* 5316 (US). Near Boquete (to 3 mi N), 3300–4200 ft, *Lewis et al.* 610 (MO, US). 4 mi from Boquete on road to David, *Kirkbride* 91 (MO, NY). N of Dolega, *Partch* 69–142 (MO). Pastures around Boquete, *Pittier* 3125 (US). Palo Alto, 5000 ft, *Stern et al.* 1049 (MO, US). Llanos Francia, 3300 ft, *Stern et al.* 1182 (MO). 3 mi S of El Volcán, 4000 ft, *Tyson* 875 (MO). Río Macho de Monte, 1 mi E of Cuesta de Piedra, 2800 ft, *Tyson* 907 (MO). Bambito, 5600 ft, *Tyson* 5657 (MO), 5868 (MO). Valley of upper Río Chiriquí Viejo, *White* 238 (MO). Near Callejón Seco, Volcán de Chiriquí, 1700 m, *Woodson & Schery* 491 (MO). Finca Lérída to Boquete, 1300–1700 m, *Woodson et al.* 1101 (MO, NY), 1139 (MO, US, NY). COCLÉ: Near El Valle, 800 m, *Allen* 784 (MO, US). Above El Valle 2 mi on road to La Mesa, *Croat* 13316 (MO). Cerro Pilón near El Valle, 700–900 m, *Duke* 12063 (MO). El Valle de Antón, foot of Cerro Pilón, 2000 ft, *Dwyer & Correa* 7922 (MO). El Valle, *Ebinger* 1104 (MO, US). Cerro Pilón, *Lallathin* 5031 (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2505 (MO). N of El Valle de Antón ca. 7 mi, *Luteyn* 1220 (MO). 2 mi S of El Valle, 600 m, *McDaniel* 8244 (US). Llano Bonito N of Las Margaritas, 400–500 m, *Seibert* 525 (MO, NY, US).

2. *Baccharis trinervis*¹⁴ Pers., Syn. Pl. 2: 423. 1807.—FIG. 36B.

Weak *tree* or *shrub*, often somewhat scandent, to 4 m tall; branches arising at right angles, drying green with many longitudinal striations or angles, puberulent

¹⁴ A number of synonyms are listed by Cuatrecasas, *Webbia* 24: 269. 1969. Only the above name has been used for Panamanian material.

with appressed arachnoid hairs, mostly not resinous. *Leaves* to 8 cm long, entire, elliptic, basally obtuse or acute, apically acuminate and sometimes mucronate, beneath with three prominent, elevated, parallel veins and finely reticulate, above with more or less obscure venation, puberulent to pilose on both sides, more so above, coriaceous; petioles to 15 mm long. *Inflorescence* paniculate, situated within or overtopping the foliage; peduncles stout, pubescent, to 20 cm long; bracts 20–25 mm long, leaflike, pilose; pedicels mostly less than 8 mm long, drying strongly angled with minute bracteoles on the lower half. Pistillate *heads* discoid, hemispherical or globose; involucre bracts imbricate in about 3 unequal series, the innermost acuminate, the remainder obtuse or rounded, apically erose, indurate, stramineous except for the short broad midvein visible in the upper portion; receptacle 1–2 mm across, conical, conspicuously muricate, with elongate, deciduous paleas 2–4 mm long; florets ca. 5 mm long, the corolla white, capillary, inflated near the base, apically erose, sparingly pubescent, the style long-exserted, its branches linear, flattened. Staminate *heads* discoid, smaller than the pistillate heads; involucre bracts dorsally puberulent; receptacle conical, naked, muricate, florets 4 mm long, the limb constituting more than half the corolla length, the tube divided nearly to the base into 5 lanceolate, apically acuminate, marginally thickened, glabrous lobes, the anthers ca. 1.3 mm long, fully exserted, basally auricled, the appendages narrow, the style pubescent upwards, its branches lanceolate, flattened, copiously glandular pubescent on the dorsal surface, the ovary (sterile) reduced to an inconspicuous disc between carpodium and pappus. *Achene* densely pubescent; carpodium prominent; pappus of fine strigulose bristles in 1 series, strigose and slightly larger near the apex, tawny or greenish colored.

This species is distinct in its puberulent vegetative parts, and in its elongate, deciduous paleas. The conical receptacle differs from the flat receptacle of the other Panamanian species. Pistillate and staminate plants differ not only in the sex of their flowers; the staminate plants also have narrower, less pubescent leaves and more pubescent involucre bracts.

Cuatrecasas (1969) recognized two varieties under *B. trinervis*. Variety *trinervis* has broader leaves and is less pubescent than var. *rhexioides* (H.B.K.) Baker. Both varieties may be identified in Panamanian material.

Baccharis trinervis ranges from Mexico to Peru and northern Argentina but does not extend east to Venezuela. In Panama it is a frequent plant from lower to upper elevations in all provinces, occurring wherever natural or man-made disturbance has taken place. "Santa Maria."

CANAL ZONE: Victoria fill near Miraflores Locks, *Allen* 1744 (MO, NY). Barro Colorado Island, *Croat* 4206 (MO, NY), 6457, 7221 (both MO). 1 mi N of Summit Gardens, *Croat* 8885 (MO). Ca. 1 mi N of Gamboa Gate on Pipeline Road, *D'Arcy* 5217 (MO). Pipeline Road within 5 mi of Gamboa Gate, *D'Arcy* & *D'Arcy* 6015 (MO). Fort Sherman, *Duke* 4350 (MO). Barro Colorado Island, *Ebinger* 38 (MO). Chagres, *Fendler* 156 (MO), 161 (MO, US). Gamboa, *Heriberto* 54bis (US). Chagres River 1 mi N of Gamboa, *Lazor* 3500 (MO). Between Corozal and Ancón, *Pittier* 2646 (NY). Ancón Hill, *Pittier* 3 March 1906 (US). Barro Colorado Island, *Shattuck* 583 (MO). Balboa, *Standley* 27002 (US). Near Summit, *Standley* 29589 (US). Between France Field and Catival, *Standley* 30288 (US). Between Matías Hernández and Juan Díaz, *Standley* 32041 (US). Barro Colorado Island, *Starry* 264 (MO). Miraflores Locks area, *Tyson* 1254 (MO). 10 mi N of Gamboa, *Tyson* 6313 (MO). Barro

Colorado Island, *Woodworth & Vestal* 437 (MO). CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, upper Río Chiriquí Viejo, 1500–2000 m, *Allen* 1472 (MO, NY). 1 mi SW of Boquete, 4000 ft, *Allen* 4720 (MO). Palo Santo, 3 mi N of Volcán, *Croat* 13551 (MO). Roadside from Paso Canoas to Cañas Gordas, *Croat* 22212 (MO). Ca. 17 mi from David on road to Boquete, *D'Arcy & D'Arcy* 6305 (MO). Bajo Chorro, Boquete District, 6000 ft, *Davidson* 366 (MO, US). Río Chiriquí Viejo, N of Volcán, *Duke* 8995 (MO). Tolé, *Dwyer & Hayden* 7767 (MO). Llanos Francia, *Dwyer* 8715 (MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 620 (MO). Pastures around Boquete, *Pittier* 2872 (NY). Llanos Francia, 3300 ft, *Stern et al.* 1222 (MO). Llanos just S of Boquete, *Stern et al.* 1953 (MO, US). Finca Lérída to Boquete, 1300–1700 m, *Woodson et al.* 1113 (MO, NY). COCLÉ: Hills S of El Valle de Antón, 600–800 m, *Allen* 2864 (MO, US). Near Sardinilla, ca. 7 mi E of cement plant, *Blum & Tyson* 496 (MO). Ca. 1 mi E of Santa Clara Beach, *D'Arcy* 4087 (MO, NY). Santa Clara Beach, *Croat* 9591 (MO). Road to La Mesa 2 mi above El Valle, *Croat* 13299 (MO). Hills above El Valle de Antón, *D'Arcy & D'Arcy* 6767 (MO). Cerro Pilón near El Valle, *Duke* 12074 (MO). El Valle, *Dwyer* 1937 (MO). Above El Valle, *Gentry* 5624 (MO). Near Salamanca, 8 mi E of Transisthmian Hwy., ca. 100 m, *Gentry* 6705 (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2518 (MO). Santa Rita Ridge, *Lewis et al.* 5266 (MO). 5 mi N of El Valle, 2500 ft, *Tyson et al.* 2438 (US). Near Penonomé, *Williams* 206 (NY). DARIÉN: Isla Boca Grande, *Duke* 8839n (MO). HERRERA: Between Ocú & Chitré, *D'Arcy* 4144 (MO). Between Las Minas & Pesé, 600 ft, *Duke* 12336 (MO). S of Ocú 12.5 mi, 1200 ft, *Lewis et al.* 1666 (MO, US). LOS SANTOS: Loma Prieta, 800–900 m, *Duke* 11903 (MO). Pocerí, *Dwyer* 1119 (NY). 17.8 mi S of Macaracas, 1100 ft, *Lewis et al.* 1594 (MO, US). Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al.* 2230 (MO). Isla de Coiba, *Mendez* 137 (MO). Between Tonosí and Macaracas, *Oliver et al.* 3573 (MO). 12 mi S of Macaracas, *Tyson et al.* 2931 (MO). PANAMÁ: Cerro Jefe, 2700 ft, *Blum & Duke* 2186 (MO). 10 km N of El Llano on road to Cartí, *Busey* 915 (MO). Finca del Indio, Cerro Jefe, *D'Arcy* 5232 (MO). Panamá Viejo, *Duke* 5727 (MO). Near top of Cerro Campana, *Duke* 5989 (MO). Cerro Jefe, *Duke* 9422 (MO). Cerro Campana, *Duke* 10723 (MO). Coronado Beach, *Duke* 11799 (MO). Río Pacora below Río Corso, *Duke* 12024 (MO). Cerro Campana, *Ebinger* 361 (MO, US). Camino de las Sabanas, *Heriberto* 282 (US). Cerro Campana, *Lazor* 2217 (MO). Near Panamá, *Macbride* 2615 (US). Bellevista, Panama City, *Macbride* 2740 (MO, US). Cerro Campana, 2600 ft, *McDaniel* 6921a (MO). Between Matías Hernández & Juan Díaz, *Standley* 32041 (US). Just S of La Capitano, *Tyson* 6763 (MO). VERAGUAS: Hills W of Soná, 500 m, *Allen* 1025 (MO, US). Ca. 29 mi W of Santiago, *King* 5280, 5277 (both US). Isla de Coiba, *Mendez* 137 (MO).

36. CONYZA

Conyza Less., Syn. Gen. Comp. 203. 1832, not L.; nom. cons. TYPE: *C. chilensis* Spreng.

Leptilon Raf., Amer. Monthly Mag. & Crit. Rev. 2: 268. 1818. TYPE: *Erigeron divaricatus* Michx.

Erigeron sect. *Caenotus* Nutt., Gen. N. Amer. Pl. 2: 148. 1818. LECTOTYPE: *E. canadensis* L. *Laennecia* Cass., Dict. Sci. Nat. 25: 91. 1822. LECTOTYPE: *L. gnaphalioides* (Kunth) Cass. = *Conyza gnaphalioides* Kunth.

Caenotus (Nutt.) Raf., Fl. Tell. 2: 220. 1836. “*Coenotus*” auct., orth. mut., not Nutt.

Annual or perennial *herbs*, rarely shrubby, our species erect and not truly rosette forming. *Leaves* alternate, simple, entire to pinnatisect, pubescent or glabrous. *Inflorescence* mostly of many heads in an open or compact panicle or sometimes racemose or subspicate along the terminal portion of the main stem, rarely of few or solitary heads; leaves of the flowering portion often smaller and of different shape from those lower on the stem. *Heads* disciform; involucrel bracts imbricate in 1–several series with a herbaceous midvein and a hyaline margin, this usually contracted before the apex; receptacle naked, flat to slightly convex, smooth or muricate, sometimes darkened; outer florets numerous in many series, the corolla apices denticulate or minutely ligulate, the style branches exserted, linear, glandular-verrucose; inner florets fewer than the outer florets,

narrowly tubular, differentiated about mid-length into a tube and limb, the limb tubular, apically 5-dentate, the anthers basally rounded or obtuse, the appendages narrowly lanceolate to subulate, the style branches flattened with a thickened margin, dorsally papillose, its appendages triangular. *Achenes* uniform, much compressed, the margins thickened by two nerves, glabrous to pubescent; pappus of fine strigulose bristles in one or more series, the inner bristles about the length of the inner florets, the outer bristles when present shorter than the achene itself.

Conyza is distinguished from *Erigeron* by its short or absent ligules. It is included in *Erigeron* by many botanists. The florets are usually white or yellowish but in some species may be brownish. The genus is primarily pantropical with about 60 species, but some species are native to the temperate zones, and a few tropical species are wide ranging into temperate areas. Many species are troublesome weeds of towns and cultivation. "Horseweeds."

Conservation of the name *Conyza* Less. (Astereae) with the type *C. chilensis* over *Conyza* L. (Inuleae) and its type *C. squarrosa* L. resulted in a major reconstruction; many Old World species of *Conyza* L. have been or must be transferred to other genera as they are not congeneric with *Conyza* Less.

Literature:

Marshall, J. B. & D. McClintock. 1972. *Conyza* in Britain. *Watsonia* 9: 201–202. 1972.

- a. Inflorescence an open panicle; pedicels elongate and slender, glabrate to puberulent.
 - b. Lower leaves mostly scabrous, the teeth when present obtuse or rounded apically; receptacle 4–6 mm across; outer floret with a distinct ligule 1. *C. apurensis*
 - bb. Leaves not scabrous, the teeth when present with pointed tips; receptacle less than 3 mm across; outer floret with or without a ligule.
 - c. Outer florets with a distinct but minute ligule 0.5 mm long; receptacle 1–1.5 mm across; upper leaves linear, glabrate 3. *C. canadensis*
 - cc. Outer florets apically dentate without a distinct ligule; receptacle 2–2.5 mm across; upper leaves narrow but not linear, mostly pubescent 2. *C. bonariensis*
- aa. Inflorescence compacted or crowded in clusters or spikelike racemes; pedicels short and stout, lanate or tomentose.
 - d. Lower leaves small (to 3 cm) and divided nearly to the margin into 3–7 teeth; stems arachnoid to lanate with soft, wispy hairs; inner florets less than 5 mm long, tubiform with a deeply cleft limb; achene with an irregular ring of glands near the apex 5. *C. schiediana*
 - dd. Lower leaves larger than 3 cm, toothed or crenate but not deeply divided; stems puberulent to tomentose with dense spreading hairs; inner florets more than 5 mm long, tubular, the lobes not twice as long as wide; achene without glands 4. *C. chilensis*

1. *Conyza apurensis*¹⁵ H.B.K., Nov. Gen. Sp. Pl. 4: 73. 1820 [1818]. TYPE: Venezuela, *Humboldt & Bonpland* (P, not seen).—FIG. 37.

Erigeron spathulatum Vahl in West, *Bidrag Ste. Croix* 303. 1793. TYPE: St. Croix, West (C, not seen), not *Conyza spathulata* Hoenem. 1815.

Pubescent ephemeral *herbs*, mostly erect, often branched, to 1 m tall in lowland areas, smaller in uplands; stems pilose near the base with spreading whitish hairs.

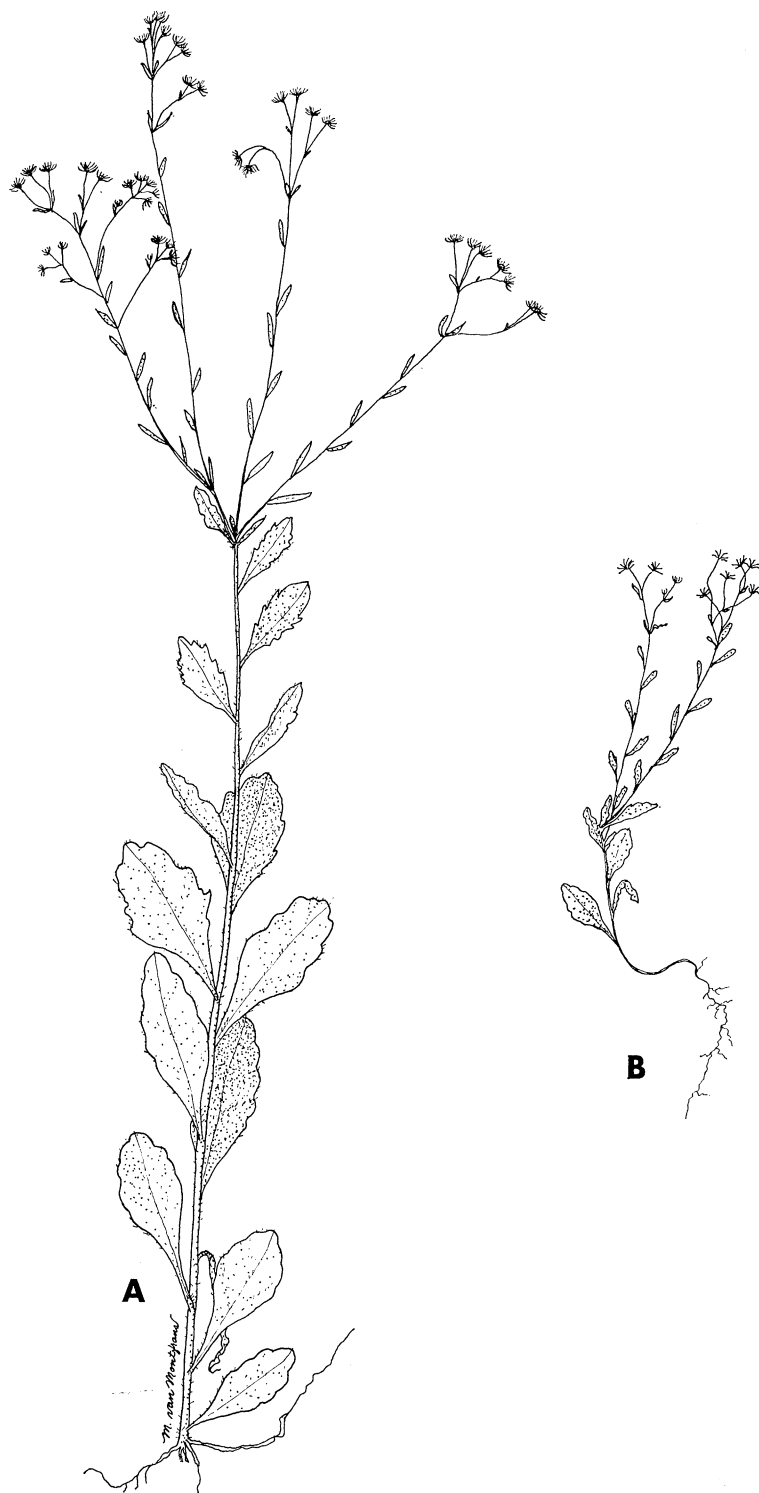
¹⁵ Other synonyms are listed by Cuatrecasas, *Webbia* 24: 222. 1969. Only the names listed have been used for Panamanian material.

Lower leaves to 12 cm long, thin, spatulate; blade orbicular or elliptic, crenate toothed in the upper half, cuneate toward the base; petiole slender and narrowly winged, sparingly to densely pilose on both sides, the midvein prominent, the minor (pinnate) venation often obscure, upper leaves becoming smaller, entire, oblanceolate, sessile. *Inflorescence* an open panicle of many heads; pedicels to 20 mm long. *Heads* disciform, with many florets; involucre bracts imbricate, nearly equal, 3–4 mm long, the midvein flanked by stramineous, somewhat indurate tissue and a hyaline margin, sparingly pilose with long weak hairs; receptacle slightly convex, to 4 mm across, manifestly muricate and sometimes drying blackish; outer florets numerous in about 2 series, white, filiform with a distinct, minute, apically notched ligule to 1 mm long, rarely equalling or barely exceeding the pappus, the tube pubescent in the upper half, the style long-exserted, its branches short, linear-lanceolate, basally flattened; inner florets 3–5 mm long, the limb not much enlarged from the tube, apically 5-lobed, the anthers ca. 0.5 mm long, basally obtuse, apically with narrowly deltoid appendages, the style branches flattened, papillose-verrucose on the sides, glandular pilose on the short terminal appendages. *Achene* compressed, the margins somewhat thickened by two prominent veins, copiously pubescent; pappus of fine strigulose bristles in 1 series about as long as the inner florets.

This species is usually recognizable by the spatulate, crenate leaves near the base of the stem and by the numerous white florets. The large, muricate, often dark receptacle is also distinctive. The basal leaves are not scabrid as are those of *C. chilensis*. Lowland plants of *C. apurensis* are reminiscent of plants of *Erigeron annuum*, but that species has long, showy ligules and is not known to occur in lowland Panama.

Conyza apurensis ranges widely through tropical America. According to Cuatrecasas (1969) it is a native of Asia. In Panama it occurs at all elevations, but plants of the lowlands are much larger and coarser than those of middle and higher elevations.

CANAL ZONE: Barro Colorado Island, *Croat* 5597, 8676 (both MO). Summit Garden, *Croat* 15009 (MO). Old road to Gamboa between Madden Wye and Summit Naval Radio Station, *Croat* 15022 (MO). Chagres, *Fendler* 162 (MO). Barro Colorado Island, *Foster* 970 (DUKE). Cerro Galera ca. 2 km from Pacific Ocean near W boundary of Canal Zone, *Gentry* 6655 (MO). Fort Amador causeway island, *Tyson* 5416 (MO). Macapale Island in Madden Lake, *Tyson* 5487 (MO). CHIRIQUÍ: Quebrada Manzanillo, 9 km SSW of Puerto Armuelles, *Busey* 722 (MO). Near El Hato del Volcán, *Croat* 10710 (MO). Boquete Lookout, 4000 ft, *D'Arcy & D'Arcy* 6327 (MO). Hwy. N of Cerro Panda, 6000 ft, *D'Arcy & D'Arcy* 6619 (MO). Potrero, Boquete, 3800 ft, *Davidson* 664 (MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 364 (MO). Near Boquete, 1200–1500 m, *Woodson & Schery* 775 (MO). Finca Lérida to Boquete, 1300–1700 m, *Woodson et al.* 1164 (MO). COCLÉ: La Mesa above El Valle, *Croat* 14302 (MO). Above El Valle de Antón, *D'Arcy & D'Arcy* 6737 (MO). Slopes of Cerro Pilón, 700–900 m, *Duke* 12089 (MO). DARIÉN: Caná, 2000 ft, *Williams* 724 (NY). LOS SANTOS: Loma Prieta, 800–900 m, *Duke* 11873 (MO). PANAMÁ: Interamer. Hwy. near Tocumen Airport, *Croat* 9768 (MO). Panama City on way to Tocumen, *D'Arcy & D'Arcy* 6115 (MO). Between Cerro Azul and Cerro Jefe, *D'Arcy & D'Arcy* 6228 (MO). Ca. 6 mi E of Chepo on Pan-Am. Hwy., *Duke* 4064 (MO). Río Pacora just below Río Corso, *Duke* 12030 (MO). Near Goofy Lake, *Lazor* 5540 (MO). W slope of Cerro Campana, 2300 ft, *Tyson* 4024 (MO). W slope of Cerro Campana, *Tyson* 4025 (MO).



2. *Conyza bonariensis*¹⁶ (L.) Cronq., Bull. Torrey Bot. Club 70: 632. 1943.

Erigeron bonariensis L., Sp. Pl. 863. 1753. TYPE: Herb. Linn. 994.11 (LINN, not seen).

Conyza floribunda H.B.K., Nov. Gen. Sp. Pl. 4: 69. 1820 (1818). TYPE: Quito, *Humboldt & Bonpland* 3100 (P).

Coarse erect, sparingly branched ephemeral *herb* to 1.5 m tall; stems reaching 5 mm thick at the base, striate, green, evenly puberulent or sometimes glabrescent. Lower (few) *leaves* near the base broadly spatulate and dentate; median leaves to 10 mm long becoming somewhat smaller upwards, oblanceolate, entire or sparingly toothed, the base narrowed, sometimes into a petiolelike region, thin, puberulent, the midvein prominent, the minor venation obscure above, drying fine reticulate beneath. *Inflorescence* a many-headed open terminal panicle, much branched with scattered lanceolate bracts ca. 10–15 mm long; pedicels slender, to 20 mm long. *Heads* small, disciform with many florets; involucre bracts imbricate in ca. 2 series, 4–6 mm long, herbaceous with broad hyaline apically erose margins, glabrous to pilose; receptacle flat or slightly convex, 2–2.5 mm across, muricate; outer florets numerous, white, capillary, 3–4.5 mm long, apically denticulate, usually without a distinct ligule; inner florets few, yellow, clearly differentiated about halfway up into a slender, cylindrical limb, sparingly pubescent towards the top, the lobes deltoid-acuminate, glandular papillose at the tips, the anthers ca. 0.75 mm long, basally auriculate, apically with narrow appendages, the style branches broadly flattened with deltoid appendages, conspicuously glandular-pilose dorsally. *Achene* compressed, the margins slightly thickened by two prominent veins, pubescent, especially towards the base; pappus of fine strigulose bristles in 1 series, ca. 1.5 mm long.

The species is sometimes difficult to distinguish from *C. canadensis* or from large specimens of *C. apurensis*. In *C. canadensis* the leaves are narrower, the heads are smaller, the involucre and other green parts are generally less pubescent or glabrous, and there are small but distinct ligules on the outer florets. Large plants of *C. apurensis* which lack basal leaves may be distinguished by the large inner florets and by the manifest ligules on the outer florets.

Conyza bonariensis is nearly cosmopolitan in distribution, but Cuatrecasas (1969) indicates it may be a native of Argentina. In Panama it may be found in weedy areas throughout the country. Cuatrecasas distinguishes a puberulent var. *leiotheca* (Blake) Cuatr. with a glabrous involucre (most Panamanian plants) from the typical, densely pubescent var. *bonariensis*. Marshall & McClintock (1972) distinguished *C. bonariensis* from *C. floribunda*, but examination of type material revealed they are the same. They may be correct in recognizing two similar taxa in the British flora. "Tabaquillo."

¹⁶ Other synonyms are listed by Cuatrecasas, *Webbia* 24: 222. 1969. Only the names listed have been used for Panamanian material.

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FIGURE 37. *Conyza apurensis* H.B.K.—A. Lowland plant ($\times \frac{3}{10}$). [After Croat 5597 (MO).]—B. Upland plant ($\times \frac{3}{10}$). [After Davidson 664 (MO).]

BOCAS DEL TORO: N slope of Cerro Horqueta, 6000–7000 ft, *Allen* 5007 (MO). Without definite locality, *Wedel* 324 (MO). CANAL ZONE: Barro Colorado Island, *Bailey & Bailey* 363 (BH). Gaillard Hwy. near Paraíso, *Croat* 10138 (MO). Gaillard Hwy. near Gamboa Bridge, *Croat* 14899 (MO). Llanos Francia, 400 ft, *Dwyer & Lallathin* 8722 (MO). Ca. 1 mi S of Madden Dam, *King* 5238 (US). 1 mi NW of Gamboa, *Lazor* 2247 (MO). Ancón Hill, *Standley* 26315 (US). Sosa Hill, *Standley* 26427 (US). Frijoles, *Standley* 27622 (US). Río Pedro Miguel near East Paraíso, *Standley* 30019 (US). Between France Field & Catival, *Standley* 30364 (US). Near Fort Sherman, *Standley* 31223 (US). Obispo, *Standley* 31748 (US). CHIRIQUÍ: Near New Switzerland, 1800–2000 m, *Allen* 1372 (MO). Escuela San Benito, Volcán, *Croat* 10417 (MO). Monte Rey above Boquete, *Croat & Porter* 15661 (MO); *Croat* 15764 (MO). NW side of Cerro Panda, *Croat* 15951 (MO). Between Cerro Punta and Bajo Grande, *Croat & Porter* 15995 (MO). Quebrada Quanabanito beyond La Represa, 2 mi SW of Puerto Armuelles, 0–200 m, *Croat* 22040, 22073 (both MO). Near Las Nubes, 2.7 mi NW of Río Chiriquí Viejo W of Cerro Punta, 2200 m, *Croat* 22360 (MO). First big bridge N of David on way to Boquete, ca. 800 ft, *D'Arcy & D'Arcy* 6289 (MO). Slope of La Popa above Boquete, 5400 ft, *D'Arcy & D'Arcy* 6414 (MO). Slope of Cerro Respinga above Cerro Punta, 8400 ft, *D'Arcy & D'Arcy* 6567 (MO). Bajo Chorro, Boquete District, *Davidson* 149 (MO, US). Llanos Francia, 400 ft, *Dwyer & Lallathin* 8722 (MO). San Bartolo Limite, 12 mi W of Puerto Armuelles, 400–500 m, *Liesner* 214 (MO). E of Boquete, *Stern et al.* 1009 (MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson* 6521 (MO). COCLÉ: Cerro Pilón, *Lallathin* (MO). DARIÉN: Without definite locality, *Bristan* 187 (MO). Near Campamento Buena Vista, Río Chucunaque above Río Tuquesa, *Stern et al.* 874 (MO). LOS SANTOS: 5 mi S of Pocrí, *Croat* 9730A (MO). Los Toretos, *Dwyer* 2436 (MO). 17.8 mi S of Macaracas, 1100 ft, *Lewis et al.* 1618 (MO). PANAMÁ: Pan-Am. Hwy. near Jenine, Río Cañita, *Duke* 3826, 3885, 3894 (all MO). 5–6 mi E of Chepo, *Duke* 4026 (MO). Panamá Viejo, *Dwyer* 2890 (MO). Juan Díaz, *Standley* 30569 (US). Río Tapia, *Standley* 28162 (US). Cerro Jefe, *Tyson et al.* 4311 (MO).

3. *Conyza canadensis*¹⁷ (L.) Cronq., Bull. Torrey Bot. Club 70: 632. 1943.

Erigeron canadensis L., Sp. Pl. 863. 1753. TYPE: Herb. Linn. 994.10 (LINN, not seen).

Coarse erect, sparingly branched ephemeral *herb* to 1.5 m tall; stems striate, glabrous to puberulent. *Leaves* to 10 cm long, linear or linear-lanceolate, sessile, entire or sparingly toothed, apically acute or acuminate, membranaceous, glabrous or sparingly pubescent on both sides, the midvein prominent and the minor venation obscure. *Inflorescence* a many-flowered open terminal panicle, much branched; bracts scattered, rarely to 15 mm long; pedicels slender, to 10 mm long. *Heads* small, disciform with many florets; involucre bracts imbricate in 2–3 unequal series, 3–4.5 mm long, mostly thin and glabrous; receptacle flat or slightly convex, 1–1.5 mm across, muricate; outer florets numerous, white, capillary, 2.5–3 mm long with a definite, short (0.7 mm) ligule; inner florets few, corolla, yellowish; slender, clearly differentiated about halfway up into a slender, cylindrical limb, sparingly pubescent or glabrous, the lobes deltoid-acuminate, the anthers ca. 0.5 mm long, basally obtuse and with obtuse appendages, the style branches flattened with short-deltoid appendages, thickened at the margins, glandular-verrucose dorsally and glandular pilose at the junction of branch and appendage. *Achene* compressed, the margins slightly thickened by two prominent veins, glabrous or pubescent, especially near base and apex; pappus of fine strigulose bristles in 1 series reaching or somewhat exceeding the inner florets.

This species is sometimes difficult to distinguish from *C. bonariensis*. It is distinct in its smaller heads, more glabrate, linear foliage, glabrous or glabrate

¹⁷ Other synonyms are listed by Cuatrecasas, *Webbia* 24: 222. 1969. Only the names listed have been used for Panamanian material.

involucral bracts, and in the presence of a definite, if small, ligule on the outer florets.

Plants smaller than usual with purplish-tipped involucral bracts have been recognized as var. *pusillus* (Nutt.) Cronq. This variety is common in the south-eastern United States and includes the majority of Panamanian specimens of *C. canadensis*.

Conyza canadensis is nearly cosmopolitan in distribution but is perhaps more plentiful in temperate regions. In Panama it is found in weedy areas in upland Chiriquí. Plants from Europe tend to have more prominently ciliate leaves. "Pascueta," "Orozuz" (Puerto Rico), "Horseweed."

CHIRIQUÍ: Escuela San Benito, Volcán, *Croat 10413* (MO). Near El Hato del Volcán, *Croat 10711* (MO). Near Methodist camp near Nueva Suiza, *Croat 13528* (MO). Between Boquete & Monte Rey, *Croat 15805* (MO). Boquete, *D'Arcy & D'Arcy 6348* (MO). Potrero, Boquete, 3800 ft, *Davidson 663* (MO, US). Valley of Río Chiriquí Viejo, N of El Hato de Volcán, 5200–5600 ft, *Duke 9038* (MO). Near Volcán, 4600 ft, *Duke 9136* (MO). Near Boquete, 3300–4200 ft, *Lewis et al. 583* (MO, US). Nueva California, W of Volcán, *Tyson 6674* (MO).

4. *Conyza chilensis* Spreng., *Novi Prov. Hort. Acad. Hal.* 14. 1818. TYPE: Chile, *Chamisso* (not seen).

C. myosotifolia H.B.K., *Nov. Gen. Sp. Pl.* 4: 69. 1820, fide Cuatrecasas, *Webbia* 24: 209. 1969.

Erigeron chilensis (Spreng.) G. Don in Loud., *Hort. Brit.* 343. 1830.

Conyza arabidifolia Remy in Gay, *Fl. Chil.* 4: 76. 1849. TYPE: Chile, *Gay* (NY ex P).

C. yungasensis Rusby, *Mem. Torrey Bot. Club* 3: 55. 1893. TYPE: Bolivia, *Bang 202* (MO).

C. catharinensis Cabr., *Bol. Soc. Argent. Bot.* 7: 191, *tab.* 3. 1959. TYPE: Brasil, *Smith & Klein 7487* (LP, not seen). Cabrera's plate shows a damaged plant of *C. chilensis*.

Coarse erect, little branched ephemeral or short-lived perennial *herb* to 60 cm tall; roots fibrous and sturdy; stems to 6 mm thick at the base, puberulent to tomentose with spreading hairs, scabrous in the lower portion. Basal and lower *leaves* obovate to oblanceolate, to 12(–20) cm long, the basal portion cuneate and somewhat clasping the stem, the apical portion coarsely crenate, scabrous on both sides with short, sharp, stout-based hairs, the midvein prominent, the upper leaves becoming fewer and smaller, oblanceolate, oblong to linear, sessile and somewhat clasping at the base, mostly entire, mucronulate. *Inflorescence* terminal with few or many florets in a compact panicle or corymb; bracts linear, to 9 mm, inconspicuous; pedicels short, stout, tomentose. *Heads* relatively large, disciform with many florets; involucral bracts imbricate in several unequal series, the longest 7–8 mm long, stiff, the grey-green midvein with a prominent median groove flanked by stramineous, indurate ribs and a narrow hyaline margin, apically narrowly acute, dorsally scabrous with copious stiff, straight, ascending or loosely spreading hairs; receptacle flat, 4–6 mm across, brownish, conspicuously muricate; outer florets numerous, the corolla white, capillary, 5–6 mm long and slightly exceeding the involucre, glabrous or sparingly pubescent, apically dentate, usually without a distinct ligule, the style branches glandular, linear but slightly flattened with a median dorsal groove; inner florets fewer, yellowish or brownish, 5–6 mm long and slightly exceeding the outer florets, slightly differentiated into

tube and limb about halfway up the corolla, the limb pubescent with long ascending hairs and the upper portion angled, the anthers ca. 1.5 mm long, basally obtuse, apically with narrow appendages; the style branches flattened with thickened and slightly inrolled margins, copiously glandular-pilose dorsally and on the short-deltoid appendages. *Achene* compressed, slightly thickened at the margins by two veins, pubescent, especially towards the base; pappus of fine strigulose bristles in 1 or 2 series, the inner series as long as the inner florets, slightly longer than the outer florets, the outer series when present of a few bristles much shorter than the achene.

This species is distinct from other Panamanian elements in its strict, erect habit, its strigose foliage and involucre, and in its large florets. As in *C. bonariensis*, the outer florets are apically dentate without distinct ligules.

Conyza chilensis has been collected in Panama only in the Chiriquí mountains. It is widespread in the uplands of tropical America, ranging from Mexico to Argentina and Venezuela.

CHIRIQUÍ: Potrero, Boquete, 3800 ft, *Davidson 648* (MO). SW slopes of mts. just E of Chica, *King 5265A* (US). Near El Hato de Volcán, *King 5302* (US). Between Cerro Vaca and Hato del Horo, Chiriquí, 850–1100 m, *Pittier 5397* (US). Near Boquete, 1200–1500 m, *Woodson & Schery 778* (MO).

5. *Conyza schiediana* (Less.) Cronq., Bull. Torrey Bot. Club 70: 632. 1943.

Erigeron schiedianus Less., Linnaea 5: 145. 1830. TYPE: Mexico, *Schiede & Deppe* (not seen). *E. subspicatus* Benth. in Örst., Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn 82. 1852.

TYPE: Costa Rica, *Örsted* (C, not seen).

Erect or decumbent pubescent *herb* to 30 cm tall, unbranched or much branched from the base; stems slender, densely leafy, arachnoid to lanate with weak, fine white hairs, drying reddish brown. *Leaves* small, sessile, the lower leaves on the stem 15 mm long, upfolded from the midvein, pinnatifid with 1–3 irregular ascending lobes on each side, the lobes callose-tipped, the upper leaves numerous, 15 mm long, linear oblong but flared or auricled at the clasping base, apically mucronate, arachnoid pubescent. *Inflorescence* with many heads subspicate along the upper half or $\frac{2}{3}$ of the stem, the heads crowded in pairs or small groups. *Heads* disciform with many florets, hemispherical to globose; involucre bracts slightly imbricate in about 3 unequal series, the longest ca. 3 mm long, the midvein broad, herbaceous, pubescent, especially near the base, the hyaline margin erose-ciliate, narrower near the apex; receptacle not observed; outer florets numerous, pale blue or almost white, capillary, 3 mm long, the tube sparingly pubescent in the upper half with a distinct, flat but hardly expanded, apically notched ligule 0.5 mm long; inner florets ca. 4.5 mm long, tubiform, the limb basally pubescent, deeply 5-lobed, the margins of the lobes thickened, the anthers ca. 0.7 mm long, basally slightly auricled, the appendages narrow, the style branches flattened and expanded upwards, the lanceolate or narrowly deltoid appendages and the branches copiously papillose-pilose. *Achene* compressed, the margins not thickened, 0.8 mm long, finely appressed pubescent and with an irregular ring of short-stalked glands near the apex; pappus of fine strigulose bristles in 1 series, slightly exceeding the corollas.

This species differs from other Panamanian species in a number of respects. The small, divided leaves and dense, spikelike inflorescences are good general characters, while the expanded, deeply cut limbs of the inner florets and the unthickened margin of the achene are good technical characters. The irregular ring of glands around the top of the achene is also distinctive.

This species is known in Panama from only one collection.

CHIRIQUÍ: Cerro Pando, upper Río Chiriquí Viejo Valley, *White 49* (MO).

37. ERIGERON

Erigeron L., Gen. Pl., ed. 5. 956. 1754. TYPE: *E. uniflorus* L.

Annual or perennial pubescent *herbs*, erect or prostrate, sometimes caespitose, sometimes woody, some species with rhizomes. *Leaves* alternate, sometimes forming rosettes, simple, entire or variously divided, herbaceous, sessile but the lower portion of the leaf often narrowed into a petiolelike region. *Inflorescence* scapose, solitary, or variously paniculate or corymbose. *Heads* radiate or nearly disciform; involucre campanulate or hemispheric, the involucre bracts in about 2 mostly subequal series, somewhat imbricate, herbaceous with a hyaline margin, narrow and apically attenuate, acute or subulate; receptacle flat to slightly convex, naked, alveolate or smooth; ray florets numerous, usually in about 2 series, fertile, the ligule slender to linear, rarely broad, exceeding the style and pappus, apically denticulate or entire; disc florets numerous, the corolla yellowish with a campanulate to infundibuliform, sometimes only slightly expanded limb and 5 regular apical teeth, the anthers basally obtuse, rarely auriculate, the appendage obtuse, oblong or almost linear, the style branches more or less flattened, dorsally papillose-pilose or verrucose with margins thickened, its apical appendages triangular lanceolate to linear, the ovary fertile or a few in the center abortive. *Achene* compressed, ovoid or ellipsoid, glabrous or pubescent with two nerves thickening the margins and sometimes 2–3 additional less conspicuous nerves on the sides; pappus of 1 or 2 series, the inner of fine strigulose bristles, the outer of shorter bristles, scales or wanting.

Erigeron is distinguished from *Aster* by the absence of an apical expansion of the herbaceous nerve of the involucre bracts and from *Conyza* in having ligules longer than the pappus or disc florets. *Erigeron* and *Conyza* are combined by some workers. In general, species of *Erigeron* may be recognized by the many white or bluish (never yellow) slender ray and yellowish disc florets. The nearly similar involucre bracts are arranged in about two imbricate series.

The genus *Erigeron* includes about 200 species almost worldwide in distribution but with the greatest number of species in North America. "Fleabanes."

- a. Large erect plants to 1 m tall; stem leaves more than 6 cm long; stems becoming 3 mm thick; pappus of the ray florets composed of both bristles and scales 1. *E. annuus*
- aa. Decumbent or scapose plants less than 30 cm tall; stem leaves less than 5 cm long; stems less than 2 mm thick; pappus of the ray florets composed only of bristles in 1 or 2 series.
 - b. Plants scapose; stem leaves less than 10 mm long; involucre bracts more than 4 mm long; pappus as long as the disc florets; disc florets more than 3 mm long 2. *E. cuneifolius*

bb. Plants decumbent; stem leaves more than 10 mm long; involucre bracts less than 4 mm long; pappus exceeding the disc florets; disc florets less than 3 mm long

3. *E. karvinskianus*

1. *Erigeron annuus* (L.) Pers., Syn. Pl. 2: 431. 1807.—FIG. 38A.

Aster annuus L., Sp. Pl. 875. 1753. TYPE: not seen.

A. stenactis Krause in Sturm, Deutschl. Fl., ed. 2, 13: 54. 1905. TYPE: not seen.

Erect short-lived perennial *herb* to 1 m tall with a sturdy fibrous root and a small ephemeral rosette; stems striate-angled, puberulent with ascending, sometimes long and spreading, stout-based hairs. Basal *leaves* spatulate, the basal $\frac{1}{2}$ narrowed into a slender petiole, slightly expanded and clasping at the base, the blades dentate with callose-mucronate teeth, scabrous above with sharp ascending hairs, beneath with some long white stiff hairs; stem leaves sessile, glabrescent, longer towards the middle of the stem (to 9 cm long and 15 mm wide) becoming smaller, entire and lanceolate towards the apex, the midvein prominent and flanked by a pair of weaker veins and another pair close to the margin. *Inflorescence* an irregular corymb or panicle of few to many heads; peduncles variable in length, each with 1 or 2 scalelike bracts along their length. *Heads* radiate; involucre bracts in two similar series, slightly imbricated, 3–4 mm long and 0.6–0.8 mm wide, tapering to an acute or acuminate sometimes elongate point, chartaceous with a relatively broad hyaline margin, pilose with conspicuous, ?glandular, thin-walled, large-celled hairs; receptacle 2.5–3 mm across, convex, manifestly alveolate; ray florets numerous in about 2 series, the corollas white, 5–10 mm long and 0.7 mm broad, apically notched or entire, the tube ca. 1 mm long, pubescent with ascending hairs, the style branches ca. 0.25 mm long, flattened and narrowly elliptical; disc florets numerous, yellow, 2–2.5 mm long, the tube ca. 1 mm long, the limb only slightly expanded, tubular-campanulate, prominently angled, the upper half comprising 5 thick-margined deltoid teeth, the anthers 0.6–0.7 mm long, not exerted, the appendages narrow. *Achene* compressed with two veins thickening the margins, densely pubescent, stramineous or greenish; pappus in 2 series, the inner of fine strigulose bristles not exceeding the disc florets, the outer of short, united scales usually much shorter than the achene, the achenes of the ray florets with scales only and lacking bristles.

This species is distinct from other Panamanian species in its robust, coarse habit and in its showy, numerous white ligules. It is distinct from most species of *Erigeron* of other areas in its dimorphic achenes, those of the ray florets with a pappus of scales and those of the disc florets with both scales and bristles.

Erigeron annuus is native to southern Canada and the adjacent United States but is naturalized southward and in Europe. In Panama it is known in Chiriquí Province at upper elevations where it is a frequent weed of gardens, cafetales, and towns. "Daisy fleabane."

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FIGURE 38. *Erigeron*.—A. *E. annuus* (L.) Pers. Habit ($\times \frac{1}{4}$). [After Tyson 5670 (MO).]
—B. *E. karvinskianus* DC. Habit ($\times \frac{1}{2}$). [After Stern et al. 1960 (MO).]

CHIRIQUÍ: Cerro Punta, *Godfrey* 67327 (MO). 2.2 mi below Cerro Punta, ca. 6000 ft, *Luteyn* 895 (MO). 6.7 mi W of Boquete, 8000 ft, *Luteyn* 1506 (MO). Audubon Cabin, Nueva Suiza, *Partch* 69-9 (MO). 2.5 mi S of Cerro Punta, 5500 ft, *Sawyer* 1 March 1967 (MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson* 5620 (MO). Ca. halfway between Cerro Punta and Bambito, ca. 5600 ft, *Wilbur et al.* 10950 (MO).

2. ***Erigeron cuneifolius*** DC., Prodr. 5: 288. 1836. TYPE: Puerto Rico, *Wydler* 303 (not seen).

E. bellidioides Griseb., Cat. Pl. Cub. 149. 1866. TYPE: Cuba, *Wright* 2825 (not seen).

E. domingensis Urb., Symb. Antil. 3: 403. 1903. SYNTYPES: Hispaniola, *Eggers* 2217, 2271 (not seen).

Diminutive rosette forming *herbs* developing a relatively stout rootstock. Basal *leaves* broadly obovate or spatulate to 3 cm long and 1.5 cm broad, the margins entire or with 2-5 teeth in the upper portion, glabrous to puberulent, more so beneath, minutely ciliate on the margins, the midvein strong and the minor venation more or less obscure. *Inflorescence* a scape to 30 cm tall, slender, puberulent with ascending hairs, the leaves scalelike to 10 mm long, lanceolate, basally partly clasping the stem and apically callose-glandular. *Heads* radiate, solitary or 1-3 near the top of the scape, ca. 4 mm high; involucre bracts imbricate in 2-3 unequal series, the longest ca. 3 mm long, narrowly lanceolate with a broad, erose hyaline margin, the herbaceous midvein extending into the tip; receptacle 1.5-3 mm across, convex, naked, alveolate; ray florets numerous in 1 or 2 series, 5 mm long, corollas white, the ligule 0.3 mm wide, the tube relatively long, 2-2.5 mm long, glabrous, the style branches linear, relatively short; disc florets 4 mm long, the corolla yellow, gradually expanding upwards with little distinction between limb and tube, anthers ca. 1 mm long, the appendages narrow, style branches flattened, copiously papillose-verrucose on the margin, the appendages half as broad as long. *Achene* much compressed with two veins thickening the margins, glabrous to densely pubescent; pappus of fine strigulose bristles in 1 series reaching the tips of the style branches, achene of the ray florets like that of the disc florets but narrower, perhaps not fertile.

This species is distinctive in its diminutive habit, spatulate to orbicular rosettes, and slender scapes with tiny leaves. The pubescence of the leaves, scapes, and achenes is quite variable.

Erigeron cuneifolius is known from only one Panamanian collection. It is plentiful in the Greater Antilles from where it was first described. Its range in Central America is uncertain. It has been confused with *E. jamaicensis* L. which has larger heads, more teeth on the rosette leaves, and larger leaves on the scape. *Erigeron cuneifolius* would seem to be closely related to *E. karvinskianus*. Portions of the above description (not of the heads) made use of Jamaican material.

CHIRIQUÍ: Savannas, Boquete, 3800 ft., *Davidson* 730 (MO).

3. ***Erigeron karvinskianus*** DC., Prodr. 5: 285. 1836. TYPE: Mexico, *Karwinski* (M, not seen).—FIG. 38B.

E. mucronatum DC., Prodr. 5: 285. 1836. TYPE: Mexico, *Karwinski* (M, holotype, not seen; IDC 846 III 6, herb. DC.).

- E. gaudichaudii* DC., Prodr. 7: 274. 1838. TYPE: Peru, *Gaudichaud* (not seen).
E. karvinskianum var. *mucronatum* (DC.) Hieron., Bot. Jahrb. Syst. 28: 585. 1901. TYPE: not seen.
E. irazuense Greenman, Proc. Amer. Acad. Arts 40: 36. 1904. TYPE: Costa Rica, *Pittier 14075* (GH).
E. dissectus Urb., Symb. Antil. 7: 426. 1912. TYPE: Hispaniola, *Tuerckheim 3061* (MO).
E. maxonii Blake, Contr. U. S. Natl. Herb. 22: 594. 1924. TYPE: Panama, *Maxon 5306* (US, NY).
E. chiriquensis Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 126. 1940. TYPE: Panama, *Davidson 872* (MO).

Diminutive branched *subshrub*, sometimes decumbent; stems flexuous, glabrate to arachnoid with slender white hairs, in age corky with prominent leaf bases. *Leaves* often clustered on the stem, to 7 cm long, variable in shape, those near the inflorescences smaller and nearly entire, lower leaves spatulate to oblanceolate, entire or variously 3-7 dentate in the upper portion, the sinuses shallow or almost reaching the midvein, the teeth glandular-callose, the apices acute, obtuse or rounded, the midvein prominent, minor veins following the midvein and diverging abruptly to the teeth, thus appearing pinnate, both surfaces sparingly pilose. *Inflorescences* mostly solitary heads at the ends of flowering branches with reduced leaves or more commonly on axillary peduncles which extend above the foliage; peduncles usually with one or two variously reduced bracts. *Heads* radiate; involucre bracts imbricate in about 3 series of slightly different length, 4-9 mm long, narrowly lanceolate, sparingly pilose with an erose-ciliate, hyaline margin, the midvein narrowed into the subulate tip, the outermost bracts sometimes purplish, the tips of the innermost darkened or purplish; receptacle 1.5-4.5 mm across, slightly convex, smooth or alveolate; ray florets in about 2 series, 10 mm long, the corolla white, bluish or purplish, the ligules ca. 0.8 mm broad, entire or apically notched, the tube 3 mm long with a few scattered hairs, the style branches linear, 1 mm long; disc florets 5-10 mm long, the corolla drying yellowish, tubiform, the limb hardly distinct from the tube, anthers 1-1.5 mm long, the appendages subulate-acute, the style branches 0.75 mm long, flattened, oblong with deltoid appendages, manifestly different from those of the ray florets. *Achene* flattened, the margins thickened by two conspicuous veins, copiously pubescent; pappus of fine, strigulose bristles slightly exceeding the disc florets and with at least a partial outer series of short bristles.

This species is quite variable in the size and color of the florets and in the shape of the leaves, but usually at least some leaves are dentate or lobed. In Panama it is distinct in its diminutive woody aspect, mostly solitary pedicels, and in the indistinct merging of the tube into the limb of the disc florets.

Erigeron karvinskianus is native to the upper elevations of tropical America. It ranges from Chile and Venezuela to Mexico and the Antilles. The species is also naturalized in the Old World and material has been seen from Ceylon, the Phillipines, and Tanzania.

CHIRIQUÍ: Summit and SW face of Cerro Copete, 9000 ft, *Allen 4884* (MO). Boquete District, 3800 ft, *Davidson 647* (MO, US). Potrero Muleto, Volcán de Chiriquí, Boquete District, 10400 ft, *Davidson 872* (MO, US), *1037* (MO). Cuesta Grande, E slope of Chiriquí mts., 2600-2900 m, *Maxon 5306* (NY, US). Finca Collins, El Velo, near Boquete, 6150 ft, *Stern et al. 1960* (MO). W slope of El Barú, 10000-11000 ft, *Tyson & Loftin 6144* (MO, SCZ). Chiriquí Viejo Valley, *White 101* (MO, US). Casita Alta to Cerro Copete, 2300-3300 m,

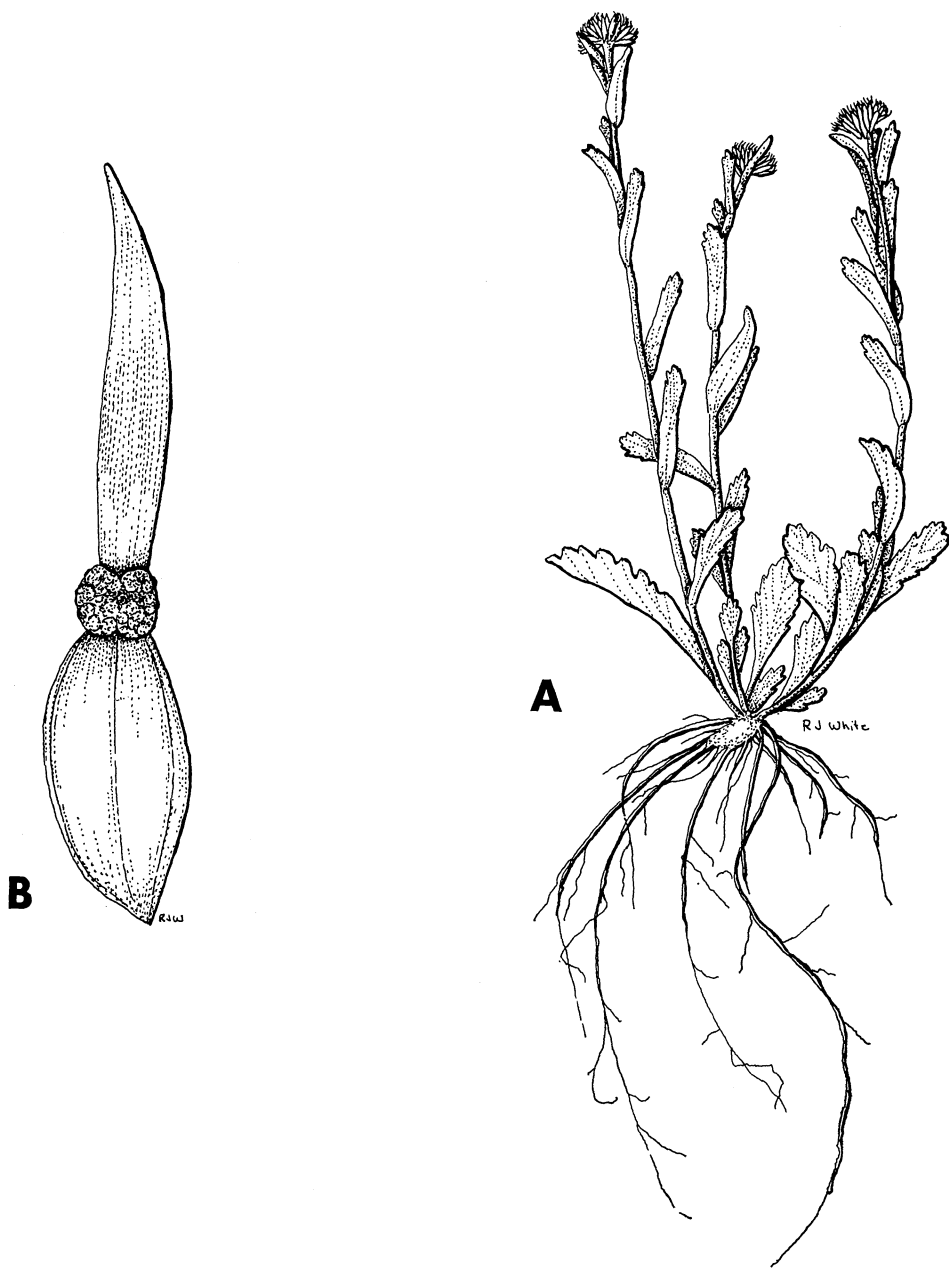


FIGURE 39. *Lagenifera panamensis* Blake.—A. Habit ($\times \frac{3}{5}$).—B. Achene with corolla ($\times 10\frac{7}{10}$). [After Woodson *et al.* 1047 (MO).]

Woodson & Schery 363 (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, Woodson & Schery 397 (MO). Near Boquete, 1200–1500 m, Woodson & Schery 776 (MO). Loma Larga to summit, Volcán de Chiriquí, 2500–3380 m, Woodson *et al.* 1051, 1069 (both MO, NY).

38. LAGENIFERA

Lagenifera Cass., Bull. Soc. Philom. Paris, sér. 3, 1815: 199. 1815. LECTOTYPE: *Calendula magellanica* Willd. = *Lagenifera nodicaulis* (Lam.) Dusén.

Lagenophora Cass., Bull. Soc. Philom. Paris, sér. 3, 1818: 34. 1818, *Lagenifera*, orth. mut.

Scapose and caespitose *herbs*, some with a thickened rootstock or stoloniferous. *Leaves* forming rosettes, alternate and mostly petiolate and spatulate, the margins entire, sinuate or toothed, the teeth sometimes callose-tipped, pubescence of uniseriate, glandular or mostly eglandular hairs or wanting. *Inflorescence* a scape, slender or stout, leafy or leafless, or the few leaves reduced to scalelike bracts; peduncle not distinct from the scape. *Heads* solitary, manifestly radiate; involucre bracts numerous, imbricate, herbaceous with a single prominent midvein and inconspicuous hyaline margins, ciliate towards the apex; ray florets in 1–3 series, pink, purplish or white, the corollas ligulate or rarely tubular, the tube short and abscising with a conspicuous callose or glandular ring at the base, the ovary laterally flattened with a prominent thickened margin, glabrous, obliquely turbinate with a narrowed stipelike base and a glandular peglike apex; disc florets clavate-crateriform corollas, the base of the tube like that of the ray floret, the anthers rounded or shortly auricled at the base with aristate appendages; the style branches usually more glandular and pubescent than those of the ray florets. *Achenes* shiny, flattened, the margin prominent, with a beak at each end, the apex sticky; carpodium inconspicuous; pappus wanting.

The genus may be recognized by its scapose habit and by the laterally flattened achenes with their sticky apical beaks. As pointed out by Beaman & De Jong (1965), this genus is better placed in subtribe Grangeinae than in subtribe Bellidinae where it was placed by Hoffman (1894). The genus is perhaps most closely related to *Laestadia* Less. where there is also a narrow column with a glandular ring that separates the corolla limb and ovary body. *Laestadia*, which occurs in similar habitats from Bolivia to Costa Rica, has similar involucre bracts and scapelike inflorescences.

Lagenifera includes about 30 species distributed mainly on the periphery of the Pacific Ocean. *Lagenifera andina* Badillo (Venezuela), *L. cuchumatana* Beaman & De Jong (Guatemala), and *L. maviensis* Mann (Hawaii) are all close relatives of *L. panamensis* and may in fact be extremes of one plastic species. This group is distinct from the species of Patagonia and the western Pacific in the stouter, leafy scapes, the dentate leaves, and the short style branches; it should probably be recognized as a separate subgenus.

Literature:

- Beaman, J. H. & D. C. D. De Jong. 1965. A new species of *Lagenophora* (Compositae) from Guatemala. *Rhodora* 67: 36–41.
- Cabrera, A. L. 1967. The genus *Lagenophora* (Compositae). *Blumea* 14: 285–308.

1. **Lagenifera panamensis** Blake in Woods. & Seib., Ann. Missouri Bot. Gard. 26: 314. 1939. TYPE: Panama, *Woodson et al.* 1047 (US, holotype; MO, isotype).—FIG. 39.

Caespitose, scapose, perennial *herb* with a sturdy rootstock. Basal *leaves* spatulate to 5 cm long including the winged petiole, the blades ca. 2 cm long, elliptical, apically obtuse or rounded, the margin callose, dentate, glabrous but sparingly ciliate-margined with eglandular hairs, more so near the base, dried material with a scattering of whitish ?glandular spots visible with a lens on the upperside, the venation obscure above, beneath with about 3 ascending pinnate veins on each side of the midvein; leaves of the scape sessile and slightly clasping at the base, to 2.5 cm long and 3–5 mm broad, oblong, apically with 5–7 teeth much smaller than those of the basal leaves. *Inflorescence* a scape, 10–12 cm tall, evenly leafy to the summit and bearing a solitary head, glabrous or with a few scattered hairs along its length but pilose to arachnoid at the summit. *Heads* radiate, hemi-globose, 8–12 mm broad and ca. 6 mm tall; involucral bracts herbaceous, 1-nerved, oblong, 4 mm long and 0.6–0.8 mm wide, apically obtuse, glabrous but ciliate especially near the apex, purplish near the apex and with minute (?glandular) whitish spots; receptacle nearly flat, naked, ca. 8 mm wide; ray florets, ca. 57, 2-seriate, the corolla “pale pink-lavender,” glabrous, 3 mm long, the tube short, basally thickened with a glandular-verrucose annulus which is hardly distinguishable from the apex of the ovary, the ligule lanceolate, its nerves obsolete and its margins slightly inrolled, the style branches 0.25–0.5 mm long, minutely papillose, the ovary laterally flattened, ca. 2 mm long, glabrous, obliquely turbinate, thick-margined, apically with a prominent peg-like, 0.25 mm long, glandular-verrucose beak and basally narrowing into a pseudostipe above the carpopodium; disc florets ca. 28, the corolla 2–2.5 mm long, the limb glabrous, campanulate, with 5 short teeth, the base of the corolla and ovary like those of the ray florets, the anthers 0.8 mm long, basally rounded or auricled, the appendage aristate, *Achene* shiny, compressed with prominent margins, the beak sticky, the base narrowed with an inconspicuous carpopodium; pappus wanting.

This species is known only from two collections. It may be recognized by the caespitose rosettes of dentate, spatulate leaves and by the small radiate heads. The glandular peg on the apex of the achene is distinctive in the Panamanian flora.

CHIRIQUÍ: Potrero Muleto, Boquete District, 10400 ft, *Davidson* 1037 (US). Potrero, Loma Larga to summit of Volcán de Chiriquí, 2500–3380 m, *Woodson et al.* 1047 (MO).

IV. INULEAE

W. G. D'ARCY¹⁸**Inuleae** Cass., Jour. Phys. 88: 193. 1819. TYPE: *Inula* L.Gnaphalieae Rydb., Fl. Rocky Mts. 833. 1917. TYPE: *Gnaphalium* L.

Herbs or *shrubs*, rarely *trees*; pubescence mostly arachnoid, stems sometimes glandular. *Leaves* alternate (Panama) or opposite, mostly cauline, mostly entire, often tomentose; petiolate or sessile. *Inflorescence* mostly paniculate or spiciform. *Heads* disciform, discoid, or seldom radiate; involucral bracts mostly numerous in several graded series, mostly indurate, overlapping, free, sometimes colored; receptacle flat or convex, mostly naked; ray florets with slender, mostly tubular corollas; disc florets with tubular-campanulate corollas; anthers connate, apically appendaged, basally obtuse, sagittate or tailed; style branches apically rounded or truncate, unappendaged; ovaries mostly terete. *Achene* mostly terete, small, often ribbed; pappus of numerous fine, strigose bristles.

This tribe may be recognized by the alternate leaves, arachnoid pubescence, and small, plump achenes. The Inuleae is especially well developed in the Old World and in Australia. Some species have in the past been confused with the Astereae but details of androecium and achene separate the two tribes in such cases of convergence.

- a. Pappus bristles exceeding the involucral bracts.
 - b. Involucral bracts, narrow, acicular, less than 1 mm wide; heads not pinkish.
 - c. Stems conspicuously winged; leaves conspicuously different above and beneath; heads in a congested spikelike inflorescence; pedicels inconspicuous or wanting 43. *Pterocaulon*
 - cc. Stems not or only inconspicuously winged; leaves alike on both sides; heads in an open panicle; pedicels evident 39. *Blumea*
 - bb. Involucral bracts obtuse, often more than 1 mm broad; heads pinkish.
 - d. Central, staminate floret solitary, the nectary larger than the achenes (Fig. 44); leaves becoming glandular punctate with a fine, dense, greyish tomentum on both sides 44. *Tessaria*
 - dd. Central, staminate florets 1-several, the nectary expanded but not as large as the achenes; leaves mostly not glandular punctate, the indumentum not dense above 42. *Pluchea*
- aa. Pappus bristles not exceeding the involucral bracts.
 - e. Heads solitary, the pedicels evident; leaves not wooly, both sides alike.
 - f. Involucral bracts green, acicular, less than 1 mm wide (native species) 39. *Blumea*
 - ff. Involucral bracts mostly colored, acute or obtuse, more than 2 mm wide (cultivated species) 41. *Helichrysum*
 - ee. Heads glomerate, the pedicels occluded or wanting; leaves wooly beneath, the upper sides often glabrate 40. *Gnaphalium*

39. BLUMEA

Blumea DC., Arch. Bot. (Paris) 2: 514. 1833, nom. cons. TYPE: *B. balsamifera* (L.) DC.

?*Laggera* Schultz-Bip. ex Benth. & Hook. f., Gen. Pl. 2. 290: 1873. TYPE: *L. purpurascens* Schultz-Bip. ex K.H.E. Koch.

¹⁸ Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.

Doellia Schultz-Bip. in Walp., Repert. Bot. Syst. 2: 953. 1843. TYPE: *D. kotschy* Schultz-Bip. (nom. nud.).

Placus Lour., Fl. Cochinch. 496. 1790. TYPE: *P. tomentosus* Lour. = *Blumea mollis* (D. Don) Merr.

Pseudoconyza Cuatr., Ciencia (Mexico) 21: 31. 1961. TYPE: *P. lyrata* (H.B.K.) Cuatr. = *Blumea viscosa* (Miller) Badillo.

Herbs or *shrubs*, annual or perennial, erect, ascending or sometimes procumbent; stems sometimes winged. *Leaves* alternate, simple, entire, or toothed, sometimes lobed, often glandular, pubescent; petiole wanting or short, sometimes winging the stem. *Inflorescence* solitary or paniculate, terminal or axillary, often aggregated into panicles, sessile or pedunculate, sometimes with paired bracts, bracteolate or not. *Heads* disciform, mostly small with many florets; involucre bracts numerous, imbricate in several series, dorsally pubescent, the margins scarious; receptacle flat or convex, naked or pilose; ray florets slender, the corolla mostly yellowish white, the style sometimes conspicuously exerted, the ovary fertile; disc florets fewer than the ray florets, the corolla apically (4-)5-lobed, the anthers with variously shaped apical appendages and slender tails, the ovary fertile or not. *Achenes* small, brown, oblong, 5-10-ribbed, plump, terete or obscurely 4-angled; pappus of numerous slender, strigose bristles in one series.

This genus may be recognized by its disciform, heterogamous heads, narrow, scarious-margined involucre bracts, naked receptacle, and mostly tailed anthers. The genus is, with the exception of the species treated here, entirely Old World in distribution. The American species has been placed in a number of genera but would seem most closely related to species such as *Blumea aurita* DC. and *Laggera kotschyi* Schultz-Bip. of Africa, and it is probably conspecific with some African species in this alliance. Randeria (1960) separated *Laggera* from *Blumea* because of its usually obtuse anther tips but Wild (1968) united the two genera. Superficially, *Blumea viscosa* treated here does not resemble the type species of either *Blumea* or *Laggera*, differing from *B. balsamifera* in having the pappus bristles in one rather than two series. If it is to be recognized as generically distinct, either the name *Pseudoconyza* or *Placus* should be used. The generic position of this species was further discussed by Badillo (1974).

Literature:

Badillo, V. M. 1974. *Blumea viscosa* y *Piptocarpha cuatrecasiana*, dos nuevas combinaciones en Compositae. Revista Fac. Agron. (Maracay) 7(3): 9-16.

McVaugh, R. 1972. Nomenclatural and taxonomic notes on Mexican Compositae. Rhodora 54: 495-516.

Randeria, A. J. 1960. The composite genus *Blumea*, a taxonomic revision. Blumea 10: 176-317.

Wild, H. 1968. The Compositae of the Flora Zambesiaca Area 2. Kirkia 7: 121-135.

1. ***Blumea viscosa*** (Miller) Badillo, Revista Fac. Agron. (Maracay) 7(3): 9. 1974.—FIG. 40.

Conyza viscosa Miller, Gard. Dict., ed. 8. 1768. TYPE: Veracruz, *Houston* (BM).

C. lyrata H.B.K., Nov. Gen. Sp. Pl. 4: 70. 1820. TYPE: Guayaquil, *Humboldt & Bonpland* (P).

- Eschenbachia lyrata* (H.B.K.) Britt & Millsp., Fl. Baham. 444. 1920.
Blumea lyrata (H.B.K.) Badillo, Bol. Soc. Venez. Ci. Nat. 10: 257. 1946.
Ernstia lyrata (H.B.K.) Pittier, Cat. Fl. Venez. 505. 1947, genus ined.
Pseudoconyza lyrata (H.B.K.) Cuatr., Ciencia (Mexico) 21: 31. 1961.
P. viscosa (Miller) D'Arcy, Phytologia 25: 281. 1973.
Blumea viscosa (Miller) D'Arcy, Phytologia 30: 5. 1975, redundant comb.

Herb to ?70 cm tall; stems solid or sometimes hollow, drying yellowish or greenish, striate, sparingly pubescent with long (1 mm) slender, simple hairs, and pulverulent-viscose with short and sessile glandular hairs, the glands often drying amber-colored. *Leaves* alternate, simple or basally divided into stipulelike auricles, obovate or spatulate, basally narrowed into a petiolelike region or not, the margins evenly dentate, the teeth mucronulate, the minor venation obscure, the midveins often prominent, both sides sparingly pilose with long slender simple hairs and short or sessile glandular trichomes. *Inflorescence* mostly an open panicle subtended by leaflike bracts; pedicels slender, to 12 mm long, sometimes much shorter or wanting, bracteolate or not. *Heads* cupular; involucre bracts many in several unequal series, the outer series herbaceous, lanceolate with strigulose margins and acute tips, strigose and glandular dorsally, the innermost slightly longer, more slender and more-or-less indurate, apically strigulose; receptacle naked, or with some small scattered simple hairs, mostly flat to depressed-hemispheric with a shallow central depression, 3–4 mm across; ray florets many, the corolla capillary, apically 3-notched, these in turn sometimes notched, ca. 3 mm long, little or not expanded basally, the style with a small nectary, the style branches mostly long exserted, the ovary fertile; disc florets few, 5 mm long, the corolla tubular, slightly expanded apically into a 5-toothed limb, slightly angled, the limb minutely pulverulent, the lobes with short, capitate hairs (colleters), the anthers ca. 1.2 mm long with fine basal tails and rounded, slightly longer than broad appendages, the style slightly expanded near the base, apically strigose and indistinct from the style branches which are unappendaged and open slightly or not at all, the ovary fertile. *Achene* brownish, plump, ellipsoid, prominently many-ribbed; pappus of numerous strigose bristles in one series.

Blumea viscosa occurs near seacoasts throughout the Caribbean region. Superficially much like species of *Conyza*, it differs in its dentate leaves which are much wider above the middle, in its plump achenes, and in the tails on the anthers. Several collectors report it to have a noxious odor. The species is closely related to African species such as *Blumea mollis* (D. Don) Merr. and species which Randeria (1960) placed in sect. *Paniculatae*. *Blumea viscosa* is the oldest name in the group.

McVaugh (1972) notes that there may be two distinct varieties in the species, and if this is the case, Panamanian material should be known as *Blumea viscosa* var. *lyrata* (H.B.K.) D'Arcy. The typical variety *viscosa* refers to pale-pilose plants, less glandular than those occurring in Panama. "Lechuguilla."

CANAL ZONE: Reserva forestal Madden, *Candido* 11 May 1970 (MO). Balboa, *Macbride* & *Featherstone* 37 (US). Ancón Hill, *Piper* 5572 (US). Balboa, *Standley* 30878 (US). COCLÉ: Aguadulce, *Pittier* 4966 (US). HERRERA: Las Salinas de Chitré on Bahía Parita E of Chitré,

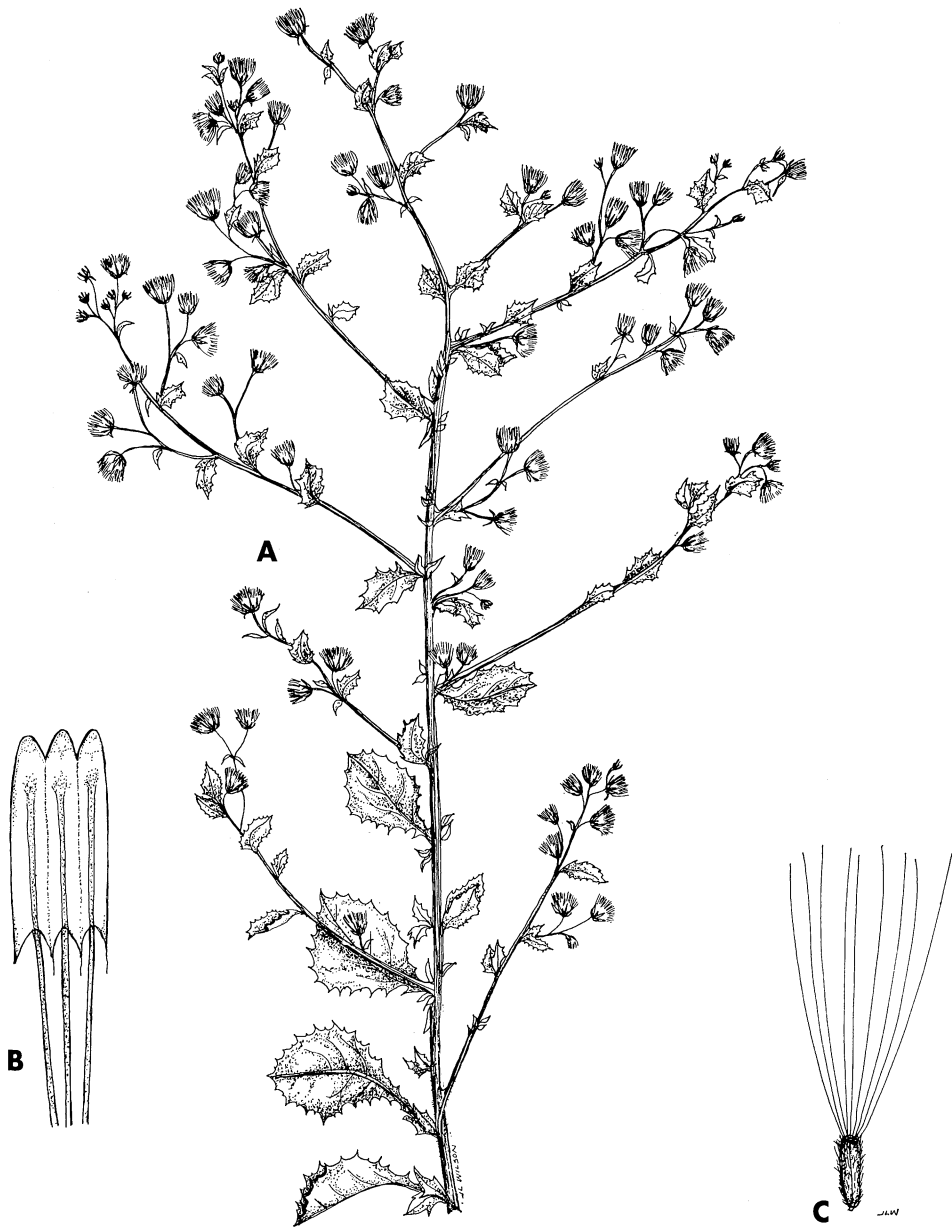


FIGURE 40. *Blumea viscosa* (Miller) Badillo.—A. Habit ($\times \frac{1}{2}$).—B. Stamens ($\times 9\frac{3}{4}$).—C. Achene ($\times 9\frac{3}{4}$). [After D'Arcy 4097 (MO).]

Croat 9691 (MO). LOS SANTOS: Between 1 mi S and 10 mi N of Tonosí, *Duke* 12487 (MO). 5 mi S of Pocrí, *Croat* 9738 (MO). PANAMÁ: Panama City, *Celestine* 116 (US). Without definite location, *Duchaissing* (P). Isla Chepillo, *Duke* 10328 (MO). Isla Espiritu Santo, *Duke* 10450 (MO). Without definite locality, *Grisebach* 1857 (MO). Las Sabanas, *Macbride* 2671 (US). Saboga Island, *Miller* 1977 (MO, US). Las Sabanas, *Standley* 30692 (US).

40. GNAPHALIUM

Gnaphalium L., Sp. Pl. 850. 1753; Gen. Pl., ed. 5. 386. 1754. TYPE: *G. luteoalbum* L. or *G. uliginosum* L.

Euchiton Cass. in Levr., Dict. Sci. Nat. 56: 215. 1828. TYPE: *E. pulchellus* Cass.

Omalotheca Cass. in Levr., Dict. Sci. Nat. 56: 218. 1828. TYPE: *O. supinum* (L.) Cass.

Gamochaeta Wedd., Chlor. And. 1: 151. 1855. TYPE: *G. americana* (Miller) Wedd.

Gnaphalium St.-Lag., Ann. Soc. Bot. Lyon 7: 127. 1880, nom. nud. TYPE: *G. dysodes* St.-Lag. (nomen).

Lanate or tomentose *herbs*, rarely suffruticose, often branched; stems leafy, rarely creeping. *Leaves* alternate, simple, entire or crenulate margined, lanate or tomentose at least in part, the hairs arachnoid, but sometimes glandular; petioles mostly wanting. *Inflorescence* an open or dense cymose panicle, racemose spike, or scapose with a congested, sometimes interrupted cluster of few or many heads, the clusters or heads mostly subtended by bracts or bracteoles. *Heads* small, disciform, with many florets, both staminate and pistillate florets present but often few of one sex, cyathiform or spindle shaped; involucre bracts many, imbricate in several series, sometimes apically corolloid, white, yellowish, sometimes with a rose or purplish cast; receptacle flat, naked, or sometimes with rudimentary, ephemeral chaff; ray florets with the capillary corolla basally expanded and contracted upwards, apically notched but without a distinct limb or ligule, the androecium wanting, the ovary fertile or rudimentary; disc florets tubiform, apically 5-lobed, about as long as the ray florets, the anthers connate, basally tailed, the tails sometimes fimbriate, the appendage obtuse, the style branches truncate, apically fringed with trichomes, unappendaged, the nectary conspicuous. *Achenes* little or not compressed, sometimes 4-many ribbed, glabrous or with glandular-appearing tubercles; pappus of fine smooth or strigulose bristles in one series, sometimes basally united and falling as a unit, in other cases free or nearly so and falling separately.

A genus of 100–300 species of cosmopolitan distribution, the species of *Gnaphalium* are most numerous in Africa, Mexico, and upland South America. A comprehensive revision of the genus has never been undertaken for any extensive region of the world, and a number of species have been named many times. The limits of the genus are not clear, and distinctions between *Gnaphalium* and *Anaphalis*, *Helichrysum*, and other groups may not be valid. Drury (1970) assessed a number of characters with a view toward delimiting these groups. Other discussions of these groups have been given by Cabrera (1961, 1963), Drury (1971, 1972), and Godfrey (1958).

Known in Panama as weeds of upland pastures and roadsides, many species in various parts of the world are credited with medicinal properties. Some are cultivated as ornamentals in temperate gardens. Although there are no reports of toxicity to livestock from living plants, some species may cause nitrate poisoning in stock when fermented with silage. "Cudweed," "Vira-vira" (Spanish).

Literature:

Cabrera, A. L. 1961. Observaciones sobre las Inuleae-Gnaphalineae (Compositae) de America del sur. Bol. Soc. Argent. Bot. 9: 359–386.

- . 1963. Compuestas. In *Flora de la Provincia de Buenos Aires*. VI. Colección Científica del I.N.T.A., Buenos Aires.
- Drury, D. G. 1970. A fresh approach to the classification of the genus *Gnaphalium* with particular reference to the species present in New Zealand (Inuleae-Compositae). *New Zealand Jour. Bot.* 8: 222–248.
- . 1971. The American spicate cudweeds adventive to New Zealand. *New Zealand Jour. Bot.* 9: 157–185.
- . 1972. The cluster and solitary-headed cudweeds native to New Zealand. *New Zealand Jour. Bot.* 10: 112–179.
- Godfrey, R. K. 1958. A synopsis of *Gnaphalium* (Compositae) in the southeastern United States. *Quart. Jour. Florida Acad. Sci.* 21: 177–184.
- a. Inflorescence spicate; involucre bracts with brown tips; pappus united at the base and falling as a unit 1. *G. americanum*
- aa. Inflorescence of glomerules of heads, sometimes congested or in open panicles; involucre bracts without contrasting brown tips; pappus separating at the base and falling as separate bristles.
- b. Leaves all lanceolate, not becoming linear near the inflorescence, glabrate and glandular above; receptacle 2–4 mm across; involucre bracts often chalky (under a lens) 3. *G. domingense*
- bb. Upper leaves mostly linear, especially near the inflorescence, eglandular, glabrate or pubescent above; receptacle less than 1.6 mm across; involucre bracts shiny, not chalky.
- c. Heads often pinkish; inflorescence congested; leaves glabrescent above, those near the inflorescence often forming a pseudo-involucre; plants to 30 cm tall, branching at the base 4. *G. roseum*
- cc. Heads not pinkish; inflorescence often an open panicle; leaves mostly sparingly lanate above, not clustered near the inflorescence; plants to 70 cm tall, often branching above the base 2. *G. attenuatum*

1. ***Gnaphalium americanum*** Miller, *Gard. Dict.*, ed. 8. 1768. TYPE: not seen.

Gamochaeta americana (Miller) Wedd., *Chlor. And.* 1: 151. 1855.

Gnaphalium spicatum Lam., *Encycl. Meth.* 757. 1788. TYPE: Uruguay, Montevideo, Commerson (P).

Erect, ephemeral *herb*, sparingly branched; stems drying angled, silvery white with more or less appressed arachnoid hairs, to 50 cm tall. *Leaves* spatulate to oblanceolate, decurrent on the stem for a short distance but not auricled, mostly entire, apically mucronulate, strongly discolorous, the lower leaves dark above, to 5 cm long and 8 mm broad, sparingly arachnoid pubescent on emerging, soon glabrous, shiny, dark when old, beneath white-tomentose, the midvein prominent, the margins slightly revolute. *Inflorescence* an often-interrupted spicate raceme to 8 cm long and 15 mm thick, tapering upwards from below the middle, the heads in clusters of 1–6, the lowermost clusters subtended by leaflike, linear bracts which diminish upwards in the spike; pedicels lanate. *Heads* disciform cyathiform to fusiform, 3–5 mm high; involucre bracts imbricate in several series, the innermost equal, green-keeled with broad hyaline margins and the apical portion conspicuously dark brown, the outer series much shorter, broader, and lacking a conspicuous keel or brown tips; receptacle flat or slightly concave, naked, muricate; ray florets capillary, narrowed upwards, the corolla 1–2-notched and darkened, 3 mm long, numerous, the ovary fertile; disc florets few, 3 mm long, the corolla tubular, apically unequally 4-notched and darker, the tube white, the

anthers 4, with fimbriate basal tails, the appendages obtuse, the style branches truncate, apically glandular fringed. *Achenes* 1 mm long, fusiform, weakly 1-4-angled with sparse glandular trichomes or tubercules, weakly longitudinally muricate-striate, yellowish to amber colored, sometimes slightly compressed; pappus of many slender, 2-2.5 mm long, basally strigose bristles which may be acicular or expanded at the tips, basally connate and falling as a unit before the fruit is shed.

This species is recognizable by its spicate inflorescences, lanate pubescence on the leaf undersides, and the brownish tips of the inner involucre bracts. *Gnaphalium americanum* is a widespread weed of tropical and warm temperate regions, and it is plentiful in Panama in the Chiriquí mountains. Interpretation of the taxon bearing this name is based in part on the concept of Adams, Flowering Plants of Jamaica (1972). Both Drury (1971) and Godfrey (1958) distinguish between *G. americanum* and *G. spicatum*.

CHIRIQUÍ: Near New Switzerland, central valley of Río Chiriquí Viejo, 1800-2000 m, Allen 1423 (MO). Trail N of Cerro Punta, Croat 10486 (MO). N of Audubon Cabin, Croat 13641 (MO—left and right specimens only). Between Boquete and Monte Rey, Croat & Porter 15619 (MO). Monte Rey above Boquete, Croat 15708 (MO). Boquete. D'Arcy & D'Arcy 6351 (MO). Slope of La Popa above Boquete, 5400 ft, D'Arcy & D'Arcy 6402 (MO). Bajo Chorro, Boquete District, 6000 ft, Davidson 155 (GH, MO). Boquete, Finca Collins, 5000 ft, Dwyer & Hayden 7682 (GH, MO). Fred Collins' Finca, Ebinger 712 (MO). 0.5 mi S of Bambito, Lazor & Correa 2704 (MO). From Boquete to 3 mi N, 3300-4200 ft, Lewis *et al.* 424 (GH, MO). Alto Boquete, Partch 69-82 (MO). Volcán de Chiriquí, 3500-4000 m, Woodson & Schery 400 (GH, MO). Casita Alta, Volcán de Chiriquí, 1500-2000 m, Woodson *et al.* 891 (MO).

2. ***Gnaphalium attenuatum* DC.**, Prodr. 6: 228. 1838. TYPE: Mexico, *Berlandier* 70 (P).

Erect, sparingly branched ephemeral *herb* to 70 cm tall; stems lanate with dirty white, arachnoid, appressed hairs, later glabrescent or floccose, striate when glabrous. *Leaves* linear-lanceolate to 6-11 cm long, 6(-10) mm wide, apically long acute or acuminate, basally contracted and slightly decurrent on the stem, the margins entire or nearly so, above glabrate but usually with wisps of arachnoid hairs, beneath lanate with dirty white hairs, and the midvein prominent or obscure, leaves smaller and linear near the inflorescence. *Inflorescence* a much or little branched, open panicle of clusters of flower heads; occasional linear bracts present. *Heads* disciform, 3-5 mm tall; involucre bracts imbricate, unequal, acute or obtuse, not chalky; receptacle 0.8-1.5 mm across, flat or slightly convex, muricate-punctate, often dark; ray florets many, ca. 3 mm long, the corolla capillary, slightly expanded at the nectary, apically 2-5-notched; disc florets several, ca. 3 mm long, the corolla tubiform, slightly expanded or bulbous at the nectary, the limb 5-lobed, glabrous, the anthers ca. 0.7 mm long, the basal tails fimbriate, the apical appendages narrowly deltoid, slightly longer than broad, the style branches equal, truncate and apically glandular-papillose, the nectary prominent, elevated above the top of the ovary. *Achene* reddish brown, 0.8 mm long, ellipsoidal, indistinctly 4-5-nerved and irregularly longitudinally striate; pappus basally strigose, bristles in one series about as long as the corolla, falling independently or in small weakly held groups.

This species is intermediate in some respects between *Gnaphalium domingense* and *G. roseum*. From *G. domingense* it differs in having conspicuously narrower leaves near the inflorescence and the leaf-uppersides mostly somewhat pubescent and eglandular. The involucre bracts also differ in not being chalky. From *G. roseum* it differs in its usually greater stature and more open inflorescence. The involucre bracts are not numerous near the inflorescence.

The name *G. attenuatum* is used here following a review of material annotated by Klatt in several herbaria.

CHIRIQUÍ: Summit and W face of Cerro Copete, 9000 ft, *Allen* 4896 (MO). 20 km W of Puerto Armuelles, 400–600 m, *Busey* 549 (MO). Trail N of Cerro Punta, *Croat* 10529 (MO). Palo Santo, 3 mi N of Volcán, *Croat* 13538 (MO). Above Cerro Punta on slope of Cerro Respinga, *D'Arcy & D'Arcy* 6542 (MO). Lava fields near Volcán, 4600 ft, *Duke* 9198 (MO). Along Boquete Trail, Cerro Respinga, 200–2500 m, *Gentry* 5936 (MO). Mountains beyond La Pintada, 400–600 m, *Hunter & Allen* 604 (MO). 6.7 mi W of Boquete, 8000 ft, *Luteyn* 1496 (MO). Alto Boquete, 1125 m, *Partch* 69-85 (MO). Cerro Pando, valley of upper Río Chiriquí Viejo, *White* 12 (MO). Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery* 421 (GH, MO).

3. ***Gnaphalium domingense*** Lam., *Encycl. Meth.* 2: 743. 1788. TYPE: Hispaniola (not seen).

G. poeppigianum DC., *Prodr.* 6: 227. 1837. TYPE: Peru, *Poeppig* 1368 (G-DC, not seen, IDC 1067. I, 1; W, isotype, not seen, MO, photo).

G. portoricense Urb., *Symb. Ant.* 3: 409. 1903. SYNTYPE: Puerto Rico, *Sintenis* 205 (MO). *G. viscosa* sensu auct., ?an H.B.K.

Herb to 2 m tall; stems lanate with a bright to dirty white tomentum of arachnoid hairs. *Leaves* lanceolate, to 10 cm long and 2 cm broad, becoming smaller near the inflorescence, apically acute, mucronulate, the margins entire or crenulate-undulate, above green, often with a few wisps of arachnoid hairs, especially near the base of the midvein, the venation obscure, drying dark with short, stout glandular trichomes, beneath lanate tomentose, the midvein prominent, basally somewhat auricled, slightly clasping the stem and sometimes appearing decurrent. *Inflorescence* an open cymose or round-topped panicle, the heads in glomerules of 1–5, subtended by small, narrowly lanceolate leaflike bracts. *Heads* disciform, 4–6 mm long; involucre bracts many, imbricate, unequal, mostly obtuse, the apices of the innermost with a chalky appearance when viewed under a lens; receptacle 2.5–3 mm across, flat or slightly convex; ray florets numerous, 4–5 mm long, the corolla capillary, with a bulbous basal enlargement around the nectary, basally glandular papillose, apically 4–5-notched, darker colored; disc florets 4–5 mm long, the corolla tubiform, with a bulbous basal enlargement around the nectary, basally glandular-papillose to puberulent, apically 5-lobed, the anthers 1.2 mm long, the tails fimbriate, the appendages twice as long as broad, rounded, the style with a conspicuous, stipitate nectary, the style branches variable, often unequal, apically truncate and weakly glandular fimbriate, sometimes flattened dorsiventrally and glandular on the adaxial surface. *Achene* reddish brown, ca. 1 mm long, wrinkled-striate, unnerved or weakly 3–5-nerved; carpopodium distinct, pale, oblique; pappus of many basally strigose and flattened bristles which fall independently or in small groups.

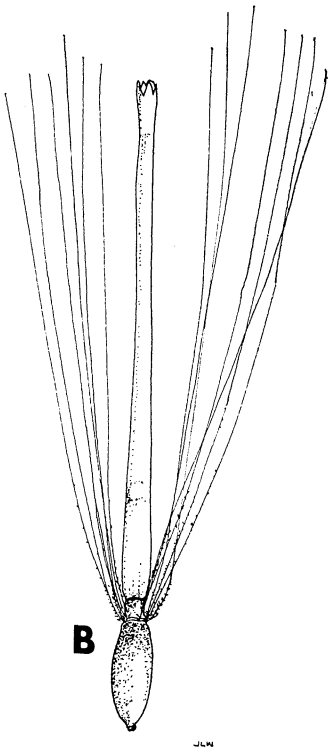
This species is distinct from other Panamanian species of the genus in its chalky involucre bracts, large receptacle, and broad leaves which lack tomentum on the ventral surface but bear short glandular trichomes. In Panama, *Gnaphalium domingense* is known only from the uplands of Chiriquí Province. It may hybridize with *G. attenuatum*, and it is sometimes difficult to separate the two species. *Gnaphalium domingense* ranges widely in the New World tropics where it is known by many names. No attempt is made here to provide more synonymy than is necessary for working with the Panamanian plants. Much Panamanian material has been known under the name *G. oxyphyllum* DC., a later name based on material from Mexico. *Gnaphalium domingense* differs from the similar *G. obtusifolium* L. of eastern North America in the glands and gland-tipped hairs on the upper surface of the leaves; leaves of *G. obtusifolium* are glabrous.

CHIRIQUÍ: Near New Switzerland, central valley of Río Chiriquí Viejo, 1800–2000 m, Allen 1374 (MO). Cerro Punta, ca. 7000 ft, Blum *et al.* 2417 (MO). Camino al Cerro de la Muerte, 6000 ft, Correa 1267 (MO). Between Cerro Punta and Las Nubes, ca. 1800 m, Croat 26386 (MO). 1.4 mi SW of Cerro Punta, Graham 296 (GH). Bajo Chorro, Boquete District, 6000 ft, Davidson 432 (GH, US). Ca. 7 mi from El Hato del Volcán, King 5300 (US). Foot of Sierra Boquete, 4300 ft, Maurice 900 (MO). Cerro Vaca, 900–1136 m, Pittier 5309 (GH). 1 mi S of Cerro Punta, 6000 ft, Tyson 5781 (MO). Near Callejón Seco, Volcán de Chiriquí, 1700 m, Woodson & Schery 494 (MO). N of Audubon Cabin, Croat 13641 (MO—middle specimen only).

4. ***Gnaphalium roseum*** H.B.K., Nov. Gen. Sp. Pl. 4: 81. 1820. TYPE: Colombia, Guanajuato, *Humboldt & Bonpland* (P).—FIG. 41.

Erect, apparently perennial *herb*, branched mostly at the base with a small but sturdy tap root, perhaps creeping by stolons; stems copiously leafy, tomentose with appressed greyish or yellowish white, lanate, arachnoid hairs. *Leaves* linear or linear-lanceolate, to 3 cm long and 3 mm wide, the margins entire or undulate, often with a crenulate appearance, above tomentose except on the emerging margins but soon glabrescent, mostly drying dark, beneath yellowish or greenish-tomentose except for the margins, the midvein occluded, apically long acute and mucronulate, basally slightly broadened and shortly decurrent on the stem. *Inflorescence* a congested, terminal panicle of short-stalked clusters, the subtending leaves often forming a partial involucre; pedicels short, tomentose. *Heads* disciform, 4–6 mm long; involucre bracts many in several unequal series, obtuse or acute, shiny, minutely and evenly striate, under a lens appearing glandular but not chalky, mostly stramineous but sometimes roseous due to the color of the glandular material; receptacle ca. 2 mm across, flat; ray florets many, the corollas capillary, ca. 3 mm long, bulbous near the base around the nectary, apically 5-lobed; disc florets several, the corollas tubular, basally bulbous around the nectary, apically 5-lobed, the anthers 1.5 mm long, basally fimbriate-tailed, the appendages twice as long as broad, obtuse-deltoid, the style with a prominent nectary situated above the base of the corolla, the style branches truncate, the apical margins glandular papillose. *Achene* (immature) reddish, 0.8 mm long; pappus of basally strigose bristles about as long as the corollas, falling separately.

This species may have yellowish, brownish, or pink to purplish heads, the color deriving from minute, gland-like thickenings of the end-walls of the elongate,



evenly parallel cells of the tissue of the involucre bracts. These evenly disposed cells also give a finely striate, silky texture to the bracts which is wanting in other Panamanian species of the genus. The tomentum of the upper surface of the leaves is usually very early deciduous and the uppersides of the leaves then appear quite glabrous. In the type collection, both sides of the leaf are tomentose.

In Panama *Gnaphalium roseum* is known only from near the summit of Volcán Chiriquí, above 3000 m.

CHIRIQUÍ: Volcán de Chiriquí, 10400 ft, *Davidson 1039* (GH, MO, US). Peak, Volcán de Chiriquí, Boquete District, 11960 ft, *Terry 1323* (GH, MO). Volcán de Chiriquí, *Sapper* April 1899 (US). Top of El Barú, 11000 ft, *Tyson & Loftin 6179* (MO). Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 429* (MO). Volcán de Chiriquí, 2500–3380 m, *Woodson et al. 1054* (MO).

41. HELICHRYSUM

Helichrysum Miller, Gard. Dict., ed. 4, abr. 1754. "Elichrysum." TYPE: *H. orientale* (L.) Gaertn. Name and type conserved.

Herbs or rarely *shrubs*, mostly lanate or arachnoid-pubescent. *Leaves* alternate, entire or nearly so, mostly without a distinct petiole, mostly narrow. *Inflorescences* solitary, congested or in open panicles, mostly terminal on the stems, leaflike; bracts commonly present. *Heads* disciform or discoid with mostly or entirely hermaphrodite (disc) florets; involucre of many imbricate, persistent paleaceous bracts, mostly in indefinite series, sometimes brightly colored; receptacle mostly flat and naked; disc florets tubular, apically 5-lobed, the anthers with setose or capillary tails, sometimes branched or fimbriate, apically with elongate, obtuse appendages, the style branches slightly expanded and dorsiventrally flattened upwards, the nectary often prominent, apically pointed. *Achene* plump, often slightly curved or oblique, indistinctly nerved; pappus of many strigose bristles in one series.

A genus of several hundred species widely distributed in the Old World. The chaffy involucre bracts are persistent and give the heads a radiate appearance although true ray (ligulate) flowers are mostly inconspicuous or wanting. Several species are cultivated for ornament.

1. **Helichrysum bracteatum** (Vent.) Andrews, Bot. Rep. Sup. 1, tab. 428. 1805; Willd., Enum. Pl. Hort. Berol. 869. 1809.

Xeranthemum bracteatum Vent., Jard. Malm. tab. 2. 1803. TYPE: not seen.

Ephemeral *herb* to 1 m tall, glabrate or puberulent with short glandular hairs and sparse, arachnoid hairs; stems green, drying striate. *Leaves* alternate, sparsely pubescent with arachnoid hairs, entire, to 12 cm long, oblanceolate, the margin undulate, narrowed in the lower portion into a petiolelike region; petiole indistinct. *Inflorescence* of solitary heads terminating the uppermost branches;

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FIGURE 41. *Gnaphalium roseum* H.B.K.—A. Habit ($\times \frac{3}{8}$).—B. Achene ($\times 25$). [After *Davidson 1039* (MO).]

several linear, leaflike bracts present under the heads. *Heads* showy, falsely radiate; involucre bracts many in several nearly equal series, the outermost obtuse, the innermost shorter and acute, paleaceous, persistent, 10–15 mm long, variously orange, yellow, purple, or white, the innermost usually lighter colored; receptacle flat, 15–25 mm across; ray florets few or wanting; disc florets 10 mm long, corolla tubular, sharply expanded basally at the nectary, broadened about $\frac{2}{3}$ up, apically 5-lobed, the anthers 3 mm long, with separate, setose tails, the appendages acute, slightly more than twice as long as broad, the style branches apically deltoid, the upper half of the branch slightly expanded laterally, compressed dorsiventrally, papillose-glandular near the apex, the nectary prominent, indistinctly lobed, elevated above the top of the ovary by an obconical process. *Achene* plump, fusiform-reniform, dark colored, indistinctly nerved or striate, ca. 3 mm long; carpopodium indistinct, oblique, a persistent apical flange subtending the pappus; pappus of yellow or white strigose bristles in one series about as long as the corollas.

Cultivated in the Chiriquí region as an ornamental for sale as cut flowers in markets. “Everlasting,” “Immortal” (Spanish).

CHIRIQUÍ: Purchased in market, David, said to be grown at Volcán, *D’Arcy & D’Arcy 6285* (MO).

42. PLUCHEA

Pluchea¹⁹ Cass., Bull. Sci. Soc. Philom. Paris 1817: 31. 1817. TYPE: *P. marylandica* (Michx.) Cass. = *P. odorata* (L.) Cass.

Herbs or *shrubs*, often aromatic, glabrous or pubescent, sometimes glandular; stems sometimes winged. *Leaves* alternate, simple, entire or toothed, mostly with a prominent midvein, sessile or petiolate, sometimes auricled or decurrent on the stem. *Inflorescences* few or many terminal panicles of congested heads, often round or flat tipped; bracts leaflike, scalelike, or wanting. *Heads* disciform with many florets, the involucre bracts imbricate in a few unequal series, ovate, obtuse, herbaceous to indurated, often with a scarious margin or ciliate, sometimes a few innermost acute, longer and paleaceous; receptacle flat, naked; ray florets numerous, the corolla slender or capillary, often purplish upwards, glabrous except on the lobes, apically 2–3-notched or toothed, basally expanded around the style base, the style branches mostly not exerted, the ovary fertile; disc florets few, the corolla tubular, campanulate, the tube slender, sometimes basally expanded, the limb with 5 deltoid lobes, the anthers 2 mm long, the appendages rounded, about twice as long as broad, the adjacent basal tails mostly united, the style branches mostly united, hirsute, flattened-fusiform, the style base expanded, the ovary rudimentary, sterile. *Achene* cylindrical, prominently 3–6-ribbed, strigose, often glandular; pappus of strigose, basally united bristles in one series.

Pluchea includes fewer than a dozen species, mainly of the Caribbean region and eastern North America. In Panama the genus is restricted to one cultivated

¹⁹ For a list of generic synonyms see Godfrey (1962). Only the above name has been used for Panamanian material.

species and another species which occurs occasionally, probably as an adventive. The pale purplish or mauve flowers, the aromatic foliage, and the stramineous, pappuslike ribs on the cylindrical achenes are good features for recognition.

Literature:

Godfrey, R. K. 1962. *Pluchea*, section *Stylimnus*, in North America. Jour. Elisha Mitchell Sci. Soc. 68: 238-271, pls. 20-23.

- a. Shrub, often over 1.5 m tall; leaves subentire, often more than 8 cm long with usually more than 7 veins on each side of the midvein; cultivated species 1. *P. carolinensis*
- aa. Herb, not exceeding 1.5 m tall; leaves mostly serrate-dentate, mostly less than 8 cm long with usually fewer than 7 veins on each side of the midvein; adventive species 2. *P. odorata*

1. *Pluchea carolinensis* (Jacq.) G. Don in Sweet, Hort. Brit., ed. 3. 350. 1839.

Conyza carolinensis Jacq., Coll. 2: 271. 1788 (1789); Ic. Pl. Rar. 3, tab. 585. 1788 (1789).

TYPE: not seen.

C. odorata sensu Godfrey, Jour. Elisha Mitchell Sci. Soc. 68: 247. 1952, not L.

Branched *shrub* to 4(-5) m tall; twigs minutely whitish to reddish cinereous with fine, weak, spreading or crumpled hairs, drying faintly angled. *Leaves* elliptical to lanceolate, mostly to 10-12 cm long, 3-5 cm broad, apically acute or obtuse, mucronulate, basally acuminate or acute, the margins entire or with a few teeth, ca. 8 veins on each side of the prominent midvein, wider spaced upwards, felty tomentose beneath with weak whitish or greyish hairs, drying lighter beneath; petioles stout, 10-15 mm long, fine-tomentose. *Inflorescence* a somewhat congested cymose panicle with many florets, held erect above the foliage, with undifferentiated bracts and occasional linear bractlets ca. 5 mm long. *Heads* campanulate-cyathiform, somewhat flat-topped, disciform; involucre bracts numerous in several unequal series, indurated, dorsally tomentose, ca. 2 mm long, apically rounded to acute, entire, minutely erose or ciliate; ray florets numerous, capillary, 4 mm long, the corolla purplish, apically denticulate, basally expanded around the style base, the style branches slender, the style base globose, ca. 3 times the diameter of the style, elevated from the ovary on a distinct stipe, the ovary fertile, slightly flattened, oblong-cylindrical, basally expanded at the carpodium and apically expanded at the pappus, the 3-5 ribs pubescent with ascending hairs; disc florets few, 5 mm long, the corolla narrowly tubular, expanding upwards, the 5 apical lobes dorsally papillose with whitish trichomes, otherwise glabrous, the anthers 2-3 mm long, the appendages narrowly obtuse, the basal tails filiform, partly connate, the style branches flattened, the style base expanded-globose, the ovary rudimentary, sterile. *Achene* reddish brown, ca. 1 mm long, cylindrical with pronounced stramineous ribs, the basal area and carpodium yellowish; pappus of numerous barbellate bristles in one series, ca. 4 mm long.

This species is known in Panama only in cultivation. It is grown around homes and sold in markets as a medicinal. "Salvia," "Curforal."

Godfrey (1962) applied the name *Pluchea odorata* to this species. Lecto-

typification of *Conyza odorata* correctly reassigns that name to the other Panamanian species of *Pluchea* leaving *Pluchea carolinense* as the correct name for the taxon described above.

CANAL ZONE: Curundú at house no. 2114, tea used as cure for chest cold, *Tyson* 3467 (MO). COLÓN: Sold in Colón market for "tea" by Jamaican weedwomen, *D'Arcy* 3993 (MO). VERAGUAS: Semicultivated, Santa Fe, *Gentry* 2945 (MO).

2. *Pluchea odorata* (L.) Cass. in Levr., Dict. Sci. Nat. 42: 3. 1826.—FIG. 42.

Conyza odorata L., Syst. Nat., ed. 10. 1213. 1759. LECTOTYPE: Antilles, Plumier, Pl. Amer., ed. Burm. tab. 197, excl. fig. dext.

C. purpurascens Swartz, Nov. Gen. Sp. Pl. Prodr. 112. 1788. LECTOTYPE: Jamaica, Sloane, Voy. Isl. Madera 2: tab. 152, fig. 1. 1725.

Pluchea purpurascens (Swartz) DC., Prodr. 5: 452. 1836.

Erect, aromatic *herb* to 1 m tall; twigs puberulent or cinereous with fine, weak, ascending or spreading hairs, drying faintly many-angled, sometimes reddish. *Leaves* ovate, elliptic or lanceolate, mostly 5–8 cm long, 1.5–3 cm wide, apically acute, mucronulate, basally obtuse, acute or acuminate, often oblique, the margins serrate to subentire, 4–6 veins on each side of the prominent midvein, evenly pubescent above and beneath with short, erect, weak hairs and glandular punctae; petioles mostly 3–5 mm long but sometimes wanting. *Inflorescence* an open panicle of slightly congested, several-headed paniculate clusters, without well differentiated bracts and sometimes with linear, 4–8 mm long bracteoles. *Heads* globose-campanulate, disciform; involucre bracts numerous in several unequal series, indurated, dorsally pubescent, the inner series lanceolate, acute; ray florets purplish, numerous, ca. 5 mm long, the corolla capillary, apically 2–3-dentate, the lobes dorsally papillose, the style slender, papillose, branches basally globose, the ovary cylindrical, pubescent with ascending hairs, copiously glandular; disc florets several, purplish, ca. 5 mm long, the corolla tubular, expanding upwards, glabrous, the lobes dorsally glandular, the anthers ca. 2 mm long, the appendages acute, the basal tails slender, coherent, the style branches slender, pilose, free only at the tips, the style base little expanded, the ovary rudimentary, sterile. *Achenes* reddish brown, the body ca. 1 mm long, with glandular, prominently stramineous ribs, pubescent; pappus of numerous, basally united setose bristles in one series.

Widespread in the Caribbean region and eastern North America, *Pluchea odorata* occurs as an adventive in the Panamanian flora, collected only on Barro Colorado Island in February 1932 and July 1960. It may be recognized by its showy, massive inflorescences of pale purple or mauve flowers and by its aromatic foliage. It grows in fresh- and brackish-water marshes.

The lectotype chosen here consists of an ample line drawing of the species. The plant from which it was drawn may be extant in Paris (P), but Linnaeus saw only the drawing. Similarly, the lectotype chosen for *Conyza purpurascens* consists

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FIGURE 42. *Pluchea odorata* (L.) Cass. Habit ($\times \frac{3}{10}$). [After Ebinger 582 (MO).]



of a black and white illustration. Swartz did not see the plant from which it was drawn and it may be in London (BM).

CANAL ZONE: Barro Colorado Island, *Ebinger* 582 (MO); *Woodworth & Vestal* 611 (MO).

43. PTEROCAULON

Pterocaulon Elliott, *Sketch Bot.* 2: 323. 1823. TYPE: *P. pycnostachyum* (Michx.) Elliott = *P. virgatum* (L.) DC.

Chlaenobolus Cass. in *Levr.*, *Dict. Sci. Nat.* 49: 337. 1827. LECTOTYPE: *C. virgatum* (L.) Cass. = *Pterocaulon virgatum* (L.) DC.

Herbs; roots stout, black, mostly little branched; stems winged by the leaf bases. *Leaves* alternate, linear to elliptic or obovate, the margins entire or crenate, strongly discolorous, tomentose beneath, glabrate above. *Inflorescences* dense or interrupted terminal spikes of single heads and clusters of heads, the clusters bracteolate. *Heads* disciform, white or yellow; involucre bracts in several series, acute, pubescent, the midvein prominent; ray florets numerous, the corollas capillary, the androecium wanting, the ovary fertile, pubescent, sometimes glandular; disc florets several, the corollas tubular, 5-lobed, the anthers appendaged, the basal auricles connate or distinct with short, fine tails, the style branches lanceolate, pubescent, the style base expanded, situated on a thickened stipe, the ovary rudimentary. *Achenes* dark, plump, with conspicuous ribs which continue into the pappus; pappus of numerous fine bristles in 1 series, slightly united basally.

The circumscription of *Pterocaulon* poses difficulties. Many species have been described from the southern hemisphere of the Old World which appear at least superficially distinct and which appear to belong under *Monarrhenus* Cass. (1817) or *Monenteles* Labill. (1825). The many species of *Pterocaulon* described from South America would seem for the most part congeneric with the taxon treated here.

The black roots of these plants have long been of medicinal repute.

In Panama, the genus is best recognized by the green upper leaf surface, the prominently winged stems, and by the small heads amassed in silky, apical cylinders.

1. *Pterocaulon virgatum* (L.) DC., *Prodr.* 5: 454. 1836.—FIG. 43.

Gnaphalium virgatum L., *Pl. Jamaic.* Pug. 405. 1759. LECTOTYPE: *Herb. Linn.* 993.29 (LINN).

Conyza virgata Lam., *Encycl. Meth.* 2: 93. 1786. TYPE: Carolina merid., Lamarck (P).

C. alopecuroides Lam., *Encycl. Meth.* 2: 93. 1786. LECTOTYPE: Martinique, "L.B." (P).

Gnaphalium undulatum Walt., *Fl. Carol.* 203. 1788. TYPE: Carolina, *Walter* (not seen).

Conyza polystachya Michx., *Fl. Bor. Amer.* 2: 126. 1803. TYPE: not seen.

Pterocaulon polystachyum (Michx.) Elliott, *Sketch Bot.* 2: 324. 1823.

P. alopecuroides (Lam.) DC., *Prodr.* 5: 454. 1836.

P. virgatum var. *alopecuroides* (Lam.) Griseb., *Cat. Pl. Cub.* 150. 1866.

P. undulatum (Walt.) Mohr, *Contr. U.S. Natl. Herb.* 6: 790. 1901.

P. virgatum f. *alopecuroides* (Lam.) Arech., *Anales Mus. Nac. Montevideo* 6: 268. 1908; *Fl. Uruguay* 3: 268. 1908.

Erect *herb* to 1 m tall; stems prominently winged by linear, discolorous leaf-bases; rootstock thick and woody with a black surface. *Leaves* mostly 6–8 cm

long, smaller and narrower near the inflorescence, lanceolate to elliptic, entire or crenate, apically obtuse, basally narrowed at the juncture with the stem, beneath tomentose with buff, cobwebby or crinkled, simple hairs, above glabrate, the principal veins pubescent. *Inflorescence* to 12 cm long and 5 cm across, a terminal, unbranched spike, congested or open, the peduncle not evident, the heads sessile in glomerules or solitary with linear bracts approaching or subtending the glomerules. *Heads* disciform, to 1 cm long; involucral bracts imbricate in several unequal series, acute, tomentose outside, 2–3 mm long, the midrib prominent; ray florets numerous, ca. 10 mm long, the corolla capillary, apically 4-denticulate, slightly expanded at the base, the style branches slender, slightly exserted, the style base hemispherical, the ovary cylindrical, densely hirsute with ascending hairs; disc florets several, 7–8 mm long, the corolla tubular, 6–7 mm long, apically irregularly 5-lobed, the lobes ca. 1 mm long, the anthers ca. 1 mm long, the appendages blunt, the basal auricles connate with filiform, short, crumpled tails, the style branches lanceolate, dorsally puberulent, the style base expanded, situated on a thickened conical stipe, the ovary rudimentary, pubescent with weak spreading hairs. *Achene* orange-brown, ca. 1 mm long, plump, with prominent, stramineous ribs, hirsute with ascending hairs, glandular; pappus white to stramineous, of numerous slender bristles 8–11 mm long in 1 series.

This species is rare in Panama. It is a sporadic weed of the Caribbean area. North American and Antillean plants have usually been separated as *P. alopecuroides* and *P. undulatum*, but the differences, if any, are not apparent. The name *Pterocaulon virgatum* has often been restricted to plants having a slender elongate spike of interrupted heads. While strikingly different on the herbarium sheet, such plants are not specifically distinct.

PANAMÁ: Hills above Campana, 600–800 m, Allen 1325 (MO).

44. TESSARIA

Tessaria Ruiz & Pavon, Fl. Peru 112, tab. 24. 1794. LECTOTYPE: *T. integrifolia* Ruiz & Pavon.

Trees or *shrubs* of streams or swamps; stems glabrate. *Leaves* alternate, simple, entire or dentate, sessile or petiolate, appearing glabrous but with the surface minutely glandular, often appearing punctate, and covered with a dense, minute tomentum. *Inflorescence* a terminal panicle, open or congested; bracts scalelike, culminate, broad and unlike the leaves; pedicels pubescent. *Heads* disciform; involucral bracts ovate in several unequal, imbricate series, often pubescent and with scarious margins, the innermost narrow and paleaceous, deciduous with the flowers, the outermost persistent, minute; receptacle convex or concave, sometimes obscured by the palea; paleas persistent, scalelike basally, often divided into pappuslike bristles which reach the tips of the corollas; ray florets numerous, the corolla capillary, apically 4–5-notched, often unequally so, the ovaries fertile, somewhat dorsally flattened with a pappus of slender bristles, strigose in the lower portion, sometimes expanded apically; disc florets mostly solitary, the corolla campanulate, the tube short, indistinct from the deeply lobed, tubular limb, the lobes oblong-obtuse, mucronate, making up about half the length of the flower, the



FIGURE 43. *Pterocaulon virgatum* (L.) DC.—A-B. Habit ($\times \frac{2}{5}$).—C. Achene ($\times 7\frac{1}{2}$).
[After Allen 1325 (MO).]

anthers mostly exerted, basally auricled with crumpled, fimbriate tissue which may be derived from taillike appendages, apically 5-lobed and mucronate, the distinction between anther and apical appendage not clear, the style apically thickened into a fusiform, glandular, papillose-pubescent area of stylar branches which separate unequally only apically or not at all, slightly contracted at the point of insertion, the ovary nearly obsolete except for the large, cylindrical, apically lobed nectary and the basally scalelike pappus which separates part way up into slender, strigose bristles.

Tessaria is a genus of 3–4 species of Central America and South America ranging to Argentina. In Central America, only the type species, *T. integrifolia* is known, and this species ranges to Peru. Other species are all south of Panama. The species from Texas and Mexico known as *T. sericea* (Nutt.) Shinnery is not congeneric with *T. integrifolia* and must be assigned a different name.

Tessaria is singular in the large nectary of the solitary disc floret. Superficially this looks like the ovary with the pappus attached to the bottom. This well-developed pappus is actually inserted on the rudimentary ovary below. Dried species of *Tessaria* usually have smooth, or wrinkled greyish leaves which appear somewhat coriaceous.

Literature:

Robinson, H. & J. Cuatrecasas. 1973. The generic limits of *Pluchea* and *Tessaria* (Inuleae, Asteraceae). *Phytologia* 27: 277–285.

1. ***Tessaria integrifolia*** Ruiz & Pavon, *Syst. Veg.* 213. 1798. TYPE: Peru, ?*Dombey* s.n. (P-Jussieu, not seen).—FIG. 44.

Conyza riparia H.B.K., *Nov. Gen. Sp. Pl.* 4: 76. 1820. TYPE: not seen.

Tree or *shrub* to 10 m tall; twigs drying chocolate brown, puberulent, soon glabrescent. *Leaves* entire or denticulate, oblanceolate or elliptical, mucronulate, to 9 cm long, 2.5 cm wide, basally narrowed, apically acute, mucronulate, with ca. 5 pinnate veins on each side of the midvein, drying grey or yellowish green, canescent, ?glandular when young, glabrescent in age and then with a waxy, punctate patina of dense hairs; petiole 5–10 mm long. *Inflorescence* an open, cymose panicle, the pedicels slender, thickening in fruit, puberulent-pulverulent, the heads grouped in somewhat compacted clusters; bracts and bracteoles scalelike, broad, resembling the lowermost involucre bracts, appressed pubescent. *Heads* disciform ca. 4 mm long, campanulate; involucre bracts in 3–5 tightly appressed imbricate series, ochraceous, indurate, scarious margined, sparingly pubescent-pulverulent, the innermost lanceolate, glabrous, paleaceous, persistent, the outer series broad, deciduous except for the basal 2 or 3; receptacle conical, ca. 1 mm across, copiously tufted with bristlelike hairs, alveolate, the punctae well separated; ray florets many, the corolla capillary, ca. 3 mm long, basally expanded and lighter colored around the nectary, apically notched, sometimes with a rudimentary lobe or ligule, the style exerted for part of its united portion, the branches long exerted, linear, puberulent, basally with a small but distinct nectary of a lighter color than the style; disc floret solitary, much larger than the



ray florets, the corolla tube short, the limb fusiform, divided halfway into acute lobes which are dorsally angled, with a large, 1-mm long, achene-like swelling around the nectary, this portion contracted apically, the base of the tube slightly expanded to give the appearance of a false nectary, the anthers basally sagittate, the adjacent tails united, entire, the pointed appendages not differentiated in texture, acute, exerted for half their length, the style with a large (1 mm long) basal, apically lobed nectary, the style branches not separating, exerted, uniformly cylindrical, much thicker than those of the ray flowers, apically capitate or not, short pubescent, the ovary rudimentary, minute, the pappus sturdy, of strigose bristles which recurve outwards and then upwards from the united base, much larger and sturdier than those of the ray flowers. *Achenes* (of ray flowers) light brown, ca. 0.5 mm long with somewhat irregular rounded angles; carpopodium prominent, lighter colored; pappus of nearly smooth white bristles, basally united and flaring.

Tessaria integrifolia may be recognized by its subcoriaceous, subentire leaves which dry with a greyish or yellowish cast. The solitary large disc floret with its large stylar nectary is notable.

CHIRIQUÍ: 2 mi SW of Puerto Armuelles, *Croat 22076A* (MO). DARIÉN: Road from El Real to Pinogana, *Duke 5017* (MO, NY).

V. HELIANTHEAE

Heliantheae Cass., Jour. Phys. 88: 189. 1819. TYPE: *Helianthus* L.

Ambrosieae Cass., Jour. Phys. 88: 191. 1819. TYPE: *Ambrosia* L.

Madieae Jepson, Fl. West. Middle Calif. 486. 1901. TYPE: *Madia* Mol.

Iveae Rydb., N. Amer. Fl. 33(1): 3. 1922. TYPE: *Iva* L.

Mostly *herbs*, sometimes *shrubs*, *trees* or *vines*, pubescence of several types often including a characteristic rugose hair (Fig. 1). *Leaves* alternate or opposite, commonly opposite in lower, vegetative portions and alternate near the inflorescence, simple or compound, the margins entire, toothed or lobed, sometimes dissected; petiolate or sessile. *Inflorescence* scapose, paniculate, or often of solitary, long-stalked terminal heads which may form ill-defined aggregates; bracts or bracteoles sometimes present. *Heads* mostly radiate but sometimes discoid, rarely disciform; involucre of few to many, mostly imbricate bracts, usually in several series but sometimes only of 2 dissimilar series (one a calyculus) the innermost often associated with the outer achenes; receptacle flat to conical, mostly paleaceous, the paleas usually costate and enfolding the ovaries; florets mostly dimorphic, the inner or the outer ovaries often abortive; ray florets with 2–3-denticulate or entire rays, the stamens rarely free, mostly appendaged, basally auriculate or sagittate, the style mostly branched, the branches truncate or

←

FIGURE 44. *Tessaria integrifolia* Ruiz & Pavon.—A. Habit ($\times \frac{1}{2}$).—B. Central floret; pappus at base of large nectary is subtended by a rudimentary ovary ($\times 6\frac{9}{10}$). [After Allen 5096 (MO).]

rounded, sometimes appendaged, the shaft often basally expanded above a short stipe, the ovary often compressed, a cupular nectary often present. *Fruit* a relatively large, simple achene, often compressed, sometimes angled or winged, pappus of scales, awns, or bristles; or achene associated with paleas, involucre bracts, or rarely with other florets, and falling as a baccate or utriculate fruit, often as an aggregate.

This tribe is often best recognized by its combination of opposite leaves and yellow florets (distinct from Eupatorieae and Vernonieae) and its numerous graded involucre bracts (distinct from most Senecioneae). The usually well developed paleas are also characteristic. The pappus is seldom of numerous, strigose bristles. This tribe is best developed in the Americas and several subtribes are restricted to the Western Hemisphere.

Literature:

Stuessy, T. F. 1973. A systematic review of the subtribe Melampodiinae (Compositae, Heliantheae). *Contr. Gray Herb.* 203: 65–80.

- a. Leaves both alternate and finely dissected; heads small and flat, less than 3 mm tall.
 - b. Male and female florets in separate heads; anthers free; female florets apetalous, solitary; inflorescence a spike 54. *Ambrosia*
 - bb. Both male and female florets in each head; anthers connate; female florets with corolla, more than 1 in a head; inflorescence a much-branched panicle 55. *Parthenium*
- aa. Leaves opposite, or if alternate than not finely dissected; heads often larger.
 - c. Disc florets sterile; achenes mostly plump, rounded, not compressed; pappus mostly wanting or minute; paleas present or not; heads radiate or disciform; leaves mostly simple.
 - d. Fruit formed by the entire head with all the bracts; florets 9 or fewer; paleas wanting; involucre apically closed at fruit fall.
 - e. Fruit samaroid, the achene(s) enfolded by 2(–4) flat, rotund, winglike bracts 45. *Delilia*
 - ee. Fruit baccate, the achene enfolded by fused, thickened, leathery bracts 46. *Milleria*
 - dd. Fruit an individual achene, sometimes enclosed by bracts; florets often more than 9; paleas mostly present; involucre apically open.
 - f. Vine; leaves trifoliolate; achene compressed 81. *Hidalgia*
 - ff. Herbs, shrubs, or trees; leaves simple; achene plump.
 - g. Leaves conspicuously lobed; large stout herbs to 2.5 m tall; heads more than 1.5 cm across 52. *Polymnia*
 - gg. Leaves serrate, entire, or shallowly lobed; small herbs, if tall then slender; heads less than 1 cm across.
 - h. Fruits with stout, hooked spines 47. *Acanthospermum*
 - hh. Fruits without spines.
 - i. Shrubs; heads in panicles; florets white.
 - j. Achene glabrous; ray florets 2 50. *Ichthyothere*
 - jj. Achene pilose; ray florets more than 2 49. *Clibadium*
 - ii. Herbs; heads solitary or in dense clusters; florets yellow.
 - k. Leaves short-petiolate (to 5 mm) or sessile; herbs to 60 cm tall; involucre bracts green all over.
 - l. Achene smooth, not fused to involucre bracts; petioles pilose 53. *Unxia*
 - ll. Achene enveloped in an involucre bract, fruits tuberculate, involucre bracts blunt 51. *Melampodium*
 - kk. Leaves prominently petiolate; slender branched herbs to 2 m tall; involucre bracts drying yellowish or with green tips 48. *Baltimora*
 - cc. Disc florets fertile (sterile in trifoliolate *Hidalgia*); achenes often compressed or angled; pappus often well developed; paleas present; heads radiate or discoid; leaves simple or compound.

- m. Ray corolla ligulate and lacking a tube, persistent and falling with the achene.
- n. Paleas puberulent; outer involuclral bracts narrow, spreading, inner bracts shorter, valvate, and subtending the ray florets 56. *Heliopsis*
- nn. Paleas apically fimbriate-tomentose; involuclral bracts all broad, imbricate, appressed, in 2-4 series 57. *Zinnia*
- mm. All corollas (ligulate or tubular) with a tube, deciduous before the achene matures.
- o. Heads mostly sessile in the leaf axils.
- p. Leaves strongly discolorous, grey tomentose beneath, glabrate above 83. *Trichospira*
- pp. Leaves similar on each side.
- q. Leaves copiously glandular beneath; involuclral bracts wide-spreading from near the base 59. *Eleutheranthera*
- qq. Leaves eglandular; involuclral bracts applied to the head, spreading slightly at the tips 82. *Synedrella*
- oo. Heads on stalks more than 5 mm long.
- r. Leaves alternate or if opposite, then glandular beneath.
- s. Leaves opposite, mostly glandular beneath.
- t. Herbs mostly less than 60 cm tall; leaves narrow 25. (*Isocarpha*)
- tt. Herbs or shrubs more than 60 cm tall, erect; leaves broad.
- u. Pappus of numerous bristles 84. *Calea*
- uu. Pappus of a single, short, deciduous awn 63. *Montanoa*
- ss. Leaves alternate, eglandular.
- v. Heads large, involucre more than 2 cm across; peduncles long, apically thickened, hollow; leaves deeply lobed 71. *Tithonia*
- vv. Heads smaller, involucre less than 1.5 cm across; peduncles solid, not apically enlarged, mostly short; leaves serrate to entire.
- w. Outer involucre of narrow, scalelike bracts; achene winged.
- x. Shrubs or trees; pappus of two small awns 72. *Verbesina*
- xx. Low herbs; pappus wanting 78. *Chrysanthellum*
- ww. Outer involucre of 5 broad, foliaceous bracts; achene not winged 67. *Sclerocarpus*
- rr. Leaves opposite, eglandular.
- y. Pappus of flat, strigose, or plumose bristles.
- z. Leaves deeply toothed or divided; herbs less than 60 cm tall 88. *Tridax*
- zz. Leaves serrate; herbs or shrubs more than 60 cm tall 84. *Calea*
- yy. Pappus of awns, scales, or wanting.
- A. Leaves mostly pinnately compound or trifoliolate; fruits often awned.
- B. Heads large, involucre more than 20 mm across; ligules numerous in several series, often sterile; pappus poorly developed or wanting 80. *Dahlia*
- BB. Heads smaller, involucre mostly less than 20 mm across; ligulate florets in only 1-2 series, fertile; pappus of barbed awns, rarely wanting.
- C. Achenes narrowed into a beak distinct from the body; leaves deeply dissected, mostly more than 3 cm long 79. *Cosmos*
- CC. Achenes sometimes narrowed but without a distinct beak; leaves mostly trifoliolate, if dissected then mostly less than 3 cm long.
- D. Achenes linear with prominent, retrorse-strigose awns; without petiolar hooks; disc florets fertile 77. *Bidens*
- DD. Achenes compressed-rectangular, often without awns; climbing by petiolar hooks; disc florets abortive 81. *Hidalgoa*
- AA. Leaves simple, mostly serrate to entire; fruits awned or not.
- E. Receptacle conical or cylindrical; small or sprawling herbs or vines.
- F. Achene compressed, the angles ciliate.
- G. Heads solitary on long peduncles, sometimes clustered; heads more than 6 mm across 70. *Spilanthes*
- GG. Heads in small, many-headed inflorescences; heads less than 6 mm across 66. *Salmea*
- FF. Achene terete or slightly compressed, eciliate.
- H. Involuclral bracts equal or subequal, in 1(-2) series, lanceolate-linear, basally expanded into wings 86. *Jaegeria*

- HH. Involucral bracts unequal, in 2-many series, imbricate, ovate, unwinged.
- I. Heads with 3-8 ray florets, each enclosed by an involucral bract and 2-3 paleas; annual herb, mostly erect 85. *Galinsoga*
- II. Heads with 8-17 florets, these usually not enclosed by involucral bracts or paleas; annual or perennial herb, mostly prostrate or sprawling 87. *Sabazia*
- EE. Receptacle flat or convex; herbs, shrubs, trees, or vines.
- J. Outer involucre of 5 linear-spatulate, spreading bracts bearing conspicuous, stalked glands; rugose hairs wanting 68. *Sigesbeckia*
- JJ. Involucre not as above; rugose hairs mostly present.
- K. Paleas of slender, apically barbed bristles 58. *Eclipta*
- KK. Paleas broader, enfolding the achene, not apically barbed.
- L. Heads discoid, ray florets wanting.
- M. Heads solitary; leaves scabrous 62. *Melanthera*
- MM. Heads in small, compact inflorescences; leaves smooth 60. *Garcilassa*
- LL. Heads radiate.
- N. Pappus wanting.
- O. Ray florets fertile; involucre of ca. 5 broad, spreading, foliaceous bracts, the inner bracts different, smaller than the outer bracts 65. *Rumfordia*
- OO. Ray florets sterile; involucre not as above, the inner bracts usually longer than the outer bracts.
- P. Involucral bracts obtuse; leaves coriaceous; high climbing vine 75. *Wulffia*
- PP. Involucral bracts narrowly lanceolate; leaves chartaceous; herbs or erect shrubs 73. *Viguiera*
- NN. Pappus present.
- Q. Ray florets sterile.
- R. Leaves 1-veined or 3-veined from well above the base; inner involucral bracts expanded from the basal, indurate portion; outer bracts 1-costate 64. *Oyedaea*
- RR. Leaves 3-veined from near the base; inner involucral bracts not expanded; outer bracts ecostate or several-veined.
- S. Achene compressed and conspicuously recessed between the pappus of two awns; involucral bracts copiously ciliate apically; pedicels apically pilose with coarse, spreading hairs and short, often glandular hairs 69. *Simsia*
- SS. Achene compressed or terete, apically truncate, pappus of both awns and scales; involucral bracts with mostly glabrate tips; pedicels mostly appressed pubescent or glabrate 73. *Viguiera*
- QQ. Ray florets fertile.
- T. Outer achene with conspicuous wings.
- U. Achene laciniate-winged; heads sessile or nearly so in the leaf axils 82. *Synedrella*
- UU. Achene wings sometimes slightly indented but not laciniate; heads long pedunculate, solitary.
- V. Leaves pinnately veined 76. *Zexmenia*
- VV. Leaves 3-veined from the base 74. *Wedelia*
- TT. Achenes without conspicuous wings.
- W. Achene with prominent, persistent, strigulose awns 61. *Lasianthaea*
- WW. Achene with weak, small awns or scales, or without pappus.
- X. Pappus of short, broad scales 87. *Sabazia*
- XX. Pappus of 1-2 short, weak, often deciduous awns 74. *Wedelia*

A. MILLERIINAE²⁰TOD F. STUESSY²¹**Milleriinae** Benth. & Hook. Gen. Pl. 2: 190. 1873. "Millerieae." TYPE: *Milleria* L.45. DELILIA²²**Delilia** Spreng., Bull. Sci. Soc. Philom. Paris, sèr. 3, 10: 54, *tab.* 2. 1823. TYPE: *D. berteri* Spreng. = *D. biflora* (L.) Kuntze.*Elvira* Cass., Dict. Sci. Nat. 30: 67. 1824. TYPE: *Milleria biflora* L.*Meratia* Cass., Dict. Sci. Nat. 30: 65. 1824, nom. superfl., based on type of *Delilia* Spreng.

Annual *herbs*; stems much-branched. *Leaves* opposite. *Inflorescence* of numerous or few, terminal or axillary heads, often in fascicles or glomerules. *Heads* small, radiate; involucre flattened, the bracts 2(–4), slightly herbaceous, with the exterior bract conspicuously larger than the rest; receptacle small, naked; ray florets 1–3, carpellate, fertile, the corollas yellow (to white), the tube and ligule narrow, subentire; disc florets 1–4, perfect, the corollas tubular, 5-lobed, yellow, the throat narrowly campanulate, the anthers 5, entire at the base, the style undivided, hirtellous, the ovary sterile. *Achenes* obovate, flattened, smooth, glabrous, completely enclosed by the involucre bracts; pappus rudimentary. Chromosome number $n = 12$.²³

Delilia is a genus of 3 species with the most common one, *D. biflora*, widely distributed throughout Latin America. The other 2 taxa are restricted to the Galapagos Islands.

The name *Elvira* has been used most often for this genus. The competing name, *Delilia*, was believed by many workers to have been published by Sprengel in 1826 (Syst. Veg., ed. 16, 3: 367), two years after Cassini's publication (1824) of *Elvira*. However, in addition to the 1826 description, Sprengel also published the name *Delilia* three years earlier (1823) in the Bull. Sci. Soc. Philom. Paris.

1. **Delilia biflora** (L.) Kuntze, Rev. Gen. Pl. 333. 1891.—FIG. 45.

Milleria biflora L., Sp. Pl. 919. 1753. TYPE: Mexico, "Habitat in Campechia," date and collector unknown, Herb. Linn. 1031.4 (LINN, holotype, not seen, IDC 177.621.I.5).

Delilia berteri Spreng., Bull. Sci. Soc. Philom. Paris, sèr. 3, 10: 54, *tab.* 2. 1823. TYPE: Colombia, Magdalena, "ad flumen S. Magdalenae in America australi inventa," *Bertero s.n.* (P?, holotype, not seen).

Elvira martyni Cass., Dict. Sci. Nat. 30: 68. 1824, nom. superfl., based on type of *Milleria biflora* L.

²⁰ Support for this investigation under NSF Grant GB-37678 is gratefully acknowledged.

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²² Generic description adapted from Bentham & Hooker (1873: vol. 2: 343).

²³ Chromosome numbers for the genera and species listed in this portion of the *Flora of Panama* have been obtained from the standard chromosomal indexes (Darlington & Wylie, 1955; Fedorov, 1969; Cave, 1956–1964; Ornduff, 1965–1967; Moore, 1969–1970).

Meratia sprengelii Cass., Dict. Sci. Nat. 30: 66. 1824, nom. superfl., based on type of *Delilia berterii* Spreng.

Elvira biflora (L.) DC., Prodr. 5: 503. 1836.

Annual *herbs*, 1–9 dm tall; stems erect, 1–4 mm diam., glabrate to antrorsely strigose with hairs 0.5 mm long. *Leaves* narrowly ovate, 3–8 cm long, 1.5–3 cm wide, acute to acuminate, the base attenuate, both surfaces strigillose with hairs 0.3–0.5 mm long, the margin serrate; petioles 3–12 mm long and 0.5 mm diam. *Inflorescence* globose terminal and axillary clusters (approaching a secondarily headed condition); peduncles 1–2 mm long. *Heads* radiate, 4–5 mm tall, 3.5–5 mm wide; involucre compressed, completely enclosing the florets, of three herbaceous strigillose bracts, one large and two small, the large bract ovate, 4–5 mm long, 3.5–5 mm wide, the apex rounded, the smallest bract narrowly ovate, 3 mm long, 1 mm wide, the apex acute, hidden beneath the slightly larger middle-sized bract; paleas absent; ray floret 1, the ligule ovate, 0.4 mm long, 0.3 mm wide, the tube 1.3 mm long, 0.1 mm diam., glabrous; disc floret 1(–4), the corolla 0.6 mm diam., the throat 1 mm and tube 1.5 mm long, glabrous, the anthers black, the ovary filiform, 1.5 mm long, 0.1 mm diam. *Achene* obovoid, gray, compressed, with a central ridge, 2–2.5 mm long, 1.2–1.4 mm diam., glabrous. Chromosome number $n = 12$.

This species is easily distinguished from other taxa of the Heliantheae by the axillary and terminal clusters of samaralike involucre. It flowers from October to March.

CANAL ZONE: Transisthmian Hwy., ca. 19 mi from Colón, *Burch et al.* 1007 (DUKE, F, GH, MO, NY, UC, US). Las Sabanas, *Celestine* 112 (US). Madden Dam, *Ebinger* 861 (MO). Between Summit and Gamboa, *Greenman & Greenman* 5249 (GH, MO). Paraíso Station, *Hayes* 170 (GH). Las Cruces Trail, 75 m, *Hunter & Allen* 688 (MO). Río Grande, near Culebra, 50–100 m, *Pittier* 2127 (US). Balboa, *Standley* 26411 (GH, US). Gamboa, *Standley* 28363 (US). Pueblo Nuevo, *White* 302 (GH, MO). Ca. 1 mi SW of Cocoli, *Wilbur et al.* 12868 (F, DUKE, GH, NY). COCLÉ: ½ mi from El Copé, *Correa* 398 (MO). Near El Valle de Antón, *Croat* 13288 (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2590 (DUKE, MO, UC). LOS SANTOS: Ca. 5 mi S of Las Tablas, *Burch et al.* 1250 (GH, MO, UC, US). 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al.* 2890 (DUKE, MO, NY, UC). 16 mi S of Macaracas at Quebrada Bejuco, *Tyson et al.* 3094 (MO). PANAMÁ: Ca. 1 mi N of Chagres River along Boyd Roosevelt Hwy., *Blum & Tyson* 1983 (MO). Between Capira and Potrero, 80–130 m, *Dodge & Hunter* 8620 (MO). Cerro Campana, 650 m, *Kennedy et al.* 2034 (MO). VERAGUAS: 1–2 mi above Santa Fe, *Gentry* 3065 (MO). Montijo, 8 mi S of Santiago, *Tyson* 6033 (DUKE).

46. MILLERIA²⁴

Milleria L., Sp. Pl. 919. 1753. Gen. Pl., ed. 5. 390. 1754. TYPE: *M. quinqueflora* L.

Tall branching *herbs*; stems erect. *Leaves* opposite, the upper subsessile, the lower with winged petioles. *Inflorescence* of small heads in terminal racemose panicles. *Heads* radiate; involucre obliquely depressed-subglobose, enlarged after anthesis and enclosing the achene, the bracts few, concave; receptacle small, naked; paleas scarious; ray floret 1, carpellate, fertile, the ligule yellow, trifid at the apex; disc florets 3–5, perfect, the corollas tubular, 5-lobed, green,

²⁴ Generic description adapted from Bentham & Hooker (1873: vol. 2: 344).

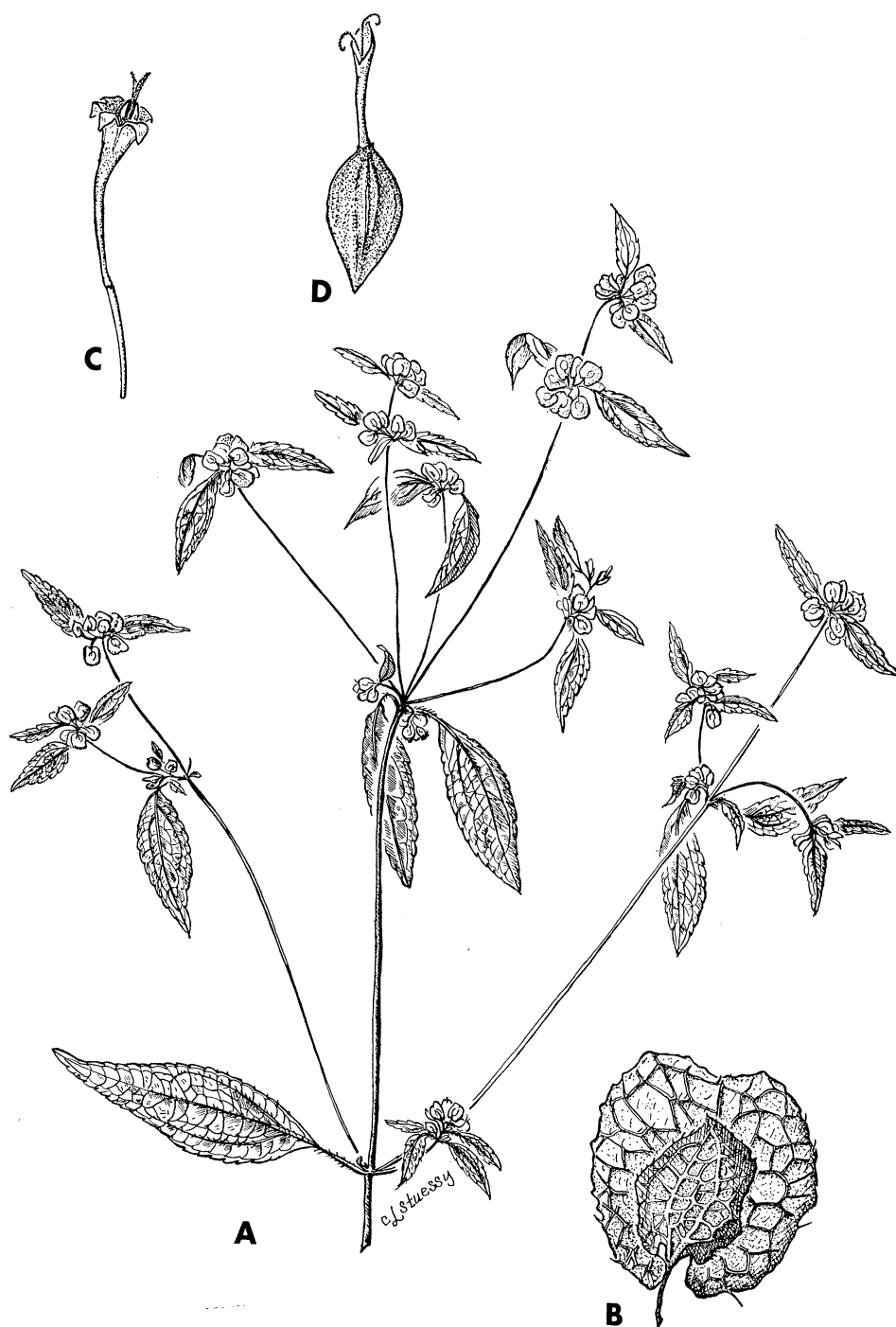


FIGURE 45. *Delilia biflora* (L.) Kuntze.—A. Habit ($\times \frac{1}{2}$).—B. Fruiting Head ($\times 6\frac{1}{2}$).—C. Inner floret ($\times 8\frac{1}{10}$).—D. Outer floret ($\times 8\frac{1}{10}$). [After Lewis et al. 2590 (MO).]



FIGURE 46. *Milleria quinqueflora* L.—A. Habit ($\times \frac{3}{5}$). [After King 5324 (UC).]—B. Flowering head ($\times 6$). [After Woodson et al. 1545 (MO).]—C. Fruiting head ($\times 3\frac{1}{2}$). [After Crawford 468 (NY).]

the throat campanulate, the anthers 5, the base slightly sagittate, the appendages short, the style undivided, subulate, hirtellous, the ovary sterile. *Achene* ovoid, compressed, smooth, glabrous, enclosed tightly by the involucre at maturity; pappus absent. Chromosome number $n = 15$.

A genus of only one species, distributed from Mexico to Ecuador. *Milleria* in fruit is easily distinguished from other members of the family by the unusual covering of hard involucral bracts around the single fertile achene (Fig. 46C).

1. *Milleria quinqueflora* L., Sp. Pl. 919. 1753. TYPE: Cultivated in Uppsala Botanical Garden, precise locality, date and collector unknown, Herb. Linn. 1031.1 (LINN, holotype, IDC 177.621:1.1).—FIG. 46.

Annual *herbs*, 0.3–1.5 m tall; stems 0.2–0.5 mm diam., glabrous below to copiously stipitate-glandular above with hairs 0.1–0.2 mm long. *Leaves* narrowly ovate to ovate or deltoid, 4.5–18 cm long, 2.8–13 cm wide, acuminate, the base attenuate, often auriculate at base of petiole, marginally serrate, both surfaces glabrate to strigose with hairs 0.1–0.3 mm long; subsessile or with tapering winged petioles 0.3–6 cm long, to 1 cm wide near blade. *Inflorescence* with peduncles 3–9 mm long, stipitate-glandular. *Heads* 3–5 mm tall, 2–3 mm across; involucre of 3 bracts, 2 bracts large, connate and conduplicate around the ray floret, together to 3 mm long and 5 mm wide, with 2 acute lobes, strigillose and stipitate-glandular, the third bract small ovate, 2 mm long, 2 mm wide, the apex acute; paleas 3–5, lanceolate to elliptic, the apex obtuse to rounded, 2 mm long, 0.6–1 mm wide; ray floret 1, the ligule broadly obovate, with 3 deep lobes, 3–5 mm long, 2.5–4 mm wide, resin-dotted on abaxial surface, the tube 0.4 mm long, 0.3 mm diam., glabrous; disc florets 3–5, the corollas green, 1.3 mm diam., the throat 2 mm and tube 1 mm long, glabrous, the anthers black, the ovary filiform, 1.2 mm long, 0.1 mm diam. *Achene* black, 5 mm long, 3 mm diam., glabrous, enclosed tightly and completely by the 3 bracts which become very leathery at maturity. Chromosome number $n = 15$.

This species flowers during most of the year.

CANAL ZONE: Juan Mina, *Bartlett & Lasser* 16513 (MO). C-15 road, *Blum & Dwyer* 2682 (MO). Colón to Empire, Panama RR, *Crawford* 468 (F, GH, NY). Chilibre, *Dwyer* 1025 (MO). Gamboa, *Piper* 5656 (GH, US). Near Gamboa, 40–80 m, *Pittier* 3694 (GH, US). Between Corozal and Ancón, 10–30 m, *Pittier* 6737 (US). Gamboa, *Standley* 28516 (US). Fort Kobe road, *Woodson et al.* 1420 (GH, MO, NY, US). CHIRIQUÍ: Near Puerto Armuelles, 0–75 m, *Woodson & Schery* 843 (GH, MO). COCLÉ: Banks of Río Grande, *Burch et al.* 1171 (F, GH, MO, NY, UC, US). Behind Club Campestre, ca. 700 m, *Duke* 13262 (MO). Ca. 10 mi SE of Antón, *King* 5268 (UC, US). W slopes of El Valle, *King* 5324 (UC, US). El Valle de Antón and vic., 500–700 m, *Seibert* 449 (GH, MO, NY, US). COLÓN: Achiote, *Tyson et al.* 4524 (GH, MO). HERRERA: Between El Potrero and Las Minas, *D'Arcy & Croat* 4135 (MO). PANAMÁ: Panama City on way to Tocumen, *D'Arcy & D'Arcy* 6112 (MO). Ca. 6 mi E of Chepo, *Duke* 4083 (GH, MO). About halfway between El Llano and Río Mamoni, *Duke* 5601 (MO). Near Río Mar, 5–20 m, *Duke* 12424 (MO). Escuela Agronomía, Tocumen, *Dwyer* 4035 (MO, US). Just E. of Chicá, *King* 5261 (UC, US). Las Sabanas, *Standley* 25896 (US). Near Juan Franco Race Track, near Panamá, *Standley* 27715 (US). Tumbo Muerto road, near Panamá, *Standley* 29718 (US). Juan Díaz, *Standley* 30494 (US). Isla Taboga, 0–186 m, *Woodson et al.* 1545 (GH, MO, NY). VERAGUAS: 2–4 mi E of Santiago, ca. 30 m, *Duke* 12350 (MO). 5 mi E of Santiago, *Tyson et al.* 4269 (MO).

B. MELAMPODIINAE²⁵TOD F. STUESSY²⁶

Melampodiinae Less., *Linnaea* 5: 149. 1830. "Melampodieae." TYPE: *Melampodium* L.

47. ACANTHOSPERMUM²⁷

Acanthospermum Schrank, *Pl. Rar. Hort. Monac. tab.* 53. 1819. TYPE: *A. brasiliense* Schrank = *A. australe* (Loefl.) Kuntze.

Annual *herbs*; stems dichotomously branched, pubescent. *Leaves* opposite, subentire to pinnatifid. *Inflorescence* of solitary heads in the axils and forks of the stem. *Heads* radiate; involucre biseriate, the outer bracts 4–6, elliptic to ovate, herbaceous, the inner bracts of the same number as the ray achenes and closely enveloping them; receptacle small, convex, paleaceous; ray florets carpellate, fertile, uniseriate, 5–8, the corollas elliptic to ovate, pale yellow, the apex emarginate or tridenticulate, the tube as long as or much shorter than the limb; disc florets perfect, 3–30, the corollas yellow with a short cylindrical tube, the throat cylindric-funnelform or campanulate, 5-lobed, the anthers barely cordate to cordate-sagittate, the appendage ovate, obtuse, and somewhat inflexed, the style clavate, obtuse, undivided, hispidulous, the ovary sterile, pappus absent. *Fruit* cuneate or oblong-fusiform, rarely trigonous-turbinate, weakly or strongly laterally compressed, more or less densely echinate on the whole surface, the angles with straight or usually uncinatate prickles. Chromosome numbers $n = 10, 11$.

This is a genus of 6 species distributed primarily throughout Latin America. One species, *A. hispidum*, has been introduced to many ports of entry throughout the world.

Acanthospermum is a close relative of *Melampodium*, a genus also found in Panama. Both taxa have perfect but sterile disc florets and involucral bracts of the inner series that enclose single ray achenes. The most important feature distinguishing the two genera comes from the fruits which are spiny in *Acanthospermum* and smooth, ribbed, or sculptured in *Melampodium* (cf. Figs. 47B, 52B).

Literature:

Blake, S. F. 1921. Revision of the genus *Acanthospermum*. *Contr. U.S. Natl. Herb.* 29: 383–392.

Stuessy, T. F. 1970. The genus *Acanthospermum* (Compositae-Heliantheae-Melampodinae): taxonomic changes and generic affinities. *Rhodora* 72: 106–109.

²⁵ Support for this investigation under NSF Grant GB-37678 is gratefully acknowledged.

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²⁷ Generic description adapted from Blake (1921).

1. **Acanthospermum humile** (Swartz) DC., Prodr. 5: 522. 1836.—FIG. 47.

Melampodium humile Swartz, Prodr. Veg. Ind. Occ. 114. 1788. TYPE: Jamaica, "Domingo," 1783–1787, Swartz s.n. (S, holotype, not seen; B, isotype, TEX, photo).

Annual *herbs*, 15–35 cm tall; stems erect, 1.5–3.5 mm diam., hirtellous to pilose with hairs to 0.7 mm long. *Leaves* lyrate, the margin sinuate especially on the blade, 2–4.5 cm long, 1.2–2.7 cm wide, the apex obtuse, the base attenuate, the upper surface sparingly pilose, the lower surface resin-dotted and sometimes more densely pilose; petiole tapering, winged, 1–2.2 cm long. *Inflorescence* with heads subsessile or with peduncles up to 1 mm long. *Heads* radiate, 3–5 mm tall, 6–10 mm across; outer involucre spreading, 6–7 mm diam., the bracts usually 5, separate, lanceolate to narrowly ovate, 3–4 mm long, 1.5–2 mm wide, apically acute, the abaxial surface resin-dotted and sparingly pilose with hairs 0.5 mm long, the margin herbaceous and ciliate; paleas elliptic, 1 mm long, 0.2 mm wide, apically erose; ray florets 5–7, the ligules light yellow, elliptic, 1 mm long, 0.4 mm wide, apically emarginate; disc florets 3–5, the corollas yellow-orange, 0.7 mm diam., the throat and tube each 0.7 mm long, the ovaries sterile, 0.8 mm long, 0.1 mm diam. *Fruits* 2.5–4 mm long, the sides resin-dotted, the apex with hooked short spines and 2 straight divergent spines to 4 mm long. Chromosome number unknown.

The center of distribution for this species is in the West Indies (especially common in Cuba and Jamaica). It flowers during most of the year.

CANAL ZONE: Chagres, *Fendler 171* (F, GH, US). COLÓN: Between Fato and Playa de Dumas, *Pittier 3833* (NY, US). CHIRIQUÍ: Boca Chica de Horconcitos, *Pittier 5123* (GH, US).

48. BALTIMORA

Baltimora L., Mant. Pl. 158. 1771. TYPE: *B. recta* L.

Scolospermum Less., *Linnaea* 5: 152, *tab. 2, figs. 19–31*. 1830. TYPE: *S. baltimoroides* Less.

Erect, annual, taprooted *herbs*; stems terete, obtuse-angled when dry, yellow-green to purple. *Leaves* opposite, acuminate, 3-nerved from near the base, the margin serrate to biserrate, petiolate. *Inflorescence* of axillary and terminal heads in few-flowered racemes or large panicles. *Heads* radiate, subcylindrical to subglobose; involucre bracts of unequal length, in 3 series, narrowly ovate, acute-acuminate, the adaxial surface glabrous, the outer bracts strigose, the margins scarious toward base, the inner bracts becoming less strigose and more scarious; receptacle convex; paleas conduplicate, lanceolate, scarious, glabrous, acute, the apical margin ciliate with hairs 0.3 mm long, the midrib weak; ray florets fertile, the ligules yellow, elliptic, apically emarginate, the undersurface strigose on veins with hairs 0.1–0.2 mm long, the tube glabrous, 0.2 mm diam., the stigmatic lobes 2, 1 mm long; disc florets perfect, the corollas yellow, glabrous, exerted above the paleas at anthesis, the throat funnelform, the lobes partially reflexed, narrowly triangular, 0.2 mm wide, pubescent on the upper surface, the anthers black, auriculate at base, the style filiform, 0.1 mm diam., the stigma yellow, undivided, 0.2 mm diam., the ovary filiform, sterile, 0.2 mm diam., glabrous. *Fruits* triquetrous, sometimes markedly winged, on sides smooth to tuberculate; pappus a crown of tissue or a collar of short awns. Chromosome number $n = 15$.



FIGURE 47. *Acanthospermum humile* (Swartz) DC.—A. Habit ($\times \frac{3}{5}$).—B. Fruit consisting of achene and a fused involucre bract ($\times 6\frac{3}{10}$). [After Pittier 5123 (US).]—C. Head ($\times 6\frac{3}{10}$). [After Pittier 5123 (GH).]

Baltimora is a genus of two species distributed throughout Mexico, the West Indies, and South America. Although traditionally placed in the subtribe Melampodiinae, the strongest affinities of the genus may be with *Wedelia* and its relatives in the subtribe Helianthinae.

Literature:

Stuessy, T. F. 1973. Revision of the genus *Baltimora* (Compositae, Heliantheae). *Fieldiana, Bot.* 36: 31–50.

1. ***Baltimora recta*** L., *Mant. Pl.* 288. 1771. TYPE: United States, Maryland, near Baltimore, date and collector unknown, cultivated in Botanical Garden Uppsala (not located).—FIG. 48.

Scolospermum baltimoroides Less., *Linnaea* 5: 152, *tab. 2, figs. 19–31*. 1830. TYPE: México, "Santa Fe," Jul 1828, *Schiede & Deppe* 335 (B, holotype, not seen, F, MICH, TEX, US, photos).

Baltimora scolospermum Steetz in Seem., *Bot. Voy. Herald* 154. 1854, nom. superfl., based on type of *Scolospermum baltimoroides* Less.

B. scolospermum var. *panamensis* Steetz in Seem., *Bot. Voy. Herald* 154. 1854. TYPE: Panamá, "in savanas," 1846–1869, *Seemann s.n.* (BM, holotype, not seen; GH, isotype).

Herb, to 3 m tall; stems glabrate at base, moderately to markedly strigose toward apex with hairs 0.3 mm long. *Leaves* broadly to narrowly ovate, 2.5–15 cm long, 1.5–12 cm broad, basally truncate to shortly attenuate, both surfaces weakly to moderately strigose with hairs 0.1–0.3 mm long; petioles 0.8–7 cm long, 0.2–1 mm diam. *Inflorescence* with heads in racemes or more often in large panicles; peduncles 8–33 mm long, 0.3–0.7 mm diam., strigose with hairs 0.3 mm long. *Heads* radiate, 7–22 mm across, 5–8 mm tall; involucre bracts 3–6, 3.5–6 mm long, 1.7–2.2 mm wide, the apical margin ciliate with hairs 0.3 mm long, the outer bracts weakly strigose abaxially with hairs 0.3 mm long; receptacle 1 mm diam.; paleas 3.5–4.2 mm long, 0.6–0.8 mm wide; ray florets 3–8, the ligules 3.8–5.5 mm long, 1.2–3.1 mm wide, the tube 1.2 mm long; disc florets 16 or more, the corolla throat 1 mm long, 0.7 mm diam. with lobes 0.5 mm long, the tube 1 mm long, 0.2 mm diam., the anthers 1.7 mm long with truncate appendages, the style 1 mm long, the stigma 1.2–2.2 mm long, the ovary 2.2–4 mm long. *Achenes* 2.4–3.2 mm long, 1.6–1.9 mm diam., truncate and puberulent; pappus a small crown or cup of tissue. Chromosome number $n = 15$.

Baltimora recta is a weedy species which is found in abundance from Mexico to its southernmost limit in Panama. The achenes of *Baltimora* show striking variations in the ornamentation of the outer pericarp, ranging from nearly smooth (Fig. 48C) to conspicuously winged (Fig. 48D). It flowers throughout the year.

CANAL ZONE: Ca. 1 mi from Miraflores, *Blum* 1856 (FSU, MO). Frijoles, *Croat* 10381 (MO). Just N of Gamboa gate, *D'Arcy & D'Arcy* 6000 (MO). Navy Reservation, N of Gamboa, *Dressler* 3216 (DUKE, MO). Sosa Hill, *Duke* 4666 (MO). Contractor's Hill, *Dwyer & Lallathin* 8805 (MO). Gamboa, Naval Reservation, *Ebinger* 486 (MO). Corozal, *Greenman & Greenman* 5187 (MO). Barro Colorado Island, *Kenoyer* 593 (US). Ancón Hill, 100–200 m, *Killip* 12001 (US). Pedro Miguel, *King* 5234 (UC, US). Ft. Kobbe, *King* 5239 (UC, US). Near Madden Dam, 50 ft, *Lewis et al.* 9 (GH, MO, NY, UC). Pedro Miguel, *Piper* 5491 (US). Near Gatuncillo, *Piper* 5632 (US). Near Culebra, 50–150 m, *Pittier* 2232 (US). Between Corozal and Ancón, 10–30 m, *Pittier* 6739 (US). Madden Dam, *Porterfield s.n.* (NY). Vista



FIGURE 48. *Baltimorea recta* L.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 2\frac{4}{5}$).—C. Achene ($\times 8\frac{3}{10}$). [After Tyson 6283 (US).]—D. Achene ($\times 8\frac{7}{10}$). [After Duke 5920 (MO).]

del Mar, *Porterfield s.n.* (NY). Sosa Hill, Balboa, *Standley 25278* (US), *26451* (GH, US). Chiva Chiva Trail, Miraflores Lake, *Tyson 1354* (MO). Near Pacific Saddle Club, Pedro Miguel, *Tyson 6283* (FSU, UC). Near Miraflores Lake, *White 246* (GH, MO, US). CHIRIQUÍ: Distrito Guanabano, along Quebrada Guanabano, 0–100 m, *Croat 22540* (MO). Ca. 8 mi W of Las Lajas, grassy roadside, *D'Arcy 5283* (MO). Outskirts of David, *D'Arcy 5289* (MO). Ca. 3 mi above David on way to Boquete, *D'Arcy & D'Arcy 6288* (MO). 10 mi W of Puerto Armuelles, *Liesner 86* (MO). 4 mi S of Puerto Armuelles, 0–100 m, *Liesner 396* (MO). NE of Gualaca, *McCorkle C-42* (FSU, UC). 5 km E of Boca del Monte, *McCorkle C-74* (NY). COCLÉ: Ca. 1 mi E of Antón, *Blum & Tyson 584* (FSU, MO). Nueva Gorgona, *D'Arcy & D'Arcy 6280* (MO). 10 mi E of Natá at Río Grande, *Tyson 5226* (DUKE, FSU). COLÓN: Portobelo, *D'Arcy 4059* (MO). Ca. 1–2 mi N of Colón-Panamá boundary, *Lazor & Tyson 3018* (FSU, UC). Between Río Piedras and Puerto Pilón, *Lewis et al. 3208* (DUKE, MO, UC). DARIÉN: 0–4 mi up river Sabana from Santa Fe, *Duke 4144* (MO). HERRERA: Pesé, ca. 50 m, *Allen 799* (GH, MO, NY). Pan-Am. Hwy. just E of Río Conaca, *D'Arcy & D'Arcy 6669* (MO). Océ, *Ebinger 1045* (MO). 2 km N of Montijo, *McCorkle C-7* (FSU). PANAMÁ: Near beach at Nueva Gorgona, *Duke 4500* (GH). Near Río Pacora and Chepo Hwy., *Duke 5920* (GH, MO). Pacora, *Dwyer 1232* (MO, UC). Tocumen, *Dwyer 4405* (FSU). Ca. 8 mi S of Goofy Lake, *Dwyer 7053* (GH, MO). Laguna de Portala, near Chepo, 50 m, *Pittier 4588* (US). Between Río Pacora and Chepo, *Porter et al. 5148* (MO). Tocumen Hwy., ca. 3 mi after the airport, *Rivas 14* (DUKE, MO). Nuevo Emperador Hwy., *Rodríguez 22* (DUKE, MO). Corozal Road, near Panamá, *Standley 26826* (US). Macapale Island in Madden Lake, *Tyson 5486* (FSU, MO). VERAGUAS: Hills W of Soná, ca. 500 m, *Allen 1066* (GH, MO). Ca. 5 mi NE of La Mesa, *Blum & Tyson 638* (FSU, MO). 2–4 mi E of Santiago, ca. 30 m, *Duke 12369* (MO). Santiago, 2 mi from Transisthmian Hwy. toward Atalaya, *Dwyer & Kirkbride 7405* (GH, MO, US). 12 mi from Santiago toward Divisa, *Dwyer & Kirkbride 7448* (MO, UC). Puerto Mutis, 12 mi S of Santiago, *Tyson 5193* (DUKE, FSU, MO).

49. CLIBADIUM

Clibadium L., Mant. Pl. 161. 1771. TYPE: *C. surinamense* L.

Shrubs; stems terete to obscurely angular. *Leaves* opposite, lanceolate to cordate, margin serrate or serrulate, petiolate. *Inflorescence* a racemose, corymbose, or capitate panicle, suboppositely branched with subtending bracts decreasing in size to 1.5–2 mm long near heads; heads 8–600, sessile or on short peduncles 0.5–2 mm long. *Heads* inconspicuously radiate; involucre cupulate or funnelform, the bracts 6–13, multiseriate, with outer bracts herbaceous and inner bracts somewhat scarious, usually subequal, imbricate, narrowly ovate to obovate; receptacle slightly convex, 0.5–1.5 mm diam.; paleas mostly absent or less often present; ray florets 3–26, usually uniseriate or less often multiseriate, fertile, the corollas tubular, white, the 2–4 lobes 0.1–0.5 mm long, the styles bifid, pappus absent, sometimes of tufts of hairs (*C. pilonicum*) or of two short awns (*C. asperum*); disc florets 5–22, the corollas tubular, white, with 5 triangular lobes; the anthers black, the style undivided (sometimes slightly parted at tip), with a 5-lobed nectary at base, the ovary sterile, pappus absent. *Achenes* obovoid, brown-black, somewhat compressed radially. Chromosome number $n = 16, 24$.

Clibadium is a genus of approximately 30 species, ranging from Guatemala to southern South America. In Panama the genus has been reported in every province except Los Santos, and the greatest concentration of species (5) occurs in Chiriquí.

Local inhabitants in Panama and Colombia use the vegetative parts of at least some of the species as fish poisons ("barbascos"). The leaves and stems are

beaten into the water releasing polyacetylene compounds that stun the fish and allow for easy capture.

At the present time, despite the existence of two papers that treat *Clibadium* in some detail (Schulz, 1912; Blake, 1917), the basic taxonomy of the genus is confused, and the treatment here must be regarded as provisional.

Clibadium is here included within the subtribe Melampodiinae rather than within the Milleriinae as traditionally placed. Blake (1917) first pointed out the close relationship of *Clibadium* to *Ichthyothere*, a genus conventionally referred to the Melampodiinae, and made the transfer to that subtribe. This decision has recently been substantiated by Stuessy (1973).

Literature:

- Blake, S. F. 1917. Notes on the systematic position of *Clibadium*, with descriptions of some new species. Contr. Gray Herb. 52: 1-8.
 ———. 1924. New American Asteraceae. Contr. U.S. Natl. Herb. 22: 587-661.
 ———. 1937. Eleven new Asteraceae from North and South America. Jour. Wash. Acad. Sci. 27: 374-391.
 Schulz, O. E. 1912. Beiträge zur Kenntnis der Gattung *Clibadium*. Bot. Jahrb. Syst. 46: 613-628.
 Stuessy, T. F. 1973. A systematic review of the subtribe Melampodiinae (Compositae, Heliantheae). Contr. Gray Herb. 203: 65-80.

- a. Heads with receptacles paleaceous throughout; ray florets multiseriate (B. sect. *Trixidium*) 8. *C. pittieri*
 aa. Heads with receptacles naked or only partly paleaceous; ray florets uniseriate (A. sect. *Clibadium*).
 b. Leaves with a winged petiole tapering to a subauriculate base 6. *C. subauriculatum*
 bb. Leaves with a wingless petiole, at base attenuate to obtuse.
 c. Leaves with 3 conspicuous main veins arising from the very base 5. *C. pilonicum*
 cc. Leaves with 3 main veins arising 5-30 mm above the base.
 d. Mature inflorescence a capitate panicle with groups of 3-6 tightly aggregated heads arranged in a flat-topped cluster 1. *C. anceps*
 dd. Mature inflorescence a corymbose or racemose panicle (young inflorescences may appear capitate, but never flat-topped).
 e. Leaves over 18 cm wide; heads usually more than 500 in each inflorescence 3. *C. grandifolium*
 ee. Leaves 10 cm wide or less; heads usually less than 200 in each inflorescence.
 f. Involucral bracts glabrate (sometimes strigillose near apex), often brown-black when dry, ciliate; peduncles and axes of inflorescence densely villous or strigose 4. *C. leiocarpum*
 ff. Involucral bracts strigillose to strigose, yellow-green when dry; peduncles and axes of inflorescence moderately strigose or densely hispid.
 g. Undersurface of leaves conspicuously reticulately veined and hispid 7. *C. surinamense*
 gg. Undersurface of leaves glabrate to strigose 2. *C. asperum*

A. Section CLIBADIUM

Section *Clibadium* (sect. *Euclibadium* DC.)

Paleas absent; ray florets uniseriate.

1. **Clibadium anceps** Greenman, Proc. Amer. Acad. Arts 39: 97. 1903. TYPE: Costa Rica, "Forêts de La Palina," 1459 m, 8 Sep. 1898, *Tonduz 12537* (CR, GH, syntypes, not seen).

Scandent *shrub* 3–6 m tall; stems at least 4 mm diam. (base not seen), antrorsely strigose with hairs 0.3–0.5 mm long. *Leaves* ovate to narrowly ovate, conspicuously 5-veined from near base; blades 10–15 cm long, 4.5–9 cm wide, acuminate, the base obtuse (sometimes shortly attenuate), the margin serrulate, both surfaces glabrate to sparsely strigillose with hairs 0.3 mm long, on midrib and major lateral veins markedly strigose with hairs up to 0.6 mm long; petioles 2–3.3 cm long, 0.7–1.5 mm diam., strigose (markedly so on adaxial side) with hairs up to 0.5 mm long. *Inflorescence* of 56–119 heads in a capitate panicle, with clusters of 3–6 sessile heads terminating all axes. *Heads* radiate; involucre funnelform, 3–4 mm tall, 3–5 mm across, the bracts 5–7, ovate, 3.5–4 mm long, 2–3 mm wide, abaxially strigose with hairs 0.3 mm long, the upper one-third of margin ciliate; paleas absent; ray florets 3–4, the corollas 2.2 mm long, 0.9 mm diam., the 4 lobes 0.2 mm long, the styles 3.3 mm long with the branches 1.8 mm long; disc florets 6–7, the corollas 3.3 mm long, the throat 2.3 mm long and 1 mm diam., the lobes 0.4 mm long, apically comose, the tube 0.4 mm diam., the anthers 2 mm long, the style 5 mm long, the ovary sterile, 2 mm long, 0.3 mm diam., villous (especially at apex) with hairs 0.6 mm long. *Achenes* 2 mm long, 1.2 mm diam., glabrous. Chromosome number unknown.

Clibadium anceps differs from other species of the genus in being scandent as well as in having the lateral branches of the inflorescence more-or-less at right angles to the main axis. The species is somewhat rare in Panama, being found only in Chiriquí. In Panama it flowers in July and August.

CHIRIQUÍ: Cerro Horqueta, 7000 ft, *Blum & Dwyer 2662* (FSU, MO). E side of Cerro Pando (near Río Chiriquí Viejo), 6000 ft, *D'Arcy & D'Arcy 6611* (MO). Palo Alto, E of Boquete, 5000 ft, *Stern et al. 1019* (GH, MO, US).

2. **Clibadium asperum** (Aubl.) DC., Prodr. 5: 506. 1836.

Baillieria aspera Aubl., Hist. Pl. Guiane 2: 804, *tab. 317*. 1775. TYPE: French Guiana, "habitat Caiennae & Guianae locis incultis," *Aublet s.n.* (BM, holotype, not seen).

Clibadium latifolium Rusby, Descr. S. Amer. Pl. 150. 1920. TYPE: Colombia, Magdalena, "in open places in alluvial forest on banks of river Buritaca, 2 miles from the sea," 28 Sep. 1898, *Smith 2014* (NY, holotype, not seen, US, photo; F, isotype, US, photo).

C. appressipilum Blake, Contr. U.S. Natl. Herb. 22: 600. 1924. TYPE: Panamá: Darién, Boca de Cupe, 13 Apr 1908, *Williams 698* (US, holotype, not seen; NY, isotype, not seen; *Pittier 4730*, GH, US, *Pittier 4157*, US, paratypes).

Shrub 1.5–3 m tall; stems copiously strigillose with hairs 0.1 mm long. *Leaves* ovate; blades 6–22(–28) cm long, 3–10 cm wide, acuminate, the base attenuate, the margin serrate, both surfaces moderately strigillose with hairs 0.1 mm long (longer and more abundant on major veins); petioles 1.5–7 cm long, to 1.5 mm diam., strigillose with hairs 0.1 mm long. *Inflorescence* a corymbose panicle of 25–100 heads; peduncles 1–2 mm long. *Heads* radiate; involucre cupulate, 4–6 mm across, the bracts 7–10, ovate to obovate, 3–4 mm long, 2–3 mm wide, abaxially strigose with hairs 0.2 mm long; paleas absent; ray florets 5–9, the corollas 1.5–2.2 mm long, 0.4 mm diam., the 3 lobes 0.4 mm long, the styles 2.2–2.6 mm long with

branches 1 mm long; disc florets 9–22, the corollas 2.5 mm long, the throat 2 mm long and 0.8 mm diam., the lobes 0.6 mm long, pubescent abaxially with hairs less than 0.1 mm long, the tube 0.3 mm diam., the anthers 1.3 mm long, the style 4 mm long, the ovary sterile, 1.3 mm long, 0.3 mm diam., villous (sometimes only toward apex) with hairs to 0.5 mm long. *Achenes* 1.7–2 mm long, 1.5 mm diam., more convex on abaxial surface, puberulent at apex with hairs to 0.1 mm long; pappus absent or of 2 short awns to 0.6 mm long. Chromosome number unknown.

One collection, *Lewis et al.* 3382, has leaves with longer teeth, heads that are smaller and less tightly aggregated than usual, and longer pappus awns. Despite these differences, the collection appears to belong in *C. asperum*.

The determination of the earliest applicable name for this taxon is mired in difficulty. I have selected a very early name, *C. asperum*, which, judging from the protologue (including the plate, which is taken to represent the holotype), appears to apply to this taxon as found commonly in Panama and in northern South America. Blake (1917) has pointed out a possible confusion in application of the name *C. asperum* with *C. sylvestre*, also described by Aublet in the same publication (both as species of *Baillieria*). Not having seen the types in question, I cannot comment on all of Blake's remarks, but I do not agree with his contention that *C. asperum* is synonymous with *C. surinamense*. The plant figured in plate 317 of Aublet appears to be not *C. surinamense*, but instead is the species treated here. The large ovate leaves with attenuate bases and nonreticulate undersurfaces are not to my knowledge ever found in *C. surinamense*.

This species flowers primarily from May to September and occasionally during the rest of the year.

CANAL ZONE: Barro Colorado Island, *Bailey & Bailey* 390 (F); *Croat* 12283 (DUKE, F, MO, NY). Vic. of Madden Dam near Río Chagres, 50–75 m, *Seibert* 559 (GH, MO, NY, US). CHIRIQUÍ: 10–11 mi W of Puerto Armuelles near San Bartolo Limite, 300–500 m, *Croat* 22017 (MO). Quebrada Quanabanito beyond La Represa, 2 mi SW of Puerto Armuelles, 0–200 m, *Croat* 22069 (MO). Distrito Baru along ridge above Brazo Seco, near Costa Rica border, 100–200 m, *Croat* 22557 (MO). COLÓN: Near Río Piedras along road to Portobelo, *Blum et al.* 2508 (FSU, MO). 1 mi E of Puerto Pilón, *Correa & Haines* 234 (MO). ¼ mi N of Maria Chiquita on road to Portobelo, *Croat* 11364 (MO). 2 mi S of Portobelo along river, *Croat* 11419 (MO). W side of Portobelo, *D'Arcy* 4077 (MO). Santa Rita Ridge, *D'Arcy & D'Arcy* 6168 (MO). Ca. 1 mi W of Portobelo, *Gentry* 1737 (MO, NY). Peluca, ca. 27 km from Transisthmian Hwy. on road to Nombre de Dios, *Kennedy* 2629 (MO). Ca. 6 mi SE of Portobelo, *Luteyn* 1425 (DUKE). Achiote, *Tyson et al.* 4531 (FSU, GH, MO). 5 mi NE of Sabanita towards Portobelo, *Wilbur & Luteyn* 11615 (DUKE). 6 mi SW of Portobelo, *Wilbur & Luteyn* 11660 (DUKE). DARIÉN: Near Yape, ca. 30 m, *Allen* 857 (F, GH, MO, NY, US). Río Chico, near Yaviza, 100 ft, *Allen* 4582 (GH, MO). Near Boca Quebrada Venado, Río Tuqueza, *Bristan* 1110 (MO). Near El Real, along road to Pinogana, *Croat & Porter* 15474 (MO). Río Pirre, *Croat & Porter* 15520 (MO). Río Pirre below Río Peresenico, *D'Arcy* 5523 (MO). 2–3 mi SE of El Real, *Duke* 4838 (GH, MO). Peak ca. 300 ft high between Río Balsa and Río Aretí at their confluence, *Duke* 8733 (GH, OS, US). Río Mortí, ca. 6 mi upstream from Mortí Abajo, ca. 100 m, *Duke* 10171 (MO). Río Piñas, *Duke* 10554 (MO, OS). Cuipo forests near Santa Fe, *Duke* 12282 (MO). Trail from Río Pucro to Quebrada Maskia, *Duke* 13069 (MO). Near helipad at Camp Hydro on Río Mortí, 229 ft, *Duke* 15409 (OS). Manené to mouth of Río Cuasí, *Kirkbride & Bristan* 1523 (MO, NY). ½ mi E of airstrip at El Real, *Lazor & Correa* 3384 (FSU, MO, UC). Near Paya, Río Paya, *Stern et al.* 236 (GH, MO, UC, US). Near El Real along trail to Río Pirre, *Stern et al.* 300 (GH, MO, UC, US). Peñas Bay near hotel, *Tyson* 5525 (FSU, MO), 5529 (MO). PANAMÁ: Isla del Rey, Archipelago de Las Perlas, *Correa* 115 (A, DUKE). Near Jenine, Río Cañita, along Pan-Am. Hwy., *Duke* 3828 (GH, MO, UC, US). Headwaters of Río Corso (off Río Pacora), ca. 500 m, *Duke* 11927 (MO). Río

Pacora, just below Río Corso, *Duke* 12013 (OS). San José Island, *Duke* 12516 (MO). Piriá-Cañas trail near Piriá, ca. 100 m, *Duke* 14325 (MO). Río Cañasas, ca. 100 m, *Duke* 14522 (MO). At beginning of El Llano-Cartí Tupile road, 12 mi above Pan-Am. Hwy., 200–500 m, *Dwyer & Nee* 11988 (MO). Ca. 2 mi S of Goofy Lake, *Dwyer & Stimson* 8066 (DUKE, UC). Pearl Archipelago, San José Island, *Erlanson* 561 (GH, NY, US); *Harlow* 2 (GH, MO, US); *Johnston* 1069 (GH, MO, US). 5 mi SW of Cerro Brewster, tributary of Río Chagres, ca. 1000 ft, *Lewis et al.* 3382 (MO). Junction of Río Pacora and Río Corso to headwaters of Río Corso, *Oliver* 2385 (MO, UC). 5 mi E of Cañita and 23 mi E of Chepo, *Tyson & Smith* 4165 (MO). SAN BLAS: Hills SE of Puerto Obaldía, *Croat* 16738 (MO). Ailigandí, *Dwyer* 6841 (MO). Above Puerto Obaldía, *Gentry* 1541 (MO).

3. ***Clibadium grandifolium*** Blake, Contr. U.S. Natl. Herb. 22: 599. 1924. TYPE: Costa Rica, Limón, Llanuras de Santa Clara, along Río Pacuare, 150 m, Apr 1896, *Smith* 6614 (US, holotype, not seen).

C. grande Blake, Contr. U.S. Natl. Herb. 22: 601. 1924. TYPE: Costa Rica, Limón, La Florida, 80 m, 18 Jun 1897, *Pittier* 11280 (GH, holotype, not seen, UC, US, photos; US, isotype).

Shrub 2–6 m tall; stems 2.5 cm diam. toward the base, glabrate to strigillose with hairs 0.3 mm long. *Leaves* broadly ovate; blades 18–32 cm long, 12–28 cm wide, acute to acuminate, the base obtuse to shortly attenuate (cordate on very large leaves), the margin serrate, the upper surface glabrate to strigillose (especially on veins) with hairs to 0.3 mm long, the lower surface moderately strigose with hairs to 0.3 mm long; petioles 5–18 cm long, to 5 mm diam., glabrate. *Inflorescence* a tightly clustered racemose panicle of 125–600 heads; peduncles 0.5 mm long. *Heads* radiate; involucre cupulate, 3–4 mm across, the bracts 8–13, ovate to obovate, 3–4 mm long, 2–2.5 mm wide, abaxially glabrate to infrequently strigillose with hairs 0.1 mm long, the upper half ciliate with hairs 0.1 mm long; paleas absent; ray florets 6–9, the corollas 2 mm long, 0.3 mm diam., the 3 lobes 0.1 mm long, the styles 2.5 mm long with branches 1.2 mm long; disc florets 7–12, the corollas 3.5–4 mm long, the throat 2.5–3 mm long and 1 mm diam., the lobes 0.6 mm long, puberulent at apex, the tube 0.3 mm diam., the anthers 2 mm long, the style 3–4 mm long, the ovary sterile, 1.5 mm long, 0.3 mm diam., villous with hairs to 1 mm long. *Achenes* 2.3 mm long, 1.8 mm diam., pubescent on the upper $\frac{1}{3}$ with hairs 0.1 mm long; pappus absent. Chromosome number unknown.

Usually *Clibadium grandifolium* is easily recognizable by its large leaves and numerous small heads clustered together. However, in juvenile specimens, the leaves are small (e.g., *Gentry* 5698) which makes *C. grandifolium* resemble *C. asperum*. The conspicuously strigose involucre bracts of the latter species, however, provide a distinguishing character. In Panama it flowers from June to September and from December to March.

Although Blake (1924) simultaneously described both *Clibadium grandifolium* and *C. grande* as distinct species, the differences emphasized by him (numbers of florets and heads) are not sufficient to warrant formal recognition.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2749 (MO, UC). Chiriquito to 5 mi S along Río Guarumo, *Lewis et al.* 2082 (MO, UC). Río Changuinola near Changuinola, *Dwyer* 5128 (MO). COCLÉ: Near El Valle de Antón, N rim, 800–1000 m, *Allen* 224 (MO, US), 1662 (GH, MO, US), 1998 (F, GH, MO, US). El Valle de Antón, floor, 600 m, *Allen* 3621 (MO). El Valle, near waterfall, *Blum et al.* 2379 (MO). 2.5 mi above El Valle on road to La Mesa, *Croat* 13372 (MO). Above El Valle, *D'Arcy & D'Arcy* 6735 (MO); *Gentry* 5698 (MO). 5 mi

N of El Valle de Antón, 1000 m, *Luteyn* 1188 DUKE). 2.8 mi NW of church in El Valle de Antón, 3100 ft, *Luteyn* 4059 (DUKE). Ca. 6 mi N of El Valle de Antón, *Luteyn & Kennedy* 1638 (DUKE). 2 mi N of El Valle, 620–660 m, *McDaniel* 8280 (US). Foot of Cerro Pílon, 2000 ft, *Porter et al.* 4651 (MO, UC). DARIÉN: Cocalita near Colombian border (Pacific side), *Dwyer* 5111 (US). VERAGUAS: 3–5 mi N of Santa Fe, 500–1000 m, *Gentry* 3034 (MO). 5 mi W of Santa Fe, 800–1200 m, *Liesner* 947 (MO).

4. ***Clibadium leiocarpum*** Steetz in Seem., Bot. Voy. Herald 152. 1853. TYPE: Panamá, Veraguas, volcano of Chiriquí, 7000 ft, Feb 1849, *Seemann* 1592 (K, holotype, not seen, GH, US, photos).

- C. schulzii* Blake, Contr. U.S. Natl. Herb. 22: 602. 1924. TYPE: Costa Rica, San José, thickets at Copey, 1800 m, Mar 1898, *Tonduz* 11915 (US, holotype, not seen; US, isotype). *C. leiocarpum* var. *strigosum* Blake, Jour. Wash. Acad. Sci. 27: 382. 1937. TYPE: Costa Rica, San José, Cerro de Piedra Blanca, above Escasú, 31 Jan 1924, *Standley* 32593 (US, holotype, not seen).

Shrub 2–4 m tall; stems 4–5 cm diam. at base, tomentose-lanate (less often villous) with hairs to 1 mm long. *Leaves* lanceolate to ovate; blades 7–19 cm long, 2–10 cm wide, acuminate, the base attenuate (less often subobtus), the margin serrate, the upper surface strigose with hairs 0.3 mm long, the lower surface tomentose (rarely strigose) with hairs to 1 mm long; petioles 1–5.5 mm long, to 2 mm diam., tomentose-lanate (rarely strigose). *Inflorescence* a racemose panicle of 30–100 heads; peduncles 0.5–1.5 mm long. *Heads* radiate; involucre cupulate, 3–7 mm across, the bracts 7–8, narrowly to broadly ovate, 3–4.5 mm long, 1.5–4 mm wide, abaxially strigose toward the apex with hairs 0.2 mm long, the margin ciliate; paleas absent; ray florets 3–5, the corollas 1.6 mm long, 0.5 mm diam., the 3 lobes each 0.1 mm long, the styles 2 mm long with branches 0.8 mm long; disc florets 11–14, the corollas 2.7–3.3 mm long, the throat 2 mm long and 1.2 mm diam., the lobes 0.5 mm long, strigillose at apex, the tube 0.3 mm diam., the anthers 1.5 mm long, the style undivided, the ovary sterile, 2 mm long, 0.2 mm diam., apically villous with hairs to 1 mm long. *Achenes* 1.3–1.7 mm long, 1 mm diam., apically with an S-shaped neck, glabrous; pappus absent. Chromosome number unknown.

The differences in pubescence of the fertile ray ovaries as well as length of the ray corollas and sterile disc ovaries, all used by Blake (1924) to separate *Clibadium schulzii* from the earlier described *C. leiocarpum*, are not sufficient to warrant formal recognition at any rank.

Blake (1937) also recognized a variety of *C. leiocarpum*, var. *strigosum*, that included plants with strigose or accumbent-hirsute stems. Variations in the degree of pubescence do prevail in *C. leiocarpum*, and representatives of var. *strigosum* are found in Panama (e.g., *Allen* 118; *Busey* 534). However, all manner of intermediates occur between these extreme states of pubescence, and the extremes show no consistent geographical separation. Furthermore, one specimen has been found (*Allen* 1341, NY) in which the vesture is strigose on one branch and tomentose-pilose on the other (attached to the former). For these reasons, var. *strigosum* is not recognized formally in this treatment.

In Panama this species flowers from December to September.

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, near "New Switzerland," 1800–2000 m, *Allen* 1341 (F, GH, MO, NY, US). Near Boquete, 4500–6500 ft, *Allen* 4653 (MO).

Quebrada Velo, near Finca Lerida, *Allen* 4679 (MO). 20 km W of Puerto Armuelles, 400–600 m, *Busey* 534 (MO). Along trail to Cerro Punta, *Croat* 10478 (MO). Near Nueva Suisa, *Croat* 13518 (MO). Monte Rey above Boquete, *Croat & Porter* 15686 (MO). Between Cerro Punta and Bajo Grande, *Croat & Porter* 16014 (MO). Above Cerro Punta, 6300 ft, *D'Arcy* 5369 (MO). Nueva Suisa, Volcán District, 5700 ft, *D'Arcy* 5420 (MO). Above Boquete, 4000 ft, *D'Arcy & D'Arcy* 6333, 6420 (both MO). Above Cerro Punta, ca. 7000 ft, *D'Arcy & D'Arcy* 6537 (MO). Río Chiriquí Viejo, opposite puebla de Cerro Punta, 7000 ft, *D'Arcy & D'Arcy* 6590 (MO). Boquete district, Bajo Chorro, 6000 ft, *Davidson* 141 (F, GH, MO). Volcán de Chiriquí, 7500 ft, *Davidson* 954 (GH, MO, US). Valley of the Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke* 9036 (MO). Cerro Horqueta, ca. 1500 m, *Duke et al.* 13642 (DUKE, MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 596 (GH, MO, UC, US). Cerro Respinga, along Boquete trail, *Gentry* 5933 (MO). 1.4 mi S of Cerro Punta, 1850 m, *Graham* 298 (GH). Ca. 7 mi N of El Hato de Volcán, *King* 5296 (US). 4.1 mi from Boquete on road to David, *Kirkbride* 94 (MO, NY). $\frac{1}{2}$ mi S of Bambito, *Lazor & Correa* 2696 (FSU, MO). Along road toward Cerro Horqueta, 1500–1600 m, *Lutelyn* 3766 (DUKE). El Boquete, 1000–1300 m, *Pittier* 3136 (GH, US). Valley of the upper Río Chiriquí Viejo, near Monte Lirio, 1300–1900 m, *Seibert* 245 (GH, MO, NY, US). Slopes of Volcán Barú, near Cerro Punta, 6000 ft, *Stern & Chambers* 80 (MO, US). E of Boquete, Palo Alto, 5000 ft, *Stern et al.* 1066 (GH, MO, UC, US), 1079 (GH, MO), 1084 (MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson* 5626 (FSU). Río Chiriquí Viejo Valley, between El Volcán and Cerro Punta, *White* 5 (MO, US). Valley of upper Río Chiriquí Viejo, *White* 64 (MO). Río Chiriquí Viejo Valley, near El Volcán, *White* 181 (GH, MO, US). Cerro Horqueta, ca. 6 km NW of Boquete, 1700–1800 m, *Wilbur et al.* 15423 (DUKE). Ca. 4 mi NW of Boquete, ca. 1350 m, *Wilbur et al.* 15512 (DUKE). Halfway between Cerro Punta and Bambito, 5600 ft, *Wilbur et al.* 10884 (DUKE). Ca. 6 km E of Cerro Punta, 2100–2400 m, *Wilbur et al.* 15160 (DUKE). Ca. 2 km W of La Garita and 3 km WNW of Cerro Punta, 2000 m, *Wilbur et al.* 15271 (DUKE). Ca. 6 mi NW of Boquete, between Bajo Quiel and Bajo Mono, ca. 1450 m, *Wilbur et al.* 12008 (DUKE). Ca. 2 mi upriver from Boquete, *Wilbur et al.* 17269 (DUKE). Between Cerro Punta and Las Nubes, *Wilbur & Teeri* 13254 (DUKE). Between Volcán de Chiriquí and Cerro Aguacate, 6500–7200 ft, *Wilbur & Teeri* 13308 (DUKE). Valley of the Río Chiriquí Viejo, E of Guadalupe, ca. 6500 ft, *Wilbur et al.* 13035 (DUKE). Ca. 4 mi NW of Boquete, 4200 ft, *Wilbur et al.* 13524 (DUKE). Near Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al.* 908 (MO, NY, US). Near Finca Lerida, 1750 m, *Woodson & Schery* 212 (GH, MO, US). Near Puerto Armuelles, 0–75 m, *Woodson & Schery* 836 (MO). COCLÉ: Near El Valle, lower Río Antón, 800–1000 m, *Allen* 118 (GH, MO, US).

5. ***Clibadium pilonicum*** Stuessy.²⁸ TYPE: Panamá, Coclé, mts. N of El Valle de Antón, 2500–3000 ft, cloud forest, 28 May 1967, *Lewis et al.* 1745 (MO, holotype).

Arching *shrub* 3–4.5 m tall; stems at least 4 mm diam., glabrate below to densely and antrorsely strigose above with hairs 0.5 mm long. *Leaves* narrowly ovate to ovate, conspicuously 3-veined from the base; blades 8–12 cm long, 2.3–5.3 cm wide, acuminate, the base obtuse (less often shortly attenuate), the margin serrulate, both surfaces strigose with hairs 0.5 mm long; petioles 1.6–4 cm long, to 1 mm diam., strigose with hairs 0.5 mm long. *Inflorescence* a corymbose (nearly cymose) panicle with 70–86 heads; peduncles 1 mm long. *Heads* radiate; involucre funnellform, 3.5–5 mm across, the bracts 7–9, the outer two bracts $\frac{2}{3}$ the length of the inner bracts, narrowly ovate, 3.3–4.7 mm long, 1.2–2.2 mm wide, abaxially strigose on upper half with hairs 0.2 mm long; paleas absent; ray florets 5, the corollas 1.9–2.2 mm long, 0.4 mm diam., the 2–4 lobes 0.2 mm long, the styles 2.9 mm long with branches each 1.6 mm long; disc florets 7–11, the

²⁸ *Clibadium pilonicum* Stuessy, sp. nov. Frutex arcuatus. Folia anguste ovata vel ovata, conspicue 3-nervata e basi. In unoquoque parte principali inflorescentiae panicula rotundata vel applanata corymbosa (prope cymosa) capitulis arcte aggregatis. Involucrum infundibuliforme. Paleae et pappus nulli.

corollas 2.9 mm long, the throat 2.2 mm long and 0.8 mm diam., the lobes 0.5 mm long, comose at apex, the tube 0.2 mm diam., the anthers 2 mm long, the style 2.5 mm long, the ovary sterile, 3.5 mm long, 0.2 mm diam., apically villous with hairs to 0.6 mm long. *Achenes* 1.8 mm long, 1.3 mm diam., apically sparingly puberulent (conspicuously pubescent on immature achenes); pappus absent at maturity (present on immature achenes as two opposing tufts of hairs 0.3 mm long). Chromosome number unknown.

In a genus so poorly known from a revisionary perspective as *Clibadium*, one hesitates to describe new species. However, after perusing nearly all original descriptions in *Clibadium*, and examining many type specimens, I have described this taxon as new.

Clibadium pilonicum differs from other species of the genus in Panama and elsewhere in having 2–4 heads tightly aggregated which are in turn secondarily clustered into tight rounded or flat-topped aggregations (*C. anceps* differs in having less tightly clustered heads). *C. pilonicum* is rare, being found only on and around the slopes of Cerro Pilón (hence the name) in Coclé Province. It flowers from May to July.

COCLÉ: Cerro Pilón near El Valle, 700–900 m, *Duke 12116* (MO, OS). Cerro Caital Caracoral, 2700–3200 ft, *Dwyer & Correa 8844* (MO). Cerro Pilón, ca. 2700 ft, *Dwyer & Lallathin 8669* (MO).

6. ***Clibadium subauriculatum*** Stuessy.²⁹ TYPE: Panamá, Bocas del Toro, Robalo Trail, N slopes of Cerro Horqueta, 6000–7000 ft, 5–7 Aug 1947, *Allen 4970* (GH, holotype; MO, isotype).

Shrub to 2.4 m tall; stems glabrous or glabrate. *Leaves* narrowly ovate; blades 8–17 cm long, 3.6–8 cm wide, acuminate, the base subauriculate, the margin serrate, the upper surface glabrous, the lower surface strigillose with hairs 0.1–0.3 mm long; petioles 2–5 mm long, winged, the wings together 5–9 mm across. *Inflorescence* a capitate panicle with 75–104 sessile heads. *Heads* radiate; involucre cupulate, 3–4 mm across, the bracts 8–9, ovate to obovate, 3–3.4 mm long, 2–2.8 mm wide, abaxially glabrous, ciliate, the hairs 0.1 mm long; receptacle convex, 1 mm diam.; paleas absent; ray florets 5, the corollas 1.8 mm long, 0.5 mm diam., the 2 lobes 0.3 mm long, the styles 2.3 mm long with branches 1.1 mm long; disc florets 7–12, the corollas 3 mm long, the throat 2.3 mm long and 1 mm diam., the lobes 0.6 mm long, the tube 0.4 mm diam., the anthers 1.7 mm long, the style 4 mm long, the ovary sterile, 1.3 mm long, 0.3 mm diam., apically villous with hairs to 0.5 mm long. *Achenes* 1.9 mm long, 1.6 mm diam., glabrous; pappus absent. Chromosome number unknown.

This new species is similar to *Clibadium glomeratum* Greenman in having tightly clustered heads, but the former differs most conspicuously in its winged petiole tapering to a subauriculate base and in the subglabrous vesture of its stems

²⁹ *Clibadium subauriculatum* Stuessy, sp. nov. Frutex. Caules glabri. Folia anguste ovata, ad apicem acuminata, basi subauriculata; petioli alati, alis 5–9 mm latitudine. Inflorescentia paniculata, glomerulis unusquisque 2–5 capitulorum, arcte fasciculorum. Involucrum cupulatum. Paleae et pappus nulli.

and peduncles. *Clibadium subauriculatum* is also rare in Panama and is found only on and around Cerro Horqueta which straddles the provinces of Bocas del Toro and Chiriquí. It flowers in July and August.

CHIRIQUÍ: Near Bajo Chorro, 1900 m, Woodson & Schery 658 (GH, MO).

7. ***Clibadium surinamense*** L., Mant. Pl. 294. 1771. TYPE: Surinam, exact locality and date unknown, *Alemand s.n.* (BM?, holotype, not seen).—FIG. 49.

C. villosum Benth., Pl. Hartw. 205. 1845. TYPE: Colombia, Bogotá, near the village of Tena, Feb–Apr 1843, *Hartweg 1139* (K, holotype, not seen, US, photo; G, isotype, not seen, F, US, photos).

C. lanceolatum Rusby, Descr. S. Amer. Pl. 150. 1920. TYPE: Colombia, Magdalena, Santa Marta Mts., 1898–1899, *Smith s.n.* (NY, holotype, US, photo).

Shrub, 1.7–4 m tall; stems 1–1.5 cm diam. at base, hispidulous to scabrous with hairs 0.1 mm long. *Leaves* lanceolate to ovate; blades 5–17.5 cm long, 1.5–10 cm wide, acute to acuminate, the base obtuse (sometimes shortly attenuate), the margin serrate, the upper surface weakly to moderately hispidulous with hairs 0.5 mm long, the lower surface strongly hispidulous with hairs 0.5 mm long, with veins conspicuously reticulate; petioles 3–25 mm long, to 1.5 mm diam., scabrous. *Inflorescence* a racemose (nearly spicate) panicle of 10–180 heads; peduncles 0.5–1 mm long. *Heads* radiate; involucre cupulate, 3–5 mm diam., the bracts 8–9, obovate, 3–5 mm long, 2–4.8 mm wide, abaxially strigose with hairs 0.1 mm long, the upper $\frac{1}{3}$ of margin ciliate; paleas absent; ray florets 3–5, the corollas 2 mm long, 0.6 mm diam., the 3–4 lobes 0.5 mm long, the styles 3 mm long with branches 1.8 mm long; disc florets 11–14, the corollas 2.5 mm long, the throat 2 mm long and 1.5 mm diam., the lobes 0.6 mm long, comose at apex, the tube 0.3 mm diam., the anthers 1.8 mm long, the style 5 mm long, the ovary sterile, 2.5 mm long, 0.3 mm diam., apically villous with hairs to 0.8 mm long. *Achenes* 2.2–2.7 mm long, 1.9–2 mm diam., pubescent on the upper $\frac{1}{3}$ with hairs 0.1 mm long; pappus absent. Chromosome number $n = 16$.

Of all the species of *Clibadium* in Panama, *C. surinamense* is the most common and has been collected in all provinces except Bocas del Toro, Los Santos, and San Blas. The most striking feature of this species is the reticulate and strongly hispidulous venation on the undersurface of the leaves. This leaf character helps distinguish *C. surinamense* from other Panamanian members of the genus. It flowers throughout the year.

Clibadium villosum, described from material collected in Colombia by Hartweg (1139), appears to be simply an excessively tomentose variation of *C. surinamense*. Four collections from Panama approach this extreme state of pubescence: *Allen 1016*, *Maxon & Valentine 6960*, *McDaniel 6909*, and *Woodson & Schery 731*. Critical revisionary studies are needed to determine if these variations might properly be recognized at the infraspecific level.

Although *C. surinamense* remains remarkably distinct throughout its range in Panama, several collections have been encountered that seem to intergrade into *C. asperum*, particularly in size of the heads and vesture on the undersurfaces of the leaves. These collections are: *Blum et al. 1745*, *Croat 12718*, *King 5255*, *Godfrey 2173*, and *Tyson 6315*, 6317. All of the collections are from the vicinity

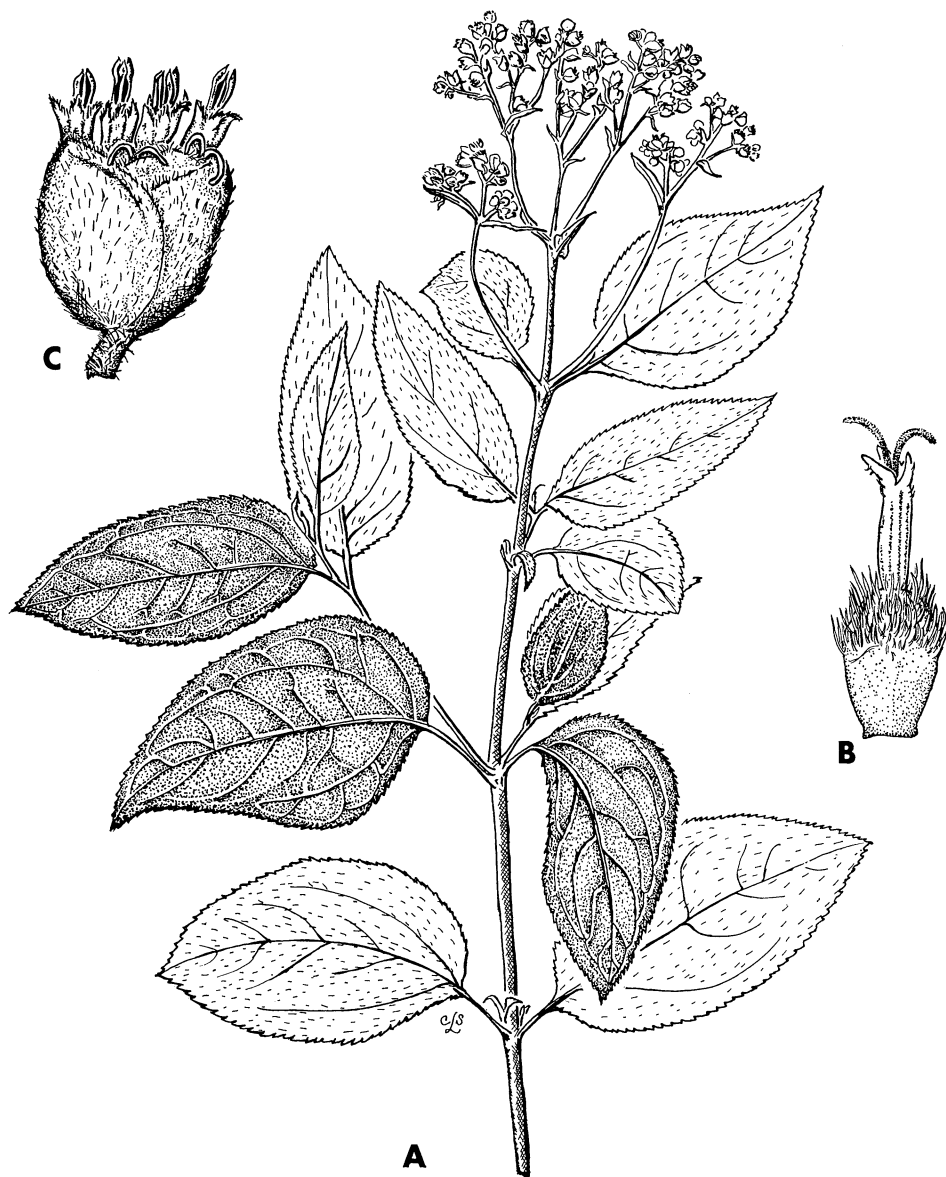


FIGURE 49. *Clibadium surinamense* L.—A. Habit ($\times \frac{1}{2}$). [After Croat 10920 (F).]—B. Outer floret ($\times 10\frac{3}{5}$).—C. Head ($\times 3\frac{1}{5}$). [After Rosario 38 (F).]

of Cerro Azul in the province of Panamá, except the *Croat* collection which comes from Barro Colorado Island in the Canal Zone. Both species are known to occur in the two localities. This suggests interspecific hybridization as a possible explanation for the morphological intermediacy.

CANAL ZONE: Barro Colorado Island, *Bailey & Bailey* 228 (GH). Pipeline Road near Gamboa, *Clewell & Tyson* 3261 (MO). Barro Colorado Island, *Croat* 6243 (MO, NY, US),

6382 (MO), 10737 (F), 12584, 12718 (both MO). Frijoles, *Croat* 6267A (F, MO, NY), 10379 (MO). Cerro Luisa, *Croat* 10781 (MO). 2 mi NW of Summit Gardens, *Croat* 10920 (F, MO). Forest across from Summit Golf Course, *Croat* 11228 (F, MO). Between Madden Dam and Summit Naval Radio Station, *Croat* 15016 (MO). Pipeline Road within 5 mi of Gamboa Gate, *D'Arcy & D'Arcy* 6006, 6194 (both MO). Behind Far Fan Beach, *D'Arcy & D'Arcy* 6090 (MO). Near Coco Solo Weather Station, *Duke* 4281 (MO). Toro Point, Ft. Sherman, *Duke* 4325 (MO). Road C-21, *Duke* 5790 (MO, UC). Gamboa, *Dwyer* 2527 (FSU). Paraíso, *Dwyer* 7149 (GH, MO), 7197 (MO). Madden Dam, *Dwyer & Elias* 7512 (DUKE, MO, UC). Cocoli to Contractor's Hill, *Dwyer & Lallathin* 8799 (MO, NY). Frijoles, *Ebinger* 96, 305 (both MO, US). Ft. San Lorenzo, *Ebinger* 463 (F, MO). Coco Solo, *Elias & Kirkbride* 1600 (UC). Albrook Research Forest Site, *Gallegos et al.* 5140 (DUKE, FSU, MO, NY, UC). Road to Corozal, *Gervais* 137 (US). Gatún Station, *Hayes* 94 (GH, NY). Between Gamboa and Darién, *Heriberto* 79 (F, GH, NY, US). Barro Colorado Island, *Hood* 977 (F); *Kenoyer* 581 (US). Ancón Hill, 100–200 m, *Killip* 12103 (GH, US). Between Frijoles and Monte Lirio, 30 m, *Killip* 12120 (NY, US). 20 mi S of Colón, *King* 5257 (UC, US). 2 mi S of back gate to Ft. Gulick, *Lazor & Blum* 5393 (FSU, MO). Monte Lirio, *Maxon* 6848 (US). Near Ft. Randolph, *Maxon & Harvey* 6505 (GH, US). Ft. San Lorenzo, *Maxon & Valentine* 7003 (US). Gamboa, *McDaniel* 5036 (FSU, MO). Empire to Mandinga, *Piper* 5534 (GH, US). Near old Ft. Lorenzo, *Piper* 5974 (US). Near Culebra, 50–290 m, *Pittier* 2228 (GH, NY, US). Mamei Hill, 20–90 m, *Pittier* 3798 (GH, US). Barro Colorado Island, *Salvoza* 839 (F, GH); *Shattuck* 301 (F, MO), 879 (MO); *Starry* 161 (MO), 201 (F, MO). Near Summit, *Standley* 25786 (MO, US). Near Ft. Randolph, *Standley* 28654 (GH, US). Frijoles, *Stimson* 5274 (DUKE, FSU, MO, NY, UC). Curundu, *Tyson* 1040 (FSU, MO). Miraflores Locks area, *Tyson* 1140 (MO, US). Chiva Chiva Trail near Miraflores Lake, *Tyson* 1411 (FSU, MO). Road from Ft. Sherman to Gatún Locks, *Tyson* 6286 (FSU, MO). Ca. 15 mi N of Gamboa, *Tyson* 6311 (FSU, MO). 10 mi N of Gamboa, *Tyson* 6312 (FSU, MO, UC). Barro Colorado Island, *Weaver & Foster* 1629 (DUKE); *Wetmore & Abbe* 66 (F, GH, MO), 180 (F, GH, MO). Ft. Kobe road, *Woodson et al.* 1408 (GH, MO, NY). CHIRIQUÍ: Near Boquete, 900 m, *Allen* 1016 (MO). 32 mi W of Santiago, *Croat* 10715 (MO). Río Majagua just N of David, *D'Arcy & D'Arcy* 6298 (MO). Ca. 2 mi above Concepción, ca. 1000 ft, *D'Arcy & D'Arcy* 6513 (MO). Tolé, ca. 1000 ft, *Dwyer & Kirkbride* 7468 (MO, UC). Río San Cristobal, 2 mi W of David, 150 ft, *Tyson* 919 (FSU, MO). Near Boquete, 1200–1500 m, *Woodson & Schery* 731 (GH, MO, US). Near Puerto Armuelles, 0–75 m, *Woodson & Schery* 836 (GH). COCLÉ: Ca. 4 mi SE of Antón, *King* 5271 (UC, US). Río Grande, *Rosario* 38 (F). Llano Bonito, N of Las Margaritas, 400–500 m, *Seibert* 519 (DUKE, GH, MO, NY). 3–6 km SE of El Valle de Antón, *Wilbur & Luteyn* 11768 (DUKE). Between Las Margaritas and El Valle, *Woodson et al.* 1743 (GH, MO, NY). COLÓN: Juan Mina Plantation, Río Chagres region above Gamboa, 25 m, *Allen* 4140 (MO). Near Sardinella, *Blum & Tyson* 487 (FSU, MO). Near Sabanita, *Croat* 11069 (MO). Isla Grande or on mainland just opposite, *D'Arcy* 4012 (MO). 1 mi N of Colón-Panamá line, *Lazor & Tyson* 2983 (FSU, MO). Between France Field (Canal Zone) and Catival, *Standley* 30344 (US). DARIÉN: Along Río Piedras, *Stern et al.* 720 (GH, MO, US). HERRERA: Between Las Minas and Pesé, ca. 600 ft, *Duke* 12315 (FSU, MO). Ca. 1 mi N of Las Minas and 14 mi S of Océ, *Wilbur et al.* 12078 (DUKE). Ca. 5 mi S of Océ, *Wilbur et al.* 12084 (DUKE). PANAMÁ: Hwy. toward Calzada Larga Caimito (Chilibre), *Bakes* 33 (GH, DUKE, MO). Just outside Canal Zone near TTC Albrook Tower, *Blum* 453 (MO). Ca. 5 mi N of Cerro Azul on road to Cerro Jefe, ca. 2400 ft, *Blum et al.* 1745 (FSU, US). 3 mi above Goofy Lake near Cerro Azul, *Croat* 11575 (MO). Panama City, *D'Arcy & D'Arcy* 6109 (MO). On way to Cerro Azul, *D'Arcy & D'Arcy* 6215 (MO). 5–6 mi E of Chervo, *Duke* 4038 (GH, MO, UC, US). Panamá Viejo, *Duke* 5725A (MO). Cerro Campana, 2700–3000 ft, *Duke* 8640 (MO, OS, US). Chilibre, *Dwyer* 1019 (GH, MO, US). Tocumen, *Dwyer* 2421 (FSU). La Campana, Cerro Campana, *Ebinger* 362 (MO, US). Road to Chervo, *Garner* 2 (DUKE, FSU). Sabana de Panamá, *Gervais* 156 (US). Cerro Azul, 2000 ft, *Godfrey* 2173 (FSU). Piña Highlands, *Hauden* 102 (MO). S slopes of Cerro Azul, *King* 5255 (UC, US). Chimán, *Lewis et al.* 3292 (MO, UC). 10 mi N of Hwy. 1, toward Cerro Jefe, *Luteyn* 1318 (DUKE). Low woods E. of Bella Vista, *Maron & Valentine* 6960 (GH, US). Cerro Campana, 2800 ft, *McDaniel* 6909 (FSU, MO). Sabana de Panamá, *Paul* 27, 540 (both US). Villa Guadalupe, *Rivas* 27 (MO, US). Cerro Azul, 2000 ft, *Tyson* 2173 (FSU, MO). Road from Cerro Azul to Cerro Jefe, ca. 2400 ft, *Tyson* 6315, 6317, 6321 (all FSU, MO). Cerro Jefe, *Tyson et al.* 4293 (FSU, MO). Road from Chervo to El Llano, *Tyson & Smith* 4122 (FSU, MO). Cerro Campana, ca. 3000 ft, *Woods & Woods s.n.* (DUKE). Near Arraiján, ca. 15 m, *Woodson et al.* 1359 (GH, MO, NY, US). VERAGUAS: San Francisco, *Dwyer* 1256 (GH). Tolé, *Dwyer & Lallathin* 8730 (MO). 15 mi N of Calobre, 644 m, *Luteyn* 1447 (DUKE).

B. Section *TRIXIDIUM*

Section *Trixidium* DC., Prodr. 5: 506. 1836. TYPE: *Clibadium erosum* DC.

Paleas present; ray florets multiseriate.

8. *Clibadium pittieri* Greenman, Proc. Amer. Acad. Arts 39: 98. 1903. TYPE: Costa Rica, Limón, La Florida, 80 m, Jul 1897, *Pittier 11290* (CR, GH, syntypes, not seen).—FIG. 50.

C. pittieri f. *phrixium* Greenman, Proc. Amer. Acad. Arts 40: 38. 1904. SYNTYPES: Costa Rica, "Buissons à Tuis," 650 m, Dec 1897, *Tonduz 11479* (CR, GH, not seen, US). "Confluent du Puerto Viejo et du Sarapiquí," Jan 1893, *Biolley 7399* (CR, GH, not seen).

Shrub 1–3.5 m tall; stems antrorsely strigose to hispidulous with hairs 0.1–1 mm long. *Leaves* narrowly ovate to ovate; blades 8–19.5 cm long, 4–10 cm wide, acuminate, the base attenuate, the margin serrate, both surfaces weakly or moderately strigose to hispidulous with hairs to 0.7 mm long; petioles 1.8–7 cm long, to 1 mm diam., strigose to hispidulous with hairs to 0.5 mm long. *Inflorescence* a corymbose panicle with 8–26 heads; peduncles 1–2 mm long. *Heads* radiate; involucre cupulate, 5–6 mm across, the bracts 6–8, narrowly ovate to ovate, 2.6–3.2 mm long, 1.3–2.1 mm wide, abaxially strigose toward the apex with hairs 0.2 mm long, ciliate; paleas subtending both ray and disc florets, lanceolate, scarious, 2–3 mm long, 0.3–0.7 mm wide, on abaxial surface strigillose toward apex with hairs 0.3 mm long; ray florets 22–26, the corollas 1 mm long, 0.3 mm diam., the 4 irregular lobes 0.3 mm long, the styles 1.7 mm long with branches 0.8 mm long; disc florets 5–10, the corollas 1.6 mm long, the throat 1 mm long, 0.6 mm diam., the lobes 0.6 mm long, weakly pubescent near apex, the tube 0.3 mm diam., the anthers 1 mm long, the style 2.7 mm long, the ovary sterile, 1.7 mm long, 0.2 mm diam., pilose (especially near apex) with hairs to 0.6 mm long. *Achenes* 2 mm long, 1.8 mm diam., pubescent on upper $\frac{1}{4}$ with hairs 0.1 mm long; pappus absent. Chromosome number unknown.

Within *Clibadium pittieri*, two different types of pubescence are found on the young stems and peduncles. In some plants, the vesture is strigose (*Duke & Elias 13778*), and in others it is hispidulous (*Wilbur & Teeri 13423*). Despite this obvious difference, the populations of each type are not recognized as varieties here because no geographic separation prevails and because one collection (*Lewis et al. 975*) is clearly intermediate in these pubescence features. One could recognize these differences by describing and naming formas (as Greenman did in recognizing forma *phrixium* for the plants with hispidulous vesture), but I do not subscribe to this policy. In Panama this species flowers in all months except June to August.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 283* (F, US). 10–15 mi S from mouth of Changuinola River, *Lewis et al. 975* (GH, MO, UC, US). Old Bank Island, near Chiriquí Lagoon, *von Wedel 2161* (MO). CANAL ZONE: Ca. 8.5 mi NW of Gamboa, *Wilbur & Teeri 13423* (DUKE). COLÓN: Near Guasimo on Río Miguel de la Borda, *Croat 10005* (MO). Santa Rita Ridge, *Porter et al. 4785* (MO). DARIÉN: Camp Summit, *Blackwell et al. 3667* (MO). Cerro Pirre, *Bristan 538* (MO). Near Boca Quebrada Venado, Río Tuqueza, *Bristan 1110* (OS). Cerro Pirre, *Duke 6088* (MO). Camp Summit, ca. 1200 ft, *Duke 15487* (OS). Cerro Pirre, 2500–4500 ft, *Duke & Elias 13778* (MO). Camp Summit, adjacent to Darién-San

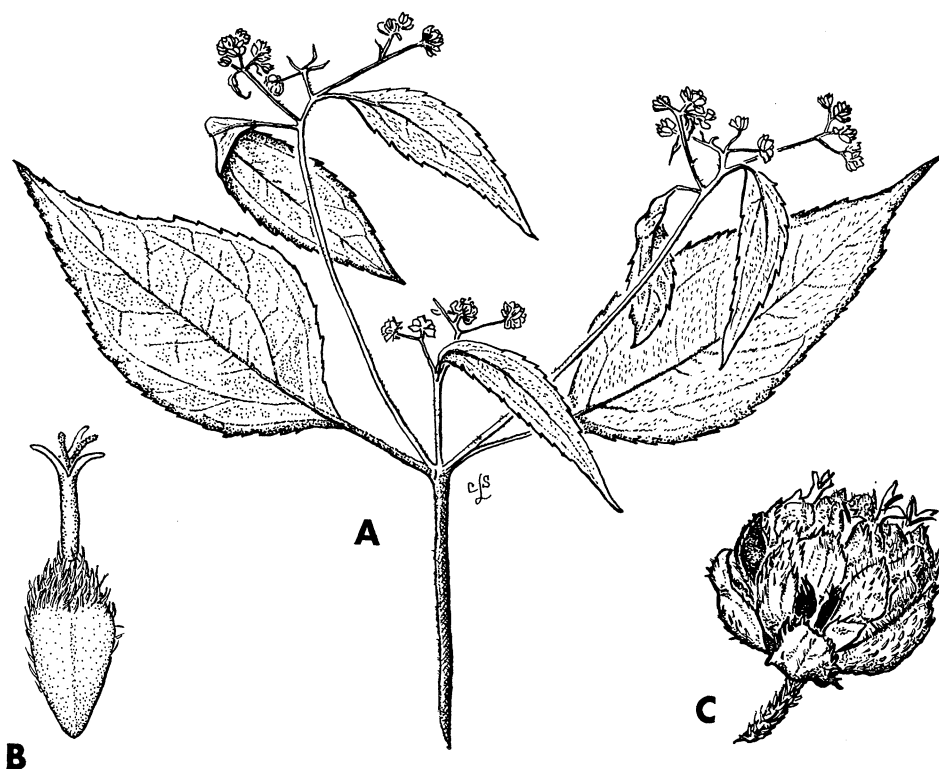


FIGURE 50. *Clibadium pittieri* Greenman—A. Habit ($\times \frac{3}{10}$).—B. Outer floret ($\times 11\frac{1}{10}$).—C. Head ($\times 5\frac{9}{10}$). [After Lewis *et al.* 3434 (MO).]

Blas border, 1000–1200 ft, *Oliver et al.* 3667 (MO). PANAMÁ: 5 km NE of Altos de Pacora, *Busey* 825 (MO). 3 mi above Interam. Hwy. on road to Cerro Campana, *Croat* 12070 (MO). Cerro Campana along trail to Summit, *Croat* 17175 (MO). Headwaters of Río Corso (off Río Pacora), ca. 500 m, *Duke* 11918 (MO, OS). Cerro Jefe, 3100 ft, *Dwyer et al.* 9496 (MO, NY). 5 mi SW of Cerro Brewster, ca. 1000 ft, *Lewis et al.* 3434 (MO). E slope Cerro Jefe, 2700 ft, *Tyson* 3422 (MO). VERAGUAS: 5 mi NW of Santa Fe, 700–1200 m, *Croat* 23190 (MO).

50. ICHTHYOTHERE³⁰

Ichthyothere Mart. in Buchn., *Repert. Pharm.* 35: 195. 1830. TYPE: *I. cunabi* Mart.

Herbs, subshrubs or shrubs; stems glabrous, scabrous or hirsute. *Leaves* opposite, sessile, or shortly petiolate, entire to subdentate. *Inflorescence* a crowded, terminal, small cymose panicle. *Heads* inconspicuously radiate, small, sessile or short-peduncled; involucre disciform, ovoid, or globose, the bracts bi- to multi-seriate, small, the inner bracts subtending and slightly adhering to ray achenes; receptacle oblong or linear; paleas broad, imbricate, subtending the disc florets; ray florets few, fertile, the corollas tubular, yellow to white, the 3–4 lobes small, the abaxial side often densely pilose in a ring, the styles bifid; disc florets perfect

³⁰ Generic description adapted from Bentham & Hooker (1873: vol. 2: 346).

but sterile, the corollas tubular, yellow to white, the lobes 5, the anthers 5, the style undivided, the ovary filiform, sterile. *Achenes* obovoid, thick, radially compressed, adaxially subplanar, smooth or costate, glabrous; pappus absent. Chromosome number $n = \text{ca. } 33$.

A genus of approximately 10 species, *Ichthyothere* is found principally in the South American tropics. At least one of the species, *I. terminalis* (Spreng.) Malme, is used as a fish poison by natives in the lower Amazon.

1. *Ichthyothere scandens* Blake, Jour. Wash. Acad. Sci. 11: 301, fig. 1. 1921. TYPE: Colombia, Tolima, in forest at Libano, 1100–1300 m, 26–29 Dec 1917, Pennell 3430 (US, holotype, not seen; NY, isotype, not seen).—FIG. 51.

Slender *shrub* 1 m tall; stems at least 5 mm diam., glabrate below. *Leaves* narrowly ovate to ovate; blades 5.5–22 cm long, 2–10 cm wide, acuminate, the base attenuate, the margin denticulate, both surfaces glabrate, strigillose when young; petioles 3–50 mm long, 1 mm diam., glabrate. *Inflorescence* a cymose panicle with 10–30 heads; peduncles 1–5 mm long, becoming strigillose. *Heads* radiate; involucre cupulate, 4–5.5 mm diam., biseriate, the outer bracts 4–6, narrowly ovate to ovate, 1–1.2 mm long, 0.6–1 mm wide, abaxially glabrate, ciliate toward the apex, the inner bracts 2, conduplicate around the ray florets, obovate, glabrate, to 6 mm long and 3 mm wide, the apex rounded; paleas scarious, obovate toward the outside of the head, becoming oblanceolate within, 2–2.8 mm long, 1–2 mm wide; ray florets 2, the corollas 1.3 mm long, 0.3 mm diam., pilose on abaxial side, the styles with branches 0.8 mm long; disc florets ca. 10, the corollas yellow, 2 mm long, the throat 1 mm long and 0.7 mm diam., the lobes 0.4 mm long, the tube 0.2 mm diam., the anthers light brown, 1 mm long, the style filiform, 2 mm long with a 5-lobed nectary at the base, the ovary 0.5 mm long, 0.2 mm diam. *Achenes* with up to 10 longitudinal ridges, 4 mm long, 3 mm wide; pappus absent. Chromosome number unknown.

In Panama, *Ichthyothere scandens* can easily be distinguished from species of the related genus, *Clibadium*, by the former's few-headed inflorescence and markedly biseriate involucre. In Panama it has been collected in flower from December to March but in other areas it flowers throughout the year.

DARIÉN: Summit of Cerro Pirre, 1000–1400 m, Gentry & Clewell 6977 (MO). Crest, Cana-Cuasi Trail, 5500 ft, Terry & Terry 1601 (F, MO).

51. MELAMPODIUM

Melampodium L., Sp. Pl. 921. 1753; Gen. Pl., ed. 5. 392. 1754. TYPE: *M. americanum* L.

Annual *herbs* to perennial *subshrubs*; stems decumbent to erect, terete to finely striate, dichotomously branched. *Leaves* opposite, decussate, linear to ovate-rhombic, acuminate to obtuse, the base attenuate to auriculate-connate, the upper surfaces glabrous to pilose, the lower surfaces glabrous to sericeous, the margin entire to toothed. *Inflorescence* of solitary heads arising from the middle

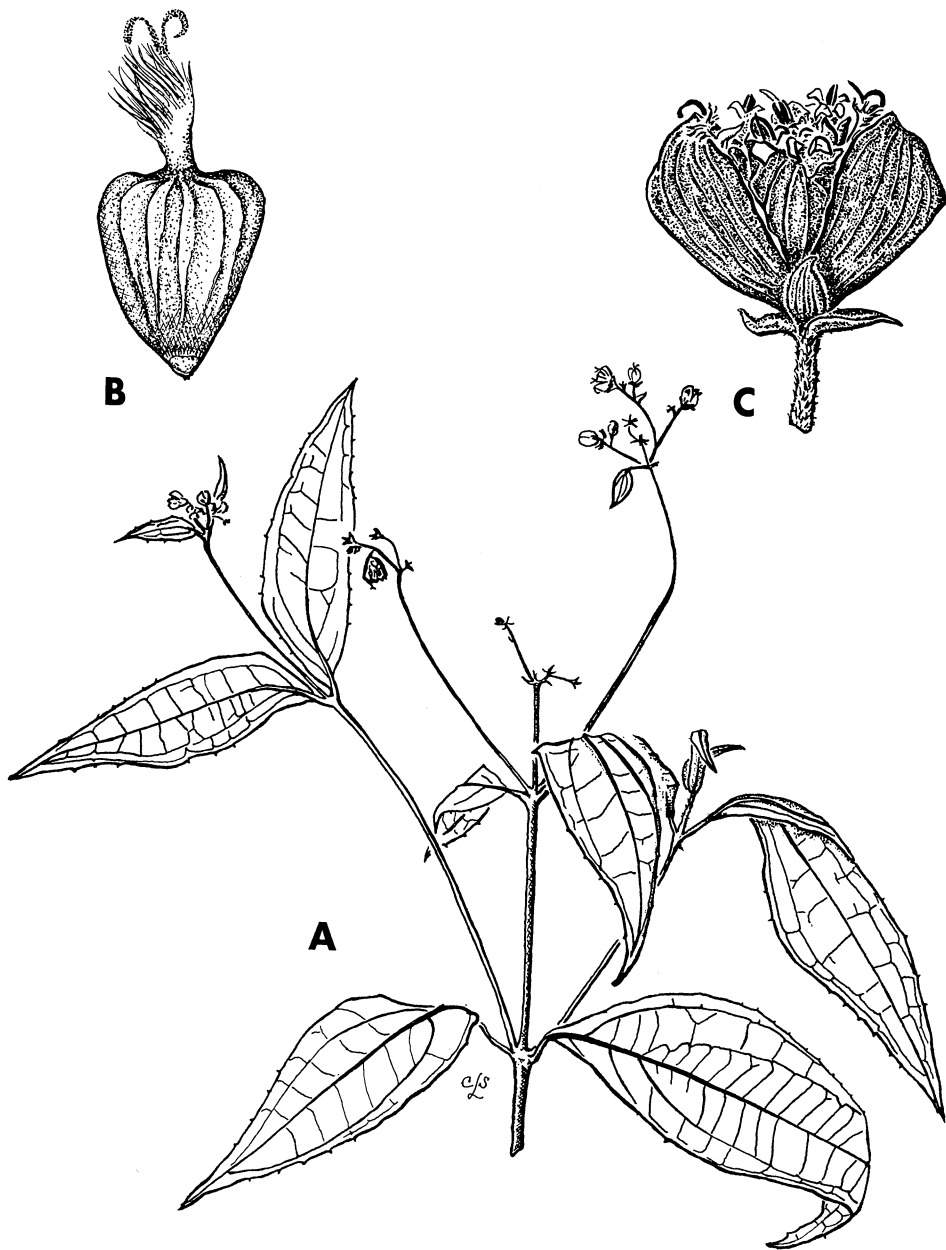


FIGURE 51. *Ichthyothere scandens* Blake.—A. Habit ($\times \frac{3}{8}$).—B. Outer floret ($\times 6$). [After Gentry & Clewell 6977 (MO).]—C. Head ($\times 6$). [After Raven 21868, Costa Rica (F).]

and upper dichotomies; peduncles very short and stout to long and filiform. *Heads* radiate; involucre biseriate, the outer involucre spreading to cupulate, the bracts 2–5, subequal, the margins entire, separate to connate more than $\frac{2}{3}$ their length, the adaxial surface glabrous, the inner involucre bracts each enclosing a single

ray achene (each unit termed an "involucral fruit"), often extending upward into a hood or other apical appendage; receptacle paleaceous, convex, sometimes elevated on a short cylindrical stalk 2–3 mm above the base of the outer involucre; paleas scarious, conduplicate around disc corollas; ray florets fertile, 3–13, the ligules varying shades of yellow or cream-white, bi- or tri-dentate, the tube obsolete or very short, the style branches filiform, flattened, obtuse at the apex; disc florets perfect, sterile, 3–110, the corollas yellow-green to yellow-orange, regular, 5-lobed, the throat salverform-funnelform, the anthers brown, the style linear-capillaceous, unbranched, the ovary abortive, capped by a disc; pappus absent. *Fruit* an "involucral fruit" consisting of an achene enclosed by an adnate involucral bract, the achenes asymmetrically obovoid and laterally compressed; pappus absent. Chromosome numbers $n = 9, 10, 11, 12, 18, 20, 23, 25 \pm 1, 27, 30$, and 33.

This is a genus of 37 species distributed primarily in Mexico and Central America. The most important morphological feature distinguishing *Melampodium* from other genera of the Heliantheae is the fusion of the ray achenes to the inner involucral bracts, which are often ribbed and/or sculptured variously, but never spiny (as in *Acanthospermum*).

Literature:

Stuessy, T. F. 1972. Revision of the genus *Melampodium* (Compositae: Heliantheae). *Rhodora* 74: 1–70, 161–219.

- a. Outer involucral bracts 3 (rarely 4 or 5); peduncles stipitate-glandular (B. sect. *Zarabellia*) 3. *M. paniculatum*
- aa. Outer involucral bracts 5; peduncles glabrous to lightly tomentose (A. sect. *Serratura*).
 - b. Ligules 3.5–7 mm long 2. *M. divaricatum*
 - bb. Ligules less than 3 mm long 1. *M. costaricense*

A. Section SERRATURA

Section **Serratura** Stuessy, *Rhodora* 74: 175. 1972. TYPE: *Melampodium divaricatum* (L. C. Rich.) DC.

Tap-rooted *annuals*. *Leaves* rhombic or deltoid (rarely narrowly ovate), serrate (rarely entire), petiolate. *Heads* with outer involucre cupulate or sometimes spreading, the bracts 5, the margins herbaceous; ovaries of the disc florets ovoid, less than 0.7 mm long, rudimentary. Involucral *fruits* apically nearly smooth or moderately sculptured and without a hood, or with a flattened abaxial awn. Chromosome base number $x = 12$.

1. ***Melampodium costaricense*** Stuessy, *Brittonia* 22: 118, fig. 7. 1970. TYPE: Costa Rica, Alajuela, Naranjo, Cerro del Espiritu Santo, 1200 m, 11 Jul 1941, *Smith* 2922 (F, holotype).

Annual *herb* 15–35 cm tall; stems erect, the lateral stems often decumbent, 0.8–3.5 mm diam., glabrous to tomentose with hairs 0.3 mm long. *Leaves* ovate-rhombic (youngest leaves approaching lanceolate), 1.5–6.5 cm long, 1.5–3.5 cm wide, acuminate to obtuse, the base obtuse-attenuate, the upper surface

infrequently strigose with hairs 0.6 mm long, the lower surface glabrous, the margin obscurely to coarsely serrate; petioles 4–23 mm long. *Inflorescence* of solitary heads; peduncles 0.5–5.1 cm long. *Heads* radiate, 4–5 mm tall, 5–8 mm across; outer involucre cupulate, 5–8 mm diam., the bracts 5, connate $\frac{1}{4}$ – $\frac{1}{3}$ of their length, imbricate, ovate-orbiculate, 3–5 mm long, 2–3.6 mm wide, obtuse, the abaxial surface glabrous, the margin herbaceous, ciliate with hairs 0.3 mm long; paleas oblong-elliptic, 2 mm long, 0.7 mm wide, apically yellow, the margin erose, the midrib weak, glabrous; ray florets 5–8, the ligules yellow, elliptic, 1–1.5 mm long, 0.5–1 mm wide; disc florets 15–25, the corollas yellow, 1.1 mm diam., the throat and tube 0.5 mm long. *Fruits* 2.9–3.1 mm long, the sides with diagonal ridges and enlarged margins. Chromosome number $n = 25 \pm 1$.

Melampodium costaricense appears very similar to *M. divaricatum* in nearly all respects except that the latter species has much larger heads (8–15 mm diam.), longer ligules (3.5–7 mm long), and a chromosome number at the diploid level ($n = 12$). It flowers throughout the year.

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 557 (US). CHIRIQUÍ: 1 mi E of Cañas Gordas, *Croat* 22320 (MO). Boquete lookout, 4000 ft, *D'Arcy* & *D'Arcy* 6326 (MO). Above Boquete 4000 ft, *D'Arcy* & *D'Arcy* 6340 (MO). 12 mi N of Concepción, *D'Arcy* & *D'Arcy* 6516 (MO). 25 mi N of Concepción, *King* 5290 (UC, US). Vic. of Boquete, *Lewis et al.* 242 (MO), 425 (GH); *Woodson* & *Schery* 724 (GH, MO).

2. *Melampodium divaricatum* (L. C. Rich. in Pers.) DC., Prodr. 5: 520. 1836.—FIG. 52.

Dysodium divaricatum L. C. Rich. in Pers., Syn. Pl. 2: 489, 1807, not Hort. ex DC. 1836.

TYPE: Colombia, "Gairam, prope St. Martham," 1785–1789, *Richard s.n.* (P, lectotype). *Melampodium paludosum* H.B.K., Nov. Gen. Sp. Pl. 4: 237, ed. qu. 1820. TYPE: Panamá, "in humidis prope ostia fluminis sinu, juxta litora Dariensis," Mar 1801, *Humboldt* & *Bonpland* 1421 (P, holotype, not seen; P, isotype).

M. panamense Klatt, Bot. Jahrb. Syst. 8: 42. 1887. TYPE: Panamá, "ad margines silvarum," 20 Aug 1880, *Lehmann* 69 (GH, holotype; G, K, US, isotypes; photo of K isotype, UC).

Annual *herbs* 15–100 cm tall; stems erect, the lateral stems sometimes decumbent and rooting at the nodes, 1–7 mm diam., glabrous to pubescent with hairs to 0.7 mm long. *Leaves* ovate to rhombic (younger leaves approaching lanceolate), 1.8–14 cm long, 0.6–8.2 cm wide, acuminate to obtuse, the base attenuate (rarely obtuse to cordate), both surfaces infrequently strigillose with hairs 0.2 mm long, the margin entire to coarsely dentate-crenate; petioles 2–25 mm long. *Inflorescence* of solitary heads; peduncles 1.5–9 cm long. *Heads* radiate, 5–8 mm tall, 8–15 mm across; outer involucre cupulate, 6–10 mm diam., the bracts 5, connate $\frac{1}{2}$ – $\frac{1}{4}$ their length, imbricate, ovate-orbiculate, 3.5–6 mm long, 3–5 mm wide, obtuse, the abaxial surface glabrous to tomentose near peduncle, the margin herbaceous, tomentose near the base; paleas obovate, 2.5 mm long, 0.9 mm wide, apically yellow-orange, the margin dentate-erose, the midrib weak, glabrous; ray florets 8–13, the ligules yellow-orange, oblong-elliptic, 3.5–7 mm long, 1.6–3 mm wide; disc florets 40–70, the corollas yellow-orange, 2 mm diam., the throat 1 mm, the tube 0.5 mm long. *Fruits* 2.8–4 mm long, the sides with diagonal striations and enlarged margins. Chromosome number $n = 12$.

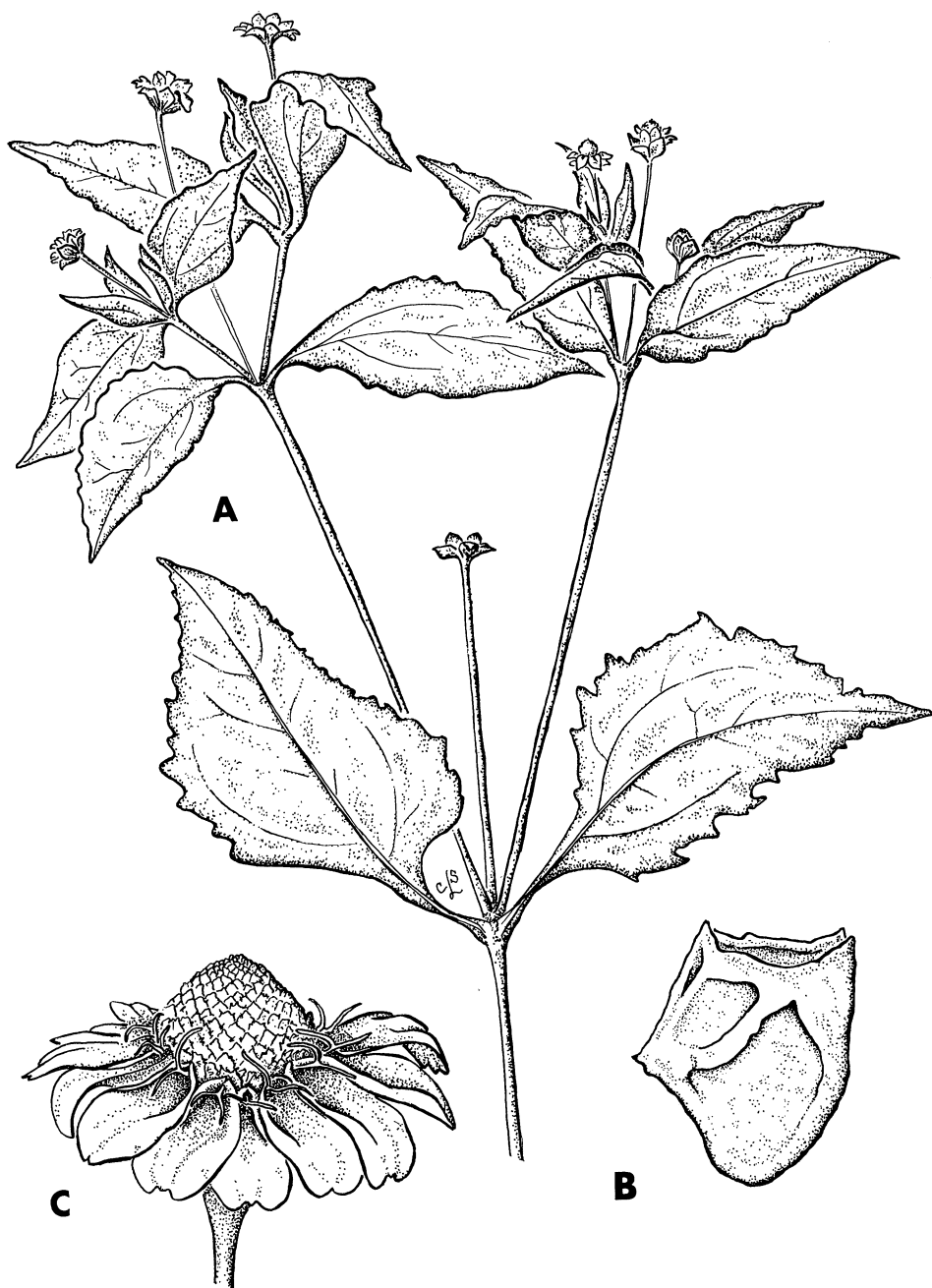


FIGURE 52. *Melampodium divaricatum* (L. C. Rich.) DC.—A. Habit ($\times \frac{3}{8}$).—B. Fruit, an achene fused with an enveloping involucre ($\times 11\frac{3}{10}$). [After Stimson 5236 (MO).]—C. Head ($\times 4\frac{1}{2}$). [After Stimson 5236 (GH).]

Of all the species of *Melampodium*, *M. divaricatum* is the most widely spread, ranging abundantly throughout Mexico and Central America and even into Colombia and Brazil of South America. The ability of the seeds to germinate immediately upon dispersal, the wide ecological tolerance of the mature plants, and the ability of the stems to root adventitiously at the nodes are all factors contributing to the weedy nature of this species. This weediness is accompanied by considerable morphological variation and plasticity, especially in the height of the plants and in the size and shape of the leaves. It flowers throughout the year.

BOCAS DEL TORO: Along runway at Bocas, *Lazor et al.* 2341 (FSU). CANAL ZONE: Ca. 1 mi from Gailla, *Blum* 467 (FSU, MO). Vic. of Miraflores power plant, *Blum* 544 (MO). Juan Mina, *Blum & Dwyer* 2683 (FSU, MO). Vic. of Monkey Hill, *Cowell* 27 (NY). Barro Colorado Island, *Croat* 4075 (MO), 4180 (DUKE, MO, NY), 5992, 6939 (both MO). Madden Forest, *Croat* 8945 (MO). Between Madden Dam and Boy Scout Road, *Croat* 8977 (MO). Pipeline Road within 5 mi of Gamboa Gate, *D'Arcy & D'Arcy* 6002, 6193 (both MO). Ft. Kobbe, *Duke* 3961 (GH, US). Navy Corrosion Lab, *Duke* 4436 (MO). Contractor's Hill, *Dwyer & Lallathin* 8804 (MO). Frijoles, *Ebinger* 76 (MO, US). Barro Colorado Island, *Ebinger* 142 (MO). Ancón, *Greenman & Greenman* 5002 (MO), 5043 (GH, MO), 5050 (MO). Barro Colorado Island, *Hayden* 36 (MO). Gatún, *Heriberto* 46 (US). Barro Colorado Island, *Kenoyer* 594 (US). Ancón Hill, *Killip* 3025 (NY, in part). Vic. of Frijoles, *King* 5226 (UC, US). Barro Colorado Island, *Luteyn* 789 (DUKE). 2 mi from front gate to Ft. Sherman, *Lazor* 5379 (MO). Between Gatún and Piña, *Liesner* 1330 (MO). Balboa, *MacBride & Featherstone* 34 (GH, US). Monte Lirio, *Maxon* 6852 (GH, US). Chiva Chiva Trail, 2 mi above Red Tank, *Maxon & Harvey* 6583 (GH, US). Ft. San Lorenzo, *Maxon & Valentine* 7015 (US). Balboa, *McMillan s.n.* (GH). Vic. of Corozal, *Piper* 5295 (GH, US). Pedro Miguel, *Piper* 5492 (US). Río Grande, near Culebra, 50–100 m, *Pittier* 2106 (US). Around Gamboa, 40–80 m, *Pittier* 3695 (GH, US). Between Corozal and Ancón, 10–30 m, *Pittier* 6740 (US). Barro Colorado Island, *Shattuck* 175 (GH). Balboa, *Standley* 25658 (US). Near Gatún, *Standley* 27278 (US). Near Summit, *Standley* 29534 (US). Vic. of Summit, *Standley* 30065 (US). Vic. of Ft. Sherman, *Standley* 31225 (US). Miraflores Locks, *Stern et al.* 74 (MO). K-9 road in Canal Zone at bridge, *Stern et al.* 978 (GH, MO, US). Near Miraflores Locks, *Stimson* 5236 (GH, MO, NY). Curundu, *Tyson* 1088, 1303 (both FSU, MO), 4192 (MO). Albrook Air Force Base, *Tyson* 1102 (MO). Gatún RR station, *Tyson* 3511 (FSU). 5 mi N of Cocoli, *Tyson* 3875 (FSU, MO). Gamboa, *Tyson* 6259 (DUKE, FSU, UC). Near Summit Golf Club, *Tyson* 6621 (FSU, MO). Frijoles, *Woodworth & Vestal* 725 (GH, MO). COCLÉ: El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2602 (MO, UC). DARIÉN: Trail between Pinogana and Yavisa, ca. 15 m, *Allen* 241 (GH, MO, NY, US). Río Chico, *Burch et al.* 1101 (GH, MO, NY, UC, US). Pucro to Río Pucro, *Duke* 5373 (MO). Manené, *Kirkbride & Bristan* 1601 (MO, NY, US). LOS SANTOS: 6 mi S of Las Tablas, *Croat* 9720 (MO). Ca. 5 mi S of Las Tablas, *Dwyer* 1226 (GH, MO). PANAMÁ: Along Río Juan Díaz above Juan Díaz, ca. 30 m, *Allen* 937 (MO). 5–6 mi E of Chepo, *Duke* 4039 (A, MO). San José Island, *Erlanson* 365 (GH, NY, US), 500, 594 (both GH, US). El Llano, *Gentry* 2646 (MO). Cerro Jefe, ca. 1000 m, *Gentry* 6759 (MO). Sabanas near Chepo, 30 m, *Hunter & Allen* 64 (MO). Balboa Heights, *Killip* 3025 (US) in part. 2–3 mi S of Goofy Lake, 2000–2200 ft, *Lewis et al.* 280 (GH, MO, US). Sabana de Juan Corso, near Chepo, 60–80 m, *Pittier* 4519 (US). Vista del Mar, *Porterfield s.n.* (NY). Arraiján, *Porterfield s.n.* (NY). Cerro Sylvestre, *Reece s.n.* (MO). Carretera Transisthmica several mi N of Chilibre, *Stimson* 5074 (GH, MO). Near Arraiján, ca. 15 m, *Woodson et al.* 1370 (GH, MO, NY, US).

B. Section ZARABELLIA

Section *Zarabellia* (Cass.) DC., Prodr. 5: 519. 1836.

Zarabellia Cass., Dict. Sci. Nat. 59: 240. 1829. TYPE: *Melampodium longifolium* Cerv. ex Cav.

Tap-rooted annuals. Leaves rhombic to deltoid (rarely narrowly ovate), entire to obscurely serrate, sessile or shortly petiolate. Heads with outer involucre usually cupulate or less often spreading, the bracts 3–5, the margins herbaceous; ovaries of the disc florets ovoid, less than 0.7 mm long, rudimentary. Involucral

fruits apically nearly smooth or moderately sculptured, or sometimes with an abaxial protuberance. Chromosome base number $x = 9$.

3. **Melampodium paniculatum** Gardn., London Jour. Bot. 7: 287. 1848. TYPE: Brazil, Goias, near Arraias, Apr 1840, *Gardner 3844* (K, holotype; F, G, NY, P, W, isotypes).

Annual *herbs*, 17–50 cm tall; stems erect, 1–3 mm diam., hispid and stipitate-glandular with hairs 0.1–1 mm long. *Leaves* ovate-rhombic (younger leaves approaching lanceolate), 1.4–5.5 cm long, 0.5–3.5 cm wide, acute to acuminate, the base attenuate, sometimes dilated almost to subauriculate, both surfaces strigose with hairs 0.3–1 mm long, the margin entire to irregularly serrate-crenate; sessile or with petioles to 5 mm long. *Inflorescence* of solitary heads; peduncles 1.4–4.2 cm long. *Heads* radiate, 2.2–4 mm tall, 3–5 mm across; outer involucre cupulate, 4–7.5 mm diam., the bracts 3, separate, ovate, 1.8–4 mm long, 1–3 mm wide, acute-acuminate, the abaxial surface strigose and stipitate-glandular with hairs 0.1–0.8 mm long, the margin herbaceous; paleas elliptical, 1.3 mm long, 0.7 mm wide, apically yellow-orange, the margin laciniate, the midrib weak, glabrous; ray florets 3–6, the ligules yellow, ovate, 1–2 mm long, 1–2 mm wide; disc florets 10–15, the corollas yellow, 1.1 mm diam., the throat and tube each 0.8 mm long. *Fruits* 2–2.8 mm long, the sides with longitudinal ribs and striations. Chromosome numbers $n = 18$ and 27.

Melampodium paniculatum is known abundantly from Costa Rica, but from only one collection in Panama. Because of the presence of this species in Costa Rica as well as in Honduras, El Salvador, Guatemala, Colombia, and Brazil, one is tempted to believe that it will some day prove to be a common element of the Panamanian flora.

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White & White 111* (MO).

52. POLYMNIA³¹

Polymnia L., Sp. Pl. 926. 1753; Gen. Pl., ed. 5. 396. 1754. TYPE: *P. canadensis* L.

Erect, perennial *herbs* to *trees* more than 12 m tall; stems terete, angular or canaliculate, to 20 cm diam., the bark on large stems becoming rough. *Leaves* opposite (upper leaves sometimes subopposite); blades entire to deeply lobed, pinnately or palmately veined; sessile or petiolate, the petioles sometimes winged. *Inflorescence* of one to many heads. *Heads* radiate; involucre with bracts usually 4–6 in 1–2 series, the innermost bracts concave and at maturity partially enclosing the ray achenes, acuminate; receptacle flat or somewhat to decidedly convex; paleas usually chartaceous or infrequently of firmer texture and subulate, with or without prominent veins; ray florets in 1 or rarely 2 series, fertile, the corollas 2–3-lobed or entire, yellow, white or orange-red; disc florets perfect and sterile, the corollas yellow or sometimes purplish (when dry), the ovary sterile. *Achenes* brown, purplish-black or black, obovoid or spherical and slightly flattened laterally, sometimes 3–5-angled, the angles infrequently winged, to 7 mm long;

³¹ Generic description adapted from Wells (1965).

pappus absent. Chromosome numbers $n = 14, 15, 16, 17$, ca. 20, over 25, ca. 29, 30, 33 ± 1 fragment.

This is a genus of 20 species distributed over both North and South America (Guianas excepted) in generally temperate regions. *Polymnia* can be distinguished from other genera of the Melampodiinae by its large, black fruits.

Literature:

Wells, J. R. 1965. A taxonomic study of *Polymnia* (Compositae). *Brittonia* 17: 144–159.

1. ***Polymnia maculata*** Cav., Icon. Descr. Pl. 3: 14. *tab.* 227. 1794. TYPE: “Nova-Hispania,” flowering in Dec 1793 in Roy. Bot. Gard. Madrid (MA, holotype, not seen).

1a. ***Polymnia maculata*** Cav. var. ***maculata***.—FIG. 53.

Perennial *herbs* 2.5–5 m tall; stems erect, more than 1 cm diam., glabrate below to moderately pilose above, especially on peduncles, with hairs to 1 mm long. *Leaves* ovate to deltoid, 9–45 cm long, 4–25 cm wide, attenuate, the base auriculate (rarely obtuse), the upper surface strigose with hairs 0.1–0.2 mm long, the undersurface strigose to tomentose with hairs 0.1–0.2 mm long, the margin serrate to deeply lobed or divided; sessile or with winged petioles to 14 cm long and 4 cm wide. *Inflorescence* of corymbiform cymose clusters; peduncles 2–5 cm long. *Heads* radiate, 8–11 mm tall, 1.5–2 cm across; involucre spreading, 2–3.2 cm diam., the outer bracts 5, uniseriate, separate, imbricate, narrowly ovate to ovate, 8–13 mm long, 7–11 mm wide, acute, the abaxial surface subglabrous to strigillose near the apex, ciliate with hairs 0.4 mm long, the inner bracts uniseriate, lanceolate, 4 mm long, 2 mm wide, the abaxial surface densely pilose; paleas lanceolate, 3–4 mm long, 0.4 mm wide, acuminate, the abaxial surface pilose; ray florets 8–12, the ligules yellow, elliptic, 10–19 mm long, 3–5 mm wide, the tube 1 mm long, pilose with hairs to 1 mm long; disc florets over 100, the corollas yellow, 1 mm diam., the throat 3 mm long, the tube 0.5 mm long, pilose, the anthers dark brown, the ovary sterile, 1 mm long. *Achenes* ovoid, black, 4–5 mm long, 3–5 mm diam., glabrous; pappus absent. Chromosome numbers $n = 16, 17$.

Three varieties have been recognized within *P. maculata* by Wells (1965). Neither of the other two taxa is known to occur in Panama, and both differ from var. *maculata* in conditions of vestiture. Variety *glabricaulis* Blake is more glabrous throughout, and is known only from Tamaulipas, Mexico. Variety *adenotricha* Blake is more stipitate-glandular on the stems and peduncles and extends from central Mexico to Costa Rica. This species flowers primarily from June to August but occasionally the rest of the year.

CHIRIQUÍ: Ca. 1 mi SW of Boquete, 4000 ft, *Allen* 4726 (GH, MO). Cerro Punta, ca. 7000 ft, *Blum et al.* 2438 (FSU, MO). Boquete, *D'Arcy & D'Arcy* 6505 (MO). Above Cerro Punta on slope of Cerro Respinga, 8000 ft, *D'Arcy & D'Arcy* 6529 (MO). Volcán de Chiriquí, 8500 ft, *Davidson* 978 (F, GH). Boquete, 6000 ft, *Ebinger* 718 (F, MO). Ca. 8 mi W of David, *King* 5285 (UC). Ca. 7 mi N of El Hato del Volcán, *King* 5301 (UC). Ca. 1 mi S of Boquete, *King* 5317 (UC). Cerro Punta, *Lazor & Correa* A. 2823 (FSU). Boquete to 3 mi

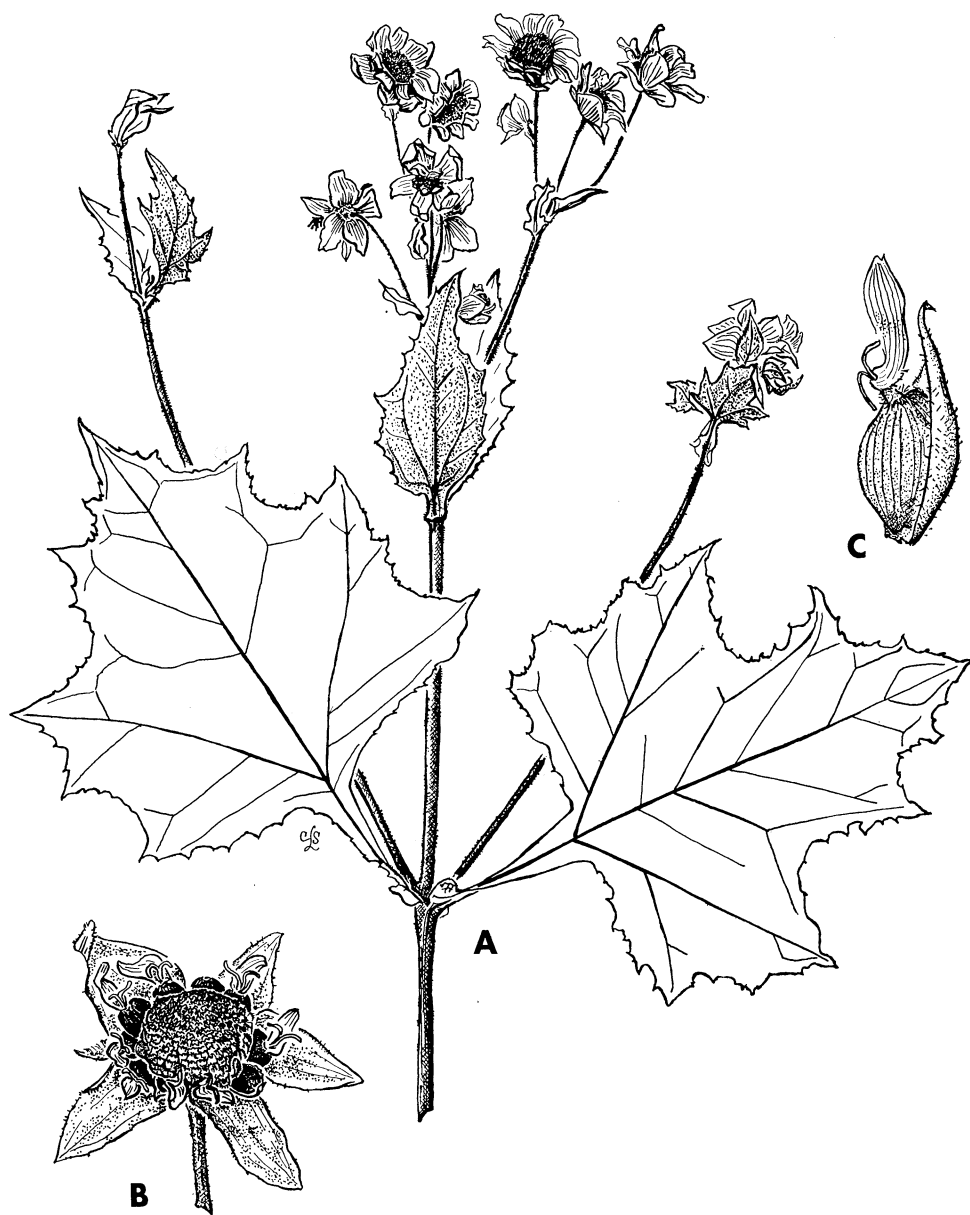


FIGURE 53. *Polymnia maculata* Cav. var. *maculata*—A. Habit ($\times \frac{1}{2}$). [After Allen 4726 (GH).]—B. Head ($\times 1\frac{3}{10}$).—C. Outer floret with subtending involucrel bract ($\times 3\frac{1}{2}$). [After D'Arcy & D'Arcy 6529 (MO).]

N, 3300–4200 ft, *Lewis et al.* 633 (GH, MO, UC). Valley of the upper Río Chiriquí Viejo, near Monte Lirio, 1300–1900 m, *Seibert* 292 (MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson* 5663 (FSU, MO). 2 mi S of Cerro Punta, 5600 ft, *Tyson* 5943 (UC). Cerro Punta, ca. 6000 ft, *Tyson* 6353 (FSU, UC), 6381 (FSU). HERRERA: $\frac{1}{2}$ mi N of Macaracas on Río La Villa, *Tyson et al.* 3135 (FSU, MO). LOS SANTOS: Los Toretos, *Dwyer* 2419 (FSU, GH, MO).

53. UNXIA

Unxia L. f., Suppl. Pl. 56. 1781. TYPE: *U. camphorata* L. f.

Annual *herbs* to suffruticose perennials, 12–50 cm tall; stems terete, dichotomously branched. *Leaves* narrowly ovate to lanceolate, 2–10 cm long, 0.4–2.7 cm wide, acute; sessile to shortly petiolate. *Inflorescence* of one to several heads; sessile or peduncles 1–5(–10) mm long. *Heads* radiate; involucre multiseriate, the bracts free, the outermost bracts 2, ovate, acute-acuminate, opaque, the inner bracts 5–8, membranaceous, the margin scarious, obtuse-acute; receptacle convex, paleaceous; paleas lanceolate, scarious, acuminate; ray florets with ligules yellow, narrowly oblong, apically rounded, flared at base into an annular disc, the style branches filiform, flattened, obtuse; disc florets with corollas yellow-orange, regular, 5-lobed, the lobes narrowly acute, the throat narrowly funnelform, the anthers exerted from corolla ca. $\frac{1}{2}$ of length, the style linear-capillaceous, undivided, the ovary sterile, pappus absent. *Achenes* ovoid, laterally compressed, narrowly keeled on adaxial and abaxial sides, notched at the point of attachment; pappus absent. Chromosome number $n = 16$.

This is a genus of 2 species in northern South America reaching into Panama. *Unxia* was regarded for over 100 years as belonging in *Melampodium*, but recent studies (Stuessy, 1969) have reestablished the genus as a close relative of *Polymnia*.

Literature:

Stuessy, T. F. 1969. Re-establishment of the genus *Unxia* (Compositae-Heliantheae). *Brittonia* 21: 314–321.

1. ***Unxia camphorata*** L.f., Suppl. Pl. 368. 1781. TYPE: Surinam, "locis arenosis," *Dalberg s.n.* (LINN, holotype, not seen, OS, photo).—FIG. 54.

U. digyna Steetz in Seem., Bot. Voy. Herald tab. 30. 1853; 154. 1854. TYPE: Panamá, "about Panamá," Nov. 1846, *Seemann* 46 (BM, holotype, not seen; K, isotype, not seen, US, photo and fragment, F, UC, US, photos).

Melampodium camphoratum (L.f.) Baker in Mart., Fl. Bras. 6(3): 161. 1884.

Annual *herbs* or suffruticose, 12–50 cm tall; stems 0.7–2.6 mm diam., glabrous to copiously pilose with hairs to 3 mm long. *Leaves* 2–3 cm long, 0.4–2 cm wide, subentire or rarely serrate, the base obtuse or rarely attenuate, both surfaces glabrate to moderately pilose with hairs to 1 mm long. *Inflorescence* with peduncles up to 1–5(–10) mm long, 0.1–0.3 mm diam., glabrate to pilose with hairs to 1 mm long. *Heads* radiate, 3.5–6 mm tall, 6–7 mm diam. at maturity; involucre bracts 3–5 mm long, 1.5–2.5 mm wide, the inner bracts 5 or 6; receptacle 0.5 mm tall, 1 mm diam.; paleas 0.3–1.3 mm long, 0.2–0.3 mm wide, without a midrib; ray florets 3–5, the ligules 2 mm long, 0.4 mm wide, the tube 0.3 mm long, 0.2 mm diam., glabrous to strigillose with hairs up to 0.1 mm long, the style branches 0.5 mm long; disc florets 5–7, the corollas 1 mm diam., the lobes 0.5 mm long and 0.3 mm wide, the throat 1.2 mm long and 0.6 mm diam., the tube 1.2–2 mm long and 0.2 mm diam., the anthers 1 mm long, the style 2 mm long, the ovary

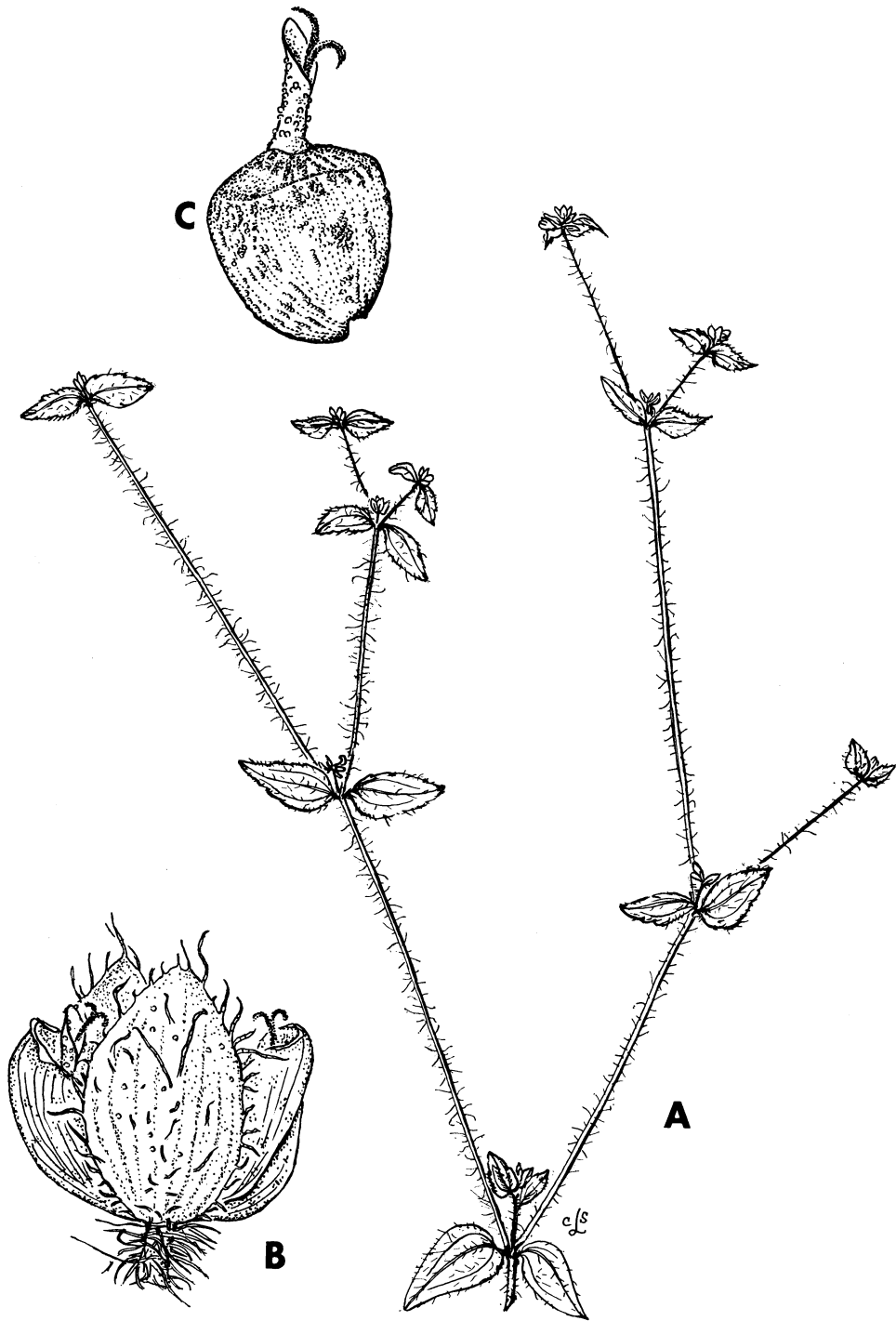


FIGURE 54. *Unxia camphorata* L.f.—A. Habit ($\times \frac{3}{5}$).—B. Head ($\times 9\frac{1}{2}$).—C. Outer floret ($\times 12\frac{3}{5}$). [After Standley 27385 (US).]

sterile, cylindrical, 0.5 mm long, 0.2 mm diam. *Achenes* 2 mm tall, 2 mm wide radially, 1 mm wide laterally. Chromosome number $n = 16$.

Although common in Colombia, Venezuela, the Guianas, and northern Brazil, the species is known in Panama from only one other collection besides the type. In other countries it flowers throughout the year.

CANAL ZONE: Corozal, *Standley* 27385 (US).

C. AMBROSIINAE³²

TOD F. STUESSY³³

Ambrosiinae Less., *Linnaea* 5: 151. 1830. "Ambrosieae." TYPE: *Ambrosia* L.

Tribe Senecioneae subtribe Ambroseae Less., *Linnaea* 5: 151. 1830.

Tribe Iveae Rydb., *N. Amer. Fl.* 33(1): 3. 1922. TYPE: *Iva* L.

54. AMBROSIA³⁴

Ambrosia L., *Sp. Pl.* 987. 1753; *Gen. Pl.*, ed. 5. 425. 1754. TYPE: *A. maritima* L.

Shrubs or *subshrubs* to perennial or annual *herbs*, glandular, aromatic, anemophilous. *Leaves* alternate (Panama) or opposite, unlobed to pinnately or palmately lobed or dissected, petiolate or sessile. *Inflorescence* of distinct staminate and carpellate heads normally on the same plant; staminate heads sessile to stalked, in terminal racemose or spicate clusters; carpellate heads in sessile or stalked clusters in axils of leaves subtending staminate racemes or spikes. *Heads* unisexual; staminate heads with involucre bracts laterally connate and forming a broadly funnel-shaped to cupulate or saucer-shaped involucre with the tips of the bracts more or less prominent as marginal lobes, the receptacle paleaceous, the florets several to numerous, the corollas hyaline, campanulate, 5-lobed, the stamens 5, weakly connivent, sometimes separating during pollen discharge, the appendages deltoid to long-attenuate, tails absent, the style short, truncate, penicillate, the ovary rudimentary; carpellate heads with bases of involucre bracts fused to form a hard, vase-shaped conceptacle, the bract tips forming more or less spiny processes, these straight to uncinat, flattened to terete, sometimes nearly absent, scattered over the bract surface in various patterns, the paleas absent, the florets 1-7 (if more than 1, interior of fruiting involucre compartmentalized, with each floret in a separate chamber), corolla and androecium lacking, the styles exerted through spinelike beaks at the involucre apex, elongate, linear, spreading, the ovary fertile, obovate, abruptly rounded to the short style base. Fruit an "involucre fruit" consisting of an achene tightly enclosed in the involucre. Chromosome numbers $n = 12, 17, 18, 36, 54, 72$.

³² Support for this investigation under NSF Grant GB-37678 is gratefully acknowledged.

³³ Department of Botany, The Ohio State University, Columbus, Ohio 43210.

³⁴ Generic description adapted from Payne (1964).

A genus of approximately 30 species distributed primarily in North America. Economically, *Ambrosia* is of great importance in the adverse effects caused by its wind-borne allergenic pollen. Fortunately, the genus has not yet spread to any large extent into Panama.

Literature:

Payne, W. W. 1964. A re-evaluation of the genus *Ambrosia* (Compositae). Jour. Arn. Arbor. 45: 401–438.

1. ***Ambrosia cumanensis*** H.B.K., Nov. Gen. Sp. Pl. 4: 276. ed. qu. 1820. TYPE: "Nova Andalusia" [Venezuela], "crescit in humidis prope Cumana," flowering in Sep, *Bonpland & Humboldt s.n.* (P, holotype, not seen).—FIG. 55.

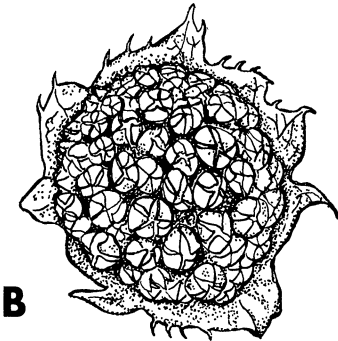
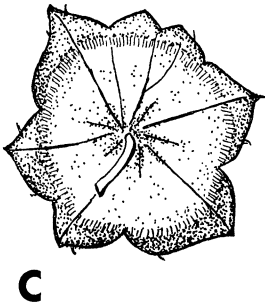
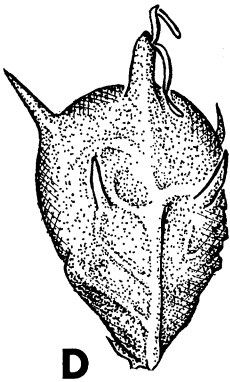
Annual *herb* to 40 cm tall; stems erect, to 4 mm diam., sparsely villous with hairs to 1.5 mm long. *Leaves* alternate, pinnately lobed to deeply divided, 6–8.5 cm long, 2.5–4 cm wide, acute-acuminate, the base attenuate, both surfaces dotted with tiny sessile glands and strigose with hairs 0.3 mm long (approaching villous on the midrib of the undersurface), the margin deeply lobed or divided. *Inflorescence* of staminate and carpellate heads separate but on the same plant; staminate heads 30–70 with peduncles 3 mm long, in terminal elongate racemose clusters to 20 cm long; carpellate heads subsessile in axillary clusters. *Heads* unisexual; staminate heads with involucre bracts connate, forming a shallow cuplike involucre with short, irregular lobes, gland-dotted, the receptacle paleaceous with filiform paleas 1 mm long, the corollas 5-lobed, campanulate, 1.5 mm long, the throat 0.9 mm long, the stamens 5, the appendages deltoid with a mucronate tip, the styles short, truncate, the ovary rudimentary; carpellate heads with outer involucre bracts 3–5, lanceolate to narrowly ovate, to 9 mm long, gland-dotted, the inner bracts 1–3, each tightly enclosing and fused with a single ovary, the outer surface with a crown of 3–5 small spines on the upper $\frac{1}{3}$ of the fruit, a tapering beak 0.8 mm long at the apex, corollas and androecium absent, the styles bifid with stigmatic branches to 1 mm long. *Fruits* beaked, spiny, 3–4 mm long (including beak), terete, gland-dotted. Chromosome number $n = 18$.

Ambrosia cumanensis is known in Panama from only one collection near Panama City. Because this species occurs abundantly throughout Mexico and the northern part of Central America, it is likely that the Panamanian collection represents a fairly recent introduction. The species also occurs infrequently in Nicaragua.

PANAMÁ: Near La Jagua, E of Panama City, *Bartlett & Lasser* 16392 (MO).

→

FIGURE 55. *Ambrosia cumanensis* H.B.K.—A. Habit ($\times \frac{1}{5}$).—B. Male head ($\times 6\frac{1}{10}$).—C. Involucre of male head ($\times \frac{1}{10}$).—D. Fruit consisting of achene enfolded by the involucre ($\times 12\frac{1}{5}$). [After *Bartlett & Lasser* 16392 (MO).]



55. PARTHENIUM³⁵

Parthenium L., Sp. Pl. 988. 1753; Gen. Pl., ed. 5. 426. 1754. LECTOTYPE: *P. hysterophorus* L.

Bitter, aromatic *herbs* or *shrubs*; stems terete to slightly ridged. *Leaves* alternate, entire to highly divided. *Inflorescence* with heads solitary or in terminal corymbs or panicles. *Heads* radiate; involucre biseriate, each series of 5 bracts; receptacle paleaceous; ray florets 5, fertile, the ligules white, the corollas and styles persistent at apex of matured achenes; disc florets perfect but sterile, all except those of the outer row falling together as a unit, the corolla tubular, 5-lobed, the anthers with white or yellow pollen. *Fruit* an "achene complex" (Rollins, 1950), the achenes obcompressed, rounded to somewhat keeled on the inner face, puberulent, the margins thickened into riblike structures which are attached to a contiguous pair of infertile disc florets and a subtending inner involucre bract, the achene and attached florets and bract falling together at maturity; pappus of 2–3 awns or scales or absent. Chromosome base numbers $x = 12, 17$ and 18 .

Parthenium is a genus of 16 species distributed throughout the western hemisphere, but has the highest concentration of taxa in Mexico. Two species, *P. cinaraceum* Rollins and *P. glomeratum* Rollins, are known from as far south as Argentina.

One of the species of *Parthenium*, *P. argentatum* A. Gray ("guayule"), was cultivated in the southwestern United States as a potential alternate source of natural rubber during World War II. As a result of this economic potential, numerous investigations have been conducted upon many aspects of the species (anatomy, chemistry, etc.), and most of these publications are summarized in Hammond & Polhamus (1965).

Traditionally, *Parthenium* has been placed in the subtribe Melampodiinae. In the present treatment, however, which follows the recent suggestions of Stuessy (1973), the genus is regarded as belonging to the Ambrosiinae.

Literature:

Hammond, B. L. & L. G. Polhamus. 1965. Research on Guayule (*Parthenium argentatum*): 1942–1959. Tech. Bull. U.S.D.A. 1327: 1–157.

Rollins, R. C. 1950. The guayule rubber plant and its relatives. Contr. Gray Herb. 172: 1–72.

Stuessy, T. F. 1973. A systematic review of the subtribe Melampodiinae (Compositae, Heliantheae). Contr. Gray Herb. 203: 65–80.

1. **Parthenium hysterophorus** L., Sp. Pl. 988. 1753. TYPE: Cultivated in Hort. Uppsala, Herb. Linn. 1115.1 (LINN, holotype, not seen, IDC 177, 664: I. 5).—FIG. 56.

Annual *herb* to 50 cm tall; stems erect, much branched, to 4 mm diam., strigillose with hairs 0.3 mm long. *Leaves* lanceolate above to pinnately dissected

³⁵ Generic description adapted from Rollins (1950).

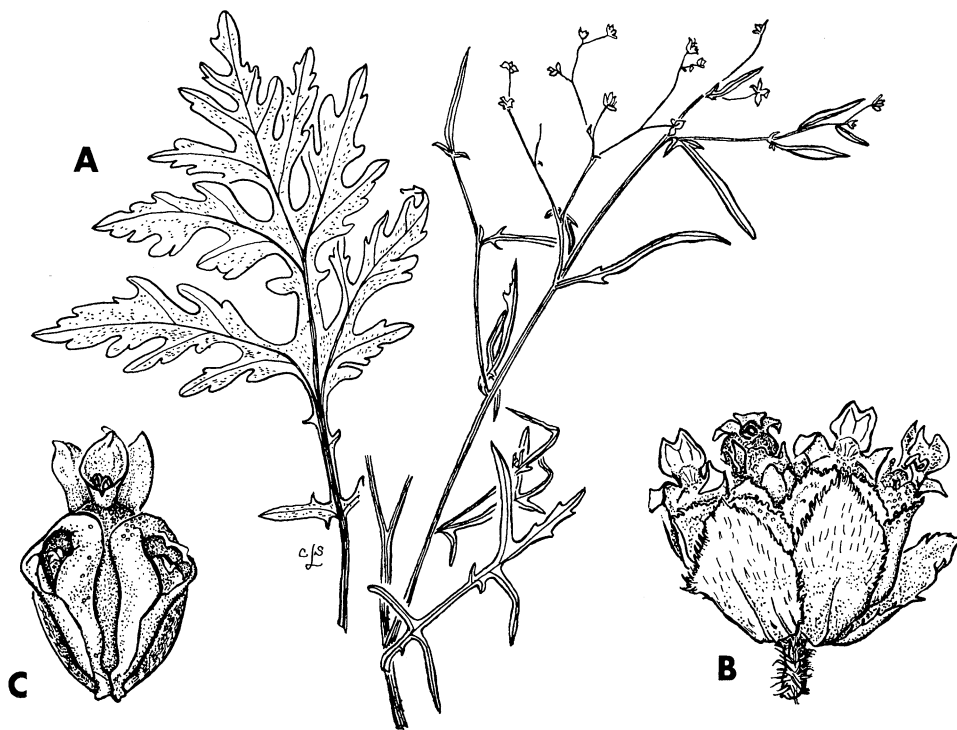


FIGURE 56. *Parthenium hysterophorus* L.—A. Habit ($\times \frac{3}{10}$).—B. Head ($\times 5\frac{1}{10}$).—C. Fruit consisting of an achene, two contiguous inner florets, and an involucral bract ($\times 5\frac{1}{10}$). [After Croat 9673 (MO).]

below, 2.5–8 cm long, 0.2–4.5 cm wide, acute, the base attenuate, both surfaces strigillose with hairs 0.2–0.4 mm long, the margin entire or deeply lobed. *Inflorescence* paniculiform, of numerous small heads; peduncles 5–8 mm long. *Heads* radiate, 2.5–3 mm tall; outer involucre cupulate, 4–5 mm diam., the bracts 5, separate, narrowly ovate, 1.6–2.2 mm long, 1.5–1.8 mm wide, acute, abaxial surface strigose with hairs 0.2 mm long, the margin herbaceous, the inner bracts 5, uniseriate, each attached abaxially to the base of a ray floret, two disc paleas and two included sterile disc florets also attached to the base of the ray floret on the adaxial side (the whole unit termed an “achene complex” (Fig. 56C), each of the two disc florets and enclosing paleas is additionally attached from the base to near the apex of the achene by a thin rib); paleas elliptic, 1 mm long, 0.3 mm wide, apically fimbriate; ray florets 5, the ligules light yellow, ovate, 0.6 mm long, 0.5 mm wide, emarginate; disc florets perfect, 25–50, the corollas light yellow, narrowly funnelform, 0.3 mm diam., the throat 1 mm long, the ovary sterile, filiform, 0.7 mm long. *Achenes* flattened, 2 mm long, 1.2 mm diam.; pappus of two broad awns 0.5 mm long. Chromosome number $n = 17$.

As with the genus *Ambrosia*, *Parthenium* is known in Panama from only one collection. This specimen probably represents a recent introduction from countries

to the north such as Honduras, Guatemala, and Mexico, where the species is common. It is believed to be native to the Gulf of Mexico, including the West Indies (Rollins, 1950).

HERRERA: Near Pesé, *Croat* 9673 (MO).

D. ZINNIINAE³⁶

TOD F. STUESSY³⁷

Zinniinae Benth. & Hook., Gen. Pl. 2: 193. 1873. TYPE: *Zinnia* L.

56. HELIOPSIS³⁸

Heliopsis Pers., Syn. Pl. 2: 473. 1807. TYPE: *Buphthalmum helianthoides* L. = *Heliopsis helianthoides* (L.) Sweet.

Herbs; stems erect and ascending, or prostrate, leafy, branched, glabrous or variously pubescent. *Leaves* opposite or rarely alternate, filiform, lanceolate, orbicular, ovate, or deltoid, glabrous or variously pubescent, the margin serrate to nearly entire; nearly sessile or with petioles to 3.5 cm long. *Inflorescence* with heads terminal and from axils of upper leaves. *Heads* radiate, 0.6–3.5 cm across; involucre cupulate, the bracts 2–3-seriate, herbaceous or coriaceous, ovate-lanceolate to ovate, subequal, the outer series foliaceous and longer than the disc; receptacle broadly convex, often hollow; paleas firm, conduplicate, persisting, light brownish-yellow, red, or purple; ray florets fertile, the corollas yellow, orange-yellow, or purple, with ligules ovate-lanceolate to oblong-lanceolate, notched, persistent; disc florets perfect and fertile, the corollas yellowish, brownish-yellow or purple. Ray *achenes* triangular, the outer surface convex; disc achenes quadrangular apically, conical basally, glabrous or minutely pubescent; pappus lacking or represented by 2–3 membranaceous teeth or merely a crenulate ridge. Chromosome numbers $n = 14, 16, 28$.

This is a genus of 13 species restricted to the western hemisphere with most taxa occurring in Latin America. *Heliopsis helianthoides* (L.) Sweet is the only species confined north of Mexico.

Literature:

Fisher, T. R. 1957. Taxonomy of the genus *Heliopsis* (Compositae). Ohio Jour. Sci. 57: 171–191.

1. **Heliopsis buphthalmoides** (Jacq.) Dunal, Mém. Mus. Hist. Nat. 5: 57. 1819.—FIG. 57.

Anthemis buphthalmoides Jacq., Hort. Schoenb. 2: 13, *tab. 151*. 1797. TYPE: not seen.

³⁶ Support for this investigation under NSF Grant GB-37678 is gratefully acknowledged.

³⁷ Department of Botany, The Ohio State University, Columbus, Ohio 43210.

³⁸ Generic description adapted from Fisher (1957).

Perennial *herb* to 38 cm tall; stems ascending, to 0.3 mm diam., glabrous below to sparsely pilose above with hairs to 0.5 mm long. *Leaves* narrowly ovate to ovate, 3.9–7.5 cm long, 1.9–5.4 cm wide, acute, the base obtuse to slightly attenuate, both surfaces strigillose with hairs 0.1 mm long, the margin serrate; petioles 0.5–3 cm long, 0.8 mm diam. *Inflorescence* of solitary heads; peduncles 9–14 cm long. *Heads* radiate, 7–9 mm tall, 15–20 mm across; involucre 9–13 mm diam., biseriate, the outer bracts herbaceous, narrowly ovate to elliptic, 5–6 mm long, 1.3–2 mm wide, obtuse, the abaxial surface strigillose toward the apex with hairs 0.1–0.2 mm long, the inner bracts more scarious and strigillose, but the same size and shape as the outer bracts; paleas narrowly elliptic, 4 mm long, 1.2 mm wide, obtuse, glabrous; ray florets 8–12, the ligules persistent on achene at maturity, yellow above, greenish below, narrowly elliptic, 4–6 mm long, 2.5 mm wide, the tube absent; disc florets over 50, perfect, the corollas yellow, cylindrical, 2.5 mm long, 0.8 mm diam., glabrous, the anthers 5, black. Ray and disc *achenes* similar, black, triquetrous, 3 mm long, 1.5 mm diam., glabrous; pappus absent. Chromosome numbers $n = 14$ and 28.

Perhaps the most conspicuous and distinguishing features of this species are the long peduncles with solitary heads, the ligules persistent on the ray achenes, and the involucral bracts all approximately the same length. In Panama flowering specimens have been collected in February, March, and July.

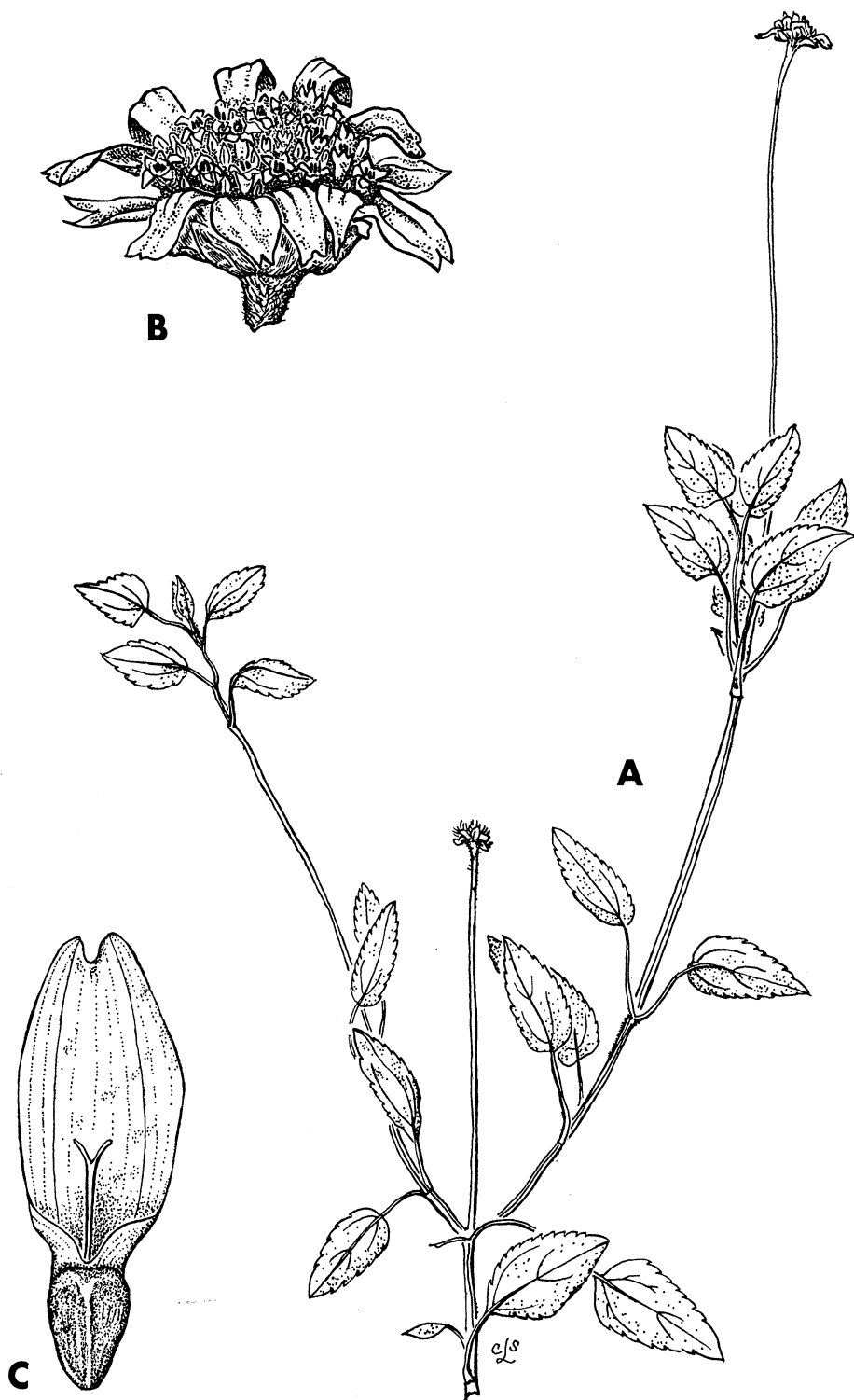
CHIRIQUÍ: Alto Lino, 4000 ft, *Maurice* 878 (US). El Boquete, 1000–1300 m, *Pittier* 2960 (US). Near Bajo Mona and Quebrada Chiquero, 1500 m, *Woodson & Schery* 530 (GH, MO).

57. ZINNIA³⁹

Zinnia L., Syst. Nat., ed. 10. 1221. 1759, nom. cons. TYPE: *Z. peruviana* (L.) L.

Annual or perennial *herbs* or low *shrubs*; stem angular to terete, green to sometimes purplish, smooth or striate, pubescent. *Leaves* opposite, the bases connate and sheathing the stem, both surfaces glabrous to pubescent, the margin entire; sessile or petiolate. *Inflorescence* of solitary heads; peduncles terete, striate to smooth, hollow, pubescent. *Heads* radiate; involucre cylindrical to hemispherical, the bracts multiseriate, oblong to obovate, imbricate, graduated, apically rounded and erose and/or ciliate with a dark band; receptacle slightly concave to narrowly conical; paleas persistent, conduplicate, rounded to acute, the margin erose or fimbriately lobed or entire-cuspidate, hyaline to membranaceous; ray florets fertile, the ligule usually present, persistent on the mature achene, white, yellow-orange, red, or purple, with or without a short tube, 1–3-lobed, the style bifid, filiform, acuminate; disc florets perfect, fertile, the corollas tubular, 5-lobed, sometimes zygomorphic with one lobe longer, the anthers with acute appendages, basally truncate to free-sagittate, the style bifid with filiform branches, apically acuminate and hairy or penicillately truncate. Ray *achenes* compressed to 3-angled, smooth, striate, or tuberculate, glabrous or pubescent; disc achenes compressed or angular, awned or awnless or simply bearing horns,

³⁹ Generic description adapted from Torres (1963).



glabrous or pubescent. Chromosome numbers $n = 10, 11, 11 + 2B, 12, 13, 19 + 2B, 20, 21, 24$, ca. 42.

Zinnia, sensu stricto, is a genus of 17 species restricted to North America with the exception of *Zinnia multiflora* which extends into Colombia, Ecuador, Peru, and Argentina. Based mainly upon experimental crossing data, Olorode & Torres (1970) recently included the related Mexican genus *Tragoceros* H.B.K., composed of 5 species, in *Zinnia* as a separate section.

Literature:

Olorode, O. & A. M. Torres. 1970. Artificial hybridization of the genera *Zinnia* (sect. *Mendezia*) and *Tragoceros* (Compositae-Zinninae). *Brittonia* 22: 359-369.

Torres, A. M. 1963. Taxonomy of *Zinnia*. *Brittonia* 15: 1-25.

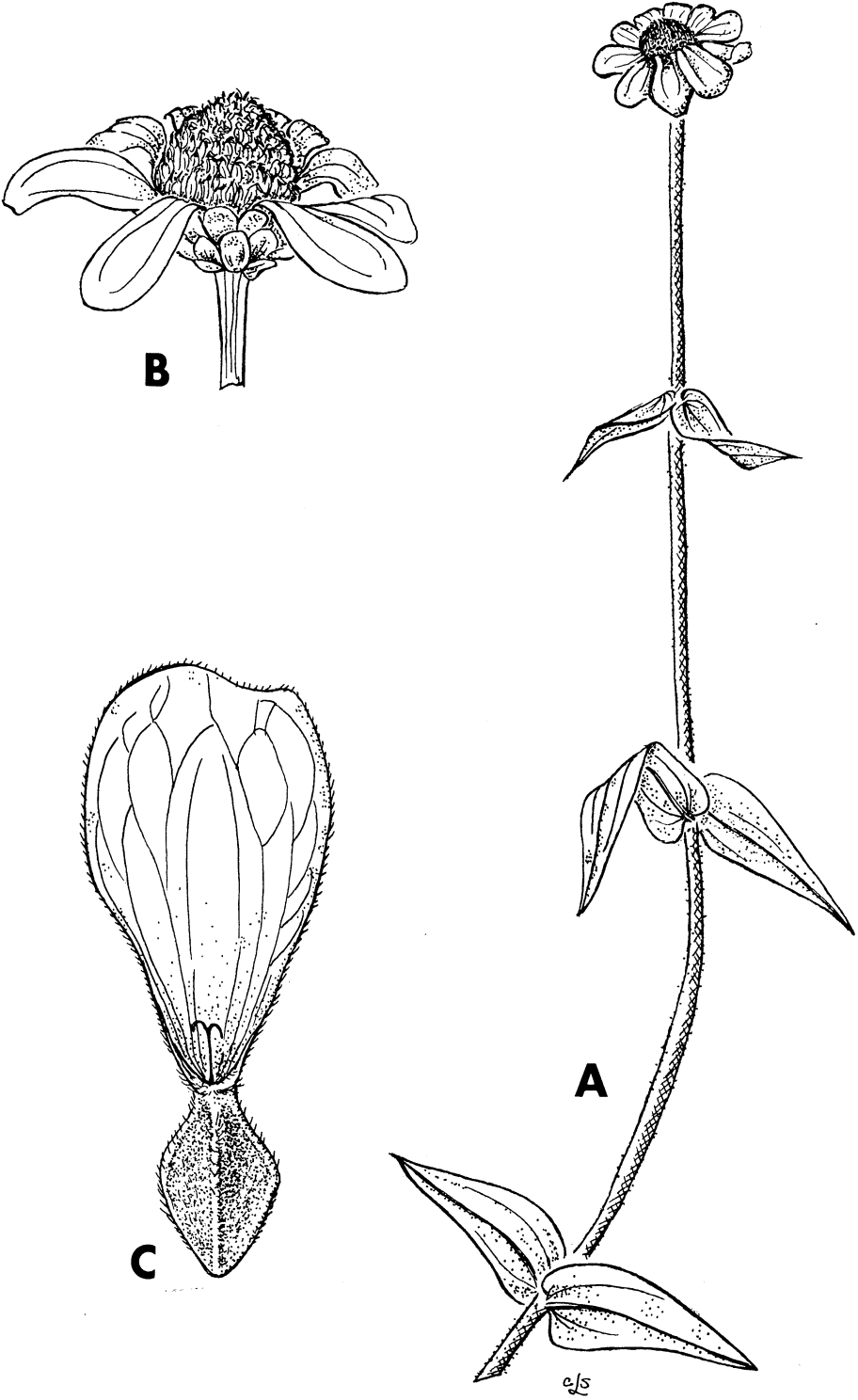
1. *Zinnia elegans* Jacq., Ic. Pl. Rar. 3, tab. 587. 1793; 3: 15. 1795. TYPE: *Jacquin s.n.* (BM?, holotype, not seen).—FIG. 58.

Annual *herb* to 42 cm tall; stems erect to decumbent, 2-5 mm diam., glabrous below to antrorsely strigose above with hairs 0.3 mm long. *Leaves* sessile; blades narrowly ovate, 3-5 cm long, 1-2.3 cm wide, acute, the base obtuse to subauriculate, both surfaces glabrous and resin-dotted, the margin entire and ciliate with hairs 0.1 mm long. *Inflorescence* with peduncles 2-15 cm long, 2-4 mm diam. *Heads* radiate, 1.5-2.8 cm tall, 3-6 cm across; involucre hemispheric, 1.3-2.5 cm diam., multiseriate, the bracts oblong, the outermost the shortest, 2-4 mm long, 3-4 mm wide, increasing in size to the innermost, to 10 mm long, apically rounded with a green to black border, glabrous; paleas lanceolate, to 15 mm long, 5 mm wide, apically pink to purple and fimbriate; ray florets 9-12 (sometimes many more in cultivated forms), the ligules red-orange above, yellow-green below, broadly oblanceolate, 1-2.5 cm long, 0.6-1.8 cm wide, the tube absent; disc florets over 50, the corollas yellow, the lobes black-purple and densely pubescent on the abaxial surface, cylindrical, 9 mm long, 0.6 mm diam., the tube slightly swollen below throat, the anthers 5, black. Ray *achenes* triquetrous, 7-8 mm long, 4-5 mm diam., strigillose with hairs 0.1 mm long; disc achenes compressed but nearly triquetrous, with small lateral wings extending upward 0.3 mm from the apex; pappus absent. Chromosome number $n = 12$.

This species is native to Mexico, but because of its ornamental value, it has been transported to many parts of the world and has often escaped from cultivation. This is apparently what has happened to the species in Panama. Flowering Panamanian collections have been made in January, June, and August.

←

FIGURE 57. *Heliopsis buphthalmoides* (Jacq.) Dunal.—A. Habit ($\times \frac{3}{8}$).—B. Head ($\times 1$).—C. Ray floret ($\times 2\frac{1}{2}$). [After Pittier 2960 (US).]



CANAL ZONE: Sabanas, *Paul* 7 (US). Río Pedro Miguel, near East Paraíso, *Standley* 30014 (US). COLÓN: Purchased in market, Colón, *D'Arcy* & *D'Arcy* 6700 (MO). SAN BLAS: Soskatupu, 0–150 ft, *Elias* 1674 (MO, UC).

E. HELIANTHINAE

W. G. D'ARCY⁴⁰

Helianthinae Dumort., Fl. Belg. Prodr. 71. 1827. "Heliantheae." TYPE: *Helianthus* L.

Tribe Asteroideae subtribe Ecliptinae Less., Linnaea 6: 153. 1831. "Ecliptae." TYPE: *Eclipta* L.

Tribe Helianthoideae subtribe Verbesineae Benth. in Benth. & Hook., Gen. Pl. 2: 193. 1873. TYPE: *Verbesina* L.

58. ECLIPTA

Eclipta L., Mant. Pl. 2: 157. 1771, nom. cons. TYPE CONS.: *E. alba* (L.) Hassk.

Eupatoriophalacron Miller, Gard. Dict., abr. ed. 4. 1754.

Micrelidium Forsk., Fl. Aegypt. Arab. 152. 1775. TYPE: *M. tolak* Forsk.

Paleista Raf., New Fl. Bot. N. Amer. 2: 43. 1836. TYPE: *P. flexuosa* Raf. = *Eclipta alba* (L.) Hassk.

Erect or sprawling, short-lived *herbs*. *Leaves* opposite, simple, entire or toothed, mostly pubescent with verrucose hairs arising from expanded bases. *Inflorescence* solitary or a few-headed fascicle; peduncles elongate, but in our species often shorter than the leaves, appressed pubescent, especially near the apex. *Heads* radiate; involucral bracts imbricate in ca. 2 similar or irregular series, ovate to lanceolate, apically acute and mucronulate, herbaceous or somewhat indurate below; receptacle flat or somewhat convex, muricate; paleas slender, bristlelike, apically barbed; ray florets in 2–3 series, fertile, the corolla white or yellow, the tube short, puberulent, a staminode sometimes present; disc florets more numerous than the ray florets, fertile, 4-merous, the corolla campanulate, angled, the lobes ciliate, the anthers sagittate, the appendages ovate, the style branches acute. *Achene* dorsiventrally flattened, the sharp angles extended near the base, the pericarp tuberculate, brown; pappus of thick scales partially united in a cone.

Although many names have been published in the genus, there are apparently only two species, the one described here and *E. bellidioides* (Spreng.) Blake from Uruguay. *Eclipta alba* is a near-cosmopolitan weed.

⁴⁰ Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.

←

FIGURE 58. *Zinnia elegans* Jacq.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 1$).—C. Ray floret ($\times 2\frac{1}{2}$). [After *Elias* 1674 (MO).]

Eclipta is distinguished by the conelike pappus, bristlelike paleas, and sagittate anthers.

1. *Eclipta alba*⁴¹ (L.) Hassk., Pl. Jav. Rar. 528. 1848.—FIG. 59

Verbesina alba L., Sp. Pl. 902. 1753. TYPE: Herb Linn. 1020.1 ex Hort. Cliff. (LINN).

V. prostrata L., Sp. Pl. 902. 1753. TYPE: Herb Linn. 1020.4 or 1920.5 (LINN).

Eclipta punctata Jacq., Sel. Stirp. Amer. 216, tab. 129. 1763. TYPE: not seen.

Bellis ramosa Jacq., Enum. Pl. Carib. 23. 1769.

Eclipta erecta L., Mant. Pl. 2: 286. 1771. Based on *Verbesina alba* L.

E. prostrata (L.) L., Mant. Pl. 2: 286. 1771.

Micrelium tolak Forsk., Fl. Aegypt. Arab. 152. 1775. TYPE: Egypt, *Forskal* (BM).

Erect or sprawling ephemeral *herbs*, sometimes rooting at the lower nodes; stems sparingly pubescent, mostly below the nodes. *Leaves* opposite, simple, to ca. 7 cm long, elliptical to lanceolate, apically mucronulate, basally cuneate, the margins entire, serrate or shallowly toothed, the teeth mucronulate, pubescent and often scabridulous above and beneath with appressed, ascending, stiff, white verrucose hairs, the bases of which sometimes give the leaf a punctate appearance, eglandular, the midvein prominent, the minor venation obscure except for two ascending pinnate veins which arise partway up the lamina; petioles wanting, a ridge present at the nodes. *Inflorescence* arising terminally but often appearing axillary, a solitary head or a few-headed fascicle, the leaves near the inflorescence not reduced; pedicels slender, mostly not exceeding the leaves, sparingly pubescent, more so near the apex. *Heads* small, 3–9 mm across, radiate; involuclral bracts 8–9, imbricate in 2–3 similar series, the outermost alike, ovate, acute or short acuminate, mucronulate, herbaceous or sometimes somewhat indurated below, sparingly pubescent, the venation mostly obscure but sometimes prominent in fruit; receptacle flat or convex, muricate; paleas numerous, slender, bristlelike with antrorse barbs near the apex; ray florets in 2–3 series, fertile, the corollas white, 1–2 mm long, the tube short, sparingly pubescent apically, the limb 1–2 mm long, 2-dentate, a staminode sometimes present; disc florets more numerous than the ray florets, the corolla mostly whitish, campanulate, ca. 1 mm long, the tube short, sparingly pubescent apically, the limb 4-angled, 4-lobed from $\frac{1}{8}$ – $\frac{1}{2}$ downward, the lobes ciliate on the ventral surface at the margin, stamens 4(?5), the anthers 0.6 mm long, basally sagittate, the appendages ovate, the style branches dorsally pubescent, acute, the nectary large, cupular, the ovary smooth, subterete. *Achene* dorsiventrally compressed and sharply angled, the angles produced into rudimentary basal wings, apically flared into a ridge subtending the pappus, the ridge with a few small hairs, pericarp tuberculate, dark brown, often withering to expose the black shiny, minutely rugose endocarp; carpodium not evident; pappus a ring of thick, ciliate, acute, partially or completely united scales forming a cone over the top of the achene.

Eclipta alba is a cosmopolitan weed, occurring in Panama in disturbed situations in the lowlands. It flowers throughout the year.

⁴¹ The majority of names published in the genus *Eclipta* are synonyms here, but only the names listed have been used for Panamanian plants.

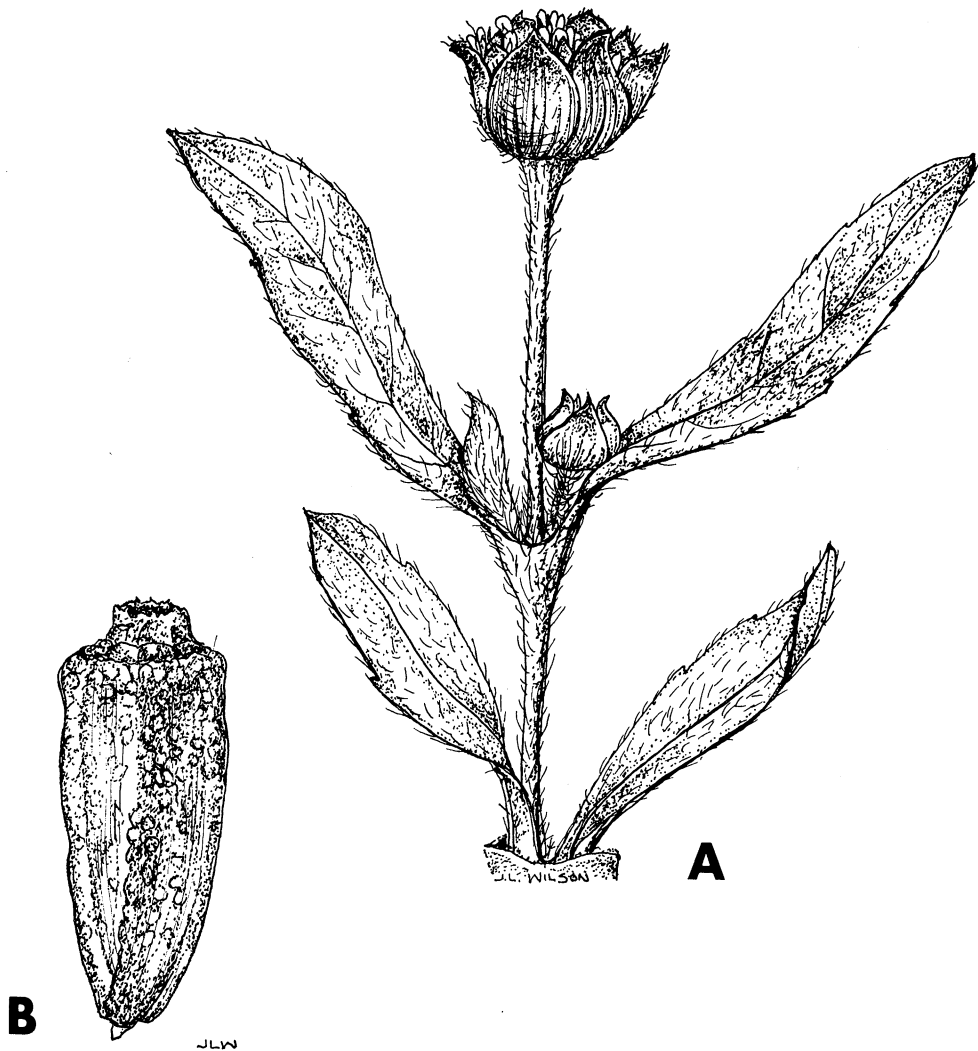


FIGURE 59. *Eclipta alba* (L.) Hassk.—A. Branch with heads ($\times 4\frac{1}{2}$). [After Robertson & Austin 322 (MO).]—B. Achene ($\times 25$). [After Duke 4025 (MO).]

BOCAS DEL TORO: Railroad near station at mi 10, *Croat & Porter* 16316 (MO). Railroad near station at mi 5, *Croat & Porter* 16461 (MO). Almirante, *Lazor et al.* 2333 (MO). Bocas del Toro, *Lazor et al.* 2356 (MO). Without locality, *Wedel* 250 (MO). Old Bank Island, *Wedel* 2002A (GH, MO), 2074A (MO). CANAL ZONE: Juan Mina, *Bartlett & Lasser* 16883 (MO). 5 mi N of Gamboa, *Blum & Loftin* 2309 (MO). Fort San Lorenzo, *Burch et al.* 1038 (MO). Pipeline road $2\frac{1}{2}$ mi from Gamboa gate, *Croat* 9336 (MO). NW of Escobal, *Croat* 12472 (MO). Fort Kobbe, *Duke* 3960 (MO). Fort Sherman, *Duke* 4377 (MO). Road K-2, *Dwyer* 2891 (MO). Albrook, *Dwyer* 7321A (MO). Chagres, *Fendler* 169 (MO, US). Gatún, *Heriberto* 83 (GH). 1 mi N of Colón-Panamá line, *Lazor & Tyson* 2990 (MO). Balboa, *Macbride & Featherstone* 26 (US). Between Corozal and Panamá, *Pittier* 2181 (GH, NY, US). Near Gatún, *Standley* 27281 (US). Near Fort Randolph, *Standley* 28751 (US). Curundu, *Tyson & Blum* 2528 (MO, NY). Madden Lake, *Tyson* 5507 (MO); *Woodson & Schery* 960 (MO). Near Salamanca Hydrographic Station, Río Pequení, *Woodson et al.* 1628 (MO, US). BARRO COLORADO ISLAND: *Croat* 7957, 8271, 9562, 14817 (all MO); *Tyson* 4199 (MO); *Ebinger* 205

(MO); *Shattuck* 291, 599 (both MO); *Starry* 221, 276 (both MO); *White* 117 (MO). CHIRIQUÍ: 6 km SW of airport at Puerto Armuelles, *Busey* 580 (MO). 1 mi W of Puerto Armuelles, *Croat* 22034 (MO). Quebrada Caña Blanca, Burica Peninsula, *Croat* 22582 (MO). Llanos Francia 4 mi from Boquete toward Dolega, 4500 ft, *Dwyer & Hayden* 7611 (MO, US). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al.* 425 (NY). David airport, *Lewis et al.* 772 (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, *Liesner* 495 (MO). Quebrada Quanabanito, 2 mi SW of Puerto Armuelles, *Liesner* 123 (MO). COCLÉ: Near Antón, *Woodson et al.* 1702 (NY), 1709 (GH, MO). COLÓN: Colón, *Correa* 1217 (MO). Near Río Lopez on Boyd-Roosevelt Hwy., *Croat* 11048 (MO). Near Portobelo, *D'Arcy & D'Arcy* 6683 (MO). DARIÉN: El Real, *Burch et al.* 1075 (MO, US). 0–4 mi up Río Sabana from Santa Fe, *Duke* 4140 (MO). Near El Real, *Stern et al.* 805 (MO, US). 3 mi N of Santa Fe, *Tyson et al.* 4609 (MO). 1 mi N of Sabana River, *Tyson et al.* 4777 (MO). 2 mi E of Santa Fé, *Tyson et al.* 4810 (MO). LOS SANTOS: Río Tonosí near Tonosí, *Lewis et al.* 1576 (GH, MO, US). 5 mi SE of Chitré, *Tyson et al.* 3048 (MO). PANAMÁ: Las Delicias, *Carleton* 221 (NY, US). Río Pacora a 4 km del corregimiento de Pacora, *Carrera* 30 (MO). Road to Cerro Azul 5 mi above Interam. Hwy., *Croat* 11525 (MO). Cerro Azul, *Croat* 17332 (MO). Universidad de Panamá, Panama City, *D'Arcy & D'Arcy* 6110 (MO). Isla del Rey, *Duke* 9573 (MO). Río Pacora below confluence with Río Corso, *Duke* 11999 (MO). San José Island, *Erlanson* 333 (NY, US); *Harlow* 21, 51 (both US). 5 mi SW of Cerro Brewster, tributary of Río Chagres, *Lewis et al.* 3378 (MO). Falls of La Chorrera, *Lewis et al.* 5192 (MO). Near Tapia River, Juan Díaz region, *Maxon & Harvey* 6758 (GH, US). 5 mi W of Chepo, *Tyson* 6698 (MO). SAN BLAS: Río Ibedi, Mulatuppa, *Duke* 8497 (MO), 8502 (MO). Isla Mosquito (Sunset Island), *Duke* 8860 (MO).

59. ELEUTHERANTHERA

Eleutheranthera Poit. ex Bosc., *Nouv. Dict. Hist. Nat.*, ed. 1., 7: 498. 1803.

TYPE: not designated.

Ogiera Cass., *Bull. Soc. Philom.* 1818: 32. 1818. TYPE: *O. triplinervis* Cass. = *Eleutheranthera ruderalis* (Swartz) Schultz-Bip.

Fingalia Schrank, *Syll. Ratisb.* 1: 87. 1824. TYPE: *F. hexagona* Schrank, fide *Index Kewensis*. *Chalarium* Poit. ex DC., *Prof.* 5: 546, pro syn., nom. nud. 1836.

Eleutherantheron Steud., *Nom. Bot.*, ed. 2, 1: 549. 1840, nom. nud. TYPE: *Herb. Linn.* 984.3. *Kegelia* Schultz-Bip., *Linnaea* 21: 245. 1848. TYPE: *K. ruderalis* (Swartz) Schultz-Bip.

Erect or sprawling, branched *herbs*, the nodes mostly with two leaves and two branches. *Leaves* opposite, ovate, the margins entire or denticulate, 3-veined from near the base, pubescent with verrucose hairs having expanded bases, and mostly copiously glandular beneath; petiole slender. *Inflorescence* a terminal aggregate of 1–several heads; peduncles slender, ebracteate and ebracteolate. *Heads* inconspicuous, discoid, the involucre bracts loosely imbricate in 2–3 series, herbaceous, the innermost sometimes paleaceous and partly enfolding the florets; receptacle minute, ill-defined; paleas mostly flattened, slightly exceeding the achenes; florets 5-merous, the corolla lobes ventrally pilose, the anthers apically free with rudimentary appendages, basally auriculate, the style branches lanceolate, the ovary laterally flattened, 3-angled, minutely puberulent. *Achene* brown, clavate, indistinctly angled, tuberculate, contracted below an apical peg, the shoulders sometimes sparingly pilose.

Eleutheranthera embraces the pantropical weed, *E. ruderalis*, and a second species reported from Madagascar.

The inner involucre bracts, so-called because they are the last series of bracts external to the florets, are in fact the outer series of paleas, the ray florets peripheral to them having been lost through reduction. Thus the innermost involucre bracts represent in this case a homologous inner system of paleas and

the green, herbaceous bracts represent an involuclral system of bracts. The apex of the achene in *Eleutheranthera* resembles a peg, sometimes pubescent, which is formed by an abrupt contraction of the achene body above the locule, and coherence to the slightly shorter nectary.

1. ***Eleutheranthera ruderalis*** (Swartz) Schultz-Bip., Bot. Zeitung (Berlin) 24: 165. 1866.—FIG. 60.

Melampodium ?ruderae Swartz, Fl. Ind. Occ. 3: 1372. 1806. TYPE: Jamaica, Swartz (? BM, not seen).

Eleutheranthera ovata Poit. ex Steud., Nom. Bot., ed. 2, 1: 549. 1840, nom. nud.

Kegelia ruderalis (Swartz) Schultz-Bip., Linnaea 21: 245. 1848. TYPE: not seen.

K. ramossissima Schultz-Bip., Linnaea 21: 245. 1848. Provisional name for *K. ruderalis* (Swartz) Schultz-Bip.

Eleutheranthera prostrata Schultz-Bip., Bot. Zeitung (Berlin) 24: 239. 1866. TYPE: not seen.

Erect or sprawling *herbs* to 30 cm tall; stems glabrate to pilose. *Leaves* opposite, ovate, mostly 3(–8 mm) long, apically acute or acuminate, basally obtuse, acute or acuminate, the margins entire or crenulate-dentate, 3-veined from near the base, both sides pubescent with verrucose hairs and glandular; petiole slender, less than $\frac{1}{2}$ the length of the leaf. *Inflorescence* a terminal aggregate of 2–5 heads, the subtending leaves not reduced; pedicels slender, pilose, often longer than the head. *Heads* discoid, 4–6 mm long; involuclral bracts in two series of 4–5 each, the outermost slightly imbricate, ovate, apically acuminate or acute, often mucronulate, green, ciliate, dorsally pubescent on the lower portion, ventrally on the apical portion with copious sessile glandular excrescences, the midvein impressed ventrally, slightly elevated dorsally, with two inconspicuous veins running parallel and close to the margin, some of them exceeding the flowers, the innermost receptacular or paleaceous, folded from the costa to partially enclose the florets, apically green, acuminate, ciliate; florets 2–6, 4–5 mm long, somewhat arched, the corolla 2.5 mm long, campanulate, the tube short, the limb apically 5-lobed, the lobes ventrally pilose, yellow, basally hardly expanded, the stamens 5, the anthers black, the upper $\frac{1}{4}$ free, the appendages rudimentary, the anther collar thickened, prominent, the anthers basally auriculate, the adjacent auricles mostly connate, the style branches lanceolate, conspicuously dorsally pubescent, the stigmatic surface confined to two lateral ridges on the lower $\frac{3}{4}$, the apical $\frac{1}{4}$ flattened and thinner, the nectary coroniform, 0.25 mm long, the ovary laterally flattened, 3-angled, evenly and finely puberulent, contracted above the locule and expanded into a pilose, coroniform pappus not exceeding the nectary. *Achene* 3 mm long, brown, the pericarp buff colored, prominently tuberculate, especially along the ribs and near the apex with dark brown umbonate tubercles, sparingly pubescent with weak spreading white hairs; pappus an apical peg, dark brown and white-pubescent on top.

Eleutheranthera ruderalis is a plant of the lowlands, occurring in disturbed spots in sun or shade.

Sometimes mistaken for *Eclipta*, to which it is closely related, or with *Synedrella*, *Eleutheranthera* is distinct in its glandular foliage, discoid heads, and loosely arranged involuclral bracts. The florets are quite inconspicuous but the

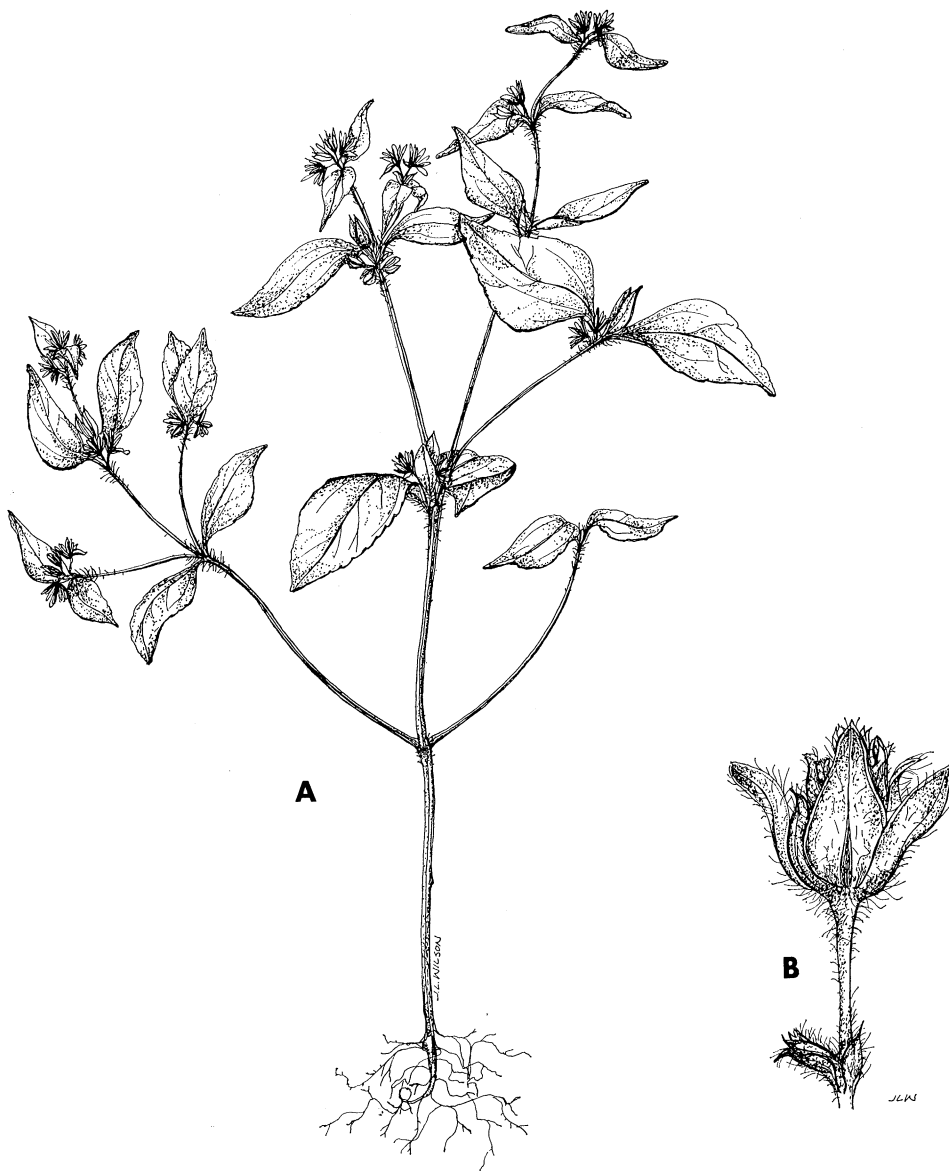


FIGURE 60. *Eleutheranthera ruderalis* (Swartz) Schultz-Bip.—A. Habit ($\times \frac{1}{2}$). [After Croat 6347 (MO).]—B. Head ($\times 4\frac{1}{2}$). [After Croat 7057 (MO).]

fruits and empty bracts are usually more readily observed. *Eleutheranthera* is similar in appearance to *Wedelia keatingii* which has larger leaves, larger bracts, and winged, flattened achenes.

BOCAS DEL TORO: Near Changuinola, Croat & Porter 16486 (MO). Lower Changuinola, Stork 274 (US). CANAL ZONE: Tropic Test Centre Miraflores Annex, Blum 681 (MO). Barro Colorado Island, Croat 6347 (MO). Summit Garden, Croat 10289 (MO). Road to Gamboa airport, Croat 14605 (MO). Road K-10D near divide W of canal, Croat 15134 (MO). Farfan

Beach, *D'Arcy & D'Arcy* 6069 (MO). Sosa Hill, *Duke* 4661 (MO). Miraflores, *Dwyer* 1009 (MO). Fort Clayton, *Dwyer* 1051 (MO). Gatún, *Hayes* 676 (NY). Near Frijoles, *King* 5228 (US). Miraflores Locks, *Stern et al.* 77 (MO, US). Curundu, *Tyson* 1080, 1085, 6642 (all MO). Albrook Air Force Base, *Tyson* 1101 (MO). Miraflores locks area, *Tyson* 1256 (MO). Fort Sherman, *Tyson & Blum* 3775 (MO). Macapale Island in Madden Lake, *Tyson* 5481 (MO). Near Miraflores Lake, *White* 173 (MO). Near Salamanca Hydrographic Station, Río Pequeni, *Woodson et al.* 1612 (MO, NY). CHIRIQUÍ: Quebrada Tuco, 9 mi S of Puerto Armuelles, *Liesner* 169 (MO). COCLÉ: Río Hato Airstrip, *Blum & Dwyer* 2483 (MO). DARIÉN: Manené to mouth of Río Cuasí, *Kirkbride & Bristan* 1499a (MO, NY). PANAMÁ: Las Delicias, *Carleton* 47 (US). Ca. 1 mi N of Panam. Hwy. on road from El Llano, *D'Arcy & D'Arcy* 6127 (MO). Hills NE of Hacienda La Joya, 50–300 m, *Dodge et al.* 16878 (MO). Near Jenine, Río Cañita, *Duke* 3811 (MO). Nueva Gorgona, *Duke* 4527 (MO). Near Goofy Lake, Cerro Azul, *Ebinger* 985 (MO). San José Island, *Erlanson* 360, 595 (both US). 7 mi W of Chepo, *Gentry & Tyson* 1634 (MO). San José Island, *Johnston* 890 (US). Ca. 13 mi SE of La Chorrera, *King* 5260 (US). Road to Cerro Jefe, *Lewis et al.* 227 (US). Río Chilibre, *Piper* 5663 (US). Matías Hernández, *Pittier* 6752 (NY, US). Taboga Island, *Standley* 27032 (US). Near Las Sabanas, *Standley* 40783 (US). Saboga Island, Pearl Islands, *Tyson* 5590 (MO). SAN BLAS: Permé, *Cooper* 272 (NY, US). Río Ibedi, Mulatuppa, *Duke* 8507 (MO).

60. GARCILASSA

Garcilassa Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 45, *tab.* 251. 1843. TYPE: *G. rivularis* Poepp. & Endlich.

Erect, branching, sparingly pubescent *herbs*; branches slender; roots fibrous. *Leaves* alternate but sometimes appearing opposite, simple, ovate, the margins serrate, chartaceous, sparingly pubescent; petioles slender. *Inflorescences* several, loose, small, umbellate or cymose panicles subtended by foliaceous bracts; pedicels slender, subtended by minute linear bracteoles. *Heads* small with few florets, discoid; involucre bracts 3–5, ovate-lanceolate, unequal, pubescent, drying reddish brown; receptacle minute; paleas indurate, acute, longer than the involucre bracts, pubescent, enveloping the florets; disc florets 3–5, the corolla narrowly campanulate, pubescent outside, the anthers black with narrowly deltoid appendages, basal auricles present but obscured, the style branches deltoid with a cuspidate apex, pubescent, the style base expanded, slightly immersed in the nectary, the ovary compressed. *Achene* plump, pubescent without longitudinal veins; pappus a ring of minute, partially connate scales.

This genus is superficially similar to *Stevia* in its reduced heads, but the florets, individually wrapped in paleas, and the pappus of minute scales easily separate the two genera, which are in fact, only distantly related. Superficially the plants are similar to those of *Eleutheranthera ruderalis* but the flower structure and achene is quite different, and the pubescence is sparser.

1. **Garcilassa rivularis** Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 45, *tab.* 251. 1843. TYPE: Peru, *Poeppig* 1459 (B, if extant, US, photo).—FIG. 61.

Erect *herb* to 1.3 m tall; stems slender, drying striate, puberulent with sparse, short hairs, lower nodes sometimes with a distinct intrapetiolar line; roots short and fibrous. *Leaves* alternate but sometimes appearing opposite, ovate, to 10 cm long, apically acuminate, basally obtuse, the margins serrate, 3 principal veins diverging from just above the base, chartaceous, sparingly pubescent on each side; petiole slender, to 1.5 cm long. *Inflorescences* several, terminal or on short

shoots below the apex, umbellate or weakly cymose paniculate aggregates of 3–12 heads; peduncles slender, puberulent, flexuous, to 3 cm long, foliaceous bracts often present; pedicels slender, mostly shorter than the heads, bracteoles pubescent, linear, scalelike. *Heads* small with few florets, discoid; involucre bracts 3–5, ovate-lanceolate, dorsally pubescent, unequal, to ca. 3 mm long; receptacle minute; paleas indurate, enveloping the florets, ca. 5 mm long, apically out-curving, acute, sometimes short-cuspidate, pubescent; florets 3–4, ca. 5 mm long, the corolla narrowly campanulate, ca. 3 mm long, pubescent outside with appressed, ascending white hairs, the 5 lobes narrowly deltoid, the anthers black, ca. 1.2 mm long, the appendages narrowly deltoid, black at least in part, the basal auricles obscured by a thickening of the filament apex which gives the anther a truncate appearance, the style branches recurved, flattened-deltoid with a short-cuspidate apex, pubescent inside and out, the dorsal surface of the area just below the dichotomy black, the style base expanded-ellipsoid, basally truncate but slightly immersed in the short, cylindrical nectary, the ovary compressed. *Achene* brown, 3 mm long, only slightly flattened, not veined, reddish brown, evenly pubescent with numerous, short, ascending hairs, the bases of which appear glandular; pappus a ring of minute scales.

This species may be recognized by its small heads of few, palea-enclosed florets and by the plump, pubescent achenes which lack longitudinal veins. Collector's notes record flower color as greenish yellow, green or greenish, but in dried condition, the corolla and the dorsal surface of the style branches appear blackish.

The species ranges from Costa Rica to Peru and Bolivia.

BOCAS DEL TORO: Río Teribé, near Quebrada Lukulon, *Kirkbride & Duke 518* (MO). Río Cricamola, 10–50 m, *Woodson et al. 1821* (MO). CANAL ZONE: Between Frijoles and Monte Lirio, *Killip 12163* (NY, US). CHIRIQUÍ: 1 mi E of Cañas Gordas near Costa Rican border on road to Volcán, *Croat 22343* (MO). DARIÉN: Caña vic., 2000–6500 ft, *Williams 955* (NY, US). PANAMÁ: Confluence of Río Pacora and Río Corso, ca. 450 m, *Duke 11966* (MO). Junction of Río Pacora to headwaters of Río Corso, *Oliver 2372* (MO).

61. LASIANTHAEA

Lasianthaea DC., Prodr. 5: 607. 1836, new name for *Lasianthus* Zucc., ined., not *Lasianthus* Adans. 1763, nom. rejic. = *Gordonia* Ellis. 1771 (Theaceae), nor Jack. 1823 (Rubiaceae). TYPE: *L. helianthoides* Zucc. ex DC.

Zexmenia A. Gray, Pl. Wright. 1: 113. 1852, not *Zexmenia* LaLlave 1824. TYPE: *Lasianthaea helianthoides* Zucc. ex DC.

Perennial *herbs*, *shrubs*, or *trees*, mostly pubescent; stems slender, striate. *Leaves* opposite, simple, ovate or elliptical, serrate, pinnate or 3-veined, mostly with an intrapetiolar ridge. *Inflorescences* paniculate or umbellate, rarely solitary heads, bracts mostly present. *Heads* radiate; involucre of oblong, basally imbricate nonrecurving bracts in 2 or more series, alike in shape but not in size; paleas scarious, enfolding the florets; ray florets few, yellow (Panama), narrow, apically notched, the style branches flat, the ovary fertile, strongly trigonous; disc florets numerous, the tube forming ca. $\frac{1}{4}$ the corolla length, the throat tubular, the 5 lobes puberulent, the stamens with deltoid appendages and the auricles obscured by a

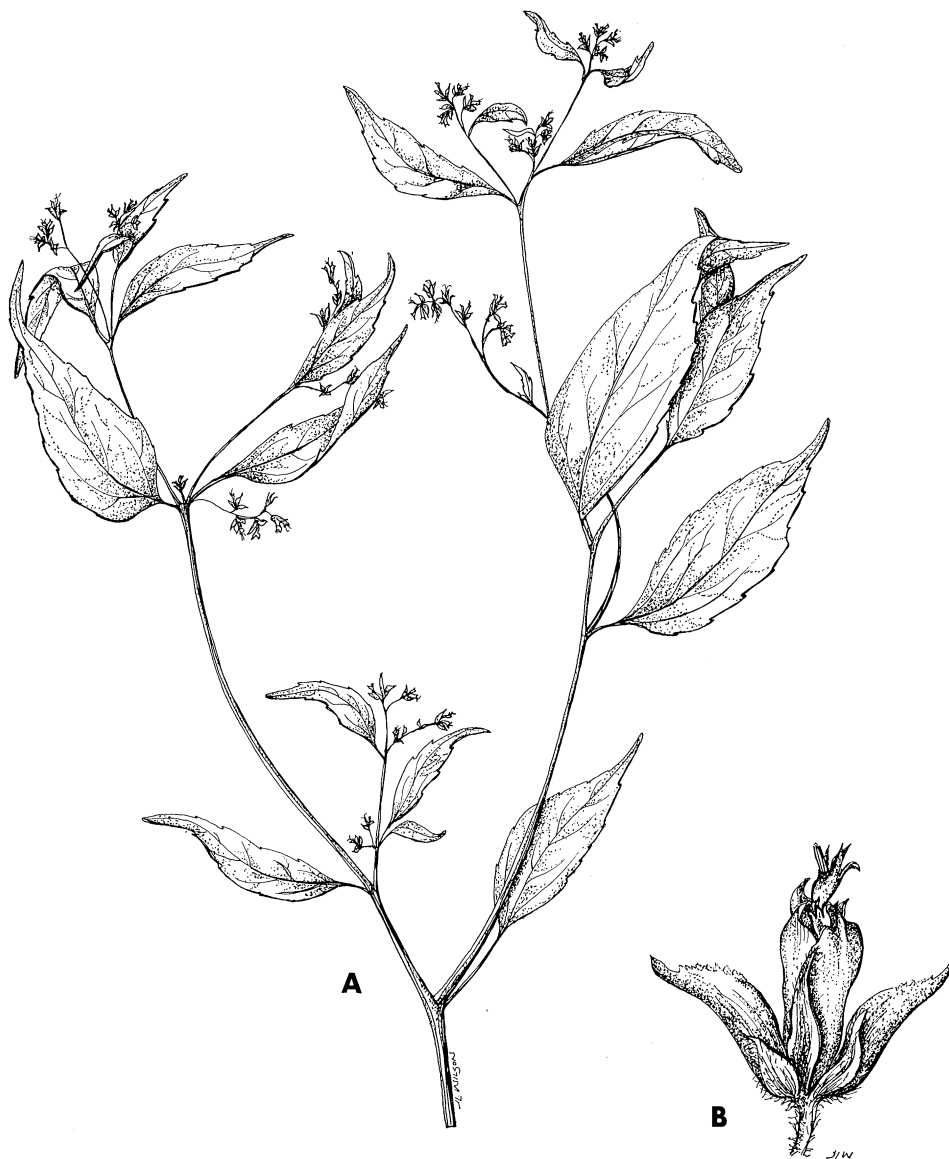


FIGURE 61. *Garcilassa rivularis* Poepp. & Endlich—A. Habit ($\times \frac{1}{2}$). [After Kirkbride & Duke 518 (MO).]—B. Head ($\times 6\frac{7}{10}$). [After Duke 11966 (MO).]

truncate expansion of the filament apex, the style branches lanceolate, pilose, the style base immersed in a cylindrical nectary, the ovary fertile, flat, thin-winged. *Achenes* shiny, sharply 2–3-angled, 2–3-awned; awns inserted at the apical margin of the achene with narrow dorsal wings near the point of insertion, united by a ring of fused squamellae.

This genus differs from the similar genus *Zexmenia* in several respects. The leaves are all opposite, the outermost involucre bracts are alike and mostly

compact and not bending outwards, the achenes are not winged when mature except in the region of pappus insertion, and the straight awns are inserted near the edge of the achene apex rather than inwards and bent out and then upwards as in *Zexmenia*.

The name *Zexmenia* has been used to embrace two distinct genera, and recognition of the distinction results in resurrection of the name *Lasianthaea* for the species known from Panama. *Zexmenia* LaLlave & Lexarza was long interpreted as based on elements of *Lasianthaea*, but examination of the type of *Z. serrata* LaLlave & Lexarza by Blake (1930: 254–255) showed it to typify a taxon different from *Lasianthaea*. A proposal to conserve *Zexmenia* A. Gray over *Zexmenia* LaLlave & Lexarza (Becker, 1972) was rejected. *Lasianthaea* includes perhaps 20 species ranging from Mexico to Panama and has been recorded from northern South America. Mr. Kenneth Becker of the New York Botanical Garden is now studying the group.

Literature:

Becker, K. M. 1972. Proposal to conserve the generic name 9216. *Zexmenia* A. Gray (1852) non LaLlave & Lexarza (1824) (Asteraceae). *Taxon* 21: 712–715.

Blake, S. F. 1917. New and noteworthy Compositae. *Contr. Gray Herb.* 52: 1–106.

———. 1930. Notes on certain type specimens of American Asteraceae in European herbaria. *Contr. U.S. Natl. Herb.* 26: 227–263.

Jones, W. W. 1905. A revision of the genus *Zexmenia*. *Proc. Amer. Acad. Arts* 41: 143–167.

- a. Plants more than 50 cm tall; leaves mostly more than 10 mm wide; involucre bracts more than 5 mm wide 1. *L. fruticosa*
- aa. Plants less than 30 cm tall; leaves mostly less than 10 mm wide; involucre bracts less than 3 mm wide 2. *L. nowickeana*

1. *Lasianthaea fruticosa* (L.) K. M. Becker, *Phytologia* 31: 297. 1975.—FIG. 62.

Bidens fruticosa L., *Sp. Pl.* 833. 1753. Based on *Bidens foliis ovatis serratis petiolatis, caule fruticosa* L., *Hort. Cliff.* 399. TYPE: Central America, *Hort. Cliff.* (BM, not seen, GH, photo).

Verbesina fruticosa L., *Sp. Pl.*, ed. 2. 1271. 1763. Based on *Bidens foliis ovatis serratis petiolatis, caule fruticosa* L., *Hort. Cliff.* 399. TYPE: Central America, *Hort. Cliff.* (BM, not seen).

Bidens frutescens Miller, *Gard. Dict.*, ed. 8. 1768. TYPE: Carthasuna, (BM, not seen).

Zexmenia costaricensis Benth. in Ørsted, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 1852: 95. 1852. TYPE: Costa Rica, *Oersted* (not seen).

Z. nicaraguensis C. Muell. in Walp., *Ann. Bot. Syst.* 5: 226. 1858, sphalm.

Narvalina fruticosa (L.) Urb., *Symb. Antil.* 5: 265. 1907.

Zexmenia frutescens (Miller) Blake, *Contr. Gray Herb.* 52: 50. 1917, not *Z. fruticosa* Rose, *Contr. U.S. Natl. Herb.* 1: 103. 1891.

Z. frutescens var. *genuina* Blake, *Contr. Gray Herb.* 52: 51. 1917. Based on *Z. frutescens* (Miller) Blake var. *frutescens*.

Shrub or *tree* to 5 m tall; branches slender, striate, gray or brown, twigs puberulent with appressed, ascending hairs, glabrescent. *Leaves* opposite, simple, ovate, apically acuminate, basally obtuse, to ca. 14 cm long, the margins serrate,

the veins ascending-pinnate, above appearing 3-nerved from near the base, elevated and fine reticulate beneath, scabrous above with scattered, white-based verrucose hairs, softly pubescent beneath with sturdy hairs on the veins, glabrate on the lamina; petiole 6–9 mm long, slender, pubescent above, an intrapetiolar ridge present and prominent after leaf fall. *Inflorescences* with several heads, compound, subumbellate, cymose or round-topped panicles; pedicels puberulent, 2–3 cm long, linear bracts sometimes present. *Heads* radiate, ca. 3 mm across; involucre 8–10 mm tall, cylindrical to campanulate, the 4 outermost bracts basally imbricate, equalling or overtopping the disc florets, oblong, apically darker and deltoid, indurate, evenly puberulent and ciliate, the innermost bracts shorter, less pubescent; receptacle nearly flat; paleas scarious, enfolding the floret, apically acute-cuspidate, ciliate on the costa and margins, otherwise glabrous, about as long as the awns, much shorter than the corolla; ray florets few, the ligule showy yellow, ca. 20 mm long, spatulate, 1-notched, the style branches flattened, glabrous, the ovary fertile, sharply trigonous, 3-awned; disc florets numerous, ca. 8 mm long, the corolla tubular, ca. 6 mm long, the tube ca. 2 mm long, the throat cylindrical, glabrous, the 5 lobes ventrally pubescent, the anthers ca. 3 mm long, dark, the appendages lighter, the auricles obscured by a truncate apical expansion of the filaments, the style branches lanceolate, dorsally pilose, the base not expanded, immersed in the 1 mm tall, apically erose, cylindrical nectary, the ovary fertile, flat, glabrous, thin-winged, the pappus of two stout awns and united by a squamellous ring. *Achene* black, shiny ca. 5 mm long, strongly 2–3-angled, flat, the margins yellow; pappus of awns inserted near the edges of the achene apex, mostly shorter than the achenes, stout, ascending-strigulose, the dorsal angles continued by thin, scarious tissue to the sides of the achene, the awns united by a short or long, fimbriate ring of scales.

CHIRIQUÍ: Near San Félix, eastern Chiriquí, *Pittier 5455* (GH, NY). COCLÉ: Near El Valle, 800–1000 m, *Allen 749* (GH, MO). Penonomé, *Dwyer 2015* (MO). Between Las Margaritas and El Valle, *Woodson et al. 1748* (GH, MO, NY). PANAMÁ: Road to Cerro Campana, ¼ mi from Pan-Am. Hwy., *Croat 12032, 12039* (both MO). Near top of Cerro Campana, *Duke 6018* (GH, MO). Cerro Campana, 2400–2700 ft, *Duke 8692* (MO). Cerro Campana, *Ebinger 372* (MO, NY); *McDaniel 6922a* (MO). Road to Cerro Campana, *Tyson 6421* (MO). VERAGUAS: Hills W of Soná, 500 m, *Allen 1038* (MO).

2. ***Lasianthaea nowickeana*** D'Arcy, *Phytologia* 30: 6. 1975. TYPE: Panama, *Duke et al. 3632* (MO).—FIG. 63.

Weak, sprawling *herb* to 30 cm long, branching at the base, rooting at the lower nodes; stem slender with ascending verrucose hairs, glabrescent, the surface becoming chartaceous, tan colored. *Leaves* mostly 3–4 cm long and 5–9 mm wide, oblanceolate, apically obtuse or acute, mucronulate, basally acute, the margins callose-serrate, veins ca. 4 on each side of the midvein, anastomosing near the margins and not running directly to the teeth, fine-reticulate and ascending-pubescent beneath with appressed white, verrucose hairs, a few scattered hairs above, drying much lighter beneath; petioles short, canaliculate above. *Inflorescence* a solitary terminal head but sometimes 2–3 aggregated on a stem; peduncle ascending-pubescent, ebracteate. *Heads* inconspicuously radiate, obconical; involucre bracts lanceolate, imbricate, about 7, the outermost ca. 7 mm long,



FIGURE 62. *Lasianthaea fruticosa* (L.) K. M. Becker. Habit ($\times \frac{7}{10}$). [After Woodson et al. 1748 (MO).]

lanceolate, stiff, with ascending, stiff hairs, the apical half distinctly darker green, the innermost narrower, slightly longer, the margins serrulate, the apical half not so clearly marked, glabrate; paleas like the inner involucre bracts but narrower, glabrous, the margins serrulate, only partly enfolding the florets; ray florets several in one series, 10–16 mm long, the corolla yellow, the ligule 2 mm wide, 3–4 mm long, deeply 2-lobed, glabrous, 6-nerved, the tube elongate, ca. 7 mm long, pubescent, especially apically, the style branches slender, long exserted, the ovary fertile, linear, 3-angled, the angles ascending-strigose with brownish glandular spots, pappus of 4 stout, erect, strigulose awns with distinct, swollen bases, the carpodium inconspicuous; disc florets numerous, 9–10 mm long, the corolla yellowish, narrowly tubular, expanding gradually upwards, pilose just above the middle with a few scattered hairs above and below, the 5 small yellow lobes porrect, ventrally pilose, the anthers black, ca. 2 mm long, the appendages yellowish, basally obtuse, the anther column 0–3 mm long, orange, the filaments glabrous, white, the style branches lanceolate, pubescent, the style base not expanded, the ovary linear, 3-angled, the angles ascending-strigose, apically 2–3-awned, the awns unequal, 7–8 mm long, pappus mostly of 2 awns and a ring of small scales. *Achene* not seen.

This species is distinctive in its straight, acute, smooth involucre bracts and small oblong oblanceolate leaves. The elongate tube and broad ligule of the ray florets are distinctive as well. It is known only from one collection.

SAN BLAS: Along river, headwaters of Río Cuasí, *Duke et al.* 3632 (MO).

62. MELANTHERA

Melanthera Rohr, Skr. Naturhist.-Selsk. 2: 213. 1792. TYPE: *Bidens nivea* L. = *Melanthera nivea* (L.) Small.

Amellus P. Browne, Civ. Nat. Hist. Jam. 317. 1756, nom. rejic., not *Amellus* L., Syst. Nat., ed. 10: 1225, 1377. 1759, nom. cons. Published without species.

Melanthera Michx., Fl. Bor. Amer. 2: 106. 1803. TYPE: *M. hastata* Michx. = *M. nivea* (L.) Small.

Lipotriche R. Brown, Trans. Linn. Soc. London 12: 118. 1817, not Less., Syn. Gen. Comp. 231. 1832. Published without species. LECTOTYPE: *L. brownei* DC. = *Melanthera scandens* (Schum. & Thonn.) Roberty.

Psathurochaeta DC., Prodr. 5: 609. 1836. TYPE: *P. dregei* DC. = *Melanthera scandens* subsp. *dregei* (DC.) Wild.

Wuerschmittia Schultz-Bip., Flora 24, Intell. 27. 1841, nom. nud. TYPE: *W. abyssinica* Schultz-Bip. ex A. Rich. = *Melanthera* (A. Rich.) Benth. & Hook.f.

Echinocephalum Gardn., Hooker's Jour. Bot. Kew Gard. Misc. 7: 294. 1848. LECTOTYPE: *E. latifolia* Gardn. = *Melanthera latifolia* (Gardn.) Cabr.

Herbs or *vines*, mostly perennial; stems drying sulcate, pubescent with appressed, ascending, stout-based verrucose hairs, often glabrescent, the nodes with an interpetiolar ridge. *Leaves* opposite, often decussate, sometimes verticillate, lobed or not, the margins mostly crenate or dentate, mostly 3-nerved from the base, often scabrous, especially above, membranaceous; sessile or petiolate. *Inflorescence* undifferentiated, the few heads paniclelike, open; pedicels slender, elongate. *Heads* globose, discoid (Panama) or radiate; involucre bracts in several somewhat unequal imbricate series, ovate to lanceolate, acute or obtuse, indurate,



FIGURE 63. *Lasianthaea nowickeana* D'Arcy. Habit ($\times \frac{3}{8}$). [After Duke 3632 (MO).]

apically green, basally stramineous, mostly puberulent with whitish hairs which obscure the venation; receptacle convex; paleas indurate, thickening upwards, apically obtuse or cuspidate, dorsally puberulent, half-enfolding the florets; ray florets (when present) few in one series with conspicuous, white, yellow or orange ligules, the style present or not, the ovary sterile; disc florets numerous, the corolla tubular, the 5 lobes dorsally pubescent, the stamens 5, the anthers with expanded, cordate, infolded appendages, the adjacent basal auricles connate, the style branches flattened, acuminate, the base not expanded, the ovary slender, 3-4-sided, broadening upwards, the nectary cylindrical, apically entire or minutely irregular, expanded basally, the pappus caducous, of 2-several weak awns and few or numerous hairs, often in more than 1 series. *Achenes* plump, somewhat compressed, 3-4-angled, apically truncate, the pericarp thin, whitish or yellowish, the endocarp black, stony; carpopodium evident; pappus mostly wanting.

Melanthera comprises 20-25 species of the tropics and subtropics of both the New and Old Worlds. Those in the New World north of Colombia are perennial herbs with white, rayless flowers. Two of these species, *M. nivea* (L.) Small and *M. aspera* are widespread and differ mainly in the apices of the palea (Fig. 64). Parks (1968) recognized several unusual groups of Florida as distinct species and a seaside race of *M. aspera* in Panama and other parts of the Caribbean area as a distinct variety. In Panama, only *M. aspera* is present and the seaside variety cannot be distinguished. Some collections from the savannas near Panama City match collections from Florida and other localities which Parks referred to *M. angustifolia*. These are considered to be ecotypes adapted to situations of impeded drainage and are recognized as *M. aspera* var. *subhastata*, but they might better be treated at a lower rank.

In Africa and southeastern South America, *Melanthera biflora* (L.) Wild and *M. latifolia* (Gardn.) Cabr. are herbs with small rays. The two species occur on different continents and are separated by differences in the length of the palea tips, differences of the same sort as those which separate *M. nivea* and *M. aspera* in the Caribbean region. Most other species are large, scandent plants of forests with showy yellow radiate heads. These forest species, which occur in both Africa and ultramontane South America, approach *Wulffia* in most features, and the fruits, although baccate in *Wulffia* and stony in *Melanthera*, are of the same general appearance. Evolution would appear to have gone from scandent, large showy forest plants to herbaceous habit and then to loss of rays and a shift to white flowers. These advanced members of the genus are the ones found in our area.

Melanthera is also closely related to *Pascalina glauca* Ort. of South America, which has narrow leaves and involucre bracts. It is more closely related to the species of *Melanthera* than to those of *Wedelia* where it has usually been placed.

Melanthera was published without species, and the type species was designated by Cassini (Dict. Sci. 29: 488. 1823.). Strother's (Taxon 19: 336. 1970.) designation of *M. panduriformis* Cass. as lectotype cannot be accepted.

In Panama, species of *Melanthera* are mostly ruderal weeds, best recognized by the membranaceous, scabrous, opposite leaves and by the globose heads of

whitish florets. They are of no known use and have no known common name in Panama.

Both Seemann (Bot. Voy. Herald 156. 1854.) and Hemsley (Biol. Cent. Amer. Bot. 2. 163. 1881) reported *Melanthera hastata* Michx. from Panama. Parks (1968, 1973) placed this name in synonymy under *M. nivea*. This species occurs around the Gulf of Mexico but is not otherwise known from regions near Panama. It differs from *M. aspera* in the length of its paleas and in other small details, and confusion of the two species is facile. Hemsley cited *Fendler 165* from Panama but this collection was not seen in this study nor was it cited by Parks. The Seemann and Hemsley reports may be based on misidentification.

Literature:

Parks, J. C. 1968. A revision of the genus *Melanthera* Rohr. (Compositae) in North America and the Caribbean. Ph.D. thesis, Vanderbilt University.
 ———. 1973. A revision of North American and Caribbean *Melanthera* (Compositae). *Rhodora* 75: 169–210.

Wild, H. 1965. The African species of the genus *Melanthera* Rohr. *Kirkia* 5: 1–5.

- a. Leaves less than 4 cm long and 1.5 cm wide; plants of impeded drainage, savannas, etc. _____ 1b. *M. aspera* var. *subhastata*
 aa. Leaves more than 4 cm long and 1.5 cm wide; plants of many habitats _____ 1a. *M. aspera* var. *aspera*

1. *Melanthera aspera* (Jacq.) Small, Bull. Torrey Bot. Club 36: 164. 1909.—
 FIG. 64.

1a. *Melanthera aspera*⁴² var. *aspera*.

Calea aspera Jacq., Coll. 2: 290. 1788 (1789); Ic. Pl. Rar. 3: 15, tab. 583. 1789. TYPE: not seen.

Melanthera deltoidea Michx., Fl. Bor. Amer. 107. 1803. Based on *Calea aspera*.

Melanthera urticaefolia Cass., Dict. Sci. Nat. 29: 484. 1823. Based on *Melanthera deltoidea* Michx. and *Calea aspera* Jacq.

Amellus asper Kuntze, Rev. Gen. Pl. 1: 305. 1891. Based on *Calea aspera* Jacq.

A. asper var. *glabriusculus* Kuntze, Rev. Gen. Pl. 1: 305. 1891. TYPE: Panamá, Colón, ?Kuntze (NY, not seen).

Melanthera brevifolia O. E. Schulz in Urb., Symb. Antil. 7: 123. 1911. TYPE: Cuba, Ekman 15505 (NY).

M. hastata var. *cubensis* O. E. Schulz in Urb., Symb. Antil. 7: 123. 1911. TYPE: Cuba, Wright 3600 (NY).

M. crenata O. E. Schulz in Urb., Symb. Antil. 7: 123. 1911. TYPE: Bahamas, New Providence, Northrop & Northrop 58 (NY).

M. calcicola Britt. in Britt. & Wils., Sci. Surv. Puerto Rico 6: 309. 1925. TYPE: Britton *et al.* 6784 (NY).

M. confusa Britt. in Britt. & Wils., Sci. Surv. Puerto Rico 6: 309. 1925. TYPE: Tortola, Fishlock 440 (NY).

M. aspera (Jacq.) Rendle in Fawcett & Rendle, Fl. Jamaica 7: 232. 1936, redundant comb.

M. aspera (P. Brown) D'Arcy, Phytologia 30: 6. 1975, superfluous comb.

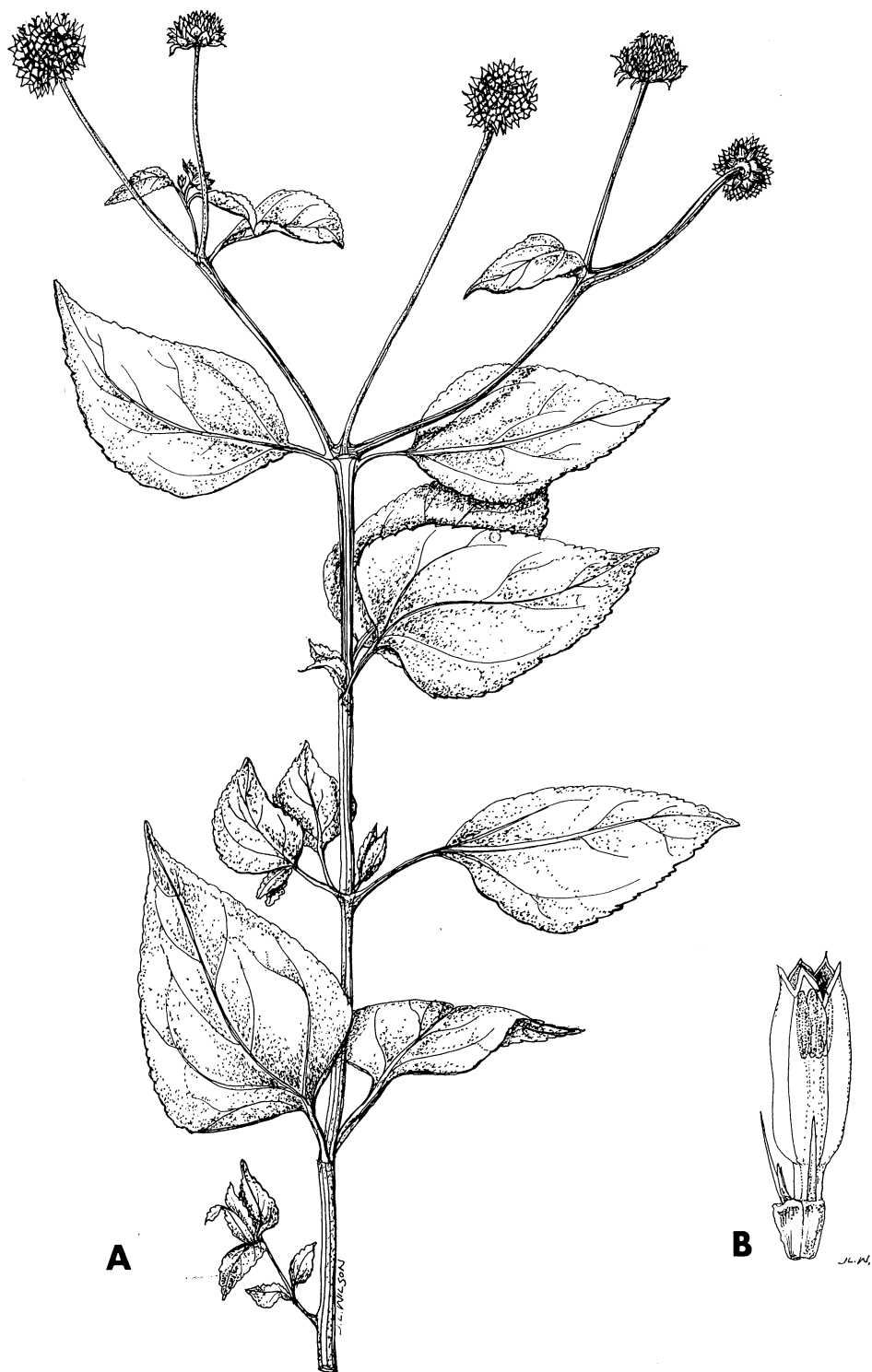
Erect or sprawling perennial *herb* to 80 (150) cm; stems drying sulcate, sparingly appressed-pubescent with verrucose hairs, lower nodes with a con-

⁴² A number of other synonyms were cited by Parks (1968), but only the names listed relate to Panamanian material.

spicuous interpetiolar ridge. *Leaves* opposite, ovate, 5–11 cm long, apically acuminate, basally obtuse, truncate or hastate-lobed, marginally serrate, 3-veined from the base, drying darker above, scabrous, the many-celled bases of the short hairs sometimes imparting a punctate appearance, drying green beneath, sparingly pubescent with reduced, more or less appressed simple hairs and with tufts in the axils of the secondary veins; petiole slender, 1–3 cm long. *Inflorescence* undifferentiated, 1–several terminal or subterminal heads on slender, sulcate, ascending, 0.5–5 cm long pedicels; one or more minute linear bracts sometimes present at or near the base. *Heads* discoid, globose, 8–12 mm across; involucre bracts in 2–3 imbricate, somewhat unequal, similar series, ovate, acute, indurate, apically green, basally ochraceous or stramineous, the venation obscured by numerous, appressed, ascending whitish hairs, 2–3 mm long; receptacle convex, white, 3–4 mm across; paleas indurate, thickening upward, apically obtuse with a short (less than 1 mm long) cusp, many nerved, enfolding the florets, the keel slightly excurrent; florets ca. 7 mm long, the corolla tubular, ca. 5 mm long, the 5 white lobes acute, long-papillose on the dorsal surface and on the margins, the tube short, not basally expanded, outside with minute ascending hairs, the stamens ca. 5 mm long, the appendages deltoid, infolded, the adjacent auricles connate, the style branches long acuminate, the style base not expanded, the ovary 3–4-angled, the nectary columnar, 0.5 mm tall, expanded in the basal half, the pappus caducous, of 2–several weak bristles and a ring of short hairs or scales, often in more than 1 series. *Achene* ca. 2 mm long, 3–4-angled slightly compressed, broadening upward, greyish or brownish, the pericarp thin, whitish or yellowish, the endocarp black, striate, stony; carpodium yellow, the apex truncate, sometimes recessed; pappus mostly wanting.

Melanthera aspera is a frequent weed of roadsides, fields, and shores of lowland Panama. It is recognizable by its whitish globose heads and plump apically truncate achenes. This species ranges from Florida to Panama and Venezuela. Plants of seacoasts may have fewer, more appressed trichomes and slightly longer palea apices and were recognized by Parks (1968) as var. *glabriuscula*. This distinction is not evident in Panamanian plants.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2714 (MO). Almirante, *Blum* 1319 (MO). Bocas del Toro, *Carleton* 154 (US). Changuinola Valley, *Dunlap* 336 (GH). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al.* 2088 (MO). Lower Changuinola, *Stork* 135 (MO). Without definite locality, *Wedel* 271 (GH, MO). Isla Colón, *Wedel* 538 (MO). Water Valley, *Wedel* 751 (MO), 931 (MO, US). Near Chiriquí Lagoon, *Wedel* 1339 (MO), 1797 (MO, US). Old Bank Island, *Wedel* 1962 (MO). Changuinola River, *Wedel* 2602 (MO, US). Near Nievécita, *Woodson et al.* 1818 (MO, NY, US). CANAL ZONE: Matachin, *Cowell* 191 (NY). Colón to Empire, *Crawford* 402 (NY). 2½ mi N of Gamboa gate, *Croat* 9343 (MO, NY). Railroad near Pedro Miguel, *Croat* 7148 (MO). Hill S of Pedro Miguel locks, *Croat* 9177 (MO). 1 mi N of Summit Garden, *Croat* 12866 (MO). Road C21 3 mi from Gaillard Hwy., *Croat* 13003 (MO). Fort Sherman, *Duke* 4335 (MO). Madden Dam, *Dwyer* 3040 (NY). Chagres, *Fendler* 164 (NY). Outskirts of Ancón, *Greenman & Greenman* 5045 (GH, MO). Between Gamboa and Darién, *Heriberto* 33 (US). Chagres River, ca. 3 mi above Gamboa Bridge, *Kennedy et al.* 2289 (MO). Between Frijoles and Monte Lirio, *Killip* 12115 (GH, US). Fort Sherman, *Lazor & Blum* 5388 (MO). Between Rodman Marine Base and Chorrera, *Nowicke et al.* 3607 (MO). Corozal, *Piper* 5296 (GH, US). Empire to Mandinga, *Piper* 5570 (GH, US). Río Grande near Culebra, *Pittier* 2101 (NY, US). Balboa, *Standley* 25556, 32135 (both GH, US). Near Summit, *Standley* 25778 (US). Corozal road near Panamá,



Standley 26790 (US). Near Gatún, *Standley* 27220 (US). Frijoles, *Standley* 27650 (US). Near Fort Randolph, *Standley* 28749 (US). Between Fort Clayton & Corozal, *Standley* 29008 (US). Obispo, *Standley* 31211 (US). Summit, *Standley* 26920 (US). Fort Sherman, *Tyson* 2263 (MO). Curundu, *Tyson* & *Blum* 2527 (MO). 6 mi N of Gamboa, *Tyson* 3499 (MO). Fort San Lorenzo, *Tyson* & *Blum* 3672 (MO). BARRO COLORADO ISLAND: *Croat* 12945 (MO); *Shattuck* 537 (MO); *Wetmore* & *Abbe* 37 (GH, MO); *Woodworth* & *Vestal* 395 (GH, MO). CHIRIQUÍ: San Bartolo Limite, *Busey* 538 (MO). Bajo Mono, Boquete District, *Davidson* 499 (GH, MO). From Boquete to 3 mi N, *Lewis et al.* 636 (MO, US). Near Boquete, *Maurice* 701 (US). Near San Félix, *Pittier* 5153 (GH). Río Caldera beyond Bajo Mono, 1700 m, *Wilbur et al.* 11054 (MO). COCLÉ: Near El Valle de Antón, *Croat* 13279 (MO). Ridge S of El Valle, *Gentry* 6802 (MO). El Valle de Antón, *Lewis et al.* 2524 (MO). Boca del Toabre at Río Cocle del Norte, *Lewis et al.* 5504 (MO). Cerro Pilón above El Valle de Antón, 2000 ft, *Porter et al.* 4641 (MO). Bismark above Penonomé, *Williams* 281 (NY, US). COLÓN: Miguel de la Borda, *Croat* 10049 (MO). Near Portobelo, *D'Arcy* & *D'Arcy* 6689 (MO). María Chiquita E of Río Piedras, *Dwyer* & *Kirkbride* 7791 (MO, NY). Portobelo, *Ebinger* 128, 448 (both MO). Near Salamanca, *Gentry* 6715 (MO). Manzanillo Island, *Hayes* 4 (US), 687 (NY). Aspinwall, *Hayes* 845 (NY). Mouth of Río Piedras, *Lewis et al.* 3183 (MO). Porvenir, *Montgomery* 207 (MO). Without definite locality, *Tyson et al.* 4528 (MO). DARIÉN: Río Balsa, *Duke* 8721 (MO). Río Piñas, *Duke* 10553 (MO). Around Puerto Obaldía, *Pittier* 4403 (US). LOS SANTOS: 5 mi S of Pocrí, *Croat* 9734 (MO). Punta Mala, *Tyson* 2721 (MO). PANAMÁ: Taboga Island, *Allen* 138 (MO). Las Sabanas, *Celestine* 113 (US). Cerro Azul, *Dwyer* 2179 (MO). San José Island, *Johnston* 1103, 1203 (both US). Taboga Island, *Killip* 3203 (NY), 3206 (US). Chimán, *Lewis et al.* 3288 (MO). Las Sabanas, *Macbride* 2643 (US); *Paul* 191 (US). Matías Hernández, *Pittier* 2899 (US). Old Panama, *Porterfield* 1933 (NY). Río Tapia, *Standley* 28064 (US). Cerro Azul, *Tyson* 6322 (MO). SAN BLAS: Near Puerto Obaldía, *Croat* 16869 (MO). Airport at Irandi, *Duke* 6516 (GH, MO). Puerto Obaldía, *Gentry* 1572 (MO). Soskatupu, *Kirkbride* 204 (MO, NY). VERAGUAS: 5 mi W of Santa Fe, *Croat* 23036 (MO).

1b. *Melanthera aspera* var. *subhastata* (O. E. Schulz) D'Arcy, comb. nov.

- M. angustifolia* A. Rich. in Sagra, Hist. Cuba 11: 54. 1850. TYPE: Cuba, Isle of Pines, Sagra (P).
M. microphylla Steetz, Bot. Voy. Herald 1561. 1854. TYPE: Panamá, *Seemann* 254 (BM, photo MO).
M. linearis Blake, Contr. U.S. Natl. Herb. 24: 30. 1922. TYPE: Guatemala *Blake* 9601 (GH).
M. angustifolia var. *subhastata* O. E. Schulz, Repert. Spec. Nov. Regni Veg. 26: 109. 1929. TYPE: Cuba, *Ekman* 12359 (NY).
M. amellus var. *subhastata* (O. E. Schulz) D'Arcy, Phytologia 30: 6. 1975.

Slender, erect or sprawling *herb* to 70 cm tall, glabrate. *Leaves* opposite, lanceolate to oblong, sometimes basally short-lobed, apically obtuse or acute, basally narrowed or obtuse, the margins crenate-serrate, 1-nerved, both sides puberulent with weak, short hairs and scabrous on the veins with longer, ascending, stout-based hairs; petioles short or wanting. *Inflorescence* not differentiated; peduncles to 5–6 cm long, slender, arising terminally or subterminally. *Heads* discoid, globose, whitish, to 12 mm across; involucre bracts in ca. 3 similar, somewhat unequal series, ovate, obtuse, indurate, apically green, basally stramineous or ochraceous, the venation obscured by numerous, fine, whitish, ascending hairs; receptacle convex; paleas indurate, conspicuously many-nerved, obtuse with an apical cusp 0.5–1 mm long; ray florets wanting; disc florets presumably resembling those in the typical variety. *Achene* not examined.

Melanthera aspera var. *subhastata* has been recognized as a distinct species

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FIGURE 64. *Melanthera aspera* (Jacq.) Small.—A. Habit ($\times \frac{1}{2}$). [After *Gentry* 2263 (MO).]—B. Floret ($\times 7\frac{1}{2}$). [After *Tyson* 2263 (MO).]

by several workers, but it seems to represent an edaphic response of populations of *M. aspera* to habitats with impeded drainage. It has small leaves, weaker stems, less pubescence, and blunter involucre bracts than the typical variety. Reports of var. *subhastata* are known (Parks, 1968) from a number of widespread localities within the range of typical *Melanthera aspera*, e.g., Panama, Guatemala, Mexico, Florida, and the Greater Antilles.

PANAMÁ: Near Río Pacora E of Panama City, *Bartlett & Lasser 16466* (MO). Near Las Sabanas, *Standley 4077* (US). Las Sabanas, *?Zetek 1932* (MO). Río Tataré, *Woodson & Schery 1004* (MO).

63. MONTANOA

Montanoa Cerv. in LaLlave & Lexarza, Nov. Veg. Desc. 2: 11. 1825. TYPE: *M. tomentosa* Cerv.

Montagnaea DC., Prodr. 5: 564. 1836. Based on *Montanoa* Cerv.

Shrubs or *trees*; branches slender. *Leaves* opposite, entire or lobed, sometimes toothed or crenate, 3-nerved from above the base; petioles mostly slender, sometimes partly winged, mostly pubescent and glandular. *Inflorescences* mostly open panicles; peduncles slender; bracts and bracteoles foliaceous to scalelike. *Heads* radiate, sometimes showy; involucre bracts in two dissimilar series, the outermost 5–8, narrow, herbaceous, sometimes unequal, the innermost smaller, often inconspicuous, apiculate or spinose; paleas enfolding the florets, apiculate, accrescent and persistent in fruit, becoming chartaceous to coriaceous, sometimes spine-tipped; ray florets with an elongate, spathulate ligule, sometimes glandular, the tube short, the ovary sterile; disc florets numerous, the corolla limb tubiform, 5-lobed, the tube mostly short, the anthers with deltoid appendages, the style branches slender, clavate, truncate, sometimes apiculate, the ovary fertile or those of the central florets abortive. *Achenes* obovate, laterally compressed; pappus wanting.

Montanoa includes numerous species in Mexico and Guatemala and a few others in Central and South America. Only one species is known from Panama. The accrescent apiculate paleas which loosely envelop the achenes readily identify fruiting collections.

1. **Montanoa hibiscifolia** (Benth.) Standley, Contr. U.S. Natl. Herb. 23: 1533. 1926.—FIG. 65.

Montagnaea hibiscifolia Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 89. 1852. TYPE: not seen.

Montanoa hibiscifolia (Benth.) D'Arcy, Phytologia 30: 5. 1975, redundant comb.

Shrub to 4 m tall; branches slender, puberulent with a mixture of erect, spreading, long-celled hairs and weak, collapsed, reddish, short-celled hairs. *Leaves* opposite, to 25 cm long, mostly 3–9-lobed, deltoid to broadly ovate, apically acuminate, basally obtuse, truncate or cordate, the sinuses rounded, the margins irregularly crenate-dentate, 3-veined from near the base, softly tomentose and glandular beneath, tomentulose and drying darker above; petiole to 15 cm long, tomentose and canaliculate on the dorsal surface, basally expanding to clasp



FIGURE 65. *Montanoa hibiscifolia* (Benth.) Standley. Fruiting branch ($\times \frac{2}{5}$). [After White & White 113 (MO).]

the stem, sometimes apically auriculate. *Inflorescence* an open, many flowered panicle; rachis and pedicels tomentulose; paired bracts decreasing in size upwards; bracteoles scalelike, sometimes solitary along the ultimate branches. *Heads* radiate, showy, 2.5–3 cm across in flower, 2–2.5 cm across in fruit; involucre bracts lanceolate, ca. 3 mm long, herbaceous, grey-puberulent, spine-tipped; paleas completely enfolding the ovary and only slightly exceeding it; ray florets 6–10 in one series, the corollas with a short tube and the limb 10–15 mm long, narrowly spatulate, denticulate, dorsally puberulent and glandular, ovary abortive; disc florets numerous forming a globose disc 7–8 mm across, the limb broadly tubular, the lobes incurved, the tube short, ascending pubescent and glandular, the anthers ca. 1.8 mm long with hyaline apical lobes, basally obtuse or subauriculate, the style branches cuneiform, the style base slightly contracted, the nectary a large, cupular, stipitate structure, the ovary quadrangular, pappus a single short, stout, deciduous awn. *Achene* dark, quadrate, rugulose, glabrous, epappose, ca. 3 mm long.

Montanoa hibiscifolia is a large, apparently open shrub with slender branches and large, lobed leaves. The heads enlarge and change dramatically in appearance as the slender, porrect, yellow or white ligules disappear and the paleas enlarge into papery, minutely striate sacs loosely enveloping the small achenes. In some species of *Montanoa*, the paleas develop conspicuous, recurved apical hooks, but in this species the apices become small, straight bristles.

Montanoa has been collected only once in Panama. It ranges to Mexico (Chiapas). The type locality is in Costa Rica.

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, *White & White 113* (MO).

64. OYEDAEA

Oyedaea DC., Prodr. 5: 576. 1836. TYPE: *O. verbesinoides* DC.

Large, erect, branched *herbs*; stems villous. *Leaves* opposite, simple, ovate, elliptical or obovate, often narrow, the margins crenate-serrate, 3-veined from well above the base, tomentose; petioles mostly distinct, articulating at the base and leaving conspicuous ridges on the stem. *Inflorescence* an open, several-many-flowered panicle; bracts foliaceous; bracteoles sometimes present, opposed or not. *Heads* radiate, showy; involucre bracts numerous in several graded series, loosely imbricate, lanceolate, apically acute, indurate and even in texture, the veins obscure, puberulent; paleas scarious, conduplicate around the floret, with a ligulate apical appendage; receptacle slightly convex; ray florets several in 1 series, the corolla yellow, the ligule conspicuous, emarginate, pubescent on the veins, the androecium and style wanting, the ovary sterile, trigonous, the pappus with 3–4 awns and a row of short hairs; disc florets numerous, the corolla tubular, slightly expanded into a cylindrical limb, the 5 lobes dorsally puberulent, the anthers and narrowly deltoid appendages black, the basal auricles inconspicuous, the style branches with a short, pubescent apicule, the style basally immersed in a cylindrical, 1 mm tall, apically erose nectary, the ovary laterally flattened,

pilose. *Achene* compressed with a suggestion of wings, glabrate; pappus a dense ring of basally conrescent hairs and two strigose awns.

Oyedaea includes a few species of South America and one species ranges through Central America into Mexico. It is distinguished mainly by its pappus which consists of two awns plus an intermediate ring of scalelike, basally fused hairs. The awns (Fig. 66) are not inserted at the edges of the achene as in *Lasianthaea*, but closer to the center. They at first move outwards and then bend back to point upwards. The loosely imbricate, narrow involucre bracts are also distinctive.

1. *Oyedaea verbesinoides* DC., Prodr. 5: 577. 1836. TYPE: Venezuela, Vargas 191 (G-DC, not seen, IDC. DC. Prod. 946. II. 5).—FIG. 66.

Large *herbs* to 5 m tall; stems villous-tomentose, faintly ridged. *Leaves* opposite, ovate, to 15 cm long, apically acuminate or acute, basally acuminate, acute or obtuse, the margins crenate-serrate, 3-veined from well above the base, above scabridulous with ascending, stout based hairs, softly tomentose beneath; petioles thin-winged and appearing canaliculate, articulating at the base and leaving conspicuous annular ridges on the stem. *Inflorescence* paniculate, somewhat rounded or flat-topped, several-many-headed; peduncles bracteolate. *Heads* showy, yellow, radiate, to 6 cm across; involucre bracts numerous in several graded series, loosely imbricate, lanceolate, the innermost ca. 10 mm long, apically acute and callose-mucronulate, the veins obscure, indurate but remaining evenly green, puberulent with appressed or ascending hairs; paleas scarious, conduplicate around the floret, the apex with a ligulate appendage, 10–11 mm long; receptacle slightly convex; ray florets several in 1 series, the corollas yellow, 15–20 mm long, broad, emarginate, the veins pubescent, the style wanting, the ovary trigonous, pappus with 3–4 awns and a row of short hairs; disc florets numerous, the corolla tubular, ca. 15 mm long, the tube glabrous, ca. 3 mm long, slightly expanded into a cylindrical limb, the 5 lobes dorsally puberulent, the anthers and appendages black, narrowly deltoid, 4 mm long, basally auriculate but the filaments darkened and thickened to give a truncate appearance, the style apically puberulent, the branches with a short, pubescent apicule, the base immersed in a cylindrical, 1 mm tall, apically erose nectary, the ovary laterally flattened, pilose with long ascending hairs. *Achene* black, ca. 5 mm long, compressed with a suggestion of wings, glabrate; pappus a dense thick ring of basally conrescent hairs and two strigose, easily detached awns.

Oyedaea verbesinoides is superficially similar to *Tithonia* in its large size and showy radiate yellow flowers, but differs in its tomentose stems, relatively slender peduncles and involucre bracts, and in its pappus which lacks large scales. The species occurs at lower to upper elevations in western Panama. It blooms mainly from November to February but collections have been taken in other months.

CHIRIQUÍ: Boquete, 3800 ft, Davidson 827 (GH, MO, US). Near Volcán, 4600 ft, Duke 9183 (MO, US). Boquete, Dwyer 6970 (MO). Near Boquete, 3300–4200 ft, Lewis *et al.* 631 (GH, MO, US). Sierra del Boquete, 1380 m, Maurice 724 (MO, US). Around Boquete, Pittier 2948 (US). Camiseta, Volcán de Chiriquí, 7500 ft, Terry 1339 (GH, MO). COCLÉ:



FIGURE 66. *Oyedaea verbesinoides* DC.—A. Habit ($\times 7/10$).—B. Achene ($\times 6\frac{3}{5}$). [After Lewis et al. 3106 (MO).]

Near El Valle, 800–1000 m, Allen 79 (MO, US). S of El Valle de Antón, 600–800 m, Allen 2866 (MO, US). La Mesa to El Valle, ca. 2500 ft, Dwyer & Duke 8289 (MO). S of El Valle de Antón, 600 m, Gentry 6797 (MO). El Cope, 1500 ft, Tyson 6097 (MO). HERRERA: 10 mi S of Ocu, Tyson et al. 2846 (MO). PANAMÁ: Above Campana, 600–800 m, Allen 1306 (GH, MO,

NY, US). Road to Cerro Campana, *Croat 14675* (MO). SE slope of Cerro Campana, *Lewis et al. 3106* (MO). Road to Cerro Campana, 1500 ft, *Tyson 6422* (MO).

65. RUMFORDIA

Rumfordia DC., Prodr. 5: 549. 1836. TYPE: *R. floribunda* DC.

Large branching *herbs* or weak *shrubs* to 3 m tall; stems glabrescent, drying striate. *Leaves* opposite, simple, apically acuminate, basally acute, obtuse, rounded or hastate, often contracted into wings on the petiole, the margins serrate or crenate, sometimes with one or two prominent lobes or angles, the midvein dividing into 3 principal veins well above the base, the minor venation mostly pinnate, puberulent with weak, multicellular, uniseriate hairs; petioles mostly distinct, broadly winged apically or for the full length, the wings sometimes produced into basal auricles. *Inflorescences* mostly well differentiated open panicles; foliaceous bracts subtending the lowermost two or three branches; minute leaflike or scalelike bractlets present at the base of minor branches and pedicels. *Heads* radiate, sometimes showy; involucre bracts in two dissimilar series, the outer herbaceous, ca. 5, the innermost smaller, narrow, only slightly enfolding the outer achenes; ray florets numerous in one series, the ligules yellow, broad or narrow, entire or 1–3-notched, sometimes glandular or pubescent, the tube elongate, the ovary fertile; disc florets much more numerous than the rays, the corolla limb tubular, 5-lobed, basally expanded, pubescent or glandular, the tube slender, sometimes as long as the limb, the anthers light or dark, long-exserted, apically appendaged, basally subauriculate, the style branches slender, glabrate, the ovary fertile. *Achenes* obovoid, glabrous, slightly compressed; pappus wanting.

A genus of about a dozen species ranging from Mexico to Panama, *Rumfordia* is distinguished by its large outer involucre bracts and by the elongate tubes of the corollas. Only one species occurs in Panama.

Rumfordia is closely related to *Tetragonotheca* of the southern United States which differs in having more strongly angled achenes, relatively shorter corolla tubes, and the fixed number of 4 outer involucre bracts. Both *Tetragonotheca* and *Rumfordia* are closely related to *Polymnia*, differing mainly in having both ray and disc florets with fertile ovaries. The elongate corolla tubes of *Rumfordia* are unusual but such tubes are also found in *Sclerocarpus*. *Rumfordia* and *Sigesbeckia* lack verrucose hairs and it is likely that these genera are best placed in association with *Polymnia* and other Melampodiinae.

1. **Rumfordia polymnioides** Greenman, Proc. Amer. Acad. Arts 39: 99. 1903. TYPE: Costa Rica, *Tonduz 11947* (US).—FIG. 67.

Large branching *herb* to 3 m tall; stems pilose with white, weak, spreading, multicellular hairs, glabrescent, drying striate, fistulose. *Leaves* large, to 35 cm long, ovate, sometimes deltoid, apically acuminate or acute, basally truncate or acuminate, sometimes with 1–5 prominent, acuminate lobes, the margins minutely callose-denticulate, the sinuses little indented, 3 major veins departing well above the base, the secondary venation pinnate, more frequent on the lateral veins than

on the midvein, both sides puberulent with scattered weak hairs, glandular beneath; petiole elongate except on leaves near the inflorescence, prominently winged, basally auriculate. *Inflorescence* an open, many flowered, cymose panicle; rachis and pedicels spreading-pilose, slender; bracts resembling the leaves; bractlets scalelike, apically acute or rounded, ciliate. *Heads* radiate, but sometimes appearing disciform; outer involucre bracts ca. 5, porrect, ovate or elliptical, sometimes broad, to 15 mm long, herbaceous, 3-nerved, ciliate and dorsally pubescent, glabrate ventrally, the inner bracts narrow, much shorter, stramineous, dorsally pubescent; paleas acute, drying stramineous, pubescent, shorter than the disc; ray florets in one series, ca. 9 mm long, inconspicuous when dried, the corolla yellow, the limb broad, the tube as long as the limb, glandular-hispid, inserted obliquely with a basal enlargement, the ovary fertile, slightly compressed dorsiventrally; disc florets numerous, forming a flattened or convex disc 1–2 cm across, the corolla yellow, 6 mm long, the limb tubular, about as long as but many times the diameter of the tube, basally hispid, apically 5-lobed, the lobes with 1 or 2 dorsal hairs, the tube slender, basally pubescent, the base expanded into a glandular-hispid cone or pedicel, the anthers yellowish, ca. 1.3 mm long, with yellowish apical appendages, basally subauriculate, the style branches clavate, apically sparingly pubescent, the style base slightly expanded, the ovary plump, fertile. *Achenes* black, lachrymiform, with faint, sharp longitudinal striations, ca. 1.5 mm long; pappus wanting.

Rumfordia polymnioides is distinguished from other Panamanian Compositae by its patent, broad, herbaceous outer involucre bracts and by the hispid corolla tubes which are about as long as the limb. The plump, black seeds somewhat resemble those of *Polymnia*. Another species, *R. aragonensis* Greenman, was described from Costa Rica. It reportedly differs in its less pubescent involucre bracts. *Rumfordia polymnioides* is the earlier name.

This species is known in Panama only from the Chiriquí mountains.

CHIRIQUÍ: Near "New Switzerland," central valley of the Río Chiriquí Viejo, 1800–2000 m, Allen 1413 (MO, NY, US). Entrance to canyon below Bambito, 5000 ft, Tyson 7042 (PMA).

66. SALMEA

Salmea DC., Cat. Pl. Monsp. 57, 140. 1813, nom. cons. TYPE CONS.: *S. scandens* (L.) DC.

Salmia auct., not *Salmia* Cav. (Liliaceae), nom. rejic.

Hopkirkia Spreng., Novi Prov. Hort. Acad. Hal. 23. 1819. TYPE: *H. eupatoria* (DC.) Spreng. = *Salmea eupatoria* DC., nom. rejic.

Shrubs or *vines*; stems slender. *Leaves* opposite, ovate, entire or dentate, pubescent with simple hairs or glabrous; petiolate, the interpetiolar ridge sometimes conspicuous. *Inflorescences* congested, cymose panicles and axillary or terminal peduncles. *Heads* small, discoid, the involucre bracts broad, sometimes apiculate, in 1–3 unequal series; paleas indurate, enfolding the florets; florets small, deeply 5-lobed, the anthers appendaged, basally auriculate, the style branches rounded, dorsally papillose, the ovary compressed, ciliate on margins and apex. *Achene* black, ciliate; pappus of 1–3 unequal awns.

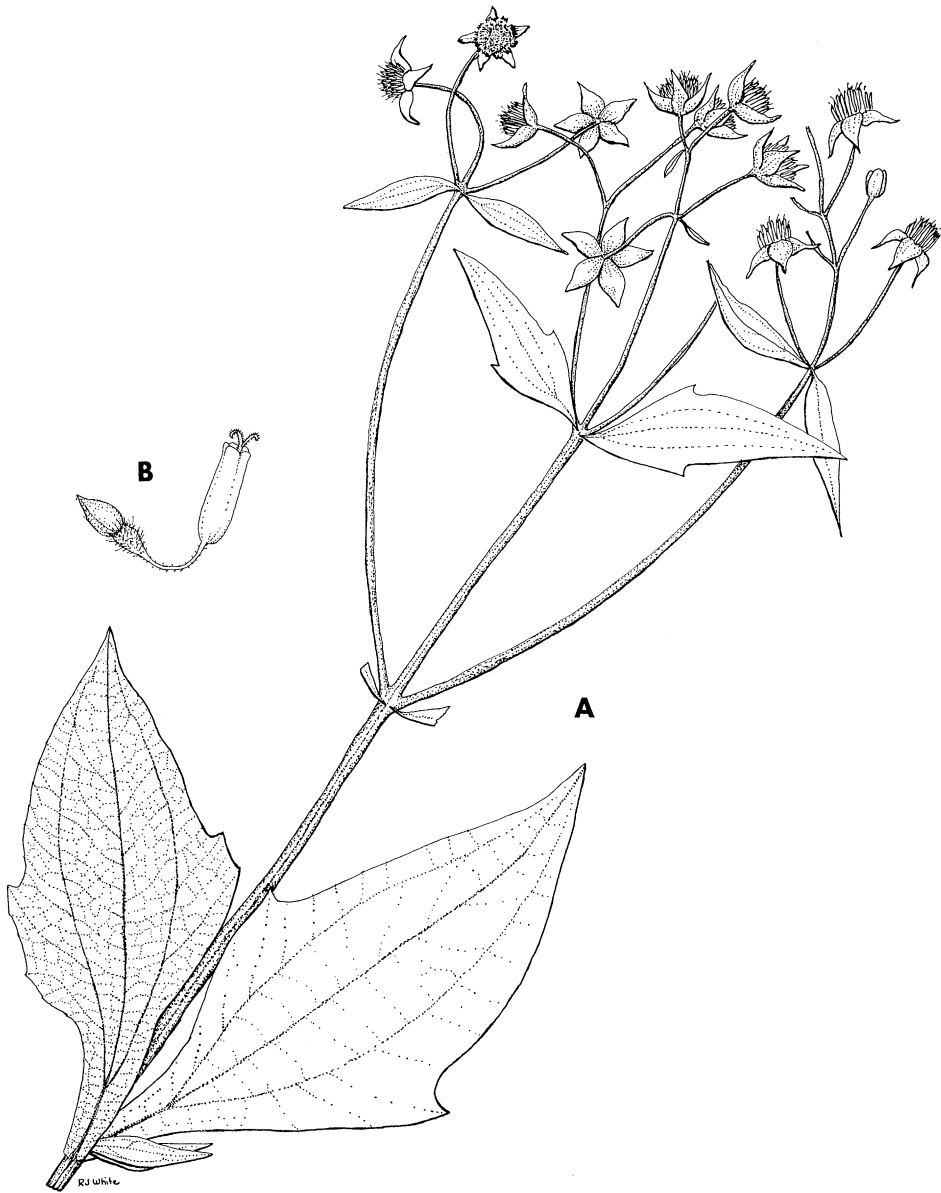


FIGURE 67. *Rumfordia polymnioides* Greenman—A. Inflorescence ($\times \frac{1}{2}$).—B. Central floret ($\times 4\frac{1}{2}$). [After Allen 1413 (NY).]

Salmea includes 3 or 4 species of tropical America. Only one species is known from Panama.

Literature:

- Blake, S. F. 1915. A revision of *Salmea* and some allied genera. Jour. Bot. 53: 193–202.

1. *Salmea scandens*⁴³ (L.) DC., Cat. Pl. Monsp. 141. 1813.—FIG. 68.

Bidens scandens L., Sp. Pl. 833. 1753. TYPE: Mexico, Vera Cruz, Hort. Cliff. (BM, not seen). *Salmea grandiceps* Cass., Dict. Sci. Nat. 47: 88. 1827. TYPE: not seen.

Scandent *shrub*, sometimes elongate; stems slender, glabrate, with long internodes. *Leaves* opposite, ovate, to 8 cm long, apically acute or acuminate, basally obtuse or rounded, the margins denticulate with minute, appendiform, distant teeth or entire, often drying yellowish-brown, 3-nerved from near the base, the midvein pinnately veined in the upper half, glabrate or pubescent with weak hairs, often barbellate in the vein axils beneath; petioles to 15 mm long, deeply canaliculate above. *Inflorescences* small panicles, the heads congested, subumbellate; peduncles minutely pubescent with short, erect or ascending, whitish hairs, with minute, foliaceous opposite bracts and the ultimate divisions with alternate scalelike bractlets. *Heads* small, 3–4 mm tall, 3–4 mm across, discoid; involucre bracts in several unequal series, broadly ovate and acuminate into a narrow, green, oblong and rounded apex, or ciliolate, dorsally puberulent; paleas indurate, dorsally puberulent, enfolding the ovary; florets exerted about halfway from the involucre, ca. 3 mm long, the corolla whitish, ca. 1.5 mm long, lobed about halfway down, the 5 lobes cuculate, dorsally puberulent, the anthers appendaged, the basal auricles fused, filaments glabrous, the style branches rounded, dorsally papillose, the style base contracted into the cylindrical nectary, the ovary compressed, ciliate, with ca. 3 weak or stout, unequal strigose awns. *Achenes* black, compressed, ciliate on the margins and apex with 1–3 short, unequal awns.

Salmea scandens ranges through tropical America, but is not common. It may be recognized by its scandent habit, congested inflorescences of discoid heads and by the paleas which envelop each floret. Superficially it may be mistaken for species of the Eupatorieae, e.g. *Mikania* or *Stevia* species, but these species lack paleas and their achenes lack awns. It is known in Panama from middle and lower elevations.

CANAL ZONE: Around Gamboa, *Pittier 3411* (US). Fort Clayton near old hospital building no. 519, *Tyson & Blum 3903* (MO). COCLÉ: Near Penonomé, *Williams 85* (NY, US). Bismark above Penonomé, 2000–3000 ft, *Williams 284* (NY).

67. SCLEROCARPUS

Sclerocarpus Jacq., Ic. Pl. Rar. 1: 17, *tab. 176*. 1781. TYPE: *S. africanus* Jacq. ex Murr.

Mostly erect, annual *herbs*, rarely perennial or *shrubs*; stems slender, pubescent. *Leaves* alternate, sometimes opposite below, ovate, elliptical or filiform-dissected, the margins mostly serrate, 3-veined from near the base, pubescent, sometimes scabrous above; petioles slender, sometimes short or wanting. *Inflorescence* mostly a solitary head; peduncles elongate or almost wanting, sometimes stout, pubescent. *Heads* radiate; involucre bracts 4 or more, foliaceous, sometimes

⁴³ Other synonyms are listed by Blake (1915: 197). Only the names noted here relate to Panamanian material.

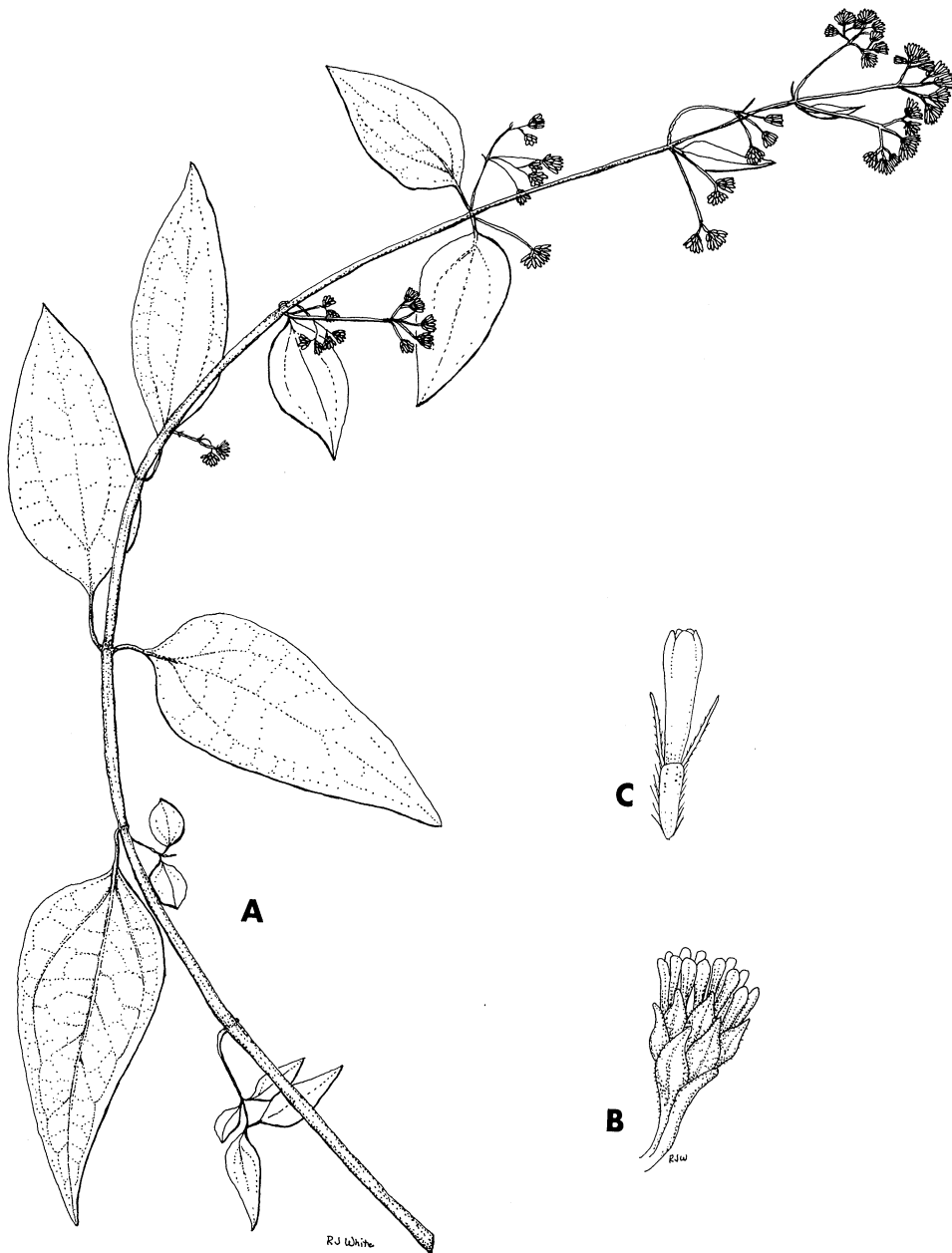


FIGURE 68. *Salmea scandens* (L.) DC.—A. Flowering branch ($\times \frac{1}{2}$).—B. Head ($\times 3\frac{1}{2}$).—C. Floret ($\times 4$). [After Williams 284 (NY).]

apparently petiolate, eglandular, pubescent on both sides, rarely rudimentary; paleas tubular, the edges overlapped and fused below, the apex dentate or lobed, mostly pubescent, indurate, expanding and sclerifying in fruit; receptacle conical; ray florets 3–10, fertile, corolla yellow, the pubescent tube forming much of the

length, the limb elliptical with a conspicuously notched apex, ovary as long as the corolla tube, flattened, sterile; disc florets several to many, the corolla with elongate, slender, strigose apical lobes, the tube little differentiated, the stamens dark, exserted or not, the appendages narrow, long, dark, eglandular, the basal auricles small or indistinct, the style branches cylindrical, pilose, the style base expanded-globose, stipitate, the ovary turbinate, the pappus a ring of hairs or squamellae, or wanting, the carpopodium conspicuous. *Fruit* a utricle, the sclerified palea sometimes strongly oblique, often with a slender beak, fused to the achene apex.

A genus of about 8 species of warm temperate and tropical America, and one species (the type) of dry regions of Africa. *Sclerocarpus* may be recognized in flower by the elongate, strigose lobes of the disc florets and the elongate anther appendages, and in fruit by the distinctive oblique, urn-shaped utricles.

Bentham (1872) considered *Aldama* LaLlave & Lexarza to be synonymous. Although closely related, that genus is distinguished in having three distinctive types of floret per head. Feddema in his herbarium annotations recognized *Aldama* as distinct.

Literature:

Feddema, C. 1972. *Sclerocarpus uniserialis* (Compositae) in Texas and Mexico. *Phytologia* 23: 201–209.

1. ***Sclerocarpus divaricatus*** (Benth.) Hemsl., *Biol. Centr. Amer., Bot.* 2: 164. 1881.—FIG. 69.

Gymnopsis divaricata Benth., *Bot. Voy. Sulphur* 116. 1845. TYPE: Gulf of Fonseca (K, not seen).

Erect, spreading *herb* to 1.5 m tall; branches slender, divaricate; roots short and fibrous. *Leaves* alternate or at the base opposite, to 9 cm long, ovate, apically acuminate or acute, basally rounded, obtuse or cuneate, the margins serrate, sometimes saliently so, 3-nerved from near the base, scabridulous with copious, stiff, ascending hairs; petiole slender, 5–30 mm long, an intrapetiolar ridge mostly present below. *Inflorescences* solitary heads on slender, to 6 cm long, apically tomentose peduncles. *Heads* radiate; involucre bracts 4–5, ovate, foliaceous, mostly 6–11 mm long, apically obtuse, basally rounded, sessile, the margins entire, both sides grey-pubescent with ascending, appressed hairs; paleas slightly exceeding the ovary, enfolding the ovary and the edges connate to about halfway up, pilose, apically ca. 3-lobed, erose-pilose; ray florets several, the corollas yellow, ca. 20 mm long, the narrow, pilose tube forming $\frac{1}{3}$ the length, the limb broadly ovate, apically 2–3-dentate, basally truncate, dorsally pubescent, ventrally uniform in color and texture, glabrous, the ovary sterile, pubescent, 2 mm long, pappus

→

FIGURE 69. *Sclerocarpus divaricatus* (Benth.) Hemsl.—A. Habit ($\times \frac{1}{2}$).—B. Achene enfolded by involucre bract ($\times 5$).—C. Disc Corolla ($\times 4$). [After *Molina* 22028, Honduras (MO).]



wanting; disc florets numerous, the corolla 13–14 mm long, the tube not differentiated, cylindrical but broadening slightly upwards, hispid, especially on the upper portion, the apical lobes 3 mm long, strigose, the ventral hairs below the expanded apex black, the apices yellow, thick, slightly expanded, dorsally white-strigose, ventrally verrucose, the anthers dark, the thecae 2 mm long, the appendages narrowly lanceolate, 0.8 mm long, the bases obtuse or subauriculate, the style branches cylindrical, strigose, the style base expanded-globose, stipitate above the nectary, the ovary lenticular, glabrous, 1–1.5 mm long, dorsiventrally compressed, 2-nerved, the pappus wanting, the conical, glandular apex surmounted by a short cylindrical umbo and nectary, the carpopodium large. *Fruit* a globose-prismatic utricle, ca. 2 mm across, greenish or stameneous, the beak minute, apically tuberculate, sparingly white-pilose; achene reddish brown, faintly dark-striate, broadly turbinate, the base oblique; pappus wanting, the apex a hard, solid cylindrical peg, surmounted by a minute, cylindrical, disclike nectary; embryo broadly turbinate.

Superficially resembling a species of *Wedelia*, *Hymenostephium* or other yellow-flowered helianthoid Compositae, this species is highly distinctive upon closer examination and is unique in the Panamanian flora in a number of easily observed characters; the foliaceous involucre is approached only in species of *Montanoa* and *Rumfordia*; the ray corollas have unusually long tubes and are pilose on the dorsal surfaces; the disc corollas are not clearly differentiated into tube and limb, and the 5 apical lobes are strigose, ending in yellow, outcurving pads, highlighted by black hairs just below them; the anther appendages are dark like the thecae, and are narrowly lanceolate; both anther appendages and corolla lobes are proportionally much longer than in most other Panamanian species of Compositae. The fruit, a utricle formed of the achene enveloped by the palea is also unique. There is fusion between the palea and achene at the apex and basally at the carpopodium, a feature perhaps unique in the family. In some collections of this species from Mexico, the palea of some fruits on some heads is extended as a narrow ligule, but this could not be observed in the Panamanian collection. Because of the paucity of material from Panama, the above description is taken mainly from *Anderson & Mori 296*, Costa Rica (MO). *Sclerocarpus divaricatus* ranges from Mexico into South America.

CHIRIQUÍ: Ca. 3 mi above David on way to Boquete, *D'Arcy & D'Arcy 6300* (MO).

68. SIGESBECKIA

*Sigesbeckia*⁴⁴ L., Sp. Pl. 900. 1753; Gen. Pl., ed. 5. 973. 1754. TYPE: *S. orientalis* L.

Siegesbeckia sensu auct., not L.

Mostly erect, branching, annual *herbs*, a few species procumbent or scapose; stems mostly with erect, multicellular hairs, these often gland-tipped; roots mostly fibrous. *Leaves* opposite, simple, mostly ovate or elliptic, entire or serrate,

⁴⁴ For a list of synonyms see Humbles (1972). Only this name has been used for Panamanian material.

viscid-pubescent with weak, spreading multicellular, often gland-tipped hairs, the surface sometimes glandular; petioles mostly winged, sometimes basally auriculate or nearly connate-perfoliate, the leaves near the inflorescence smaller, sessile. *Inflorescence* an open, several-many-flowered panicle; peduncles with prominent multicellular, often glandular hairs; bracts foliaceous; unpaired, scale-like bractlets often present on the pedicels. *Heads* mostly radiate, small; involucre bracts of 2 dissimilar series, the 5 outermost lanceolate to linear-spathulate, apically rounded, mostly copiously stipitate-glandular, the stipes stout and the glands conspicuous, opaque, the innermost as many as the ray flowers, ovate, apically deltoid to acuminate, stipitate-glandular, enveloping the ovaries of the ray florets; paleas ovate, scarious, apically stipitate-glandular, enveloping the disc florets; receptacle conical, small; ray florets 5–15, rarely lacking, the corolla yellow, the tube forming half the length, sometimes cobwebby-pubescent, the limb broad, apically sinuate-dentate or bifid, the style branches short, the ovary fertile, asymmetrically fusiform-lenticular, the carpodium somewhat ventral, pappus wanting; disc florets few to numerous, the corolla with the tube making up half the length, sometimes pubescent, the limb campanulate, angled with 5 deltoid lobes, the anthers yellow or green, with ovate, discrete-appearing apical appendages, basally auriculate, the filaments inserted high in the corolla tube, mostly not flexing in development or anthesis, the style branches somewhat flattened, cuneiform, dorsally pilose at the broadest point, the style base not expanded but articulated with the umbonate ovary apex, the ovary fertile, slightly compressed laterally with a prominent carpodium, the apex conical with a cylindrical umbo; pappus wanting. *Achenes* black, minutely striate, curved, plump, sometimes strongly angled, square or ovoid in cross section; carpodium indistinct; pappus wanting.

Sigesbeckia includes about 9 species of warm parts of both the New and Old Worlds. The glandular-stipitate, narrow outer series of involucre bracts are a good feature for recognition. The paleas become indurated in fruit, enveloping the achene but ultimately releasing it.

Literature:

- Humbles, J. E. 1972. Observations on the genus *Sigesbeckia*. L. Ci. & Nat. 13: 3–19.
 McVaugh, R. & C. Anderson. 1972. North American counterparts of *Sigesbeckia orientalis* (Compositae). Contr. Univ. Michigan Herb. 9: 487–493.

1. ***Sigesbeckia jorullensis***⁴⁵ H.B.K., Nov. Gen. Sp. Pl. 4: 284. 1820. TYPE: Mexico *Bonpland*, (P).—FIG. 70.

Erect, short-lived branched *herb* to 1 m tall; stems drying striate, with spreading, multicellular, glandular hairs; roots fibrous. *Leaves* opposite, to 10 cm long (including petiole), apically acute, basally rounded or truncate, acuminate into the petiole, the margins serrate, the principal veins 3 from the base,

⁴⁵ For a list of synonyms see Humbles (1972). Only this name has been used for Panamanian material.



FIGURE 70. *Sigesbeckia jorullensis* H.B.K.—A. Habit ($\times \frac{2}{5}$). [After White 45 (MO).]—
B. Ray floret ($\times 7\frac{2}{5}$). [After Fiebrig 2068, Bolivia (MO).]

puberulent above and beneath with scattered, multicellular hairs, some of these gland-tipped, the surface eglandular; petiole prominently winged, basally expanded-auriculate and connate in pairs; leaves near the inflorescence much smaller, sessile with cuneate bases. *Inflorescence* an open, several-many-flowered panicle; peduncles slender, copiously glandular with erect hairs; bracts foliaceous; bractlets scalelike, not opposed. *Heads* small, inconspicuously radiate; outer involucre bracts 5, spreading, linear-oblongate, apically obtuse or rounded and slightly expanded, 8–18 mm long, ca. 1 mm wide, copiously stipitate-glandular, the inner 8 involucre bracts ca. 3 mm long, cucullate and enveloping the ray flower, apically acute or acuminate, 3-nerved, dorsally stipitate-glandular; paleas broadly ovate, scarious, enveloping the flower, the apex stipitate glandular; receptacle conical; ray florets 4–5 mm long, the corolla yellow, the cobwebby, apically glandular tube forming about half the length, the tube with an apical lobe opposite the ligule, the ligule recurved, broadly elliptical, 3-nerved, apically sinuate 3-dentate, the style branches darker than the style, the style base not expanded, the ovary fertile, 1.5 mm long, irregular-fabiform, glabrous or minutely cobwebby, the pappus wanting, the carpodium relatively large; disc florets ca. 8, ca. 4 mm long, the corolla yellowish, ca. 2 mm long, the tube with erect hairs, forming half the length, the limb campanulate-angular, lobed $\frac{1}{3}$ – $\frac{1}{2}$ way down, the lobes deltoid, glabrous, the stamens inserted at the apex of the tube, the anthers green, the appendages ovate, the adjacent basal auricles connate, ?toothed, the style branches flattened, the basal half pilose, the apex deltoid, the style base not expanded, the nectary cylindrical, the ovary fabiform, glabrous, slightly compressed laterally, the apex a contracted umbo surmounted by the nectary. *Fruit* a utricle or achene, black, minutely striate, ca. 2 mm long, plump and the angles rounded, slightly beaked, sometimes falling enclosed by the palea; carpodium inconspicuous; pappus wanting.

Sigesbeckia jorullensis is distinguished by the linear, stipitate glandular involucre bracts. Several features of the plants are of interest, e.g., the ligulelike corolla projection at the adaxial apex of the corolla tube, the inner series of involucre bracts which enfold the ray flowers much like paleas, and the insertion of the stamen filaments which at no stage flex in preparation for anthesis. The species ranges from southern Chile to northern Mexico and occurs on Hispaniola.

A related species, *S. agrestis* Poepp. & Engl., may be expected in Panama. It differs in its achenes being square rather than ovate in cross section, in its usually succulent stems, and in its usually shorter outer series of involucre bracts. *Sigesbeckia jorullensis* is a species of upper elevations; *S. agrestis* is a species of lowlands.

CHIRIQUÍ: 2.7 mi NW of Río Chiriquí Viejo, W of Cerro Punta, Croat 22418 (MO). Bajo Chorro, Boquete District, 6000 ft, Davidson 150 (GH). Cerro Pando, valley of the upper Río Chiriquí Viejo, White 45 (MO).

69. SIMSIA

Simsia Pers., Syn. Pl. 2: 478. 1807. LECTOTYPE: *Coreopsis amplexicaulis* Cav. = *Simsia amplexicaulis* (Cav.) Pers.

?*Amania* Bert. ex. DC., Prodr. 5: 576. 1836. Based on *Hopkirkia fruticulosa* Spreng.
Barrattia A. Gray & Engelm., Proc. Amer. Acad. Arts 1: 48. 1846. TYPE: *B. calva* A. Gray & Engelm. = *Simsia calva* (A. Gray & Engelm.) A. Gray.
Encelia sect. *Simsia* (Pers.) A. Gray, Proc. Amer. Acad. Arts 19: 8. 1883.

Pubescent, branched, short-lived, erect *herbs*. *Leaves* opposite except near the inflorescence, mostly serrate, sometimes lobed, 3-nerved; petiolate with an interpetiolar ridge or auricles. *Inflorescence* loosely paniculate; peduncles elongate, ebracteolate. *Heads* radiate or discoid, subglobose; involucre bracts in about 3 series, imbricate, lanceolate, equal or not, sometimes alike, dorsally pubescent, 3-9-nerved, mostly indurate but often green; paleas scarious, stiff, acuminate, often pubescent upward, persistent, conduplicate and half-enfolding the flowers; receptacle flat or convex; ray florets several in 1 series, sometimes wanting, the corolla mostly yellow with a pubescent tube and an elliptical, emarginate limb, the androecium wanting, the style short and stout, the ovary sterile, trigonous, slender, often epappose; disc florets numerous, mostly yellow, the corolla with a short, pubescent tube and a cylindrical, 5-lobed limb, puberulent on the veins, slightly ventricose, the anthers with short appendages and usually stiff dorsal ascending hairs near the top of the connective, basally obtuse or subauriculate, the style branches slender, ascending-strigose, the style base expanded, elevated or (Robinson & Brettell) immersed in the nectary, the ovary fertile, laterally flattened. *Achene* flat, black, the margins thin but sometimes ciliate, the sides sometimes pubescent; pappus of 2 stiff, basally flattened, ascending-strigose bristles, rarely wanting.

Simsia includes perhaps 40 species ranging throughout tropical and warm temperate America. One species occurs in the Greater Antilles, and one species occurs in Panama. The relatively large, globose heads with numerous involucre bracts and the tomentose or velutinous leaves which usually dry dark gray-green are good features for recognition. The flat, black, 2-awned achenes are also distinctive.

Literature:

Robinson, H. & R. D. Brettell. 1972. Studies in the Heliantheae (Astereae).

II. A survey of the Mexican and Central American species of *Simsia*. *Phytologia* 24: 361-377.

1. *Simsia panamensis* H. Robinson & Brettell, *Phytologia* 24: 372. 1972. TYPE: Panama, *Standley* 25386 (US, not seen).—FIG. 71.

Erect, branched *herb* to 3 m tall; stems slender, drying striate, puberulent with 1 mm long, 5-6-celled, spreading, deciduous hairs and short, often glandular hairs. *Leaves* opposite except near the inflorescence, thin, softly tomentose or velutinous on each side with long simple hairs and stipitate glands, ovate or elliptical, sometimes sublobate, apically acute, basally obtuse to cordate, the margins serrate, drying dark gray-green, 3-nerved from the base or nearly so; petioles slender, to 3 cm long, the nodes with a manifest intrapetiolar ridge. *Inflorescence* an open panicle, the branching alternate, and the nodes subtended

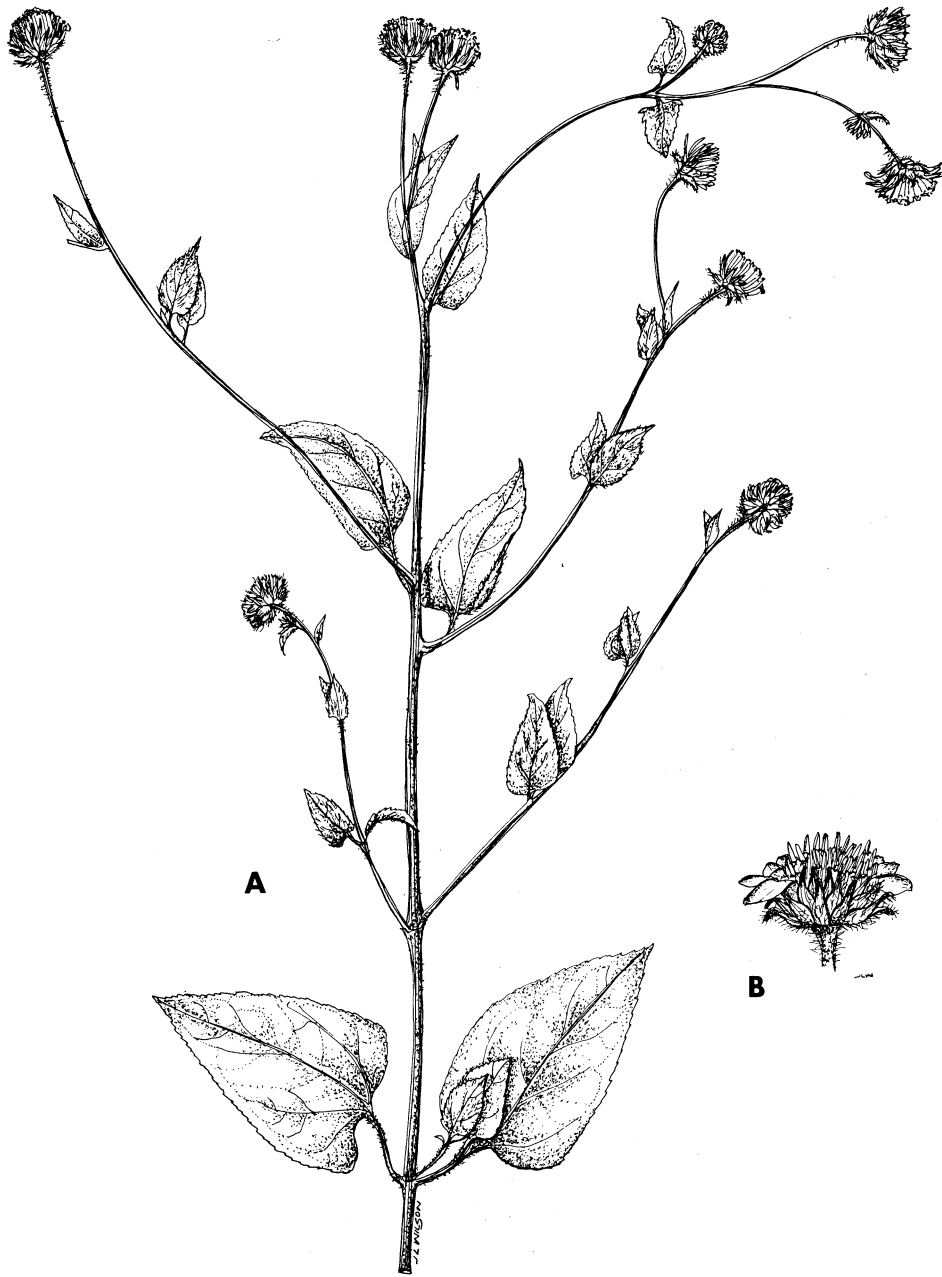


FIGURE 71. *Simsia panamensis* H. Robinson & Brettell—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 1\frac{1}{2}$). [After Blum 1866 (MO).]

by bracts which are smaller and narrower upwards. *Heads* radiate, subglobose, to 20 mm across, yellow; involucre bracts numerous in ca. 3 similar, imbricate series, lanceolate, 7–9 mm long, conspicuously 3–7-nerved, indurate but remaining at least partly dark green, dorsally pilose; receptacle convex; paleas scarious,

acuminate, dorsally pubescent upwards, sometimes mucronate, conduplicate and covering more than half of the floret; ray florets in 1 series, ca. 15 mm long, the corollas yellow, early deciduous, ca. 6 mm long, the tube pubescent, ca. 2 mm long, the limb elliptical, pubescent on the veins, emarginate, ca. 7 mm long, the ovary sterile, slender, 3-angled, glabrate, 5 mm long, epappose; disc florets numerous, 11 mm long, the corolla 6 mm long, the tube densely pubescent, the throat cylindrical, basally ventricose, the 5 lobes dorsally puberulent, the anthers yellow, ca. 3 mm long, with a few stiff ascending hairs arising near the apex of the connective, the appendages small, yellow, the base obtuse or subauriculate, the style branches elongate, ascending-pilose, the style base expanded-elliptical, elevated, the ovary laterally flattened with an apical stipe. *Achene* black, flat, 4 mm long, elliptical, the margins ciliate, the sides with a few hairs; pappus of two basally flattened strigose, stiff, 5 mm long awns.

This species may be recognized by its softly tomentose leaves, large size, globose yellow heads, and flat, black achenes. It is similar to *Simsia dombeya* DC. of Peru which differs in having achenes more than 6 mm long. Several species from neighboring areas, e.g., *S. polycephala* Benth. of Costa Rica may be conspecific, but no type material of these species has been seen. It differs from the similar *S. pubescens* Triana of South America in its narrower, pubescent involucre bracts. In Panama, most collections come from the Azuero Peninsula.

CANAL ZONE: Ancón Hill, *Greenman & Greenman 5109, 5119* (both MO). COCLÉ: Río Hato airstrip, *Burch et al. 1146* (GH, MO). Entrance to Río Hato air base, *Blum & Tyson 1866* (MO). Río Chico 4 mi W of Antón, *Tyson & Blum 2595* (MO). Near Penonomé, *Williams 242* (NY). HERRERA: Road from La Avena to outskirts of Pesé, *Burch et al. 1312* (GH, MO). 4 mi S of Los Pozos, *Tyson 2697* (MO). LOS SANTOS: 7 mi S of Chitré, *Croat 9699, 9703* (both MO). Salinas de Chitré, *D'Arcy & Croat 4165* (MO). Ca. 7 mi S of Chitré, *D'Arcy & Croat 4171* (MO). Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2982* (MO). 17.8 mi S of Macaracas, 1100 ft, *Lewis et al. 1616* (MO, GH). Monagre Beach, 5 mi SE of Chitré, *Tyson et al. 3024* (MO). 12 mi S of Macaracas, *Tyson et al. 3069* (MO). PANAMÁ: Near San Carlos, *Allen 1131* (MO). Punta Paitilla, *Heriberto 222* (NY); *Piper 5427* (NY). Road to Cerro Azul, 1600 ft, *Tyson 6329* (MO).

70. SPILANTHES

*Spilanthes*⁴⁶ Jacq., Enum. Pl. Carib. 8. 1760. TYPE: *S. urens* Jacq.

Erect or prostrate ephemeral (Panama) *herbs*, sometimes rooting at the nodes; stems fistulose, glabrous or pubescent. *Leaves* opposite, entire or shallowly toothed, glabrous or pubescent with short, simple hairs, sometimes with sessile glands, mostly 3-nerved from near the base; petiolate or cuneate and sessile. *Inflorescence* one or a few heads arising terminally, axillary to a pair of leaves; peduncles slender, elongate, ascending, drying striate or angled. *Heads* yellow (Panama), white or purplish, radiate or discoid, at first lenticular, becoming globose or elongate-conical; involucre bracts slightly imbricate in 1–2 similar series, lanceolate, oblong or ovate, apically rounded or obtuse, sometimes mucronulate, or with a narrow hyaline margin, 1–several-nerved, the midvein often basally prominent;

⁴⁶ For synonyms of *Spilanthes*, see Moore (1907).

receptacle conical or fusiform; paleas oblong, folded around the florets; ray florets when present few, in 1–2 series, sometimes showy, the tube short-pubescent, slightly expanded basally, the limb broad, 2–3-sinuate-toothed, the androecium lacking, the style branches slightly exerted, resembling those of the disc florets but smaller, the style base slightly expanded, the ovary strongly 2–3-angled with a convex dorsal surface, otherwise resembling those of the disc florets; disc florets numerous, the corollas often colored, tubular and slightly expanded in the upper portion or campanulate, the (4–)5 deltoid lobes often oblique to the tangential axis of the head, papillose on the dorsal surface, the tube glabrate basally swollen, the stamens (4–)5, the anthers mostly dark with deltoid, infolded appendages and coherent adjacent auricles, the style branches flattened, marginally papillose or ciliate, apically truncate and fringed, the style base stipitate, much expanded and filling the expanded corolla base, the ovary laterally compressed, lenticular to flat, obovate in outline, apically recessed at the region of corolla insertion, with a small umbo below the stylar base. *Achene* black, the exocarp transparent, the margins thin to massively thickened, ciliate, the sides elevated or flat, glabrous, pubescent, or tuberculate, the endocarp black, finely striate; pappus of 2–several slender bristles or wanting.

Spilanthes is a genus of about 50 species of tropical and temperate regions of the New and Old World and is best represented in America and Africa. The black seed with fine perpendicular striae and the easily removed, sometimes tuberculate, exocarp are reminiscent of *Eleutheranthera*, but other features, including the general shape of the achenes, are quite different.

A number of writers have reported *Spilanthes uliginosa* Swartz from Panama but such Panamanian material is referable to *S. alba* L'Her. *Spilanthes uliginosa* is smaller with narrower leaves. It is a species from the Greater Antilles.

Literature:

- Koster, J. T. & W. R. Philipson. 1950. Nomenclatural changes in *Spilanthes* and *Blainvillea* with remarks and a key to the species of *Spilanthes* in the Malay Archipelago. *Blumea* 6: 349–354.
- Moore, A. H. 1907. Revision of the genus *Spilanthes*. *Proc. Amer. Acad. Arts* 42: 521–569.
- Standley, P. C. 1928. Flora of the Panama Canal Zone. *Contr. U.S. Natl. Herb.* 27: 1–416.
- a. Achene margin massive, 4–10 cells wide on each side of the line of hairs; leaf apices obtuse or acute and mostly more than 3 cm long 4. *S. paniculata*
 - aa. Achene margin thin, 1–2 cells wide on each side of the line of hairs; leaf apices acute or acuminate, if obtuse, then leaves less than 3 cm long.
 - b. Ligules prominent, more than 8 mm long; receptacle more than 2 mm across at the base; heads becoming more than 8 mm across; upland plants 3. *S. oppositifolia*
 - bb. Ligules inconspicuous, less than 6 mm long; receptacle less than 1.5 mm across at the base; heads becoming less than 7 mm across; lowland plants.
 - c. Trailing plants; leaves mostly more than 3.5 cm long; ligules ca. 2 mm long, little exerted from the involucre bracts 2. *S. diffusa*
 - cc. Erect plants; leaves less than 3 cm long; ligules ca. 3 mm long, exerted about the length of the involucre bracts 1. *S. alba*

1. *Spilanthes alba* L'Her., Stirp. Nov. 7, *tab.* 4. 1784 (March, 1785). "*Spilanthus albus*." TYPE: Peru, Dombey, (G-DC-holotype, not seen, IDC G-DC 962, III, 5. "h Dombey, Musee de Paris 1833"; P, isotype).—FIG. 72D.

Bidens ocymifolia Lam., Encycl. Meth. 1: 416. 1783 (August, 1785). TYPE: Cultivated in Paris, received from Dombey, Peru (BM, "L'Heritier").

Spilanthes radicans Jacq., Coll. 3: 229. 1789 (1791). TYPE: Cultivated in Vienna, received from Venezuela, not seen.

S. exasperata Jacq., Ic. Pl. Rar. 3: 15, *tab.* 584. 1795. Renaming of *S. radicans* Jacq.

S. ocymifolia (Lam.) A. H. Moore, Proc. Amer. Acad. Arts 42: 531. 1907.

S. ocymifolia f. *radifera* A. H. Moore, Proc. Amer. Acad. Arts 42: 533. 1907. TYPE: Colombia, Smith 513 (NY, holotype, not seen; MO, isotype).

Erect, branched *herb* to 70 cm tall, sometimes rooting at the lower nodes; stems pilose with weak spreading hairs on emerging, soon glabrescent, often reddish, fistulose. *Leaves* opposite, ovate, to ovate-lanceolate, apically acuminate or rarely acute, basally obtuse or rounded, the margins entire or weakly serrate, glabrate; petiole 5–30 mm long. *Inflorescence* mostly a solitary head but sometimes a loose cluster of heads; peduncles slender, elongate, ascending and overtopping the leaves, to 9 cm long, glabrate. *Heads* 5–8 mm across, mostly radiate, becoming elliptical or conical, to 12 mm long; involucral bracts ca. 8, slightly imbricate, oblong, apically erose or mucronulate, the margins hyaline, the midvein darker than the lamina and basally impressed; receptacle fusiform, 5–7 mm long, basally 1 mm across; paleas stramineous, apically colored, enfolding the florets; ray florets few, inconspicuous, ca. 5 mm long, the corolla yellowish, ca. 3 mm long, the limb 3-nerved, apically truncate or obscurely 3-dentate, the tube ca. 1 mm long, pubescent on the 2 angles, the androecium wanting, the style branches drying dark orange, not evidently papillose, the style base expanded, stipitate above the ovary, the ovary strongly 3-angled, sparingly pubescent between the angles and sometimes inconspicuously tuberculate on the dorsal surface, otherwise resembling that of the disc florets; disc florets numerous, ca. 4 mm long, the corolla tubular, the 5 deltoid lobes oblique to the tangential axis of the head, papillose on the dorsal surface, the stamens 5, the anthers ca. 0.5 mm long with deltoid appendages and coherent adjacent basal auricles, the anther collar indistinct, the style branches yellow or orange, truncate and apically papillose-fringed, the style base globose, much expanded, the ovary laterally compressed, almost flat, obovate in outline with a small apical umbo below the style base. *Achene* black, 1.5 mm long, the pericarp transparent with a yellowish cast, the margins thin, long-ciliate, the testa black, shiny, finely striate; pappus of 2 weak bristles.

A species widespread in tropical America ranging from Mexico to Peru, *Spilanthes alba*, occurs in Panama as a weed of moist places at lower and middle elevations, and it appears to have some salt tolerance. Superficially much like *S. paniculata*, it is distinct in its thin achene margins, acuminate leaf apices, and longer disc corollas. The flower color is reported variously as yellow, yellowish-green, white, or greenish-white. This may be what Standley (1926) referred to as *S. uliginosa*.

CANAL ZONE: Barro Colorado Island, Croat 7468, 7782 (both MO). Madden Dam, Dwyer 3039 (MO). Chagres, Fendler 166 (MO). Cerro Galera ca. 2 km from Pacific Ocean, 350–400 m, Gentry 6656 (MO). COCLÉ: Below Cerro Pilón, Croat 13460 (MO). El Valle de Antón,

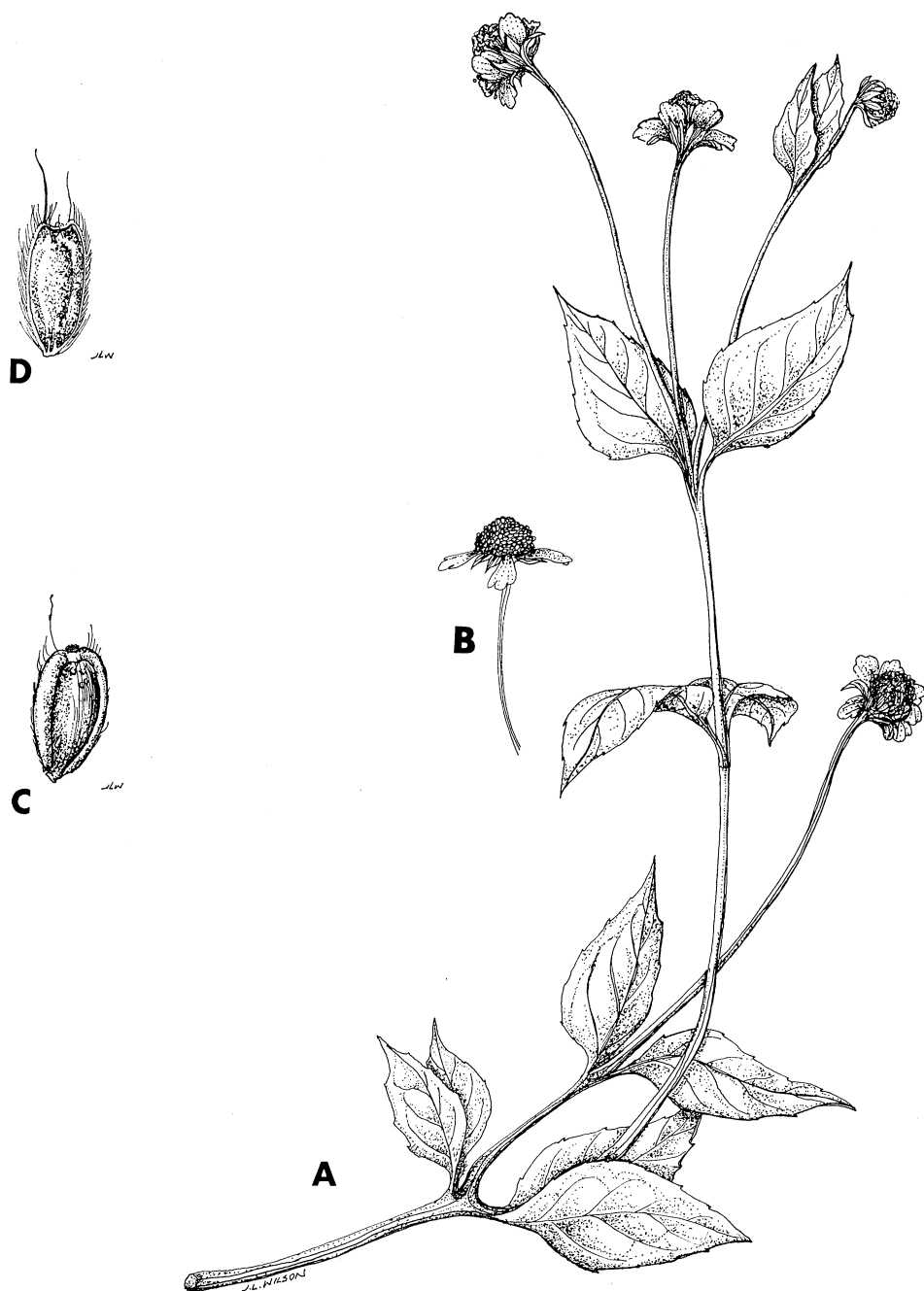


FIGURE 72. *Spilanthes*.—A–B. *S. oppositifolia* (Lam.) D'Arcy.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times \frac{1}{2}$). [After *Partch 69-11* (MO).]—C. *S. paniculata* Wall. ex DC. Achene ($\times 7\frac{1}{2}$). [After *Burch et al. 1059* (MO).]—D. *S. alba* L'Her. Achene ($\times 15$). [After *Tyson 6440* (MO).]

1000–2000 ft, *Lewis et al.* 2533 (MO). COLÓN: 6 mi SW of Portobelo, *Wilbur & Luteyn* 11659 (MO). Agua Fria, ca. 8 mi N of Santa Fe, 50 m, *Duke* 10106 (MO). HERRERA: Near Océ, 100 m, *Allen* 4046 (MO). LOS SANTOS: Monagre Beach, 5 mi SE of Chitré, *Tyson et al.* 3054 (MO). 12 mi S of Macaracas, *Tyson et al.* 3059 (MO). PANAMÁ: Taboga Island, *Allen* 139 (MO). Road to Cerro Jefe beyond Goofy Lake, *Correa et al.* 570 (MO, US). Isla del Rey, *Duke* 9509 (MO). Isla Esperitu Santo, *Duke* 10436 (MO). Road to Cerro Jefe, 2–3 mi S of Goofy Lake, 2000–2200 ft, *Lewis et al.* 245 (MO, NY, US). SE slope of Cerro Campana, *Lewis et al.* 3152 (MO). Cerro Campana, 2500 ft, *Tyson* 6440 (MO). Ca. 9 km SE of El Valle de Antón, *Wilbur et al.* 11167 (MO, US). VERAGUAS: 8 mi W of Santiago, *Tyson* 6089 (MO).

2. ***Spilanthes diffusa*** Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 50. 1843. TYPE: Peru, *Poeppig* 1206 (W, not seen, MO, photo).

Ceratocephalus diffusus (Poepp. & Endlich.) Kuntze, Rev. Gen. Pl. 1: 326. 1891.

Spilanthes ciliata var. *diffusa* (Poepp. & Endlich.) A. H. Moore, Proc. Amer. Acad. Arts 42: 539. 1907.

Prostrate or somewhat ascending, decumbent *herb*; stems glabrous to pilose. *Leaves* opposite, ovate, 7–25 mm long and 7–12 mm wide, apically obtuse or acute, basally rounded or short acuminate, the margins shallowly callose-serrate, glabrous to sparingly pubescent, reticulate veined beneath; petiole 2–3 mm long, mostly sparingly pubescent. *Inflorescence* one or two heads arising terminally, between a pair of leaves; peduncles 5–10 cm long, slender, ascending, glabrate, drying striate. *Heads* radiate, 4–6 mm tall, 7–10 mm across including ligules, becoming ellipsoidal or conical; involucre bracts ovoid, 2–3 mm long, short-ciliate, several ribbed; receptacle cylindrical-fusiform, ca. 10 mm long, 1 mm wide; paleas with streaks of orange-yellow, enfolding the florets; ray florets ca. 8, reportedly yellow but drying whitish, ca. 6 mm long, the ligule 3 mm long, 2 mm wide, apically 2–3-sinuate-dentate, the tube 2.5 mm long, pilose with ascending hairs outside, the style branches reduced, the style base expanded and discontinuous from the ovary, the ovary 3-angled, otherwise resembling that of the disc florets; disc florets numerous, ca. 3 mm long, the corolla tubular, 1.5 mm long, the lobes deltoid, somewhat oblique to the tangential axis of the head, minutely papillose on the dorsal surface, the tube glabrate, the anthers black, ca. 1 mm long with short-deltoid appendages and coherent adjacent auricles (?minutely tailed), the anther column little thickened, the filaments expanded below the collar, the style branches drying orange, apically truncate, the style base hemispherical, filling the corolla tube and stipitate above the ovary, the ovary laterally compressed, obovate in outline with a small umbo below the style base. *Achene* black, 1.5 mm long, lenticular, the exocarp transparent with a yellowish cast, the margins thin, long ciliate, the endocarp black, fine striate; pappus of 2–several weak bristles.

This species occurs sporadically in tropical America and is known in Panama from only two collections. It is distinct in its small, shortly but distinctly petiolate, blunt-tipped leaves and its trailing habit. It may not be distinct from species of the genus occurring in other areas, but it is distinct in the Panamanian flora. Assignment of the name *S. diffusa* to this taxon is not without question. The specimen of *Seibert* 471 at Kew was annotated by A. H. Moore as *S. americana* (Mutis) Hieron.

COCLÉ: El Valle de Antón, 500–700 m, *Seibert 471* (K, MO). HERRERA: Ocú, *Ebinger 1052* (MO).

3. *Spilanthes oppositifolia* (Lam.) D'Arcy, comb. nov.—FIG. 72A–B.

Anthemis americana Mutis ex L.f., Suppl. Pl. 378. 1781, not *A. americana* L., Sp. Pl. 895. 1753.

TYPE: Colombia, *Mutis* (LINN 1016.32).

A. oppositifolia Lam., Encycl. Meth. 1: 576. 1783 (1785). TYPE: not seen.

Spilanthes americana (L.f.) Hieron in Sodiro, Bot. Jahrb. Syst. 29: 42. 1901 (1900).

?*S. macrophylla* Greenman, Proc. Amer. Acad. Arts 39: 109. 1903. TYPE: Costa Rica (not seen).

Erect or sprawling branched *herb* to 1 m tall; stems pilose with weak spreading hairs, mostly glabrescent, often reddish, the lower nodes with a prominent interpetiolar ridge, fistulose. *Leaves* opposite, ovate to ovate-lanceolate, apically acuminate or occasionally acute, basally obtuse or rounded, to 10 cm long, entire or weakly serrate, glabrate; petiole to 3.5 cm long, apically narrowly winged. *Inflorescence* one or two heads arising terminally between a pair of leaves; peduncles slender, to 15 cm long, weakly ascending, glabrate. *Heads* radiate, 9–15 mm across exclusive of ligules, becoming ellipsoidal and then conical, to 15 mm long; involucre bracts ca. 8, slightly imbricate, 5–6 mm long, oblong or lanceolate, apically erose, the margins hyaline, the midvein basally prominent, other venation indistinct; receptacle narrowly conical or fusiform, 7–10 mm long, basally 3 mm across; paleas stramineous, enfolding the floret, apically yellow; ray florets few, ca. 15 mm long, the corolla showy yellow, the ligule 4–5 mm wide, apically 2-dentate, the tube ca. 3 mm long, sparingly pilose outside, the androecium wanting, the style branches like those of the central florets but shorter, the style base only slightly expanded, discontinuous from the ovary, the ovary 3-angled, otherwise resembling that of the disc florets; disc florets numerous, 4–5 mm long, the corolla tubular-campanulate, the 5 deltoid yellow lobes oblique to the tangential axis of the head, minutely papillose-granular on both sides, the tube glabrate, basally expanded and inserted into the ovary apex, the anthers black, 1–1.2 mm long, with short-deltoid, infolded, apical appendages and coherent adjacent basal auricles, the style branches flattened, marginally papillose, truncate and apically papillose-fringed, the style base hemispherical, much expanded and discontinuous from the ovary, the ovary laterally compressed, flat to lenticular, obovate in outline with a small apical umbo below the style base. *Achene* black, 2 mm long, the exocarp transparent with a yellowish cast, the margins thin, long ciliate, the endocarp black, shiny, finely striate; pappus wanting.

Spilanthes oppositifolia is widespread in temperate and tropical America ranging from Missouri and the Carolinas on the north at least as far south as Catamarca in Argentina. A number of varieties have been proposed but the range of variability of *S. oppositifolia* and the taxonomy of its close relatives are not sufficiently understood to recognize infraspecific taxa at present. In Panama the species is known only in the Chiriquí mountains. It is distinct from other Panamanian members of the genus in the large size of the flower heads and ligules.

Selection of the name used here is based on the synonymy presented by Moore (1907).

CHIRIQUÍ: Nueva Suiza, *Croat 13503* (MO). N of Audubon Cabin, *Croat 13630* (MO). Above Boquete, 5200 ft, *D'Arcy & D'Arcy 6376* (MO). Above Cerro Punta on slope of Cerro Respinga, 8000 ft, *D'Arcy & D'Arcy 6523* (MO). Bajo Chorro, Boquete District, 6000 ft, *Davidson 148* (MO). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9017* (MO). Mountains N of Cerro Punta, *King 5302* (US). Along Río Caldera S of El Boquete, 1250 m, *Killip 3612a* (US). Alto Linio, 4000 ft, *Maurice 878a*, 893 (both US). Nueva Suiza, *Partch 69-11* (MO). Cerro Punta, 5500 ft, *Sawyer 1967* (MO). Bajo Mona, mouth of Quebrada Chiquero along Río Caldera, 1500–2000 m, *Woodson et al. 1002* (MO).

4. *Spilanthes paniculata* Wall. ex DC., Prodr. 5: 625. 1836. TYPE: not seen.—FIG. 72C.

Ascending *herb* to 40 cm tall, sometimes rooting at the lower nodes; stems often reddish on emerging, with weak, spreading white hairs or glandular trichomes, soon glabrescent. *Leaves* opposite, ovate, 1.5–7 cm long, apically obtuse to acute but seldom acuminate, basally rounded or truncate, shallowly serrate, sparingly pubescent with spreading white hairs; petioles 4–30 mm long. *Inflorescences* of single or paired, ascending heads on slender peduncles mostly overtopping the foliage. *Heads* 6–8 mm across, radiate, becoming elliptical or conical, to 12 mm long; involucral bracts several, slightly imbricate, 3–5 mm long, oblong or ovate, marginally erose or entire, apically acute, obtuse or rounded-erose, several-nerved, a pair of elevated indurated lines often flanking the depressed midvein; ray florets few, inconspicuous, 4–5 mm long, the corolla yellowish, ca. 3 mm long, the limb as broad as long, apically 2–3-sinuate-dentate, the tube pubescent, ca. 1 mm long, the style branches yellowish, the style base slightly expanded, stipitate above the ovary, the ovary with two prominent angles and the dorsal surface strongly convex, otherwise resembling that of the central flowers; disc florets numerous, ca. 3 mm long, the corolla campanulate, 1.5–2 mm long, the 5 lobes slightly oblique to the tangential plane of the flower and conspicuously papillose on the dorsal surface, the tube indistinct, glabrous, basally expanded and inserted into the depressed ovary apex, the anthers ca. 0.8 mm long, the appendages deltoid, infolded, the adjacent auricles coherent, narrow, the anther collar thicker than the filament, the style branches flattened, sometimes not papillose on the margins, apically truncate, papillose, the style base globose, stipitate above the ovary. *Achene* 2 mm long, compressed-lenticular, ovate in outline, the pericarp transparent, massively thickened and ciliate at the margins, sparingly pubescent and tuberculate on the sides near the apex, endocarp black, shiny, finely striate; pappus of 2–3 weak, minutely strigose awns, sometimes wanting.

A species widespread in warm portions of the Old World, *Spilanthes paniculata* occurs in Panama as a weed of lowland towns and ruins. It also occurs in Bolivia at middle elevations. Superficially much like *S. alba*, this species is distinct in a number of inconspicuous details, including the less sharply pointed leaf apices, the shorter and broader corollas of the florets, and the thicker achene with its massively thickened margins.

CANAL ZONE: Fort San Lorenzo, *Burch et al. 1042* (MO, NY); *Porter et al. 5010* (MO); *Tyson & Blum 3699* (MO). DARIÉN: Around El Real, *Burch et al. 1059* (MO). Río Pirre, 2–5 mi above El Real, *Duke 4901* (MO). Río Pirre, ca. 10 mi S of El Real, *Duke 5411* (MO).

71. TITHONIA

Tithonia Desf. ex Juss., Gen. Pl. 189. 1789. Based on Desf., Ann. Mus. Natl. Hist. Nat. 1: 49, *tab.* 4. 1802 (delivered 1780). TYPE: *T. tagetiflora* Desf. = *T. rotundifolia* (Miller) Blake.

Mirasolia (Schultz-Bip.) Benth. & Hook.f., Gen. Pl. 2: 367. 1873. TYPE: *Tithonia calva* Schultz-Bip.

Urbanisol Kuntze, Rev. Gen. Pl. 1: 370. 1891. TYPE: *U. tagetiflorus* (Desf.) Kuntze = *Tithonia rotundifolia* (Miller) Blake.

Large *herbs* or *shrubs*, glabrate to scabrous or villous-sericeous, mostly sprawling or wide-branching. *Leaves* alternate, sometimes opposite below, simple, entire or 1-4-arcuate-lobed, the margins sometimes crenate or irregularly denticulate, mostly apically acuminate or acute, basally narrowed or rarely sessile, scabridulous to villous, the petiole base sometimes expanded and auriculate or decurrent on the stem. *Inflorescence* an undifferentiated panicle-like group of terminal heads, rarely solitary; peduncles elongate, apically expanded and fistulose, drying striate, sometimes with one or more foliaceous bracts along the length. *Heads* large and showy, radiate; involucral bracts in several equal or unlike series, indurated and many nerved, the innermost series rounded, obtuse or short acuminate; paleas hyaline, exceeding the achenes and completely enfolding them; ray florets several in one series, the ligules yellow or orange, elongate, 1-4-denticulate, dorsally puberulent, glabrous inside, the style and staminodes mostly wanting, the ovary abortive, flat or slightly triquetrous, often glabrous; disc florets numerous, 5-merous, the corollas tubular, puberulent outside, the teeth cuculate, colored with thickened margins and tomentose outside, basally contracted, the anthers black, the appendages yellow, expanded, cordate, somewhat infolded, the thecae connate, basally auriculate, the filaments flattened, puberulent, inserted low in the corolla tube, the ovary fertile, the style branches flattened, apically delineated from the appendage by a tuft or row of dorsal hairs, the style base sometimes a much enlarged bulb, slightly immersed in the nectary, the nectary peltate-cupuliform, the margin irregular, smooth. *Achene* compressed, obconical, gray or black, glabrous or pilose; carpopodium oblique, conspicuous or not; pappus wanting or (in our species) of two stout, persistent awns and a series of broad, apically erose scales.

The two species present in Panama are recognizable by their large aspect, showy flowers, lobed, scabridulous leaves, and by their mostly flattened, greyish, pilose achenes bearing awns and scales. One of these two species is widely grown for ornament and is naturalized in many tropical countries. The genus is native to tropical Mexico, Central America, and the Antilles and comprises about a dozen species. At least two elements are present in this genus; a group including those in Panama with pilose achenes with well-developed pappus and inconspicuous carpopodium, and a group with glabrous, often mottled achenes lacking pappus and having enlarged carpopodia. Species of both groups are present in Costa Rica.

Literature:

Blake, S. F. 1921. Revision of the genus *Tithonia*. Contr. U.S. Natl. Herb. 20: 423-436.

- a. Outer involucre bracts less than half as long as the inner bracts, the outer bracts ovate, apically obtuse or short acuminate; ligules 4–5 cm long 1. *T. diversifolia*
 aa. Outer involucre bracts about as long as the inner bracts, the outer bracts acute; ligules 2–3 cm long 2. *T. rotundifolia*

1. ***Tithonia diversifolia***⁴⁷ (Hemsl.) A. Gray, Proc. Amer. Acad. Arts 19: 5. 1883.

Mirasolia diversifolia Hemsl., Biol. Centr. Amer., Bot. 2: 168, tab. 47. 1881. TYPE: not seen.

Large, shrublike *herb* to 2 m tall; stems drying green, striate, puberulent. *Leaves* alternate, ovate, or cuneiform, apically acuminate or acute, basally acuminate, entire and 2–3-lobed, the lobes acute with broad, rounded sinuses, the margins often crenate, darker and scabridulous above with short, stout, hairs, some with multicellular bases, beneath glandular and with weak white rugose hairs; petiole slender, basally clasping, often auriculate. *Inflorescence* of solitary or clustered terminal heads on elongate, apically expanded, striate, puberulent peduncles 8–15 cm long. *Heads* radiate, large and showy; involucre 25–40 mm across, the bracts in several series of at least 2 different sizes, broadly ovate and prominently veined, the outermost to 10 mm long, apically short acuminate or acute, the innermost twice as long, apically acute, obtuse or rounded; paleas hyaline, completely enclosing the ovary; ray florets several in one series, the ligules 4–5 cm long, apically 2–3-dentate, puberulent outside, drying with conspicuous nerves, the tube 2 mm long, the ovary abortive, 4 mm long, triquetrous, pilose, with a well-developed pappus; disc florets numerous, ca. 15 mm long, the corolla tubular, pubescent outside, the lobes yellow, narrowly obtuse with thickened, dorsally pubescent margins, the anthers black, 5 mm long, the apical appendages yellow, expanded and slightly enfolded, the basal auricles connate, the filaments flattened, ventrally puberulent, the ovary fertile, the style branches flattened, pubescent on both sides and tomentose dorsally at the base of the narrow appendage, the style base bulbous, 0.5 mm across, the nectary stipitate, crateriform, enclosing the base of the stylar bulb. *Achene* body 5 mm long, flat, somewhat triquetrous, the endocarp blackish, appearing grey under the dense ascending white indumentum; carpophodium inconspicuous; pappus of two sturdy, persistent, 5 mm long awns and a ring of broad, 2–3 mm long, distinct scales.

The broad involucre bracts of widely differing sizes distinguish this species from *Tithonia rotundifolia*. Cultivated for ornament, it occurs naturally in several parts of Panama. It is native to Mexico and Central America and is naturalized in many other tropical countries.

COCLÉ: Near El Valle de Antón, Croat 13296 (MO). El Valle, 2000 ft, Tyson & Godfrey 2467 (US). PANAMÁ: Between Chorrera and Capira, Tyson 6427 (MO, NY).

2. ***Tithonia rotundifolia*** (Miller) Blake⁴⁸, Contr. Gray Herb. 52: 41. 1917.—FIG. 73.

Tagetes rotundifolia Miller, Gard. Dict., ed. 8. 1768. TYPE: Chelsea Garden, Miller (BM).

⁴⁷ For a list of synonyms see Blake (1921). Only the listed names have been used for Panamanian material.

⁴⁸ For a list of synonyms see Blake (1921). Only the listed names have been used for Panamanian material.

Large, shrublike, short-lived *herb* to 4 m tall; stems drying green or brown, striate, puberulent. *Leaves* to 35 cm long, ovate or cuneiform, sometimes broadly so, apically and basally acuminate, entire or 3-5-lobed, the lobes ovate with obtuse sinuses, the margins mostly crenate, scabridulous above with short stout hairs and occasional glands, softly pubescent beneath with stout, arching, verrucose hairs; petiole elongate, winged in the upper portion, basally clasping the stem. *Inflorescence* of solitary or clustered terminal flowers on elongate apically expanded, striate, puberulent peduncles 8-20 cm long with one or more large or small foliaceous bracts along their length. *Heads* large and showy, radiate; involucre bracts 20-30 mm across, in several subequal series, 10-15 mm long, indurated, many nerved, whitish puberulent, the outermost slightly longer, acute, the innermost obtuse or short acuminate; paleas hyaline, dorsally puberulent, completely enclosing the achene; ray florets several in one series, the ligules yellow or orange, 2-3 cm long, minutely 1-2-notched, puberulent outside, drying with conspicuous veins, staminode sometimes present, the ovary abortive, ca. 3 mm long, flat but faintly 3-angled, glabrous, the pappus of scalelike awns and a ring of short hairs; disc florets numerous, ca. 10 mm long, the corolla tubular, pubescent on the veins outside, the lobes yellow, cuculate with the thickened margins, dorsally papillose-pubescent, the anthers black, 4 mm long, the appendages yellow, expanded and slightly enfolded, the basal auricles connate, the filaments flattened, minutely puberulent, the ovary fertile, the style branches flattened, ventrally puberulent with a tuft of hairs at the base of the short, narrow appendage, the style base slightly expanded, the nectary stipitate, crateriform with irregular margins, enclosing the base of the style. *Achene* body 5-6 mm long, flat, the endocarp blackish, appearing gray under the weak, white, ascending indumentum; carpophodium inconspicuous; pappus of two sturdy, persistent 3-5 mm long awns and a ring of broad, distinct, 2-3 mm long scales.

The acute outer involucre bracts which equal or slightly exceed the inner series are a good feature distinguishing this species from the larger-flowered, longer-lived *Tithonia diversifolia*. It is a native of Central America and the Antilles and has the widest native range of any member of the genus.

CHIRIQUÍ: 1 km W of La Repressa, Quebrada Guanabanito, *Busey 477* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5218* (MO). HERRERA: Near Chitré, *Allen 1106* (MO). PANAMÁ: Isla Taboga, *Allen 1286* (MO). 3 mi beyond turnoff to Cerro Azul, *Croat 13008* (MO). Hills between Capira and Potrero, 80-130 m, *Dodge & Hunter 8647* (MO). Cerro Azul, *Dwyer 2182* (MO). Road to Cerro Azul, 500 ft, *Tyson 6330* (MO).

72. VERBESINA

Verbesina L., Sp. Pl. 90. 1753; Gen. Pl., ed. 5. 384. 1754. TYPE: *V. alata* L.

Herbs, shrubs or *trees*, rarely prostrate; stems glabrous or pubescent, in some species 2-6-winged by concaulescence of the petiole bases. *Leaves* alternate (in Panama) or opposite, dentate or lobed, rarely entire, mostly pubescent, sometimes scabrous; petioles sometimes winged or auricled, sometimes fused in part with the stem and forming wings. *Inflorescences* mostly several-many-headed, mostly open panicles; bractlets mostly minute, situated along the length or subtending



FIGURE 73. *Tithonia rotundifolia* (Miller) Blake.—A. Habit ($\times \frac{1}{2}$). [After Tyson 5218 (MO).]—B. Head ($\times \frac{1}{2}$). [After Tyson 6427 (MO).]

the heads and resembling involucre bracts. *Heads* large or small, mostly radiate, of various shapes; involucre bracts narrow in 2–6 graduated, more or less similar series, mostly much shorter than the paleas, the outermost bracts rarely the longest; paleas mostly resembling the involucre bracts but narrower and longer, the

apices various, enfolding the disc florets; ray florets mostly yellow or white, the limb broad, denticulate, the tube relatively long, often pubescent, the ovary mostly fertile, laterally compressed; disc florets numerous, the corolla tubular, 5-merous, the tube short and mostly poorly demarcated from the limb, the anthers appendaged, basally obtuse or auriculate, the style branches dorsally pubescent, sometimes apically penicillate with a short or long, deltoid, pubescent apical appendage, the two stigmatic lines often evident, the style base sometimes expanded, sessile on the cylindrical nectary, the ovary mostly fertile, ciliate, pubescent or glabrous, laterally compressed, lenticular, the pappus mostly of two, sometimes unequal, strigose awns. *Achenes* mostly black and broadly winged with two apical, strigose awns, the body or wings sometimes pubescent, the body sometimes tuberculate, the outermost achenes sometimes distinctive.

A commonly represented but poorly understood American genus of more than 100 species, *Verbesina* is distinguished by its compressed, winged achenes with their two apical awns. The ovary is usually stipitate. Several attempts have been made to segregate various elements into distinct genera, but these have not been accepted, and in the current century, little has been done to clarify the taxonomy of the group as a whole. In Panama, all species are shrubs or trees with alternate leaves, and the involucre bracts are short and narrow in 2-3 series.

- a. Leaves mostly lobed.
 - b. Stems glabrate 2. *V. gigantea*
 - bb. Stems copiously pubescent.
 - c. Stems in inflorescence area winged by concaulescent petiole bases; leaves scabridulous above 7. *V. turbacensis*
 - cc. Stems not winged, or if so, only below the inflorescence area; leaves strongly scabrous above 6. *V. sublobata*
- aa. Leaves denticulate or entire, not lobed.
 - d. Leaves scabrous above 6. *V. sublobata*
 - dd. Leaves glabrate above.
 - e. Heads more than 10 mm across; leaves large, more than 20 cm long and 5 cm wide 1. *V. fuscascicans*
 - ee. Heads less than 10 mm across (excluding rays); leaves smaller, narrower.
 - f. Involucre bracts acute; leaf midvein glabrous beneath 3. *V. guatemalensis*
 - ff. Involucre bracts obtuse or rounded; leaf midvein puberulent beneath.
 - g. Involucre bracts less than 3 mm long; disc corollas glabrous; pubescence of young stems all appressed 5. *V. oerstediana*
 - gg. Some involucre bracts more than 3 mm long; disc corollas basally pilose; young stems with some loose, spreading hairs 4. *V. lanata*

1. *Verbesina fuscascicans* D'Arcy, *Phytologia* 30: 6. 1975. TYPE: Panama, *Croat* 27091 (MO).

Shrub to 2.5 m tall; stems stout, soft, finely striate, tomentose, glabrescent, light brown or yellowish. *Leaves* alternate, oblanceolate or obovate, to 30 cm long, 10 cm wide, apically short acuminate, basally acuminate into the winged petiole, the margins entire or denticulate, slightly revolute, veins ca. 9 on each side of the midvein, excurrent and contrasting beneath, less prominent above, glabrate, sparingly pubescent on the veins beneath, shining above, drying dark brown or green and contrasting with the stem; petioles 5-6 cm long, broadly winged, abruptly contracted at the very base. *Inflorescence* a condensed, cymose panicle

to 15 cm across, foliose bracts distributed through the branches; pedicels short or long (to 9 cm long), tomentulose with short, weak hairs. *Heads* ca. 2 cm across, globose; involucre bracts numerous, of two distinct forms, the outer series in 2–3 whorls, oblong, costate, ciliolate, with slightly expanded, green, rotund tips, the inner series in about 1 whorl, slightly longer, narrower, apically acute; paleas ca. 10 mm long, folded around the floret, the costa extended in a thin, ciliate wing, apically dark and the acute tip slightly outcurving; ray florets several, the corolla ca. 10 mm long, the tube tomentose, curved, the ligule narrow, apically entire or cuculate, the style branches linear, pubescent, the ovary fertile, laterally flattened, the margins corneous-ciliate, in part narrowly winged; disc florets numerous, ca. 11 mm long, the corolla shallowly lobed, ca. 7 mm long, the tube narrow, the base of the limb abruptly expanded, the anthers black, ca. 3 mm long, the appendages black, the basal auricles crumpled, the style branches fusiform, pubescent, the base expanded into a cylinder emersed in the urceolate nectary, the ovary fertile, flattened, ciliate but otherwise glabrous. *Achene* black, 5 mm long, flat, apically recessed, the margins ciliate and narrowly winged; carpodium not evident; pappus of two short, stout strigose awns.

This species is distinctive in its large leaves which dry dark, contrasting with the light colored stems, in the nectary on the ovary which is large and urceolate, and in the ciliate margins of the achenes. The achene (immature in all material seen) resembles achenes of *Spilanthes*. It is likely that these margins expand and become broad wings with maturity.

Verbesina fuscasiccans is known only from two collections taken on Cerro Jefe, a hill northeast of Panama City.

PANAMÁ: E slope of Cerro Jefe, 2700 ft, *Blum & Dwyer 2189a* (MO). Campo Tres beyond Cerro Jefe, 700 m, *Croat 27091* (MO).

2. ***Verbesina gigantea*** Jacq., Coll. 1: 53. 1787; Ic. Pl. Rar. 1: 17, *tab. 175*. 1784.

TYPE: not seen.

V. myriocephala Schultz-Bip. in Klatt, Leopoldina 23: 144. 1887. TYPE: Mexico, *Liebman 271* (C, not seen, US, fragment, MO, photo).

Erect, branched *herb* to 3.5 m tall; twigs strongly angled and pubescent, soon glabrate, terete and finely striate. *Leaves* alternate, to 20 cm long, often 3–7-lobed more than halfway, the margins often minutely callose-denticulate, darker and sometimes scabridulous above, softly tomentose beneath, the venation elevated and reticulate beneath; petiole broadly winged to the base, basally auricled. *Inflorescence* a large, many-headed cymose panicle to 30 cm across; peduncles and rachis puberulent, soon glabrescent, sharply angled when young, soon terete and finely striate; bracteoles linear, those near the heads minute, scalelike, resembling the bracts of the involucre. *Heads* mostly radiate, small, 6–7 mm tall, 4–5 mm across; involucre bracts in 2–3 graded series, appressed, ciliate, dorsally pubescent, apically acute; paleas enfolding the flowers, scarious, apically acute, pubescent; ray florets few, ca. 7 mm long, the corolla limb deeply lobed, the tube pilose, the ovary ciliate, laterally compressed, stipitate, the pappus of two strigose awns; disc florets ca. 6 mm long, tubiform, the limb glabrous, the tube

pilose, constricted medially, the anthers auriculate, dark, the appendages dark, the style branches slender, minutely appendaged, the style base slightly expanded, sessile on a large, orange nectary, the ovary stipitate-fusiform, laterally compressed, ciliate, the pappus of two awns as long as the corolla tube. *Achene* body black, 5 mm long, with scattered brownish hairs, not tuberculate, broadly winged; pappus of two strigose awns ca. 2 mm long.

This species is similar to *Verbesina turbacensis* but may be distinguished by its glabrate unwinged stems and auricled leaf-bases. "Cerbatana."

CANAL ZONE: Ca. 4 mi S of Fort Sherman, *Blum & Tyson* 2012 (MO). Near W end of Gatún Lake dam, *Blum & Tyson* 1979 (MO). Barro Colorado Island, *Croat* 4387 (MO). Road C21 near Police Lodge, *Croat* 12994 (MO). Balboa Heights, *Greenman & Greenman* 5029 (MO). Ancón Hill, *Greenman & Greenman* 5111 (MO). Near Corozal, *Greenman & Greenman* 5190 (MO). 2 mi N of Paraiso, *Lazor & Blum* 5230 (MO). Between Corozal and Ancón, *Pittier* 2164 (NY, US). Barro Colorado Island, *Shattuck* 399 (MO); *Wetmore & Abbe* 117 (MO). COCLÉ: Road to El Cope from Interam. Hwy., *Burch et al.* 1371 (MO, NY, US). COLÓN: Santa Rita, 200–300 m, *Gómez-Pompa et al.* 2979 (MO). PANAMÁ: Cerro Azul, *Croat* 13025 (MO). Tocumen Airport, *Dwyer* 1967 (MO). Goofy Lake to ca. 9 mi S toward Cerro Jefe, *Dwyer* 7051, 7058 (both MO). SE slope of Cerro Campana, *Lewis et al.* 3137 (MO, NY). Cerro Jefe, 2700–3000 ft, *Tyson et al.* 3325 (MO). Road from Cerro Azul to Cerro Jefe, 2400 ft, *Tyson* 6319 (MO).

3. *Verbesina guatemalensis* B. L. Robinson & Greenman, Proc. Amer. Acad. Arts 34: 550. 1899. TYPE: Guatemala, *Donnell Smith* 2860 (GH, not seen).

Herb or weak *shrub* to 2.5 m tall; stems soft, finely striate, sometimes with conspicuous, elongate lenticels, soon glabrate, unwinged. *Leaves* alternate, lanceolate or oblanceolate, subentire, the margins sometimes irregularly sinuate, apically acute or acuminate, basally narrowed to the base, darker above and scabridulous, punctate with short white hairs, the lateral venation not prominent, beneath velutinous with small verrucose hairs; petiole wanting, auricles rotund, small but manifest. *Inflorescence* a many-headed, flat-topped, open panicle to 30 cm across; bracts becoming spatulate upwards, the bractlets linear, variously situated but sometimes subtending the head and resembling involucre bracts; peduncles angled, pubescent. *Heads* radiate or discoid, to 9 mm long (in Panama); involucre bracts appressed, ciliate, to 6 mm long, indurate and cuculate below, the apex acute or acuminate, sometimes slightly expanded or reflexed; paleas ca. 6 mm long, folded over the disc florets, ciliate on the keel and apex; ray florets few, the corolla white, rectangular, 3 mm long, 3-nerved, truncate, 3-lobed, the tube ca. 2 mm long, pilose, the ovary laterally compressed, pyriform, the narrowed basal portion forming a stipe, ciliate, with two short, strigose awns; disc florets 20–25, 5–6 mm long, the corolla 3–4 mm long, the basal $\frac{2}{3}$ pilose, the tube not demarcated from the 5-lobed limb, the anthers black, the appendages dark, the style branches not expanded, apically appendaged, dorsally pubescent, the style base not expanded, subsessile on the ellipsoidal, 0.5 mm long nectary, the ovary laterally compressed, ciliate on the angles, the awns half as long as the corolla, slightly unequal. *Achene* body (Robinson & Greenman) 5 mm long, tuberculate, especially along the prominent midnerve; pappus awns 2, long, slender, equal.

This species is similar to *S. gigantea* but the leaves are not lobed. The heads of the single Panamanian collection are somewhat smaller than those seen from Nicaragua and Honduras.

CANAL ZONE: Road K-10D N of Arraiján, *Croat 15133* (MO).

4. ***Verbesina lanata*** B. L. Robinson & Greenman, Proc. Amer. Acad. Arts 34: 558. 1899. TYPE: Guatemala, *Tuerckheim 1344* (MO, US).

Shrub or *tree* to 4 m tall; twigs stout, tomentose with elongate, ascending, mostly appressed, yellowish brown hairs. *Leaves* alternate, elliptic or lanceolate, acuminate at both ends, veins 6–7 on each side of the midvein, conspicuously elevated and fine-reticulate beneath, glabrescent above, pilose beneath, tomentose on the veins, drying with a dusty brown appearance; petioles stout, 1–5 mm long, narrowly winged but more or less distinct from the blade. *Inflorescence* a large, many-headed flat- or round-topped panicle; rachis and peduncles stout, tomentose, drying brown; bracteoles linear, small, variously situated. *Heads* globose, ca. 7 mm long, radiate; involucre bracts in about 2 unequal series, the innermost ca. 4 mm long, evenly appressed pilose over the dorsal surface, not conspicuously ciliate; paleas resembling the involucre bracts but longer; ray florets ca. 8, the corolla yellow, the limb 4–6 mm long, dorsally pubescent in the basal half, dentate, the tube pilose, 1–2 mm long, the ovary laterally flattened, 1.2–1.5 mm long, fusiform, stipitate, ciliate and ascending pubescent, the pappus of 2 short awns; disc florets 6–7 mm long, the corolla broadly tubular, the tube short, pilose, the limb basally pilose, the lobes deltoid, anthers dark with dark appendages, ca. 2 mm long, the style branches puberulent, truncate with a short but evident caudate appendix, the style base narrowed into the minute nectary, the ovary laterally compressed, ciliate, with two short awns. *Achene* not seen.

This species differs from *Verbesina sublobata* in having smooth, not scabrous leaves. The leaf bases are gradually acuminate merging into a distinct petiole whereas those of *V. sublobata* are variously truncate or acuminate into a petiole which is cuneiform-winged to the base. *Verbesina lanata* is distinct from *V. oerstediana* with which it may easily be confused, in its pubescent disc corollas, in its larger heads, and in the appearance of the leaves which usually are dry dusty-looking.

PANAMÁ: Roadside below Cerro Campana, *Croat 14233* (MO). Cerro Campana, *Duke 5981* (MO). W slope of Cerro Campana, 2500 ft, *Tyson et al. 2335* (US).

5. ***Verbesina oerstediana*** Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1851: 96. 1852. TYPE: Costa Rica, *Oersted 94* (K, photo US).—FIG. 74.

Shrub or *tree* to 12 m tall; twigs stout, strongly ridged, becoming terete or merely striate, tomentose with several-celled, weak, mostly collapsing, whitish or brownish hairs, sometimes glandular; axillary buds tomentose. *Leaves* alternate, lanceolate or elliptical, 15–20 cm long, acuminate at both ends, entire or serrulate, lateral veins 5–6 on each side of the midvein, undersides drying lighter, reticulate, above softly and sparingly pubescent with short, weak, often wide-based hairs,

beneath tomentulose with longer hairs which lack broad bases; petiole 1.5–2.5 cm long, slender, pubescent. *Inflorescence* a many-headed, cymose panicle; peduncles slender, pubescent, striate, the ultimate divisions 10–15 mm long; minute bracteoles sometimes subtending the head and appearing as involucre bracts. *Heads* radiate, small, 5–7 mm tall; involucre bracts appressed, acute, in about 2 series, the innermost ca. 2 mm long, dorsally pubescent; paleas about twice as long as the involucre bracts, resembling them and enfolding the florets, persistent after the achenes fall; ray florets few, the corolla yellow, the limb broad, denticulate, ca. 5 mm long, glabrous or pubescent on the ribs beneath, the tube slender, pilose, ca. 2 mm long, the ovary linear-fusiform, glabrate; disc flowers 5–6 mm long, glabrous, the tube short, not well demarcated, the anthers dark with dark appendages, the auricles crumpled, the style branches obtuse, thickened, dorsally pilose, the style base not expanded, the nectary cylindrical, smaller in diameter than the style, the ovary fusiform, laterally flattened. *Achene* body black, linear-fusiform, compressed, 3.5 mm long, prominently winged; pappus of 2 subequal, slender awns ca. 2 mm long.

This species may be recognized by its entire or minutely denticulate leaves and the many-headed panicles of small, radiate, yellow heads. Similar to *V. lanata*, the heads are smaller with smaller involucre bracts, and the leaves appear less pubescent. In fruiting collections, the numerous awns of the achenes are evident emerging from the paleas.

CHIRIQUÍ: Robalo Trail, N slopes of Cerro Horqueta, 6000–7000 ft, *Allen 4966* (MO). “Monte Rey,” above Boquete, *Croat 15721* (MO). Palo Alto, 5000 ft, *Stern et al. 1050* (MO). Valley of upper Río Chiriquí Viejo, *White & White 91* (MO).

6. ***Verbesina sublobata*** Benth., Pl. Hartw. 76. 1841. TYPE: Guatemala, *Hartweg 536* (K, not seen, US, fragment).

Shrub to 3 m tall; stems stout, strongly angled but soon terete and striate, pubescent with weak small hairs, sometimes purplish on one side, in age glabrescent and grey. *Leaves* alternate, ovate to spatulate, apically acute, sometimes 3–5-lobed, basally rounded or acuminate into the winged petiole, the margin minutely callose-dentate, above scabrous and punctate, beneath softly pubescent, the venation elevated; petiole 3–4 cm long, cuneiform-winged to the base, sometimes minutely expanded into auricles. *Inflorescence* a somewhat compacted panicle, the inflorescence branches strongly angled, becoming stout, pubescent, and with minute, obtuse or rounded bracteoles sometimes present. *Heads* to 6–9 mm long, radiate, globose; involucre bracts in 2–3 imbricate series, rounded or obtuse, ciliate, but otherwise glabrate, the innermost largest, ca. 5 mm long; ray florets ca. 6, 10–11 mm long, the corolla white, the limb ca. 6 mm long, narrow, entire or denticulate, glabrous, the tube ca. 2 mm long, puberulent, the ovary compressed, fusiform without a conspicuous stipe, the pappus of two short awns; disc florets numerous, ca. 6 mm long, the corolla pilose on the basal $\frac{1}{3}$, glabrous above, the lobes 1–2 mm deep, obtuse, the anthers 2 mm long, dark with light appendages, basally truncate, the style branches narrow with apical appendages, the style base not expanded, smaller than the cylindrical, apically sinuate nectary,

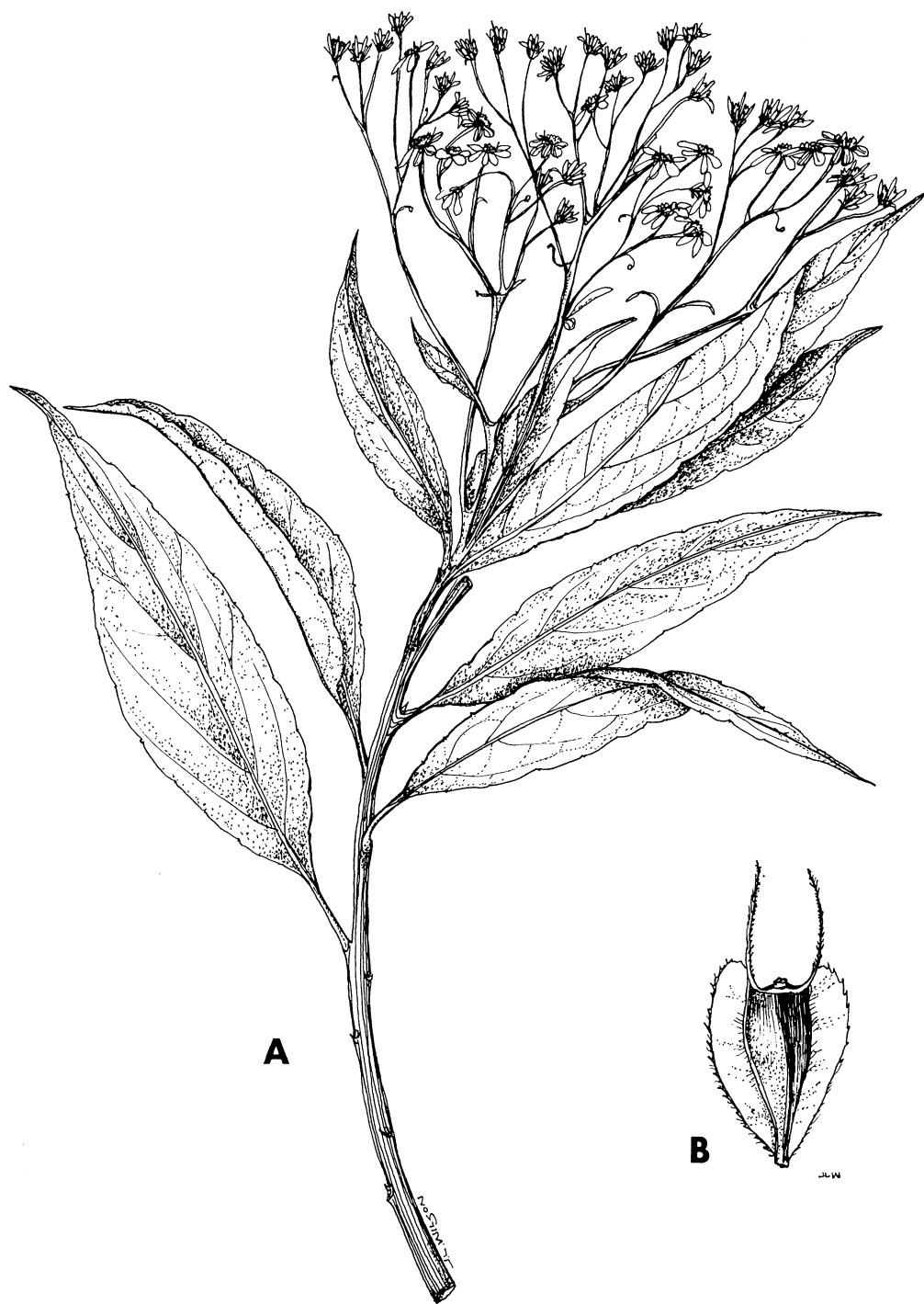


FIGURE 74. *Verbesina oerstediana* Benth.—A. Flowering branch ($\times \frac{3}{8}$).—B. Achene ($\times 6\frac{3}{10}$). [After Croat 15721 (MO).]

the ovary much compressed, ciliate, somewhat oblique. *Achene* body black, whitish tubercular, 3 mm long, broadly winged; pappus of 2 awns ca. 1 mm long.

This species is known in Panama from only one collection which has heads somewhat larger than those of the type collection. Some material from other countries going under this name may be different. The leaf uppersides of *V. sublobata* are quite scabrous. In this species, leaves may be lobed or not.

HERRERA: Road between Las Minas and Pesé, *Duke 12300* (MO).

7. ***Verbesina turbacensis*** H.B.K., Nov. Gen. Sp. Pl. 4: 203. 1820. TYPE: Colombia, *Bonpland 1456* (P, photo, MO).

Shrub or *tree* to 4 m tall; stems tomentose, with thin petiolar wings. *Leaves* alternate, to 25 cm long, the larger ones sinuate-lobed, minutely callose-denticulate, the midvein prominent, elevated beneath, the minor venation sometimes appearing reticulate beneath, above scabridulous with short, stout-based hairs, beneath softly tomentose with short, verrucose hairs; petiole cuneiform-winged to near the base, mostly distinct from the blade, concaulescent and forming thin wings on the stem in the region of the inflorescence. *Inflorescence* a large, open, many-headed panicle, somewhat flattened; branches stout, tomentulose with short whitish or yellowish-brown hairs; foliose bracts present, scalelike bracteoles sometimes present on the ultimate peduncles, sometimes subtending the head and appearing as part of the involucre, the basal portion of the leaves sometimes concaulescent and forming pairs of green lines between the nodes. *Heads* small, ca. 5 mm high, ca. 4 mm across, radiate; involucre bracts in several unequal series, imbricate, appressed, acute, dorsally pubescent; paleas scarious, folded over the florets, the keel ciliate; ray florets about 8, white, the ligule elliptical, entire, 2–3 mm long, the tube pilose, ca. 1.5 mm long, the ovary lenticular, laterally compressed, ciliate and pubescent on one side, pappus of two small, strigose awns, the dorsal awn the largest; disc florets several, 4–5 mm long, the corolla tubiform, the lower portion pilose, the lobes ventrally papillose, the anthers dark, apically light-appendaged, basally truncate, the style branches truncate, penicillate with a short appendage, the stigmatic lines well marked, the style base expanded-globose, situated against the stout, cylindrical nectary, the ovary laterally compressed-lenticular, sparingly pubescent except apically, the shoulders with 1 or 2 stout, short awns. *Achene* body black, 2.5 mm long, 4-angled, slightly compressed, those of the margins with large, white, tubercular-based trichomes, those of the disc mostly smooth, the wings ca. 1–4 mm wide, white, minutely striate; pappus of two unequal, strigose, short awns.

This species closely resembles *Verbesina gigantea* but the stems are more pubescent and the bracteoles are narrower. The wings on the stems, which are formed by concaulescence of the stem and petioles, are often narrow and sometimes difficult to see.

CHIRIQUÍ: Quebrada de Vuelta, 30 km N of Paso Canoas, 600 m, *Busey 626* (MO). Lava fields near town of Volcán, 4600 ft, *Duke 9217* (MO). PANAMÁ: Cerro Azul, *Croat 13022* (MO). E slope of Cerro Jefe, 2700 ft, *Tyson 3412* (MO).

73. VIGUIERA

Viguiera H.B.K., Nov. Gen. Sp. Pl. 4: 224, *tab.* 379. 1820. TYPE: *V. helianthoides* H.B.K. = *V. dentata* (Cav.) Spreng.

Hymenostephium Benth. in Benth. & Hook.f., Gen. Pl. 2: 382. 1873. TYPE: *H. mexicanum* Benth.

Herbs or *shrubs*; stems and branches mostly slender, puberulent or rarely incanous-tomentose. *Leaves* opposite, often alternate near the inflorescence, mostly entire or serrate, rarely lobed, chartaceous, occasionally coriaceous or textilous; petioles mostly slender, rarely wanting. *Inflorescence* a solitary head or paniculate aggregation of heads; bracts foliaceous; bractlets often wanting. *Heads* mostly radiate, yellow (Panama); involucral bracts in 2–3 series, often dark, slender or broad, mostly alike but often unequal, pubescent; paleas indurate, striate, equalling or exceeding the involucral bracts, the basal, scarious portion completely enfolding the achene; ray florets with a flat pubescent tube, the limb broad or narrow, denticulate or entire, dorsally pubescent, the androecium wanting, the ovary sterile, flat or trigonous, often elongate; disc florets numerous, the tube short, the limb sometimes oblique, pubescent, the 5 lobes dorsally pubescent, the anthers dark, the apical appendages often dorsally glandular, the basal auricles short, the style branches flattened, pilose, with a pilose apicule, the base mostly expanded-globose, stipitate, the ovary somewhat laterally compressed, mostly pubescent. *Achene* compressed-lenticular, sometimes quadrate, unmarginated except sometimes at the base, appressed pubescent or glabrous; pappus usually of 2–3 basally broadened awns and intermediate squamellae, the awns or squamellae or both sometimes wanting.

Viguiera may be recognized by its lenticular seeds and uniform, narrowly acute involucral bracts. The pappus may be wanting or may consist of scales or awns or both. The genus is similar to *Simsia* which has flatter achenes and usually more persistent awns. Suggestions that *Viguiera* is confused with *Helianthus*, a genus not occurring in Panama, cannot be maintained. In addition to a number of features noted by other writers, species of *Helianthus* have a conspicuous annular bulge or corolla bulb (Anderson, 1952) near the base of the disc corolla limb.

In Panamanian species of *Viguiera*, the involucral bracts are in two series, the outermost shorter and more pubescent than the inner series which are slightly erose near the apex. The lobes of the disc corollas are noticeably pubescent outside.

Earlier writers who reported *Gymnolomia rudbeckioides* H.B.K. (1820) from Panama were probably referring to *Viguiera cordata*. *Index Kewensis* placed some of the synonyms noted here for *Viguiera cordata* under *Gymnolomia rudbeckioides*. Although they had not seen its type collection, both Robinson & Greenman (1899) and Blake (1918) in their revisions of *Gymnolomia* and *Viguiera* distinguished *Gymnolomia rudbeckioides* from plants of Central America. *Gymnolomia*, here lectotypified by *G. rudbeckioides*, may be the correct name for much

of the New World material which has been placed in the genus *Aspilia* Thouars. *Aspilia* is based on a strand plant of eastern Madagascar.

Literature:

- Anderson, E. 1952. Details of the flowers of a sunflower. Missouri Bot. Gard. Bull. 40(7): frontispiece.
 Blake, S. F. 1918. A revision of the genus *Viguiera*. Contr. Gray Herb. 54: 1–205.
 Robinson, B. L. & J. M. Greenman. 1899. Revision of the genus *Gymnolomia*. Proc. Boston Soc. Nat. Hist. 29: 87–108.

- a. Leaves sessile; ray corollas less than 10 mm long; pappus of awns and squamellae 3. *V. tenuis*
 aa. Leaves petiolate; ray corollas more than 10 mm long; pappus of awns, squamellae, or wanting.
 b. Leaves eglandular beneath; involucre bracts less than 1.5 mm wide; pappus, if present, without awns 1. *V. cordata*
 bb. Leaves copiously glandular beneath; some involucre bracts exceeding 2 mm wide; pappus of fimbriate squamellae and 2 basally flattened awns 2. *V. sylvatica*

1. *Viguiera cordata* (Hook. & Arn.) D'Arcy, Phytologia 30: 6. 1975.—FIG. 75.

- Gymnolomia microcephala* Less., Linnaea 5: 153. 1830. TYPE: not seen, not *Viguiera microcephala* Greenman, Proc. Amer. Acad. Arts 39: 105. 1903.
Wedelia cordata Hook. & Arn., Bot. Beech. Voy. 435. 1841. TYPE: Nicaragua, Sinclair (K, not seen).
Gymnopsis costaricensis Benth. in Örst., Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenhavn. 1851: 90. 1852. TYPE: not seen.
G. vulcanica Steetz in Seem., Bot. Voy. Herald 157. 1854. TYPE: Panama, Chiriquí Volcano, Seemann (not seen).
Montanoa thomasi Klatt, Abh. Naturf. Ges. Halle 15: 328. 1882. TYPE: Mexico, Thomas (GH).
Aspilia costaricensis (Benth.) Klatt, Bull. Soc. Roy. Bot. Belgique 31: 201. 1892.
Hymenostephium cordatum (Hook. & Arn.) Blake, Jour. Bot. 53. 268. 1915.
H. microcephalum (Less.) Blake, Contr. Gray Herb. 54: 8. 1918, not *Viguiera microcephala* Greenman, Proc. Amer. Acad. Arts 39: 109. 1903.

Sprawling or erect *herb* to 3 m tall; stems elongate, sometimes purplish, puberulent with weak, whitish, spreading hairs, glabrescent. *Leaves* mostly opposite or nearly so, to ca. 8 cm long, ovate, sometimes broadly so, apically acute or acuminate, basally cordate, rounded or truncate, the margins serrate or dentate, the teeth obtuse, callose-mucronulate, 3-veined from near the base, each pinnately veined, elevated and prominent beneath, puberulent or scabrous with slender, verrucose hairs above, some with stout bases, and on the veins with weak, collapsing verrucose hairs, beneath glabrate to tomentose, sometimes scabridulous with mostly verrucose hairs; petiole slender, to 15 mm long, pubescent, slightly enlarged and indurate at the base. *Inflorescence* a loose, terminal aggregate of several heads; peduncles short or to 30 cm long, pubescent; bracts foliaceous, solitary bracteoles sometimes present. *Heads* radiate, mostly 20–25 cm across and 8 mm tall; involucre bracts numerous in ca. 2 similar, unequal series, lanceolate or ovate, subherbaceous, apically acute, strongly 7–5-nerved, ascending-strigose, 4–6 mm long, callose or minutely erose at the tip; paleas resembling the inner involucre bracts, but longer, indurate, striate, ca. 6 mm long, enfolding the ovary, ciliate on the keel; ray florets 6–10, the corolla yellow, the tube 1–1.5 mm



FIGURE 75. *Viguiera cordata* (Hook. & Arn.) D'Arcy.—A. Flowering branch ($\times \frac{1}{2}$).—B. Achene ($\times 30$). [After Tyson *et al.* 2829 (MO).]—C. Achene ($\times 15$).—D. Base of style and nectary ($\times 14\frac{2}{3}$). [After Croat 9659 (MO).]—E. Base of style and nectary ($\times 14\frac{2}{3}$). [After Croat 13628 (MO).]

long, pilose, the limb elliptical, ca. 13 mm long, entire or denticulate, with a few strigose hairs near the base, the ovary sterile, compressed, pubescent, epappose; disc florets numerous, ca. 5 mm long, the corolla ca. 4 mm long, the tube pilose, the limb slightly broadening upwards, apically strigose and the lobes dorsally strigose, the anthers dark, 2–3 mm long, dorsally glandular, the style base expanded or not, the nectary cylindrical, the ovary compressed, glabrous or pilose, the pappus of small scales or wanting. *Achene* black, ca. 2 mm long, compressed, minutely striate, glabrous or pilose with long, ascending hairs near the base; pappus wanting or of 1–3 small, hyaline, fimbriate scales.

This species displays puzzling variation in characters of the style base and achene, and two distinctive forms appear in Panama. Either the style base is conspicuously enlarged above the nectary and the achene is copiously pilose and epappose, or the style base is not at all expanded and the achene is glabrous with a distinct squamellate pappus. Blake (1918) devoted considerable attention to these differences but decided they were of little taxonomic value. The type collection of *Montanoa thomasi* is intermediate: the style base is hardly expanded, and the achene is glabrate with very few long hairs, lacking a pappus. In Panamanian material, the difference noted could not be correlated with any other differences in the plants. Although a type specimen was not seen, the material included here matches a range of specimens annotated as *Hymenostephium cordatum* by S. F. Blake.

Viguiera cordata may be recognized by its yellow, radiate heads and the usually grey-pubescent involucre bracts which contrast with the longer, blackish, striate paleas. It is known mainly from lower and middle elevations. The species ranges widely in tropical America.

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, upper valley of the Río Chiriquí Viejo, 1500–2000 m, *Allen* 1585 (MO, NY, US). Forested hill N of Audubon Cabin Bambito, *Croat* 13628 (MO). Nueva Suisa, Volcán District, 6000 ft, *D'Arcy* 5324 (MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 574 (MO). Pastures around Boquete, 1000–1300 m, *Pittier* 2904 (US). COCLÉ: Trails near Finca Tomas Arias, El Valle de Antón, 600 m, *Allen* 4227 (MO). Near El Valle de Antón, *Croat* 13278 (MO). Penonomé and vic., 50–1000 ft, *Williams* 145 (NY). HERRERA: Roadside between El Potrero and Las Minas, *Croat* 9659, 9661 (both MO). 10 mi S of Ocu, *Tyson et al.* 2813, 2829 (both MO).

2. *Viguiera sylvatica* Klatt, Bull. Soc. Roy. Bot. Belgique 31: 204. 1892. TYPE: Costa Rica, *Pittier* 779 (GH, not seen).

Erect *herb* to 3 m tall; branches slender, finely striate, sparingly pilose with long white hairs, glabrescent. *Leaves* alternate, (?opposite below), mostly ovate and to 12 cm long but sometimes broadly ovate and 20 cm long, apically acuminate, basally obtuse or short acuminate, the margins serrate, 3-nerved from just above the base, chartaceous, sparingly pubescent, glandular beneath, sometimes scabridulous above and drying darker; petioles slender, mostly 5–12 mm long, sometimes pilose, but on large leaves longer, stouter and glabrescent. *Inflorescence* mostly an open, ill-defined panicle but sometimes somewhat compact and cymose; peduncles somewhat stout, to ca. 4 cm long, the appressed tomentum obscuring the glandular, often strongly striate surface, subtended by linear bracts. *Heads* globose, 10–13 mm tall, radiate, but the rays sometimes few and inconspicuous;

involucral bracts in 2 similar and subequal series, ca. 8 mm long, lanceolate, indurate and striate, sparingly pubescent, drying glandular; paleas oblong, indurate, striate, the costa dark, apically excurrent and acute, equalling or slightly exceeding the involucral bracts, the margin scarious, dorsally puberulent, the basally scarious, corrugated portion completely enveloping the floret; ray florets 6–8, the corolla apparently fugaceous, ca. 15 mm long, the tube ca. 1 mm long, flattened, pilose, the limb elliptical, yellow, apically entire or notched, dorsally pubescent, the ovary sterile, elongate, trigonous or flat, 3–4 mm long, dorsally pubescent; disc florets numerous, 8–10 mm long, the corolla 4–5 mm long, the tube short, the limb basally oblique, puberulent, the lobes dorsally pilose, the anthers black, ca. 3 mm long, the appendages narrow, dorsally glandular, the basal auricles short, the style branches flattened, dorsally pilose, truncate with a conspicuous acicular, pilose apicule, the style base expanded, cylindrical-globose, stipitate above an elongate, cylindrical nectary. *Achene* black, ca. 4 mm long, only slightly compressed, ascending-pilose; carpopodium conspicuous, slightly swollen; pappus of two basally hyaline-squamellous, stiff, strigulose awns, and a slightly interrupted hyaline ring of erose scales dorsal to the awns, the nectary remaining as an apical peg.

This species is known in Panama from only one collection taken in January 1939. It ranges into Costa Rica where it occurs at middle or upper elevations.

Similar to *Viguiera cordata*, this species is distinguished by the looser involucre, the paleas which are black along the costa to the pointed tip instead of only below the tip, and the two awns which accompany the ring of scales to make up the pappus. The carpopodium is also larger.

Because of the paucity of Panamanian material, part of the above description is taken from *Worthen*, Costa Rica (MO).

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, upper valley of the Río Chiriquí Viejo, 1500–2000 m, *Allen 1495* (MO, NY).

3. ***Viguiera tenuis*** A. Gray in Wats., Proc. Amer. Acad. Arts 22: 426. 1886.
TYPE: Mexico, *Palmer 657* (MO, NY).

Wiry *herbs* to 50 cm tall; stems slender, pubescent with appressed, ascending, white, verrucose hairs, more conspicuous below; roots short and fibrous. *Leaves* opposite, narrowly oblong or lanceolate, to 4 cm long, rarely ovate, inconspicuously denticulate, obscurely 3-veined from near the base, both sides appressed-canescens; petiole short or wanting. *Inflorescence* an open, several-headed terminal panicle; peduncles becoming narrower upwards, expanding slightly and whitish-pubescent at the apex; bracts subtending the branches and alternate along the branches, foliaceous but smaller and narrower upwards. *Heads* radiate, globose, to 10 mm across; involucral bracts narrow, imbricate in several series of equal length, the outermost linear, the inner series broader, all appressed-canescens and whitish except for the dark green tips; paleas exceeding the involucral bracts; ray florets several, 8 mm long, the corolla yellow, 4 mm long, the limb ca. 3 mm wide, emarginate, glabrous, the tube short, pubescent, the ovary linear, sterile, ca. 4 mm long, ascending pubescent, the pappus wanting; disc florets numerous,

ca. 5 mm long, the corolla broadly tubular, ascending-pilose, the lobes ventrally papillose, dorsally hispid, the tube short, sharply contracted, the anthers ca. 1.5 mm long, basally sagittate, the light-colored appendages with a darker costa, the filaments glabrous, the anther column conspicuous, the style branches slender, dorsally long-pilose, the style base expanded, stipitate above a short nectary, the ovary compressed-lenticular, ca. 2 mm long, densely ascending-pilose, the pappus of two awns and 4 broad, hyaline, fimbriate scales. *Achene* body 2 mm long, dark but covered with long, ascending-hispid, stramineous hairs; pappus of 4 large, rotund, apically erose scales and two basally flattened, strigose awns ca. 5 mm long.

COCLÉ: Near Olá, 100–130 m, Pittier 5033 (US).

74. WEDELIA

Wedelia Jacq., Enum. Pl. Carib. 8, 28. 1760; Sel. Stirp. Amer. 217. 1763. TYPE: *W. fruticosa* Jacq.

Herbs or *shrubs*, erect, ascending or sometimes procumbent; stems slender or stout and succulent; rootstock stout or fibrous. *Leaves* opposite, the margins lobed or not, mostly dentate or serrate and scabrous, the indumentum of glandular trichomes and of verrucose hairs; petioles elongate, short or wanting, united to form a distinct intrapetiolar ridge. *Inflorescence* of 1–several long-pedunculate, ebracteate heads at a node. *Heads* radiate, globose, campanulate or funnellform; involucre bracts several in 2–4 dissimilar series, the outermost narrower, often basally indurate and stramineous and apically green, mostly scabrous on both sides, the innermost often entirely stramineous, rounded or obtuse, ciliate and sometimes pubescent dorsally; receptacle flat or slightly convex; paleas hyaline, somewhat indurated, enfolding the florets, the erose or ciliate, deltoid apex often folded over the floret in bud, the costa prominent, occasionally excurrent; ray florets several, the corollas yellow or white, broad, 2–3-denticulate, the anthers wanting, the style branches slender, elongate and outcurving, the base not expanded but immersed in the tall, cylindrical nectary, the ovary compressed, sometimes angled or winged, glabrous or pubescent, apically contracted below the coroniform, scaly pappus, the awns mostly wanting or one or more of the erose scale elements produced into small awns; disc florets mostly numerous, tubular, the 5 deltoid lobes pubescent inside and out, the tube often pubescent on the veins and just above the base, the 5 anthers black with deltoid, black, yellow or transparent appendages and short or long, connate basal auricles, the style branches somewhat flattened, pilose, apically acicular, the style base not enlarged, immersed in the tall, cylindrical nectary, the ovary angled, slightly compressed, apically contracted below the pappus, the pappus resembling that of the rays. *Achenes* often unlike in the same head, sometimes clearly dimorphic, differing in shape, size, color, pubescence and texture, the outermost often flattened, the margins sometimes with massively thickened wings, the innermost clavate, 3–4-angled but the angles not thickened, all apically contracted and surmounted by a coroniform pappus of fused, erose or ciliate scales, sometimes produced into one or two short awns.

A genus of over a dozen species mainly of the Caribbean area, *Wedelia* may be recognized by the salient green involucre bracts or their apices, or by the contracted achene apices surmounted by a small, peglike, coroniform pappus of minute, fused scales. Several sections have been recognized in *Wedelia* and two distinct elements are present in Panama. *Wedelia trilobata* is related to species in the Antilles and South America, and some Panamanian collections are suggestive of these species. The group has succulent leaves, more or less homogeneous green involucre bracts and glandular achenes. The balance of the Panamanian *Wedelia* species are more or less erect plants with thin, scabrous leaves, graded involucre bracts, and sometimes pubescent but not glandular achenes. *Wedelia fruticosa* Jacq. of northern South America has been reported from Panama but the cited specimens when examined turned out to be other species. *Wedelia fruticosa* has small, mostly rounded leaves, broad involucre bracts, and eglandular stems and leaves.

Several Panamanian collections from upland Chiriquí may represent a species distinct from those treated here. Much like plants of *W. calycina*, these collections have much smaller flowers and leaves which are smaller, narrower, and tend to have shallow, irregular lobing in the basal half.

Material now available is not adequate for determination or construction of a good species description.

CHIRIQUÍ: Near El Hato del Volcán, *Croat 10712* (MO). Volcán on grounds of Escuela San Benito, *Croat 10412* (MO). Above Boquete on road past Princesa Janca coffee finca, *D'Arcy & D'Arcy 6338* (MO). Above Boquete on slope of La Popa, 5400 ft, *D'Arcy & D'Arcy 6392* (MO). Llanos del Volcán, 1120–1200 m, *Seibert 338* (MO).

Literature:

Schultz, O. E. 1911. *Wedelia*. In I. Urban, *Symb. Antil.* 7: 94–115.

- a. Leaf base extended into an abruptly terminating petiolar wing; leaves often 3-lobed, glandular beneath; plants procumbent; ray corollas glandular outside; achenes glandular, not pubescent 5. *W. trilobata*
- aa. Leaf base narrowed into the petiole; leaves seldom 3-lobed, eglandular; plants erect; corollas eglandular; achenes glabrous or pubescent, eglandular.
 - b. Involucre pilose; achenes thin-winged; petiole margins long-pilose 3. *W. keatingii*
 - bb. Involucre pubescent but not pilose; achenes unwinged or thick-winged; petiole margins not long-pilose.
 - c. Some involucre bracts more than 5 mm wide; achenes distinctly dimorphic, some compressed with massively thickened margins, others 3–4-angled without thickened margins, more than 5 mm long; some leaves more than 30 mm wide 1. *W. calycina*
 - cc. Involucre bracts less than 5 mm wide; achenes often dissimilar but not of two distinct classes, mostly 3–4-angled, less than 5 mm long; leaves mostly less than 30 mm wide.
 - d. Leaves mostly obtuse apically, scabrous but lacking a pubescence of minute hairs; upland plants 4. *W. parviceps*
 - dd. Leaves mostly acute or acuminate apically, scabrous and densely pubescent with minute hairs; lowland plants 2. *W. inconstans*

1. *Wedelia calycina* L. C. Rich. in Pers., *Syn. Pl.* 2: 490. 1807. TYPE: Guadeloupe, *Richard* (?P, not seen).

W. acapulcensis H.B.K., *Nov. Gen. Sp.* 4: 215. 1819. TYPE: Mexico, *Bonpland* (P).

W. caracasana DC., *Prodr.* 5: 541. 1836. TYPE: Venezuela, *Vargas* (G-DC, not seen, photo MO).

- W. acuminata* DC., Prodr. 5: 541. 1836. TYPE: Cuba, *Ossa* (not seen).
W. scaberrima Benth., Ann. Nat. Hist. 2: 110. 1839. TYPE: Guyana, *Schomburgk 128* (BM, holotype, not seen; G, isotype, not seen, MO, photo).
W. hookeriana Gard., London Jour. Bot. 7: 289. 1848. TYPE: Brasil, *Gardner 2219*.
W. villosa Gard., London Jour. Bot. 7: 289. 1848. SYNTYPE: Brazil, *Gardner 1349* (W, not seen, MO, photo); 1730 (BM).
W. jacquini E. O. Schulz in Urb., Symb. Ant. 7. 100. 1911, not L. C. Rich. in Pers. 1807, nom. illeg. based on *W. fruticosa* Jacq.

Erect or scrambling *shrub* to 3 m tall; stems slender, spreading-pubescent, glabrescent, minutely glandular, drying finely angled. *Leaves* ovate, apically acuminate, basally rounded or short acuminate, the margins serrate, the veins prominent beneath, obscure above, 3-nerved from somewhat above the base, drying darker above, both sides scabrous with erect and ascending stout hairs, the minor venation glandular beneath; petioles slender, ca. 1 mm long, united in an intrapetiolar ridge. *Inflorescence* of 1–several heads at a node; peduncles slender, pubescent, to 5 cm long. *Heads* radiate, campanulate to globose; involucre bracts several in about 2 dissimilar series, the outermost ca. 15 mm long, basally distinct, lanceolate, indurate and stramineous below, the upper green portion scabrid on both sides, the innermost bracts indurate, stramineous, obtuse or rounded, ciliate and sometimes dorsally pubescent; paleas ca. 7 mm long, hyaline, grading narrower inwards, the innermost oblong, contracted below the ovate, erose apex, the costa prominent; ray florets showy, 15–20 mm long, the corolla yellow, sometimes drying white, 2-dentate, glabrous, the style branches sometimes green, the ovary fertile, pilose, slightly trigonous; disc florets numerous, ca. 8 mm long, the 5 lobes dorsally and ventrally puberulent, the stamens black with narrowly deltoid, yellow appendages and elongate basal auricles, the style branches slightly flattened, pilose, the style base not expanded, immersed in the cylindrical ovarial disc, the ovary pubescent, angled, mostly awnless. *Achenes* 5–6 mm long, dimorphic in shape and color, puberulent, clavate, strongly angled and slightly compressed, or glabrous and flattened, with massively thickened, winglike angles.

This species is here interpreted broadly to include both Antillean and mainland American plants, and may include a number of infraspecific taxa. Schulz (1911) considered most mainland plants to have more deeply lobed ligules and be specifically distinct from plants of the Antilles. *Wedelia aequatoreale* Spruce has slightly larger and heavier involucre bracts than most Panamanian plants, but a few collections are quite similar to the Spruce material.

Fruits of this species display heterocarpy: the ray achenes are compressed and curved with thick wings or margins while the disc achenes are little compressed, 3–4-angled, clavate, slightly smaller, and usually pubescent with a different color. The plump wings or margins are unlike the thin wings in the related genus *Verbesina* and in *Wedelia keatingii*.

In Panama, *Wedelia calycina* is restricted to the lowlands, and most collections are from areas of disturbance and secondary growth. It is sometimes reported to be a climber.

CANAL ZONE: Near Paraíso, *Croat 7159* (MO). Hill S of Pedro Miguel Locks, *Croat 9174* (MO). Road C2C on Cerro Luisa, *Croat 10771* (MO). NW of Pedro Miguel, *Croat*

12261 (MO). Farfan Beach, *D'Arcy & D'Arcy* 6074 (MO). Fort Kobbe, *Duke* 4211 (GH, MO). Military Road K-9, *Ebinger* 517 (MO). Chagres, *Fendler* 167 (GH, MO). Ancón Hill, *Killip* 12053 (GH). 2 mi W of Ferry Thatcher Bridge, *Lazor* 2197 (MO). 5 mi N of junction Interam. Hwy. and C-10 Artillery road, *Lazor* 5455 (MO). Farfan Beach area, *Lazor & Tyson* 5718 (MO). Chiva Chiva Trail, 2 mi above Red Tank, *Maxim & Harvey* 6593 (GH). Ancón Hill, *Maxim* 6777 (GH). Curundú, *McDaniel* 5184 (MO). Between Rodman Marine Base and Chorrera, *Nowicke et al.* 3599 (MO). Ancón Hill, *Piper* 5580 (GH). Between Corozal and Ancón, *Pittier* 2642 (GH). W slope of Ancón Hill near Balboa, *Seibert* 386 (GH, MO). Ancón Hill, *Standley* 25187 (GH). Corozal Road near Panamá, *Standley* 26866 (GH). Near Río Cocoli, Road K-9, *Stern et al.* 16, 329 (both GH, MO). Chiva Chiva Trail near Miraflores Lake, *Tyson* 1409 (MO). Farfan Beach area, *Tyson* 1818 (MO). Fort Amador, *Tyson* 2029 (MO). Farfan Beach area, *Tyson & Blum* 2622, 2624 (both MO); *Tyson et al.* 3173 (MO). Fort Clayton, *Tyson & Blum* 3896 (MO). Near Miraflores, *White & White* 51 (MO). W slope of Ancón Hill, *Woodson et al.* 1319 (GH, MO). COCLÉ: Hills S of El Valle de Antón, 6–800 m, *Allen* 2858 (MO). 3 mi NE of Antón, *Croat* 9614 (MO). Penonomé, *Dwyer* 2004 (GH, MO). 12 mi NE of Penonomé, 1200 ft, *Lewis et al.* 1515 (GH, MO). COLÓN: Under Colón Highway bridge on Chagres River, *Lazor & Tyson* 3043 (MO). HERRERA: Océ, *Ebinger* 1044 (MO). PANAMÁ: Río Charco-Espiritu on Tocumen Highway, *Duke* 5698 (GH, MO). Tumba Muerto, *Heriberto s.n.* (GH). Taboga Island, *Macbride* 2793 (GH). Around Alhajuela, Chagres Valley, *Pittier* 2331 (GH), 3451 (GH, MO). Sabana de Juan Corso near Chepo, *Pittier* 4521 (GH). Near Arraiján, *Woodson et al.* 1371 (GH, MO). Isla Taboga, *Woodson et al.* 1469 (GH, MO). Ca. 5 mi NE of La Mesa, *Blum & Tyson* 672 (MO).

2. ***Wedelia inconstans*** D'Arcy, *Phytologia* 30: 5. 1975. TYPE: Panama, *Croat* 15241 (MO).

Erect *herb* or *subshrub* to 1 m tall; stems slender, copiously pubescent with spreading hairs and glandular trichomes, glabrescent. *Leaves* opposite, deciduous from lower parts of the stem, to 6 cm long and 2.5 cm wide, ovate, apically obtuse to acuminate, basally rounded, obtuse or acuminate, the margins inconspicuously serrate, the venation often obscure, both sides softly tomentose to scabrous with ascending whitish hairs, glandular on the minor venation beneath; petioles short, to 4 mm long, scabrous. *Inflorescence* of 1–2 heads at a node; pedicels slender, to ca. 4 cm long, hispid. *Heads* radiate; involucre bracts several in 2–3 series, the outermost narrowly ovate, apically acuminate, basally indurate, green above and pubescent on both sides, 8–9 mm long, the inner series mostly indurated and stramineous, obtuse or rounded, ciliate, often dorsally pubescent; receptacle somewhat convex; paleas hyaline, oblong, 4–7 mm long, constricted below the ovate, erose apex, the costa prominent; ray florets several, to 10 mm long, the corollas yellow (?or white), 8 mm long, exserted ca. 5 mm, 2-denticulate, puberulent along the main angles and low on the tube, the style branches yellowish, the ovary flattened, pubescent or glabrous; disc florets several, ca. 6 mm long, the 5 corolla lobes pubescent inside and out, the tube puberulent, the anthers black with narrowly deltoid yellowish appendages, the basal auricles short, the style branches somewhat flattened, dorsally pubescent, apically acicular, the base not expanded, the nectary narrowly cyathiform, 0.5 mm high, the ovary compressed, sometimes pubescent, the pappus with one or more scales produced into short, smooth awns. *Achenes* variable within a head, less than 5 mm long, tan, mottled, somewhat pubescent and partially tuberculate, ranging from strongly 3–4-angled and clavate to flattened with heavily thickened margins, apically constricted below the peglike, coroniform pappus of fused scales and sometimes one or more small awns.

This species is similar to *Wedelia calycina* but differs in its smaller, narrower leaves, overall pubescence, and in its smaller heads and achenes. It occurs in sun and shade mainly in disturbed areas of the Pacific coast lowlands. It is similar to *W. parviflora* L. C. Rich of the Antilles, but the type of that species has larger, less pubescent leaves.

COCLÉ: Hills S of El Valle de Antón, 600–800 m, *Allen* 2858 (MO). Santa Clara Beach, *Croat* 9582 (MO). Ca. 1 mi E of Santa Clara Beach, *D'Arcy* & *Croat* 4086 (MO). El Valle, *Dwyer* 1803 (GH, MO, NY). Between Las Margaritas and El Valle, *Woodson et al.* 1256 (MO, NY). HERRERA: Road between Las Minas and Pesé, 600 ft, *Duke* 12302 (MO). 10 mi S of Océ, *Tyson et al.* 2857, 2858 (both MO). PANAMÁ: Near end of Tocumen Airport runway, *Croat* 9769 (MO). Roadside on way to Cerro Campana, *Croat* 12022 (MO). Near Madden Lake N of Calzada Larga, *Croat* 12926 (MO). Between Chepo and El Llano, *Croat* 14492 (MO). Roadside along approach to Cerro Jefe, *Croat* 15241 (MO). Ca. 13 mi W of Chepo, *D'Arcy* & *D'Arcy* 6030 (MO). Savanas between Panamá and Chepo, *Dodge et al.* 16655 (MO). Near bridge at Nueva Gorgona, *Duke* 4540 (MO). Riomar, near Río Mar, *Ebinger* 503 (MO). Savanas near Chepo, *Hunter & Allen* 36 (MO). Cerro Campana, *Porter et al.* 4172, 4320 (both MO). E of Pacora, *Woodson et al.* 724 (MO).

3. ***Wedelia keatingii*** D'Arcy, *Phytologia* 30: 5. 1975. TYPE: Panama, *Allen* 4212 (MO-1600341, holotype; MO, isotype).—FIG. 76.

Herb to 1 m tall; stems weak, branching, puberulent with minute, spreading verrucose hairs and scattered stout, multicellular hairs; roots weakly developed. *Leaves* opposite, ovate, to 10 cm long, apically acuminate, basally obtuse or short acuminate, the margins serrate, the venation appearing pinnate or 3-nerved from near the base, sometimes reticulate beneath, both sides with scattered, stout, white, appressed hairs, scabridulous above; petiole short, sometimes to 3 cm long, winged upwards, the keel strigose. *Inflorescence* undifferentiated, mostly solitary or small clusters of heads on slender peduncles to 2.5 cm long; bractlets wanting. *Heads* radiate, small, to 8 mm long; involucre bracts ca. 10, the outer 4–5 herbaceous, oblong, slightly shorter, apically rounded; paleas scarious, completely enveloping the ray floret, apically erose-obtuse, the costa darkened, prominent; receptacle flat or slightly convex, 2–3 mm across; ray florets about 5, 7–8 mm long, slightly shorter than the outer involucre bracts, the corolla white, ca. 5 mm long, the tube compressed, short, glabrous, the limb broad, flattened-induplicate in bud and short ciliate on the angles, apically 2-notched, the style branches slender, the ovary flattened, the body narrowly oblong-turbinate, ciliate at the angles and puberulent apically, contracted at the apex and expanding into a fimbriate-squamellate pappus, awns wanting; disc florets about 15, ca. 4 mm long, the corolla yellowish, the tube forming almost half the length, the limb cylindrical, the 5 apical lobes dorsally puberulent, the anthers black, 1.5 mm long with transparent, small apical appendages, basally subauriculate, the style branches tomentose, white, with a distinct, subulate apical appendage, the ovary flattened laterally, ciliate, apically contracted and expanded again into the pilose-squamellate pappus which may include one or more short, stout, ascending-strigose awns. *Achenes* black, compressed, with conspicuous wings and sometimes falling with the paleas, the body compressed quadrangular, the lateral (flattened) angles rounded, the sides with elongate, white, ascending, appressed hairs, the wings broad, striate-reticulate,

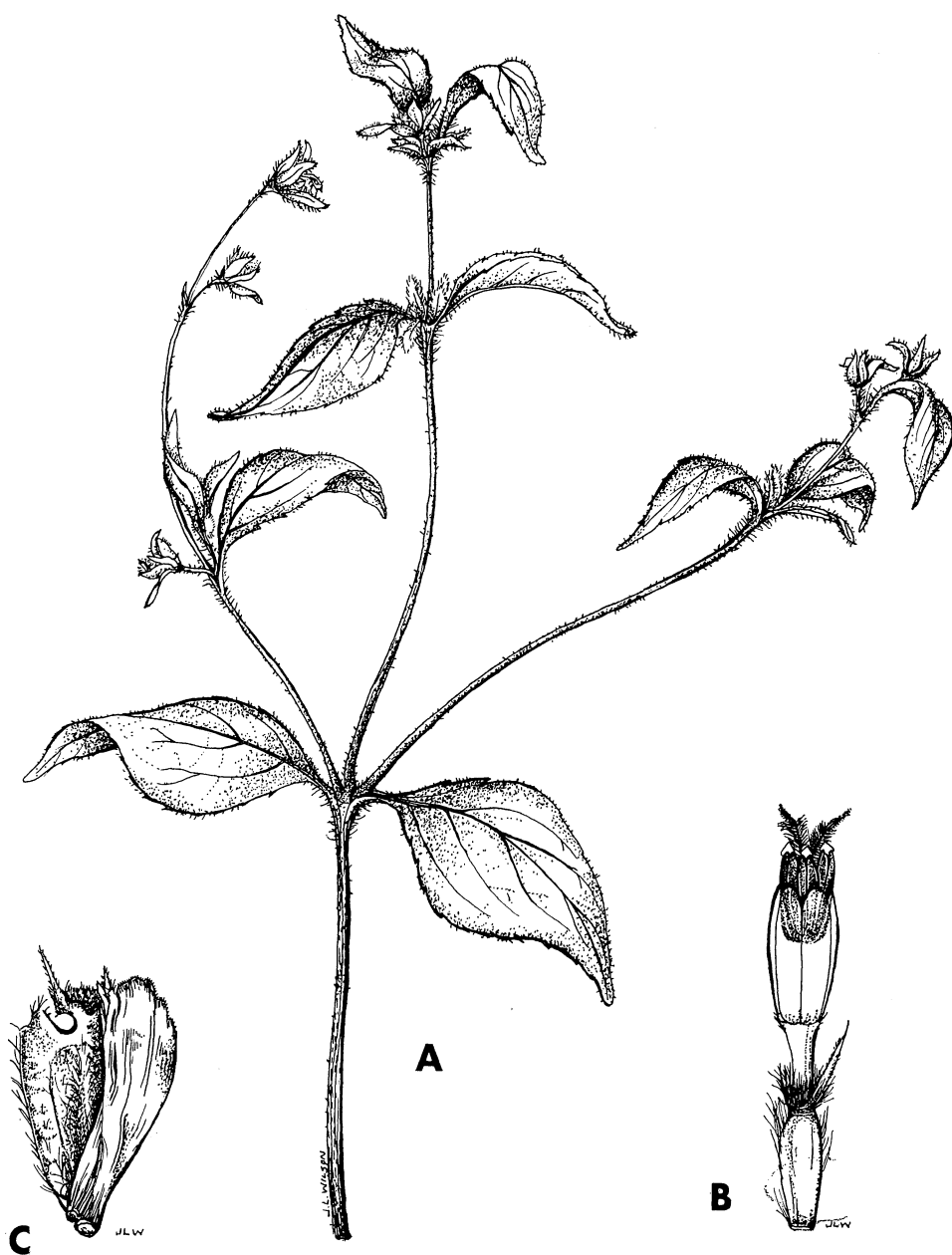


FIGURE 76. *Wedelia keatingii* D'Arcy.—A. Habit ($\times \frac{3}{10}$).—B. Central floret ($\times 6\frac{3}{10}$).—C. Achene with subtending palea ($\times 10\frac{7}{10}$). [After Allen 4212 (MO).]

streaked with brown, ?glandular cells; carpopodium a yellowish, smooth area on the lower ventral side flush with the achene body; pappus of a ring or cup of pilose-squamellate processes and sometimes one or two short stout, strigose awns.

This species differs from other species of *Wedelia* in its broadly winged achenes which sometimes have persistent awns and in the narrow, herbaceous outer phyllaries. It would appear to be closely related to *Wedelia calycina* and *W. parviflora* in Panama and to *Calyptocarpus vialis* Less. a species of warm parts of the New World which has not yet been recorded from Panama. It differs from the two species of *Wedelia* just mentioned in its prominently winged achenes which appear to be of one type, while it differs from the *Calyptocarpus* species in its narrow outer involucre bracts. *Calyptocarpus* also has both winged and unwinged achenes in the same head.

COCLÉ: Trails and clearings N of El Valle de Antón, 700–800 m, *Allen 4212* (MO). El Valle, ca. 650 m, *Croat 25280* (MO). Without locality, *Duke 6156* (MO). Hills above El Valle, 1000 m, *Gentry 6902* (MO). Granitic river gorge, 12 NE of Penonomé, 1200 ft, *Lewis et al. 1509* (MO).

4. *Wedelia parviceps* Blake, Contr. U.S. Natl. Herb. 24: 28, pl. 9. 1931. Guatemala, *Blake 7681* (US-989584).

Perennial *herb* or *subshrub* to 50 cm tall, usually with several shoots from a woody rootstock; stems slender, scabridulous with ascending and spreading hairs. *Leaves* elliptical to ovate, to 3.5 cm long, 12 cm wide, apically rounded, obtuse or sometimes acute, basally acute or acuminate, the veins prominent beneath, obscure above with 3 main veins from just above the base, the margins inconspicuously serrate, scabrous on both sides with ascending whitish hairs; petioles short, less than 2 mm long, pubescent. *Inflorescences* 1–several heads at a node; peduncles slender, scabrous, mostly drying dark. *Heads* radiate, small, 5–7 mm tall; involucre bracts several in ca. 2 unlike series, the outermost ca. 3 mm long, ovate, indurate and stramineous except for the green tips, the innermost bracts slightly larger with green tips or entirely stramineous; receptacle flat or slightly convex; paleas hyaline, ca. 2 mm long, apically erose or ciliate, sometimes dorsally puberulent, the costa prominent and sometimes apically excurrent; ray florets several, the ligules yellow, ca. 6 mm long, 2-denticulate, puberulent on the principal veins, the ovary fertile, glabrous, the awns wanting; disc florets several, ca. 6 mm long, the corolla lobes puberulent, the tube puberulent near the base, the anthers black with whitish appendages, the basal auricles short, the style branches somewhat flattened, pilose, apically acicular, the style base not expanded, the nectary narrowly cylindrical, 0.6 mm high, the ovary pubescent, flattened. *Achenes* dimorphic, those of the ray florets trigonous, tuberculate, grayish with massively thickened margins, those of the disc florets clavate, black, the margins not thickened and the surface not tuberculate, 3–4 mm long.

This species is distinct among Panamanian *Wedelia* species in its small heads, wiry diminutive aspect, and small leaves. First described from Guatemala, in Panama it is found mainly in upland Chiriquí although one collection, *Dwyer et al. 7564*, was taken in lowland Veraguas Province.

Wedelia parviceps is sometimes confused with *Baltimora recta* L., a lowland species with sterile rays and broader leaves, the three nerves of which arise at the base rather than just above the base as in species of *Wedelia*.

CHIRIQUÍ: 4 mi from Boquete toward Dolega, 4500 ft, *Dwyer & Hayden* 7614 (MO). 4.1 mi from Boquete on road to David, *Kirkbride* 87 (MO, NY). Alto Boquette, 1125 m, *Partch* 69-81 (MO). Around Boquete, 1000 m, *Pittier* 2867 (MO). Gualaca in savanas, *Pittier* 4346 (GH). Llanos Francia, Boquete District, 3300 ft, *Stern et al.* 1185 (GH, MO). VERAGUAS: 2 mi W of Santiago, *Dwyer et al.* 7564 (MO).

5. *Wedelia trilobata*⁴⁹ (L.) Hitchc., Rep. Missouri Bot. Gard. 4: 99. 1893.

Silphium trilobatum L., Syst. Nat., ed. 10. 2: 1233. 1759. Based on Plumier, Pl. Amer. 97, tab. 107, fig. 2. 1755.

Wedelia carnososa L. C. Rich. in Pers., Syn. Pl. 2: 490. 1807. TYPE: Herb Rich (P).

Procumbent perennial *herb*; stems stout, glabrous or pubescent, seldom scabridulous; roots fibrous. *Leaves* opposite, somewhat succulent, to 18 cm long, elliptic or lanceolate, often with 3 angular lobes and conspicuous marginal teeth, apically acute, basally cuneate, glabrous or sparingly pubescent, sometimes scabrous; petiole distinct but less than 5 mm long, the intrapetiolar ridge persistent and conspicuous on old stems. *Inflorescence* of solitary heads on elongate, ebracteate peduncles. *Heads* radiate; involucre green, of several lanceolate, ciliate, obscurely nerved bracts 10–15 mm long, the innermost narrower; paleas hyaline, cuculate, partially enfolding the disc florets, contracted below the deltoid apex; ray florets 4–8, the ligules showy, yellow, 15–20 mm long, broad, glabrous, 3–4-denticulate, the ovary fertile, trigonous; disc florets numerous, ca. 2 cm long, the corolla yellow, 5–6 mm long, the 5 deltoid lobes dorsally glabrous, ventrally pubescent, the tube narrowed below, the anthers black, ca. 3 mm long with blackish appendages and short basal auricles, the style branches flattened and marginally pubescent, the style not basally expanded, the nectary 1 mm high, cylindrical, the ovary 3–4-angled, slender, the pappus lacking awns. *Achenes* blackish, sometimes mottled, clavate, angled, ca. 5 mm long, apically contracted and expanded into a small peglike, coroniform pappus of fused scales.

A native of the New World tropics, this species is widely cultivated as an ornamental ground cover and is now naturalized in many countries. Commonly found along seacoasts, *Wedelia trilobata* also occurs naturally inland in disturbed, wet places. The solitary yellow flowers and thick, mostly 3-lobed leaves on crawling stems are good features for recognition in the field.

Wedelia brasiliensis (Spreng.) Blake (= *W. paludosa* DC.) is closely related but differs from *W. trilobata* in its entire leaves and upright habit. Some Panamanian collections resemble *W. brasiliensis* but cannot be separated specifically from *W. trilobata* growing in the country. Similarly, *W. gracilis* L. C. Rich. of the Greater Antilles has smaller, more saliently lobed and generally pubescent leaves, and the few Panamanian collections resembling *W. gracilis* are better considered as extremes of *W. trilobata* rather than as a separate taxon. "Clavellin de Playa."

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2715 (MO). Almirante, *Blum* 1320 (MO). Bocas del Toro, *Carleton* 134 (GH). RR track near station at mi 5, *Croat & Porter* 16487 (MO). Columbus Island, *Dodge* 3464 (GH). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al.* 2006 (GH, MO). Isla Colón, *Wedel* 73 (GH, MO). Without locality,

⁴⁹ For a list of synonyms see Schulz (1911). Only the listed names are pertinent to Panamanian material.

Wedel 223 (GH, MO). Vic. of Chiriquí Lagoon, *Wedel* 1147 (MO), 1792 (GH, MO), 2768 (GH), 2943 (MO). CANAL ZONE: Pipeline Road near Gamboa, *Clewell & Tyson* 3274 (MO). Coco Solo road $\frac{1}{2}$ mi from Transisthmian Hwy., *Correa* 61 (MO). Barro Colorado Island, *Croat* 4264, 6117, 15166 (all MO). Near Coco Solo Weather Station, *Duke* 4288 (MO). Just E of Gatún Locks, *Duke* 4295 (MO). Toro Point, Fort Sherman, *Duke* 4322 (MO). Frijoles, *Ebinger* 314 (MO). Chagres, *Fendler* 168 (GH, MO). Cristobal, *Greenman & Greenman* 5216 (MO). Gatún, *Heriberto* 59 (GH). Between Frijoles and Monte Lirio, *Killip* 12118 (GH). 1 mi N of JOTC Center at Ft. Sherman, *Lazor* 5369 (MO). Cristobal, *Salvoza* 1012 (GH). Old Fort San Lorenzo, *Tyson* 1554 (MO). Fort Sherman, *Tyson* 2255 (MO). COLÓN: Miguel de la Borda, *Croat* 9810 (MO). Near Miguel de la Borda, *Croat* 9884 (MO). Road to Portobelo $\frac{1}{4}$ mi N of María Chiquita, *Croat* 11350 (MO). Beach strand W of Portobelo, *Croat* 14133A (MO). Santa Rita Ridge, *D'Arcy & D'Arcy* 6142 (MO). W of Portobelo, *D'Arcy & D'Arcy* 6702 (MO). María Chiquita, *Ebinger* 436 (MO). Mouth of Río Piedras, *Lewis et al.* 3169 (MO). Colón, *Macbride & Featherstone* 9 (GH). Near Santa Isabel, *Pittier* 4182 (GH). Around Portobelo, *Pittier* 2467 (GH). Beach between Fató and Playa de Damas, *Pittier* 3926 (GH). 5 mi NE of Sabanita, *Wilbur & Lutey* 11622 (MO). LOS SANTOS: Río Tonosí near Tonosí, *Lewis et al.* 1587 (GH, MO). PANAMÁ: Pedro Gonzalez, Pearl Island, *Allen* 2588 (MO). San José Island, *Erlanson* 1 (GH); *Johnston* 490 (GH); *Harlow* 23 (GH). Chimán, *Lewis et al.* 3347 (MO). Taboga Island, *Pittier* 3612 (GH). Saboga Island, *Tyson & Loftin* 5131 (MO). Isla Espíritu Santo, Pearl Islands, *Tyson* 5572 (MO). SAN BLAS: Hills SE of Puerto Obaldía, *Croat* 16722 (MO). Near Puerto Obaldía, *Croat* 16969 (MO). Airport at Irandí, *Duke* 6514 (GH, MO). Mulatuppu, *Duke* 8524 (MO). Mainland opposite Achituppu, *Lewis et al.* 88 (MO). Nargana Island, *Gentry* 1513 (MO). W end of Soskatupu, *Kirkbride* 207 (MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al.* 2827 (MO).

75. WULFFIA

Wulffia Neck. ex Cass. in Levr., Dict. Sci. Nat. 29: 491. 1823; 38: 17. 1825. TYPE: *Wulffia baccata* (L.f.) Kuntze, Rev. Gen. Pl. 1: 373. 1891.

Woody vines, often high-climbing; stems terete or angled, puberulent or scabrous. Leaves opposite, ovate, shallowly toothed, coriaceous, glabrate or scabridulous, pinnately veined but successively 3–5-veined from near the base; petioles slender, forming a persistent intrapetiolar ridge. Inflorescence a terminal aggregate of several heads, these sometimes dichasial or subumbellate; bracts often present. Heads radiate, showy; involucre of numerous bracts in 2–3 imbricate series, ovate, indurate, sometimes recurving apically; receptacle convex; paleas indurate, stramineous, enfolding the florets, apically thickened; ray florets in 1 series, the corolla yellow, mostly narrow, denticulate, the tube short, the limb elongate; disc florets numerous, 5-merous, the corolla obconical, the tube short, the anthers with obtuse appendages, basally auriculate, the style branches lanceolate, unappendaged, the ovary strongly 3–4-angled, the pappus of one deciduous awn arising from an angle of the achene. Achene blackish, prismatic, plump, the pericarp thick, soft and fleshy, the endocarp black, hard; carpodium small, yellowish; pappus absent at maturity.

Wulffia differs from *Melanthera* in the soft thickening of inulin materials in the pericarp of the achene and in the sclerified, thickened tips of the paleas. While Panamanian species of *Melanthera* are white flowered and lack rays, some species from South America have yellow rays and resemble *Wulffia*. *Wulffia* is also superficially similar to some species of *Zexmenia*, but these particular species have prominent awns on the achenes. *Wulffia* consists of one species ranging through

Central America and northern South America and several species from ultramontane South America.

The black fruits are held high at the edges of the forest and are eaten by birds which presumably digest the pericarp and pass through the hard seeds unscathed.

Literature:

- Huber, J. 1898. Observações histológicas e biológicas sobre o fruto da *Wulffia stenoglossa* DC (Jambú). Bol. Mus. Paraense Hist. Nat. 2: 96–101.
Schulz, O. E. 1911. Compositarum genera nonnulla. In I. Urban, Symb. Ant. 7: 78–144.

1. *Wulffia baccata*⁵⁰ (L. f.) Kuntze, Rev. Gen. Pl. 1: 373. 1891.—FIG. 77.

Coreopsis baccata L. f., Suppl. Pl. 380. 1781. TYPE: (LINN 1026.7).

Wulffia platyglossa DC., Prodr. 5: 563. 1836. TYPE: not seen.

Large woody *vine*, mostly high climbing; stems at first quadrate, soon terete, scabridulous with minute, white appressed hairs, often mottled. *Leaves* opposite, ovate, to 15 cm long, coriaceous, apically acuminate, basally obtuse or rounded, the margins crenate-dentate, the teeth callose tipped, pinnately veined with 1–2-pairs of strong veins diverging successively near the base, both sides scabridulous with scattered, small appressed, verrucose hairs, appressed pubescent on the major veins; petiole slender, to 15 mm long, the slender wings upfolded, the bases united in an interpetiolar ridge. *Inflorescence* a terminal aggregate of few–several heads, sometimes disposed in dichasial or subumbellate groups; bracts foliaceous; pedicels stout, deeply furrowed, scabrid, to 4 cm long, sometimes with a solitary bracteole along the length. *Heads* radiate, showy, globose, 1.2–1.8 cm across (not counting ray corollas); involucral bracts numerous in 1–3 similar but unequal series, 3–4 mm long, 2–4 mm wide, obovate, green to stramineous, indurate, often recurved apically, callose-mucronulate, the basally impressed midvein flanked by two sometimes elevated veins, dorsally puberulent; receptacle convex; paleas conspicuous, ca. 6 mm long, stramineous, indurate, enfolding the florets, the apex callose-sclerified into a thick, pointed umbo, strongly nerved, ciliate on the margins and costa; ray florets several in one series, the corolla orange or yellow, the tube short, flattened, the limb 10–15 mm long, ca. 4 mm wide, denticulate, the staminodes and style wanting, the ovary sterile, rudimentary; disc florets numerous, ca. 7 mm long, the corolla yellow, the tube short, the limb opening gradually upwards, ca. 4 mm long, the lobes obtuse, papillose-ciliate, the anthers black, ca. 2 mm long, the appendages yellow, the base auriculate, the style branches lanceolate, unappendaged, pilose, the style base not expanded, the nectary large, ca. 0.2 mm tall, cupular, apically sinuate, sometimes green, the ovary prismatic, with one short, stout, early deciduous awn arising from one of the angles. *Achene* black, ca. 5 mm long, prismatic, plump, the pericarp soft, fleshy, the endocarp black, flinty, apically surmounted by a small peg (the nectary); epappose.

⁵⁰ A list of synonyms was published by Schulz (1911). Only the two names appearing here have been applied to Panamanian plants.



FIGURE 77. *Wulffia baccata* (L.f.) Kuntze. Habit ($\times \frac{1}{2}$). [After Croat 6419 (MO).]

Wulffia baccata is widespread in tropical America, and is frequent in lowland Panama, the showy heads emerging at forest edges and from trees in fencelines. Immature herbarium specimens are sometimes mistaken for *Melanthera*, and mature specimens are sometimes taken for *Zexmenia virgulta* which differs in its pinnately-veined, puberulent leaves and shorter, broader involucral bracts.

BOCAS DEL TORO: Water Valley, Wedel 753 (MO, US), 832 (GH, MO). Near Chiriquí Lagoon, Wedel 1086, 1238 (both GH, MO), 2632 (GH, MO, NY, US). CANAL ZONE: Near Albrook Tower, Blum 437 (US). Pipeline Road just N of Gamboa gate, D'Arcy & D'Arcy 6017 (MO). Madden Forest S of Río Pedro Miguel, D'Arcy 6100 (MO). Fort Kobbe, Duke 3936 (GH, MO, US). Fort Sherman, Dwyer 4358 (GH, MO). Coco Solo, Dwyer & Duke 7900 (MO). Military road K-9, Ebinger 538 (MO). Coco Solo, Elias & Kirkbride 1610 (GH, MO). Gatún Station, Hayes 69 (GH), 249 (NY). N of Frijoles, Standley 47420 (US). Old Fort San Lorenzo, Tyson 1547 (MO). 1 mi N of Summit Garden, Tyson & Blum 1957 (MO). BARRO COLORADO ISLAND: Aviles 86 (MO); Bailey & Bailey 477 (GH); Bangham 482 (GH);

Croat 4224, 4267, 4371, 5961, 5980, 6009, 6082, 6137, 6363, 6378, 6419, 9123, 9291, 11466, 11772 (all MO), 16547 (MO, NY); Dwyer 1426; Ebinger 138, 617 (both MO); Kenoyer 375 (US); Shattuck 36 (A, MO), 987 (MO, US); Standley 10469 (US); Starry 2, 182 (both MO); Wetmore & Abbe 96 (A, GH, MO). COCLÉ: N of El Valle, 1000 m, Allen 3686 (GH, MO). Hills above El Valle de Antón, D'Arcy 6760 (MO). COLÓN: Santa Rita Ridge, D'Arcy & D'Arcy 6143 (MO). Portobelo, Dwyer 4397, 4398 (both MO). Fató, Pittier 3861 (GH, NY, US), 4245 (GH, US). Santa Rita Ridge, Gentry 9369 (MO). DARIÉN: La Boca de Pirre, Bristan 1284 (MO). Río Pirre, Croat & Porter 15525 (MO). Río Tuira, 5–15 mi below El Real, Duke 4952 (GH, MO, US). Path from Pucro to Río Pucro, Duke 5358 (MO). Río Sambú above Río Venado, Duke 9263 (US). Loma-Cuasí behind Manené, Duke 13636 (MO). Cerro Pirre, 2500–4500 ft, Duke & Elias 13806 (MO). Santa Fe, Duke 14284 (MO). Río Chucunague above Río Tuquesa, Stern *et al.* 852 (GH, MO, NY, US). HERRERA: 10 mi S of Ocú, Tyson *et al.* 2829 (MO). PANAMÁ: Panama National Hwy. near Río Pacora, Bartlett & Lasser 16948 (MO). Near Cerro Azul 3 mi above Goofy Lake, Croat 11578 (MO). Road to Cerro Azul, 1000 ft, D'Arcy & D'Arcy 6216 (MO). Cerro Jefe, D'Arcy & D'Arcy 6262 (MO). Near Jenine, Río Cañita, Duke 3802 (MO). Ca. 6 mi E of Chepo, Duke 4066 (MO). Halfway between El Llano and Río Mamoni, Duke 5602 (MO). Cerro Jefe, Duke 9406, 9418 (both MO). Between Cañasas and Sabalo, 100 m, Duke 14465 (MO). Tocumen, Dwyer 4233 (US). Cerro Jefe, 2900 ft, Dwyer & Gauger 7330 (GH, MO, US). Río Maestro, Gentry 2208 (MO). Icantí, Río Agua Clara, Gentry 2610 (MO). Without locality, Hayes 74 (NY). Gatun Locks and Gatun Lake, Johnston 1660 (GH, MO). S slope of Cerro Azul, King 5253 (US). Cerro Jefe below summit, Kirkbride & Crebbs 22 (MO, NY). 5 mi SW of Cerro Brewster, Lewis *et al.* 3519 (MO). Cerro Azul, 2000 ft, Tyson 2102 (MO). Road from Cerro Azul to Cerro Jefe, 2400 ft, Tyson 6316 (MO). SAN BLAS: SW of Puerto Obaldía, Croat 16763 (MO). Ailigandí, Dwyer 6821 (MO). Mainland opposite Playon Chica, Gentry 6401 (MO).

76. ZEXMENIA

Zexmenia La Llave in La Llave & Lexarza, Nov. Veg. Descr. 1: 13. 1824. TYPE: *Z. serrata* La Llave.

Herbs or widely branched *shrubs*, sometimes scrambling; stems slender, pubescent. *Leaves* opposite, ovate or lanceolate, entire or denticulate, often pinnately veined, pubescent, sometimes coriaceous; petioles pubescent, canaliculate above. *Inflorescence* an open panicle, sometimes cymose; bracts or bracteoles sometimes alternate. *Heads* radiate; involucre bracts in several series, the outermost narrower, the inner series ovate, basally indurate; paleas scarious, enfolding the florets; ray corollas mostly yellow, the limb narrow, denticulate, the ovary fertile, 3-angulate, 3-awned; disc corollas tubular, 5-merous, the lobes short, porrect, dorsally pubescent, the anthers appendaged, basally subauriculate, the ovary fertile, laterally flattened, apically winged, two awns departing centrifugally from near the center of the apex, then bending upwards, a small squamellate pappus sometimes present. *Achenes* dark, glabrous, apically winged, with two stout awns arising from near the center of the summit, bending first outwards and then upwards; pappus of small scales sometimes present between the awns.

Zexmenia includes 3–4 species of Central America which are closely related to species of *Wedelia* and *Oyedaea*. Only one species occurs in Panama.

1. ***Zexmenia virgulta*** Klatt, Bull. Soc. Roy. Bot. Belgique 31: 203. 1892. TYPE: not seen.—FIG. 78.

Scrambling *shrub*; twigs slender, drying longitudinally striate, tomentose with fine hairs and stout, ascending white hairs, glabrescent. *Leaves* opposite, to 15



FIGURE 78. *Zexmenia virgulta* Klatt.—A. Habit ($\times \frac{1}{2}$).—B. Achene ($\times 3\frac{1}{2}$). [After Busey 659 (MO).]

cm long, chartaceous to subcoriaceous, ovate to lanceolate, apically acute or acuminate, basally obtuse, the margins serrulate, the veins pinnate, ca. 5 on each side of the midrib, drying darker above, scabridulous, soft tomentose beneath; petioles mostly 8–10 mm long, tomentose, canaliculate above. *Inflorescence* an

open panicle with few or many heads, umbelliform; bracts foliaceous, opposite; bracteoles subfoliaceous or scalelike, sometimes alternate on the peduncles or associated with the heads and forming an outer whorl of involucre bracts. *Heads* compressed-globose; involucre ca. 1.5 mm across, the outermost bracts 4–10 mm long, apically or entirely oblong-lanceolate, green, somewhat recurving, the inner series broader, mostly shorter, ovate, basally indurate, dorsally appressed pubescent, ciliate; paleas 6 mm long, scarious, apically pubescent, enfolding the floret; ray florets ca. 12 in one series, the corolla yellow, the ligule ca. 5 mm long, ovate, minutely denticulate, glabrous, the tube glabrous, ca. 5 mm long, the style branches small, ovary fertile, 3-awned; disc florets numerous, 8 mm long, the corolla yellow, 6 mm long, the tube lighter, glabrous, forming almost half the length, apical lobes puberulent dorsally, the anthers dark with dark appendages, basally auriculate, the style branches ascending-pilose with a minute appendage, the stigmatic lines running the full length of the branches, the style base not expanded, inserted in a narrow, cylindrical, apically irregular, 1 mm long nectary, the ovary fertile, strongly laterally compressed, the angles long-pilose, slightly constricted apically with two stout, ascending-strigose awns which exceed the corolla, the pappus of a ring of squamellae. *Achene* bodies black, ca. 3 mm long, surrounded by corky, 1 mm thick, sparingly pilose wings, and surmounted by the squamellate pappus and sometimes by one or two weak awns.

The achene of this species resembles that of some species of *Wedelia*, but the organization of the involucre is quite different. This species is known also from Costa Rica. Herbarium material may be mistaken for *Wulffia baccata*, which has slightly shiny, less pubescent leaves, and leaves more strongly 3–5-nerved from near the base.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 410* (US). CHIRIQUÍ: 30 km N of Paso Canoas, 600 m, *Busey 621* (MO). 2–8 km N of Cañas Gordas (Costa Rica), 1000–1100 m, *Busey 659* (MO). Along road to Cerro Punta, *King 5291* (US). Near San Félix, *Pittier 5455* (US). El Valle, *Allen 749* (US). W facing slopes of El Valle, *King 5323* (US). Between Margaritas and El Valle, *Woodson et al. 1748* (US). PANAMÁ: Cerro Campana, *Ebinger 372* (US). SW slopes of mountains W of Chica, *King 5262* (US). VERAGUAS: Hills W of Soná, *Allen 1038* (US). Highway to Soná, *King 5282* (US).

F. COREOPSIDINAE

W. G. D'ARCY⁵¹

Coreopsidinae Less., *Linnaea* 5: 153. 1830. "Coreopsidaeae." TYPE: *Coreopsis* L.

Coreopsidaceae Link, *Handb.* 1: 768. 1829. "Coreopsidaeae." TYPE: *Coreopsis* L.

Trichospirinae Less., *Linnaea* 6: 690. 1831. "Trichospireae." TYPE: *Trichospira* H.B.K.

Literature:

Sherff, E. E. 1955. Subtribe Coreopsidinae. In E. E. Sherff & E. J. Alexander. *North American Flora*, ser. 2, 2: 1–190.

⁵¹ Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.

77. BIDENS⁵²

Bidens L., Gen. Pl., ed. 5. 362. 1754. TYPE: *B. tripartita* L.

Pluridens Neck., Elem. Bot. 1: 86. 1790, nom. mut. *Bidens* L.

Edwardsia Neck., Elem. Bot. 1: 1790, nom. mut. *Bidens* L.

Kerneria Moench, Meth. 595. 1794. TYPE: *K. trigona* Moench = *Bidens pilosa* L.

Ceratocephalus Cass., Dict. Sci. Nat. 7: 432. 1817. TYPE: *Bidens pilosa* L.

Delucia DC., Prodr. 5: 633. 1836. TYPE: *D. ostruthioides* DC.

Diodonta Nutt., Trans. Amer. Phil Soc., n.s. 7: 360. 1841. LECTOTYPE: *D. leptophylla* Nutt.
= *Bidens mitis* (Michx.) Sherff.

Diadonta Walp., Repert. Bot. Syst. 2: 614. 1843, orth. mut. *Diodonta* Nutt.

?*Acocotli* Hernandez, Altam. Mat. Med. Mex. 2: 154. 1898, cf. Sherff, N. Amer. Flora, ser. 2, 2: 113. 1955.

Herbs, perennial or annual, erect, scandent or procumbent, rarely shrubby or paludal; stems mostly pubescent and drying striate or sulcate, at least when young. *Leaves* opposite, simple or compound, serrate, lobed or dissected, rarely entire, mostly petiolate. *Inflorescences* of solitary, sometimes aggregated terminal heads; peduncles slender, narrowing upwards, striate, subtended by paired, foliaceous bracts and often by one or more alternately disposed foliaceous or scalelike bracteoles along their length. *Heads* mostly radiate, sometimes showy; involucre of an outer series of distinct, herbaceous, acute or rarely foliaceous bracts and an inner series of broader, membranous, sometimes basally united bracts, the margins often hyaline; receptacle flat or convex; paleas resembling the inner involucre bracts but narrower, slightly curved around the ovary; ray florets few—many in 1 series or wanting, the corolla with a broad, apically denticulate limb, drying with longitudinal nerves, the tube short, the ovary sometimes fertile; disc florets numerous, the corolla tubular, the 5-lobes yellowish, glabrous or puberulent on the ventral surface, the anthers often black, basally obtuse or subauriculate, the appendages large, the style branches flattened, apically pilose with a short, narrow appendage, the ovary mostly fertile. *Achenes* black or brown, narrowly fusiform or linear, sulcate, often apically ascending-strigose, mostly surmounted by 1–6 retrorsely strigose awns held at various angles, those of the marginal disc florets sometimes different from those of the central disc florets, those of the rays sometimes flattened, broad.

Bidens is a genus of about 75 species mainly of Mexico but ranging into North and South America. Several species are widely naturalized as weeds. It is closely related to *Coreopsis* and *Cosmos*.

Literature:

Sherff, E. E. 1937. The genus *Bidens*. Field Mus. Nat. Hist., Bot. Ser. 16: 1–709.

- a. Plant erect, annual; ray florets not showy, yellow or white, less than 12 mm long, or wanting.

⁵² Assistance from T. Melchert, University of Iowa, in preparing the treatment for *Bidens* is gratefully acknowledged.

- b. Leaves 3(–5)-foliolate, the leaflets serrate; achenes straight.
 - c. Achenes less than 12 mm long, the awns erect 3. *B. pilosa*
 - cc. Achenes more than 12 mm long, the awns divaricate, sometimes reflexed 5. *B. riparia* var. *refracta*
- bb. Leaves 2–3-pinnately divided, the leaflets deeply toothed or lobed; achenes curved 1. *B. bipinnata* var. *cynapiifolia*
- aa. Plants procumbent, ascending or scandent, not erect, perennial; ray florets showy, yellow or orange, more than 12 mm long.
 - d. Plants scandent, the shoots more than 45 cm long; the solid portions of the leaf blade more than 10 mm wide, the margins serrate 4. *B. reptans*
 - dd. Plants procumbent, rooting at the lower nodes, the ascending shoots less than 30 cm long; the solid portions of the leaf blade less than 10 mm wide, the margins deeply toothed or lobed.
 - e. Ray florets fertile; style branches conspicuous in living material 2. *B. ostruthioides* var. *costaricensis*
 - ee. Ray florets sterile; style branches mostly wanting 6. *B. triplinervia*

1. ***Bidens bipinnata*** L., Spec. Pl. 832. 1753. TYPE: not seen.

1a. ***Bidens bipinnata*** var. ***cynapiifolia*** (H.B.K.) Maza, Anales Soc. Esp. Hist. Nat. 19: 275. 1890.

Bidens cynapiifolia H.B.K., Nov. Gen. Sp. Pl. 4: 235. 1820. TYPE: Cuba, Guanavaca, Bonpland 1562 (P).

Erect, branched annual *herb* to 1.5 m tall; stems glabrate, drying conspicuously many-ribbed. *Leaves* opposite, pinnate or bipinnate, to 15 cm long (including petiole), leaflets apically acuminate or acute, basally cuneate to truncate, the margins mostly saliently toothed, ciliate in part, puberulent above and beneath with short hairs, venation pinnate; petiole slender, glabrate. *Inflorescences* solitary heads or a panicle aggregation of heads involving upper portions of the plant; peduncle slender, to 12 cm long, glabrate; bracts small, compound; bracteoles when present solitary on the peduncle, linear. *Heads* radiate, sometimes inconspicuously so; involucre bracts in 2 dissimilar series, the outermost ca. 8, linear, expanded apically and basally, apically obtuse or rounded, glabrate, drying 1- or 3-nerved, ca. 5 mm long, the innermost lanceolate, glabrous, conspicuously dark-striate, the margins hyaline; receptacle pilose; paleas resembling the innermost series of involucre bracts but narrower; ray florets several or wanting, the corollas yellow, the limb broad, drying strongly 5–7-nerved, apically entire or minutely emarginate, the tube flat, 1.5 mm long, glabrous; disc florets numerous, 5–6 mm long, the corolla tube 1 mm long, ?angled, the limb cylindrical, conspicuously dark-nerved, the 5 lobes glabrous with dark nerves, the anthers ca. 1.5 mm long, dark, the appendages dark, the basal auricles small or wanting; style branches flattened, lanceolate, dorsally pilose, with a slender apicule, the style base not expanded, immersed in the 1 mm tall, cylindrical nectary, the ovary compressed, the margins sparingly pubescent near the apex, the pappus of ca. 6 awns, each with a dark costa. *Achene* dark, ca. 12 mm long, slightly curved, angled, glabrous, with ca. 6 stout, erect, retrorsely barbed awns, those of the margin shorter, ascending-tomentose.

This erect species may be recognized by the usually bipinnate leaves which are not divided into narrow segments as in *B. ostruthioides*. The achenes are dimorphic; the majority of the innermost are glabrous but a few at the margin are densely tomentose.

Variety *cynapiifolia* ranges through the Antilles and Central America. It is reported from South America and is adventive in Hawaii and in the Old World. It is a weedy species of lowlands.

Bidens bipinnata L. var. *bipinnata* of the southeastern United States differs from var. *cynapiifolia* in having usually straight achenes with less differentiation between those of the margin and those of the center.

CANAL ZONE: Mount Hope Cemetery, *Standley* 28804 (US). Farfan Beach area, *Tyson & Blum* 2610 (MO). COCLÉ: Aguadulce, *Pittier* 4839 (US). PANAMÁ: Peña Prieta, *Heriberto* 251 (US). E of Río Tocumen, *Standley* 26646 (US). Near Juan Franco race track, *Standley* 27799 (US). Nuevo San Francisco, *Standley* 30741 (US).

2. ***Bidens ostruthioides*** (DC.) Schultz-Bip. in Seem., Bot. Voy. Herald 308. 1856.

2a. ***Bidens ostruthioides* var. *costaricensis*** (Benth. in Örst.) Sherff, Bot. Gaz. (Crawfordsville) 88: 298, pl. 21. 1929.

B. costaricensis Benth. ex Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 94. 1852. TYPE: *Oersted* 137 or 183 (K, mounted on same sheet).

Perennial *herb* to 40 cm tall, glabrate; stems terete, drying strongly angled, reclining, rooting at the nodes, new growth ascending. *Leaves* 2–3-pinnately lobed, the segments acute or obtuse, mucronulate, to 10 cm long, 2–10 mm broad, drying with the venation prominent beneath; petiole slender, often narrowly winged, to 4 cm long, slightly expanded and ciliate at the base. *Inflorescences* of 1–3-terminal heads; peduncles slender, narrowing upwards, to 20 cm long; mostly ebracteolate but sometimes with one or two entire bracteoles along the length. *Heads* radiate, showy; outer involucral bracts ca. 5, distinct, glabrate, ca. 8 mm long, 4 mm wide, herbaceous, apically acute, basally contracted and thickened, the inner bracts membranaceous, shorter or longer than the outer bracts, basally puberulent; ray florets yellow, showy, the corollas 2–3 cm long, 10–15 mm wide, longitudinally veined, minutely 3-denticulate, the teeth acute, the style slender, 4–5 mm long, exserted, the branches slender, slightly compressed, granular, not pubescent, the ovary fertile; disc florets numerous, the corolla yellowish, glabrous outside, the lobes minutely puberulent on the ventral surface, the anthers black, the style branches expanded-truncate with conical, pilose appendages. *Achene* (after Sherff) pale brown, narrow, 7–9 mm long, glabrous with 2–4 retrorsely barbed awns 3.5–5 mm long.

This species closely resembles *Bidens triplinervia* but is slightly larger in habit and leaves and the ray florets are fertile. The sole Panamanian collection is in poor condition and is referred to this species with hesitation. However, as the species has been collected in neighboring Costa Rica, it is a likely member of the

Chiriquí mountain flora. The above description is taken mainly from a series of Costa Rican collections. Thomas Melchert has mentioned verbally that in living material the styles of the ray flowers are a conspicuous feature distinguishing *B. ostruthioides* from *B. triplinervia*. *Bidens ostruthioides* var. *ostruthioides* has trifoliolate, hardly dissected leaves.

CHIRIQUÍ: Cerro Pando, valley of the upper Río Chiriquí Viejo, White 48 (MO).

3. ***Bidens pilosa*** L., Sp. Pl. 832. 1753. TYPE: America, Herb Linn. (LINN 975.8).

B. leucantha Willd., Sp. Pl. 3: 1719. 1803.

Erect, branched, annual *herb* to 1.5 m tall; stems angled, green, glabrate. *Leaves* opposite, 3(–5)-foliolate, the leaflets to 7 cm long, ovate, apically acute, obtuse or acuminate, basally acuminate to truncate, the margins serrate, pinnately veined, reticulate beneath, puberulent on both sides, the hairs longer beneath; petiole slender, basally expanded and slightly clasping, the basal margins ciliate. *Inflorescence* mostly of several loosely aggregated, terminal heads; peduncle to 5 cm long, slender, erect, glabrate or puberulent, drying angled. *Heads* radiate or discoid; involucre 5–8 mm high, the bracts in 2 dissimilar series, the outer series narrow, herbaceous, expanded basally and apically, only the basal expansion imbricate, 1-nerved, the apex ciliate, obtuse or rounded, the inner series ovate, indurate, obscurely or conspicuously several-nerved, the margins scarious-hyaline; receptacle flat; paleas wanting; ray florets several in 1 series or wanting, the corolla white or yellow, 7–12 mm long, the tube short, dorsiventrally flattened, ciliate on the margins, the limb ovate, sometimes broadly so, 2-notched, drying prominently 5–7 nerved, the style present or not, the ovary sterile, faintly trigonous; disc florets numerous, the corolla yellowish or greenish, 3–4 mm long, sparingly stipitate-glandular, the tube ca. 1 mm long, the limb narrowly obconical, the 5 lobes dorsally pilose, the anthers black, ca. 2 mm long, with ovate, eglandular appendages, the basal auricles indistinct, the style branches flattened, lanceolate, pilose, with a linear apicule, the style base not expanded, immersed in a 0.5 mm long, cylindrical nectary, the ovary compressed, weakly 4-angled, pilose with ascending hairs, glandular-stipitate near the apex, the pappus of two stout retrorse-strigose awns. *Achene* black, 15–22 mm long, linear, strongly angled, glabrous but with a few stiff, short, ascending hairs near the apex; carpopodium oblique, stramineous, puberulent; pappus of 2–3 stiff, retrorsely strigose awns (aristae), ca. 3 mm long.

This species is native to the Caribbean region but is widespread as a weed of tropical and warm temperate lands. It may be recognized by its usually trifoliolate, serrate-margined leaves and by its black, straight, 3-awned, linear achenes. The awns are erect. It is the only species of *Bidens* in Panama which sometimes produces white-rayed heads. “Spanish Needles.”

A number of varieties and forms have been recognized under this species, T. Melchert has indicated that probably none of these is of taxonomic significance.

Panamanian plants which have reduced rays (most collections) may be referred to as f. *minor* Sherff.

BOCAS DEL TORO: Above railroad station at mi 7.5, *Croat & Porter* 16426, 16438 (both MO). Changuinola, *Stork* C36 (UC). Without definite locality, *Wedel* 158 (GH, MO). CANAL ZONE: Pedro Miguel, *Heriberto* 103 (US). Monte Lirio, *Maxon* 6850 (US). Ancón Hill, *Piper* 5545 (US). Juan Mina, *Piper* 5706 (US). Balboa, *Standley* 27004 (US). Frijoles, *Standley* 27630 (US). Gamboa, *Standley* 28473 (US). France Field, *Standley* 28592 (US). Near Summit, *Standley* 29995 (US). Darién Station, *Standley* 31533 (US). Near Salamanca Hydrographic Station, Río Pequeni, *Woodson et al.* 1610 (US). Darién Station, *MacBryde* 2683 (F, US). CHIRIQUÍ: 19 km W of Puerto Armuelles, 500 m, *Busey* 608 (MO). El Hato del Volcán, *Croat* 10404 (MO). Between Boquete and Monte Rey, *Croat & Porter* 15649 (MO). Cerro Pando, *D'Arcy & D'Arcy* 6321 (MO). Roadside W of Cerro Pando, ca. 6000 ft, *D'Arcy & D'Arcy* 6636 (MO). Near Boquete, 3300–4200 ft, *Lewis et al.* 422 (MO). Valley of the upper Río Chiriquí Viejo near Monte Lirio, 1300–1900 m, *Seibert* 233 (MO). Collins Finca, Boquete District, 6000 ft, *Ebinger* 697 (F). Interam. Hwy. at Concepción, *King* 5287 (UC, US). Near Boquete, *Maurice* 686 (US). Alto Boquete, *Partch* 69-135 (MO). Cerro Punta, *Sawyer*, 1 March 1967 (MICH). Upper Río Chiriquí Viejo near Monte Lirio, *Seibert* 232 (MO), 233 (GH, NY). Bambito, 5600 ft, *Tyson* 5635 (MO). COCLÉ: El Valle de Antón, *D'Arcy & D'Arcy* 6716 (MO). PANAMÁ: S slopes of Cerro Azul, *King* 5245 (UC, US). Las Sabanas, *Paul* 18 (US). Cerro Jefe, *Tyson et al.* 4299 (MO). VERAGUAS: 15 mi N of Calobre, 644 m, *Lutelyn* 1449 (MO).

4. *Bidens reptans* (L.) G. Don in Sweet, Hort. Brit., ed. 3. 360. 1839.—FIG. 79.

Coreopsis reptans L., Syst. Nat., ed. 10, 2: 1228. 1759. TYPE: Jamaica, *P. Browne* (LINN 1026.13).

Bidens squarrosa H.B.K., Nov. Gen. Sp. Pl. 4: 187. 1820. TYPE: Venezuela, *Humboldt & Bonpland* (P, not seen).

?*B. segetum* Mart. ex Colla, Herb. Pedem. 3: 307. 1834. TYPE: Brasil, *Martius* (TO, not seen). *B. tereticaulis* DC., Prodr. 5: 598. 1836. TYPE: not seen.

Large, scandent *herbs*, often clambering in thickets to 3 m high; stems glabrate, fistulose, sometimes stout. *Leaves* opposite, trifoliate, the leaflets to 10 cm long, ovate or lanceolate, apically acuminate, basally obtuse, the margins serrate, pinnately veined, sometimes drying reticulate beneath, puberulent on both sides with weak hairs; petioles glabrate or puberulent, slightly expanded and clasping at the base. *Inflorescence* a racemose-paniculate aggregation of flowers along the ends of the branches; peduncles glabrate or pubescent, slender, to 11 cm long; bracts short, linear-spatulate; linear-spatulate bracteoles sometimes present. *Heads* radiate, showy, to 4 cm across; involucre bracts in 2 dissimilar series, the outermost narrow, to 6 mm long, expanded basally and apically, imbricate only at the basal expansion, drying 3-nerved, ciliate, sometimes pubescent at the base, the innermost series lanceolate, indurate, the margins hyaline-scarious, apically thickened and tomentose; paleas lanceolate, scarious, apically dark-striate and puberulent; ray florets 4–7, the corolla showy yellow, to 2.5 cm long, the tube 2–3 mm long, flattened, sparsely pilose, the limb narrow, glabrate, drying prominently 10–12-nerved, apically mucronulate or minutely denticulate, the style mostly wanting, the ovary sterile, flat; disc florets numerous, 8–10 mm long, the corolla 5–6 mm long, the tube ca. 1.5 mm long, glabrate, the limb tubular, the lobes glabrous, the anthers black, ca. 3 mm long, the appendages ovate, dark, the base subauriculate, the style branches flattened, ventrally pilose with a thick



apicule, the style base not expanded, immersed in a 1 mm long, cylindrical nectary, the ovary flattened, pilose on the margins. *Achene* dark, 12–16 mm long, linear, flattened, ascending-pilose on the angles and at the apex; the two awns erect, retrorsely strigose.

This species is recognizable by its showy yellow heads, its scandent habit, and its dark, linear, marginally pubescent achenes which usually bear two stout apical awns.

Bidens reptans ranges through the moist uplands of tropical America. In Panama it is found mainly in the Chiriquí mountains but one collection comes from Cerro Azul which does not reach 1,000 m.

Bidens segetum appears to refer to unusually pubescent plants of *B. reptans* such as *Allen 4864* from Panama.

CHIRIQUÍ: Near New Switzerland, 1800–2000 m, *Allen 1342* (F, MO, US). N face of Cerro Copete, an eastern spur of Chiriquí Volcano, 8000–8500 ft, *Allen 4864* (MO). Cerro Punta, ca. 7000 ft, *Blum et al. 2404* (MO). Las Nubes, 5.5 km NW of Río Chiriquí Viejo, 2200 m, *Busey 682* (MO). Trail north of Cerro Punta, *Croat 10482* (MO). Palo Santo, 3 mi N of Volcán, *Croat 13542* (MO). Between Cerro Punta and Bajo Grande, *Croat & Porter 16010* (MO). 10–11 mi W of Puerto Armuelles, near San Bartolo Limite, 300–500 m, *Croat 22001* (MO). Above Cerro Punta on slope of Cerro Respinga, 8000 ft, *D'Arcy & D'Arcy 6532* (MO). Bajo Chorro, Boquete District, 6000 ft, *Davidson 151* (F, MO). Volcán de Chiriquí, 9500 ft, *Davidson 1004* (F). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9070* (MO). Boquete, 6000 ft, *Ebinger 690, 693* (F, MO). Near Boquete, *Lewis et al. 314, 580* (both MO, US). NE of Alto Linio, 4300 ft, *Maurice 862* (F, MO, UC, US). Volcán de Chiriquí, *Woodson et al. 806* (MO, US). COCLÉ: Hill S of El Valle de Antón, 600–800 m, *Allen 1177* (MO), 2854 (US, MO). PANAMÁ: Road between Cerro Azul and Cerro Jefe, 2400 ft, *Tyson 6318* (SCZ). VERAGUAS: 2 mi W of Santa Fe, 400–800 m, *Liesner 842, 843A* (both MO). Ca. 2 km N of Escuela Agrícola Alto de Piedra, N of Santa Fe, *Mori & Kallunki 2610* (MO).

5. ***Bidens riparia*** H.B.K., Nov. Gen. Sp. Pl. 4: 236. 1820, not *B. riparia* E. L. Greene, Pittonia 4: 261. 1901. TYPE: Colombia, Herb. H.B.K. (P, not seen, IDC 602. 109. III. 6).

- 5a. ***Bidens riparia* var. *refracta*** (Brandeggee) O. E. Schulz, Symb. Ant. 7: 132. 1911.

B. refracta Brandeggee, Zoe 1: 310. 1890. TYPE: Baja California, collection not designated.

Erect, branched *herb* to 1 m tall; stems sometimes stout, drying conspicuously striate, glabrate. *Leaves* opposite, mostly trifoliate, occasional leaves 7-foliate or bipinnate, to 7 cm long, leaflets mostly 2–3 cm long, ovate, apically acuminate, basally truncate to obtuse, serrate, pinnately veined, often reticulate beneath, sparingly pubescent with short weak hairs; petiole ca. $\frac{1}{2}$ as long as the leaflet, slender, glabrate, slightly expanded and clasping at the base. *Inflorescence* an open aggregate of terminal and subterminal heads; peduncles to 10 cm long, striate, glabrate; bracts foliaceous; bractlets mostly 1 or 2, alternate, linear or

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FIGURE 79. *Bidens reptans* (L.) G. Don.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 2$). [After *Blum et al. 2404* (MO.)]

compound. *Heads* mostly radiate; involucral bracts in 2 dissimilar series, the outermost ca. 8, linear, ca. 5 mm long, green, glabrate, the innermost broadly lanceolate, membranous or indurate, dark, glabrous, the margins scarious imbricate; receptacle pubescent; paleas resembling the innermost involucral bracts but narrower; ray florets inconspicuous, the corolla ?yellow, the limb drying prominently 5–9-nerved, apically minutely notched, 3–4 mm long, the tube ca. 1 mm long; disc florets numerous, the corolla 4–5 mm long, the tube puberulent, the limb cylindrical, angled, the angles with prominent dark veins, the 5 lobes with dark nerves, glabrous, the anthers dark, basally subauriculate, the appendages narrow, ovate, dark, the style with 4 dark nerves, the branches flattened, apiculate, pilose, the style base immersed in the short, cylindrical, apically sinuate nectary, the ovary elongate, angled, pubescent, the pappus of ca. 4 stout, retrorsely strigose awns. *Achene* dark, linear, slightly outcurving, ca. 1.5 cm long, conspicuously striate, glabrous or puberulent apically; the outermost achenes densely tomentose with ascending hairs, pappus of ca. 4 stiff, spreading, retrorsely strigose, 3–4 mm long awns.

This species ranges through Central America and northern South America, occurring as a lowland weed of ruderal or disturbed situations.

B. riparia is distinct from *B. bipinnata* var. *cynapiifolia* to which it is closely related in its trifoliate rather than pinnate leaves, its serrate rather than saliently toothed leaflets, and its larger achenes with relatively shorter awns. Although radiate, the head may appear disciform.

Sherff (1955) and Schulz (1911) recognized two varieties under *B. riparia*, the first writer because of the degree of division of the leaves, a feature which appears to vary on different parts of a single plant, and the second writer because of the degree of pubescence of the achenes.

CANAL ZONE: Balboa, *Standley* 26078 (US). Near Gatún, *Standley* 27332 (US). Near Juan Franco race track, *Standley* 27800 (US). HERRERA: 10 mi S of Ocú, *Tyson et al* 2836 (MO). LOS SANTOS: 3 mi S of Carreta, ca. 5 mi S of Las Tablas, *Burch et al.* 1239 (MO). PANAMÁ: 1 mi E of Tocumen Airport, *Blum & Tyson* 1963 (MO). Vera Cruz, *Lewis et al.* 2997 (MO). Saboga Island, Pearl Islands, *Tyson & Loftin* 5120 (MO).

6. ***Bidens triplinervia***⁵³ H.B.K., Nov. Gen. Sp. Pl. 4: 182. 1820. TYPE: Mexico, *Humboldt & Bonpland* (P, not seen).

?*B. andicola* H.B.K., Nov. Gen. Sp. Pl. 4: 186. 1820. TYPE: Ecuador, *Humboldt & Bonpland* (P, not seen).

B. mollis Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 49. 1845. TYPE: Peru, *Poeppig* 1377 (W, not seen).

B. humilis H.B.K. var. *macrantha* Wedd., Chlor. And. 1: 69. 1856. TYPE: Ecuador, *Jameson* 55 (C, K, neither seen).

B. triplinervia var. *macrantha* (Wedd.) Sherff, Bot. Gaz. (Crawfordsville) 80: 383. 1925.

B. triplinervia var. *mollis* (Poepp. & Endlich.) Sherff, Bot. Gaz. (Crawfordsville) 80: 383. 1925.

Sprawling or ascending perennial *herb*, to 40 cm tall, sometimes much branched below; stems glabrous or pilose in lines, sometimes rooting at the lower nodes, the internodes short or long. *Leaves* opposite, to 4 cm long, deeply lobed, sometimes

⁵³ Other synonyms are presented by Sherff (1937: 506) but only the listed names have been used for Panamanian material.

trifoliolate or bi-compound, the sinuses narrow, the lobes 2–4 on each side, apically obtuse or acute, mucronulate, the basal half entire, acute; petiole short or to 7 mm long, basally ciliate. *Inflorescence* of 1–3 heads inserted between reduced, foliaceous bracts or branching from a common peduncle; peduncle slender, to 20 cm long, gradually narrowing upwards, sometimes with one or two bracteoles opposite or alternating along its length. *Heads* radiate, sometimes showy; involucre bracts in several series of about equal length, the outer series glabrate, 3 mm long, linear, apically rounded and mucronulate, the inner series dorsally pubescent at the base, broader, slightly longer; receptacle convex; paleas scarious, 7 mm long, the costa striate, the tip darkened; ray florets 5–8, the corolla yellow, broad, apically minutely 2–3-denticulate or entire, the venation prominent, 2–3 cm long, 1–1.5 cm wide, the style mostly wanting, the ovary sterile; disc florets numerous, the corolla yellowish, ca. 5 mm long, tubular, the limb expanded, tubular, the margins of the lobes thickened, papillose, the anthers ca. 2 mm long, yellowish, basally subauriculate, the appendages narrow, ligulate, the filaments glabrous, the style branches apically ascending-pilose with a short, papillose, linear appendix, the style base inserted in a cylindrical nectary, the ovary fertile. *Achenes* dimorphic, the outer series few, shorter, slightly incurved and dull, the innermost numerous, linear, deeply sulcate, black, shiny, mostly straight, glabrous or with a few minute ascending bristles near the apex; carpophodium yellowish; pappus of 2–4 short awns, retrorsely barbed, yellow, 1–2 mm long.

This species is known in Panama only from middle and upper elevations in the Chiriquí mountains. The small, toothed and deeply lobed, sometimes trifoliolate or bipinnate leaves, the showy yellow heads on long peduncles, plus the short, black, aristate needlelike achenes are distinctive. This species is quite similar to *Bidens ostruthioides* DC. which occurs in neighboring Costa Rica. *Bidens ostruthioides* is distinguished by its fertile ray florets and by its styles which are conspicuous on living material. It also has somewhat larger leaves, and the receptacle is glabrous.

CHIRIQUÍ: Llanos del Volcán, 1300 m, *Allen 1545* (MO). Potrero Muleto, Volcán de Chiriquí, 10400 ft, *Davidson 1008* (MO). Near Boquete, *Duke 9179* (US). Volcán de Chiriquí, 11960 ft, *Terry 1324* (MO). Top of El Barú, above 11000 ft, *Tyson & Lofton 6169* (MO). W slope of El Barú, 10000–11000 ft, *Tyson & Loftin 6152* (MO). Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 420* (MO).

78. CHRYSANTHELLUM

Chrysanthellum L. C. Rich. in Pers., Syn. Pl. 2: 1807. TYPE: *C. procumbens* L. C. Rich. = *C. americanum* (L.) Vatke.

Microlecan Schultz-Bip. ex Benth. & Hook., Gen. Pl. 2: 384. 1873. TYPE: *M. abyssinica* Schultz-Bip. = *Chrysanthellum americanum* (L.) Vatke.

Chrysanthellina Cass., Dict. Sci. Nat. 25: 390. 1822, orth. mut. *Chrysanthellum* L. C. Rich.

Collaea Spreng., Syst. Veg. 3: 622. 1826. TYPE: *C. procumbens* (L. C. Rich.) Spreng.

Sebastiania Bertol., Lucubr. 37. 1822. TYPE: *S. heterophylla* Bertol. = *Chrysanthellum americanum* (L.) Vatke.

Diminutive, short-lived *herbs*, erect, prostrate or ascending with a short, slender tap root. *Leaves* alternate or opposite, entire, dentate to bipinnately dissected with

fine divisions, glabrate; the petiole slender, sometimes not distinguished from the blade, slightly clasping the stem. *Inflorescence* of solitary ascending flowers or rarely clustered in an ill-defined panicle; peduncle slender, glabrate, often with foliaceous or scalelike bracts. *Heads* radiate; involucre bracts in 2–3 dissimilar series, the outer bracts few, short, linear to lanceolate and conspicuously basally thickened, the inner series similar, imbricate, the innermost sometimes slightly narrower, imbricate, oblong to lanceolate, indurate or chartaceous, drying striate, the hyaline margins broad, entire; receptacle hemiglobose; paleas mostly persistent, linear with a dark costa and hyaline margins, the outermost half enfolding the ray ovaries; ray florets several in ca. 2 series, the corolla yellow with a short tube and two distinct longitudinal ribs, apically 2(3)-denticulate, the ovary laterally flattened, epappose; disc florets several, the corolla campanulate, the 5 lobes enervate, glabrous, the anthers dark with deltoid, uncolored appendages, basally obtuse or subauriculate, the style branches with flattened, pilose margins. *Achenes* often dimorphic, the outermost oblong, buff, tuberculate, sometimes puberulent, the apex slightly expanded into two lateral ears, the innermost flat, black, with massive, light-colored wings; pappus wanting.

This is a genus of perhaps 6 species in the tropics of both the New and Old Worlds. The dimorphic involucre bracts, and the prominently winged, epappose, central fruits are distinctive. This is a genus where the term *palea* requires broad definition, for the bracts enfolding the ray ovaries and those subtending the disc ovaries are alike but different from the two types of involucre bracts.

1. ***Chrysanthellum americanum* (L.) Vatke**, Abh. Naturwiss. Vereine Bremen 9: 122. 1885.

Anthemis americanum L., Sp. Pl. 895. 1753. TYPE: Jamaica, Hort. Cliff. (BM, not seen). Protologue cites also Sloane, Voy. Isl. Madera 1: 263, *tab.* 155, *fig.* 3. 1707. TYPE: Jamaica, Sloane (BM, not seen).

Bidens apiifolia L., Syst. Nat., ed. 10. 1203. 1759. Based on Sloane, Voy. Isl. Madera 1: 263, *tab.* 155, *fig.* 3. 1707.

Verbesina mutica L., Sp. Pl., ed. 2. 1273. 1763. TYPE: Jamaica, Houston 1732 (LINN 1020.10 ex herb Gronov.).

Chrysanthellum procumbens L. C. Rich. in Pers., Syn. Pl. 2: 471. 1807. Based on *Verbesina mutica* L.

Sebastiania heterophylla Bertol., Lucubr. 37. 1822. TYPE: not seen.

Collaea procumbens (L. C. Rich.) Spreng., Syst. Veg. 3: 622. 1826.

1a. ***Chrysanthellum americanum* var. *integrifolium* (Steetz) Alexander**, N. Amer. Flora, ser. 2, 2: 148. 1955.—FIG. 80.

C. integrifolium Steetz in Seem., Bot. Voy. Herald 160. 185.

Small glabrate *herbs*; stems prostrate and ascending, to 20 cm long, sparingly branching, with a small tap root. *Leaves* oblanceolate, to 10 cm long and 2.5 cm wide, apically dentate and rounded to obtuse, mostly entire below, basally narrowed and the slender petiole not differentiated from the blade, slightly clasping the stem, pinnately veined mostly in the upper portion, often drying reticulate on both sides, glabrate, ?succulent. *Inflorescence* a solitary head; peduncle ascending, slender, glabrate, to 15 cm long, sometimes minutely

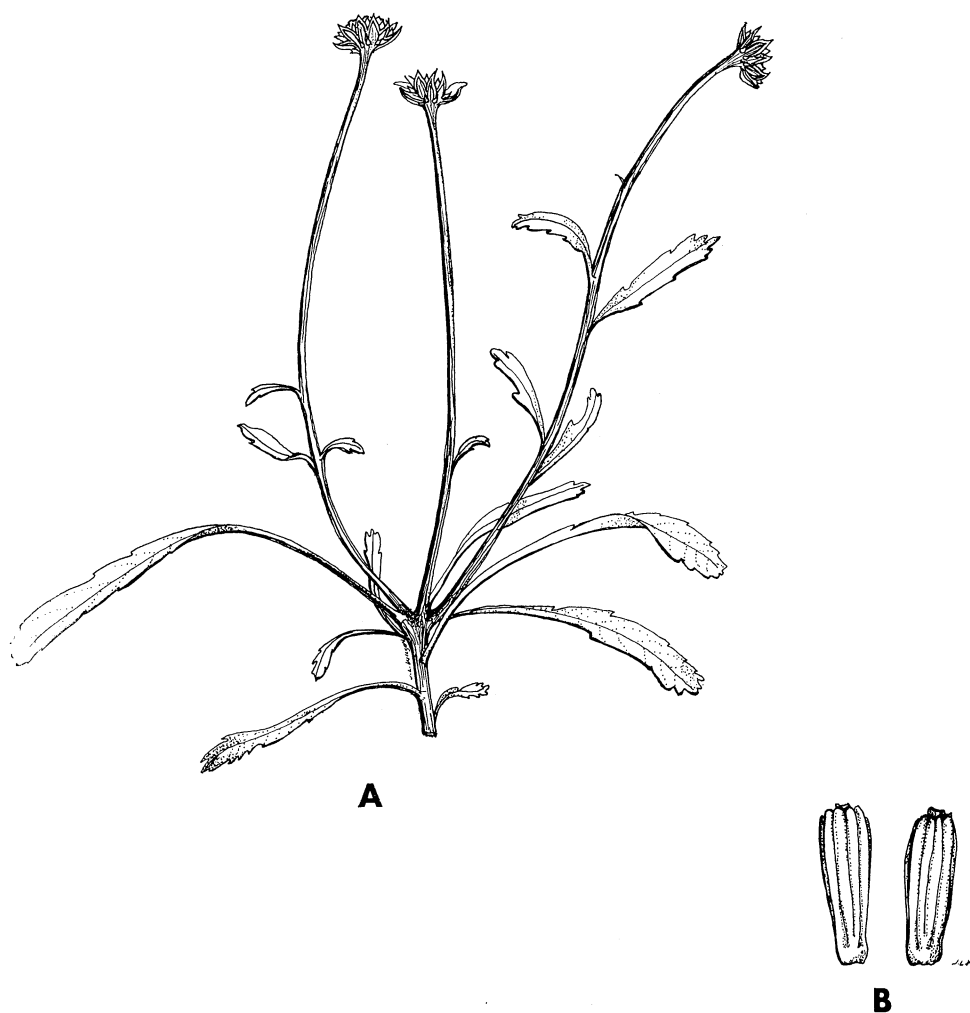


FIGURE 80. *Chrysanthellum americanum* var. *integrifolium* (Steetz) Alexander.—A. Habit ($\times \frac{1}{5}$).—B. Achenes ($\times 5$). [After Duke 5933 (MO).]

puberulent at the apex, sometimes with one or two foliaceous or scalelike bracts along the length. *Heads* radiate; involucre bracts of 2 dissimilar forms, the outermost 4–8, subulate, ca. 2 mm long and 0.5 mm wide, apically acute, basally enlarged into a (?succulent) boss, the innermost 13–18 bracts in 2 similar series, imbricate, 3–5 mm long, 1.5 mm wide, oblong, apically obtuse, drying reddish brown, indurate, the margins broad, hyaline, entire; receptacle depressed-hemispherical; paleas linear, drying dark-striate, exceeding the ovaries but mostly shorter than the filaments, nearly flat; ray florets ca. 18 in 2–3 series, ca. 9 mm long, the corolla yellow, 6–7 mm long with two prominent, puberulent, brownish-red longitudinal stripes, apically 2(3)-denticulate, the tube ca. 1 mm long, the style branches flattened, glabrous, the style with 2 vascular traces, basally minutely

expanded, the ovary narrowly turbinate, laterally flattened, pubescent with weak, multicellular hairs, half enfolded by palealike bracts; disc florets ca. 13, ca. 4 mm long, the corolla campanulate with a short tube and 5 glabrous lobes, the lobes veinless, the anthers dark, 1 mm long, the appendages clear, deltoid, the style branches flattened, pilose ventrally and marginally, the style with 2 vascular traces, not basally expanded, the ovary oblong, compressed. *Achene* oblong, strongly flattened, 3 mm long, 1–2 mm wide, black with massive, light-colored wings; pappus wanting.

Chrysanthellum americanum grows in wet, sunny spots in lowland Panama. The wings of the achenes are larger and more massive relative to the flat, black central portion than in any other epappose species of Compositae in Panama.

Variety *integrifolium* has entire or apically dentate leaves, while the typical var. *americanum* has dissected leaves with filiform segments. The heads of var. *integrifolium* are larger as well. Variety *integrifolium* is reported to have only one sort of achene, but this may not be true of all plants. Both varieties occur on Jamaica, the type locality for the species. The typical variety ranges across the Old and New World tropics, but var. *integrifolium* appears to be restricted to the Caribbean region.

CANAL ZONE: Fort Kobbe, *Duke* 3973 (MO). COCLÉ: Llanos, Penonomé, *Ebinger* 1028 (MO). Between Aguadulce and Antón, 15–50 m, *Woodson et al.* 1220 (MO). HERRERA: Pesé, ca. 50 m, *Allen* 811 (MO). PANAMÁ: Savanna near Río Pacora and Chepo Hwy., *Duke* 5933 (MO). Sabana de Juan Corso near Chepo, 60–80 m, *Pittier* 4505 (MO).

79. COSMOS

Cosmos Cav., Icon. Descr. Pl. 1: 9. 1791. TYPE: *C. bipinnatus* Cav.

Cosmea Willd., Sp. Pl., ed. 4. 3: 2250. 1803, orth. mut. *Cosmos* Cav.

Cosmus Pers., Syn. Pl. 2: 477. 1807, orth. mut. *Cosmos* Cav.

Adenolepsis Less., Linnaea 6: 510. 1831. TYPE: *A. pulchella* Less.

Herbs or rarely *subshrubs*, perennial or annual, mostly glabrate, sometimes hispid; stems branched, erect, slender, quadrate or terete; roots of perennial species thickened, fasciculate. *Leaves* opposite, mostly compound or dissected, petiolate. *Inflorescence* a solitary head or loose aggregate of heads; peduncles elongate, terete or slightly angled; bracts resembling the leaves, one or two bracteoles sometimes alternate along the peduncle. *Head* normally radiate, sometimes showy; involucre bracts in 2 dissimilar series each about as many as the ray florets, the outermost herbaceous, drying striate, basally fused into a meniscoid hypanthium, the innermost longer, broader, membranous, mostly not striate, sometimes colored like the rays; receptacle nearly flat; paleas scarious-membranous, flat or cuculate, curved around the ovary; ray florets 5–12 in 1 series (except some horticulture forms), the corolla variously colored, the limb 3-denticulate, longitudinally sulcate with scattered elongate slender hairs on the dorsal surface, the ventral surface minutely puberulent-papillose near the base, the tube short, dorsiventrally compressed, the ovary rudimentary; disc florets few–many, often forming a cone or cylindrical disc, colored like the rays or not, the corolla cylindrical or narrowly obconical, the limb not demarcated from the tube, faintly 5-angled, glabrate,

5-lobed, the lobes obtuse, ciliate or ventrally pubescent, the point of filament insertion marked by a ridge on the corolla tube, the anthers with large appendages, basally obtuse or subauriculate, the filaments pubescent, the style branches pilose, truncate with a short or long acicular appendage, often appearing acicular overall, the ovary subcylindrical, with the basal half slightly enlarged, sometimes strigose. *Achenes* narrowly cylindrical-fusiform, often apically narrowed into a slender beak, sometimes strigose, mostly with 1–3 stout, barbed awns.

Cosmos includes about 30 species occurring mainly in Mexico but ranging south into Central America. It is closely related to *Dahlia*, *Coreopsis*, and *Bidens*. *Dahlia* is distinguished by its naked awns and more robust habit. *Coreopsis* does not have thickened rootstocks and the awns are not barbed. In *Bidens* the achene apex is not produced into a distinct beak.

Three easily distinguished species of *Cosmos* occur in Panama. One of these, *C. sulphureus* is known mainly from cultivation. *Cosmos bipinnatus* Cav., native of Mexico and Arizona, is frequently cultivated for ornament in other countries and may be expected in Panamanian gardens from imported seed. It resembles *C. crithmifolius* but is annual instead of perennial, and the similar leaves are shorter and softly flexuous instead of stiffly erect. *Cosmos bipinnatus* is available from northern seed houses in various colors.

- a. Leaf segments stiff, uniform in width (1–2 mm); perennial; rays showy pink; bristles at summit of achene 1–5 and erect 2. *C. crithmifolius*
- aa. Leaf segments membranaceous, flexuous, conspicuously wider (to 6 mm) near the middle; annual; rays various colors; bristles at summit of achene 0–3, divaricate, seldom erect.
 - b. Flowers showy yellow; anthers yellow; inner involucre bracts mostly orange or yellowish at the tips; cultivated species sometimes escaping 3. *C. sulphureus*
 - bb. Flowers pink or purplish (? or white), mostly not showy; anthers black; inner involucre bracts mostly not colored; native species 1. *C. caudatus*

1. ***Cosmos caudatus*** H.B.K., Nov. Gen. Sp. Pl. 4: 240. 1820. TYPE: Mexico, *Humboldt & Bonpland* (P).

Erect, annual *herb* to 2 m tall; stems slender, terete, glabrate with occasional sturdy hairs, drying striate. *Leaves* to 20 cm long, 2–3-pinnatisect, the segments to 6 mm broad, apically acute, aristate; petiole slender, to 8 cm long but shorter or wanting on the uppermost leaves, the margins basally hirsute. *Inflorescences* of 1–3 heads in an open cluster; peduncle slender, elongate, subtended by bracts resembling reduced leaves, sometimes bearing one or more alternate, scalelike bracteoles. *Heads* radiate, rarely showy; involucre bracts in 2 unlike series, the outer series ca. 8, herbaceous, slender, ca. 7 mm long, the midvein basally prominent on drying, the inner series scarious, longer and broader, colored with hyaline margins; paleas resembling the innermost bracts but narrower and lacking color; ray florets mostly pink or purplish, 10–15 mm long, sometimes abortive, the limb apically entire or 2–3-denticulate with scattered long hairs on the dorsal surface and minutely puberulent near the base on the ventral surface; disc florets numerous, the corollas yellowish tipped, 5–6 mm long, cylindrical but expanding slightly upwards, the lobes copiously pubescent ventrally, the anthers black, ca. 2 mm long, the appendages hyaline, costate with a projection of the anther con-

nective, the bases obtuse or subauriculate, the filaments inserted about $\frac{1}{3}$ of the way up the corolla tube, puberulent, the style branches pilose, yellow, with short, acicular appendages, inserted on a 0.6 mm long, narrow, cylindrical nectary, the ovary as long as the corolla, fusiform, larger in the lower half, curved. *Achene* mostly black, 1–3 cm long, fusiform, compressed, sulcate, slightly curved, the upper $\frac{1}{3}$ produced into a brown, ascending-strigose beak terminated by 2 diverging, retrorsely strigose, 3–4 mm long bristles.

Cosmos caudatus is native to Central America and the Antilles but is now widespread in many parts of the world. It has probably been distributed adventively as a weed but may occasionally be cultivated for ornament. It is not usually a showy bloomer. With leaves much like those of *C. sulphureus*, *C. caudatus* is distinguished by its smaller pinkish rays, larger achenes, and less pubescent filaments which are inserted higher in the corolla tube. "Pega pega," Clavijena de Monte."

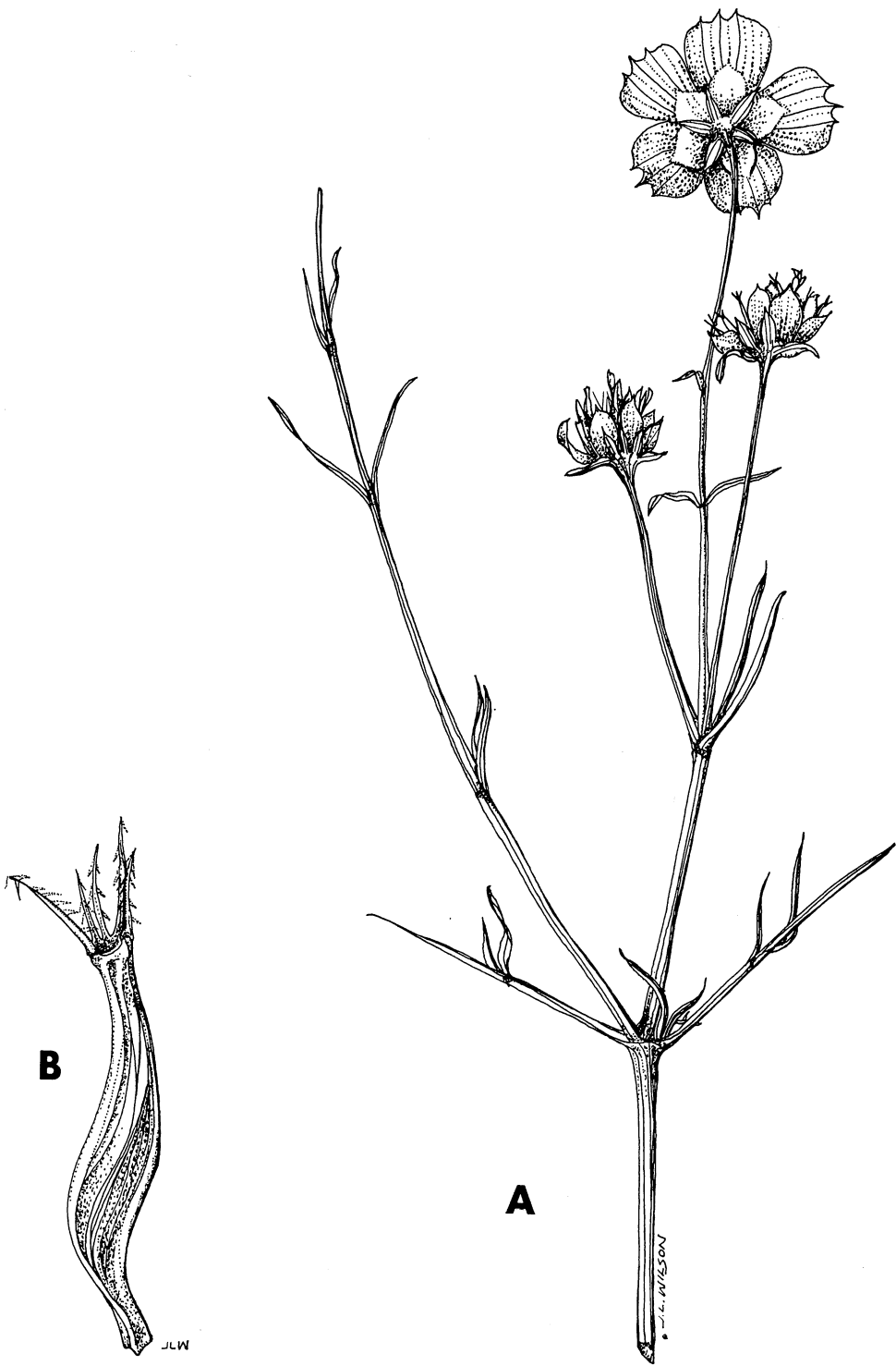
BOCAS DEL TORO: Changuinola to 5 mi S at junction of Río Changuinola and Terebé, 100–200 ft, *Lewis et al.* 906 (MO). CANAL ZONE: Between Mount Hope and Santa Maria Trail, *Cowell* 91 (NY). Banks of Gatún River, *Greenman & Greenman* 5151 (MO). Ancón Hill, *Paul* 156 (US). Empire to Mandinga, *Piper* 5531 (US). Around Culebra, *Pittier* 2152 (US). Between Gorgona and Mamei, *Pittier* 2246 (US). Between Fort Clayton and Corozal, *Standley* 29029 (US). Near Fort Sherman, *Standley* 31069 (US). COCLÉ: El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2574 (MO). 1–5 mi S of Antón, *Tyson & Blum* 2584 (MO). COLÓN: Between France Field and Catival, *Standley* 30409 (US). DARIÉN: 10 mi S of El Real on Río Pirre, *Duke* 5377 (MO). HERRERA: Between Las Minas and Pesé, 900–1200 ft, *Burch et al.* 1350 (MO). 10 mi S of Ocu, *Tyson & Blum* 2869 (MO). PANAMÁ: Nueva Gorgona, *Duke* 4489 (MO). Near El Llano, *Duke* 5515 (MO). Tocumen, *Dwyer* 5161 (MO). Chiva-Chiva, *Killip* 3134 (US). Between Las Sabanas and Aguarrubia, *Killip* 3354 (GH). Between Savannas and Yguana, *McBride* 2656 (F, US). Without locality, *Seeman* (GH). Past Río Mamoni 3 mi along road to El Llano, *Tyson* 6797 (MO). SAN BLAS: Outskirts of Puerto Obaldía, *Gentry* 1566 (MO). Mainland opposite Ailigandí from mouth of Ailigandí River, 2.5 mi inland, *Lewis et al.* 79 (MO). VERAGUAS: 4 mi N of Santiago, *Dwyer* 1245A (MO). WITHOUT LOCALITY *Duke* 6163 (MO).

2. *Cosmos crithmifolius* H.B.K., Nov. Gen. Sp. Pl. 4: 242. 1820. TYPE: Mexico, *Bonpland* (P).—FIG. 81.

Erect, branched perennial *herb*, sometimes woody near the base, to 1 m tall; stems slender, green, glabrate, the angles conspicuously lighter in color. *Leaves* to 10 mm long, pinnate, the segments and petiole linear, evenly 1–2 mm wide, the midvein conspicuous on both sides. *Inflorescence* of 1–4 heads at a terminal node; peduncle slender, angled, to 20 mm long, sometimes with 1 or 2 alternate or opposite, scalelike bractlets along their length. *Heads* radiate, showy; outer involucre bracts narrow, herbaceous, drying with the veins elevated, 4–8 mm long, the inner bracts almost twice as long, hyaline, broad, colored or not; ray florets ca. 5, bright pink, the limb broad, apically 3-dentate, conspicuously longitudinally sulcate or nerved with scattered, long white hairs near the base on

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FIGURE 81. *Cosmos crithmifolius* H.B.K.—A. Habit ($\times \frac{3}{8}$).—B. Achene ($\times 3\frac{1}{2}$). [After D'Arcy & D'Arcy 6461 (MO).]



the dorsal surface, the tube 2–3 mm long; disc florets numerous, the corolla yellowish or pinkish, cylindrical, ca. 10 mm long, the lobes dorsally puberulent, the anthers black, the appendages ca. 0.8 mm long, the style branches compressed, ?glandular, the apex and the caudex pilose. *Achene* brown, ascending-strigulose, with 1–5 stiff, erect, retrorsely strigose awns.

Cosmos crithmifolius is native from southern Mexico to Honduras, and the Panamanian collection represents a significant range extension. It is an upland species of open woods. Similar to *C. bipinnatus* Cav. which may be cultivated from time to time in Panama, this species differs in its stiff leaves with segments 1–2 mm wide. *Cosmos bipinnatus* has weak leaves, and the segments are mostly 1 mm wide or less. It often has much longer outer involucre bracts as well.

CHIRIQUÍ: N end of Boquete, 4000 ft, D'Arcy & D'Arcy 6461 (MO).

3. ***Cosmos sulphureus* Cav.**, Icon. Descr. Pl. 1: 56. 1791. TYPE: not seen.

C. gracilis Sherff, Bot. Gaz. (Crawfordsville) 88: 304. 1929. TYPE: Panama, Pittier 5053 (US).

Annual *herb* to 1 m tall; stems slender, branching, erect, slightly quadrate, glabrate but with a few scattered, large whitish hairs. *Leaves* to 15 cm long, 2- or 3-pinnatisect, the segments acuminate and aristate-tipped, to 3–5 mm broad, glabrous or with a few stout hairs; petiole slender, angled, much shorter or wanting in the upper leaves, often hispid-ciliate at the expanded base. *Inflorescences* of one or more heads arising at terminal nodes; peduncles slender, to 15 cm long, apically narrowed, one or more leaflike bracts sometimes alternate along its length. *Heads* radiate, showy orange, to 5 cm across; outer involucre bracts ca. 8, herbaceous, slender, 5–7 mm long, drying basally striate, the inner bracts membranous-scarious, broader and longer than the outer bracts, drying without striations; paleas resembling the innermost involucre bracts but narrower, partly enfolding the floret; ray florets ca. 8 (a second series present in some horticultural forms), the corolla yellow or orange, 15–20 mm long, the limb obovate, apically 3-denticulate, longitudinally sulcate, sparingly pilose dorsally, minutely papillose-puberulent basally on the ventral surface, the tube 1–2 mm long, the ovary rudimentary; disc florets numerous forming a cylindrical, apically rounded disc, the corollas cylindrical, 7–12 mm long, the tube not demarcated from the limb, the apical lobes narrowly obtuse, ciliate on the inner surface, the anthers yellow, ca. 3 mm long, the bases acute or sometimes subauriculate, the filaments inserted near the bottom of the corolla tube, flattened, densely ciliate, the style branches yellow, pilose, the appendix slender, elongate, the ovary cylindriform, slightly expanded basally, the angles with short ascending hairs. *Achenes* black, ca. 20 mm long, slender, slightly curved, sharply angled, somewhat compressed, the upper $\frac{1}{4}$ narrowed into a linear, ascending-strigose beak terminated by 2 porrect, retrorsely strigose bristles 3 mm long.

A native of Mexico and Guatemala, this species is widely cultivated for ornament and is known from escapes and naturalized populations in many other parts of the world including Panama. It is usually recognized at a glance by its showy yellow or orange flowers, slender stems, and dissected leaves. Throughout

its range, isolated plants or populations may have awnless achenes, and two of the collections cited below represent this condition (*Pittier* 5053 and *Seibert* 544). Sherff considered this form to be a distinct species, *Cosmos gracilis*, but it is not worthy of taxonomic recognition. "Niño Muerto."

CANAL ZONE: Hotel Washington, Cristóbal, *Bailey & Bailey* 692 (US). Fort Kobbe, *Duke* 3949 (MO). Chagres, *Fendler* 173 (US). Río Pedro Miguel near East Paraíso, *Standley* 30005 (US). COCLÉ: 10 mi E of Río Hato, *D'Arcy & D'Arcy* 6274 (MO). Near Olá, *Pittier* 5053 (GH, US). Llano Bonito N of Las Margaritas, 400–500 m, *Seibert* 544 (MO, US). PANAMÁ: Panama City, *Hunter* 18 Dec 1934 (NY, GH).

80. DAHLIA

Dahlia Cav., Icon. Descr. Pl. 1: 56. 1791. TYPE: *D. pinnata* Cav.

Georgina Willd., Sp. Pl., ed. 4. 3(3): 2142. 1803. TYPE: *G. purpurea* Willd. = *Dahlia pinnata* Cav.

Georgia Spreng., Anleit., ed. 2. 2: 567. 1818, orth. mut. *Georgina* Willd.

Mostly perennial *herbs*, sometimes shrubby, rarely (?hemi-) *epiphytes*; stems branched or not, sometimes fistulose; mostly with thickened rootstocks. *Leaves* opposite or 3 per node, simple or pinnately 1–3-compound, the leaflets ovate to linear, the margins mostly serrate or dentate; stipels and petioles present. *Inflorescence* a solitary terminal head; peduncles sometimes aggregated into corymbs or panicles. *Heads* radiate, sometimes large and showy; involucre bracts in 2 unlike series, the outer series 4–7, green, porrect or reflexed, linear to ovate, somewhat fleshy, longitudinally striate-nervate, the inner series 7–9, thinner, broader, sometimes scarious margined, imbricate, accrescent in fruit; paleas scarious or slightly indurate; ray florets numerous, showy, variously colored, the limb broad or narrow, often apically denticulate, sometimes dorsally puberulent, the ovary sterile; disc florets numerous, much shorter than the rays, the corolla yellow or with some reddish or purplish, tubular, apically 5-lobed, the anthers with deltoid apical appendages and obtuse bases, the style branches narrow, dorsally pilose and ventrally puberulent at the tips. *Achene* mostly linear, apically contracted, surmounted by a thickened cap; pappus wanting or of 2 rudimentary awns or threads.

A genus of about two dozen species, *Dahlia* is mostly Mexican but ranges south into Colombia. Two species, *D. pinnata* Cav. and *D. coccinea* Cav. have hybridized in cultivation to produce the majority of horticultural forms commonly grown for ornament in many parts of the world.

Literature:

Sorenson, P. D. 1969. Revision of the genus *Dahlia* (Compositae, Heliantheae-Coreopsidinae). *Rhodora* 71: 309–416.

- a. Herb or shrub to 4 m tall; leaflets opposite, pubescent on the veins on both sides; inner involucre bracts twice as long as the outer bracts; ray florets white or pale pink, violet or purple, the disc prominent and yellow 1. *D. imperialis*
- aa. Herb to 1.5 m tall; leaflets randomly placed on the rachis, glabrate; inner involucre bracts slightly longer than the outer bracts; ray florets variously colored, the disc prominent or not, sometimes absent, yellow or purplish 2. *D. pinnata*

1. ***Dahlia imperialis*** Roezl ex Ortgies, *Gartenflora* 12: 243. 1863. TYPE: Mexico, *Roezl* (B, if extant, not seen).—FIG. 82.

Perennial *herb* or *shrub*, rarely a tree to 4 m, mostly branched from the base; stems stout; rootstock not seen. *Leaves* opposite, 35 cm or longer, 1–3-pinnate, the leaflets ovate, apically acuminate, basally rounded or obtuse, the margins evenly serrate, appressed puberulent on the veins above, loosely pilose beneath, especially on the veins, reticulate veined beneath; petiole stout, slightly shorter than the laminate portion. *Inflorescence* a terminal, several-flowered panicle, the branches subtended by foliaceous bracts and reduced leaves resembling abortive peduncles; peduncle glabrous, stout, of varying length, tardily articulating near the apex. *Heads* large, radiate; involucral bracts in 2 unlike series, the outermost oblong, thickened, reflexed, ca. 10 mm long, the innermost twice as long, broadly ovate, scarious, drying dark brown with hyaline margins; ray florets ca. 9, the corollas white or lavender, the ligule narrowly elliptical or oblanceolate, 2–4 mm long; disc florets very numerous, yellow. *Achene* (Sorenson) 13–17 mm long, linear or slightly oblanceolate.

This species was previously reported (Sorenson, 1969) from Mexico to Costa Rica and from Colombia on the east. The Panamanian collection reported here removes the disjunction between northern and southern populations. The species is sometimes cultivated for ornament in other countries and the possibility that the Panamanian collection represents a feral element cannot be discounted.

Dahlia imperialis differs from the commonly cultivated *D. pinnata* in its large size, its woody perennial growth, and in other characters noted in the key.

CHIRIQUÍ: 2 mi SW of Cerro Punta, 5600 ft, *Tyson* 6352 (MO).

2. ***Dahlia pinnata***⁵⁴ Cav., *Icon. Descr. Pl.* 1: 57. 1791. TYPE: not seen.

Erect, sometimes branched, cultivated *herbs* to 1.5 m tall; stems stout, sparingly branched, glabrous or scabridulous with sparse hairs, often reddish or purplish; rootstock not seen. *Leaves* opposite, simple or 1–2-pinnate, the leaflets ovate or elliptical, apically acuminate, basally obtuse or acute, the margins serrate or remotely dentate, to 15 cm long, glabrate, the petiolules mostly short, the petiole slender or stout, sometimes partly winged, basally expanded and with an intra-petiolar ridge. *Inflorescence* mostly a solitary terminal nodding head on an elongate, naked peduncle but sometimes several clustered into a pseudopanicle. *Heads* radiate, large, to 15 cm across; involucral bracts in 2 dissimilar series, the outermost ca. 10 mm long, oblong, apically obtuse or acute, patent, thick, many nerved, the innermost slightly longer, narrower, thin, drying dark and scarious, sometimes with a scarious margin; ray florets showy, extremely variable, purple, red, or white (rarely yellowish), ovate to linear, to 5 cm long, the ovary sterile; disc florets mostly yellow but sometimes reddish or purplish, sometimes replaced by fertile or sterile ligulate florets. *Achene* not seen.

⁵⁴ For a list of synonyms see Sorensen (1969).



FIGURE 82. *Dahlia imperialis* Roezl ex Ortgies.—A. Leaf ($\times \frac{1}{2}$).—B. Head, top view ($\times \frac{1}{2}$).—C. Head, bottom view, the corollas removed ($\times \frac{1}{2}$). [After Tyson 6352 (MO).]

The cultivated *Dahlia* is grown in many countries and exhibits wide variation in form of the flowers. It is best recognized by the large heads and by the two series of involucre bracts, the outermost of which is fleshy, patent or reflexed and the innermost is thin, seldom drying green yet not quite indurate. In Panama the species is grown in the Chiriquí mountains from imported seed, and it makes its appearance as cut flowers in lowland markets.

Sorensen (1969) discussed the uncertain origin of what is today grown as *Dahlia pinnata*, and he recommended against use of this name for the wide range of material in cultivation. Use of cultivar names as he suggested will be satisfactory only for horticultural purposes. Under the International Code of Botanical Nomenclature, the name *Dahlia pinnata* is currently the best choice, although it must be understood to include considerable variability derived from hybridization with other species. Selection of another, later, name from Sorensen's synonymy to express the advanced hybrid nature of plants now in cultivation is desirable, but must be made with reference to the appropriate types.

CHIRIQUÍ: Cultivated in Boquete, *D'Arcy* & *D'Arcy* 6465, 6509 (both MO).

81. HIDALGOA

Hidalgoa LaLlave & Lexarza, Nov. Veg. Descr. 1: 15. 1824. TYPE: *H. ternata* LaLlave.

Vines climbing by hooked petiole bases; stems weak, slender, sulcate, puberulent, sometimes woody at the base. *Leaves* opposite, trifoliate, 1–2-pinnate or palmately compound, the leaflets lobed or serrate; petioles mostly elongate and slender, the basal portion often lignified, recurved and following detachment of the apical portion, becoming a stout hook. *Inflorescences* axillary, mostly few or solitary along the stem; leaflike or scalelike bracts mostly present; scalelike bracteoles occurring sometimes along the petiole. *Heads* radiate, sometimes showy; involucre bracts in 2 dissimilar series, the outer series ca. 5, linear, porrect, the inner series broad, membranaceous, imbricate; ray florets 5–8, the corolla variously colored, apically minutely denticulate, drying prominently longitudinally nerved, the ovary dorsiventrally flattened, rectangular, surmounted by 2 stout, hornlike processes; disc florets numerous, the corolla tubular, long exerted from the paleas, 5-lobed, glabrous, the anthers basally obtuse or subauriculate, the appendages short, the style long exerted, branched or not, granular, the ovary sterile. *Achenes* (after Sherff) obcompressed, elongate-linear, mostly biaristate.

Hidalgoa includes 4 species which range from Mexico (Vera Cruz) to Peru. The plants are apparently rarely collected members of the liana-canopy accompaniment of forests. Only one species occurs in Panama.

The genus superficially resembles *Bidens* but differs markedly in a number of features, e.g., the hooked, lignified petiole bases, the porrect outer involucre bracts, the flat, rectangular ovaries of the ray florets and the abortive ovaries of the disc florets. The heads apparently appear in many colors. To judge from the shape of the achenes, the genus is related to *Bidens*, particularly such species as *B. vulgata* E. L. Greene of Canada and the northeastern United States.



FIGURE 83. *Hidalgia ternata* LaLlave & Lexarza.—A. Habit ($\times \frac{2}{5}$).—B. Achene ($\times 4$). [After Liesner 857 (MO).]

1. ***Hidalgia ternata*** LaLlave & Lexarza, Nov. Veg. Descr. 1: 15. 1824. TYPE: Mexico, *LaLlave* (not seen).—FIG. 83.

Slender *vine*, climbing by hooked petioles; stems puberulent, weak, drying sulcate, the nodes somewhat enlarged. *Leaves* opposite, trifoliate, the leaflets 3–4 cm long, ovate, apically acuminate, basally narrowed, irregularly serrate, the venation pinnate with 4–8 lateral veins on each side of the midvein, glabrate; petiolules short or wanting; petiole slender, weak, to 8 mm long, the basal 5–8 mm on some leaves becoming lignified, curved and hooklike, the distal portion deciduous. *Inflorescence* of solitary or paired heads distributed along the stem; peduncles slender, weak, sulcate, to 7 cm long, subtended by 1–2 entire bracts, sometimes with a bracteole along the length. *Heads* radiate; involucre bracts in 2 dissimilar series, the outermost ca. 5, linear, porrect, 8–14 mm long, herbaceous, thick, the midvein prominent, the inner series membranous, ca. 7 mm long and 3 mm wide, drying striate, the margins lighter in color; paleas resembling the inner involucre bracts but narrower; ray florets ca. 5, the corolla yellow, orange, red, or pink, 7–20 mm long, apically denticulate, the numerous longitudinal veins conspicuous, the ovary dorsiventrally flattened, rectangular, apically indented between the 2 hornlike lobes, pappus of a minute retrorsely barbed awn on each lobe, or wanting; disc florets numerous, the corolla tubular, slightly curved, ca. 8 mm long, long-exserted from the palea, glabrous outside, the lobes 1 mm long, glabrous, the anthers dark, 2 mm long, basally obtuse or auriculate, the apical appendages short, emarginate, the filaments glabrous, the style branches united, long-exserted, the surface granular, the ovary sterile. *Achene* (after Sherff) blackish, 7–11 mm long, ca. 4 mm wide, apically 2-dentate, slightly winged, papillose in rows, strigose.

Hidalgoa ternata ranges from Mexico (Vera Cruz) to Peru, but has been collected in Panama infrequently. It is usually found climbing at the edge of forests.

This species may be recognized by its scandent habit and hooked petiole bases which apparently assist in climbing. The heads are subtended by narrow, porrect outer involucre bracts.

VERAGUAS: Río Primero Braso, 2.5 km beyond Agricultural School Alto Piedra near Santa Fe, 700–750 m, Croat 25505 (MO). 5 mi SW of Santa Fe on road past Escuela Agrícola de Alto Piedra on Pacific side of the divide, 800–1200 m, Liesner 857 (MO). N of Santa Fe on property of Escuela Agrícola de Piedra, Mori & Kallunki 2513 (MO).

82. SYNEDRELLA

Synedrella Gaertn., Fruct. 2: 456, tab. 171, fig. 7. 1791, nom. cons. TYPE: *S. nodiflora* (L.) Gaertn.

Ucacou, Adanson, Fam. 2: 615. 1763. LECTOTYPE: *U. nodiflorum* (L.) Hitchc.

Ukakou, Adanson, Fam. 2: 615. 1763, nom. nud.

Ucacea, Cass., Dict. Sci. Nat. 29: 489. 1823. Revised spelling of *Ukakou* Adanson.

Branching *herb*, erect or procumbent. *Leaves* opposite, chartaceous, serrate, pubescent with appressed white hairs; petiole winged, short. *Inflorescences* fascicles of heads in the leaf axils; peduncles short, sometimes with foliaceous bracts. *Heads* radiate, cylindrical; involucre bracts several, imbricate, the outermost green, those inward scarious, narrower; receptacle convex, minute; ray florets 4–5, the corolla yellow with a substantial, narrow tube and broad limb, apically denticulate, the style branches slender, pilose, the ovary dorsiventrally flattened, with broad, apically erose margins, 2 awns evident; disc florets several, the corolla tube nearly as long as the angled, obconical limb, the short lobes dorsally pubescent, the anthers dark, the appendages dark, ligulelike, the basal auricles rounded, the style branches slender, flattened, marginally pilose, the style base not expanded but inserted in a slender, elongate, apically erose, stipitate nectary, the ovary oblong, slender, with 2 apical awns and a thick cap. *Achenes* dimorphic, those of the ray florets flat with broad, light colored, toothed margins and 2 short apical awns, those of the disc florets slender, tuberculate, with 2 sturdy, diverging strigose awns.

A monotypic genus ranging through the tropics, *Synedrella* may be recognized by its fascicles of inconspicuous heads and by the two distinct types of achenes.

1. *Synedrella nodiflora* (L.) Gaertn., Fruct. 2: 456. 1791.—FIG. 84.

Verbesina nodiflora L., Cent. I. Pl. 28. 1755. TYPE: not seen.

Ucacou nodiflorum (L.) Hitchc., Annual Rep. Missouri Bot. Gard. 4: 100. 1893.

Herb to 1.5 m tall, dichotomously branching, erect, sprawling or sometimes procumbent; stems terete, puberulent with appressed, ascending white hairs; sometimes rooting along the stem without respect to the nodes. *Leaves* opposite, mostly at the stem dichotomies, mostly 3–10 cm long, ovate or elliptical, apically acuminate, basally obtuse, the margins callose-serrate to subentire, both sides with appressed ascending white hairs, rarely scabridulous, the veins appearing pinnate

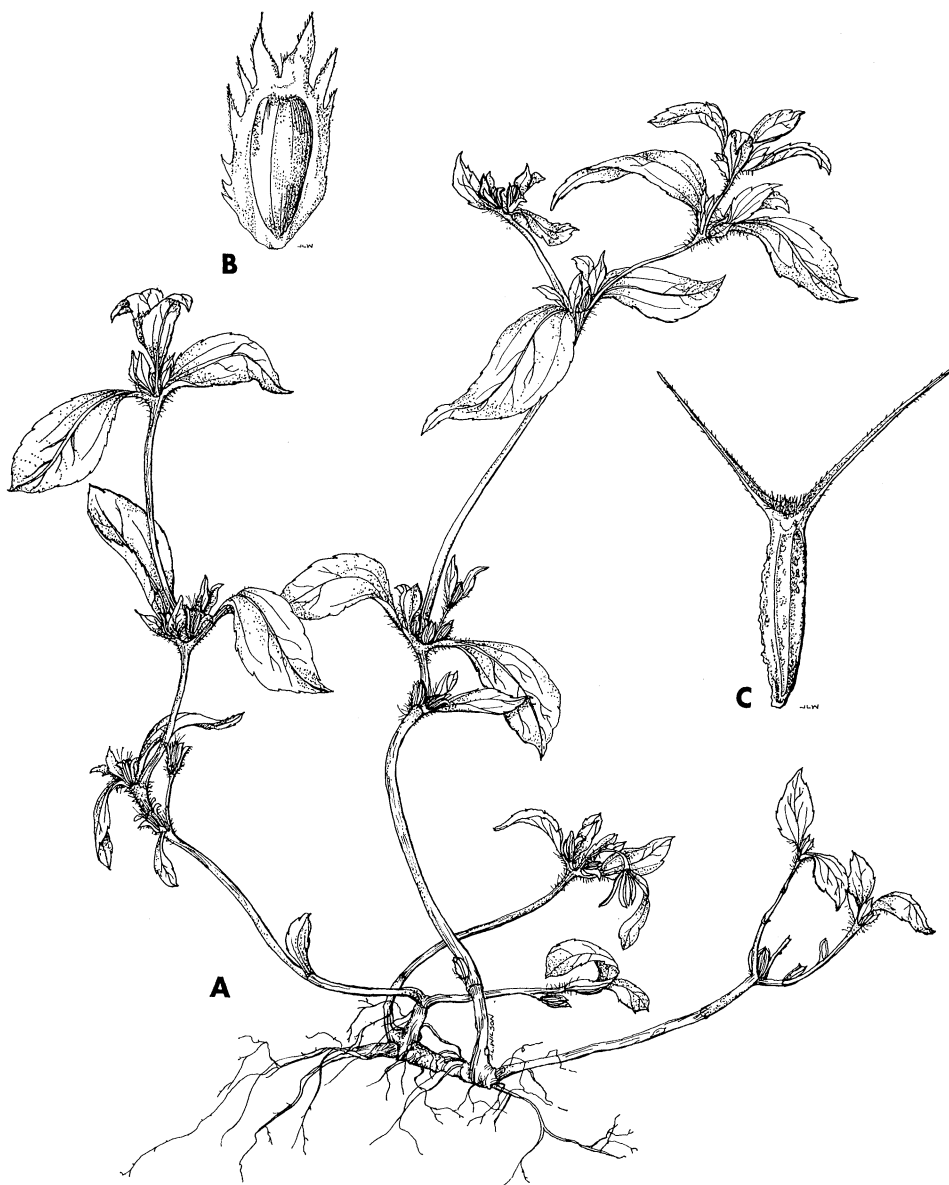


FIGURE 84. *Synedrella nodiflora* (L.) Gaertn.—A. Habit ($\times \frac{1}{2}$).—B. Outer Achene ($\times 6\frac{3}{4}$).—C. Inner achene ($\times 6\frac{3}{4}$). [After Croat 8162 (MO).]

or 3-nerved from near the base; petiole short, 5–10 mm long, winged, the margin and keel ciliate. *Inflorescence* a fascicle of 1–many heads at a dichotomy of the stem or leaf axil, the heads aggregated in groups of 1–4; peduncles to 2 mm long, stout; foliaceous bracts sometimes present. *Heads*, radiate, cylindrical, ca. 8 mm long and 5 mm thick; involucre bracts several, imbricate, oblong, apically acute, obtuse or erose, the outermost green, nervate, becoming stramineous, narrower

and scarious inwards; receptacle convex; ray florets 4-5, ca. 6 mm long, the corolla yellow, 3-4 mm long, glabrous, the tube 1.5-2 mm long, apically notched or denticulate with 2 main veins, the limb broad, the style branches flattened, slender, pubescent, the style base not enlarged, the ovary dorsiventrally flattened, oblong, apically erose, the erose margins partly obscuring the two strigose awns; disc florets several, ca. 8 mm long, the corolla yellow, 3 mm long, the tube narrow, forming about one half the length, the limb narrowly obconical, angled, the lobes short-deltoid, dorsally pubescent, the anthers dark, the appendages large, the basal auricles rounded, the style branches flattened, marginally pilose, the style base not expanded but inserted in a narrow, stipitate, ca. 1 mm long, apically fimbriate or sinuate nectary, the ovary slightly compressed, oblong, with 2 flattened, stout, apical awns and a connecting ring of hairs or erose scales. *Achenes* dimorphic, those of the ray florets 3-5 mm long, ovate, flattened, the body black with a 1 mm broad, winglike margin bearing short ascending awns similar to the apical pair of true awns, those of the disc florets with a black, ca. 3 mm long, slender, tuberculate body; pappus a pair of stout slender, strigose awns.

This is a common species of disturbed areas in lowland Panama occurring in towns, fields, and roadsides.

BOCAS DEL TORO: Almirante, *Blum* 1324 (MO). Changuinola, *Carleton* 49 (GH). Changuinola to 5 mi S at junction of Río Changuinola and Terebé, *Dwyer et al.* 916 (GH, MO); *Lewis et al.* 2072 (GH, MO, US). Water Valley, Chiriquí Lagoon, *Wedel* 768 (GH); 1677 (MO). Isla Colón, *Wedel* 2851 (GH, MO, US). CANAL ZONE: Fort San Lorenzo, *Burch et al.* 1045 (GH, MO). Madden Forest Road, *Croat* 8932 (MO). Pipeline Road at Río Frijoles, *Croat* 12338 (MO). Fort Kobbe, *Duke* 3916 (MO). Navy Corrosion Laboratory, *Duke* 4437 (MO). U.S. Army Tropic Test Mine Emplacement, *Dwyer* 8537 (MO). Ancón, *Greenman & Greenman* 5007 (MO). Government forest along Las Cruces Trail, *Hunter & Allen* 744 (MO). 2 mi N of road to Fort Sherman, *Lazor & Blum* 5429 (MO). Near Culebra, *Pittier* 2102, 4065 (both GH). Chiva Chiva trail to Pueblo, *Piper* 5712 (US). Along Corozal Road, *Standley* 26830 (US). Near Fort Randolph, *Standley* 28956 (US). Fort San Lorenzo, *Tyson & Blum* 3700 (MO). 12 mi S of Colón on Río Providencia, *Tyson & Blum* 3940 (MO). Curundú, *Tyson* 4185 (MO); 6287 (MO). Across railroad from Summit Garden, *Tyson* 6394 (MO). BARRO COLORADO ISLAND: *Croat* 5909, 6961, 7389 (all MO), 8162 (MO, US); *Ebinger* 592 (MO). CHIRIQUÍ: Puerto Armuelles, *Busey* 504 (MO). Quebrada del Medio, 2 km N of Punta de Burica, 40-80 m, *Busey* 764 (MO). 1.6 mi W of Puerto Armuelles, *Croat* 21922 (MO). COCLÉ: El Valle de Antón, *Allen* 4228 (MO). Near El Valle de Antón, *Croat* 13282 (MO). COLÓN: Near Sardinilla, *Blum & Tyson* 498 (MO). Peluca, ca. 27 km from Trans-isthmian Hwy. on road to Nombre de Dios, *Kennedy* 2624 (MO). Near Peluca along Río Boquerón, *Kennedy* 2810 (MO). DARIÉN: El Real, *Burch et al.* 1077 (GH, MO, US). Río Sabana, 0-4 mi above Santa Fe, *Duke* 4143 (GH, MO). HERRERA: 12 mi S of Ocu on Las Minas Road, *Graham* 229 (GH). LOS SANTOS: Playa de La Concepción, *Burch et al.* 1265 (GH, MO, US). PANAMÁ: Isla Taboga, *Allen* 1300 (MO, US). Las Delicias, *Carleton* 49 (GH). Tocumen, *Croat* 9766 (MO). El Llano, near Río Bayano, *Gentry & Tyson* 1716 (MO). Río Pasiga, *Gentry* 2253, 2387 (both MO). Camino de las Sabanas, *Heriberto* 189 (US). Cerro Campana on road to Su Lin, *Kennedy et al.* 2031 (MO). 2 mi S of Goofy Lake, road to Cerro Jefe, *Lewis et al.* 277 (GH). Taboga Island, *Macbride* 2795 (US). Cerro Azul, 2000 ft, *Tyson* 2061, 2193 (both MO). SAN BLAS: Near Puerto Obaldía, *Croat* 16857, 16954 (both MO). VERAGUAS: 1 mi W of Santiago, *Tyson* 5170 (MO).

83. TRICHOSPIRA

Trichospira H.B.K., Nov. Gen. Sp. Pl. 4: 27, tab. 312. 1820 (1818). TYPE: *T. menthoides* H.B.K. = *T. verticillata* (L.) Blake.

Small *herbs*, sprawling or erect. *Leaves* alternate, opposite in the inflorescence

region, spatulate, crenate or entire, glabrate above and tomentose beneath, sessile, sometimes with basal auricles. *Inflorescence* of heads sessile in the upper leaf axils. *Heads* small, discoid; corolla tubular, deeply lobed, 4–5-parted; anthers 4–5, the appendages small, the base sagittate; style pubescent upwards, the branches short, pubescent, nectary prominent. *Achene* dorsiventrally compressed, 2–3-ribbed on each side, the ribs and angles ciliolate; pappus of 2 strong diverging awns and several minute awns on the sides.

This is a monotypic genus of tropical America.

Literature:

Robinson, H. & R. D. Brettell. 1973. Tribal revisions in the Asteraceae II. The relationship of *Trichospira*. *Phytologia* 25: 259–261.

1. *Trichospira verticillata*⁵⁵ (L.) Blake, *Torreyia* 15: 106. 1915.

Bidens verticillata L., Sp. Pl. 833. 1753. TYPE: not seen.

Trichospira menthoides H.B.K., Nov. Gen. Sp. Pl. 4: 28, *tab.* 312. 1820 (1818). TYPE: not seen.

Herbs, sprawling or erect, sometimes rooting at the lower nodes; branches tomentose, sometimes whitish, often drying sulcate. *Leaves* opposite in the inflorescence, alternate below, mostly spatulate, irregularly crenate, apically rounded, basally cuneate, discolorous, drying dark and glabrous above, the emerging leaves glandular punctate, beneath grey-tomentose with arachnoid hairs, the ca. 4 pinnate veins on each side of the midvein prominent; petiole wanting or consisting of a narrowed portion of the leaf blade, rotund, basal auricles often present. *Inflorescence* of single, paired heads axillary to the expanded and enveloping leaf bases. *Heads* discoid, 4–5 mm tall; involucre bracts 2–5, ca. 4 mm tall, oblong, hyaline, apically rounded and herbaceous, glabrous except on the tips; receptacle minute; paleas oblong, flat, hyaline with slightly expanded, pubescent, herbaceous tips; florets ca. 10, the corolla tubular, ca. 2 mm long, the 4 lobes oblong and forming ca. ½ the length, the anthers 4 with short, round appendages, the style apically pilose, the branches short, pilose, the nectary prominent. *Achenes* flat, cuneiform, 4–5 mm long, each side 2–3-ribbed, the ribs and angles minutely ciliate; pappus of 2 stout, diverging awns 1–2 mm long and several minute awns on each side.

This species occurs in muddy places at lower elevations. It may be recognized by its small discolorous leaves and flat, 2-awned achenes.

PANAMÁ: La Jagua, wet savanna area E of Panama City, *Bartlett & Lasser* 16393 (MO).

G. GALINSOGINAE

JUDITH M. CANNE⁵⁶

Galinsoginae Benth. in Benth. & Hook., Gen. Pl. 2: 217. 1873. TYPE: *Galinsoga* R. & P.

⁵⁵ Other synonyms are presented by Blake but only the names noted here are pertinent to the Panamanian flora.

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84. CALEA

Calea L., Sp. Pl., ed. 2. 1179. 1763. TYPE: *C. jamaicensis* L.

Alloispermum Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 1: 139. 1807. TYPE: not designated.

Leontophthalmum Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 1: 140. 1807. TYPE: *L. peruvianum* H.B.K.

Calydermos Lag., Gen. Sp. Pl. Nov. 24. 1816. LECTOTYPE: *C. scaber* Lag., here chosen.

Mocinna Lag., Gen. Sp. Pl. Nov. 31. 1816. LECTOTYPE: *M. serrata* Lag.

Caleacte R. Brown, Trans. Linn. Soc. London 12: 109. 1818, nom. invalid.

Allocarpus H.B.K., Nov. Gen. Sp. Pl. 4: 291. 1820. TYPE: *A. caracasana* H.B.K.

Calebrachys Cass., Dict. Sci. Nat. 55: 265. 1828. TYPE: *C. peduncularis* (H.B.K.) Cass. ex Less.

Lemmatium DC., Prodr. 5: 669. 1836. TYPE: *L. rotundifolium* (Less.) DC.

Meyeria DC., Prodr. 5: 670. 1836. TYPE: not designated.

Tetrachyron Schlechter, Linnaea 19: 744. 1847. TYPE: *T. manicatum* Schlechter.

Stenophyllum Schultz-Bip. ex Benth. & Hook. f., Gen. Pl. 2: 391. 1873, pro syn.

Tonalanthus Brandegee, Univ. Calif. Publ. Bot. 6: 75. 1914. TYPE: *T. aurantiacus* Brandegee.

Perennial *herbs* or *shrubs*; stems glabrous to tomentose. *Leaves* opposite, petiolate or sessile; blades linear to ovate, with 1, 3 or 5 principal veins, margins entire, toothed, crenate, dentate or pinnatifid, surfaces glabrous to tomentose, often resin-dotted. *Inflorescences* of solitary heads or of heads in few- to many-headed cymose, corymbose, or umbellate clusters; peduncles axillary or terminal, to ca. 40 cm long, glabrous or pubescent. *Heads* variable in size, radiate or discoid, ovoid to cylindrical or campanulate; involucre bracts 3—many-seriate, imbricate, graduate, the outer bracts shorter and broader, scarious or the outer bracts herbaceous or herbaceous-tipped, glabrous or pubescent, flattened or convex; receptacle conical to flat; paleas scarious, white or pale yellow, flat to conduplicate, obtuse to aristate at the apex; ray florets fertile, one to several, the ligules white, yellow or roseate, ovate to oblong, entire or denticulate; disc florets fertile, the corollas white, yellow or orange with the limb cylindrical to campanulate, 5-lobed, the tube often flaring at the base, the anthers exserted, yellow or black, appendaged, basally sagittate. *Achenes* narrowly turbinate, subterete to 4-5-angled, glabrous to pubescent, black or reddish black; carpodium present; pappus of a few to many setose bristles or blunt to aristate broad scales or absent. Chromosome numbers $x = 16, 18, 19$ (Powell & King, 1969).

Calea is a genus of nearly 100 species, sorely in need of taxonomic revision. The genus ranges from Mexico through Central America into South America.

Literature:

Powell, A. M. & R. M. King. 1969. Chromosome numbers in the Compositae: Colombian species. Amer. Jour. Bot. 56: 116–121.

Robinson, B. L. & J. M. Greenman. 1896. Revision of the Mexican and Central American species of the genus *Calea*. Proc. Amer. Acad. Arts 32: 20–30.

———. 1899. Supplementary notes upon *Calea*, *Tridax*, and *Mikania*. Proc. Boston Soc. Nat. Hist. 29: 105–108.

- a. Heads radiate 3. *C. urticifolia*
- aa. Heads discoid.
 - b. Outer involucral bracts oblong to narrowly ovate, 1–3 mm long, 0.6–1.5 mm wide 1. *C. pittieri*
 - bb. Outer involucral bracts ovate-oblong to rotund, 0.6–3.6 mm long, 1–6 mm wide 2. *C. prunifolia*

1. ***Calea pittieri*** B. L. Robinson & Greenman, Proc. Boston Soc. Nat. Hist. 29: 105–106. 1899. SYNTYPES: Costa Rica, banks of the Río Ceibo near Buenos Aires, 200 m, Jan. 1892, *Pittier 4913* (GH, not seen). Costa Rica, chemin de Caldera between San Mateo and San Ramón, *Biolley 7015* (US).—FIG. 85C.

Shrub 1–3 m tall; stems terete to angular on younger branches, rusty brown, puberulent to tomentose. *Leaves* opposite; blades ovate to elliptic, apically acute, basally short attenuate to rounded, the margins crenate-serrate, 1.4–6.8 cm long, 0.7–4.5 cm wide, both surfaces rugose, upper surface green and scabrous, prominently 5-veined, lower surface resin-dotted, pale and tomentose; petioles 0.3–1.3 cm long, tomentose. *Inflorescences* hemispherical, umbellate clusters of heads on the ends of branches; peduncles slender, brown, 0.4–1.8(–2.9) cm long, tomentose to hirsute, occasionally resin-dotted. *Heads* discoid, campanulate, 3–9 mm wide, 5–13 mm tall; involucral bracts multiseriate, the outermost bracts herbaceous, oblong to narrowly ovate, tomentose to hirtellous, 1–3 mm long, 0.6–1.5 mm wide, the intermediate bracts scarious with erose, rounded, brownish tips, somewhat squarrose, the inner bracts lance-oblong, shiny yellow, 5–6 mm long, 1.3–2.3 mm wide; receptacle cylindrical to narrowly conic, 1–2 mm tall, 0.6–1 mm wide; paleas scarious, yellow-gold, lanceolate, the margins minutely laciniate, strongly folded at the base and clasping the achenes, 4–6.5 mm long, 1–2 mm wide; florets 10–17 per head, the corollas yellow, hirtellous to glabrous, 3.5–5 mm long, 0.7–2 mm diam., the lobes 4–5, 1–1.6 mm long, the tube angular, flaring at the base, 1.1–2.2 mm long, the anthers exserted, lemon-yellow with ovate appendages, basally sagittate, the style branches revolute with obtuse tips. *Achenes* narrowly turbinate, angular, black, antrorsely hirsute, 1.5–2 mm long, 0.5–0.8 mm diam. with a wheel-shaped apical annulus; carpopodium present; pappus setose, of 15–25 stout bristles, 2.6–4.8 mm long.

Calea pittieri is a bushy to lianoid shrub of roadsides and savannas, flowering from October through February. *Calea pittieri* has often been confused with *Calea prunifolia* but the two may be distinguished most readily by differences in shape of the outer involucral bracts. The outer bracts of *C. pittieri* are oblong to narrowly ovate while those of *C. prunifolia* are ovate-oblong to rotund. The leaves of *C. pittieri* are smaller, more pubescent beneath, and the margins more divided than those of *C. prunifolia*. The peduncles, achenes, and pappus of *C. pittieri* are all shorter than those of *C. prunifolia*.

CANAL ZONE: Road to San Carlos, *Harvey 5151* (F). CHIRIQUÍ: Boquete, 4000 ft, *Davidson 840* (F, MO). Ca. 14 mi N of David, 1200 ft, *Lewis et al. 672* (GH, MO, UC, US). Alto Boquete, 1125 m, *Partch 69-39* (MO). N of Dolega, *Partch 69-141* (MO). Cerro Vaca, 900–1136 m, *Pittier 5299* (GH, US). Near Las Lagunas W of El Hato del Volcán, 1400 m, *Wilbur et al. 10995* (DUKE). COCLÉ: Vic. of El Valle, 600–1000 m, *Allen 1181* (F, GH, MO,

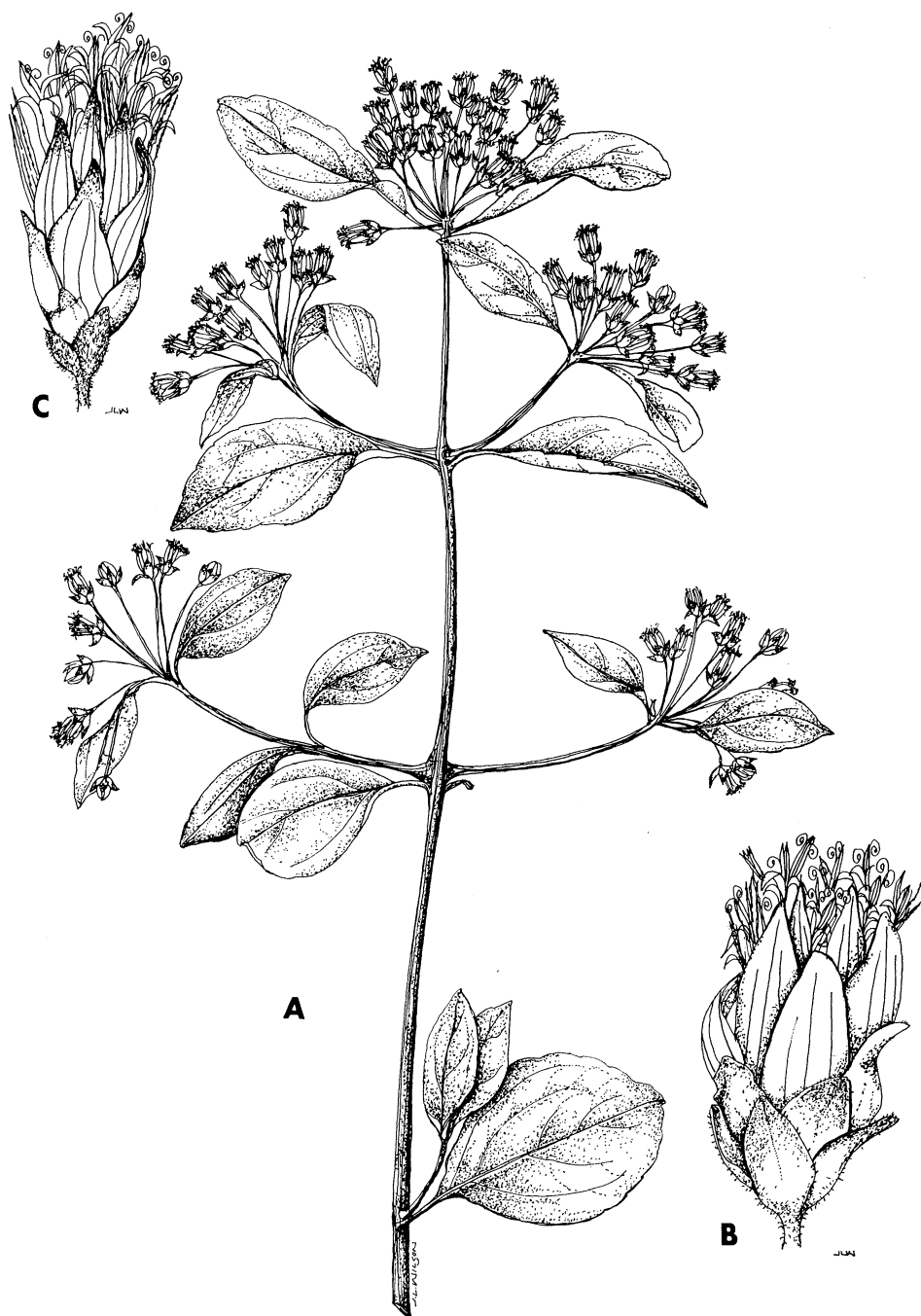


FIGURE 85. *Calea*.—A-B. *C. prunifolia* H.B.K.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 2$).
[After McDaniel 5175 (MO).]—C. *C. pittieri* B. L. Robinson & Greenman. Head ($\times 2$).
[After Blum & Tyson 1875 (MO).]

US). Hills S of El Valle de Antón, 600–800 m, *Allen* 2813 (GH, MO, US). Vic. of Río Teta and Interam. Hwy., *Blum et al.* 1875 (FSU). Margarita, *Dwyer* 8291 (MO). 2 mi E of Río Hondo, *Gentry* 2909 (MO). Road to El Valle, *Harvey* 5156 (F). Aguadulce, *McDaniel et al.* 14761 (FSU); *Pittier* 4901 (NY, US). 8.5 mi S of El Valle, 400 m, *McDaniel* 8229 (DUKE, FSU). Between Aguadulce and Chico River, 20 m, *Pittier* 5103 (US). W slope Cerro Campana, 2500 ft, *Tyson et al.* 2368 (FSU, US). Vic. of La Mesa, *Tyson* 6052 (FSU, MO). Río Hato Military Reservation along Interam. Hwy., *Tyson et al.* 2554 (MO). Road to El Valle de Antón, *Wilbur et al.* 15586 (DUKE). Slopes leading to El Valle de Antón, *Wilbur et al.* 15594 (DUKE). COLÓN: Ca. 8 km NE of Santa Rita along ridge, 650 ft, *Wilbur et al.* 10834 (DUKE, F, GH, MO, NY, US). HERRERA: Vic. of Chitré, ca. 20 m, *Allen* 1109 (GH, MO, US). Vic. of Ocú, 100 m, *Allen* 4054 (GH, MO). Road between Las Minas and Pesé, 900–1200 ft, *Burch et al.* 1320 (F, GH, MO, NY, UC, US). Vic. of Ocú, 2 mi NW, *Stern et al.* 33572 (MO, US). 10 mi S Ocú, *Tyson et al.* 2859, 2860 (both MO). PANAMÁ: Vic. of Bejuco, *Allen* 979 (MO). Nueva Gorgona, *Duke* 4492 (GH, MO, US). Cerro Campana, *Lewis et al.* 3031 (MO, UC). Cerro Campana, 500–600 m, *McDaniel* 8093 (DUKE). VERAGUAS: 15.5 mi S of Santa Fe, *Gentry* 2928 (MO). Ca. 5 mi NW of Santiago, *Wilbur & Teeri* 13341 (F, GH, MO, NY). Ca. 17 mi NW of Santiago along Interam. Hwy., *Wilbur et al.* 15469 (DUKE).

2. ***Calea prunifolia*** H.B.K., Nov. Gen. Sp. Pl. 4: 294. *tab.* 406. 1818. TYPE: Colombia, on the sides of the river Magdalena, near the town of Honda, 140 hex., June–Sept. 1801, *Humboldt & Bonpland s.n.* (P, holotype, not seen; B, isotype, not seen, photo US).—FIG. 85A–B.

A dense bushy to sprawling *shrub*, 1–5 m tall; stems terete to angular on younger branches, reddish brown, hirtellous to tomentose. *Leaves* opposite; blades elliptic to ovate, apically acute, basally short attenuate to rounded, often slightly oblique, the margins nearly entire to serrulate with the serrations callous tipped, 1.5–10.5 cm long, 1–6.8 cm wide, upper surface rugose, grey-green, shiny, hirsute to nearly glabrous, with 5 prominent veins, lower surface resin-dotted, pale green, hirsute; petioles tomentose, 0.5–1.7 cm long. *Inflorescences* of heads in terminal and axillary umbellate clusters; peduncles 0.5–4.0 cm long, grooved, hirsute to tomentose, resin-dotted. *Heads* discoid, campanulate, 3–10 mm wide, 6–13 mm tall; involucre bracts multiseriate, the outer bracts herbaceous, ovate-oblong to rotund, tomentose, resin-dotted, 0.6–3.6 mm long, 1–6 mm wide, the intermediate bracts ovate grading to oblong-ovate with rounded, squarrose, ciliate apices, scarious or herbaceous tipped, the inner bracts oblong, scarious, glabrous, or scattered hirtellous, 4.8–6.6 mm long, 1.4–2.3 mm wide; receptacle cylindro-conic, knobby, 1.2–2 mm tall, 0.7–1.2 mm wide; paleas scarious, golden yellow, lanceolate, with 2 small lobes, apically attenuate, the margins minutely laciniate and strongly conduplicate, clasping the achenes, 5.2–7 mm long, 0.7–1.6 mm wide; florets 10–20, the corollas yellow, glabrous, 4–6 mm long, 0.5–1.3 mm wide, the limb campanulate, the lobes 5, 0.8–1.8 mm long, the tube 1.2–2.4 mm long, flaring at the base, the anthers exerted, bright yellow, each with a narrowly ovate, acute appendage, the base sagittate, the style branches revolute, with weakly acute tips. *Achenes* narrowly turbinate, subterete to angular, black, antrorsely hirsute to nearly glabrous, 1.3–3 mm long, 0.3–0.8 mm wide, with a wheel-shaped annulus; carpodium prominent; pappus of 20–25 stout attenuate bristles arising from a low crown, 3.7–6.3 mm long.

Calea prunifolia is a South American species ranging into Panama. It occurs as a dense bushy shrub or as a vine growing on trees at the forest edge. It is common in the sun in open thickets, on roadsides, and along the coastal bluffs. Flowering occurs from June through January.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al.* 2718 (MO). Almirante Chinguinola Canal, *Blum* 1404 (MO, FSU). Laguna de Chiriquí, *Hart* 174 (US). Isla Colón, 0–120 m, *von Wedel* 510 (GH, MO). Vic. of Chiriquí Lagoon, *von Wedel* 1181, 1414, 2477, 2731 (all GH, MO, US). CANAL ZONE: Fort Sherman, *Blum et al.* 381 (FSU, MO). Ancón, road to Corozal, *Celestine* 29 (US). Barro Colorado Island, *Croat* 6729 (DUKE, MO, NY), 12278 (DUKE, F, MO, NY). Near Coco Solo weather station, *Duke* 4289 (MO). Goofy Lake, 1–2 mi in direction of Cerro Jefe, 2000 ft, *Gentry et al.* 3395 (MO). Manzanillo Island, *Hayes* 689 (NY). Ancón Hill, 100–200 m, *Killip* 12054 (GH, US), 39945 (US). Fort San Lorenzo, *McDaniel* 5175 (FSU, MO). Ancón Hill, *Standley* 25195 (GH, MO, US). Vic. of Fort Sherman, *Standley* 31216 (US). Fort Sherman, *Tyson et al.* 1208 (MO). Old Fort San Lorenzo, *Tyson* 1576 (FSU, MO). COLÓN: Vic. Río Piedras along road to Portobelo, *Blum et al.* 2539 (FSU); *Dwyer* 2539 (MO). Portobelo, *Dwyer* 4399 (GH, MO). Mouth of Río Piedras, *Lewis et al.* 3178 (DUKE, MO, UC). DARIÉN: Chepigana, *Duke et al.* 273 (MO, US). PANAMÁ: Vic. of Bejuco, *Allen* 979 (F, GH). Cerro Campana, *Bartlett* 16923 (DUKE, GH, MO). Ca. 7 mi N Cerro Azul on road to Cerro Jefe, ca. 2600 ft, *Blum et al.* 1815 (FSU). Isla del Rey, *Correa* 114 (DUKE). 3–4 mi N beyond Goofy Lake in Cerro Azul, *Correa et al.* 440 (DUKE, FSU, MO). Beyond Goofy Lake along road to Cerro Jefe, *Correa et al.* 578 (DUKE, MO, US). Between Panamá and Chepo, *Dodge et al.* 16645 (MO). Panamá Viejo, *Duke* 5726 (MO). Cerro Campana, 2400–2700 ft, *Duke* 8682 (MO, US). Isla del Rey, *Duke* 9530 (MO). San José Island, *Duke* 12512 (MO). Isla de la Bayonetta, *Dwyer* 1734 (MO). Cerro Azul, *Dwyer* 1963 (FSU, NY). 8 mi S Goofy Lake toward Cerro Jefe, *Dwyer* 7066 (GH, MO, UC, US). La Campana, Cerro Campana, *Ebinger* 916 (MO). San José Island, *Erlanson* 394 (GH, NY, US); *Harlow* 19 (GH, US); *Johnston* 29 (GH, MO, US), 1038 (GH). Cerro Campana, *Lewis et al.* 3031 (DUKE). NE of Panamá City, *Paul* 198 (US). N of Panamá City, *Paul* 555 (MO, US). Sabana de Juan Corso, near Chepo, 60–80 m, *Pittier* 4538, 4674 (both GH, US). Carretera de Nuevo Emperador, *Rodriguez* 18 (DUKE, MO). Las Sabanas, *Standley* 25921 (US). Corozal road near Panamá, *Standley* 26807 (US). Vicinity of Juan Franco Race Track, near Panamá, *Standley* 27744 (GH, US). Taboga Island, *Standley* 27994 (US). Río Tapia, *Standley* 28170 (US). Cerro Azul, 2000 ft, *Tyson* 2071, 6327 (both FSU, MO). San José Island, *Tyson* 5086 (DUKE, FSU, MO). SAN BLAS: Isla Soskatupo, *Duke* 8514 (MO), 10193 (DUKE, MO). Ailigandí, *Dwyer* 6806 (MO). Soskatupu, 0–150 ft, *Elias* 1665 (GH, MO, US). Isla Pino, near Mulatupo, *Elias* 1713 (GH, MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al.* 2842 (DUKE, MO, UC). PROVINCE UNKNOWN: *Hayes* 21 (GH). Camino de Las Sabanas, *Heriberto* 198 (GH, NY, US). *Seemann* (GH).

3. *Calea urticifolia* (Miller) DC., Prodr. 5: 674. 1836. TYPE: Mexico, Vera Cruz, *Houstoun* (not seen).

Solidago urticifolia Miller, Gard. Dict., ed. 8, no. 30. 1768.

Mocinna serrata Lag. Gen. Sp. Pl. Nov. 31. 1816. TYPE: Mexico, near Salmanticam, *Née* (not seen).

Caleacte urticifolia R. Brown, Trans. Linn. Soc. London 12: 109. 1817, nom. inval., not accepted by the author in the original publication.

Galinsogea serrata (Lag.) Spreng., Syst. Veg. 3: 579. 1826.

Calea cacosmioides Less., Linnaea 5: 157. 1830. TYPE: Mexico, *Schiede* 351 (not seen, MO, photo).

C. axillaris DC., Prodr. 5: 673. 1836. TYPE: based on *Moccina serrata* Lag.

C. pellucidinerva Klatt, Bull. Soc. Roy. Bot. Belgique 31: pt. 1, 207. 1892. SYNTYPES: Costa Rica, *Pittier* 3707 (not seen); *Pittier* 3726 (US).

C. axillaris var. *urticaefolia* (DC.) B. L. Robinson & Greenman, Proc. Amer. Acad. Arts 32: 27. 1896.

C. urticifolia var. *axillaris* (DC.) Blake, Contr. Gray Herb. 3: 57. 1917.

Shrub 1.5–3.5 m tall; stems terete, striate, purplish, glabrous below to tomentose on younger branches. *Leaves* opposite; blades ovate to lance-ovate, acute to attenuate at the apex, rounded to somewhat cuneate at the base, the margins nearly entire on smaller leaves or dentate, crenate-serrate to sharply serrate with callous-tipped teeth, 3–13 cm long, 1.4–8 cm wide, the upper surface rugose, dark green, usually scabrous or glabrate, prominently 3-veined, the lower surface resin-dotted, pale green, scattered hirsute, denser on the veins; petioles 0.4–1.5 cm long, grooved, hirsute. *Inflorescences* of heads in terminal and axillary umbellate clusters on narrow branches; peduncles 0.2–2.5 cm long, tomentose. *Heads* radiate, campanulate, 6–13 mm wide (including rays), 8–10 mm tall; involucre bracts multiseriate, the bracts of the outer 2 or 3 series herbaceous or less often only herbaceous tipped, the outermost bracts lanceolate, 2.5–7.3 mm long, 1.1–3 mm wide, abaxially scabrous, adaxially resin-dotted, scattered hirsute, the intermediate bracts grading to broadly ovate, apically acute, the margins ciliate and often reddish-purple, scarious, the inner series narrower and longer, lance-ovate to oblong, the innermost bracts often bright yellow, 4.5–6.5 mm long, 1.7–2.2 mm wide; receptacle short conic, 1.2 mm tall, 1 mm wide, knobby; paleas scarious, lanceolate, with or without 2 short lateral lobes, folded and enclosing the disc achenes, 5–6.3 mm long, 1.5–2.5 mm wide; ray florets 4–7, pistillate, fertile, the ligules creamy-white to yellow, oblong, shallowly to deeply 2–3(–4)-lobed, gland dotted, 2.7–6 mm long, 1–3.2 mm wide, the tube 2–3 mm long, flared at the base, glabrous, the style branches bifid, revolute, acute; disc florets numerous, fertile, the corolla yellow, glabrous, the limb campanulate, the lobes 4–5, 1–1.6 mm long, the tube 1.7–2.5 mm long, flaring at the base, anthers exserted, yellow, the appendages narrowly ovate, sagittate at the base, the style branches recurved with obtuse tips. Ray *achenes* 1.2–2.3 mm long, 0.3–0.7 mm diam., narrowly turbinate, subterete to angular, black, sparsely antrorsely hirsute, with brownish hairs, carpopodium present, pappus setose, of 10–20 bristles 2.3–3.7 mm long; disc achenes like those of the ray florets but longer and more densely hirsute, 2–2.7 mm long, 0.5–0.8 mm diam., annulus 0.2–0.3 mm tall, pappus like that of the ray achene but longer, 2.5–4.3 mm long, occasionally purple at the base. Chromosome number $n = 19$, ca. 19 (Powell & Turner, 1963; Turner & Flyr, 1966).

Calea urticifolia ranges from Durango, Mexico through Central America to Panama. The species is weedy, occurring in dry savannas, thickets, forests, along roadsides, and in cultivated areas. Flowering occurs from November through June.

CANAL ZONE: Banks of Quebrada La Palma and cañon of Río Chagres, 70–80 m, *Dodge et al.* 17335 (GH, MO, NY). Las Cruces Trail, 75 m, *Hunter et al.* 708 (MO). Around El Paraíso, 30–100 m, *Pittier* 2578 (F, GH, NY, US). Balboa, *Standley* 29254, 29280 (both GH, US), 32144 (US). Río Chagres, between junction with Río Pequení and Río Indio, 66 m, *Steyermarck et al.* 16780 (MO). 10 mi S Ocuí, *Tyson et al.* 2807 (MO). CHIRIQUÍ: El Huacal, Boquete, *Atencio* 21 (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al.* 573 (GH, UC, US). COCLÉ: Vic. of El Valle, 800–1000 m, *Allen* 77 (GH, US). El Valle de Antón, 1000–2000 ft, *Lewis et al.* 2600 (DUKE, UC). HERRERA: 4 mi S Los Pozos, *Tyson* 2680 (FSU, MO). PANAMÁ: Augarubia, *Killip* 3356 (US). Bella Vista, *Standley* 25344 (US). Between Matías Hernández and Juan Díaz, *Standley* 31967 (GH, US). PROVINCE UNKNOWN: *Haenke s.n.* (F). *Halsted s.n.* (NY).

85. GALINSOGA

Galinsoga Ruiz & Pavon, Fl. Peru Prodr. 110. tab. 24. 1794. LECTOTYPE: *G. parviflora* Cav.

Wiborgia Roth, Catal. Bot. 2: 112. 1800, nom. rejic. not *Viborgia* Moench 1794, nom. rejic., nor *Wiborgia* Thunberg 1800, (Leguminosae), nom. cons. TYPE: *W. acmella* Roth.

Galinsogea Attributed to Ruiz & Pavon in Willd., Sp. Pl. 3: 2228. 1803. Orthographic variant of *Galinsoga* Ruiz & Pavon.

Vigolina Poir. in Lam., Encycl. Meth. 8: 613. 1808. TYPE: *V. acmella* (Roth) Poir, substitute name for *Wiborgia* Roth, nom. rejic.

Galinsogaea Attributed to Ruiz and Pavon in Zucc., Flora 4: 612. 1821. Orthographic variant of *Galinsoga* Ruiz & Pavon.

Vargasia DC., Prodr. 5: 676. 1836, not Bertero ex Spreng. 1825. TYPE: *V. caracasana* DC.

Stemmatella Wedd. ex Benth. in Benth. & Hook., Gen. Pl. 2: 193. 359. 1873. TYPE: *S. congesta* Wedd. ex O. Hoffm.

Annual *herbs*, erect, decumbent or procumbent; stems 0.1–6 dm tall, often rooting at the lower nodes, branching, striate, green, reddish-green or red, sparsely to densely pubescent with multicellular trichomes. *Leaves* opposite, petiolate or sessile, entire to dentate-serrate, often ciliate, narrowly oblong to broadly ovate, glabrate to densely pubescent, with 3 principal veins, the bases connate around the stem. *Inflorescences* loose to congested cymose clusters of heads; peduncles slender, strigose and hispid-pilose, often with glandular capitate trichomes intermixed, axillary or terminal. *Heads* radiate or discoid, 3–8 mm tall, 3–20 mm wide, campanulate; involucre bracts biseriate, imbricate, 1–3 smaller, ovate outer bracts, deciduous or persistent, glabrous or sparsely pilose, the inner bracts more broadly ovate, each deciduous with 2–3 attached adjacent paleas enclosing a ray floret or not, 3–5-nerved, green or with light to dark red-purple tips, glabrous or pilose, slightly to strongly convex, the margins minutely lacinate, ciliate, or entire; receptacle convex to conical, 0.4–3.8 mm tall, 0.7–2.2 mm wide; paleas scarious, linear or narrowly to broadly lanceolate-oblong, entire to deeply trifid, the margins minutely lacinate, sometimes purple-tipped, deciduous or the innermost paleas persistent; ray florets fertile, 3–5 or 8–10, the corolla white, pink, reddish-purple, the ligule wanting or quadrate to oblong, shallowly to deeply trifid, 0.5–7 mm long, 0.3–7 mm wide, the lobes subacute to obtuse, occasionally bilabiate, the tube pubescent, the style bifid with recurved branches, obtuse to acute; disc florets numerous, fertile, perfect or a single outer row of disc florets pistillate, the corolla tubular to campanulate, yellow, yellow-green or red-purple above with yellow below, 1.2–2 mm long, deciduous, lobes 5, acute, erect or reflexed, the limb hirtellous or glabrous, the tube short and pubescent, the anthers with ovate appendages, sagittate at the base, the style branches recurved, acute. Ray *achenes* turbinate, often compressed, glabrous to hispidulous, black, pappus coroniform or like that of the disc achene but usually shorter and present only on the side of the achene toward the interior of the head, sometimes wanting; disc achenes narrowly turbinate, subterete to somewhat angular, glabrous to hispidulous black, pappus of 10–20 linear-lanceolate, ovate to obovate, apically obtuse to acuminate or aristate scales with fimbriate, ciliate, or lacinate margins, or pappus coroniform or wanting. Chromosome number $x = 8$ (Turner & Flyr, 1966).

Galinsoga is a New World genus of about 16 species. *Galinsoga urticaefolia* (H.B.K.) Benth. and *G. parviflora* Cav. have become established as weeds in temperate areas world-wide. The remaining species are restricted in distribution to Mexico, Central America and South America. The species of *Galinsoga* are all very similar but may be distinguished by habit, leaf type, and features of the heads, such as ligule shape and size, type of pappus when present and shape of the paleas.

The genus *Galinsoga* may be distinguished from the other genera in the subtribe Galinsoginae by a combination of characters including, erect stems, generally small head size, white to purple ligules, the usual presence of 5 ray florets per head, and the usual enclosure of each ray floret in an ovate involucre bract and 2–3 adjacent scarious paleas. These structures: ray floret, involucre bract, and paleas, fall from the head as a single unit.

Literature:

St. John, H. & D. White. 1920. The genus *Galinsoga* in North America. *Rhodora* 22: 97–101.

Thellung, A. 1916. Über die in Mitteleuropa vorkommenden *Galinsoga*-Formen. *Allg. Bot. Zeitschr. Syst.* 21: 1–16.

1. *Galinsoga urticaefolia* (H.B.K.) Benth. in Örsted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn. 1852: 102. 1852.—FIG. 86.

Wiborgia urticaefolia H.B.K., Nov. Gen. Sp. Pl. 4. 257, tab. 389. 1818. TYPE: Ecuador, "Crescit juxta villam Marchionis de Miraflores, inter Mulalo et Pansache, 1700 hex., (Regno Quitensi.)," June, 1802, *Bonpland* 3055 (P, holotype, US, photo).

Sabazia urticaefolia (H.B.K.) DC., Prodr. 5: 497. 1836.

Vargasia caracasana DC., Prodr. 5: 676. 1836. TYPE: Venezuela, Caracas, 1830, *Vargas* 267 (G-DC, holotype, not seen, US, photo).

Galinsoga parviflora Cav. γ *hispida* DC., Prodr. 5: 677. 1836. SYNTYPES: "in Mexico circa urbem," *Berlandier* 615 (P). "In Chilensibus montibus," *Haenke* 1990 (PR, photo US).

Adventina ciliata Raf., New Fl. Bot. N. Amer. 1: 67. 1836. TYPE: not known.

Galinsoga hispida Benth., Bot. Voy. Sulph. 119. 1845. SYNTYPES: Colombia, Peyta (BM, not seen). Ecuador, Guayaquil, 1841, *Hinds s.n.* (K, US, photo). Peru, Lima, *Cuming* 1028 (BM).

G. brachystephana Regel, Index Sem. Hort. Turic. 2. 1846. TYPE: not seen.

Wiborgia brachystephana (Regel) Heynh., Nom. Bot. Hort. 2: 707. 1846, pro syn.

Galinsoga hispida β *purpurascens* Fenzl, Del. Sem. Hort. Vindob. Advers. Bot. Strip. Sem. 4. 1851, pro syn.

G. parviflora var. *caracasana* (DC.) A. Gray, Smithsonian Contr. Knowl. 5: 98. 1853.

G. caracasana (DC.) Schultz-Bip., Linnaea 34: 529. 1866.

Stemmatella urticifolia (H.B.K.) O. Hoffm. ex Hieron., Bot. Jahrb. Syst. 28: 603. 1901.

Galinsoga humboldtii Hieron., Bot. Jahrb. Syst. 28: 618. 1901. TYPE: Locality not indicated, *Humboldt s.n.* (B, holotype, probably destroyed, US, photo; US, isotype fragment).

Stemmatella urticifolia var. *eglandulosa* Hieron., Bot. Jahrb. Syst. 36: 487. 1905. TYPE: Peru, near Cutervo, April 1879, *Jelski* 609 (not seen).

Galinsoga quadriradiata Ruiz & Pavon var. *hispida* (DC.) Thell. Allg. Bot. Zeitschr. Syst. 21: 11. 1916.

G. quadriradiata var. *quadriradiata* f. *purpurascens* (Fenzl) Thell., Allg. Bot. Zeitschr. Syst. 21: 15. 1916.

G. quadriradiata var. *quadriradiata* f. *albiflora* Fenzl ex Thell., Allg. Bot. Zeitschr. Syst. 21: 15. 1916. SYNTYPES: Costa Rica, "prope San José ad fossam in campis sabanas dictis,"

- 5 June 1875, *Polakowsky 1* (not seen); "prope San José," July 1857, *Hoffmann 805* (not seen).
- G. aristulata* Bicknell, Bull. Torrey Bot. Club 43: 270. 1916, new name for *G. parviflora* var. *hispida*.
- G. bicolorata* St. John & White, Rhodora 22: 99. 1920. TYPE: Mexico, Chiapas, near Tumbala, 20 Oct. 1895, *Nelson 3356* (GH, holotype; US, isotype).
- G. ciliata* (Raf.) Blake, Rhodora 24: 34. 1922.
- Sabazia urticaefolia* var. *venezuelensis* Steyerl. Fieldiana, Bot. 28: 672. 1953. TYPE: Venezuela, Lara, slopes of mountain between Santo Domingo and Los Quebraditos, south of Las Sabanetas, above Humocaro Bajo, 8 Feb. 1944, *Steyermark 55379* (F, holotype, not seen; US, isotype).

Annual branching *herbs*, erect to spreading and rooting at the nodes, to 5.5 dm tall; stems green to reddish green, sparsely hirsute below to densely strigose and hispid-pilose above with multicellular trichomes, often with glandular capitate trichomes intermixed at the uppermost nodes. *Leaves* petiolate, ovate, ovate-lanceolate, 1.8–6 cm long, 0.5–4 cm wide, apically acute to obtuse, basally cuneate to somewhat rounded, the margins ciliate, serrulate to coarsely serrate, or crennate-serrate, sparsely to moderately hispid-pilose on both surfaces, prominently 3-veined. *Inflorescences* with peduncles 1–3.8 cm long, slender, green to reddish green, strigose and hispid-pilose often with multicellular glandular capitate trichomes, axillary or terminal, in cymose clusters. *Heads* radiate, campanulate, 2.9–7 mm wide; involucre bracts biseriate, imbricate, herbaceous, the margins minutely lacinate, the outermost bracts 1 or 2, narrowly to broadly ovate, 1–3.3 mm long, 0.9–1.5 mm wide, apically acute, glabrous or rarely sparsely hirsute, the inner involucre bracts 5, each subtending a ray flower and 2 attached outer paleas, broadly ovate, 2.5–3.5 mm long, 1.5–2.0 mm wide, convex, the margins minutely lacinate, acute, dark green or reddish purple, with dark veins, glabrous or sparsely glandular pilose; receptacle conic, 0.8–1.7 mm tall, 0.8–1.7 mm wide at the base; paleas scarious, the outermost narrowly ovate, the inner paleas lanceolate, entire to shallowly trifid, the margins minutely lacinate; ray florets 5, fertile, the corollas white, pink, or reddish purple, the ligule quadrate, 0.9–2.5 mm long, 1.1–2.5 mm wide, glabrous, with 3 obtuse lobes, occasionally bilabiate with 1 or 2 oblong inner lobelets to 1.2 mm long, the tube 0.5–1.1 mm long, pilose, the style branches recurved, apically acute; disc florets fertile, numerous, the corollas yellow, 5-lobed, acute, the limb tubular, hirtellous near the base to sparsely so on the lobes, 0.8–1.2 mm long, 0.4–0.7 mm wide, the tube hirtellous, 0.3–0.5 mm long, the style branches recurved, apically acute, the anthers yellow, 0.6 mm long, appendages ovate, basally sagittate. Ray *achenes* turbinate, compressed, black, 1.3–1.8 mm long, 0.6–0.8 mm wide, glabrous to strigose, the pappus coroniform, composed of 8–20 fimbriate, sometimes aristate scales, 0.2–1.1 mm long, or wanting; disc achenes turbinate, terete to subangular, black, 1.0–1.8 mm long, 0.4–0.7 mm wide, strigose, the pappus coroniform, of a few to 20 fimbriate, sometimes aristate, lanceolate scales, 0.2–1.2 mm long, or wanting. Chromosome number $n = 16$ (from Costa Rican material, Turner & King, 1964).

Galinsoga urticaefolia is a weedy species found commonly in disturbed habitats in the eastern United States, Mexico, Central America, South America, and Europe. The features of the achenes, pappus, and ray florets that historically have been used as characters to delimit species within the genus *Galinsoga* occur in a



FIGURE 86. *Galinsoga urticaefolia* (H.B.K.) Benth.—A. Habit ($\times \frac{1}{2}$).—B. Ray floret with involucre ($\times 6\frac{1}{10}$).—C. Disc floret ($\times 6\frac{1}{10}$). [After Sawyer 1 March 1967 (MO).]

greater variety of form in *G. urticaefolia* than anywhere else in the genus. Many new taxa have been described on the basis of characters which may be exhibited throughout their entire range of variability within a single population of *G. urticaefolia*. Except for ligule color, which is usually white in North America and often purple in South American plants, there is little geographical correlation with variability of morphological characters. For this reason no taxa below the specific rank are recognized.

I have not seen type material (MA) or photographs of *Galinsoga quadri-radiata* and the possibility exists that this is the appropriate name for the Panamanian *Galinsoga*. The original description of *G. quadriradiata* is inadequate for purposes of identification.

Flowering occurs from December through August.

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, 1800–2000 m, *Allen 1406* (GH, MO, NY, US). Cerro Punta, ca. 7000 ft, *Blum et al. 2432* (FSU, MO). Between Bambito and Cerro Punta, *Croat 10607* (MO). 2 mi N of El Hato del Volcán, *Croat 10640* (MO). Slopes of Las Cumbres near Cerro Punta, *Croat 13685* (MO). Between Boquete and Monte Rey, *Croat 15631* (MO). Vic. of Las Nubes, 2200 m, *Croat 22420* (MO). Along Río Chiriquí Viejo just above Guadeloupe, *Croat et al. 16050, 16051* (both MO). Ca. 2 mi below Boquete Lookout, *D'Arcy & D'Arcy 6310* (MO). Boquete Lookout, 4000 ft, *D'Arcy & D'Arcy 6322* (MO). Boquete, *D'Arcy & D'Arcy 6353A* (MO). La Popa above Boquete, 5200 ft, *D'Arcy & D'Arcy 6411* (MO). Bajo Chorro, 6000 ft, *Davidson 135* (F, GH, MO). Volcán de Chiriquí, 7000 ft, *Davidson 962* (MO). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9007* (MO). NW of Boquete, Cerro Horqueta, 5000–5800 ft, *Dwyer et al. 462* (MO). Boquete, *Dwyer et al. 7674* (MO); *Ebinger 648* (MO). Ca. 7 mi N of El Hato del Volcán, *King 5298* (US). Finca Collins, *Kirkbride 129* (MO, NY). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 387* (GH, MO, US). Alto Lino, 4200 ft, *Maurice 890* (US). Vic. Cerro Punta, 6800 ft, *Ridgway et al. 2389* (MO). Cerro Punta, *Sawyer s.n.* (WIS). Bambito, 5600 ft, *Tyson 5679* (FSU, MO). Above Bambito, ca. 6000 ft, *Tyson 5780* (FSU, MO). Vic. Boquete, 1700 m, *Wilbur et al. 11050* (DUKE). Between Cerro Punta and Las Nubes, *Wilbur & Teeri 13252* (DUKE). Along Río Caldera beyond Bajo Mono, *Wilbur et al. 13518* (DUKE). Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 856* (GH, MO). Cerro Punta, ca. 2150 m, *Tyson 1023* (FSU). COCLÉ: Forest behind Club Campestre, 700 m, *Duke 13261(3)* (FSU, MO). DARIÉN: Cerro Pirre, 2500–4500 ft, *Duke et al. 13688* (MO).

86. JAEGERIA

Jaegeria H.B.K., Nov. Gen. Sp. Pl. 4: 278. 1820. TYPE: *J. mnioides* Kunth = *J. hirta* (Lag.) Less.

Aganippea Ses. & Moc. ex DC., Prodr. 6: 3. 1838. TYPE: *A. bellidiflora* Ses. & Moc. ex DC. *Heliogenes* Benth., Pl. Hartw. 42: 1840. TYPE: *H. reglae* Benth. *Macella* C. Koch, Ind. Sem. Hort. Berol. 1855. TYPE: *Acmella hirta* Lag.

Annual or perennial *herbs* of moist places, often rooting at the decumbent lower nodes; stems 0.5–10 dm tall, branching, striate, and glabrate to pubescent. *Leaves* opposite, petiolate or sessile, entire to dentate-serrate, linear to ovate, glabrous or pubescent, mostly with 3 principal veins, the bases connate around the stem. *Inflorescences* solitary heads or cymose clusters of a few to many heads; peduncles slender, glabrous to densely pubescent, axillary or terminal. *Heads* radiate, ca. 1 cm tall, 2.3 cm wide, campanulate; involucre bracts free, equal to subequal, 5–22, in 1–2 series, deciduous, linear to lanceolate, 0–4 nerved, glabrous to densely pubescent, flattened to convex, the margins expanded below into hyaline

often ciliate wings enclosing the ray achenes, the wings sometimes reduced or wanting; receptacle conical; paleas scarious (with corky thickenings in *J. sterilis*), the margins short to long ciliate, narrow to broadly lanceolate-oblongate, enclosing the achenes or sometimes narrowly linear and not enclosing the disc achenes, persistent or deciduous; ray florets fertile or sterile, equal in number to the involucre bracts, the corollas purplish, pink, yellow or white, the ligules narrowly oblong to spatulate, with or without a tube, apically entire to shallowly 3-lobed, the style branches recurved, obtuse to rounded; disc florets numerous, perfect, fertile, the corollas tubular, yellow or yellow-green, deciduous, (4)5-lobed, acute, the limb glabrous, the tube short, pubescent, with a thickened basal enlargement, the anther appendages acute, free-sagittate at the base, the style branches recurved or inwardly flattened, apically obtuse to rounded. Ray achenes turbinate to linear, mostly terete, glabrous and minutely striate, shiny black, with a shallow annulus at the apex, epappose; disc achenes resembling those of the ray florets, somewhat compressed or angular, epappose. Chromosome number $x = 9$ (Torres, 1968).

Jaegeria is New World genus of 9 species ranging from northern Mexico through Central America as far south as Uruguay. The one Panamanian species, *J. hirta*, is a highly variable weedy species occurring from northern Mexico to Uruguay. Of the other species, 5 are restricted to Mexico, 2 to the Galapagos Islands, and 1 to Colombia.

Literature:

Torres, A. M. 1968. Revision of *Jaegeria* (Compositae-Heliantheae). *Brittonia* 20: 52-73.

1. *Jaegeria hirta* (Lag.) Less., Syn. Gen. Comp. 223. 1832.—FIG. 87.

Acmella hirta Lag., Gen. Sp. Pl. Nov. 31: 1816. TYPE: Based on an unknown specimen originally at MA, but presumed lost.

Jaegeria mnioides H.B.K., Nov. Gen. Sp. Pl. 4: 278, tab. 400. 1820. TYPE: Mexico, near Aria, Michoacán, 1000 hex., *Bonpland* (not seen).

J. bellidioides Spreng., Syst. Veg. 3: 591. 1826. TYPE: Uruguay, Montevideo, *Sellow s.n.* (B, holotype, destroyed; P, lectotype, not seen).

J. parviflora DC., Prodr. 5: 544. 1836. TYPE: "Mus. Imp. Brasil" no. 433 (P, not seen).

J. repens DC., Prodr. 5: 544. 1836. TYPE: Brazil, near Serra dos Orgaos, Rio de Janeiro, *Vauthier* 323 (G-DC, not seen, photo KANU).

Spilanthes mariannae DC., Prodr. 5: 623. 1836. TYPE: Brazil, near Marianna, Minas Gerais, *Vauthier* 322 (G-DC, not seen).

S. karvinskiana DC., Prodr. 5: 623. 1836. TYPE: Mexico, *Karvinski s.n.* (G-DC, not seen).

S. ecliptoides Gardn., London Jour. Bot. 7: 407. 1848. TYPE: Brazil, Perma de Pao, Minas Gerais, *Gardner* Oct. 1840 (K; GH, drawing, not seen).

S. sessilifolia Hemsl., Biol. Centr. Amer., Bot. 2: 193. 1881. TYPE: Mexico, Orizaba, *Sallé* 41 (K, not seen).

Jaegeria hirta var. *glabra* Baker, Fl. Bras. 6(3): 1967. 1884. TYPE: Brazil, *Mandon* 80 (K, not seen).

J. discoidea Klatt., Jahrb. Hamb. Wiss. Anst. 102: 126. 1893. TYPE: Mexico, Sierra de las Cruces, 1 Oct 1892, *Pringle* 4279 (MO, MSC, US, none seen).

Annual, little to profusely branching *herbs*, erect to spreading and rooting at the lower nodes, to 5.5 dm tall; stems greenish-red, sparsely to densely hirsute with

spreading trichomes of ca. 5 cells, 1–1.5 mm long, more densely pubescent at the nodes. *Leaves* sessile to subsessile, elliptic to lanceolate-ovate, 0.9–6.2 cm long, 0.3–2.5 cm wide, apically acute to acuminate, basally obtuse to rounded, ciliate, entire to denticulate, sparsely to densely hirsute on both surfaces, green, lighter beneath, prominently 3-veined, more pronounced beneath. *Inflorescences* with peduncles 0.5–6.5 cm long, slender, flaring at the apex, hirsute, green to reddish, solitary, terminal or axillary, or in cymose clusters. *Heads* radiate, campanulate, 3–10 mm wide, 3–6 mm tall; involucre bracts uniseriate, free, 5–12, linear-lanceolate, trinerved, 0.6–1.2 mm wide, 2–5.2 mm long, usually densely hispid on the basal half, the wings hyaline, 1.2–2.2 mm long, the margins short ciliate to erose; receptacle narrowly conic, 1–3.4 mm tall, 0.6–1.7 mm wide at the base; paleas linear to obovate, the inner ones narrower, hyaline, generally glabrous, the outermost rarely hirsute, the margins ciliate, convex, enclosing the disc achenes; ray florets fertile, the corollas white to yellow, the ligule oblong to obovate with 2 prominent veins and 2-lobed, or varying to 4–5-veined and 3-lobed, glabrous, 1.3–5 mm long, 0.5–1.8 mm wide, the tube 0.3–0.8 mm long, the style branches recurved, acute; disc florets 12–76, fertile, the corollas yellow, funnelform, the lobes (4)5, acute, often black-dotted, 1–1.7 mm long, 0.3–0.8 mm wide, the tube narrow, ca. 0.3 mm long with a pubescent basal enlargement. Ray *achenes* shiny black, narrowly obovate, somewhat flattened, 0.8–1.8 mm long, 0.3–0.6 mm wide, minutely striate, glabrous, carpopodium present, epappose but with an annulus 0.1–0.2 mm high; disc achenes 0.9–1.5 mm long, 0.3–0.5 mm wide, shiny black, glabrous, narrowly turbinate, terete to somewhat angular, carpopodium present. Chromosome number $n = 18$ (Torres, 1968).

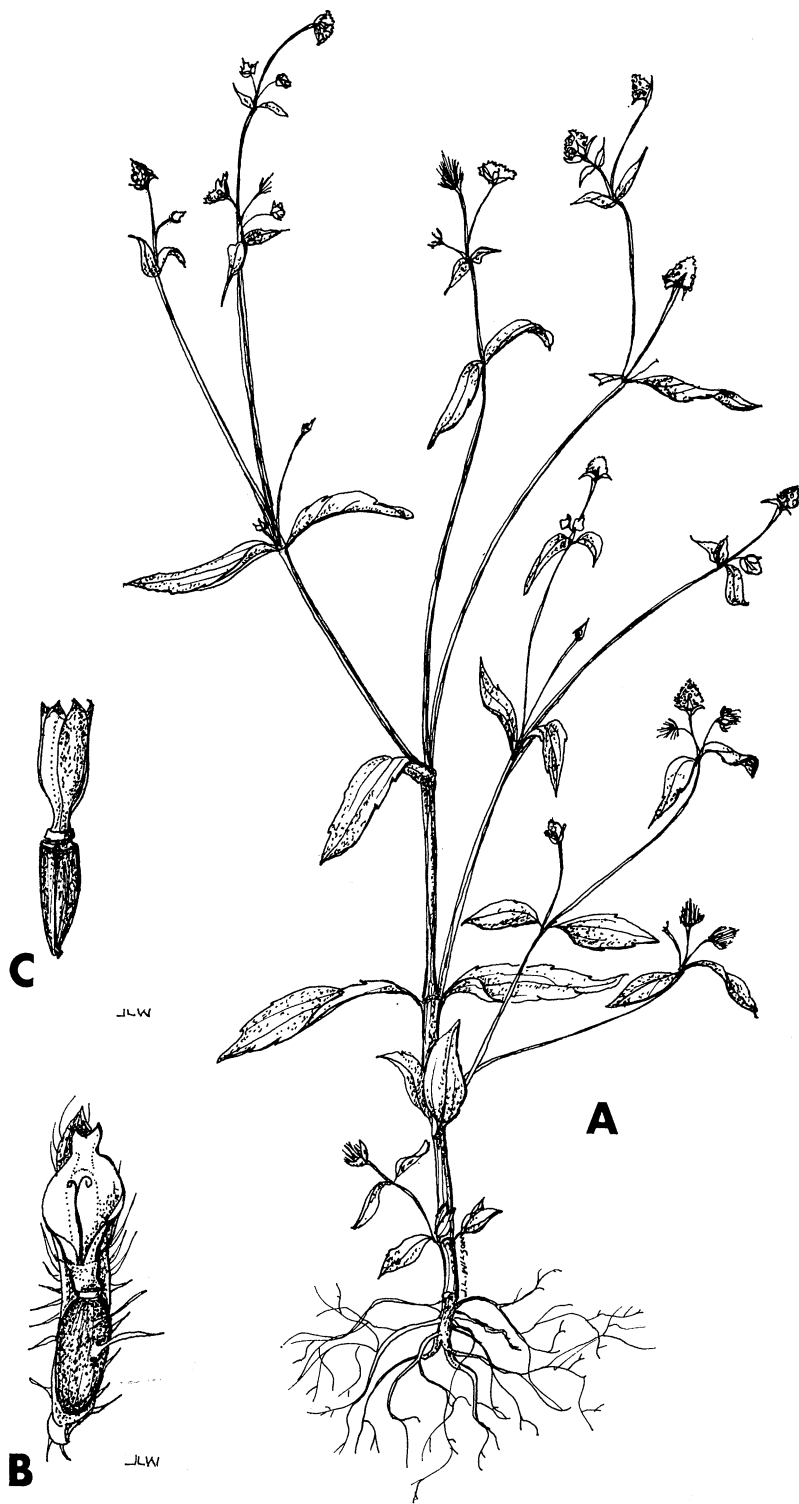
Jaegeria hirta is a common weedy species in Panama inhabiting moist disturbed areas. Although highly variable in respect to number and size of heads, involucre bracts (and ray florets) and number of disc florets, the variation is continuous, making varietal designations inappropriate. *Jaegeria hirta* is distinct in having rays to 5 mm long, densely hirsute involucre bracts which are longer than the paleas, and generally elliptic pubescent leaves.

Flowering occurs most commonly during the periods from December to March and June to August.

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, 1800–2000 m, *Allen 1377* (F, GH, MO, NY, US). Vic. of Las Nubes, *Croat 22366* (MO). Along Río Chiriquí Viejo just above Guadalupe, *Croat et al. 16042* (MO). La Popa above Boquete, 5200 ft, *D'Arcy 6405* (MO). E side of Cerro Pando near Río Chiriquí Viejo, *D'Arcy 6640* (MO). Bajo Chorro, 6000 ft, *Davidson 136* (GH, MO). Lava fields near town of Volcán, *Duke 9171* (US). El Boquete, 1300 m, *Killip 3507* (US). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 323* (GH, MO). Vic. of El Boquete, 1000–1300 m, *Maxon 4998* (GH, US). Cerro Vaca, *Pittier 5314* (US). Cerro Punta, ca. 2150 m, *Tyson 1033* (FSU). W slopes of Volcán de Chiriquí, ca. 7500 ft, *Wilbur et al. 11021* (DUKE). Along Río Caldera beyond Bajo Mono, 1700 m, *Wilbur et al. 11048* (DUKE). Between Cerro Punta and Guadalupe, 1980 m, *Wilbur et al. 13050* (DUKE). Between Cerro Punta and Las Nubes, *Wilbur et al. 13264* (DUKE). 1 km N of Las Nubes, ca. 2000–2300 m, *Wilbur et al. 15191* (DUKE). Nueva Suiza, ca. 2.5 mi from Cerro Punta, *Wilbur et al. 15297* (DUKE). Río Caldera, ca. 2 mi up river from Boquete, *Wilbur et al.*

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FIGURE 87. *Jaegeria hirta* (Lag.) Less.—A. Habit ($\times \frac{9}{10}$).—B. Ray floret ($\times 12\frac{3}{5}$).—C. Disc floret ($\times 12\frac{3}{5}$). [After *Lewis et al. 323* (MO).]



17264 (DUKE). Volcán de Chiriquí, ca. 1500–2000 m, Woodson *et al.* 898 (GH, MO, NY, US). Vic. of Bajo Chorro, 1900 m, Woodson & Schery 641 (MO). COCLÉ: Vic. of El Valle de Antón, Croat 13291 (MO). W slopes of El Valle, King 5328 (UC, US). PANAMÁ: Cerro Azul, 2000 ft, Tyson 2060 (MO).

87. SABAZIA

Sabazia Cass., Dict. Sci. Nat. 46: 480. 1827. TYPE: *S. humilis* (H.B.K.) Cass.

Eclipta sensu H.B.K., Nov., Gen. Sp. Pl. 4: 264. 1818. TYPE: *E. humilis* H.B.K.

Baziasa Steud., Nom. Bot., ed. 2. 1: 192. 1840. TYPE: *B. humilis* (H.B.K.) Steud.

Annual or perennial *herbs*; stems erect, decumbent or procumbent, arising from a caudex, occasionally rooting at the nodes, striate and grooved, glabrous to densely pilose, strigose or hirsute. *Leaves* opposite, petiolate or sessile; blades simple, ovate, obovate, elliptical, lanceolate or linear, the margins entire, serrate or denticulate. *Inflorescences* of solitary heads or of heads in few- to many-headed, loose to congested cymose clusters; peduncles terminal or axillary, to 20 cm long, slightly to densely pubescent, occasionally with glandular tipped trichomes. *Heads* radiate, campanulate or hemispherical; involucre bracts 1–4-seriate, imbricate, broadly ovate to linear-lanceolate, the outer series herbaceous, often purple at the apex, the inner series scarious; receptacle convex to conical; paleas scarious, lanceolate, entire to deeply trifid, acute to acuminate; ray florets fertile, 4–17, the ligules white above, often roseate below, oblong, obovate or quadrate, 3-lobed, the tube sparsely to densely pubescent; disc florets fertile, the corolla yellow, the limb cylindrical to campanulate, lobes 5, erect or reflexed, the tube sparsely pubescent, the anthers yellow or dark reddish brown, the appendages ovate, basally rounded or sagittate, the style branches terete or flattened on the inner surface, with acute or subulate tips. *Achenes* turbinate, obscurely ridged, glabrous or pubescent, black; carpopodium present; pappus of setose bristles, blunt broad scales, or absent. Chromosome number $x = 4$ (Longpre, 1970).

Sabazia is a genus of approximately 14 species. The genus is primarily Mexican in distribution with 3 species occurring in Central America and 2 species in Colombia.

Literature:

Fay, J. J. 1973. New species of Mexican Asteraceae. *Brittonia* 25: 192–199.

Longpre, E. K. 1970. The systematics of the genera *Sabazia*, *Selloa* and *Tricarpha* (Compositae). Publ. Mus. Michigan State Univ., Biol. Ser. 4: 283–384.

1. ***Sabazia sarmentosa*** Less., *Linnaea* 5: 148. 1830.

1a. ***Sabazia sarmentosa* var. *papposa*** (Blake) Canne, comb. nov.—FIG. 88.

Sabazia triangularis Blake, Proc. Amer. Acad. Arts 22: 615. 1924. TYPE: Panama, Chiriquí, around El Potrero Camp, Chiriquí Volcano, 2800–3000 m, 10–13 March 1911, Pittier 3109 (US, holotype).

Sabazia triangularis var. *papposa* Blake, Ann. Missouri Bot. Gard. 26: 317. 1939. TYPE: Panama, Chiriquí, Loma Larga to summit, Volcán de Chiriquí, ca. 2500–3380 m, 4–6 July 1938, Woodson *et al.* 1055 (US, holotype; MO, isotype).

Sabazia sarmentosa var. *triangularis* (Blake) Longpre, Publ. Mus. Michigan State Univ., Biol. Ser. 4: 356. 1970.

Perennial, procumbent or decumbent *herbs*, 20–90 cm tall; stems striate, greenish-red, glabrous below to strigose above, often rooting at the nodes. *Leaves* opposite; blades ovate to triangular-ovate, apically long acuminate, basally truncate to obtuse, 1.2–5 cm long, 0.5–2.6 cm wide, both surfaces appressed hirsute, the margins serrate. *Inflorescences* with heads terminal or axillary, solitary or in loose cymes; peduncles to 13 cm long, scattered hirsute below to densely hirsute near the heads, with interspersed glandular trichomes. *Heads* radiate, hemispherical to suboval, 1–2 cm wide, 0.5–1.1 cm tall; involucre bracts 2–3-seriate, herbaceous, the margins minutely lacinate, the outermost bracts ovate to lance-ovate, 1.7–4.3 mm long, 1–2.2 mm wide, sparsely hirsute, the inner bracts elliptic-ovate to oblong-lanceolate, 3.5–7 mm long, 2–3.2 mm wide, slightly to moderately hirsute; receptacle convex to short conic; paleas scarious, 3.7–5.5 mm long, lanceolate, the inner paleas narrower, long attenuate, and with 1–2 small, acute or attenuate lateral lobes and minutely lacinate margins, the outermost paleas broader, obtuse to acute, attached in groups of 3 to the base of an inner involucre bract and enclosing a ray floret; ray florets 6–7, fertile, the ligules 3.6–7 mm long, 2.8–5.4 mm wide, white above, white to roseate below, obovate to subquadrate, trilobed, sparsely hirsute, denser along the base of veins, the tube 1.5–1.7 mm long, hirsute, the style branches oblique to recurved with obtuse tips; disc florets fertile, the corollas yellow, 2.5–3 mm long, the limb narrowly campanulate, hirtellous near the base to sparsely so above, the lobes 5, 0.5–1 mm long, the tube hirtellous, 0.7–1 mm long, the anthers exserted, the appendages ovate to elliptic-ovate, sagittate at the base, the style branches recurved with acute to subulate tips. Ray *achenes* obconical somewhat compressed, obscurely ridged, black, glabrous or strigose at the apex, ca. 2 mm long, 0.7–0.9 mm wide, pappus of a few bristles, short spatulate, fimbriate scales, or absent; disc achenes obconical, obscurely ridged, black, strigose on the margins or hispidulose over the entire surface, 2 mm long, 0.6–0.7 mm wide, carpophodium present, pappus of a few obovate to spatulate fimbriate scales, 0.5–1.2 mm long, or absent.

Sabazia sarmentosa var. *papposa* is endemic to the Volcán Chiriquí in Panama and the Cordillera de Talamanca in Costa Rica. It occurs along streams, in humid ravines, and in cloud forests from ca. 2500 to 3000 m. Flowering extends from January through July. *Sabazia sarmentosa* var. *papposa* is characterized by truncate leaf bases or a triangular ovate leaf shape, and achenes with trichomes distributed over the entire achenal surface.

CHIRIQUÍ: Las Cumbres, hogback ridge N of Quebrada, *Croat & Porter 16175* (MO). Bajo Chorro, 6000 ft, *Davidson 202* (MO, US). Volcán de Chiriquí, 10400 ft, *Davidson 1010* (MO, US). Around El Potrero Camp, Chiriquí Volcano, 2800–3000 m, *Pittier 3109* (US). Loma Larga to summit, Volcán de Chiriquí, *Woodson et al. 1055* (MO, US). Casita Alta to Cero Copete, 2300–3300 m, *Woodson & Schery 348* (MO).

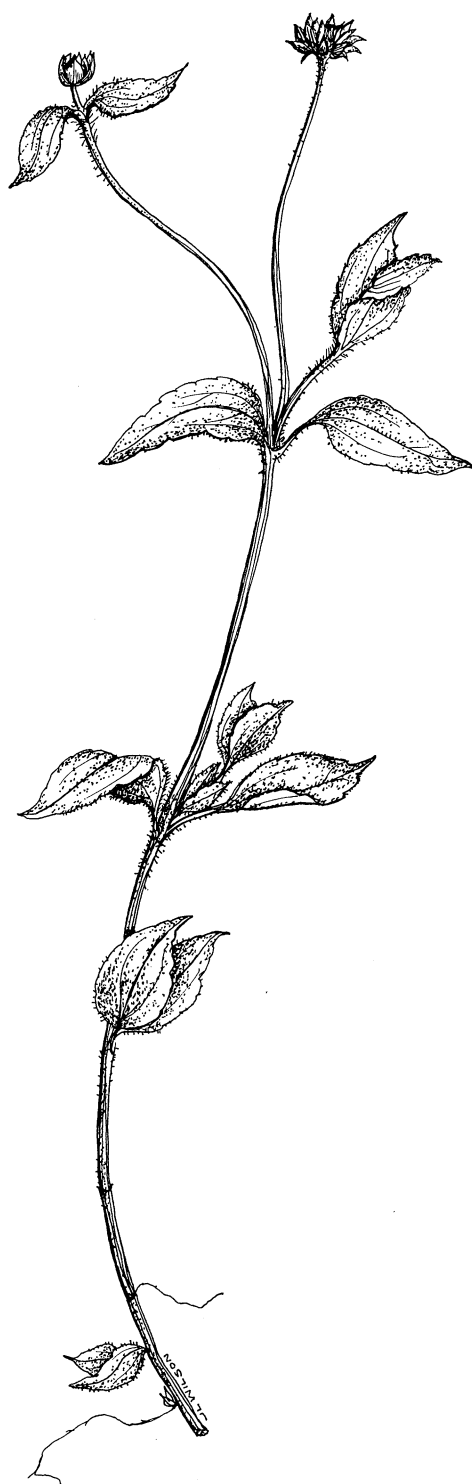
88. TRIDAX

Tridax L., Sp. Pl. 2: 900. 1753; Gen. Pl. 382. 1754. TYPE: *T. procumbens* L.

Bartolina Adanson, Fam. 2: 124. 1763, nom. invalid.

Amellus Ortega ex Willd., Sp. Pl. 3: 2214. 1803, pro syn.

Balbisia Willd., Sp. Pl. 3: 2214. 1803, nom. rejic., *Balbisia* Cav. 1804, nom. cons. TYPE: *B. elongata* Willd.



Sogalgina Cass., Bull. Soc. Philom. 31. 1818. TYPE: *Galinsoga trilobata* Cav.
Galinsoga H.B.K., Nov. Gen. Sp. Pl. 4: 252, tab. 386. 1818. TYPE: *G. trilobata* Cav.
Ptilostephium H.B.K., Nov. Gen. Sp. Pl. 4: 253, tab. 387-388. 1818. LECTOTYPE: *P. coronopifolium* H.B.K. (here chosen).
Carphostephium Cass., Dict. Sci. Nat. 44: 62. 1826. TYPE: *Ptilostephium trifidum* H.B.K.
Mandonia Wedd., Bull. Soc. Bot. France 11: 50, pl. 1. 1864. TYPE: *M. boliviensis* Wedd.

Annual or perennial *herbs* with slender taproots; stems procumbent, decumbent or erect, subscapose to leafy, sparsely to densely pubescent. *Leaves* opposite, or rarely alternate above, petiolate or sessile, simple, trilobed, pinnately lobed or divided, the margins entire, serrate, dentate to repand. *Inflorescences* with heads solitary or in few- to many-headed cymose panicles; peduncles slender to stout, elongate, pubescent, often with glandular-tipped trichomes. *Heads* discoid or radiate, campanulate (urceolate in *T. erecta*); involucre bracts 2-3-seriate and subequal in length to 4-5-seriate and obviously unequal in length, imbricate, greenish, often purplish at the apex, the inner bracts with scarious, purple margins; receptacle conical to convex or flattened; paleas scarious, persistent, rarely readily deciduous, partially enclosing the disc achenes, yellowish to yellow-green; ray florets fertile if present, the ligules white, yellow, roseate, or purple, obscurely to conspicuously bilabiate, the external lip with 2-4 shallow to deep lobes, the inner lobelets obvious to rudimentary, or wanting, the tube narrow, often pubescent; disc florets regular (except in *T. bilabiata* and occasionally in *T. coronopifolia* of Mexico), yellow, greenish-yellow, purplish, or whitish, the limb tubular or narrowly funnelform, glabrous or pubescent, the lobes 5, equal, sublanceolate, acute or obtuse, erect or reflexed, the anthers somewhat to nearly completely exerted, the appendages ovate, cordate, sagittate, or rhombic, the base sagittate, the style branches recurved to revolute, slender, subterete to flattened on the inner surfaces, with subulate tips. *Achenes* turbinate, narrowly obconic to sub-cylindric, terete to ridged, glabrous to densely pubescent with ascending hairs, pappus usually of ca. 20 plumose bristles or fimbriate, linear-lanceolate scales, rarely absent. Chromosome number $x = 9, 10$ (Powell, 1965).

Tridax is a genus of 27 species occurring in Mexico, Central America, and South America with the greatest number of species found in Mexico. It is distinguished from other members of the subtribe Galinsoginae by its generally bilabiate ray corollas (although this character also occurs occasionally in some *Galinsoga*), the long disc corollas, and chromosome numbers based on 9 and 10.

Literature:

Powell, A. M. 1965. Taxonomy of *Tridax* (Compositae). Brittonia 17: 47-96.

1. ***Tridax procumbens*** L., Sp. Pl. 900. 1753. TYPE: Mexico, Veracruz, *Houstoun* (BM, holotype, not seen).—FIG. 89.

Balbisia elongata Willd., Sp. Pl. 3: 2214. 1803. TYPE: "Herbarium Horti Botanici Matritensis, Plantae Novae Hispaniae," "*Amellus pedunculatus* N." (B, photograph of fragment, not seen).

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FIGURE 88. *Sabazia sarmentosa* var. *papposa* (Blake) Canne. Habit ($\times \frac{1}{2}$). [After Davidson 1010 (MO).]

Amellus pedunculatus Ortega ex Willd., Sp. Pl. 3: 2214. 1803, pro syn.

Balbisia canescens Pers., Syn. Pl. 2: 407. 1807. TYPE: Colombia, Santa Marta, Richard (P, holotype, cf. Blake, 1930, not seen).

B. pedunculata Ortega ex Hoffmannsegg, Verz. Pfl. 228. 1824. TYPE: not seen.

B. divaricata Cass., Ann. Sci. Nat. 23: 90. 1831. TYPE: Crown from seed collected in "Maurice," probably introduced (not located).

Tridax procumbens var. *canescens* (Pers.) DC., Prodr. 5: 679. 1836.

T. procumbens var. *ovatifolia* B. L. Robinson & Greenman, Proc. Amer. Acad. Arts 32: 7. 1896. TYPE: Mexico, Oaxaca, vicinity of Yalagal, July 1894, Nelson 948 (GH, holotype; US, isotype; neither seen).

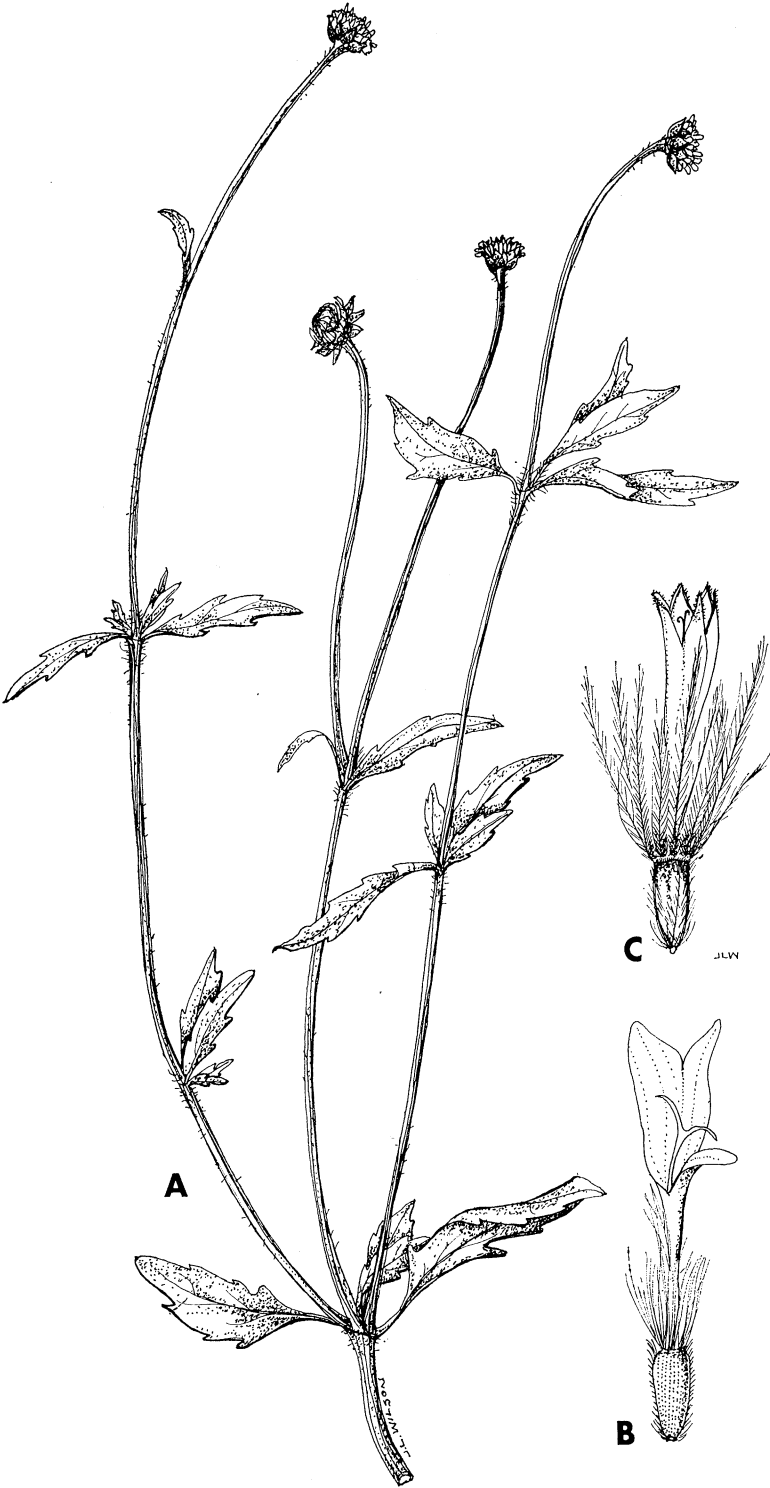
Perennial, procumbent, trailing *herbs*, 14–40 cm tall; stems striate with woody bases, branching, often reddish, hirsute with multicellular trichomes, somewhat denser at the nodes. *Leaves* ovate to lanceolate, often lobed near the base, apically acute, cuneate to attenuate at the base, the margins nearly entire to serrate-dentate, undulate, 1–6 cm long, 0.5–4 cm wide, both surfaces hirsute, generally denser on the veins; petioles 0.2–2 cm long, the bases clasping the stem. *Inflorescences* solitary heads; peduncles 6–18.4 cm long, striate, hirsute with long spreading hairs, denser at the summit. *Heads* radiate, campanulate, 0.6–2.2 cm wide (including rays), 0.6–1.4 cm high; involucral bracts 2–3-seriate, the outer bracts ovate to oblong, 3.2–6.4 mm high, 1.5–3.6 mm wide, alternating bracts somewhat longer and wider, hirsute, acute to attenuate, the margins often purple, the inner bracts ovate to obovate, 4–8 mm long, 1.5–2.7 mm wide, hirsute, somewhat convex, the margins scarious and purple, cuspidate; receptacle short conical to nearly flat, 0.9–1.5 mm high, 3–4 mm wide; paleas persistent, scarious, lanceolate, with purple, minutely laciniate margins, cuspidate, 5–8 mm long, 0.8–1.7 mm wide, the inner paleas narrower; ray florets 3–6, fertile, the corollas pale yellow to white, the ligule oblong with 2 or 3 lobes, shallowly to deeply incised, hirsute on the 2 principal veins, 2–4 mm long, 1.2–4 mm wide, the tube 2–4 mm long, hirsute, the inner lobelets 1–2, lanceolate, 0.5–1.3 mm long, the style branches recurved; disc florets numerous, fertile, the corolla yellow and often purple tinged, 3.5–6.5 mm long, 0.6–1.4 mm wide, the limb narrow tubular, tapering to the tube, pilose at the base, with 5 lanceolate lobes, apically short hirsute, the tube 0.5–1.3 mm long with a ringlike thickening near the base, the style branches slender, flattened, revolute, with subulate tips. Ray *achenes* brown-black, narrowly obconical, obscurely angular, 1.5–2.5 mm long, 0.7–0.9 mm wide, densely ascending pilose, the carpopodium distinct, the pappus of plumose bristles, 0.7–2.5 mm long; disc achenes brownish-black, narrowly obconical, each with a narrow annulus at the apex, densely ascending pilose, the pappus of 18 to 20 plumose bristles, alternately longer and shorter, 3.5–6 mm long. Chromosome number $n = 18$ (Powell, 1965).

Tridax procumbens is a common weedy species in Panama and in tropical and subtropical areas of the world, although apparently native only to Mexico and Central America. Flowering occurs throughout the year.

BOCAS DEL TORO: Railroad track near station Milla 7.5, Croat *et al.* 16437 (MO). Changuinola to 5 mi S at junction of Río Changuinola and Río Terebe, 1–200 ft, Lewis *et al.*

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FIGURE 89. *Tridax procumbens* L.—A. Habit ($\times \frac{1}{2}$).—B. Ray floret ($\times 5\frac{1}{2}$).—C. Disc floret ($\times 5\frac{1}{2}$). [After Tyson 1398 (MO).]



925 (GH, UC, US). CANAL ZONE: Barro Colorado, *Bailey & Bailey* 148 (GH). Farfan Beach, *Burch et al.* 1408 (DUKE, F, GH, MO, UC, US). Alrededores de la represa de Miraflores, *Correa et al.* 1180 (DUKE, FSU, GH, MO). Barro Colorado Island, *Croat* 4169, 6025, 6799 (all MO). Behind Farfan Beach, *D'Arcy & D'Arcy* 6071 (MO). Fort Kobbe, *Duke* 3906 (GH, MO). Just E of Gatún locks, *Duke* 4310 (MO). Navy Corrosion Lab., *Duke* 4432 (MO). Culebra Island, *Duke* 4628 (MO). Sosa Hill, *Duke* 4664 (MO). Frijoles, *Ebinger* 84 (MO, US). Barro Colorado Island, *Ebinger* 136 (MO); *Foster* 1375 (DUKE). Ancón, *Greenman & Greenman* 5008 (GH, MO). Chagres River, ½ mi S of Gamboa, *Lazor* 2258 (FSU). W side of Ferry Thatcher bridge, *Lazor* 2888 (FSU, UC). 8 mi N of Gamboa, *Lazor* 5273 (MO). ½ mi NW of Gamboa, ca. 70 m, *Liesner* 1397 (MO). Barro Colorado Island, *Luteyn* 788 (DUKE). Ancón, *Macbride et al.* 13 (F, FSU, GH, US). Monte Lirio, *Maxon* 6845 (GH, NY, US). Balboa, *Mell* 7 (MO, NY). Ancón, *Piper* 6005 (US). Between Corozal and Panamá, *Pittier* 2172 (GH). Mamei Hill, 20–90 m, *Pittier* 3797 (GH, US). Madden Dam area, *Porter et al.* 4029 (MO). Balboa station, *Porterfield s.n.* (NY). Barro Colorado Island, *Shattuck* 76 (GH, MO), 538 (MO). Sosa Hill, Balboa, *Standley* 26418 (US). Hills N of Frijoles, *Standley* 27634 (US). Barro Colorado Island, *Starry* 117 (F, MO), 188 (MO). Miraflores Locks, *Stern et al.* 66 (GH, MO, UC, US). Curundú, *Tyson* 1088, 6244 (both FSU). Chiva Chiva Trail near Miraflores Lake, *Tyson* 1398 (MO). Gatún railroad station, *Tyson* 3520 (FSU, MO). Fort Amador causeway islands, *Tyson* 5422 (FSU, MO). 1 mi SW of Cocoli, *Wilbur et al.* 12937 (DUKE). CHIRIQUÍ: Burica Peninsula, Puerto Armuelles, *Busey* 505 (MO). 1 mi W of airport at Puerto Armuelles, *Croat* 21894 (MO). Río Majagua 3 mi above David, *D'Arcy & D'Arcy* 6302 (MO). Boquete, *Davidson* 692 (F, GH, MO, US). COCLÉ: Río Hato airstrip, *Burch et al.* 1154 (GH, MO). Vic. of Olá, *Pittier* 5041 (GH, US). 10 mi E Natá at Río Grande, *Tyson* 5263 (DUKE, FSU), 5289 (FSU, MO). Between Las Margaritas and El Valle, *Woodson et al.* 1719 (GH, MO). DARIÉN: Without definite locality, *Macbride* 2678 (US). Peñas Bay near hotel, *Tyson* 5542 (FSU, MO). LOS SANTOS: 3 mi S of La Palma, *Correa* 77 (DUKE, MO). 2 mi S of Guarare, *Wilbur et al.* 12176 (DUKE). PANAMÁ: Juan Díaz, *Castillo* 20 (DUKE, GH, MO). Ca. 13 mi W of Chepo, *D'Arcy & D'Arcy* 6034 (MO). Between Panamá and Chepo, *Dodge et al.* 16696 (MO). San José Island, *Erlanson* 133 (US), 552 (GH, US); *Harlow* 25 (GH, US). Near Chepo, *Hunter et al.* 53 (MO); *Pittier* 4523 (US). Cerro Bandera, Las Cumbres, *Sandoval* 60 (F). Taboga Island, *Standley* 27094 (US); *Woodson et al.* 1518 (GH, MO, NY, US). PROVINCE UNKNOWN: Vic. of Monkey Hill, *Cowell* 25 (NY). Without definite locality, *Grisebach s.n.* (MO); *Hayes* 690, 832 (both NY).

VI. TAGETEAE

DAVID J. KEIL⁵⁷

Tageteae Cass., Jour. Phys. 88: 162. 1819. "Tagetineae." TYPE: *Tagetes* L.

Helenioideae subtribe Tagetineae (Less.) Benth. in Benth. & Hook. Gen. Pl. 2: 202. 1873.

TYPE: *Tagetes* L.

Vernoniaceae subtribe Pectideae Less., Linnaea 5: 134. 1830. TYPE: *Pectis* L.

Senecioideae subtribe Tagetineae Less., Linnaea 6: 253. 1831. TYPE: *Tagetes* L.

Herbs or *shrubs*, usually strongly gland-dotted. *Leaves* mostly opposite, sometimes alternate, simple or compound. *Heads* radiate or discoid, few- to many-flowered; involucre of various shapes, the bracts in 1–3 series, distinct or fused; receptacle flat or convex, mostly naked, sometimes fimbriate, never with chaff; florets white or yellow to purple, orange, red, or brown, the anthers basally cordate

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with elongate-deltoid or short-emarginate appendages, the style branches mostly elongate (in *Pectis* very short), smooth or papillate, appendaged or not. *Achenes* slender, cylindrical or clavate, terete or angled; carpodium short to elongate; pappus of scales, awns, or bristles, or sometimes absent.

The Tageteae is a New World taxon of about 16 genera distributed in the warmer areas of both North and South America. All four of the largest genera of the tribe, *Dyssodia*, *Pectis*, *Porophyllum*, and *Tagetes*, occur in Panama. The most conspicuous feature of the various members of the Tageteae is the presence of pellucid oil glands on the foliage and usually on the involucre bracts as well. The oils of some of the taxa are strongly scented.

In the widely-followed systems of Bentham & Hooker (1873) and Hoffman (1894), the genera here included as the tribe Tageteae were placed in the catchall tribe Helenieae as subtribe Pectidinae (or Tagetinae). Cronquist (1955) argued that the sole unifying character of the Helenieae, the lack of receptacular chaff, is polyphyletic in origin, and consequently merged the Helenieae with the tribe, Heliantheae. For some genera traditionally placed in the Helenieae (e.g. *Gaillardia*, *Helenium*), such a transfer seems justified. For some other groups, particularly the well-defined Pectidinae, a placement in the Heliantheae is questionable. The Pectidinae have little in common with the remainder of the Helenieae (sensu lato). A better choice is to follow the lead of earlier workers (Cassini, 1826–1834; Rydberg, 1915) and the recent work of Strother (1969) and treat the Pectidinae as a tribe, the Tageteae. The differences separating the Tageteae from other tribes are at least as great as those separating the currently recognized tribes.

Literature:

- Rydberg, P. A. 1915. (Carduales) Carduaceae: Helenieae, Tageteae. N. Amer. Flora 34: 81–180.
- . 1916. (Carduales) Carduaceae: Tageteae, Anthemideae. N. Amer. Flora 34: 181–288.
- Strother, J. L. 1969. Systematics of *Dyssodia* Cavanilles (Compositae: Tageteae). Univ. Calif. Publ. Bot. 48: 1–88.
- a. Involucre uniseriate.
 - b. Involucral bracts united into a tube or cup 92. *Tagetes*
 - bb. Involucral bracts free or nearly so.
 - c. Heads discoid; leaves petiolate, the blades broad 91. *Porophyllum*
 - cc. Heads radiate; leaves sessile, the blades linear or narrowly oblanceolate 90. *Pectis*
 - aa. Involucre biseriate 89. *Dyssodia*

89. DYSSODIA

Dyssodia Cav., Descr. Pl. Dem. 202. 1802. TYPE: *Tagetes papposa* Vent.
= *Dyssodia papposa* (Vent.) Hitchc.

Willdenowa Cav., Icon. Descr. Pl. 1: 61, tab. 89. 1791, not *Willdenowa* Thunb. 1790. TYPE: *W. glandulosa* Cav.

Boebera Willd., Sp. Pl. 3: 2125. 1804. TYPE: *B. chrysanthemoides* Willd. nom. illeg.

Schlectendalia Willd., Sp. Pl. 3: 2125. 1804, nom rejic., *Schlectendalia* Less. 1830, (Compositae), nom. cons. TYPE: *Willdenowa glandulosa* Cav.

- Adenophyllum* Pers., Syn. Pl. 2: 458. 1807. TYPE: *Willdenowa glandulosa* Cav.
Thymophylla Lag., Gen. Sp. Pl. Nov. 25. 1816. TYPE: *T. setifolia* Lag.
Clomenocoma Cass., Dict. Sci. Nat. 9: 416. 1817. TYPE: *Aster aurantius* L.
Hymenatherum Cass., Bull. Soc. Philom. 1818: 183. 1818. TYPE: *H. tenuifolium* Cass.
Lebetina Cass., Dict. Sci. Nat. 25: 395. 1822. TYPE: *L. cancellata* Cass.
Rosilla Less., Syn. Gen. Comp. 245. 1832. TYPE: *R. lutea* Less.
Syncephalantha Bartl., Ind. Sem. Hort. Goett. 6. 1836. TYPE: *S. decipiens* Bartl.
Gnaphalopsis DC., Prodr. 7: 258. 1838. TYPE: *G. micropoides* DC.
Aciphyllaea (DC.) A. Gray, Mem. Amer. Acad. Arts, n.s. 4: 91. 1849. TYPE: *Dyssodia acerosa* DC.
Lowellia A. Gray, Mem. Amer. Acad. Arts, n.s. 4: 89. 1849. TYPE: *L. aurea* A. Gray.
Comaclinum Scheidw. & Planch. ex Planch., Fl. Serres 8: 19. 1852. TYPE: *C. aurantiacum* Scheidw. & Planch.
Boerbastrum (A. Gray) Rydb., N. Amer. Flora 34: 161. 1915. TYPE: *Dyssodia anthemidifolia* Benth.
Dysodiopsis (A. Gray) Rydb., N. Amer. Flora 34: 171. 1915. TYPE: *Dyssodia tagetoides* Torr. & A. Gray

Glabrous or pubescent annual or perennial *herbs* or *shrubs*, often strong-scented; stems few- to many-branched, depressed to erect. *Leaves* opposite or alternate, simple and entire to deeply pinnatisect or pinnately compound, variously punctate with oil glands. *Inflorescence* of few to many, solitary or cymosely clustered, sessile or peduncled heads, sometimes condensed into secondary heads; peduncles short to elongate, usually bracteolate. *Heads* radiate, or less commonly, discoid; involucre cylindric to campanulate, the bracts biseriate, distinct or variously fused, often subtended by an outer series of smaller bracts, variously punctate; receptacle flat to convex, fimbriate; ray florets fertile, the corollas yellow, orange, red, or white, the ligules small to conspicuous; disc florets perfect and fertile, few to many, the corollas yellow to orange, regular or unequally lobed, the anthers subsagittate basally, the appendages deltoid-acute, the style branches elongate, variously appendaged. *Achenes* cylindric to obpyramidal, usually angled or ribbed, variously pubescent; carpopodium small, knoblike; pappus of awns, scales, coroniform, or absent. Chromosome base numbers $x = 7, 8, 13$ (Johnston & Turner, 1962; Strother, 1969).

Dyssodia is a mostly North American genus of about 33 species. Except for two taxa with amphitropical distributions, the genus does not reach South America. The primary center of diversity of the genus is Mexico. In Panama, the genus is represented by a single, somewhat anomalous species, *Dyssodia montana*. According to Strother (1969), *Dyssodia* is linked through *D. montana* to the small South American genus, *Schizotrichia* Benth. *Dyssodia montana* is also suspected of bridging the gap between *Dyssodia* and the Mexican genus, *Gymnolaena* Rydb. (Strother, 1967, 1969).

A recent revision by Strother (1969) has provided a much-needed updating of the nomenclature of *Dyssodia*. The only previous treatments of the genus of any comprehensive nature were those of Hoffman (1894) and Rydberg (1915), the latter complicated by a proliferation of ill-defined genera.

Literature:

- Johnston, M. C. & B. L. Turner. 1962. Chromosome numbers of *Dyssodia* (Compositae-Tagetinae) and phyletic interpretations. *Rhodora* 64: 2-15.

Strother, J. L. 1967. Taxonomy of *Gymnolaena* (Compositae: Tageteae). *Sida* 3: 110–114.

1. *Dyssodia montana* (Benth.) A. Gray, Proc. Amer. Acad. Arts 19: 38. 1883. —FIG. 90.

Clomenocoma montana Benth., Pl. Hartw. 86. 1841. TYPE: Guatemala, in mountains of Aceytuno, near Guatemala, Hartweg 592 (K, holotype, not seen; LE, NY, P, isotypes, not seen).

Comaclinium aurantiacum Scheidw. & Planch., Fl. Serres 8: 19. 1852. TYPE: not seen.

Tithonia splendens Planch., Fl. Serres 8: 19. 1852, pro syn.

Dyssodia integrifolia A. Gray, Proc. Amer. Acad. Arts 19: 37. 1883. TYPE: Mexico, Chiapas, along streams in the mountains, 1864–1870, Ghiesbrecht 784 (GH, holotype, not seen).

Gymnolaena integrifolia (A. Gray) Rydb., N. Amer. Flora 34: 161. 1915.

Perennial herbs, 0.3–2 m tall, arising from a woody caudex with thick fascicled roots; stems puberulent, at least above, stramineous to purplish, striate, sparingly branched. Leaves opposite, simple or rarely trifoliate, 2–10 cm long, sessile, or with winged petioles up to 1.5 cm long, narrowly to broadly lanceolate, elliptic, or ovate, apically acute to acuminate, basally rounded to cuneate, serrate, crenate or subentire, usually basally ciliate with 1–3 pairs of bristles or aristate lobes 2–8 mm long, pinnately veined, glabrous to densely puberulent on one or both surfaces, especially toward the base, conspicuously punctate on both surfaces with round, black oil glands. Inflorescence few-headed; peduncles terminal, 10–20 cm long, puberulent; bracteoles alternate, scattered, slender, 0.5–1 cm long, puberulent, usually punctate. Heads radiate; involucre hemispherical, 2–4 cm diam., the principal involucre bracts in 2 series, subequal, 1–1.4 cm long, distinct, oblong to obovate, broadly rounded and erose above, more-or-less indurate-keeled below, punctate with slender, elongate black oil glands, subtended by a graduated series of smaller, more slender bracts; receptacle rounded, fimbriate with slender, aristate-tipped paleas 5–7 mm long; ray florets bright orange, conspicuous, the tubes slender, puberulent, 5–8 mm long, the limbs broadly ovate, 10–15 mm long, dark-purple veined; disc florets orange, 50–100, the corollas slender, 8–10 mm long, puberulent below, the limb glabrous, the lobes slender, ca. 3 mm long, the anthers ca. 3 mm long, the style branches ca. 2 mm long, slender, with short conic appendages. Achenes turbinate, 2–3 mm long, densely strigose; carpodium conspicuous, knoblike; pappus of 30–40 scabrid bristles 3–7 mm long.

Dyssodia montana, with its large, orange heads and its simple, serrate leaves is distinctive. The leaf bases of this and a few related species bear elongate setiform lobes similar to those found in *Pectis* and in some species of *Tagetes*. This is another of the numerous characters which unite members of the tribe Tageteae.

The range of *D. montana* extends from southern Mexico south through Central America into Panama. In Panama, this species occurs in a broad range of altitudinal zones on the Pacific slope from Chiriquí to central Panamá. It flowers from November to February.

CANAL ZONE: El Valle, Harvey 5162, 5178 (both F). CHIRIQUÍ: Cerro Vaca, 900–1136 m, Pittier 5313 (US). Valley of upper Río Chiriquí Viejo, White & White 101 (MO). COCLÉ: S of El Valle de Antón, 600–800 m, Allen 2769 (GH, MO, US), 4209 (MO). El Valle de Antón, Croat 13283 (MO); Hunter & Allen 373 (MO). El Valle, Lewis et al. 2586 (MO). Vic. of



FIGURE 90. *Dyssodia montana* (Benth.) A. Gray.—A. Habit ($\times \frac{1}{2}$).—B. Achene ($\times 4\frac{1}{2}$).—C. Disc corolla ($\times 5$). [After Correa & Dressler 454 (MO).]

Olá, 100–350 m, *Pittier 5079* (GH, NY, US). Vic. of El Valle, *White & White 74* (MO). LOS SANTOS: 12 mi S of Macaracas, *Tyson & Blum 3065* (MO). PANAMÁ: Beyond Goofy Lake on road to Cerro Jefe, *Correa & Dressler 454* (MO). Between Cerro Jefe and Cerro Azul, *Croat 13063* (MO). Cerro Jefe, 3100 ft, *Dwyer & Gentry 9433* (NY). Without locality, *Hunter s.n.* (MO, UC). Road to Cerro Campana, 700 ft, *Tyson 6432* (MO, FSU). PROVINCE UNKNOWN: *Duke 6176* (MO).

90. PECTIS

Pectis L., *Syst. Nat.*, ed. 10. 1221. 1759. TYPE: *P. ciliaris* L.

Seala Adanson, *Fam.* 2: 131. 1763. LECTOTYPE (here designated): *Pectis carthusianorum* Less. *Lorentea* Lag., *Gen. Sp. Pl. Nov.* 28. 1816, not *Lorentea* Ortega, 1797. TYPE: *Pectis prostrata* Cav.

Cryptopetalon Cass., *Bull. Soc. Philom.* 1817: 12. 1817. TYPE: *C. ciliare* Cass.

Chthonia Cass., *Dict. Sci. Nat.* 9: 173. 1817. TYPE: *C. glaucescens* Cass.

Lorentea Less., *Linnaea* 5: 135. 1830, not *Lorentea* Ortega, 1797, nor Lag., 1816. TYPE: *Inula saturejaoides* Miller.

Pectidium Less., *Linnaea* 6: 706. 1831. TYPE: *Pectis punctata* Jacq.

Helioreos Raf., *Atlantic Jour.* 1: 145. 1832. TYPE: *Pectis angustifolia* Torr.

Pectidopsis DC., *Prodr.* 5: 98. 1836. TYPE: *Pectis angustifolia* Torr.

Tetracanthus A. Rich. in *Sagra, Hist. Cuba* 11: 60. 1850. TYPE: *T. linearifolius* A. Rich.

Cheilodiscus Triana, *Ann. Sci. Nat. Bot., sér.* 4, 9: 36. 1858. TYPE: *C. littoralis* Triana.

Glabrous or pubescent annual or perennial *herbs*, often strong-scented; stems slender, usually much branched. *Leaves* opposite, sessile, simple, narrow, usually entire, rarely toothed or lobed, 1-nerved, marginally ciliate with slender bristles, especially toward the base, variously punctate with oil glands. *Inflorescence* of open to condensed cymose clusters or solitary heads; peduncles short to elongate, with or without bracteoles. *Heads* small, radiate; involucre cylindric to campanulate, the bracts uniseriate, sometimes imbricate, distinct, thin-margined, indurate-keeled, apically ciliolate, variously punctate; receptacle convex, naked; ray florets fertile, equal in number to and individually subtended by the involucre bracts, the corollas yellow, ligulate; disc florets perfect and fertile, few to many, the corollas yellow, regular or weakly bilabiate, 4- or 5-lobed, the anthers weakly sagittate, the appendages short, truncate or emarginate, the style branches short, unappendaged, densely papillose. *Achenes* terete, weakly many-ribbed, glabrous or variously pubescent; carpophodium short, knoblike; pappus of scales, awns, bristles, coroniform, or absent. Chromosome base number $x = 12$ (Strother, 1969; Keil, in press).

Pectis is the largest genus in the Tageteae. The genus is well defined and has no close relatives among the other members of the tribe. *Pectis* may be distinguished from the other Panamanian members of the Tageteae by its slender, entire leaves and short style branches.

Pectis contains about 80 species distributed through much of the warmer portion of the New World. In Panama, *Pectis* is poorly represented with only 4 species. At least 2 species, *P. linifolia* and *P. uniaristata*, are distributed both to the north and to the south of Panama but have not been found in Panama.

Although *Pectis* has never been revised for the whole of its range, several useful partial revisions are available (Fernald, 1897; Urban, 1905; Rydberg, 1916; Keil, 1973).

Literature:

- Fernald, M. L. 1897. A systematic study of the United States and Mexican species of *Pectis*. Proc. Amer. Acad. Arts 33: 57-86.
- Keil, D. J. 1973. A re-evaluation of *Pectis* L. subgenus *Pectidopsis* (DC.) Fernald (Compositae: Pectidinae). Ph.D. dissertation, Ohio State University.
- . in press. Cytological investigations of North and Central American species of *Pectis* (Compositae: Tageteae). Rhodora.
- Urban, I. 1905. Compositarum genera nonnulla. Symb. Antil. 5: 212-286.

- a. Stems prostrate or decumbent.
- b. Heads subsessile; involucre falling entire; ray florets 5 3. *P. prostrata*
- bb. Heads conspicuously peduncled; involucre bracts falling separately; ray florets 5-8.
- c. Involucre bracts 3-4 mm long; diminutive annual of various habitats; stems not rooting at the nodes 4. *P. swartziana*
- cc. Involucre bracts ca. 1 cm long; semisucculent, herbaceous perennial of seashores; stems elongate, creeping, rooting at the nodes 2. *P. multiflosculosa*
- aa. Stems erect.
- d. Peduncles mostly less than 10 mm long, ascending; inflorescences with heads tightly clustered 1b. *P. elongata* var. *floribunda*
- dd. Peduncles more than 10 mm long, spreading; inflorescences more open 1a. *P. elongata* var. *oerstediana*

1. *Pectis elongata* H.B.K., Nov. Gen. Sp. Pl. 1(4): 262. 1816. TYPE: Colombia, "Prope Popayan?," *Humboldt* or *Bonpland* s.n. (P, holotype, not seen, IDC Microfiche 6209. 111:II. 4; B, isotype, not seen, IDC Microfiche 1163:I. 6).

Erect annual or sometimes apparently perennial *herbs* 5-100 cm tall; stem terete or weakly angled, usually purplish, glabrous or minutely puberulent, usually much branched above. *Leaves* linear to narrowly oblanceolate, obtuse to acute, mucronate or aristate, basally ciliate with several pairs of bristles, glabrous to scaberulous on one or both surfaces, punctate on the undersurface with scattered small round oil glands. *Inflorescence* of few- to many-flowered cymose clusters or solitary heads; peduncles short to elongate, bracteolate. *Heads* small, radiate; involucre cylindric to narrowly campanulate, the bracts 5, little if at all imbricate, linear-oblanceolate, acute to acuminate, narrowly indurate-keeled, basally gibbous, glabrous, variously punctate; ray florets 5, the corollas 3-7 mm long, yellow or becoming reddish, glabrous, the tubes slender, the ligules usually involute; disc florets 5-9, the corollas 2-4 mm long, bilabiate. *Achenes* 2-3 mm long, black, short-strigillose; carpodium short, knoblike; pappus of 2-20 scabrid bristles 2.5-4 mm long.

Pectis elongata is a widespread species in Latin America. There has been considerable confusion over the application of the name *P. elongata*, and several species have been described from various parts of the range of *P. elongata*. The recognition of some of these taxa is warranted on the basis of correlation between morphological variation and geographic distribution. These differences are insufficient to justify their distinction as separate species. Consequently, the combinations made below place these races at the varietal level under *Pectis elongata*.

Typical *P. elongata*, described originally from Colombia, does not occur in

Panama. This variety, distinguished primarily by its somewhat larger heads and 15–20 pappus bristles (fewer in the other varieties), apparently is restricted to northern South America. In Panama, the species is represented by two varieties, the Central American var. *oerstediana* and the primarily Caribbean var. *floribunda*. In some areas of Central America, these two varieties intergrade, but the Panamanian plants are usually easy to distinguish. Variety *oerstediana* is by far the more common in Panama.

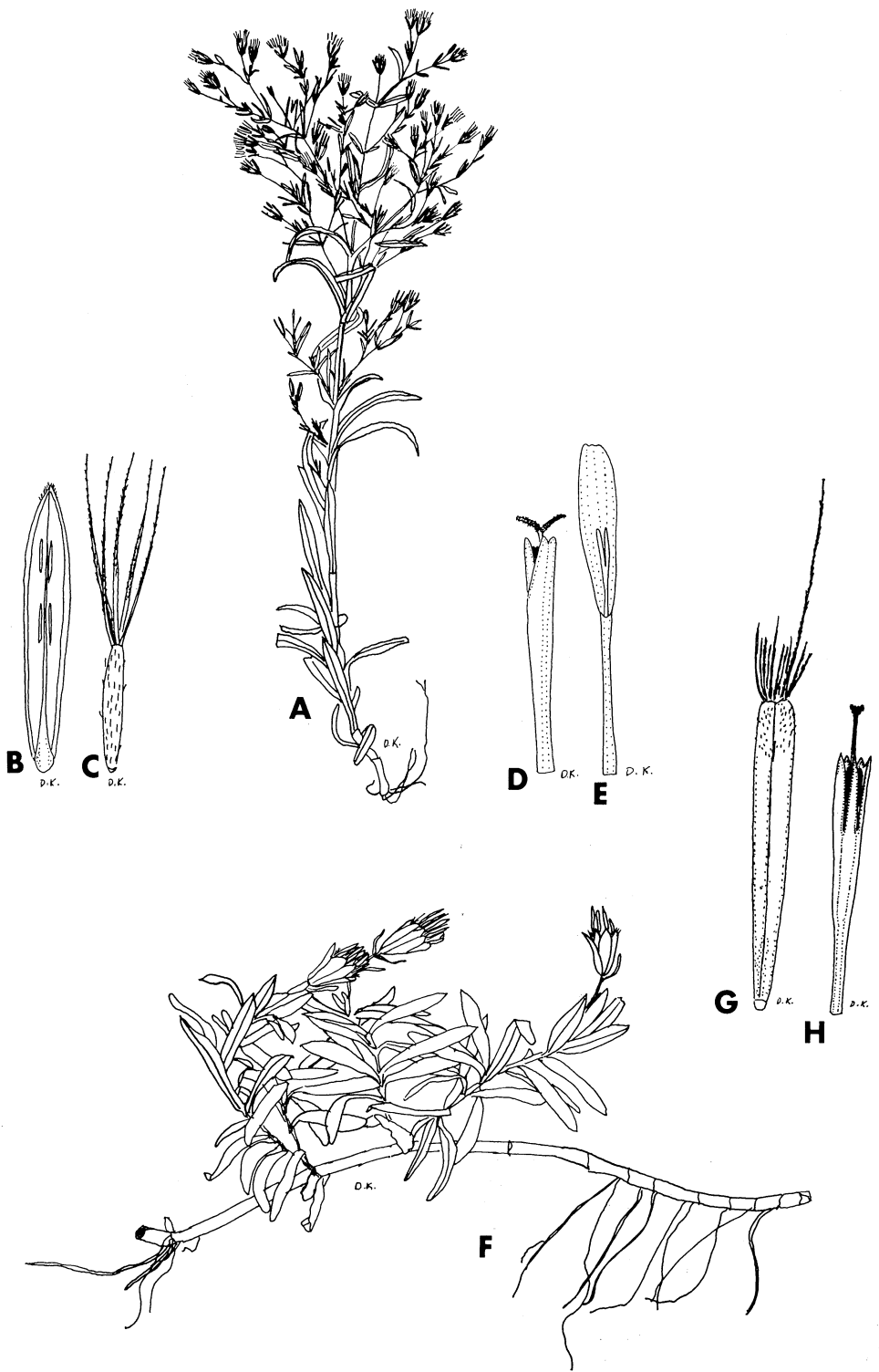
1a. *Pectis elongata* var. *oerstediana* (Rydb.) Keil, comb. nov.—FIG. 91A–E.

P. oerstediana Rydb., N. Amer. Flora 34: 213. TYPE: Nicaragua, Chinadega, Realejo, 19 Jan. 1903, *Baker 2137* (US, holotype; GH, MICH, MO, MSC, ND-G, POM, UC, isotypes).

Mostly erect *herbs*, lemon-scented or with disagreeable odor; stems 10–100 cm long, usually purplish, often diffusely, much branched above. *Leaves* 1–4 cm long, 1–4 mm wide, with 2–11 pairs of bristles. *Inflorescence* cymosely, much branched; peduncles mostly 10–25 mm long. *Heads* radiate; involucre cylindric at anthesis but spreading in age, the bracts 4–5.5 mm long, with erect to spreading acuminate tips, smooth or minutely ciliolate, dotted with 3–6 pairs of narrow glands; ray corollas 3.5–5.5 mm long; disc corollas 2–3.5 mm long. *Achenes* 2–2.5 mm long; pappus mostly of 4–8 bristles 2–5 mm long. Chromosome number $n = 12$ (Keil, in press).

Pectis elongata var. *oerstediana* occurs only in Central America, extending from Guatemala to Panama. In some areas, a decoction of the plants is prepared as a medicinal beverage. The odor of some of the plants of this taxon has been likened by some collectors to that of stinkbugs (Pentatomidae) while other plants are lemon scented or combine both scents. In Panama, var. *oerstediana* is quite common on the Pacific slope from Chiriquí to central Panamá. It flowers primarily from October to January.

CANAL ZONE: Ancón Hill, *Paul 218* (US). Chiva-Chiva trail, Red Tank to Pueblo Nuevo, *Piper 5742* (GH, US). Sabana of Panamá, *Pittier 2543* (GH, NY, US). Balboa, *Standley 25297* (GH, US), *30902* (US). Corozal Road near Panamá, *Standley 26800* (US). Between Fort Clayton and Corozal, *Standley 29125* (US). CHIRIQUÍ: 14 mi N of David, *Lewis et al. 656* (GH, MO). COCLÉ: S of El Valle de Antón, *Allen 2809* (GH, MO, US). E of Río Teta and Interam. Hwy., *Blum & Tyson* (FSU, MO). Río Hato airstrip, *Burch et al. 1139* (DUKE, GH, MO, NY, UC, US). Aguadulce, *Pittier 4853* (US). Vic. of Olá, *Pittier 5084* (GH, NY, US). Penonomé and vic., *Williams 170* (NY, US). HERRERA: Vic. of Océ, *Allen 4040* (MO). 4 mi S of Los Pozos, *Dwyer 2649* (MO). Océ, *Ebinger 1088* (GH, MO). Vic. of Océ, *Stern et al. 1695* (MO, US). Vic. of Las Minas, *Stern et al. 1810* (MICH, MO, US). 4 mi S of Los Pozos, *Tyson 2649* (FSU). 10 mi S of Océ, *Tyson et al. 2879* (MO). PANAMÁ: Vic. of Pacora, *Allen 999* (MO). Between Capira and Potrero, *Dodge & Hunter 8619* (MO). Between Panamá and Chepo, *Dodge et al. 16650* (GH, MO, NY). Nueva Gorgona, *Duke 4541* (MO). Near Playa Río Mar, *Duke 11770* (DUKE, MO). Tocumen airport, *Dwyer 4005* (MO). Santa Clara, *Dwyer & Duke 8290, 8291* (both MO). San José Island, *Erlanson 571, 580* (both US). Llanos de Panamá Viejo, *Heriberto 287* (US). Near Chepo, *Hunter & Allen 16* (MO). San José Island, *Johnston 172* (GH, US). Near Alajuela, *Killip 3224* (GH, NY, US). Between Las Sabanas and Río Yguana, *Macbride 2660* (F, US). 7 mi S of Campana, *McDaniel 8315* (DUKE, FSU). Bayano River, *Mell s.n.* (NY, US). Sabana de Dormisolo near Chepo, *Pittier 4658* (NY, US). Matías Hernández, *Pittier 6886* (US). Bella Vista, *Standley 25364* (US). Las Sabanas, *Standley 25889* (GH, US), *25930* (US). Near Punta Paitilla, *Standley 26290* (MO, US). E of Río Tocumen, *Standley 26580* (US). Near Panamá, *Standley 27722* (GH, US). Río Tapia, *Standley 28187* (GH, US). Río Tocumen, *Standley 29476* (US). Tumba Muerto Road, near Panamá, *Standley 29766* (US). Nuevo San Francisco, *Standley*



30711, 30784 (both US), 30755 (US, in part). Between Las Sabanas and Matías Hernández, Standley 31853 (US). Between Matías Hernández and Juan Díaz, Standley 32089 (US). VERAGUAS: Vic. of Santiago, Allen 1018 (F, GH, MO, US). PROVINCE UNKNOWN: Seemann s.n. (GH, K).

1b. *Pectis elongata* var. *floribunda* (A. Rich.) Keil, comb. nov.

P. floribunda A. Rich. in Sagra, Hist. Cuba 12: 36. 1850. TYPE: Cuba, Sagra 19 (P, holotype). *P. plumieri* Griseb., Fl. Brit. W. Ind. 378. 1864. TYPE: Jamaica, McNab TYPE: not seen, probably at GOET or K.

Tall, mostly erect, lemon-scented *herbs*; stems 10–50 cm tall, straw-colored or purplish, much branched, the branches ascending. *Leaves* 1–4 cm long, 1–3 mm wide, with 2–5 pairs of marginal bristles toward the base. *Inflorescence* cymosely much branched, the heads clustered at the stem tips; peduncles less than 10 mm long. *Heads* radiate; involucre cylindric, tardily spreading in age, the bracts 4–4.5 mm long, linear-oblongate, acuminate, glabrous, dotted with 3–5 pairs of narrow glands; ray corollas 3.5–4 mm long; disc corollas 2–2.5 mm long. *Achenes* 2–2.5 mm long; pappus of 4–8 bristles 3.5–4 mm long.

Pectis elongata var. *floribunda* is widespread in the Caribbean region and reaches the mainland in scattered localities from eastern Mexico to northern South America. In Panama, this variety is allopatric with var. *oerstediana*, occurring only in northern Bocas del Toro and eastern Darién Provinces. In other areas of Central America, these taxa sometimes intergrade. It flowers through much of the year.

BOCAS DEL TORO: Bocas, Lazor *et al.* 2420 (FSU). Bocas del Toro Island Airport, Lewis *et al.* 997 (GH, MO, NY, UC, US). Without definite locality, von Wedel 335 (MO). Isla Colón, vic. of Chiriquí Lagoon, von Wedel 2824 (GH, MO, US). DARIÉN: El Real, Burch *et al.* 1072 (GH, MO, UC, US). Río Balsas between Manené and Guayabo, Duke & Nickerson 14939 (MO).

2. *Pectis multiflosculosa* (DC.) Schultz-Bip. in Seem., Bot. Voy. Herald 309. 1856.—FIG. 91F–H.

Lorentea multiflosculosa DC., Prodr. 5: 102. 1836. TYPE: Peru, “in montibus Guanaccentibus,” Haenke s.n. (G-DC, lectotype, here chosen IDC Microfiche 800. 788: II. 3; M, isoelectotype, MO, photo).

Pectis arenaria Benth., Bot. Voy. Sulphur 110. 1845. SYNTYPES: Ecuador, Puna, near Guayaquil. Mexico, Guerrero, sands of the sea coast, Acapulco. Honduras, Conchagua (not seen).

Cheilodiscus littoralis Triana, Ann. Sci. Nat. Bot., sér. 4, 9: 36. 1858. TYPE: Colombia, Prov. Buenaventura, Amarales, Triana, May 1853 (P, holotype, not seen, F, photo).

Pectis bibracteata Klatt, Leopoldina 20: 92. 1884. TYPE: Mexico, St. Augustin, Oct. 1842, Liebmann 465 (C, not seen).

P. maritima Ses. & Moc., Naturaleza (Madrid), ser. 2, 1: app. 143. 1890. TYPE: Mexico, “in arenosis Oceani Australis littoribus,” Dec. (type not located, possibly at MA).

P. grandiflora Klatt, Bot. Beibl. Leopoldina 6. 1895. TYPE: Costa Rica, Hato Viejo, Jan. 1893, Pittier 7342 (GH, holotype).

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FIGURE 91. *Pectis*.—A–E. *P. elongata* H.B.K. var. *oerstediana* (Rydb.) Keil.—A. Habit ($\times \frac{1}{2}$).—B. Involucral bract ($\times 5$).—C. Achene ($\times 5$).—D. Disc corolla ($\times 10$).—E. Ray corolla ($\times 10$). [After Keil 9413 (OS).]—F–H. *P. multiflosculosa* (DC.) Schultz-Bip.—F. Habit ($\times \frac{1}{2}$).—G. Achene ($\times 5$).—H. Disc corolla ($\times 5$). [After Dwyer 2520 (MO).]

P. lehmannii Hieron., Bot. Jahrb. Syst. 28: 620. 1901. SYNTYPES: Ecuador, Bahia de Caraquez, Jan.–Feb., *Lehmann* 7954 (B, probably now destroyed, F, photo). Colombia, *Triana* 1401 (not seen).

P. falcata Cufod., Arch. Bot. Sist. 9: 202. 1933. TYPE: Costa Rica, "Peninsula Osa ad Golfo Dulce, prope Puerto Jimenez," 2 Apr. 1930, *Cufodontis* 177 (GE, holotype, not seen, OS, photo; W, isotype).

Stout, prostrate, semisucculent, perennial, seashore *herb*; stems terete or weakly angled, usually purplish, creeping, rooting at the nodes, giving rise to short, densely leafy, floriferous lateral branches, glabrous or puberulent in lines. *Leaves* linear to oblanceolate, 2–3 cm long, 1–5 mm wide, obtuse to acute, mucronate, ciliate below with 4–7 pairs of long bristles, marginally puberulent to scaberulous, otherwise glabrous, punctate on the undersurface with submarginal rows of circular oil glands and sometimes with additional scattered glands. *Inflorescence* of solitary terminal heads; peduncles 1–3 cm long, leafy-bracted. *Heads* radiate; involucre campanulate, 10–12 mm high, 7–10 mm broad, the bracts 5–8, oblong to obovate, acute, strongly imbricate, indurate and gibbous at the base, longitudinally striate, marginally ciliolate, otherwise glabrous, inconspicuously punctate with scattered slender oil glands; ray florets 5–8, the corollas yellow, 10–12 mm long, glabrous, the tube ca. 3 mm long, the ligule elliptic, strongly nerved; disc florets 20–40, the corollas yellow, 7–8 mm long, bilabiate, sparsely glandular-puberulent below, the anthers 2.5 mm long, the appendage short, emarginate. *Achenes* narrowly clavate, dark brown to black, 8 mm long, glabrous; carpopodium short and blunt; pappus a crown of low scales, or some of the scales prolonged into slender scabrid bristles 3–7 mm long. Chromosome number $n = 36$ (Keil, in press).

Pectis multiflosculosa occurs on Pacific Ocean beaches from Peru to central Mexico. The width of the leaves, size of the heads, and structure of the pappus are all rather variable in this species, and this variation is reflected in the proliferation of names.

The horizontal stems of *P. multiflosculosa* sometimes extend for several meters just under the surface of the sand. This growth form is unique in the genus, indeed in the entire tribe. This species is one of the two known hexaploids in *Pectis* (Keil, in press) and the ancestry, if through allopolyploidy, is difficult to surmise.

At present, *P. multiflosculosa* is known from Panama only from two collections that flowered in August and September.

CHIRIQUÍ: Vic. of San Félix, *Pittier* 5746 (GH). LOS SANTOS: Pocrí, *Dwyer* 2520 (MO).

3. ***Pectis prostrata*** Cav., Icon. Descr. Pl. 4: 12. 1797. TYPE: Grown from seed at Royal Botanical Garden of Madrid, 1795 (holotype not located at MA; F probable isotype, cultivated at Madrid from seed collected by Née in Queretaro).

P. costata Ser. & Merc. ex DC., Prodr. 5: 100. 1836. TYPE: Cuba, *Sagra* s.n. (not seen).

P. prostrata var. *urceolata* Fern., Proc. Amer. Acad. Arts 33: 68. 1897. TYPE: Mexico, Chihuahua, Hacienda San José, 1885, *Palmer* 53 (GH, holotype).

P. urceolata (Fern.) Rydb., N. Amer. Flora 34: 197. 1916.

P. multisetosa Rydb., N. Amer. Flora 34: 198. 1916. TYPE: Guatemala, Santa Rosa, Chupadero, 1892, *Heyde & Lux* 4232 (NY, holotype).

Prostrate to ascending, much branched, often mat-forming, fibrous-rooted, annual *herbs*; stems several to many from the base, leafy, terete or round-angled, often purplish, diffusely much branched, pubescent in lines. *Leaves* linear to narrowly oblanceolate, 1–3 cm long, 1.5–5 mm wide, obtuse, mucronate, marginally ciliate sometimes to above the middle with 4–12 pairs of bristles, scaberulous on the margins, villous-ciliolate toward the base, otherwise glabrous, densely punctate on the pale undersurface with scattered, tiny round glands. *Inflorescence* of congested cymose clusters; peduncles 1–2 mm long, or heads sessile. *Heads* radiate; involucre cylindrical, ellipsoid or campanulate, 6–7 mm long, 3 mm wide, the bracts 5, oblong to obovate, obtuse to emarginate with spreading tips, imbricate, indurate-keeled to the tip, bowed out toward the middle, gibbous basally, glabrous, punctate in submarginal rows and sometimes also along the midrib with tiny elliptical glands; ray florets 5, the corollas bright yellow, 3.5–4 mm long, scarcely exceeding the involucre, spreading, but in dried specimens apparently ascending, glabrous, the slender tube ca. 1 mm long, the ligule narrowly ovate but often inrolled and appearing narrower; disc florets 6–15, the corollas yellow, 2.5 mm long, bilabiate, glabrous, the tube narrow, 0.7–1 mm long, the anthers 0.8 mm long with short, truncate appendages, the style branches scarcely exceeding the corolla lobes. *Fruit* consisting of involucre and enclosed achenes which fall together at maturity; achenes black, narrowly clavate, obscurely many-ribbed, 3–3.7 mm long, strigose to villous in lines; carpodium small; pappus of 3–5 thin, whitish, lacerate-margined, long-acuminate scales 2–2.5 mm long. Chromosome number $n = 12$ (Keil, in press).

Pectis prostrata is apparently a recent introduction into Panama. Although the species occurs naturally from the southern United States to northern South America, it was not collected in Panama until 1969. It is known in Panama only from disturbed sites in the Canal Zone. *Pectis prostrata* is a common roadside weed through most of its range, and can be expected to spread along roads and other disturbed sites in Panama. Fortunately it does not become a nuisance in cultivated areas.

Pectis multisetosa, described by Rydberg from Guatemalan material, is a name that has been applied to a large-headed form of *P. prostrata* common in Central America. Other than in number of flowers, these plants do not differ significantly from typical *P. prostrata*. Because of intergradation in other areas of Central America, recognition of *P. multisetosa* as a species distinct from *P. prostrata* is not warranted. Further study may necessitate the recognition of these plants at the varietal level. Both the large-headed and the smaller-headed forms of *P. prostrata* have been collected in Panama.

CANAL ZONE: Curundú, D'Arcy 6102 (MO); Tyson & Lazor 5432 (FSU, MO). Albrook, Tyson & Lazor 6015 (FSU).

4. *Pectis swartziana* Less., *Linnaea* 6: 711. 1831. TYPE: "ex India Occidentalis et Jamaica," Swartz Herb. Thunberg (UPS, holotype, not seen, IDC Microfiche 1036, 844:III:3).

P. pratensis C. Wright in Sauvalle, *Anales Acad. Ci. Méd. Habana* 6: 210. 1870. TYPE: Cuba, "en sabanas cerca de la hacienda de Puercos Gordos, jurisdicción de San Cristobal," Wright 3612 (F, isotype fragment).

P. panamensis Brandegee, Univ. Calif. Publ. Bot. 4: 192. 1911. TYPE: Panama, 50 mi S of the Canal Zone, *Bolivar Jurado s.n.* (UC, holotype).

Diminutive spicy-scented, prostrate, fibrous-rooted, annual *herb*; stems 5–25 cm long, leafy, much branched in age, glabrous or minutely puberulent in lines. *Leaves* linear to narrowly oblanceolate or elliptical, 6–23 mm long, 1.5–6 mm wide, obtuse to acute, mucronate, entire, with 1–3 pairs of bristles toward the base, glabrous or minutely scaberulous on the margins, punctate on the under-surface with numerous round oil glands. *Inflorescence* of loosely clustered heads; peduncles slender, 8–20 mm long, 3–5 bracteolate, glabrous. *Heads* small, radiate; involucre cylindric or narrowly campanulate, the bracts 5–8, linear, rounded, erose-ciliolate above, thin-margined, indurate-keeled, bowed out toward the middle, gibbous basally, glabrous, punctate with 2–3 pairs of slender submarginal glands and 1 or 2 rounded subterminal glands; ray florets 5–8, the corollas yellow or becoming purplish, 2.5–3.5 mm long, glabrous, the ligule ovate but usually inrolled and appearing narrower, about equalling the slender tube; disc florets 5–8, the corollas yellow or becoming purplish, 1.5–2 mm long, bilabiate, the anthers 0.7 mm long with a short emarginate appendage. *Achenes* cylindrical, weakly ribbed, black, 2.5–2.7 mm long, sparsely to densely strigillose; carpopodium short; pappus a short crown of fimbriate scales 0.5–0.7 mm long, rarely with one or more of the scales prolonged into bristles to 2.5 mm long. Chromosome number $n = 24$ (Keil, in press).

Pectis swartziana often grows as a roadside weed and with the foliage often concealed by that of associated plants is easily overlooked. It is probably more common than is indicated by the collections now available. This species occurs from southern Mexico to Panama and also is found on some of the Caribbean islands. It flowers from June to December.

CANAL ZONE: Fort Kobbe, *Duke* 3913 (MO). CHIRIQUÍ: 2 mi S of Boquete Lookout, 3000 ft, *D'Arcy* 6320 (MO). David airport, 25 ft, *Lewis et al.* 734 (GH, MO, NY, UC). COCLÉ: Vic. of Natá, *Allen* 833 (GH, NY). Penonomé, *Ebinger* 1005 (F). Aguadulce, *Pittier* 4937 (GH). PANAMÁ: Near Chepo, *Duke* 6037 (MO). Sabana de San Juan Corso, *Pittier* 4502 (GH, NY). Laguna de Portala, *Pittier* 4623 (GH). Nueva San Francisco, *Standley* 30755 (US, in part). Between Pacora and Chepo, *Woodson et al.* 1658 (GH). VERAGUAS: 14 mi W of Santiago, *King* 5275 (UC). 5 mi SE of Calobre, *Wilbur et al.* 12127 (DUKE).

91. POROPHYLLUM

Porophyllum Guett., Hist. Acad. Sci. Paris Mém. 1754. TYPE: *Cacalia porophyllum* L. = *Porophyllum ruderalis* (Jacq.) Cass.

Kleinia Jacq., Enum. Pl. Carib. 8. 1760, not *Kleinia* L. 1753. TYPE: *K. ruderalis* Jacq. *Hunteria* Moc. & Ses. ex DC., Prodr. 5: 648. 1836, pro syn.

Glabrous or pubescent, often strong-scented, annual or perennial *herbs* or *shrubs*; stems terete or weakly angled, leafy, erect. *Leaves* alternate or opposite, simple, sessile or petiolate; blades linear to ovate, variously punctate with oil glands. *Inflorescence* cymose, corymbiform, paniculiform, the heads solitary or few at ends of branches, pedunculate. *Heads* discoid; involucre cylindric to campanulate, the bracts uniseriate, 5–9, narrow, free or basally fused, variously punctate with oil glands; receptacle flat or slightly convex, naked; florets all

perfect and fertile, the corollas whitish, yellowish, greenish or purplish, short- to long-tubular, the throat very short to longer than the tube, equally to somewhat unequally 5-lobed, the anthers rounded to weakly sagittate, the appendages short, rhombic or triangular-acute, the style branches long, slender, hirtellous. *Achenes* cylindric or narrowly obpyramidal, striate, variously pubescent; pappus of numerous slender, scabrid bristles. Chromosome base numbers $x = 11, 12, 15$.

Porophyllum, a genus of about 28 species, is widespread in the warmer areas of both North and South America. Several of the species have highly disagreeable odors. In Panama, *Porophyllum* is represented by a single species, *P. ruderale*.

The systematics of *Porophyllum* have been studied recently by Johnson (1969). A useful earlier reference is the one by Rydberg (1916).

Literature:

- Johnson, R. R. 1969. Monograph of the plant genus *Porophyllum* (Compositae: Helenieae). Univ. Kansas Sci. Bull. 48: 225-267.
 Keil, D. J. & T. F. Stuessy. 1975. Chromosome counts of Compositae from the United States, Mexico and Guatemala. Rhodora 77: 171-195.

1. *Porophyllum ruderale* (Jacq.) Cass., Dict. Sci. Nat. 43: 53. 1826.

Stout, malodorous, tap-rooted, annual *herbs*; stems erect, 0.15-1.5 m tall, often much branched above, terete, striate, leafy, green or purplish, often glaucous, glabrous. *Leaves* opposite or alternate, slender-petiolate, simple, ovate, elliptical or obovate, cuneate, crisped-undulate or crenate, pinnately veined, glabrous, often glaucous, punctate with conspicuous, crescent-shaped or oblong marginal oil glands and sometimes with additional scattered glands. *Inflorescence* corymbiform; peduncles 3-5 cm long, terminating leafy branches, glabrous, often glaucous. *Heads* discoid; involucre cylindric at anthesis, 13-22 mm long, 5-10 mm diam., the bracts 5, linear-oblong, acute, flat, glabrous, glaucous, streaked with elongate glands, the margin thin, hyaline; florets 30-60, the corollas greenish to purplish, 10-13 mm long, sparsely puberulent, the tube slender, 8-10 mm long, the throat short, abruptly expanded, equally 5-lobed, the anthers 1.5-2 mm long with short acute to acuminate, rhombic appendages, the style branches long, slender, curved. *Achenes* cylindric, black or brownish, densely hispidulous, 7-12 mm long; carpodium conspicuous; pappus of many slender, scabrid, tawny bristles 7-11 mm long.

The range of *Porophyllum ruderale* nearly equals that of the genus, extending from the southwestern United States and the West Indies south to northern Argentina. Two widespread varieties occur within this broad range, both of which are found in Panama. According to Johnson (1969), intermediates between the two varieties occur in northern South America, but such intermediates are unknown in Panama.

- a. Leaf blades mostly 2-9 cm long; peduncles not or only slightly inflated 1a. *P. ruderale* var. *runderale*
 aa. Leaf blades mostly 1-2.5 cm long; peduncles strongly inflated 1b. *P. ruderale* var. *macrocephalum*

1a. *Porophyllum ruderales* var. *ruderales*.

- Cacalia porophyllum* L., Sp. Pl. 834. 1753. TYPE: Herb. Linn. 976.8 or 976.9 (LINN, not seen).
Kleinia ruderalis Jacq., Enum. Pl. Carib. 28. 1760. LECTOTYPE (here designated): Jacq., Sel. Stirp. Amer. tab. 127. 1763.
Cacalia ruderalis (Jacq.) Swartz, Prodr. Veg. Ind. Occ. 110. 1788.
C. glandulosa Salisb., Prodr. 187. 1796, based on *C. porophyllum* L.
Kleinia porophyllum (L.) Willd., Sp. Pl. 3: 1738. 1804.
Porophyllum ellipticum Cass. Dict. Sci. Nat. 43: 56. 1826, based on *Cacalia porophyllum* L.
P. ellipticum Cass. β *intermedium* DC., Prodr. 5: 648. 1836. SYNTYPES: Brazil, Rio de Janeiro, 1834, *Gaudichaud* 680 (G-DC, not seen, IDC Microfiche 800. 970: I. 7b). *Gaudichaud* s.n. (G-DC, not seen, IDC Microfiche 800. 970: I. 8). Brazil, Sierra los Orgãos (Province de Rio de Janeiro), 1833, *Vauthier* 305 (G-DC, not seen, IDC Microfiche 800. 970: I. 7a). Brazil, Bahia, 1832, *Blanchet* (G-DC, not seen, IDC Microfiche 800. 970: I. 6).
P. latefolium Benth., Jour. Bot. (Hooker) 2: 44. 1840. pro parte (fide Johnson, 1969). TYPE: Guiana, "Dry savannas on the upper Rupunoonny," *Schomburgk* 442 (K, holotype, not seen).
P. porophyllum (L.) Kuntze, Rev. Gen. Pl. 3: 168. 1898, nom. illeg.
P. macrolepidium Malme, Kongl. Svenska Vetenskapsakad. Handl. 32: 69. 1899. TYPE: Brazil, Mato Grosso, Cuyaba, 7 Feb. 1894, *Malme* 1368B (not seen).
P. ellipticum var. *genuinum* Urb., Symb. Antil. 1: 467, 1900, nom. illeg.
P. ellipticum var. *ruderales* (Jacq.) Urb., Symb. Antil. 1: 468. 1900.
P. ruderales var. *macrolepidium* (Malme) Chodat, Bull. Herb. Boissier, sér. 2, 3: 729. 1903.
P. ruderales f. *suffruticosa* Chodat, Bull. Herb. Boissier, sér. 2, 3: 729. 1903. TYPE: Paraguay, "ad marginem silvae in regione fluminis Apa, Nov.," *Hassler* 7995b (not seen).
P. ruderales var. *glandulosum* Chodat, Bull. Herb. Boissier, sér. 2, 3: 729. 1903. TYPE: Paraguay, "in campis pr. Vaqueria Capibary, Sep.," *Hassler* 4495 (not seen).
P. ruderales var. *angustifolia* Hassler, Trab. Mus. Farm. Fac. Ci. Med. Buenos Aires 21: 131. 1909. SYNTYPES: Argentina, "campos y orillas de los montes, flor mayo y agosto," *Rojas* 128, 596 (not seen).
Tagetes integrifolia Musch., Bot. Jahrb. Syst. (50 Beibl.) 111: 77. 1913. SYNTYPES: Peru, "supra San Bartolome," 27 Mar. 1910, *Weberbauer* 5259, 5260 (not seen). Peru, "prope Cocachacra," 27 Mar. 1910, *Weberbauer* 5263 (not seen).
Porophyllum ruderales var. *ellipticum* (Cass.) A. Gray ex B. L. Robinson, Proc. Amer. Acad. Arts 49: 509. 1913.

Herbs 0.3–1.5 m tall. *Leaves* with blades 1–9 cm long, 0.6–5.5 cm broad; petioles 0.8–4 cm long. *Inflorescence* with peduncles 3–5 cm long, weakly if at all clavate. *Heads* with involucre 13–20 mm long, 5–7 mm diam., the bracts streaked with 2 vertical rows of elongate oil glands; florets 30–50, the corollas 10–13 mm long, the tube 8–10 mm long, the lobes ca. 1 mm long, the anthers 1.5 mm long. *Achenes* 7–9 mm long; carpodium 0.3 mm long; pappus 7–11 mm long. Chromosome number $n = 11, 22$ (Johnson, 1969).

Porophyllum ruderales var. *ruderales* ranges from Costa Rica to Argentina and is also found on several Caribbean islands. Variety *ruderales* is more common in Panama than var. *macrocephalum*, occurring in a range of elevations in Los Santos, Panamá and Darién Provinces and also in the Canal Zone. This variety is rather weedy but it does not become a nuisance in cultivated areas. It flowers the year round.

CANAL ZONE: Fort Clayton, 2600 ft, *Blum et al.* 1830 (FSU). Ancón, *Celestine* 19 (US). Gamboa, *Greenman & Greenman* 5162 (MO). Mouth of Río Chagres, *Piper* 5927 (US). Balboa, *Standley* 25624, 30888 (both US). Sosa Hill, Balboa, *Standley* 26460 (US). Vic. of Fort Sherman, *Standley* 31217 (GH, US). Between France Field and Catival, *Standley* 30365 (US). DARIÉN: Quebrada Nigua below Santa Fe, *Duke* 8823 (DUKE, MO). Tres Bocas on Río Cuasí, *Kirkbride & Duke* 1360 (US). 2 mi E of Santa Fe, *Tyson et al.* 4822 (MO). LOS SANTOS: 1–10 mi S of Tonosí, *Duke* 12490 (MO). 17.8 mi S of Macaracas, 1100 ft, *Lewis et al.* 1617 (MO). PANAMÁ: 5–6 mi E of Chepo, *Duke* 4042 (GH, MO). Halfway between El Llano

and Río Mamoní, *Duke 5607* (GH, MO). Tocumen, *Dwyer 4409* (FSU), *5126* (MO). Río Tapía, *Standley 28114* (US). Juan Díaz, *Standley 30632* (US). Cañita, 18 mi E of Chepo, *Tyson & Smith 4127* (FSU, MO).

1b. *Porophyllum ruderale* var. *macrocephalum* (DC.) Cronq., Madroño 20: 255. 1970.—FIG. 92.

P. macrocephalum DC., Prodr. 5: 648. 1836. TYPE: Mexico, "prope Villalpando," *Mendez s.n.* (G-DC, holotype, not seen, F, photo).

Kleinia glandulosa Moc. & Ses. ex DC., Prodr. 5: 648. 1836, pro. syn.

Porophyllum latefolium Benth., Jour. Bot. (Hooker) 2: 44. 1840, (*vide* Johnson, 1969). TYPE: Guiana, "dry savannas on the upper Rupunoony," *Schomburgk 442*, pro parte (holotype probably at K, not seen).

P. ruderale subsp. *macrocephalum* (DC.) R. R. Johnson, Univ. Kansas Sci. Bull. 48: 233. 1969.

Herbs 0.15–1.25 m tall. *Leaves* with blades 7–25 mm long, 4–13 mm wide; petioles 5–15 mm long. *Inflorescences* with peduncles 3–4 cm long, strongly clavate-inflated. *Heads* with involucre 20–22 mm long, 6–10 mm diameter, the bracts streaked with 2–3 vertical rows of elongate oil glands; florets 40–60, the corollas 10–12 mm long, the tube 8–9 mm long, the lobes 1–1.5 mm long, the anthers 1.5–2 mm long. *Achenes* 11–12 mm long; carpopodium 0.5–1 mm long; pappus 7–9 mm long. *Chromosome number* $n = 11$ (Johnson, 1969; Keil & Stuessy, 1975).

Porophyllum ruderale var. *macrocephalum* occurs from Arizona and Texas south through Mexico and Central America and in South America from Colombia to Bolivia. The odor of the plants of this variety is particularly unpleasant. In Panama, var. *macrocephalum* is uncommon and is known only from a few sites in Coclé Province and the Canal Zone. It flowers from December to March.

CANAL ZONE: Cocoli, *Dwyer 7208* (GH, MO). Cocoli Road, *Lewis et al. 775* (F, GH, MO, UC). COCLÉ: Río Hato Airstrip, *Burch et al. 1153* (MO). Between Porto Portada and Penonomé, 50–1000 ft, *Williams 169* (NY, US).

92. TAGETES

Tagetes L., Sp. Pl. 887. 1753. TYPE: *T. patula* L.

Diglossus Cass., Bull. Soc. Philom. 1817: 70. 1817. TYPE: *D. variabilis* Cass.

Enalcida Cass., Bull. Soc. Philom. 1819: 31. 1819. LECTOTYPE: *E. pilifera* Cass.

Solenotheca Nutt., Trans. Amer. Philos. Soc., n.s. 7: 371. 1841. TYPE: *S. tenella* Nutt.

Annual or perennial *herbs*, glabrous or pubescent, usually strong-scented; stems slender or stout, leafy, often much branched. *Leaves* opposite below, opposite or alternate above, simple and entire to deeply pinnatifid, or pinnately compound, the margins entire to serrate, glabrous or pubescent, variously gland-dotted. *Inflorescence* cymose or the heads solitary; peduncles short to elongate, slender to markedly inflated. *Heads* radiate or rarely discoid, small to large; involucre cylindric, fusiform or campanulate, the bracts uniseriate, marginally fused nearly to the tips, variously punctate; receptacles flat to convex, naked; ray florets fertile, few to many, the ligules small to large, white, yellow, or orange, sometimes spotted with brown, the tube slender, the style branches slender; disc florets perfect and fertile, few to many, the corollas yellow or orange, equally or unequally 4–5-lobed, the anthers weakly sagittate basally, the appendages



triangular-acute, the style branches long, slender. *Achenes* elongate, slender, several-angled, variously pubescent; carpopodium short; pappus of pales and/or scales. Chromosome base numbers $x = 11, 12$ (Towner, 1961; Strother, 1969).

Tagetes, a genus of about 40 species, includes several familiar ornamentals, the garden marigolds. In addition to these cultivated species, wild taxa of the genus occur from the southwestern United States to northern Argentina. In Panama, the genus is represented by one cultivated species, *T. erecta*, the common "French" marigold, and two native species, *T. filifolia* and *T. microglossa*.

No published revision for the entire genus exists. Rydberg (1915) treated the genus for North America. In preparation of the present treatment, an unpublished source (Neher, 1963), has proven useful.

Literature:

- Neher, R. T. 1963. Monograph of the genus *Tagetes* (Compositae). Ph.D. thesis, Indiana University.
- . 1967. In Documented chromosome numbers of plants. Madroño 19: 134–136.
- Towner, J. W. 1961. Cytogenetic studies on the origin of *Tagetes patula*. Meiosis and morphology of diploid and allotetraploid *T. erecta* \times *T. tenuifolia*. Amer. Jour. Bot. 48: 743–751.
- a. Leaf divisions linear-lanceolate, serrate; ray florets yellow.
- b. Involucres cylindric; rays 3–5 3. *T. microglossa*
- bb. Involucres broadly campanulate; rays 8–many 1. *T. erecta*
- aa. Leaf divisions linear, entire; ray florets (when present) white 2. *T. filifolia*

1. *Tagetes erecta* L., Sp. Pl. 887. 1753. TYPE: not seen.

T. major Gaertn., Fruct. 2: 437. 1791. TYPE: not seen.

Stout, strong-scented, fibrous-rooted, annual *herbs*; stems erect, 0.3–1 m tall, very leafy, much branched above, ribbed, glabrous or puberulent to villous in lines. *Leaves* opposite below, alternate above, 5–20 cm long, odd-pinnate with a narrowly winged rachis, the leaflets opposite or alternate, lanceolate, acute to acuminate, sharply serrate to subentire, the lowermost reduced in size and often setiform-dissected, glabrous or puberulent near the base, punctate with circular oil glands in submarginal rows. *Inflorescence* of a few terminal solitary heads; peduncles 5–15 cm long, with several setiform-dissected bracts near the base, naked and strongly clavate-inflated above, glabrous, often glaucous. *Heads* radiate, often double, showy; involucre campanulate, 13–19 mm high, 9–25 mm broad, the bracts 7–11, marginally fused nearly to the short erect triangular tips, sometimes splitting apart in age, glabrous, glaucous, punctate in two submarginal vertical rows with elliptical oil glands, the free tips with 2–7 ovate glands; ray florets few (8–10) or in double forms very numerous and grading into the disc

←

FIGURE 92. *Porophyllum ruderale* var. *macrocephalum* (DC.) Cronq.—A. Habit ($\times \frac{3}{8}$).—B. Corolla ($\times \frac{2}{3}$).—C. Achene ($\times \frac{2}{3}$). [After Lewis et al. 775 (MO).]

florets, the corollas yellow, 10–20 mm long, the tube slender, the ligule broad, showy, entire to deeply cleft; disc florets 100–200, the corollas yellow, equally to very unequally 4–5-lobed, sometimes ciliate-margined or pubescent within, the anthers 2–3 mm long with short triangular appendages, the style branches elongate, slender. *Achenes* 6.5–9 mm long, black, angled, minutely pubescent on the angles or glabrous, narrowed to a shiny knoblike carpopodium; pappus of 1 or 2 stout, long-acuminate, flattened bristles 8–11 mm long and 2–3 more-or-less united truncate scales or bristles 3–6 mm long. Chromosome numbers $n = 12$ (24) (Towner, 1961).

Tagetes erecta, the horticultural “French” marigold, is probably native to Mexico where it was under cultivation prior to the Spanish conquest. It is doubtful whether any extant populations of *T. erecta* actually represent the “wild” form of this species. The “French” marigold is extremely variable and comprises many cultivars. The double forms of *T. erecta*, some of which are grown in Panama, are extremely variable in size and shape of the corollas.

In Panama, *Tagetes erecta* is commonly cultivated and frequently escapes into fields and along roadsides. It flowers the year round, at least in cultivation. The plants are used medicinally in some areas because the strongly scented essential oils are assumed to have some healing properties. Additionally, the marigold is used in much of Latin America in connection with religious ceremonies. The use of this plant in the celebration of All Saints Day has resulted in the common name, “Flor de Muerto” (Neher, 1963).

BOCAS DEL TORO: Isla Colón, vic. of Chiriquí Lagoon, *von Wedel* 2832 (GH, MO, US). CANAL ZONE: Summit Garden, *Croat* 10285 (MO). Río Pedro Miguel, near El Paraíso, *Standley* 30007 (US). CHIRIQUÍ: Boquete, *Ebinger* 659 (F, MO, US). COCLÉ: 10 mi E of Río Hato, *D'Arcy* 6275 (MO). PANAMÁ: Taboga Island, *D'Arcy* 6808 (MO). Sabanas, *Paul* 37 (US). Río Tapía, *Standley* 28164 (US). Juan Díaz, *Standley* 30522 (US).

2. *Tagetes filifolia* Lag., Elench. Pl. 28. 1816. TYPE: Cultivated at the Royal Botanic Garden of Madrid from seed sent from Mexico by Sessé and Mocino (?MA, not seen).—FIG. 93F–J.

Diglossus variabilis Cass., Dict. Sci. Nat. 13: 241. 1819. TYPE: not seen.

Tagetes pusilla H.B.K., Nov. Gen. Sp. Pl. 4: 194. 1820(1818). TYPE: Ecuador, “prope Chillo Quitensium,” *Humboldt & Bonpland s.n.* (P, holotype, not seen, IDC microfiche 6209. 107: 1. 2; B, isotype, if extant, not seen, F, photo).

T. foeniculacea Poepp. ex DC., Prodr. 5: 646. 1836, not *T. foeniculacea* Desf. 1829. TYPE: Peru, *Poeppig* 26 (G-DC, holotype, not seen, F, photo; NY, isotype, not seen).

T. multifida DC., Prodr. 5: 646. 1836. TYPE: Mexico, “ad Lerma,” *Berlandier* 1145 (G-DC, holotype, not seen, F, photo).

T. pauciloba DC., Prodr. 5: 644. 1836. TYPE: not seen.

T. silenoides Meyen & Walp., Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19. Suppl. 1: 272. 1843. TYPE: Peru, Lago de Titicaca, *Meyen s.n.* (B, holotype, probably destroyed, F, photo).

T. dichotomum Turcz., Bull. Soc. Imp. Naturalistes Moscou 24: 72. 1851. TYPE: Ecuador, “prope Quito,” *Jameson* 865 (G, isotype, not seen, F, photo).

T. scabra Brandegee, Zoe 1: 314. 1890. TYPE: Guatemala, Antigua, collector not known, (UC, holotype, not seen).

T. anisata Lillo in Zelada, Invest. Indust. Publ. Univ. Tucuman 8: 3. 1918. TYPE: Argentina, San Javier, Villa Nougues, *Nougues s.n.* (LIL, holotype, not seen).

Bushy, anise-scented, annual *herbs* 10–30 cm tall; stems glabrous, slender, green to purplish, striate, much branched. *Leaves* opposite, or alternate above, short-petioled, pinnately dissected, 1–2 cm long, the lobes linear, 1–8 mm long, 0.2–0.5 mm wide, mucronate to aristate, the lowermost usually reduced to slender bristly cilia, marginally scabrid to glabrescent, densely punctate on the under-surface with tiny round translucent oil glands. *Inflorescence* of leafy bracted cymes; peduncles slender, 1–20 mm long. *Heads* radiate or discoid; involucre ellipsoid to cylindric, 2–3 mm diam., the bracts 5, linear to narrowly elliptic, 6–7 mm long, marginally connate nearly to the abruptly short-aristate tips, several-nerved, more-or-less indurate-keeled below, glabrous, densely punctate in irregular lines with tiny round, translucent oil glands; receptacle short-conic, pitted; ray florets 0–2, inconspicuous, white to pale yellow, the tube slender, glabrous or minutely puberulent, 1–2 mm long, the ligules ovate, ca. 1 mm long; disc florets 5–10, the corollas pale yellow, slender, 3–4 mm long, glabrous, the lobes slender, 0.5–1 mm long, the anthers 0.5 mm long, tapering to short, acute appendages, the style branches ca. 0.5 mm long, included or scarcely exerted. *Achenes* 3–4.5 mm long, black or brown, linear to narrowly turbinate, strigillose; carpopodium short, knoblike; pappus of 2–3 stiff, scale-based bristles 3–4 mm long and 2 lacerate-margined scales 1–2 mm long. Chromosome number $n = 12$ (Neher, 1967).

Tagetes filifolia is the most widespread species of the genus, extending from the highlands of northern Mexico south along the mountains to northern Argentina. This species has a very restricted distribution in Panama, occurring only above 1,000 m in the mountains of western Chiriquí. It flowers from December to May.

The sweet anise scent of the essential oils of *T. filifolia* is the basis of one of the colloquial names, "Anisillo." The plants are sometimes used to prepare a medicinal tea. This species, like its larger relatives, *T. microglossa* and *T. erecta*, is sometimes known as "Flor de Muerto."

CHIRIQUÍ: 5 km NW del Hato de Volcán, *Correa* 1360 (MO). Nueva California, *D'Arcy* 4260 (MO). Near Volcán, 4600 ft, *Duke* 9161 (MO, OS), 9201 (MO). Vic. of Boquete, 3300–4200 ft, *Lewis et al.* 357 (GH, MO). Around Alto Lino, 4200 ft, *Maurice* 863 (US). 1.5 mi NE of El Hato de Volcán, 1500 m, *McDaniel* 10186 (FSU). Cerro Vaca, 900–1136 m, *Pittier* 5341 (US). 5 mi NE of El Hato de Volcán, *Wilbur et al.* 11863 (DUKE). ½ mi from Hato de Volcán, *Wilbur et al.* 11949 (DUKE). 2.5 mi W of El Hato de Volcán, *Wilbur et al.* 15101 (DUKE).

3. *Tagetes microglossa* Benth., Bot. Voy. Sulphur 118. 1845. TYPE: Ecuador, near Salango, 462 (BM, holotype, not seen).—FIG. 93A–E.

T. macroglossa Polak., Linnaea 41:580. 1877. TYPE: Costa Rica, "ad vias prope San José," 29 Nov. 1875, *Polakowski* 372 (B?, holotype, not seen, F, photo).

Stout, strong-scented, erect, fibrous-rooted, annual *herbs*; stems 0.3–1 m tall, leafy, ribbed, glabrous or puberulent in lines, often purplish. *Leaves* opposite below, usually alternate above, 3–7 cm long, odd-pinnate, with a narrowly winged rachis, the leaflets linear to lanceolate, 1–2 cm long, acute to acuminate, serrate, the lowermost leaflets and those of the uppermost leaves reduced in size and setiform-dissected, glabrous, punctate with submarginal rows of circular oil glands,

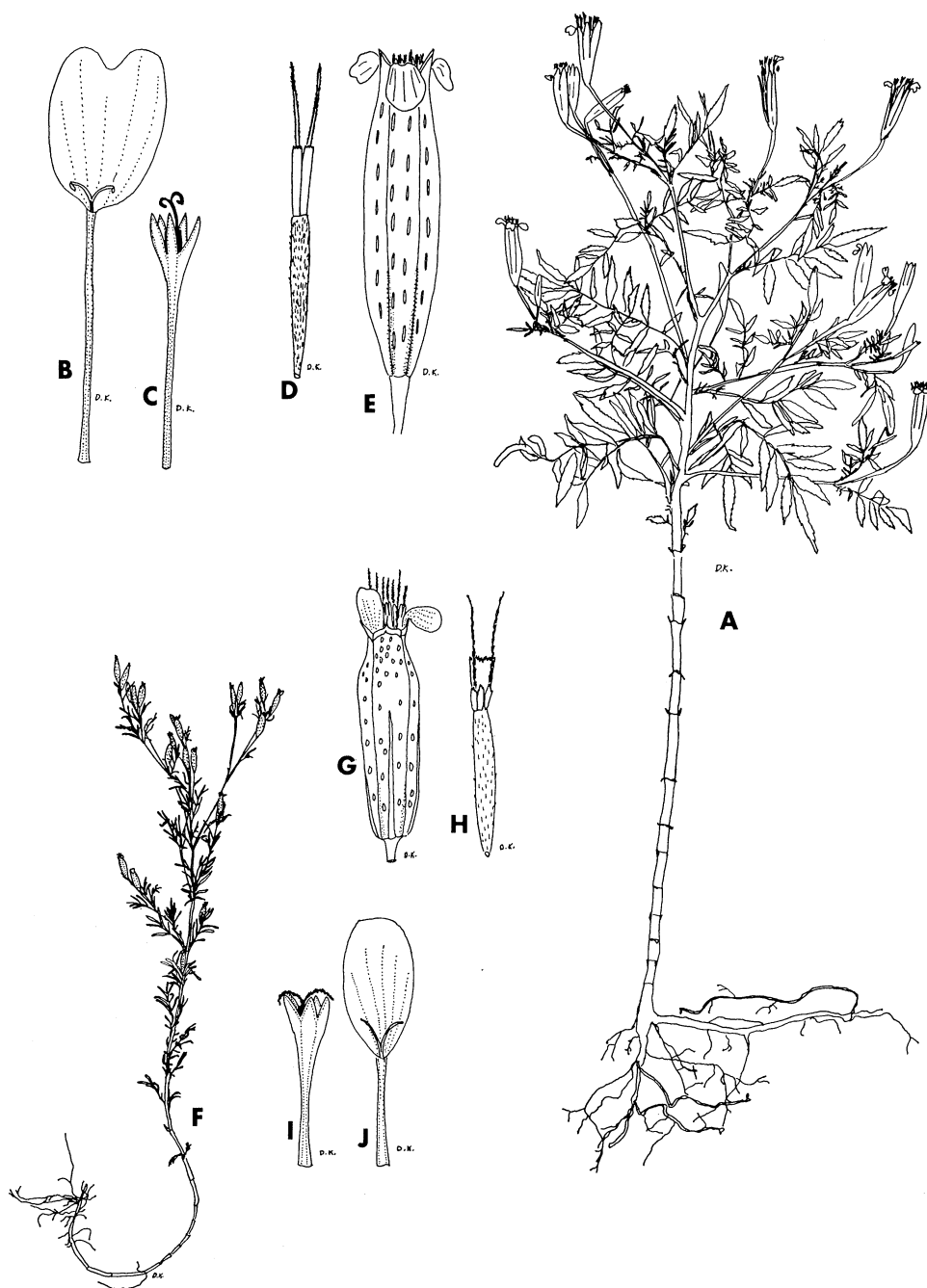


FIGURE 93. *Tagetes*.—A–E. *T. microglossa* Benth.—A. Habit ($\times \frac{1}{2}$).—B. Ray corolla ($\times 4\frac{1}{2}$).—C. Disc corolla ($\times 4\frac{1}{2}$).—D. Achene ($\times 2\frac{3}{10}$).—E. Head ($\times 2\frac{3}{10}$). [After White & White 114 (MO).]—F–J. *T. filifolia* Lag.—F. Habit ($\times \frac{1}{2}$).—G. Head ($\times 4\frac{1}{2}$).—H. Achene ($\times 4\frac{1}{2}$).—I. Disc corolla ($\times 9$).—J. Ray corolla ($\times 9$). [After Lewis et al. 357 (MO).]

sometimes with additional glands scattered on the undersurface. *Inflorescence* an open corymbiform cluster; peduncles 2–3 cm long, with one or more setiform-lacerate bracts below, slightly clavate above, glabrous. *Heads* radiate; involucre cylindrical or slightly fusiform, 15–20 mm long, 4–7 mm wide, the bracts 5, fused nearly to the triangular-acute spreading tips, often splitting apart in age, glabrous, punctate in submarginal rows with 3–6 linear to elliptic glands and 1 or 2 oval, subterminal glands; ray florets 3–5, inconspicuous, the corollas yellow, the tube slender, glabrous, 6–7 mm long, the ligule narrow to ovate, erect or spreading, about $\frac{1}{2}$ the length of the tube, sometimes essentially absent, the style branches slender, curled, shorter than to exceeding the ligules; disc florets 20–25, the corollas yellow, slender, 8–9.5 mm long, equally 5-lobed, the tube scarcely differentiated from the throat, the anthers included, ca. 2 mm long, with elongate, deltoid appendages, the style branches elongate, curved, with a scarcely discernable appendage. *Achenes* 4-angled, black, clavate, 8 mm long, strigillose on the angles, otherwise glabrous; carpodium short, knoblike; pappus of 2 stout, elongate, upwardly scabrous, acuminate bristles 8–9 mm long, and 1 broad, erose-truncate scale 3–4 mm long.

Tagetes microglossa occurs throughout much of Central America and extends south into Colombia and Ecuador. In Panama, this species occurs only in the mountains of Chiriquí and Veraguas at elevations above 1,000 m. The one collection from Veraguas is unusual in having extremely tiny ligules, almost completely concealed by the pappus. It flowers from December to April.

Like its more conspicuous relative, *Tagetes erecta*, *T. microglossa* is sometimes used in religious ceremonies or for medicinal purposes. This species is known by several colloquial names in Panama: “Flor de Muerto,” “Rudillo” and “Manzanilla.” The odor of the essential oils and the vegetative morphology of *T. microglossa* are very similar to those of *T. erecta*.

CHIRIQUÍ: 5.4 km del Hato de Volcán, *Correa & Lazor 1473* (DUKE, MO). Between Bajo and Alto Lino, 4000 ft, *Maurice 895* (US). Cerro Vaca, 900–1133 m, *Pittier 5306* (US). NE of Cerro Pando, NW of Nueva California, 1500 m, *Wilbur et al. 11008* (DUKE). Valley of upper Río Chiriquí Viejo, *White & White 114* (MO). VERAGUAS: 1–2 mi above Santa Fe, *Gentry 3069* (MO).

VII. ANTHEMIDEAE

W. G. D'ARCY⁵⁸

Anthemideae Cass., Jour. Phys. 88: 192. 1819. TYPE: *Anthemis* L.

Aromatic *shrubs* or *herbs*. *Leaves* mostly alternate, often dissected; hairs often arachnoid. *Heads* radiate (Panama), discoid or disciform; involucre of 2–many bracts in several series, imbricate, often with scarious or hyaline margins;

⁵⁸ Missouri Botanical Garden, 2315 Tower Grove Avenue, St. Louis, Missouri 63110.

receptacle flat or convex; paleas mostly wanting; ligules entire or 1–3-denticulate; corolla of disc florets mostly yellowish, tubular, 4–5-dentate, the anthers obtuse, appendaged, the style branches mostly truncate. *Achene* mostly small; pappus mostly wanting.

The Anthemideae is a large tribe of extratropical regions with many species in both hemispheres and in Australia. The few species known to tropical America are restricted to upper elevations or, as in Panama, are escapes from horticultural introductions.

93. CHRYSANTHEMUM

Chrysanthemum L., Sp. Pl. 887. 1753; Gen. Pl., ed. 5. 379. 1754. TYPE: *C. coronarium* L.

Leucanthemum Lam., Fl. Française 2: 136. 1778. TYPE: *L. vulgare* L.

Mostly erect and branched annual or perennial *herbs*, rarely *shrubs*, often strong scented. *Leaves* alternate, entire to much dissected, glabrate or sometimes pubescent. *Inflorescence* of solitary heads or paniculate, cymose or solitary, the heads long stalked. *Heads* mostly conspicuously radiate, rarely discoid, with many florets, variously colored, often showy; involucre bracts narrow in 3–4 similar but unequal series, the costa darkened with a hyaline, often brownish margin, at least at the tips; receptacle flat or convex; paleas present or not; ray florets in one or many series, the ligule entire or dentate, the tube terete, flattened or rarely winged, larger at the base, the ovary mostly fertile; disc florets numerous, the corolla mostly yellowish with little distinction between tube and limb, apically (4–)5-dentate, the anthers basally obtuse or truncate, apically appendaged, the style sometimes basally enlarged, the branches with a ventral groove and flat and fringed at the truncate, sometimes expanded apex, the ovary mostly like that of the ray floret but less compressed, or sometimes shrivelled and sterile. *Achene* mostly dorsiventrally flattened, sometimes 3-angled or winged, mostly with 5–10 prominent regular sulci or nerves; carpodium inconspicuous; pappus wanting or an interrupted ring of scales.

Chrysanthemum is sometimes interpreted narrowly to include about 5 species of Europe and the Mediterranean region, or sometimes broadly to include over 200 species widely dispersed in the Old World. In Panama, the genus is distinct in its aromatic foliage, broad rays, and achenes with conspicuous, evenly spaced nerves or sulci. It is known here only by two cultivated and sometimes escaping Old World species.

Plants in this genus are mostly aromatic and have been used in folk medicine in a number of countries. Contact with the leaves may cause dermatitis. Two species (not in Panama) are used for insecticides known as pyrethrins or Dalmation powder.

- a. Heads more than 25 mm across; leaves of the stem remotely denticulate, eglandular beneath; plants mostly exceeding 70 cm tall; scaly pappus well developed 1. *C. leucanthemum*

- aa. Heads less than 20 mm across; leaves of the stem saliently toothed, copiously glandular beneath; plants seldom exceeding 60 cm tall; pappus rudimentary (scaly) or wanting ----
 ----- 2. *C. parthenium*

1. ***Chrysanthemum leucanthemum* L., Sp. Pl. 888. 1753. TYPE: not seen.**

Leucanthemum vulgare Lam., Fl. Française 2: 137. 1778. Based on *Chrysanthemum leucanthemum* L.

Glabrate, branched, aromatic perennial *herb* to 1 m tall, densely leafy; stems soft, stout, glabrous, slightly striate. Basal *leaves* spatulate, to 15 cm long, the lower half narrowed into a slender winged petiole, prominently serrate upwards, callose margined; cauline leaves lanceolate, to 10 cm long, remotely denticulate or entire, sessile and somewhat clasping at the base, callose margined, glabrous or apically sparingly pubescent. *Heads* radiate, showy, solitary, 5–9 cm across with white ray and yellow disc florets, sometimes with one or two slender subinvolucral bracts; involucral bracts herbaceous in ca. 3 imbricate series, narrowly deltoid to oblong, ca. 10 mm long with broad, brownish, erose, hyaline margins, glabrous; receptacle convex; ray florets 20–30 in apparently 1 series, ligules 3 cm long, 5 mm broad, apically denticulate, drying with longitudinal brown lines, the tube 1–2 mm long, the style white, included, the branches colored, exserted, with a prominent, ventral groove and an expanded, truncate, flat, short-fringed apex, the ovary ca. 2 mm long, glabrous, dorsiventrally flattened, deeply 10-sulcate, the pappus an interrupted ring of scales; disc florets numerous, ca. 6 mm long, the corolla not differentiated into tube and limb, 4 mm long, obconical, apically 5-dentate, the anthers 2 mm long, basally truncate, the appendages obtuse or deltoid, the ovary 2 mm long, resembling that of the ray florets but less compressed, the style branches like those of the ray florets but the apical fringe much larger. *Achene* black, compressed, with conspicuously contrasting ribs, glabrous; pappus of irregular scales or wanting.

This species is distinguished by its large showy flowers and aromatic foliage. It is grown for ornament in upland Chiriquí and sometimes offered for sale as cut flowers in lowland markets. It is a native of the Old World. "Marguarita."

CHIRIQUÍ: Nursery in Boquete, *D'Arcy & D'Arcy* 6506 (MO), 6508 (K, MO, PMA).

2. ***Chrysanthemum parthenium* (L.) Bernh., Syst. Verz. Erfurt 145. 1800.**

Matricaria parthenium L., Sp. Pl. 890. 1753. TYPE: not seen.

Puberulent, branched, aromatic *herb* to 60 cm tall; stems densely leafy, prominently angled, puberulent. *Leaves* to 5 cm long, elliptic or obovate, bipinnately dissected, ultimately obtuse, mucronate, membranaceous, minutely puberulent; base narrowed into a slender, winged petiole 1–2 cm long. *Inflorescence* an open, several-many-flowered panicle; pedicels stout, 3–8 cm long, puberulent, with scalelike bracts along their length. *Heads* small but showy, 15–20 mm across; involucral bracts herbaceous in about 3 unequal, imbricate series, lanceolate, ca. 3 mm long, stramineous, the midvein drying dark and apically pilose, glandular beneath; paleas present; ray florets with ligules 5 mm long, 3 mm broad, apically 3-lobed, the tube 1 mm long, strongly dorsiventrally

compressed, enlarged near the base, the ovary glabrous, dorsiventrally flattened and curving inwards, obconical with 5 prominent nerves; disc florets 3.5 mm long, the corolla yellow, not clearly differentiated into tube and limb, straight or arcuate, mostly tubular, the anthers 1 mm long, basally obtuse, the appendages elongate-obtuse, the style basally enlarged, the branches with a prominent ventral groove and expanded, truncate, flat, fringed apex, the ovary sterile, shrivelled. *Achene* ca. 1.3 mm long; pappus wanting or a short, erose, fringe of scales. *Pollen* brilliant yellow.

This species somewhat resembles species of *Erigeron* but has much broader rays and a hemispherical mass of disc florets. It is grown for ornament in upland Chiriquí. Native of Europe, it is cultivated and escapes in many countries, the oil formerly finding use as a febrifuge. "Feverfew" (English), "Manzanilla" (Panama).

CHIRIQUÍ: Boquete, 5500 ft, *Dwyer 7014* (MO).

VIII. SENECTIONEAE^{59, 60}

T. M. BARKLEY⁶¹

Senecioneae Cass., Bull. Soc. Philom. 173. 1815; Dict. Sci. Nat. 20: 377. 1821.

Shrubs, subshrubs or coarse *herbs, lianas*, or short-lived seasonal herbs. *Leaves* alternate, opposite, or mostly basal. *Heads* radiate, disciform, or discoid, florets usually numerous; involucre often of a single series of prominent involucre bracts, sometimes subtended by a series of conspicuously reduced (calyculate) bracts, or the involucre of 3-4 series of imbricate bracts; receptacle usually naked but with paleas in *Neurolaena*, *Schistocarpha* and 1 species of *Liabum*; ray florets usually distinctly ligulate, the corolla reflexed and prominent but sometimes erect and short, sometimes tubular-filiform and erect; disc florets with the corolla tubular and erect, the anthers appendaged and blunt to slightly tailed at the base, the style branches truncate, terminated with short, spreading hairs (senecionioid style branch) or appendaged with a short, pointed tuft of fused hairs. *Achenes* columnar to narrowly napiform, terete or variously angled, pubescent-hirsute or glabrous; pappus of copious, capillary, smooth or minutely barbellate hairs.

Extensive generic realignments with the Senecioneae as traditionally conceived have been recently proposed by Robinson and Brettell in a series of papers in *Phytologia*. They include erecting a new tribe, Liabeae, for *Liabum*, and

⁵⁹ Contribution No. 1258, Division of Biology, Kansas Agricultural Experiment Station, Manhattan, Kansas.

⁶⁰ I am grateful to Dr. H. Robinson for assistance and advice in the preparation of this treatment and to Rupert Barneby, New York Botanical Garden, for the Latin description of *Senecio angustiradiatus*.

⁶¹ Herbarium, Kansas State University, Manhattan, Kansas 66506.

transferring *Neurolaena* and *Schistocarpa* to the Heliantheae. Their generally narrower generic concept also increases the number of genera. Their work is intriguing and will receive serious consideration, especially because it incorporates detailed observations of floral structures. However, I have elected to follow the traditional circumscription and generic alignments of the tribe for the *Flora of Panama*, because adopting the work of Robinson and Brettell would entail studies beyond the time and resources available, and further because the pertinent structural variation used by Robinson and Brettell occurs in species not found in Panama.

Generic typification follows that of Rydberg (1927).

Literature:

Rydberg, P. A. 1927. (Carduales) Carduaceae. Liabeae, Neurolaeneae, Senecioneae. N. Amer. Fl. 34: 289–360.

- a. Involucral bracts in 3–4 series, imbricate.
- b. Leaves opposite; heads radiate or disciform.
 - c. Leaves white felted-lanate beneath; style branches apically linear-subulate or filiform 96. *Liabum*
 - cc. Leaves green and glabrate beneath; style branches terminated in a tufted crest of hairs 98. *Schistocarpa*
- bb. Leaves alternate: heads discoid 97. *Neurolaena*
- aa. Involucral bracts in a single principal series of uniform length, but often subtended by a calyculus of narrow, short, unequal bracteoles.
- d. Plants small seasonal herbs; florets rose-pink, reddish to orange-red, or sometimes white; involucre of a single series of bracts without a calyculus 94. *Emilia*
- dd. Plants without this combination of characters.
 - e. Heads disciform; erect, weedy herbs 95. *Erechtites*
 - ee. Heads discoid, radiate or disciform in one subsucculent liana; herbs, shrubs, or lianas 99. *Senecio*

94. EMILIA

Emilia Cass., Bull. Soc. Philom. 68. 1817. TYPE: *E. flammea* Cass.

Coarse to frail seasonal weedy *herbs*; taprooted, but with abundant lateral fibrous roots that sometimes overgrow the taproot. *Leaves* alternate, variously petiolate or sessile to distinctly amplexicaul. *Inflorescence* a several-headed, loose-corymbose cyme, arising terminally and sometimes several arising laterally in the axils of the upper leaves. *Heads* discoid, turbinate to weakly campanulate, especially in age; involucral bracts in a single series and equal in length; calyculate bracts absent; receptacle flat or but slightly convex, naked; florets several to numerous, bisexual and fertile, rose to purple or red to orange, occasionally white, the style branches inconspicuously appendaged or surmounted by a short appendage of fused hairs. *Achenes* columnar-rapiform, terete with 10 ribs; pappus of abundant white capillary bristles about equalling the corolla.

An Old World genus of some 24 species, 3 of which are now widely distributed as pan-tropical weeds. The key distinguishes the bulk of specimens of these 3 species that have been seen by me, but the species are imperfectly separated on morphological features and occasional intermediates are to be expected. No specimens referable to *Emilia coccinea* have been seen by me from the Panamanian

flora, however its presence in adjacent regions is undisputed so it may be expected as an occasional weed.

This treatment is adapted from personal communication with F. R. Fosberg, Dan Nicolson, and Arthur Cronquist.

Literature:

Baldwin, J. T., Jr. 1946. Cytogeography of *Emilia* Cass. in the Americas. Bull. Torrey Bot. Club 73: 18–23.

Nicolson, D. H. 1975. *Emilia fosbergii*, a new species. Phytologia 32: 33–34.

- a. Involucre about equalling or only slightly shorter than the florets; heads 7–12 mm long, narrow, 3–4 times longer than wide; involucre bracts ca. 8; middle and lower leaves often conspicuously lyrate-lobed; florets lavender-pink to purple or white, less frequently reddish 3. *E. sonchifolia*
- aa. Involucre usually at least 2 mm shorter than the florets; heads relatively broad, 3 or less times longer than wide; involucre bracts 8–13; leaves usually dentate or but weakly lobed; florets variously colored, sometimes bright red or orange.
 - b. Involucre bracts (7–)9–12 mm long, 8–13; heads mostly 2–3 times longer than wide; florets pink to purple or red but not orange 2. *E. fosbergii*
 - bb. Involucre bracts 6–9 mm long, mostly ca. 13; heads relatively broad, less than 2 times longer than wide; florets often red to orange 1. *E. coccinea*

1. *Emilia coccinea* (Sims) Sweet, Hort. Brit., ed. 3. 382. 1839.

Cacalia sagittata Vahl, Symb. Bot. 3: 91. 1794, nom. illeg., *Hieracium javanicum* N. Burm. (1768) included in synonymy.

C. coccinea Sims, Bot. Mag., tab. 564. 1802. TYPE: not seen.

Emilia sagittata (Vahl) DC., Prodr. 6: 302. 1837.

Erect, seasonal *herb*, 1–5 dm tall, glabrous to lightly pilose; taproot present. *Leaves* alternate, the middle and lower cauline leaves ovate to oblanceolate in outline, but variously toothed or lobed to subentire, the teeth callose-tipped, the uppermost leaves reduced to bracts. *Inflorescence* of 1 to several loose, few-headed, corymbiform cymes, arising terminally or laterally in the axils of the upper leaves. *Heads* discoid, urceolate to turbinate, robust, ca. 1½ times longer than wide, the florets prominently exerted to about ½ their length beyond the involucre; involucre bracts ca. 13, linear, 6–9 mm long; receptacle flat to convex; florets with corollas scarlet to red-orange or orange. *Achene* brown to reddish-tan, narrowly rapiform, 3–4 mm long, minutely pubescent along the 10 ribs; pappus of abundant white capillary hairs. Chromosome number $n = 5$.

This is a showy Old World weed, apparently of sporadic occurrence in the New World tropics and subtropics. Not so frequent as either *E. sonchifolia* or *E. fosbergii*, no Panamanian specimens have been seen by me, but it is to be expected in Panama.

2. *Emilia fosbergii* Nicolson, Phytologia 32: 33. 1975. TYPE: Bahamas, Curtiss 6 (US).—FIG. 94.

E. sagittata sensu auctt., not (Vahl) DC., Prodr. 6: 302. 1837.

E. javanica sensu auctt., not (N. Burm.) C. B. Robinson, Philipp. Jour. Sci. 3: 217. 1908.

Erect to weak seasonal *herb*, (1–)2–5 dm tall, glabrous to sparsely pilose or sometimes prominently villous-pilose in and near the axils of the middle cauline

leaves; taproot present, but becoming branching fibrous-rooted in robust individuals. *Leaves* alternate, broadly ovate to oblanceolate, often tapering to a prominently winged petiole and therefore appearing pandurate, the base sessile to auriculate, the margin weakly serrate to dentate or sometimes lobed, the teeth callose-tipped, overall 5–10 cm long, 2–5 cm wide, about 2 times longer than wide, the uppermost leaves reduced to linear serrate clasping bracts. *Inflorescence* of one to several few-headed, loose, corymbiform cymes arising terminally or laterally in the axils of the upper cauline leaves. *Heads* turbinate or sometimes weakly urceolate or becoming weakly campanulate in age, robust, 2–3 times longer than wide, the florets prominently exerted ca. 2 mm beyond the involucre; involucre bracts 8–13, linear, (7–)9–12 mm long; receptacle flat to convex, the carpodia forming prominent tubercles after achenes have been shed; florets 15–30, varying greatly in size with the robustness of the plant, the corollas pink to light purple or red but not orange. *Achene* reddish brown to light tan, columnar, ca. 4 mm long with a row of strigose-hirsute pubescence on each of the 5(10) prominent ribs; pappus of abundant, white, capillary hairs. Chromosome number $n = 10$.

This is a common weed at lower elevations. It is native to the Old World but now widely distributed. Less frequent in Panama than the closely related *E. sonchifolia*, *E. fosbergii* is most often collected in flower during August to December.

CANAL ZONE: Road C-21, *Duke 5767* (MO). Balboa, *Standley 27005* (US). Chiva Chiva trail near Mira Flores Lake, *Tyson 1353* (MO). CHIRIQUÍ: 8 mi above David on road to Boquete, *D'Arcy & D'Arcy 6295* (MO). Boquete, *D'Arcy & D'Arcy 6341* (MO). Vic. of Boquete, *Lewis et al. 316* (MO, US). PANAMÁ: Cerro Azul, *Castillo 7* (MO). Beyond Goofy Lake along road to Cerro Jefe, *Correa & Dressler 449* (MO). Cerro Azul, *Croat 17327* (MO). Between Cerro Azul and Cerro Jefe, *D'Arcy & D'Arcy 6223* (MO). Cerro Azul, *Dwyer 2533* (MO); *Tyson 2059, 6323* (both MO).

3. *Emilia sonchifolia* (L.) DC., Prodr. 6: 302. 1837.

Cacalia sonchifolia L., Sp. Pl. 835. 1753.

Erect to weakly spreading *herb*, (10–)30–50 cm tall, mostly glabrous or with sparsely scattered, inconspicuous multicellular hairs; taproot present, but sometimes overgrown by active lateral fibrous roots. *Leaves* alternate, evenly distributed along the stem, the lower and middle cauline leaves ovate to oblanceolate in outline, often tapering to a weakly distinct petiole, the margins crenate to deeply and sharply lyrate-lobed, the lobes callose-tipped, overall 5–12 cm long, 1.5–4.5 cm wide, about 3 times longer than wide, the upper leaves similar and smaller, sessile to amplexicaul, the uppermost reduced to linear, subentire clasping bracts. *Inflorescence* of 1 to several, loose, corymbiform cymes of 4–10 heads, arising terminally or laterally in the axils of the upper leaves. *Heads* discoid, turbinate to weakly campanulate in aging individuals, relatively long and thin, 3–4 times taller than wide, the florets little exerted beyond the involucre; involucre bracts ca. 8, linear, 7–12 mm long, weakly connate along the margins, especially in young heads; receptacle naked, flat or convex, the carpodia prominent after mature achenes have been shed; florets 10–20, the corolla lavender-pink to light



purple or white, sometimes tinged reddish but not orange, the style branches terminated in a small tuft of hairs of the same color as the corolla. *Achene* brown to reddish brown, columnar to narrowly rapiform, 3–4 mm long, with short white hirsute bristles on the 10 prominent ribs; pappus of abundant white capillary hairs. Chromosome number $n = 5$.

This is a common weed at lower elevations. It is native to the Old World but now widely distributed throughout the tropics and subtropics. Most frequent in habitats created by human disturbance, but also found in gravel bars in stream beds, and similar habitats, it flowers the year round.

BOCAS DEL TORO: above RR stop at mi 7.5, *Croat & Porter* 6225 (MO). United Fruit Co., Changuinola Banana Plantation, *Lazor et al.* 2442 (MO). Changuinola to 5 mi S at Junction of Ríos Changuinola & Terebe, *Lewis et al.* 914 (MO, US). Without definite locality, *von Wedel* 328 (MO). CANAL ZONE: Farfan Beach, *Burch et al.* 1409 (MO, NY, US). Barro Colorado Island, *Croat* 4183 (MO, NY), 6523, 6991, 8488, 9196 (all MO). Halfway between Gamboa and Summit, *Fosberg* 27389 (US). Ancón, *Greenman & Greenman* 5080 (MO). Gamboa, *Heriberto* 15 (US). Frijoles, *King* 5229 (US). Ancón, *Macbride & Featherstone* 16 (US); *Piper* 5816 (US). Between Corozal and Ancón, *Pittier* 2207 (US). Barro Colorado Island, *Shattuck* 81 (MO). Balboa, *Standley* 25657 (US). Near Gatún, *Standley* 27320 (US). Gamboa, *Standley* 28353 (US). Mt. Hope Cemetery, *Standley* 28810 (US). Between France Field and Catival, *Standley* 30261 (US). Fort Clayton, *Tyson* 2788 (MO). CHIRIQUÍ: 2 km N of Punta de Burica, *Busey* 754 (MO). 6 mi S of Puerto Armuelles, *Liesner* 492 (MO). David airport, *Lewis et al.* 763 (MO, US). Vic. of Puerto Armuelles, *Woodson & Schery* 844 (MO). COLÓN: Mouth of Río Piedras, *Lewis et al.* 3201 (MO). DARIÉN: Vic. of Boca Quebrada Venudo, Río Tuqueza, *Bristan* 1092(2) (MO). HERRERA: Ca. $\frac{1}{2}$ mi E of Río Coroca, *D'Arcy & D'Arcy* 6674 (MO). PANAMÁ: Isla Tobaga, *Allen* 1275 (MO). Ca. 2 mi from Universidad de Panama, *D'Arcy & D'Arcy* 6105 (MO). Pan-Am. Hwy. at Río Mammoní, *Duke* 5583 (MO). San José Island, *Erlanson* 351 (NY, US). Gorgona Beach, *Woodson et al.* 1693 (MO). SAN BLAS: Without definite locality, *Cooper* 273 (US).

95. ERECHTITES

Erechtites Raf., Fl. Ludovic. 65. 1817. TYPE: *E. praelta* Raf.

Fibrous rooted, short-lived *herbs*. *Leaves* alternate, petiolate to variously weak-clasping or amplexicaul. *Inflorescences* varying from a single head (in depauperate plants) to many heads in loose to constricted compound cymes. *Heads* disciform; principal involucre bracts in a single series and equal in length, a shorter calyculate series present; receptacle flat to weakly convex, naked; marginal florets in 1–2 series, pistillate, the corolla tubular-filiform; disc florets numerous, fertile, the style branches surmounted by a terminal appendage of fused papillose hairs. *Achenes* terete or inconspicuously ribbed.

Literature:

Belcher, R. O. 1956. A revision of the genus *Erechtites* (Compositae), with inquiries into *Senecio* and *Arrhenechthites*. Ann. Missouri Bot. Gard. 43: 1–85. (This treatment presents an unorthodox generic circumscription but describes the structural and distributional data with admirable precision.)

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FIGURE 94. *Emilia fosbergii* Nicolson—A. Habit ($\times \frac{1}{2}$). [After *Tyson & Blum* 4055 (MO).]—B. Floret ($\times 5$). [After *Koch* 4922, Costa Rica (MO).]

- a. Leaves chiefly sessile, or if short-petiolate, then the petioles clasping; involucre bracts about 2 times longer than the width of the head; pappus white 1. *E. hieracifolia* var. *cacalioides*
 aa. Leaves chiefly petiolate, or if subsessile, then not clasping; involucre bracts about 3 times longer than the width of the head; corollas and pappus usually pink or reddish 2. *E. valerianaefolia*

1. ***Erechtites hieracifolia*** (L.) Raf. ex DC., Prodr. 6: 294. 1837.

1a. ***Erechtites hieracifolia* var. *cacalioides*** (Fisch. ex Spreng.) Griseb., Fl. Brit. W. Ind. 381. 1861.

Senecio cacalioides Fisch. ex Spreng., Novi Prov. Hort. Acad. Hal. 37. 1819.

Short-lived *herb*, 1–3 m tall; glabrous to sparingly pilose or occasionally conspicuously pubescent, especially on young plants; stems simple or branching above, striate. *Leaves* alternate, pinnately veined, sessile or nearly so, often clasping; blades oblong to linear-lanceolate, subentire to variously dentate-sinuate to occasionally subpinnatifid, glabrous, or frequently pilose-pubescent on the undersides, 5–15 cm long, 1–4 cm wide, ca. 4 times longer than wide. *Inflorescence* a terminal and axillary cluster of corymbiform cymes, with 50 or more heads in robust individuals, or a single head in depauperate plants. *Heads* turbinate, disciform, 10–15 cm tall and ca. $\frac{1}{2}$ as wide; principal involucre bracts linear-subulate, in a single series, ca. 21; calyculate bracts linear to filiform, subulate, unequal, ca. $\frac{1}{2}$ as long as the involucre bracts; receptacle flat, naked, and sometimes weakly inflated and fleshy; ray florets in 1 or 2 series, the corollas thin, tubular, filiform; disc florets functional but sometimes not setting seed. *Achenes* turbinate and lightly ribbed, pappus of abundant, soft, white, capillary hairs, protruding 2–5 mm beyond the involucre bracts. Chromosome number $n = 20$.

A weed in disturbed sites, especially agricultural lands, mostly below 800 m, this species flowers the year round but is more frequently collected in July to December.

Belcher (1956) recognizes 3 varieties of *Erechtites hieracifolia*: var. *hieracifolia* with short calyculate bracts, small heads, and an essentially warm-temperate distribution; var. *megallocarpa* (Fernald) Cronq. with short calyculate bracts, large heads, and a distribution restricted to coastal marshes of eastern North America; and var. *cacalioides* (Fisch. ex Spreng.) Griseb. with long calyculate bracts, small heads, and a generally tropical distribution. The varieties *hieracifolia* and *cacalioides* appear to intergrade freely and represent statistical modes in variation rather than morphologically discrete entities.

BOCAS DEL TORO: Almirante, *Blum* 1328 (MO). CANAL ZONE: Fort Sherman, *Duke* 4359 (MO). Sosa Hill, *Duke* 4662 (MO). Gatún, *Hayes* 225 (NY). Between Gatún and Piña, *Leisner* 1332 (MO). Chiva Chiva trail, Red Tank to Pueblo Nuevo, *Piper* 5773 (US). Between Miraflores and Corozal, *Pittier* 2197 (US). Barro Colorado Island, *Shattuck* 757 (MO). Sosa Hill, *Standley* 26417 (US). Gamboa, *Standley* 28352 (US). Near Fort Randolph, *Standley* 28741 (US). Vic. of Salamanca Hydrographic Station, *Woodson et al.* 1611 (NY, US). CHIRIQUÍ: 15.5 km N of Paso Canoas, *Busey* 617 (MO). Llanos Francia, 4 mi from Boquete, *Dwyer & Hayden* 7605 (MO, US). Vic. of Boquete, *Lewis et al.* 582 (MO, US). 9 mi S of Puerto Armuelles, *Liesner* 158 (MO). Around El Boquete, *Pittier* 2870, 2906 (both US).

Between Río Tinta and Río Tabasara, *Woodson et al.* 418 (MO). COLÓN: Santa Rita Ridge, *D'Arcy & D'Arcy* 6173A (MO). DARIÉN: Vic. of Boca de Cupe, *Allen* 903 (MO). Vic. of Santa Fe, Río Sabana, *Duke* 4096 (MO). Hill near Río Chucunaque, *Duke* 4870 (MO). Teotuma, *Duke* 10077(1) (MO). Manené, *Kirkbride & Bristan* 1575 (MO). LOS SANTOS: Los Toretos, *Dwyer* 2443A (US). PANAMÁ: Isla Taboga, *Allen* 1270 (MO). Ca. 5 mi N of Chagres River, *Croat & Duncan* 15288 (MO). Road N of El Llano, *D'Arcy & D'Arcy* 6041 (MO). Along Pan-Am. Hwy., Río Cañita, *Duke* 3816 (MO). 6 mi E of Chepo, *Duke* 4086 (MO). Río Pacora just below confluence with Río Corzo, *Duke* 12028(3) (MO). Cerro Azul, *Dwyer* 1503 (NY); *King* 5242 (US). Just E of Chica, *King* 5265 (US). Chimán, *Lewis et al.* 3293 (MO). Río Tapia, *Standley* 28116 (US). Juan Díaz, *Standley* 30570 (US). 3 mi E of El Llano at Finca Risso, *Tyson* 1733 (MO). Cerro Azul, *Tyson* 2106, 6324 (both MO). Cerro Jefe, *Tyson* 4305 (MO). Saboga Island, *Tyson & Loftin* 5104 (MO). Near Arraiján, *Woodson et al.* 1337 (MO, NY). SAN BLAS: Soskatupu, *Elias* 1679 (MO). Mainland opposite Achutuppu, *Lewis et al.* 133 (MO, US). Mainland opposite Ailigandí, *Lewis et al.* 140 (MO). Puerto Obaldia, *Pittier* 4373 (NY, US).

2. *Erechtites valerianaefolia* (Wolf) DC., Prodr. 6: 294. 1837.—FIG. 95.

Senecio valerianaefolius Wolf, Ind. Sem. Hort. Berol., teste Reichenb., Icon. Bot. Exot. 59, tab. 85. 1827.

Short-lived (monocarpic?) *herb*, 1–2 m tall; glabrous to scattered hispidulous; stems simple or much branched above, striate. *Leaves* alternate, pinnately veined, distinctly petiolate or at most the upper ones merely subsessile, the lower leaf blades ovate to ovate-lanceolate, subentire to variously serrate-dentate, 8–12 cm long, 2–4 cm wide, ca. 3 times longer than wide, well-developed middle leaf blades usually conspicuously pinnatifid-lobulate, the uppermost leaves passing into bracts; petiole in lower and middle leaves about $\frac{1}{4}$ to $\frac{1}{3}$ as long as the blade. *Inflorescence* a variable, paniculate-corymbiform cyme composed of several terminal and upper-axillary cymules. *Heads* turbinate, disciform, ca. 10 mm tall and ca. $\frac{1}{3}$ as wide; principal involucre bracts in 1 series, linear subulate, 12–15, sometimes 2 or 3 adjacent bracts weakly connate, especially along the lower $\frac{1}{3}$; calyculate bracts thin, linear, sometimes contorted in mature heads; receptacle flat, naked; ray florets in 1–2 series, pistillate, the corolla filiform, tubular; disc florets functional, the innermost apparently more robust and most often fertile. *Achenes* cylindric, striate with ca. 10 ribs, glabrous to minutely pubescent, especially in the grooves; pappus of abundant, soft, capillary hairs, light rose-pink or reddish but sometimes fading to dull white in aging plants, slightly exceeding the involucre bracts in length. Chromosome number $n = 20$.

Erechtites valerianaefolia is a weed in cultivated fields, disturbed sites, and streambanks. It usually occurs above 1,000 m, and has mostly been collected from January to August.

A New World native, now widespread as a weed from Mexico to Argentina, it is also adventive as an aggressive weed in tropical Asia, the Pacific Islands, and northern Australia. Belcher (1956) recognizes 4 formae based on foliage variation. Our materials are referable to f. *valerianaefolia*.

BOCAS DEL TORO: N slopes of Cerro Horqueta, *Allen* 5010 (MO). CHIRIQUÍ: Vic. of New Switzerland, *Allen* 1367 (MO, NY, US). 1 mi E of Cañas Gordas, *Croat* 22342 (MO). Side of Cerro Pando, *D'Arcy* 5394 (MO). E side of Cerro Pando, *D'Arcy & D'Arcy* 6642 (MO). Above Boquete, *D'Arcy & D'Arcy* 6475 (MO). Boquete, *Davidson* 528 (MO). Valley of upper Río Chiriquí Viejo, vic. of Monte Lirio, *Seibert* 164 (MO, NY, US).



FIGURE 95. *Erechites valerianaefolia* (Wolf) DC.—A-B. Habit ($\times \frac{1}{2}$). [After White 71 (MO).]—C. Head ($\times 2$).—D. Floret ($\times 2$). [After Liesner 6427 (MO).]

96. LIABUM

Liabum Adanson, Fam. 2: 131. 1763. TYPE: *Amellus umbellatus* L. = *Liabum umbellatum* (L.) Schultz-Bip.

Herbs, subshrubs and shrubs; branches soft, densely pubescent or glabrescent, often drying striate-ribbed. *Leaves* opposite, distinct or weakly connate-clasping, green and lightly pubescent to glabrescent above, densely whitish felted-lanate beneath. *Inflorescences* terminal and axillary in the upper leaves, numerous loose to compact paniculate or corymbiform cymes. *Heads* radiate; involucre bracts imbricate in several series; receptacle naked or paleaceous with irregular short awns; ray florets in 1–2 series, fertile, the ligules small, erect or tightly recurved, rolled or long and prominent; disc florets numerous, bisexual, fertile, the style branches linear-subulate to filiform, hirsute, the anthers sagittate. *Achenes* turbinate to weakly 5–(10°) angled, pubescent.

Literature:

Robinson, H. & Brettell, R. D. 1974. Studies in the *Liabeae* (Asteraceae) II. Preliminary survey of the genera. *Phytologia* 28: 43–63.

- a. Plants erect; principal leaves ovate to elliptic or subdeltoid; receptacle naked or loosely paleaceous.
 - b. Receptacle paleaceous with short, irregular awns; upper branches whitish felted-lanate; innermost involucre bracts acicular or long-lanceolate 1. *L. bourgeau*
 - bb. Receptacle naked; upper branches brownish, hispid to glabrescent; inner involucre bracts lanceolate-subulate 2. *L. polyanthum*
- aa. Plants lax or scrambling; principal leaves triangular; receptacle alveolate 3. *L. sagittatum*

1. **Liabum bourgeau** Hieron. in Ule, Verh. Bot. Vereins Prov. Brandenburg 48: 208. 1907.—FIG. 96.

Coarse *herb* or weakly woody *subshrub*, 1–2 m tall, the upper internodes tightly felted-lanate, dull white to light brown, often streaked with brownish pilose hairs protruding from the lanate tomentum. *Leaves* opposite, pinnately veined with 2 prominent lateral veins arising from near the base, the upper leaf blades ovate to subdeltoid, acuminate above, obtuse to abruptly contracted below to a prominently winged petiole, the margin subentire to minutely denticulate, 10–20 cm long, 7–15 cm wide, ca. 1½ times longer than wide, the upper surface glabrescent to obscurely arachnoid tomentose, the lower surface closely felted-lanate with occasional brownish hairs, usually near the prominent veins; petiole ca. ¼ as long as the blade, the wing acuminate-tapering toward the stem. *Inflorescence* a series of few-headed cymules compounded into an open, terminal, paniculate to corymbiform cyme, usually subtended by prominent and distinct lateral cymes arising in the axils of the upper leaves. *Heads* campanulate, radiate but inconspicuously so; involucre bracts numerous, conspicuously imbricate in several series, acicular to long-lanceolate, glabrous or sometimes arachnoid tomentose among the outermost bracts, the inner and longest bracts often weakly reddish-margined, ca. 8 mm long in mature heads; receptacle paleaceous with irregular subulate awns 2 mm long or less; ray florets in 1–2 series, fertile, the

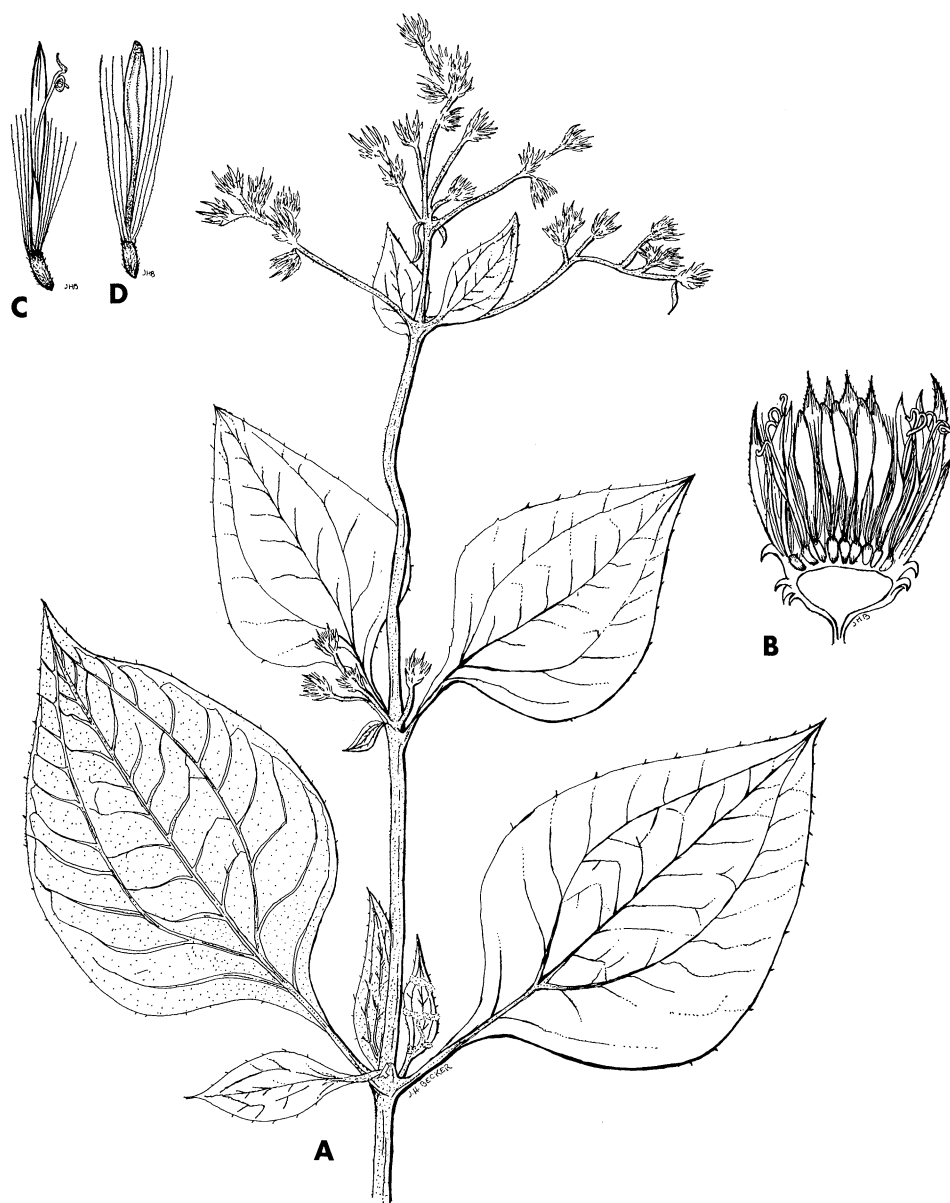


FIGURE 96. *Liabum bourgeauii* Hieron.—A. Habit ($\times \frac{1}{2}$).—B. Head cross section ($\times 2\frac{2}{5}$).—C. Ray floret ($\times 2\frac{2}{5}$).—D. Disc floret ($\times 2\frac{2}{5}$). [After Liesner 462A (MO).]

corolla yellowish, ca. 5 mm long, the tube splitting into a narrow ligule about mid-length, the ligule erect and about equalling the style; disc florets numerous, 50–60 (in well developed heads), the corollas thin, early deciduous. *Achenes* turbinate or weakly 5-angled, 1–2 mm long, lightly spreading-pubescent, especially on the angles; pappus straw-colored, uniseriate, capillary, 5–6 mm long.

This species occurs on steep, forested slopes, at elevations of 1,000–2,000 m, but has occasionally been collected at lower elevations. It flowers mostly from January to April.

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, 1500–2000 m, *Allen 1587* (MO, NY, US). San Bartolo Limite, 20 km W of Puerto Armuelles, 400–600 m, *Busey 555* (MO). 2 mi SW of Puerto Armuelles, 0–200 m, *Croat 22042* (MO). Chiquero, 6000 ft, *Davidson 561* (MO, US). El Boquete, 1000–1300 m, *Maxon 5232* (US). Las Lagunas, 2 mi SW of El Volcán, 4200 ft, *Tyson 853* (MO). NE of Cerro Pando, 1500 m, *Wilbur et al. 11010* (MO, NY, US). COCLÉ: Cerro Pilon, 700–900 m, *Duke 12068/3* (MO). El Valle de Antón, 1800 ft, *Paul (Maurice 780)* (US). Above Penonomé, *Williams 261* (NY).

2. *Liabum polyanthum* Klatt, Bull. Soc. Roy. Bot. Belgique 31: 209. 1892.

Sinclairia polyantha (Klatt) Rydb., N. Amer. Fl. 34: 299. 1927.

Erect or weakly scandent, terrestrial or epiphytic *subshrub*, 2–3 m tall, arching upward to 8 m or more, the upper internodes short-hispid to glabrescent and usually with scattered, prominent, tuberculate lenticels. *Leaves* opposite, pinnately veined, with 2 prominent lateral veins emerging from near the base; the upper leaf blades elliptic to ovate, the margin denticulate with minute, callose teeth, 7–11 cm long, 3–6 cm wide, to twice as long as wide, the upper surface glabrous or with scattered light arachnoid tomentum, the lower surface with a dense gray-white felted lanate tomentum, the prominent veins short-hispid; petiole prominent, about $\frac{1}{4}$ to $\frac{1}{3}$ as long as the blade. *Inflorescence* an irregular, open panicate cyme of 40–60 heads in several loose cymules arising terminally and from the axils of the upper leaves. *Heads* campanulate, inconspicuously radiate, at least in dried specimens; involucre bracts imbricate in 3–4 series, the innermost 4–6 mm long, lanceolate-subulate, often reflexed-spreading at maturity, brownish pubescent outside, especially toward the margin, or occasionally glabrate, the margin sometimes prominently long-villous; receptacle naked; ray florets yellow or ochroleucus to creamy-white, fertile and inconspicuous, few (5–8?), the corolla short and recurved-rolled in dried specimens; disc florets yellow to creamy-white, ca. 20, the corollas exceeding the involucre by 1–2 mm. *Achenes* turbinate to weakly angled, ca. 1 mm long, appressed-pubescent; pappus of both disc and ray florets persistent and conspicuously protruding beyond the involucre, composed of numerous yellow-white, brittle, barbellate bristles, 8–10 mm long, interspersed by several scarious, narrowly subulate awnlike bristles ca. 0.5 mm long.

Liabum polyanthum occurs in openings or disturbed places in wooded areas, usually above 1,000 m. It flowers from December to January.

CHIRIQUÍ: Vic. of New Switzerland, 1800–2000 m, *Allen 1415* (MO, NY, US). Alto Lino, 4200 ft, *Maurice 836* (MO, US). Chiriquí Viejo Valley, *White 93* (MO, US). COCLÉ: Hills N of El Valle de Antón, 1000 m, *Allen 2347* (US). Region of El Valle de Antón, 1000 m, *Allen 2886* (MO, US). Slopes of Cerro Pilon near El Valle, 700–900 m, *Duke 12068* (NY). Cerro Pilon, 3000 ft, *Duke & Lallathin 14994* (MO, NY), *15011* (MO). El Valle, *Gentry & Dwyer 3673* (MO). COLÓN: Santa Rita Ridge, *Dwyer & Gentry 9370* (MO). PANAMÁ: Goofy Lake, *Dwyer 7052* (MO, US). Cerro Jefe to La Eneida, 3100 ft, *Dwyer et al. 8229* (MO). Cerro Jefe, 3100 ft, *Dwyer & Gentry 9438* (MO, NY). Cerro Campana, *Ebinger 235* (MO). *Lewis et al. 3062* (MO).

3. *Liabum sagittatum* Schultz-Bip., Flora 36: 37. 1853.

Munnozia sagittata (Schultz-Bip.) H. Robinson & Brettell, Phytologia 28: 56. 1974.

Lax, scrambling or trailing *liana*, the upper internodes densely but irregularly arachnoid-villous, glabrescent. *Leaves* opposite, petiolate; blades triangular, sharply truncate to weakly hastate at the base, shallowly serrate-dentate, 5–9 cm long, 2.5–4 cm wide, twice as long as wide, the upper surface green, glabrous, occasionally with scattered hairs, or sometimes pubescent along the prominent large veins, the lower surface densely gray-white lanate; petiole ca. $\frac{1}{2}$ as long as the blade, basally expanded and connate-perfoliate in pairs. *Inflorescence* an open, compound cluster of long-pedunculate dichasia, arising terminally and in the axils of the uppermost leaves. *Heads* yellow, large and conspicuous, the disc 1–2 cm across (exclusive of rays) when dried; involucre bracts thin, imbricate in ca. 3 series, the largest 5–10 (–15) mm long, 2–4 (–5) mm wide, broadly oblanceolate, the margins scarious-fimbriate to coarsely pubescent; receptacle flat to weakly convex; paleas of irregular lengths, thin, lacerate, marginally fused and forming alveolae surrounding the individual achenes; ray florets 20–40 in 1–2 series, the tube short-pubescent on the lower $\frac{1}{4}$, the ligule conspicuous, 15–20 mm long in dried specimens; disc florets numerous, the corolla deeply parted into 5 prominent lobes, the style branches without conspicuous appendages. *Achenes* 1–1.5 mm long, reddish-brown except for a white torus-apophysis at the base, weakly fusiform with ca. 10 prominent ribs and a few conspicuous long hairs on the ribs, glabrate at maturity; pappus a single series of yellow-white capillary bristles 5–7 mm long.

Liabum sagittatum is known in Panama only from elevations of 2,300 m and above in the region of Cerro Punta, Chiriquí Province. Flowering collections have been made from December through May.

CHIRIQUÍ: Trail from Cerro Punta to headwaters of Río Caldera, 2250–2500 m, *Allen 1458* (US). Cerro Punta, 7000 ft, *Blaisdell 342* (US). Trail N of Cerro Punta, *Croat 10436* (MO). Slopes of Las Cumbres near Cerro Punta, *Croat 13671* (MO). Ca. 2 mi E of Cerro Punta, 6900 ft, *Wilbur et al. 13128* (MO). Trail from Bajo Grande along the Quebrado Grande, 2100–2400 m, *Wilbur et al. 15162* (MO). Guadalupe, *Wilbur et al. 15329* (MO).

97. NEUROLAENA

Neurolaena R. Br., Trans. Linn. Soc. London 12: 120. 1817. TYPE: *Conyza lobata* L.= *Neurolaena lobata* (L.) R. Br.

Coarse *herbs* with soft, pithy stems, variously covered by an appressed to spreading rough tomentum. *Leaves* alternate, the upper ones subentire to dentate, the lower ones sometimes deeply lobed. *Inflorescence* a many-headed, terminal and upper-axillary, compound, corymbiform cyme. *Heads* discoid; involucre bracts imbricate in 3–4 series; receptacle flat; paleas copious, membranous; florets numerous, the style branches thin, abruptly terminated in a crest of short hairs, the anther bases minutely sagittate. *Achenes* terete or weakly 5-ribbed, lightly pubescent, especially on the angles; pappus abundant in 1–2 series.

The relationships of this genus have been discussed by Robinson & Brettell (1973).

1. ***Neurolaena lobata*** (L.) R. Br., Trans. Linn. Soc. London 12: 120. 1817.—FIG. 97.

Conyza lobata L., Sp. Pl. 862. 1753.

Coarse *herb* or *subshrub* 1.5–3 m tall; stems soft, terete, with abundant pith, covered with an appressed to lightly spreading strigose tomentum. *Leaves* alternate, oblanceolate to narrowly elliptic, tapering to a short petiole, pinnately veined, the margin commonly serrate-denticulate to entire, sometimes deeply lobed, especially the lower leaves, the middle and upper leaves 2–4 cm wide, 8–20 cm long, and about 4–5 times longer than wide, the well-developed lower leaves sometimes much larger and relatively broader, the upper surface lightly glandular-scabrous with short, stiff appressed hairs, the lower surface with a weakly spreading strigose tomentum. *Inflorescence* a series of loose to dense clusters of bracteate corymbiform cymes, the pedunculate cymes terminal or lateral from the axils of the upper leaves. *Heads* discoid, campanulate, small, (3–)4–6(–8) mm tall when dried but varying greatly with degree of maturity and perhaps from plant to plant; involucre bracts imbricate in 3–4 series, oblong, stramineous-chartaceous, especially distally; receptacle with numerous thin paleas about as long as the inner involucre bracts; florets yellow or occasionally yellow-green or white, ca. 30 (in well-developed heads), about as long as the involucre bracts. *Achenes* black or gray-brown, ca. 2–4 mm long, terete or obscurely 5-ribbed, lightly pubescent on the angles; carpopodium small but prominent, dull yellow-white; pappus of copious, whitish, lightly barbellate bristles slightly exceeding the involucre bracts at maturity.

This species is widespread in wooded areas, clearings and disturbed sites, usually below 800 m elevation. It flowers virtually the year round but has been most frequently collected from December to March.

BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *von Wedel* 1790, 1821 (both MO, US). Old Bank Island, Chiriquí Lagoon, *von Wedel* 1866 (MO, US), 1914, 1966 (both MO). CANAL ZONE: Galen Point, *Blum & Dwyer* 2142 (MO). Barro Colorado Island, *Croat* 5292, 7223, 7224, 8302, 8381, 9112 (all MO). N of Paraíso, *Croat* 12975 (MO). Chagres, *Fendler* 155 (MO, US). Between Summit and Gamboa, *Greenman & Greenman* 5230 (MO). Gatún, *Hayes* 624 (NY). Between Gamboa and Darién, *Heriberto* 23 (US). Barro Colorado Island, *Hladick* 105 (MO). Chagres River, 3 mi above Gamboa, *Kennedy et al.* 2296 (MO). Chiva-Chiva Trail, *Piper* 5768 (US). Barro Colorado Island, *Silvestre* 607 (MO). Balboa, *Standley* 27003 (US). Las Cascadas Plantation near Summit, *Standley* 29502 (US). Frijoles, *Standley* 27620 (US). Fort Sherman, *Standley* 30977 (US). Barro Colorado Island, *Standley* 41070 (US). 1 mi N Summit, *Tyson et al.* 2780 (MO). 6 mi N Gamboa, *Tyson* 3490 (MO). Fort San Lorenzo, *Tyson & Blum* 3687 (MO). CHIRIQUÍ: Boquete, *Allen* 4652 (MO). 9 km from Puerto Armuelles, *Busey* 741 (MO). 2 km N of Punta de Burica, *Busey* 748 (MO). Vic. of Boquete, *Lewis et al.* 587 (MO). Around El Boquete, *Pittier* 2977 (US). COCLÉ: El Valle, *Allen* 1198 (MO). N of El Valle de Antón, *Allen* 3714 (MO). Hills above El Valle de Antón, *D'Arcy & D'Arcy* 6767 (MO). El Valle de Antón, along Río Indio trail, *Hunter & Allen* 305 (MO). Boca del Toabre, *Lewis et al.* 5510 (MO, NY). COLÓN: Río Viejo, vic. of Puerto Pilón, *Allen* 4101 (MO). Miguel de la Borda, *Croat* 10031 (MO). Between Salud and Boca de Río Indio, *Howell* 68 (MO). Santa Rita Ridge, *Lewis et al.* 5375 (MO). Between France Field and Catival, *Standley* 30198 (US). DARIÉN: Between Pinogana and Yavisa, *Allen* 239 (MO, NY). Río Pirre, 2–5 mi above El Real, *Duke* 5085 (MO, US). Río Pirre, ca. 10 mi S of El Real, *Duke* 5460 (MO). Cerro Pidíaque, *Duke* 8081(2) (MO). Manené, *Kirkbride & Bristan* 1609



FIGURE 97. *Neurolaena lobata* (L.) R. Br.—A. Habit ($\times \frac{1}{2}$).—B. Head ($\times 5$). [After Dwyer 2130 (MO).]—C. Leaf ($\times \frac{1}{2}$). [After Narvaez 3185, Nicaragua (MO).]

(MO). Camp Summit, Darién—San Blas border, *Oliver et al.* 3680 (MO). Along the Sambú River, *Pittier* 5539 (US). Between Paya and Boca de Paya, *Stern et al.* 271 (MO, NY, US). Vic. of Campamento Buena Vista, *Stern et al.* 875 (MO, US). Chirijana District, *Terry & Terry* 1387 (MO). Cerro Piriaque, *Tyson et al.* 3827 (MO). LOS SANTOS: Loma Pieta, *Duke* 11841(2) (MO). 17.8 mi S of Macaracas, *Lewis et al.* 1603 (MO, US). S of Macaracas at Quebrada Bejuco, *Tyson et al.* 2913, 2930, 3061 (all MO). PANAMÁ: Cerro Azul, *Croat* 17321 (MO); *Duke* 9365 (MO). Tocumen, *Dwyer* 2891 (MO). San José Island, *Erlanson* 49, 220 (both US). Cerro Campana, *Luteyn & Kennedy* 1797 (US). Near Tapia River, *Killip* 3323 (US). Cerro Jefe, *Kirkbride & Crebbs* 3 (MO, NY). 2–3 mi S of Goofy Lake, *Lewis et al.* 237 (MO, NY, US). 5 mi SW of Cerro Brewster, *Lewis et al.* 3385 (MO). Road from El Llano

to Cartí-Tupile, *Leisner* 705 (MO). Near Tapia River, *Maxon & Harvey* 6669 (US). Hills around Allajuela, *Pittier* 2337 (US). Río Tapia, *Standley* 28058 (US). Cerro Jefe, *Tyson et al.* 3186, 4303, *Tyson* 3363 (all MO). Road from Cerro Azul to Cerro Jefe, *Tyson* 6314 (MO).

98. SCHISTOCARPHA

Schistocarpa Less., *Linnaea* 6: 409. 1831. TYPE: *S. bicolor* Less.

Large coarse *herbs* or *subshrubs*. *Leaves* opposite, distinctly or weakly connate-clasping at the nodes, the uppermost leaf blades basally attenuate into a weakly-winged petiole. *Inflorescence* a conglomerate corymbiform to paniculate cyme composed of many terminal and upper-axillary cymules. *Heads* radiate or disciform; involucre bracts imbricate in 3–4 series; receptacle convex to hemispherical or even conical; paleas abundant, unequal; ray florets fertile, small, numerous, in 1–2 series, the ligule short, thin and inconspicuous, or sometimes well developed; disc florets numerous, fertile, the anther bases weakly sagittate, the style branches slender, abruptly terminated in a small, tufted crest of hairs. *Achenes* terete or weakly ribbed, glabrous.

- a. Ray florets inconspicuous in 1–2 series; ligules erect or weakly reflexed-spreading, 1 mm long or less; widespread species 2. *S. oppositifolia*
- aa. Ray florets prominent in ca. 3 series; ligules regularly spreading at right angles to the tube, 2–5 mm long; Chiriquí species 1. *S. croatii*

1. **Schistocarpa croatii** H. Robinson, *Phytologia* 29: 339. 1975. TYPE: Panama, *Croat* 26411 (MO, holotype).—FIG. 98A–B.

Erect, sparsely branched *subshrub*, 1–2 m tall, lightly short-pilose. *Leaves* opposite, ovate, acuminate above, cuneate at the base, serrate; blades 6–10 cm long, 2.5–5.0 cm wide, 2–3 times longer than wide, narrowly decurrent at the base, the midvein densely pilose beneath; petiole 1.5–4.0 cm long. *Inflorescence* a series of loose, open paniculate cymes. *Heads* narrowly campanulate, 7–8 mm tall, 7–8 mm wide; involucre bracts imbricate in ca. 4 series, oblong to broadly oblong, round-obtuse apically, the margins puberulous; receptacle paleaceous; paleas subscarious, laciniate; ray florets 40–60 in 2–3-series, the tube slender and densely pubescent, expanding into a prominent, white, lobed ligule 2–5 mm long and 0.5 mm wide; disc florets 30–40, white, the corolla 4–5 mm long, hispidulous. *Achene* glabrous, ca. 1 mm long, distinctly ribbed; pappus of prominent, early deciduous, capillary bristles.

This species is found in forest openings at elevations of 2,000 m and above in the mountains of Chiriquí. It flowers mostly in February, but has also been collected in July.

CHIRIQUÍ: W slopes of Cerro Horqueta, *Allen* 4813 (MO). Slopes of Las Cumbres near Cerro Punta, *Croat* 13770 (MO). Bajo Chorro, Boquete, *Davidson* 337 (MO, US).

2. **Schistocarpa oppositifolia** (Kuntze) Rydb., *N. Amer. Fl.* 34: 306. 1927.—FIG. 98C.

Zycona oppositifolia Kuntze, *Rev. Gen. Pl.* 373. 1891.

Schistocarpa hoffmannii Kuntze, *Rev. Gen. Pl.* 3: 170. 1898.

Erect, branching, coarse *herb* or *subshrub*, 1–3 m tall; stems terete, striate, sparsely short villous-pilose along the internodes, usually more densely pubescent



FIGURE 98. *Schistocarpha*.—A-B. *S. croatii* H. Robinson.—A. Habit ($\times \frac{1}{2}$).—B. Ray floret ($\times 6\frac{9}{10}$). [After Croat 26411 (MO).]—C. *S. oppositifolia* (Kuntze) Rydb. Ray floret ($\times 9\frac{1}{5}$). [After Croat 23902 (MO).]

at and near the nodes. *Leaves* opposite, pinnately veined, the well-developed upper leaves ovate, basally truncate to obtuse, the uppermost leaves becoming lanceolate and weakly attenuate at the base, the margins serrate to dentate, often with minute, callose teeth (6–)10–15 cm long, 3–7 mm wide, ca. 2 times longer than wide, the upper surface scattered viscid-glandular pilose to glabrate, the lower surface with a loose scattered tomentum, sometimes densely pilose on the

veins; petiole distinct, ca. $\frac{1}{8}$ – $\frac{1}{2}$ as long as the blade. *Inflorescence* of corymbiform cymules, each cymule with 6–10 heads, arising terminally or laterally from the axils of the uppermost leaves. *Heads* campanulate, inconspicuously radiate, yellow to yellow-green or sometimes white; involucre ca. 1 cm tall, 1 cm across when dried, the bracts imbricate in 3–4 series, the innermost 6–7 mm long, stramineous-chartaceous at maturity, often long-pubescent on the margins; receptacle convex; paleas thin, unequal; ray florets in 1–2 series, scarcely exceeding the involucre, the tube narrow-filiform with a short, erect ligule less than 1 mm long; disc florets ca. 60–70 in well-developed heads, slightly exceeding the involucre in length. *Achene* narrowly fusiform, terete or weakly 5-ribbed, ca. 1 mm long, black; pappus a uniseriate series of white, minutely barbellate capillary hairs.

This is a species of forests, especially openings and disturbed areas. It has been found mostly below 1,000 m in elevation, occasionally higher, in the mountains of Chiriquí. It flowers the year round but has frequently been collected in July and August.

BOCAS DEL TORO: Forest above RR stop at mi 7.5, *Croat & Porter 16226* (MO). Water Valley, *von Wedel 930* (MO). Nievécita, *Woodson et al. 1822* (MO). CANAL ZONE: Madden Forest, *Croat 12248* (MO). Vic. of Fort San Lorenzo, *Croat 12519* (MO). Madden Forest, *D'Arcy & D'Arcy 6096* (MO). Between Madden Dam and Saddle 11 near Alajuela, *Dodge et al. 16501* (MO). Ca. 1 mi S of Madden Dam, *King 5237* (US). Margarita swamp, S of France Field, *Maxon & Valentine 7056* (US). Howard Air Force Base, *Tyson 1863* (MO, US). Fort San Lorenzo, *Tyson 3505* (MO). Gamboa, *Tyson et al. 4568* (MO). CHIRIQUÍ: Above Cerro Punta on road to Cerro Respinga, *D'Arcy & D'Arcy 6512* (MO). Valley of the upper Río Gariché, *Siebert 356* (MO). COCLÉ: Between Cerro Pilón and El Valle de Antón, *Duke & Dwyer 13927* (MO). El Valle, *Dwyer 1907* (MO). COLÓN: Portobelo, *D'Arcy 4071* (MO). Santa Rita Ridge, *D'Arcy & D'Arcy 6161* (MO). Portobelo, *D'Arcy 6692* (MO); *Dwyer 4396* (MO). Quebrada Maskia off Río Pucro above Pucro, *Duke 13094(3)* (MO). LOS SANTOS: From 1 mi S to 10 mi S of Tonosí, *Duke 12495(1)* (MO). Los Toretos, *Dwyer 2454* (MO, US). Headwaters of Río Pedregal, *Lewis et al. 2916* (MO). PANAMÁ: 10 km N of El Llano, *Busey 916* (MO). 3 mi above Goofy Lake, *Croat 11582* (MO). S of Cañita, *Croat 14511* (MO). 7 mi from highway on road to Cerro Jefe, *Croat 15182* (MO). Cerro Azul, *Dwyer 2648* (MO). Between Cañita and dam site, *Gentry & Tyson 1708* (MO). 0–2.5 mi along lumber road to Río Maestro, *Gentry 2354* (MO). Near Bayano Dam E of Cañitas, *Gentry 5567* (MO). S slopes of Cerro Azul, *King 5254* (US). Junction of Ríos Pacora and Corso, *Oliver 2365* (MO). Cerro Azul, *Porter et al. 4084* (MO). Arraiján, *Woodson et al. 1394* (MO, NY). Nievécita, *Woodson et al. 1822* (NY, US).

99. SENECIO

Senecio L., Sp. Pl. 866. 1753; Gen. Pl., ed. 5. 375. 1754. TYPE: *S. vulgaris* L.

Herbs, shrubs, small trees or lianas. Leaves alternate, simple, pinnately veined, or in 1 species, palmately veined. *Inflorescence* a few-many-headed corymbiform cyme arising terminally or in the axils of the upper leaves, or occasionally heads solitary. *Heads* radiate or discoid, rarely disciform, red to orange-red or yellow, sometimes ochroleucous; principal involucre bracts of equal length in a single series or obscurely divisible into an inner and outer series, usually subtended by a calyculus of 10 or fewer irregular bractlets; receptacle flat to gently convex, naked, sometimes obscurely alveolate or with minute hairlike paleas irregularly disposed among the achenes, conspicuous paleas lacking; ray florets fertile, in a single series, the ligule usually well developed but sometimes reduced and inconspicuous,

ray florets sometimes absent; disc florets fertile, bisexual, the style branches variously tipped with a penicilliate tuft of hairs to a distinct, triangular appendage. *Achene* terete or ribbed, glabrous or variously pubescent; pappus of a single series of white, capillary bristles.

A huge complex of more than 1500 species in both the Old and New Worlds, *Senecio* is readily divisible into semidistinct groups. Some contemporary botanists advocate the recognition of several segregate genera, but the broad traditional concept of *Senecio* has been maintained in this treatment.

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- a. Erect herbs, shrubs or small trees, not scrambling lianas.
 - b. Cauline leaves palmately veined 6. *S. heterogamus*
 - bb. Cauline leaves pinnately veined.
 - c. Leaves densely white lanate-tomentose throughout, at most glabrate on the upper leaf-surfaces 8. *S. oerstedianus*
 - cc. Leaves variously pubescent to glabrous but not densely white-lanate-tomentose.
 - d. Leaves large, blades 15–35 cm long, deeply sinuate with 3–6 conspicuous sinuses on each side of the leaf 2. *S. arborescens*
 - dd. Leaves normally smaller, dentate to entire but not both large and deeply sinuate.
 - e. Involucral bracts 13–17(–18), the calyculate (basal) bracts 6 or more, conspicuous, often more than 5 mm long, the involucre often purplish 3. *S. boquetensis*
 - ee. Involucral bracts ca. 8, the calyculate (basal) bracts 4 or fewer, rarely more than 4 mm long.
 - f. Heads narrowly cylindrical; involucral bracts linear-oblong, more than 8 mm long; ligules ca. 10 mm long in dried specimens 5. *S. cooperi*
 - ff. Heads broader upwards, at least at maturity; involucral bracts lanceolate-spatulate, 6–7 mm long; ligules 5–8 mm long .. 7. *S. megaphyllus*
 - aa. Lianas.
 - g. Heads large, campanulate; principal involucral bracts 30–40; ray florets 18–24, the style branches surmounted by distinctly expanded, papillose, triangular tips 4. *S. confusus*
 - gg. Heads smaller; principal involucral bracts 10 or fewer; style branches surmounted by penicilliate hairs.
 - h. Heads radiate, the ligules long and narrow, ca. 10–15 mm long, less than 1 mm wide; leaves, especially the lower surfaces, with stipitate-stellate hairs 1. *S. angustiradiatus*
 - hh. Heads disciform or with ligules less than 1 mm long; leaves glabrescent, sometimes with scattered simple hairs 9. *S. parasiticus*

1. *Senecio angustiradiatus* Barkley.⁶² TYPE: Panama, *Dressler 4616* (MO).

Liana, variously covered with light reddish-brown pubescence of stipitate-stellate hairs with stalks 0.5–0.8 mm long arising from swollen bases and with 5–6 straight or curved radiating arms, especially on hairs along the upper stems, among the heads in the inflorescence and on the undersides of the leaves, simple hairs of the same color occurring among the stipitate-stellate hairs, especially on the outside of the involucre bracts, near the base of the heads, and on the upper peduncles. *Leaves* evenly distributed along the stem, alternate, entire, broadly elliptic to ovate, inconspicuously acuminate, rounded at the base, sometimes weakly revolute at the margins, pinnately veined, 7–10 cm long, 3.5–5 cm wide, twice as long as wide, coriaceous or at least appearing so in dried specimens, glabrescent, the upper surface with a few scattered hairs, the lower surface pubescent with stipitate-stellate hairs; petiole distinct, ca. 1 cm long, attached to the stem just above a pubescent, pulvinate bud-scale scar. *Inflorescence* a series of racemose or paniculate cymes, each with 10–20 heads, arising in the axils of the upper leaves. *Heads* campanulate at maturity, conspicuous with red-purplish involucre bracts, yellow corollas and narrow rays; involucre bracts 8–10, lanceolate, slightly acuminate, 7–10 mm long, 2–3 mm wide; calyculate bracts 1–3, lanceolate, 3–4 mm long; receptacle slightly convex with scattered, hyaline, bristlelike paleas 0.5–1 mm long, irregularly interspersed between the achenes; ray florets 5, the tube 5–6 mm long, the ligule distinct, narrow-filiform, 10–12 mm long, 0.5–1 mm wide, usually tortuous-recurved in dried specimens; disc florets 10–15, the tube 5–6 mm long, the limb 4–5 mm long, the style branches tipped with a small tuft of translucent hairs. *Achene* reddish-brown, columnar, terete or weakly angled, glabrous, 1–2 mm long; the pappus a single series of white, capillary bristles protruding 3–5 mm beyond the involucre.

This entity is known to me by only two specimens, but the narrow rays, the reddish-purple involucres, and the peculiar stipitate-stellate pubescence combine to make it distinct. Both collections were taken in flower in March.

COCLÉ: Cerro Pilón, 900–1173 m, *Liesner 789* (MO). PANAMÁ: El Llano-Cartí highway, ca. 10–12 km N of El Llano, *Dressler 4616* (MO).

⁶² *Senecio angustiradiatus* Barkley, sp. nov. *Frutex* scandens modo variabili sed praecipue secus ramulos summos, inter inflorescentiae capitula foliorumque dorso pilis rufis 0.5–0.8 mm longis basi dilatatis apice stellatim 5–6-radiatis, ulterius praecipue ad involucri bracteas, capitulorum basin summosque pedunculos pilis simplicibus concoloribus immixtis conspersa, foliis adultis glabrescentibus. *Folia* regulatim secus ramulos ordinata alterna, late elliptica vel ovata subacuminata, basi rotundata, margine integra nunc subrevoluta, 7–10 × 3.5–5 cm, bis longiora quam lata, pennivenia; petiolo ± 1 cm longo proxime supra perulae cicatricem pulvinatum orto; lamina (sicca) coriacea. *Inflorescentiae* e cymis axillaribus subterminalibusque racemosis vel paniculatis 10–20-capitulatis compositae. *Capitula* matura campanulata, bracteis involucralibus 8–10 lanceolatis subacuminatis 7–10 × 2–3 mm rubro-purpureis, calyculi bracteolis 1–3 lanceolatis 3–4 mm longis; receptaculo subconvexo paleis hyalinis setiformibus 0.5–1 mm longis inter achaenia hinc inde consperso; radii flosculorum 5 tubo 5–6 mm longo, ligula anguste filiformi 10–12 × 0.5–1 mm, sicca saepissime contortuplicatim recurva; disci flosculorum 10–15 tubo 5–6 mm, limbo 4–5 mm longis; styli ramulis apice pilis hyalinis penicillatis; pappi 1-seriati setis capillaribus albis, involucre 3.5 mm superantibus; achenio columnari 1–2 (+?) mm longo tereti vel subangulato rufo glabro.

2. **Senecio arborescens** Steetz in Seem., Bot. Voy. Herald 162, tab. 31. 1854.
TYPE: Panama, *Seemann 1163* (BM, not seen).

Telanthophora arborescens (Steetz) H. Robinson & Brettell, Phytologia 27: 426. 1973.

Shrub or small *tree*, to 9 m tall; closely lanate-pubescent and scattered-tufted villous, especially among the branches of the inflorescence and along the veins on the leaf undersides, irregularly glabrescent. *Leaves* alternate; blades 15–35 cm long, 10–20 cm wide, ca. 1½ times longer than wide, broadly ovate to obovate, regularly sinuate with 3–6 sinuses on each side of the midvein, the sinuses extending about halfway to the midvein, the lobes subentire or callose-denticulate, the venation pinnate; petiole distinct, ⅓ as long as the blade. *Inflorescence* a loose to open compound of corymbiform cymules, forming an arching inflorescence 20–30 cm across with 200–400 heads. *Heads* yellow, at least sometimes fragrant; principal involucre bracts 5–6 mm long, ca. 8 in number, arranged in 2 alternating series, the outer bracts linear-lanceolate, ca. 1 mm wide, the margins scarious but not hyaline, the inner bracts oblanceolate-oblong, ca. 2 mm wide, the margins distinctly scarious-hyaline; calyculate bracts 1–3, linear, 2–3 mm long; receptacle flat with irregular, minutely denticulate paleas; ray florets 3(–5), the tube 3–4 mm long, the ligule ca. 4 mm long, less than 1 mm wide in dried specimens; disc florets 8–10, the corolla 6–7 mm long, not sharply separated into tube and limb. *Achene* columnar, terete or weakly angled, glabrous, 3–4 mm long; pappus of white, uniseriate, capillary bristles, exceeding the involucre by 1–3 mm or more.

This species is a small, understory tree or shrub in clearings and along stream-banks, occurring at 1,500–2,300 m elevation in the mountains of Chiriquí Province. It flowers from February to June, but is most often collected in March.

The name *Senecio copeyensis* Greenman has been used for some Panamanian material properly referred to *S. arborescens*. The epithet *copeyensis* applies to an eradiate entity of Costa Rica.

CHIRIQUÍ: Trail from Bambito to Cerro Punta, *Allen 307* (MO). Nueva Swissa, *Croat 13502* (MO, NY). Bajo Mono, Boquete, *Davidson 465* (US). Cerro Punta, *Kozlovsky K-7* (MO). Río Ladrillo, above El Boquete, *Stern et al. 1972* (MO, US). Finca Collins, vic. of El Boquete, *White 7* (MO, US). Upper Río Chiriquí Viejo, *White 330* (MO). Volcán de Chiriquí, *Woodson et al. 905* (MO).

3. **Senecio boquetensis** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 394. 1940. TYPE: Panama, *Pittier 5382* (F, holotype, not seen; US, isotype).

Erect *herb* or *subshrub*, 1–2 m tall, the upper and middle nodes often swollen, the middle internodes variously lanate-villous to arachnoid, glabrescent. Middle cauline *leaves* alternate, 6–12 cm long, 3–7 cm wide, about twice as long as wide, lanceolate to narrowly elliptic, tapering basally to a conspicuously lobulate-undulate, winged petiole, sometimes with 2–3 pairs of prominent lateral lobes, pinnately veined, the margins serrate-dentate, callose-denticulate, closely short-pilose above, densely to irregularly lanate-villous beneath; petiole about as long as the blade or slightly less, basally clasping; upper cauline leaves reduced to sessile, clasping, deeply serrate to parted bracts, 3–7 cm long. *Inflorescence* a loose to tight agglomeration of 1–6 corymbiform cymules of 8–15 heads each, arising

terminally or from the axils of upper cauline leaves; peduncles sparsely pilose to glabrate, sometimes purplish. *Heads* with orange florets and purple or near-purple involucre, sometimes parasitized by an insect gall in the receptacle; principal involucre bracts 13–17(–18), elliptic-lanceolate, tapering to a weakly erose apex, (7–)8–9 mm long; calyculate bracts 6–10, conspicuous, spreading or sometimes reflexed, linear-subulate, 5–10 mm long; receptacle flat, subalveolate with short irregular teeth (paleas) projecting ca. 0.5 mm upwards between the achenes; ray florets ca. 8 but sometimes absent, even on some plants with otherwise radiate heads, the tube 5–6 mm long, the ligule 9–12 mm long, 2–3 mm wide in dried specimens, sometimes irregularly 2–3-lobed apically; disc florets 20–30, the corolla 6–9 mm long at anthesis, not sharply distinguished into tube and limb, the lobes conspicuous with sinuses 2–3 mm deep. *Achene* columnar or weakly fusiform, 2–3 mm long, hispid-hirsute, sometimes sparingly so; pappus a single series of white capillary bristles, equalling or slightly exceeding the involucre.

Senecio boquetensis occurs in open, damp rocky sites or disturbed swampy places at 1,000–3,000 m elevation in the mountains of Chiriquí Province. Flowering specimens were collected from December to January but one specimen was collected in April.

CHIRIQUÍ: Upper valley of Río Chiriquí Viejo, *Allen 1586* (MO). N of Volcán City, *Duke 9029* (MO). Vic. of Boquete, *Lewis et al. 353* (MO). Between Cerro Vaca and Hato de Loro, *Pittier 5382* (US). Chiriquí Viejo Valley, *White 94* (MO). Between El Hato and Volcán de Chiriquí, *Wilbur et al. 15397* (MO).

4. ***Senecio confusus*** Britten, Jour. Bot. 36: 260. 1898, based on *Gynoxys berlandieri* DC., not *Senecio berlandieri* Schultz-Bip. (1845).

Gynoxys berlandieri DC., Prodr. 6: 326. 1837. TYPE: Mexico, *Berlandier* (not seen).

G. cumingii Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 109. 1852. TYPE: Costa Rica, *Örsted* (not seen).

Senecio benthamii Griseb., Abh. Königl. Ges. Wiss. Göttingen 24: 206. 1879, not *Senecio benthamii* Wedd. (1859). SYNTYPES: Nicaragua, *Wright*. Panama, *Seemann*. Paraguay, *Balansa* (none seen).

S. berlandieri (DC.) Hemsley, Biol. Centr. Amer., Bot. 2: 236. 1881, not *S. berlandieri* Schultz-Bip. (1845).

S. calocephalus Hemsley, Biol. Centr. Amer., Bot. 2: 237. 1881, based on *Gynoxys cumingii* Benth., not *Senecio calocephalus* Poepp. & Endl. (1845).

S. hemsleyi Britten, Jour. Bot. 36: 260. 1898, new name for *Gynoxys cumingii* Benth., not *Senecio cumingii* Hook. & Arn. (1841).

Pseudogynoxys berlandieri (DC.) Cabr., Brittonia 7: 56. 1950.

Herbaceous *liana*, climbing over other vegetation and on natural and man-made escarpments; stems conspicuously striate, at least in dried specimens, glabrate or villous to loose-pilose, especially in and near the axils of peduncles, glabrescent. *Leaves* alternate; blades 6–12 cm long, 2–7 cm wide, ca. 2–3 times longer than wide, lanceolate to ovate-lanceolate, rounded to contracted or sometimes cordate at the base, the margin shallow-serrate or dentate to subentire, the teeth callose-denticulate, the venation pinnate; petiole distinct, 1–2 cm long but uppermost leaves becoming sessile. *Inflorescence* of 1–2(–3) large heads supported by a conspicuous peduncle 10–30 cm long, arising from axils of the

uppermost leaves, sometimes with 1–5 reduced, bractlike leaves arising along the peduncle. *Heads* campanulate at maturity, red or orange-red to bright orange, large; disc 2–2.5(–3) cm across; principal involucre bracts 30–40, narrowly lanceolate to acicular, gradually acuminate, sometimes red-pink tipped, lightly puberulent or pilose on the outer midrib, 8–12 mm long; calyculate bracts prominent and numerous, irregularly spaced and at most ca. $\frac{1}{2}$ as long as the principal involucre bracts, pubescent-pilose on the outside and often along the margins; receptacle gently convex, distinctly shallow-alveolate; ray florets 18–24 in a single whorl, the tube ca. 7 mm long, the ligule 10–15 mm long, 3–4 mm wide in dried specimens; disc florets numerous, 40–60, the corolla 10–12 mm long, the tube and limb not sharply distinguished, the lobes prominent, the sinuses ca. 2 mm deep, the style branches with expanded, papillose, triangular tips. *Achene* columnar, with ca. 10 prominent ribs, lightly pubescent, 4 mm long, 0.8 mm wide; pappus of white, uniseriate, capillary bristles.

This species ranges from sea level to ca. 800 m elevation, probably throughout Panama, in areas of disturbance. Apparently native, it has been distributed by man as an ornamental.

This species and its neotropical relatives were called section *Convolvuloidei* by Greenman (1901), and have been segregated as the genus *Pseudogynoxys* (Cabrera, 1950). They are characterized by distinctive, triangular style apices and a climbing habit. The group has its share of nomenclatural confusion, and a complete synonymy for *Senecio confusus* must await a thorough revision of the group. Williams (1975) resurrected the name *S. chenopodioides* H.B.K. (1820) for this complex but did not fully document the nomenclature or the taxonomy. He did not cite types or indicate that types were studied.

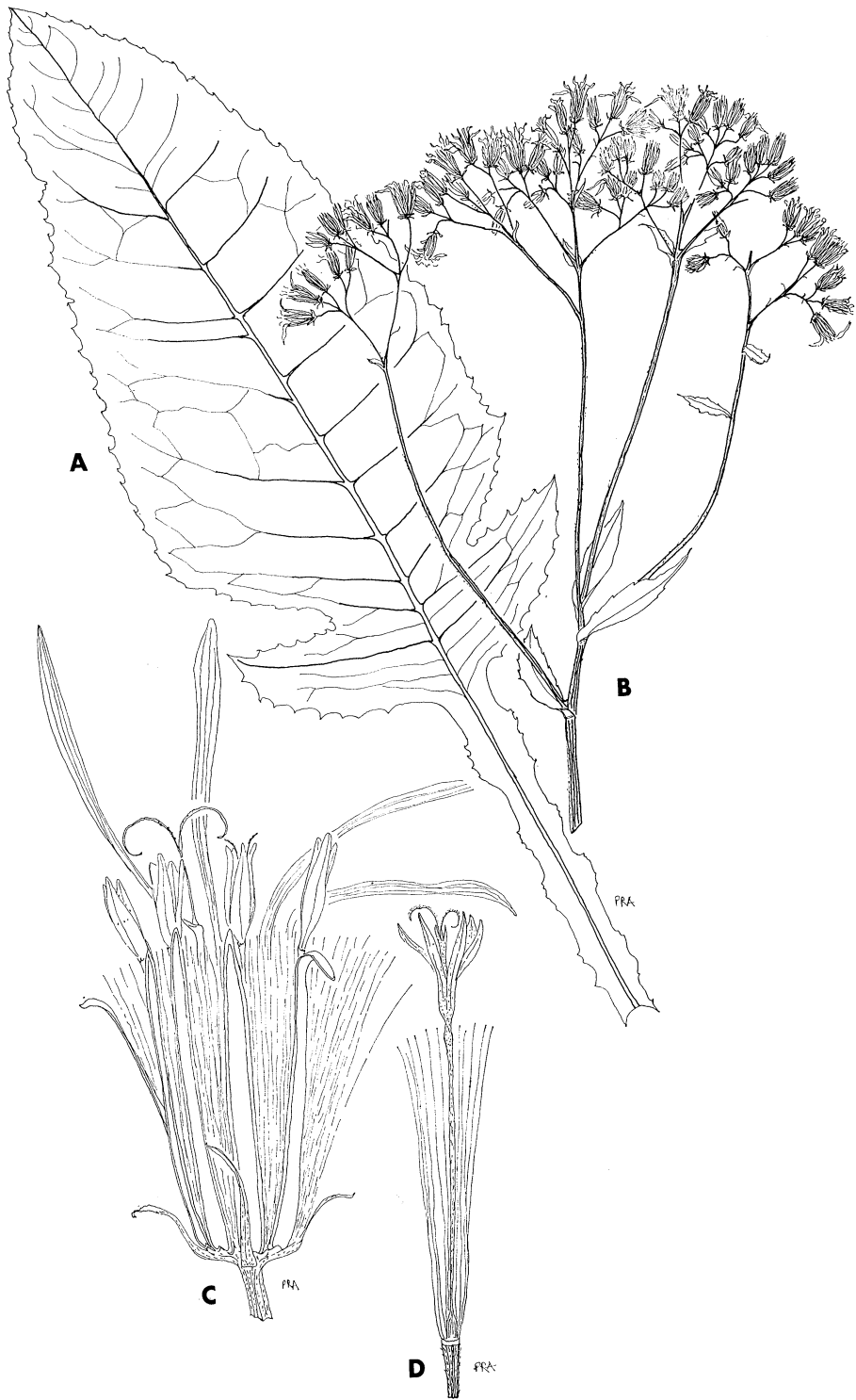
BOCAS DEL TORO: Changuinola Valley, *Dunlop* 541 (US). CANAL ZONE: Road to Lapita signal station near Summit, *Croat* 13956 (MO). Culebra Cut, *Hunter & Allen* 780 (MO, US). Empire to Mandinga, *Piper* 5473 (US). Around El Paraíso, *Pittier* 2530 (MO, US). Las Cascadas Plantation, near Summit, *Standley* 29577 (US). COCLÉ: Road to El Cope from Interam. Hwy., *Burch et al.* 1369 (MO, US). Village of El Valle, *Dwyer* 11941 (MO). Mountains beyond La Pintada, *Hunter & Allen* 548 (MO). Bismark, above Penonomé, *Williams* 314 (MO), *Williams* 599 (MO, NY, US). HERRERA: Banks of Río Santa María, *Burch et al.* 1202 (MO). Road from La Avena to outskirts of Pesé, *Burch et al.* 1313 (MO, US). Near river at Ocu, *Croat* 9648 (MO). Between Ocu and Chitré, *D'Arcy* 4147 (MO). 4 mi S of Los Pozos, *Tyson* 2638 (MO). LOS SANTOS: Ca. 5 mi S of Las Tablas, *Burch et al.* 1246 (MO, US). 5 mi E of Macaracas, *Tyson et al.* 3133 (MO). PANAMÁ: Vic. of Arraiján, *Allen* 1624 (US). VERAGUAS: 1 mi W of Santiago, *Tyson* 5166 (MO).

5. *Senecio cooperi* Greenman, Publ. Field Columbian Mus., Bot. Ser. 2: 284. 1907. TYPE: Costa Rica, Cartago, *Cooper* 5803 (GH, not seen).—FIG. 99.

Coarse *herb* with turgid, pithy stems, (1–)2–3 m tall, the uppermost internodes and branches in the inflorescence scabrous-pilose with dark-tipped hairs, at least some of which are glandular. *Leaves* alternate; blades 10–40 cm long,

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FIGURE 99. *Senecio cooperi* Greenman—A. Leaf ($\times \frac{1}{2}$).—B. Inflorescence ($\times \frac{1}{2}$).—C. Head ($\times 5\%$).—D. Floret ($\times 5\%$). [After Allen 1459 (MO).]



(5-)10-20 cm wide, about twice as long as wide; well-developed leaves elliptic to broadly lanceolate or oblanceolate, the largest subpandurate, tapering or abruptly contracted, the margin serrate-dentate with callose-denticulate teeth 4-5 mm apart, pinnately veined; petiole ca. $\frac{1}{2}$ as long as the blade, prominently winged, the wing irregularly undulate, amplexicaul at the base; lower leaves glabrescent, but with lower surfaces scattered villous, especially on the veins; uppermost leaves becoming lanceolate sessile bracts 10-20 cm long. *Inflorescence* a series of open, compound corymbiform to paniculate cymes, with 30-60(-200) heads, arising terminally and from the axils of upper leaves. *Heads* distinctly cylindrical and spreading only slightly in age, yellow or yellow-orange, radiate and fragrant; principal involucral bracts about 8, linear oblong, 8-10 mm long, 1 mm wide, the margins prominently scarious, erose at the apex; calyculate bracts 1-3, inconspicuous; receptacle flat with a few short scarious paleas irregularly interspersed among the achenes; ray florets ca. 5-8, thin and narrow, the tube 6-8 mm long, subfiliform, the ligule disposed at a right angle to the involucre but becoming lax in age, ca. 10 mm long and 1 mm wide in dried specimens; disc florets 10-18, exserted 4-6 mm beyond the involucre, the tube slender, 8-10 mm long, the limb funnellform, 3-5 mm long, deeply 5-lobed. *Achene* pubescent, narrowly fusiform to suburceolate, terete, 2-3 mm long, only occasionally filled and therefore presumably of low fertility; pappus of white, uniseriate, capillary bristles.

Senecio cooperi occurs in clearings, steep slopes, and disturbed sites in forested areas, mostly above 2,000 m, in the mountains of Chiriquí and adjacent Bocas del Toro. Apparently flowering the year round, the species has been most often collected in July, August, and September.

BOCAS DEL TORO: N slopes Cerro Horqueta, *Allen* 4999 (US). CHIRIQUÍ: Trail from Cerro Punta to headwaters of Río Caldera, *Allen* 1452 (NY, US). Cerro Punta, *Blum et al.* 2425 (MO). Between Bambito and Cerro Punta, *Croat* 10535 (MO, NY). NW Nueva Surina, *Croat* 13530 (MO, NY). NW side of Cerro Pando, *Croat* 15947 (MO). W of Cerro Punta, *Croat* 22419 (MO). Above Cerro Punta, *D'Arcy* 5351 (MO). La Popa, above Boquete, *D'Arcy* & *D'Arcy* 6406 (MO). Cerro Punta, *D'Arcy* & *D'Arcy* 6525 (MO). Cerro Pando, *D'Arcy* & *D'Arcy* 6639 (MO). Bajo Chorro, Boquete, *Davidson* 236 (MO, US). Cerro Horqueta, *Dwyer et al.* 432 (MO, US). Boquete, *Dwyer* 6997 (MO). Cerro Punta, *Gentry* 5867 (MO); *King* 3303 (US). Cerro Horqueta, *Maurice* 864 (MO, US). Nueva California, *Tyson* 6687 (MO). Finca Lérída, *Woodson* & *Schery* 231 (MO). Near Bajo Mona and Quebrada Chiquera, *Woodson* & *Schery* 515 (MO). Bajo Mona, *Woodson et al.* 1014 (MO, NY).

6. *Senecio heterogamus* Hemsley, Biol. Centr. Am., Bot. 2: 242. 1881. TYPE: Costa Rica, *Örsted* 192 (K, not seen).

Roldana heterogama (Hemsl.) H. Robinson & Brettell, Phytologia 27: 420. 1973.

Low *subshrub* 20-40 cm tall; stems coarse, distichous, branching; caudex woody, fibrous-rooted, 2-3 cm across, 2-5 cm long; pubescence lightly villous-pilose, at least some of the hairs glandular, especially on the upper stems and peduncles. *Leaves* alternate, about evenly distributed along the stem, 2.5-6 cm long, 2-7 cm wide, usually slightly wider than long, often eccentrically peltate, deltoid-orbicular to suborbicular with 5-9(-13) shallow lobes, denticulate with small but prominent teeth, palmately veined; petiole distinct, attached ca. 1 cm

inward from the margin, or sometimes basally, nearly as long as the blade or a little longer, basally expanded and sometimes subclasping; uppermost leaves reduced to lanceolate bracts. *Inflorescence* arising terminally, an open panicle cyme with 5–20 heads. *Heads* yellow, disciform; involucre bracts ca. 13, narrowly lanceolate, 7–9 mm long; calyculate bracts 1–2, linear-subulate, 2–4 mm long, inconspicuous; ray florets 8–10, apparently fertile, the corolla tubular, ca. 5 mm long; disc florets 10–20, the tube narrow, 3 mm long, the limb conspicuously expanded, 5 mm long. *Achene* columnar to weakly fusiform, glabrous, to 4 mm long; pappus a single series of white capillary bristles equalling or slightly exceeding the involucre.

This species occurs at elevations above 2,000 m in the mountains of Chiriquí Province. In Panama it has been collected flowering in June and July, but most collections from elsewhere in Central America have been taken in December–April.

CHIRIQUÍ: Volcán de Chiriquí, Woodson *et al.* 857 (MO).

7. **Senecio megaphyllus** Greenman, Publ. Field Columbian Mus., Bot. Ser. 2: 284. 1907. TYPE: Costa Rica, "Bords du Paraita Grande au Copey," *Tonduz 11700* (GH, not seen).

Coarse suffrutescent *herb* or *shrub*, 1–3 m tall, glabrate at maturity but with irregularly scattered arachnoid-villous tomentum, especially in and near the axils of the leaves. *Leaves* alternate, blade of well-developed upper leaves 8–15 cm long, 3–6 cm wide, about twice as long as wide, oblanceolate to elliptic, tapering serrate-dentate, the teeth callose-denticulate, pinnately veined; petiole winged, ca. $\frac{1}{3}$ as long as the blade, weakly clasping at the base; uppermost leaves reduced to lanceolate, subsessile, subentire bracts, 3–5 cm long. *Inflorescence* a dense compound of several clustered corymbiform cymes arising terminally and in axils of the uppermost leaves, 10–20 cm across, the heads 40–60. *Heads* yellow-orange to orange; principal involucre bracts ca. 8, lanceolate to spatulate, scarious margined, tapering to a fimbriate tip, 6–7 mm long; calyculate bracts 2–4, linear, 3–4 mm long; receptacle flat with short, obscure, irregular scarious paleas less than 1 mm long; ray florets ca. 5, the tube 5–6 mm long, filiform, the ligule 5–8 mm long, 1 mm wide in dried specimens; disc florets 8–14, exceeding the involucre by 3–5 mm, the tube 6–8 mm long, the limb sharply distinct, 4 mm long, prominently lobed with sinuses ca. 2 mm deep, the style branches surmounted by a minute conical tuft of hairs. *Achene* broadly fusiform to columnar, glabrous, 2 mm long; pappus of white, capillary bristles in a single series, only slightly exceeding the involucre bracts.

This species occurs at high elevations, over 3,000 m, in the mountains of Chiriquí Province. It flowers in February and March.

A curious single specimen, Stern *et al.* 1065, is tentatively referred here, pending acquisition of more complete materials. The specimen is immature so positive identification is not possible, but the collectors refer to it as a "small tree, up to 8" dia." Furthermore, it was collected at an elevation below that expected for *S. megaphyllus*. It may represent an undescribed entity.

CHIRIQUÍ: E of Boquete, Palo Alto, 5000 ft, *Stern et al.* 1065 (MO). Volcán de Chiriquí, *Terry* 1305 (MO). W slope of El Barú, *Tyson & Loftin* 6142 (MO).

8. **Senecio oerstedianus** Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 109. 1852. TYPE: Costa Rica, *Örsted* (not seen).—FIG. 100.

Erect *herb*, 30–50 cm tall; stems arising singly (or loosely clustered?); rhizome coarse, creeping, 10–15 mm in diam.; pubescence densely white-lanate throughout except on the upper surface of leaves, which are early irregular-glabrate, on stems unevenly glabrescent. *Leaves* evenly distributed along the stem but reduced upwards, alternate, pinnately veined, thick and coriaceous, at least in dried specimens, the lower and middle leaves lanceolate to narrowly ovate, acuminate, tapering at the base, the margin serrate-dentate, edges of the teeth weakly revolute, the blades 6–10 cm long, 2–5 cm wide, about 2–2½ times longer than wide; petiole ½–⅓ as long as the blade, sheathing-clasping at the base. *Inflorescence* a single, terminal, congested to loose, paniculate to subcorymbiform cyme of 10–20 heads, supported by stout, densely lanate peduncles. *Heads* radiate, yellow; involucre bracts ca. 21, narrowly lanceolate-subulate, greenish, with narrow, scarious margins, minutely erose-tipped, conspicuously but unevenly lanate tomentose on the outer surface; calyculate bracts few, linear-subulate, less than 5 mm long; receptacle flat, naked; ray florets ca. 8, ligule 8–10 mm long, 1 mm or more wide in dried specimens; disc florets 20–30, the corolla 7–8 mm long, the tube and limb not sharply distinguished. *Achene* columnar, glabrous, 2–3 mm long; pappus of copious, white, capillary bristles, equalling or slightly exceeding the involucre bracts.

Known in Panama only from about 3,000 m on Volcán de Chiriquí, this species flowers from February to March.

The specimens *Pittier* 3094 in MO and US have different localities on the printed labels: “Upper belt of Chiriquí Volcán, northern slope; 3000 to 3374 m” (MO); “around El Potrero Camp, Chiriquí Volcano; 2800 to 3000 m” (US). The specimens both represent the same entity.

CHIRIQUÍ: Chiriquí Volcano, *Pittier* 3094 (MO, US). Volcán de Chiriquí, *Terry* 1314 (MO).

9. **Senecio parasiticus** Schultz-Bip. ex Hemsley, Biol. Centr. Amer., Bot. 2: 244. 1881. TYPE: not seen.

Cacalia parasitica Schultz-Bip. ex Braun, Bot. Zeitung (Berlin) 15: 759. 1857, nom. nud.

Liana, often described as “succulent,” loosely climbing to 10–15 m, glabrate but with scattered hairs irregularly disposed throughout, becoming short-pilose upwards, especially on branches and peduncles. *Leaves* evenly distributed along the stem, alternate; blades 3–7 cm long, 1.5–2.5 cm wide, ca. 3–4 times longer than

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FIGURE 100. *Senecio oerstedianus* Benth.—A. Habit ($\times \frac{3}{8}$). [After *Schery* 448 (MO).]—B. Ray floret ($\times 2\frac{1}{2}$).—C. Disc floret ($\times 2\frac{1}{2}$). [After *Dwyer* 684 (MO).]



wide, elliptic to obovate, acuminate, tapering to a distinct petiole, entire or sometimes revolute at the extreme edge, pinnately veined; petiole $\frac{1}{2}$ as long as the blade. *Inflorescence* a series of small, corymbiform cymules with 8–12 heads each, arising terminally or in axils of the upper leaves. *Heads* white; involucre bracts 8, lanceolate, scarious margined, 6–7 mm long; calyculate bracts 1–2, inconspicuous, 1–2 mm long; receptacle slightly convex with prominent but minute, irregularly dentate paleas less than 1 mm long protruding between the achenes; ray florets 5, greatly reduced, the corolla ca. 5 mm long, either subactinomorphic and 5-lobed, or with a minute ligule less than 1 mm long; disc florets 8–10, the corolla 6–8 mm long, not sharply distinguished into a tube and limb. *Achene* apparently fusiform, glabrous, 1–2 mm long; pappus a single series of white, capillary bristles.

Senecio parasiticus occurs at elevations around 1,000 m in the mountains of Chiriquí, Bocas del Toro, and Veraguas Provinces. It has been collected flowering March, April, and May. A poorly understood, polymorphic complex in Panama and adjacent countries, it perhaps encompasses more than the one entity recognized here.

BOCAS DEL TORO: Divide on Chiriquicito-Caldera trail, *Kirkbride & Duke 977* (MO). CHIRIQUÍ: Chiriquí Viejo Valley, *White III* (MO). VERAGUAS: W of Santa Fe on road past Escuela Agrícola Alto Piedra, *Liesner 920* (MO).

XI. CARDUEAE

ROBERT C. GARDNER⁶³

Cardueae Cass., Jour. Phys. 88: 155. 1819. "Carduineae." TYPE: *Carduus* L.

Carlineae Cass., Jour. Phys. 88: 154. 1819. TYPE: *Carlina* L.

Centaureae Cass., Jour. Phys. 88: 154. 1819. TYPE: *Centaurea* L.

Echinopseae Cass., Jour. Phys. 88: 157. 1819. TYPE: *Echinops* L.

Cynareae Less., Linnaea 5: 128. 1830. TYPE: *Cynara* L.

100. CIRSIUM

Cirsium Miller, Gard. Dict., abr. ed. 4. 1754. TYPE: none cited.

Acaulescent *herb* to 4 dm tall; stems simple to several from the base. *Leaves* alternate, usually lobed, spines distributed along the margins, frequently decurrent on the stem. *Heads* discoid; involucre multiseriate, the bracts usually imbricate, often spine-tipped, sometimes with a glutinous dorsal ridge; receptacle subconic, bristly; florets perfect, the corolla white to purple, tubular, 5-cleft, the anthers

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appendaged, basally caudate with fringed auricles, the style with a thickened, often hairy ring below the branches, these connate except near the tip. *Achenes* oblong, somewhat flattened; pappus of plumose bristles.

Cirsium has been confused with two Old World genera: *Carduus* and *Cnicus*. *Carduus* has barbellate pappus bristles while *Cnicus* has a 2-seriate pappus, the inner series being shorter than the outer. *Cirsium* can be differentiated by its uniseriate, plumose pappus. About 200 species of *Cirsium* are native to the Northern Hemisphere and about 50 species are native to temperate America.

Besides the two species enumerated below, a third *Cirsium* species, *C. vulgare* (Savi) Airy-Shaw, has been seen from central Costa Rica (Taylor 4463B, NY). This additional taxon is an introduction from Europe, and in North America is widespread. Because of the weedy nature of *C. vulgare*, it is possible that further collecting will show that it occurs in Panama. *Cirsium vulgare* has decurrent leaves, as does *C. mexicanum*, but is easily distinguished by having reflexed involucre bracts and minute appressed spines on the upper leaf surfaces.

- a. Leaf bases decurrent, forming wings on the stem; involucre of mature heads 3–3.5 cm tall; outer rows of involucre bracts with a glutinous dorsal ridge 1. *C. mexicanum*
- aa. Leaves clasping, not forming wings on the stem; involucre of mature heads 4.5–6 cm tall; none of the involucre bracts with a glutinous dorsal ridge 2. *C. subcoriaceum*

1. ***Cirsium mexicanum* DC.**, Prodr. 6: 636. 1837. TYPE: Mexico, Tamaulipas, around Tampico, 1826–1827, *Berlandier* (G, not seen).—FIG. 101.

Cnicus costaricensis Polak., Linnaea 41: 581. 1877. TYPE: Costa Rica, San José, *Polakowsky* 64 (B, not seen, F, photo).

C. mexicanus (DC.) Hemsley, Biol. Centr. Amer., Bot. 2: 251. 1881.

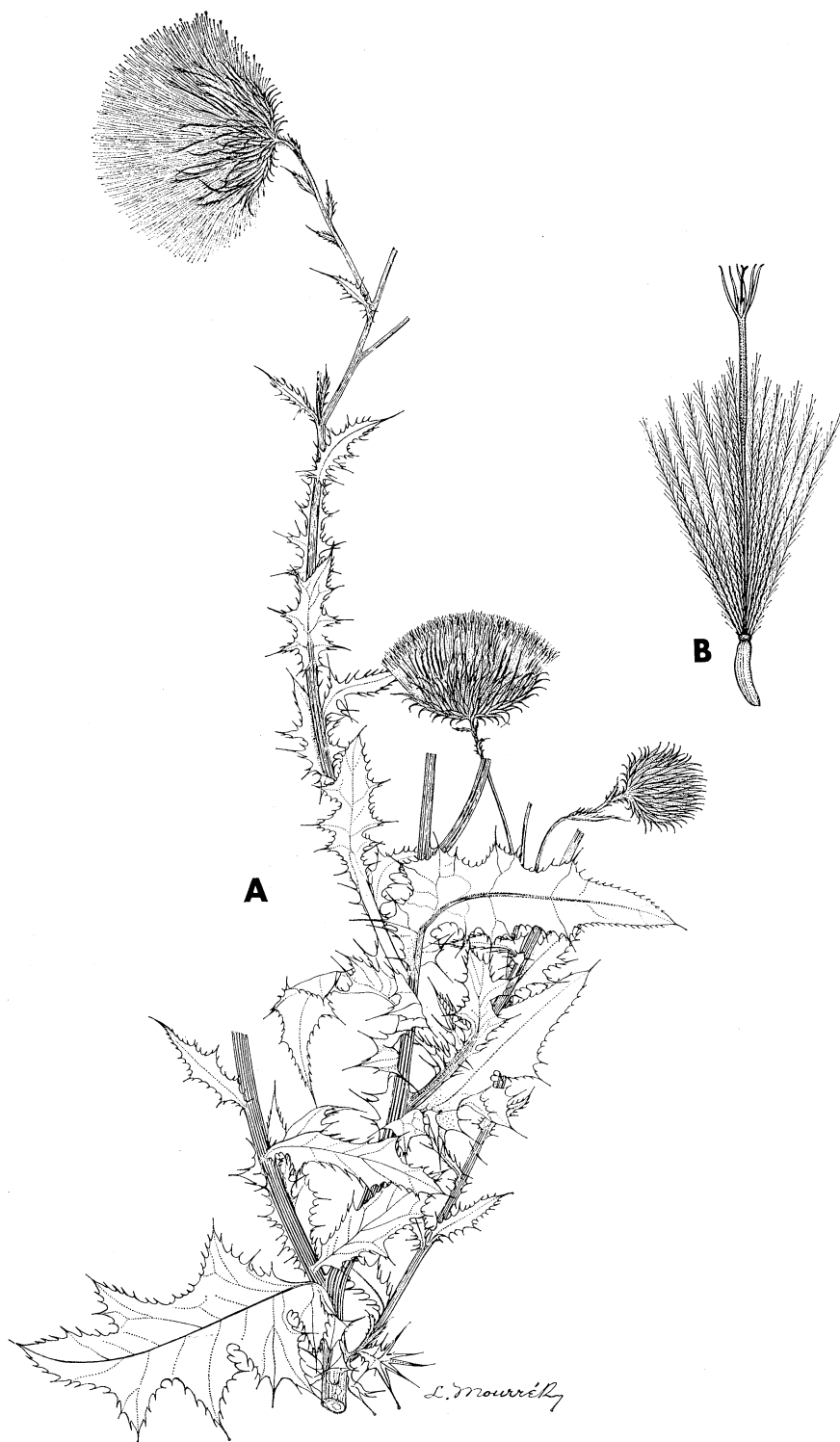
Carduus mexicanus (DC.) E. L. Greene, Proc. Acad. Nat. Sci. Philadelphia 1892: 363. 1893.

Cirsium costaricensis (Polak.) Petrak, Beih. Bot. Centralbl. 27: 219. 1910.

Annual *herbs*, 10–40 dm tall; stems simple below, branching above, tomentose when young, the tomentum becoming floccose with age. Lower *leaves* to 45 cm long and 18 cm wide, the sinus depth to 95% of the leaf width; upper leaves to 10 cm long and 6 cm wide, the sinus depth variable and less than in the lower leaves; leaf bases decurrent, the wings to 5 cm long, tomentose beneath, glabrous above or with a thin tomentum along the major veins, the marginal spines 6–12 mm long, usually longest on decurrent wings. *Inflorescence* of terminal clusters of 3–5 or single heads on short peduncles arising from the axils of the upper and middle cauline leaves. *Heads* with the involucre 8- or 9-seriate, 3–3.5 cm tall, 1.5–2 cm in diam. at the base, the outer involucre bracts 4–6 mm long, basally 1–2 mm wide, with a glutinous dorsal ridge, tapering to a 5–7 mm long spine, the innermost bracts 25–35 mm long, 1–2 mm wide, tapering, twisted and often purple near the tip; corolla purple to reddish, 26–30 mm long, the lobes 4–5 mm long, the anthers colorless, 4–5 mm long, the style purple 27–31 mm long, the branches 2–3 mm long. *Achenes* 4–5 mm long, 1–1.5 mm in diam.; pappus 23–25 mm long.

This species flowers mainly from January through May (one specimen collected in August). The description is based mostly on Costa Rican plants.

CHIRIQUÍ: 20 km W of Puerto Armuelles, *Busey* 541 (MO).



2. *Cirsium subcoriaceum* (Less.) Schultz-Bip. in Seem., Bot. Voy. Herald 312. 1856.

Carduus subcoriaceus Less., Linnaea 5: 130. 1830. TYPE: Mexico, "in monte Macultepec per. Jalapam," *Schiede & Deppe* 265 (281 assigned herbarium number, HAL).

Cirsium heterolepis Benth., Pl. Hartw. 87. 1841. TYPE: Guatemala, "in montibus Mixco," *Hartweg* 596 (K).

C. maximum Benth., Pl. Hartw. 289. 1848. TYPE: Mexico, "in montibus Santa Rosa," *Hartweg* 1837 (K).

Cnicus heterolepis (Benth.) A. Gray, Proc. Amer. Acad. Arts 10: 44. 1874.

C. subcoriaceus (Less.) Hemsley, Biol. Centr. Amer., Bot. 2: 252. 1881.

C. pinnatisectus Klatt, Bot. Beibl. Leopoldina 1895: 8. 1895. TYPE: Costa Rica, "Paramos de l'adejónal," 1900 m, *Tonduz* 7791 (GH).

Cirsium pinnatisectum (Klatt) Petrak, Beih. Bot. Centralbl. 27: 236. 1910.

Annual *herbs*, 10–40 cm tall; stems simple below, branching above, densely tomentose when young, the tomentum becoming floccose with age. Lower *leaves* to 40 cm long and 25 cm wide, the sinus depth to 90% of the leaf width; upper leaves to 25 cm long and 6 cm wide, less divided than the lower leaves; the leaf bases clasping, tomentose beneath, glabrous or with a thin tomentum above, the marginal spines 5–12 mm long, usually longest toward the base of the upper leaves. *Inflorescence* of terminal heads borne singly or in clusters. *Heads* with the involucre 8–19-seriate, 4.5–6 cm tall, 3–4 cm across the base, the outer involucre bracts 25–30 mm long, 4.5–5 mm wide at the base, tapering to a 4–5 mm long spine, spiny along the margin, without a glutinous dorsal ridge, arachnoid-pubescent along the margins, the innermost bracts 40–50 mm long, 1–3 mm wide, tapering and twisted near the tip, erose; corolla pale yellow, 43–53 mm long, the lobes 23–28 mm long, the anthers pink to yellow, 13–16 mm long, the style purple, 53–65 mm long, the branches 2–2.5 mm long. *Achenes* 5–7 mm long, 2 mm in diam.; pappus 28–33 mm long.

This species usually flowers from January through March (one specimen collected in June). The description here is based mainly on Costa Rican plants.

It is possible that the earliest correct name for this taxon is *Cirsium cernuum* Lag., Gen. Sp. Pl. Nov. 24. 1816. The original description, although short, suggests specimens examined. This thistle was described from cultivated material grown at the Jardín Botánico, Madrid, but type material has not been located.

CHIRIQUÍ: Upper valley of Río Chiriquí Viejo, *Allen* 1588 (MO). 2.7 mi NW of Río Chiriquí Viejo, W of Cerro Punta, *Croat* 22352 (MO). Volcán de Chiriquí, *Woodson & Schery* 467 (MO). Cerro Punta, *Blaisdell* 358 (FSU).

←

FIGURE 101. *Cirsium mexicanum* DC.—A. Habit ($\times \frac{2}{5}$).—B. Floret ($\times 1\frac{1}{2}$). [After *Busey* 541 (MO).]

XII. MUTISIEAE

BERYL BRINTNALL SIMPSON⁶⁴**Mutisieae** Cass., Jour. Phys. 88: 199. 1819. TYPE: *Mutisia* L.f.Nassauvieae Cass., Jour. Phys. 88: 198. 1819. TYPE: *Nassauvia* A. L. Juss.Onoserideae H.B.K., Nov. Gen. Sp. Pl. 4: 4. 1820 (ed. fol. 1818). TYPE: *Onoseris* DC.Chaetanthereae Dumort., Anal. Fam. Pl. 31. 1829, nom. illeg. consist., superfluous when published. TYPE: *Chaetanthera* Ruiz & Pavon.

Herbs, shrubs or vines. Leaves alternate or basal. *Inflorescence* paniculate, corymbose or a solitary head. *Heads* homomorphic (discoid) or heteromorphic (disciform or radiate), female, functionally male, or hermaphroditic; involucre bracts in few to several series, imbricate; receptacle flat or convex, naked, foveolate, fimbriate, paleaceous or glandular; corolla bilabiate with a 3-parted outer ligule and 2, 1, or no inner lobes, or tubular and equally 5-parted; anthers with an undemarcated, pointed terminal appendage, and usually basal auricles or pointed tails, these sometimes fringed at the tips; style branches relatively short, truncate, or rounded. *Achenes* various, columnar or fusiform, ribbed or smooth, glabrous or pubescent; pappus of setose, plumose, or flat bristles, sometimes fine.

The Mutisieae is a predominantly South American tribe with a few genera extending through Central America and the West Indian Islands to North America, and in Asia, Africa, Australia, and the Hawaiian Islands.

Literature:

Jeffrey, C. 1967. Notes on Compositae: II. The Mutisieae in east tropical Africa. Kew Bull. 21: 177-223.

- a. Heads heterogamous (with female ray florets, and hermaphroditic, or hermaphroditic combined with functionally male and/or female central florets) or completely unisexual (plants dioecious).
- b. Subshrubs or vines; plants monoecious or dioecious; heads borne on leafy branches, turbinate or scapose (Gochnatiinae).
- c. Plants dioecious; heads borne singly on branches, broadly campanulate in outline; involucre bracts ovate to lanceolate, stiff, with a few scattered hairs; achenes glabrous 104. *Lycoseris*
- cc. Plants monoecious; heads borne in panicles, narrowly turbinate in outline; involucre bracts linear-lanceolate, soft, lanate; achenes strigose 105. *Onoseris*
- bb. Rosette herbs; plants monoecious; heads borne singly on scapes (Mutisiinae).
- d. Leaves with scattered strigose hairs on both sides; achenes truncate; external female florets with staminodes and corollas with a long (± 10 mm) strap-shaped ligule 102. *Gerbera*
- dd. Leaves densely white lanate beneath, glabrate above; achenes with a long beak; external female florets lacking staminodes and corollas with a short (less than 5 mm) ligule 101. *Chaptalia*
- aa. Heads monogamous, all flowers alike, perfect (Nassauviinae).

⁶⁴ Department of Botany, Smithsonian Institution, Washington, D.C. 20560.

- e. Plants glabrate; heads narrow, turbinate; receptacle naked; pappus of several rows of setose bristles; corollas yellow 106. *Trixis*
 ee. Plants with a rust-colored tomentum, especially on the stems, leaf undersides, and bracts; heads hemispherical; receptacle with paleas enclosing the florets; pappus of a single series of setose bristles; corollas white 103. *Jungia*

101. CHAPTALIA

Chaptalia Vent., Descr. Pl. Jard. Cels. *pl.* 61. 1802. TYPE: *C. tomentosa* Vent.

Leria DC., Ann. Mus. Natl. Hist. Nat. 19: 68. 1812. TYPE: *L. nutans* (L.) DC., based on *Tussilago nutans* L. = *Chaptalia nutans* (L.) Polak.

Lieberkuhna Cass., Dict. Sci. Nat. 26: 286. 1823. TYPE: *L. bracteata* Cass., nom. illeg. = *Chaptalia piloselloides* (Vahl) Baker.

Loxodon Cass., Dict. Sci. Nat. 27: 253. 1823. TYPE: *L. brevipes* Cass., nom. illeg. = *Chaptalia exscapa* (Pers.) Baker.

Oxydon Less., Linnaea 5: 357. 1830. TYPE: *Oxydon bicolor* (H.B.K.) Less., nom. illeg. based on *Chaptalia runcinata* H.B.K.

Thyrsanthema Kuntze, Rev. Gen. Pl. 1: 369. 1891, based on *Chaptalia nutans* (L.) Polak.

Herbs with monocephalous, more or less scapose, lanate flowering stems. *Leaves* in a basal rosette, lanceolate to runcinate, entire, toothed or lobed, lanate to various degrees beneath and occasionally above. *Heads* inconspicuously radiate, turbinate or campanulate; involucre of several series of linear-lanceolate, acute bracts increasing in size inwards, lanate on the outer surfaces; receptacles flat, foveolate; florets trimorphic, occasionally only dimorphic; outermost 1 to several rows of florets female, ligulate, the ligule strap-shaped, more or less tridentate, with or without 1 or 2 minute teeth in the inner part; intermediate series of florets (sometimes wanting) also female, the corolla tubular, shorter than the style; central florets perfect with bilabiate corollas, the outer lip 3-parted, the inner lip 2-parted, the anthers with entire tails, the style short, rounded, hairy. *Achenes* columnar to fusiform, beaked or beakless, 5-several-nerved, glabrous or villous; pappus of copious, tawny, white or pinkish, setose bristles. *Pollen* spherical or prolate, tricolporate, reticulate.

The genus *Chaptalia* contains about 35 species in 5 sections (Burkart, 1944). The generic limits between *Chaptalia*, *Gerbera*, and *Triocline* are somewhat vague and problems of circumscription have been discussed by Jeffrey (1967). Within *Chaptalia* itself, many specimens seem to intergrade between species. The fact that fertile artificial hybrids have been readily made between several of the species indicates that there is relatively little genetic divergence between various recognized taxa.

Literature:

Burkart, A. 1944. Estudio del género de compuestas *Chaptalia*. Darwiniana 6: 505-594.

- a. Scape bractless; leaves lyrate; heads nodding when young and at fruit maturity 1. *C. nutans*
 aa. Scapes with scalelike bracts near the heads; leaves lanceolate; heads always upright 2. *C. runcinata*

1. *Chaptalia nutans* (L.) Polak., Linnaea 41: 582. 1878.—FIG. 102.

Tussilago nutans L., Syst. Nat. 10(2): 1214. 1759. TYPE: America, collector unknown, Herb. Linn. 995.5 (LINN, not seen; US, microfiche).

T. lyrata Pers., Syn. Pl. 2: 456. 1807. TYPE: Hab. in Amer. Meridionali (not located).

Leria nutans (L.) DC., Ann. Mus. Natl. Hist. Nat. 19: 68. 1812.

L. lyrata Cass., Dict. Sci. Nat. 26: 102. 1823. TYPE: not located.

Tussilago vaccina Vell., Fl. Flum. Icon. 8: 143. 1831. LECTOTYPE: Fl. Flum. Icon.: icon. 143.

Gerbera nutans (L.) Schultz-Bip. in Seem., Bot. Voy. Herald 313. 1856.

Thyrsanthema nutans (L.) Kuntze, Rev. Gen. Pl. 1: 369. 1891.

Chaptalia carduacea E. L. Greene, Leaf. Bot. Observ. Crit. 1: 191. 1906. TYPE: U.S.A., Texas, San Diego, 1884–1888, *Croft* 35 (US, holotype).

C. leonina E. L. Greene, Leaf. Bot. Observ. Crit. 1: 193. 1906. TYPE: Mexico, States of Coahuila and Nuevo Leon, Feb.–Oct. 1880, *Palmer* 764 (US, holotype).

C. diversifolia E. L. Greene, Leaf. Bot. Observ. Crit. 1: 194. 1906. TYPE: Guatemala, vicinity of Mazatenango, 350 m, 20 Feb. 1905, *Maxon & Hay* 3504 (US, holotype).

C. subcordata E. L. Greene, Leaf. Bot. Observ. Crit. 1: 195. 1906. TYPE: St. Croix, Big Fountain Garden, 24 June 1896, *Ricksecker* 447 (US, holotype).

C. erosa E. L. Greene, Leaf. Bot. Observ. Crit. 1: 196. 1906. TYPE: Costa Rica, San José, road edges, 1135 m, June 1892, *Tonduz* 447 (US, holotype).

C. majuscula E. L. Greene, Leaf. Bot. Observ. Crit. 1: 196. 1906. TYPE: Bolivia., Maipiri, 5000 ft, May 1886, *Rusby* 1677 (US, holotype).

C. texana E. L. Greene, Leaf. Bot. Observ. Crit. 1: 191. 1906. TYPE: U.S.A., Texas, sparsely wooded ground in western Texas, *Neally* 297 (US, holotype).

C. nutans var. *texana* (E. L. Greene) Burkart, Darwiniana 6: 569. 1944.

Perennial scapose *herbs* 46–87 cm tall. *Leaves* in a basal rosette, lyrate, the terminal segment comprising half or more of the leaf, lobed, acute, tapering at the base, 3–10 cm wide, 9–34 cm long, glabrous or with patches of wooly trichomes above, densely lanate beneath, stem leaves lacking. *Heads* inconspicuously radiate, borne singly, often several per plant, turbinate, nodding when young and at fruit maturity, to 4 cm long and 6 cm wide; involucre bracts linear, lanceolate, imbricate in several unequal series, the margins entire, the tips red, acute, densely lanate on the outer surface; receptacle flat, foveolate; florets trimorphic, white; outer series of florets female with ligulate corollas, the ligule narrow, strap-shaped, ca. 12 mm long, extending only slightly beyond the involucre bracts; second series of florets female, the corolla tube of varying length, shorter than the style; innermost disc florets perfect, the corollas bilabiate. *Achenes* fusiform, reddish brown or green, with 5–8 white nerves, beaked, the beak forming over half the length, 0.5–1.5 mm long, glabrous or slightly pilose; pappus 12–15 mm long, of tawny or more often pink, capillary bristles. Chromosome number $2n = 48$ (Federov, 1969).

Chaptalia nutans is an extremely widespread and variable species ranging from the United States to Argentina, and in the West Indies. Plants from various populations, or even within one population, can flower with scapes ranging from 6 cm to 1 m tall. The species may be recognized by the orientation of the heads; when immature or as the achenes are shed they are nodding but at anthesis they are upright. It is distinguished from *C. runcinata* by its bractless scape and lyrate, lobed leaves. Leaves of this species wetted with oil were applied medicinally in northern Argentina according to Burkart (1944).

BOCAS DEL TORO: At Bocas, *Lazer et al.* 2449 (FSU). Changuinola to 5 mi S at the Junction of Ríos Changuinola and Terebé, 100–200 ft, *Lewis et al.* 917 (MO). CANAL ZONE:

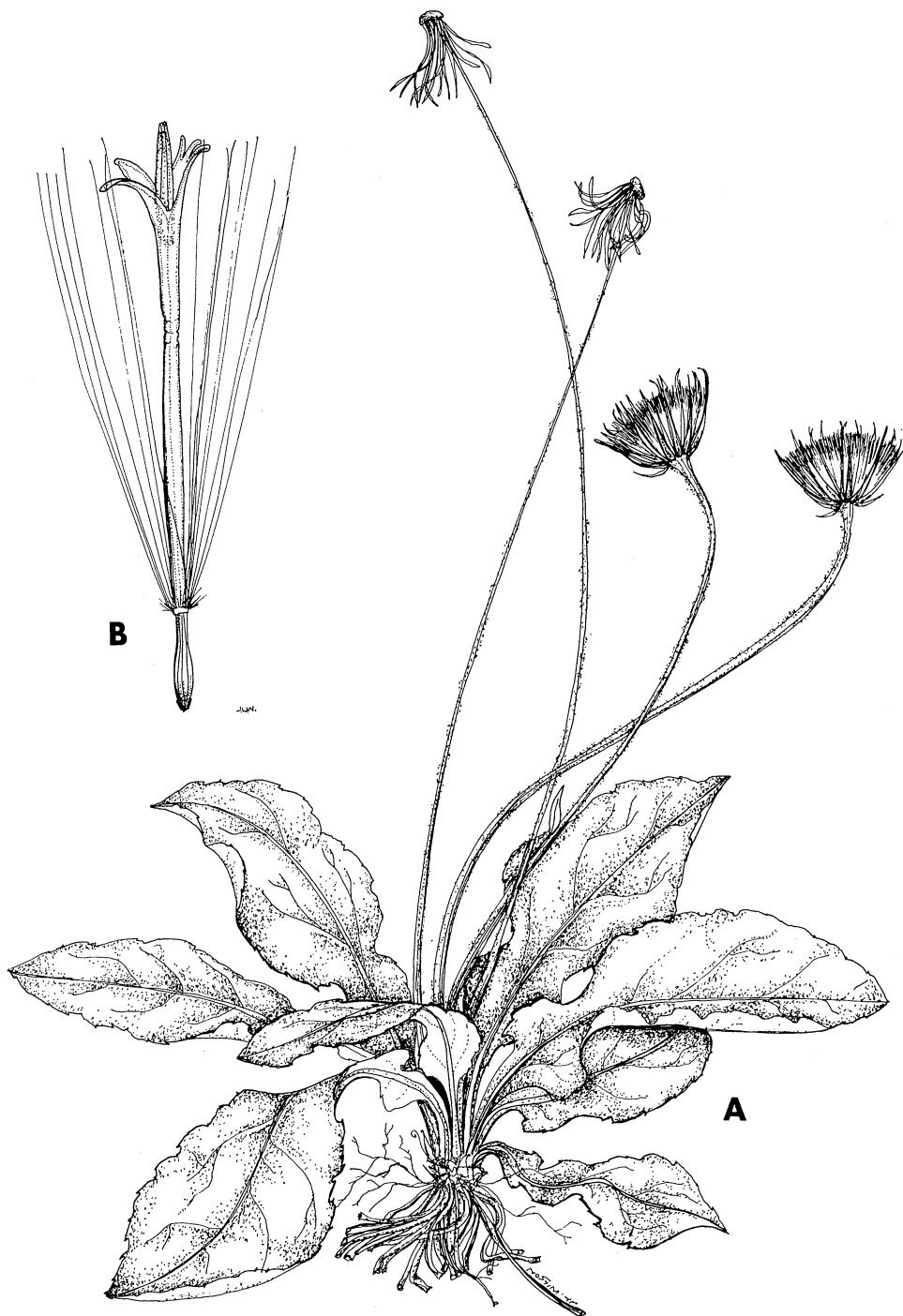


FIGURE 102. *Chaptalia nutans* (L.) Polak.—A. Habit ($\times \frac{1}{2}$).—B. Central floret ($\times 6$).
[After Lewis et al. 1639 (MO).]

Summit Garden, *D'Arcy & D'Arcy 6187* (MO). Between Madden Dam and Saddle II near Alahuéla, 90–100 m, *Dodge et al. 16501, 16512* (both MO). Ancón Hill, *Greenman & Greenman 5116* (MO). Fort Clayton, *Tyson 1840* (MO). Cerro Azul, 2000 ft, *Tyson 2068* (MO). Cerro Jefe, *Tyson et al. 4310* (MO). Miraflores Lake, *White & White 191* (MO). BARRO COLORADO ISLAND: *Ebinger 134* (MO); *Shattuck 157, 199* (both MO); *Netting 22* (MO); *Croat 4087a, 6537, 6903, 13498* (all MO). CHIRIQUÍ: 25 km W of Puerto Armuelles, 400–600 m, *Busey 533* (MO). Boquete, 3800 ft, *Davidson 640* (MO). Boquete, 5500 ft, *Dwyer 7013* (MO). Llanos del Volcán, 1120–1200 m, *Seibert 337* (MO). Near Boquete, 1200–1500 m, *Woodson & Schery 774* (MO). COCLÉ: Vic. of El Valle, 600–1000 m, *Allen 1162* (MO). COLÓN: Vic. of Sardinilla, *Blum & Tyson 488* (FSU, MO). DARIÉN: Vic. of Boca de Cupe, 40 m, *Allen 595* (MO). HERRERA: 12.5 mi S of Ocu, 1200 ft, *Lewis et al. 1639* (MO). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11875* (MO). 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2884* (MO). PANAMÁ: Ville Guadalupe-Calle, *de Hoyos 25* (MO). Pan-Am Hwy. near Jenené, Río Cañita, *Duke 3822* (MO). Toward top of Cerro Campana, *Duke 5972* (MO). Goofy Lake to 8 mi S of Goofy Lake, *Dwyer 7056* (MO). Near Arraiján, *Woodson et al. 1347* (MO). SAN BLAS: Without locality, *Duke 10129* (MO).

2. ***Chaptalia runcinata*** H.B.K., Nov. Gen. Sp. Pl. 4: 4 *tab.* 303. 1820 (ed. fol. 1818). TYPE: Colombia, Smita River, Oct. *Humboldt & Bonpland* (not seen).

Loxodon longipes Cass., Dict. Sci. Nat. 27: 255. 1823, nom. illeg., superfluous when published. *Oxydon bicolor* Less., Linnaea 5: 357. 1830, nom. illeg., superfluous when published.

Acaulescent perennial herb to 9 cm tall. *Leaves* all basal, oblanceolate, acute, retrorsely dentate with mucronate teeth, tapering to the base, 30–52 mm long, 11–13 mm wide, glabrous above, densely white lanate beneath. *Inflorescence* a monocephalous scape, 50–100 mm tall, lightly lanate, with narrow, scalelike bracts near the apex. *Heads* discoid, turbinate, 10 mm wide, 12 mm long, several per plant; involucre bracts in several series increasing in size inwards, linear-lanceolate, acute, entire, soft, glabrous or with a few scattered trichomes; receptacle slightly convex, foveolate; florets not exceeding the rim of the involucre, trimorphic; outer series of florets female, the corolla ligulate with a strap-shaped, 4-dentate ligule and no inner tooth, without anthers; second series of florets female, the corolla tubular, irregularly lobed, extending half way up the style, the style branches glabrous, spreading; innermost disc florets perfect, the corolla more or less 5-dentate but with 2 of the teeth set apart from the others by deeper sinuses, the style short, pubescent. *Achenes* beaked, ribbed, grey-green, glabrous; pappus yellow, of setose bristles.

Records of *Chaptalia runcinata* are rare for Panama, but the species has an extensive distribution elsewhere ranging from Costa Rica east into northern South America, south across Bolivia and Paraguay, and into central Argentina. This species is distinguished from *C. nutans* by the numerous bracts along the flowering stem and the nonpetiolate, retrorsely dentate leaves. Burkart (1944) reported that in Argentina *C. runcinata* produces during the year first a succession of cleistogamous and chasmogamous heads, and then a second set of cleistogamous heads. Burkart interpreted the behavior in Argentina as an adaptation to environmental conditions in the Pampas. It is not known if Panamanian plants also produce cleistogamous heads. The only specimen seen has chasmogamous heads.

CHIRIQUÍ: Llanos Francia, 3300 ft, *Stern et al. 1189* (MO).

102. GERBERA

Gerbera⁶⁵ L., Opera Varia (Soulsby no. 9) 247. 1758, nom. cons. TYPE: *G. linnaei* Cass., Dict. Sci. Nat. 18: 460. 1820. "*Gerberia*." (= *Arnica gerbera* L.), typ. cons.

Rosette *herbs* with bracteate or ebracteate flowering stems. Basal *leaves* lanceolate, ovate or lyrate parted, usually pubescent on both surfaces, petiolate. *Heads* radiate (Panama), solitary; involucre turbinate or campanulate, of several series of imbricate bracts, the outer series usually dorsally pubescent; florets of the usually single outer series female, the corolla bilabiate with a long, 3-dentate ligule and 2 filiform inner segments, staminodes present (or functional stamens, if the heads are homogamous); inner disc florets perfect, the corollas bilabiate, shorter than those of the outer series, the anthers with long, lacerate basal appendages, the style branches linear, slightly flattened, obtuse. *Achenes* with a short beak or truncate, slightly flattened, ribbed, glabrous or with strigose or villous pubescence; pappus of abundant, setose or capillary bristles.

1. **Gerbera jamesonii** Bolus, Gard. Chron., ser. 3, 5: 772, fig. 122. June 1889. TYPE: a cultivated plant in the alpine house of Kew Gardens, seeds originally sent from Natal (not seen).

Robust, perennial, rosette *herb* ca. 40 cm tall arising from a sericeous caudex. Basal *leaves* lyrate parted, the segments irregularly dentate, to 17 cm long and 4 cm wide, petiolate, the upper and lower surfaces with scattered strigose trichomes, petiole ca. $\frac{1}{2}$ the length of the leaf. *Inflorescence* a monocephalous scape, stout, ebracteate with scattered strigose hairs and narrowing slightly under the head. *Heads* radiate, ca. 3 cm wide and 5 cm long; involucre of 2–3 series of lanceolate, entire, acute bracts, the outer series setose on the back, the inner series slightly scarious along the margins and glabrate; receptacle convex, naked; outer florets female, the corollas ca. 25 mm long with a 3-dentate, strap-shaped ligule ca. 10 mm long and 2 filiform, shorter, inner segments, the ligules yellow on the underside, orange above; disc florets perfect, the corollas bilabiate, ca. 10 mm long, the outer lip entire or irregularly dentate, recurved, the inner lip of two slightly shorter, filiform segments, orange-yellow, glabrous. *Achenes* fusiform, truncate when immature but with a very short beak when mature, ribbed, light brown, covered with strigose trichomes: pappus of copious, blond, setose bristles.

Gerbera jamesonii is a native of Africa and is widely cultivated. In Panama it is cultivated and apparently has not escaped into the wild. It rarely fruits in cultivation.

CHIRIQUÍ: Cultivated in a nursery in Boquete, 3600 ft, D'Arcy & D'Arcy 6511 (MO).

⁶⁵ Not only is the nomenclature of *Gerbera* confused, but the generic limits of the genus are still unclear. Jeffrey (1967: 211–214) discussed the alternative circumscriptions of the genus and what he considers to be natural groupings of species within the complex. It should be noted that because of the subsequent conservation of the name *Gerbera* the author of the genus and the type given by Jeffrey (different from above) are now incorrect. Since *Gerbera* is introduced and only cultivated in Panama, complete synonymy, given by Jeffrey, is not repeated.

103. JUNGIA

Jungia L.f., Suppl. Pl. 58. 1781. TYPE: *J. ferruginea* L.f.

Trinacte Gaertn., Fruct. 2: 415. 1791, nom. illeg., superfluous when published. TYPE: *T. ferruginea* (L.f.) Gaertn.

Rhinactina Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 1: 139. 1807. TYPE: *R. cinerarioides* Willd. ex Less., nom. nud. Cited by Lessing as a herbarium name in synonymy under *Jungia ferruginea*.

Dumerilia DC., Ann. Mus. Natl. Hist. Nat. 19: 71. tab. 15, 16. 1812. TYPE: *D. axillaris* DC.

Pleocarpus D. Don, Trans. Linn. Soc. London 16: 228. 1830. TYPE: *P. revolutus* D. Don.

Climbing, caulescent *herbs* and *shrubs* 60 cm to 30 m long; stems densely pubescent to glabrescent. *Leaves* alternate, petiolate, palmately to pinnately veined, mostly semicoriaceous, decreasing in size toward the clusters of heads. *Inflorescences* axillary or terminal panicles or corymbs. *Heads* discoid; involucre campanulate or cylindrical, the bracts in 2 series, the innermost often encircling the outer florets; receptacle paleaceous and/or fimbriate; florets zygomorphic, the corolla bilabiate, with the outer lip 3-dentate and with 2 shorter inner teeth, the anthers with elongate, auriculate basal appendages and an elongated terminal portion, the style branches truncate. *Achenes* cylindrical or tetragonal, truncate or slightly beaked, glabrous or pubescent; pappus of 1 or 2 series of setose to almost plumose bristles. *Pollen* tricolporate with conspicuous ridges along the colpi, exine reticulate.

Jungia is a distinctive genus, even in the closely knit Nassauviinae. Its homogamous heads of bilabiate corollas and truncate style branches place it in this subtribe, but it is the only viny member of this subtribe. The genus appears most closely related to *Trixis* from which it differs in having species with white florets (except the one species *Jungia revoluta* (D. Don) Reiche formerly placed in *Pleocarpus*), in having a uniseriate pappus, and in having an unusual covering of dense strigose trichomes. The 30 species in the genus range from Mexico through Central America and along the Andes to Argentina and Chile. The primary development of the genus has been in Peru.

Literature:

Cerrate Valenzuela, E. 1951. Revisión de las especies peruanas del género *Jungia*. Publ. Mus. Hist. Nat. "Javier Prado", Ser. B., Bot. 4: 1-24.

1. ***Jungia ferruginea*** L.f., Suppl. Pl. 390. 1781. TYPE: America (not seen).—FIG. 103.

Dumerilia paniculata DC., Ann. Mus. Natl. Hist. Nat. 19: 72, tab. 16. 1812. TYPE: Peru, de Jussieu (P, not seen; US, photo from Paris Herbarium #38156).

Vine reaching 30 m in length while climbing among trees; stems with dense brown strigose trichomes. *Leaves* alternate, 3.7-11.4 cm wide, 6.0-13.0 cm long, palmately lobed, usually with 5-7 lobes, both sides with dense, dark strigose trichomes; petiole to 5 cm long. *Inflorescence* of numerous heads in axillary panicles. *Heads* discoid, campanulate, to 5 mm tall; involucre of 2 series of ovate

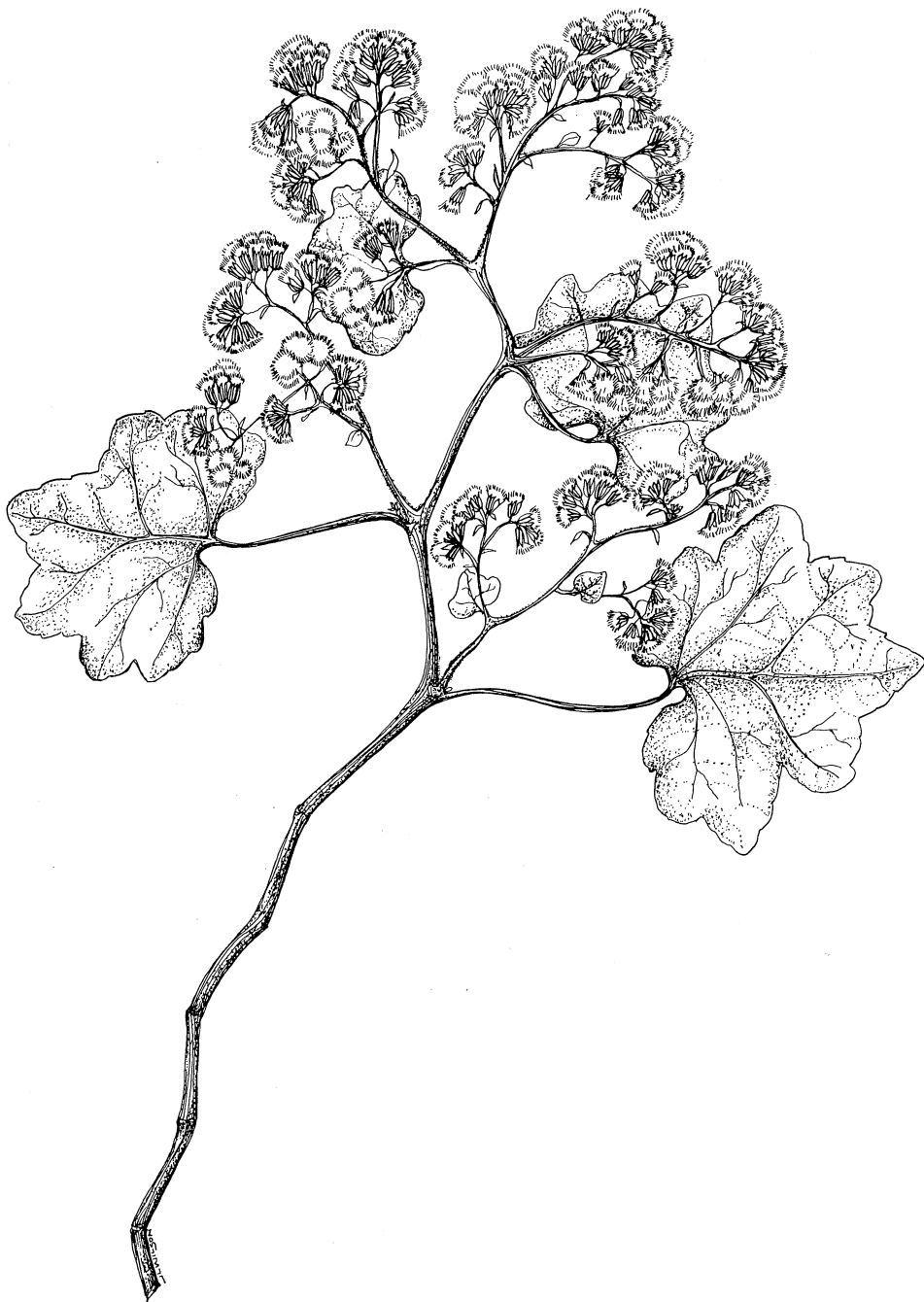


FIGURE 103. *Jungia ferruginea* L.f. Habit ($\times \frac{1}{2}$). [After Skutch 3622, Costa Rica (MO).]

to lanceolate, acute, entire bracts with strigose trichomes on the outer face, the outer series reduced, the inner series alike, few, surrounding the outermost florets; receptacle with a tuft of hairs in the center; florets few, 6–8 per head, white, all perfect, the corollas bilabiate, the outer lip 3-dentate and the inner lip of 2 small recurved equal segments, glabrous or slightly pubescent. *Achenes* fusiform, beakless, glabrous and slightly striate; pappus white, a single series of soft, setose, almost plumose bristles.

CHIRIQUÍ: Cerro Punta, 2000 m, *Allen 1520* (GH, MO). Chiquero, 6500 ft, *Davidson 559* (GH, MO). PANAMÁ: Cerro Punta, ca. 7000 ft, *Blaisell 379* (FSU).

104. LYCOSERIS

Lycoseris Cass., Dict. Sci. Nat. 33: 474. 1824. TYPE: *L. mexicana* (L.f.) Cass.

Diazeuxis D. Don, Trans. Linn. Soc. Lond. 16: 251. 1830. TYPE: *D. trinervis* D. Don.

Dioecious *shrubs* (or vines). *Leaves* alternate, short-pedunculate (or sessile), lanceolate, tomentose beneath. *Inflorescences* terminal, solitary, sometimes clustered heads. *Heads* disciform or radiate, the male heads larger than the female; involucre campanulate to globose, the bracts stiff, lanceolate to ovate, entire, acute, in many series; receptacles flat, naked or fimbriate; male heads with ligulate, 2–3-toothed marginal florets and tubular 5-parted or bilabiate disc florets, the corolla orange, the anthers with long, entire basal appendages, the style branches connate, the ovaries all rudimentary, sterile, the pappus a single series of white bristles; female heads with a row of ray florets, the corolla with a 3-parted ligule and 1 small (or no) inner tooth, the ovary functional, the disc florets numerous, the corolla orange, tubular, narrow, 5-dentate, the style branches thin, long, spreading, the androecium sometimes present and functional, the ovary functional. *Achenes* columnar, glabrate; pappus of numerous fine setose bristles.

The genus contains about 15 species that extend from Bolivia northward, primarily in the Andes, to Central America as far as Guatemala.

Literature:

Johnston, I. M. 1949. Compositae. In *The Botany of San Jose Island*. Sargentia 8: 288–296.

1. *Lycoseris latifolia* (D. Don) Benth., Bot. Voy. Sulphur 121. 1845.—FIG. 104.

Diazeuxis latifolia D. Don, Trans. Linn. Soc. Lond. 16: 302. 1830. TYPE: Venezuela, near Caracas, *Fanning* (not seen).

Carduus cernuus Bertol., Fl. Guatemala. 431. 1840. TYPE: Guatemala, Volcán d'Acqua, *Velasquez* (not seen). (A female plant in fruit.)

Aster crocatus Bertol., Fl. Guatemala 434. 1840. TYPE: Guatemala, Volcán d'Acqua, *Velasquez* (not seen). (A male plant.)

Lycoseris squarrosa Benth., Bot. Voy. Sulphur 121. 1845. TYPE: Panama, Gulf of Fonseca, *Nicoya, Hooker* (not seen).

L. crocata (Bertol.) Blake, Bull. Torrey Bot. Club 53: 218. 1926.

L. oblongifolia Rusby, Descr. S. Amer. Pl. 162: 120. 1920. TYPE: Colombia, *Smith 661* (US).



FIGURE 104. *Lycoseris latifolia* (D. Don) Benth.—A. Female plant, habit ($\times \frac{1}{3}$).—B. Disc floret, female ($\times 2$).—C. Achene ($\times 2\frac{3}{10}$). [After Cisneros 26 (MO).]—D. Male plant, habit, ($\times \frac{1}{3}$).—E. Anther ($\times 2\frac{1}{2}$).—F. Outer floret ($\times 2\frac{1}{2}$).—G. Inner, male floret ($\times 2\frac{1}{2}$). [After Croat 8979 (MO).]

Woody, branched, dioecious, scrambling *shrub* to 5 m tall; stems terete, tomentose when young, glabrescent. *Leaves* alternate, lanceolate, entire or inconspicuously serrate, acuminate, trinerved, shortly pedunculate, 18–43 mm wide, 110–180 mm long. *Inflorescences* of solitary, terminal, many-flowered heads. *Heads* of 2 kinds; involucre of many imbricate series of ovate to lanceolate, entire, acuminate bracts often with the tips recurved; receptacles flat, naked; male heads ca. 35 mm wide and 25 mm long, the outer florets orange, to 15 mm long, the corolla ligulate, 2–3-dentate, the anthers lacking, the style and ovary nonfunctional, the disc florets with the corolla tubular, 5-parted, regular, ca. 15 mm long, the anthers functional, the ovary sterile; female heads orange, to 80 mm wide and 60 mm long, the corolla of the outer florets often bilabiate, the outer lip 3-parted and the inner lip lacking or filiform, the style ca. 23 mm long, the ovary sterile, the disc florets narrowly tubular, 5-dentate, ca. 23 mm long, the anthers lacking, the ovary fertile. *Achenes* columnar, slightly constricted apically,

glabrous, to 12 mm long, deep red-brown; pappus white, of numerous soft capillary bristles to 2.5 cm long.

Lycoseris latifolia is a widespread species ranging from Guatemala through Venezuela and Colombia. The striking difference in size between the female and male heads led Bertolini to describe the female plant as a thistle (*Carduus*) and the male plant as an *Aster*. In fruit, the female heads do resemble thistles. According to Johnston (1949: 292) the male heads are deeper orange than the female, as well as being smaller.

CANAL ZONE: Fort San Lorenzo, *Burch et al.* 1040 (GH, MO). Near water reservoir W of Cocolí, *Croat* 9164 (MO). Allbrook site, *Dwyer & Robyns* 33 (MO). Madden Dam Area, *Ebinger* 849 (GH, MO). Balboa Heights, *Greenman & Greenman* 849 (MO). Madden Dam area, *Hunter & Allen* 434 (MO). Curundú, *Kozlovsky & Sawyer s.n.* (MO). Madden Dam area, *Porter et al.* 4005, 4053 (both MO). Balboa, Sosa Hill, *Standley* 26413 (MO). Madden Dam area, *Stern et al.* 48 (MO). Fort San Lorenzo, *Tyson & Blum* 3669 (FSU, MO). CHIRIQUÍ: Guanabano, *Croat* 22625 (MO). DARIÉN: Isla Saboga, *Duke* 10362 (MO). PANAMÁ: Isla del Rey, *Duke* 9537 (MO). Isla Chepillo, *Duke* 10333 (MO). San José Island, *Johnston* 1286, 1333, 1333A (all GH, MO). Sabanas near Chepo, *Hunter & Allen* 26 (MO). Chagres Valley around Alhajuela forests, *Pittier* 2355 (GH). W of Chepo on road to Panama City, *Tyson* 5375 (MO).

105. ONOSERIS

Onoseris Willd., Sp. Pl. 3: 1702. 1804. TYPE: *O. purpurea* (L.f.) Blake.

Seris Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesamnten Naturk. 1: 139. 1807. TYPE: *S. onoseroides* (H.B.K.) Willd. ex Spreng.

Hipposeris Cass., Dict. Sci. Nat. 33: 464. 1824. TYPE: No valid combination made. Jackson, Index Kew. 2: 1164 (1894) makes a combination, *H. salicifolia*, but as a synonym of *Onoseris salicifolia* H.B.K.

Centroclinium D. Don, Trans. Linn. Soc. 16: 254. 1830. TYPE: *C. albicans* D. Don.

Caloseris Benth., Pl. Hartw. 88. 1841. TYPE: *C. rupestris* Benth.

Cladoseris Spach, Hist. Nat. Veg. 10: 35. 1841. TYPE: *C. annua* (Less.) Spach.

Cursonia Nutt., Trans. Amer. Philos. Soc., n.s. 7: 422. 1841. TYPE: *C. peruviana* Nutt.

Schaetzellia Klotzsch, Allg. Gartenzeitung 17: 82. 1849. TYPE: *S. deckeri* Klotzsch.

Rhodoseris Turcz., Bull. Soc. Imp. Naturalistes Moscou 24: 38, tab. 2. 1851. TYPE: *R. conspicua* Turcz.

Cataleuca Koch & Fintelm., Wochenschr. Gärtnerei Pflanzenk. 2: 163. 1859, nom. nud. TYPE: *C. rubicunda* Koch & Fintelm, substitute name for *Isotypus onoseroides* H.B.K.

Perezipsis Coult., Bot. Gaz. (Crawfordsville) 20: 52, pl. 6. 1895. TYPE: *P. Donnell-Smithii* Coult.

Shrubs (annual herbs) with ribbed, (smooth) white or gray lanate stems. **Leaves** alternate, variable in size, usually deeply parted, slightly lanate above, densely lanate beneath, petiolate or sessile; petiole, if present, alate, lobulose, or both in most species. **Inflorescences** loosely paniculate or of solitary heads. **Heads** either discoid (in Panama) or disciform, turbinate; involucre bracts in several series, ovate to lanceolate, lanate or variously pubescent on the outer surface; receptacle flat, fimbriate, pilose or naked; in disciform heads the outer series of florets with a strap-shaped ligule and 2 minute inner teeth, the inner series either actinomorphic, tubular, 5-dentate, or slightly zygomorphic with 1 segment larger than the other 4; in discoid heads, the florets all fertile, zygomorphic, with 1 of the 5 corolla lobes expanded, the anthers with sagittate basal appendages, acute or with spreading hairs at the tip, the style claviform or cylindrical. **Achenes**

more or less terete, ribbed, the ribs glabrous or variously pubescent; pappus of abundant yellowish setose bristles.

The genus *Onoseris* with about 24 species extends from Mexico to Argentina with a concentration of shrubby species in Central America and the extreme western Andes. The annual species are all restricted to high Andean habitats. Four species occur in Central America and 9 species are endemic to Peru. The genus, usually placed in the Gochnatinae, has species with some characters of this subtribe, e.g., actinomorphic corollas, but other species have zygomorphic corollas, characteristic of the Nassauviinae.

Literature:

Ferreyra, R. 1944. Revisión del género *Onoseris*. Jour. Arnold Arbor. 25: 349–395, 9 pls.

1. *Onoseris onoseroides* (H.B.K.) B. L. Robinson, Proc. Amer. Acad. Arts 49: 514. 1913.—FIG. 105.

Isotypus onoseroides H.B.K., Nov. Gen. Sp. Pl. 4: 12. tab. 307. 1820 (ed. 1818). TYPE: Venezuela, in hot areas near Tui River, *Humboldt & Bonpland* (not seen).

Seris onoseroides (H.B.K.) Willd. ex Spreng., Syst. Veg. 3: 426. 1820.

Onoseris paniculata DC., Prodr. 7: 33. 1838, nom. nud., cited under *Isotypus onoseroides*.

Hilairia paniculata DC., Prodr. 7: 33. 1838, nom. nud., cited under *Isotypus onoseroides*.

Caloseris rupestris Benth., Pl. Hartw. 88. 1841. TYPE: Guatemala, mountain of Chorro, Hartweg (not seen).

Schaetzellia deckeri Klotzsch, Allg. Gartenzeitung 17: 82. 1849. TYPE: Grown in the Decker family's private botanic garden in Berlin from seeds sent from Colombia (not seen).

Rhodoseris conspicua Turcz., Bull. Soc. Imp. Naturalistes Moscou 24: 39, tab. 2. 1851. TYPE: Mexico, Jürgensen (not seen).

Cataleuca rubicunda Koch & Fintelm., Wochenschrift Gärtnerei Pflanzenk. 2: 163. 1859, nom. nud., substitute name for *Isotypus onoseroides* H.B.K.

Onoseris isotypus Benth. & Hook., Gen. Pl. 2: 487. 1873, substitute name for *Isotypus onoseroides* H.B.K.

Seris conspicua (Turcz.) Kuntze, Rev. Gen. Pl. 1: 364. 1891.

S. rupestris (Benth.) Kuntze, Rev. Gen. Pl. 1: 364. 1891.

Onoseris rupestris (Benth.) Greenman, Proc. Amer. Acad. Arts 41: 268. 1905.

O. conspicua (Turcz.) Greenman, Proc. Amer. Acad. Arts 41: 268. 1905.

Shrubs to 4 m tall with gray, wooly stems. *Leaves* few, clustered primarily near the base of the plant, (12.5–)20(–30) cm wide, (12–)38(–38) cm long, deeply parted, almost pinnately compound, the terminal segment cordate or sagittate, the remaining segments forming paired, ovate to lanceolate, dentate lobes along the petiole, above with wispy, scattered, long, white hairs, densely gray lanate beneath. *Inflorescences* paniculate, 140–450 mm tall; pedicles bracteate, lanate. *Heads* discoid, turbinate, 9–23 mm tall; involucre bracts in 7–8 series, lanceolate, acuminate, increasing in size inwards; receptacle flat, fimbriate, florets 4–11 per head, the corolla red, zygomorphic, 5-parted with 1 tooth larger than the other 4, glabrous, 15–25 mm long. *Achenes* columnar, truncate, ca. 6 mm long, with 4–5 narrow ribs covered with long, ascending and short, yellow trichomes; pappus of numerous, yellow, setose bristles to 17 mm in length.

Onoseris onoseroides is a striking species with red flowering heads. Its wide distribution from Guatemala to Venezuela and Colombia has led to its being



FIGURE 105. *Onoseris onoserioides* (H.B.K.) B. L. Robinson.—A. Inflorescence ($\times \frac{1}{3}$).—B. Leaf ($\times \frac{1}{3}$).—C. Corolla ($\times 2\frac{1}{2}$).—D. Achene ($\times 2\frac{1}{2}$). [After Croat 22223 (MO).]

described as a different species from several parts of its range. However, the characters such as more or less pubescence on the leaves appear to be simply geographical or even individual variation when plants from the entire range are examined.

CHIRIQUÍ: Caldera on Río Chiriquí Viejo, *Maurice* 850 (US). Roadside from Paso Canoas to Cañas Gordas 18 mi from Paso Canoas, Quebrada de Vuelta, *Croat* 22223 (MO).

106. *TRIXIS*⁶⁶

Trixis P. Browne, Civ. Nat. Hist. Jam. 312, *pl.* 33, *fig.* 1. 1756. TYPE: *T. inula* Crantz.

Dolichlasium Lag., Amen. Nat. 1: 33. 1811. TYPE: *D. lagascae* D. Don.

Prionanthes Schrank, Pl. Rar. Hort. Acad. Monac. 2: 51. 1820. TYPE: *P. antimenorrhoea* Schrank.

Tenorea Colla, Hort. Ripul. 137. 1824. TYPE: *T. berteri* Colla, nom. illeg. = *Trixis inula* Crantz.

Platycheilus Cass., Dict. Sci. Nat. 34: 212. 1825. TYPE: *P. ochroleucus* (Cass.) Cass.

Castra Vell., Fl. Flum. 342. 1825. TYPE: *C. regia* Vell. = *Trixis antimenorrhoea* (Schrank) Mart.

Bowmannia Gardn., Icon. Pl. *tab.* 519. 1843. TYPE: *B. verbascifolia* Gardn.

Shrubs arising from horizontal, woody fissured rhizomes; stems bearing prominent persistent leaf bases, glabrous or nearly so, but young branches and inflorescences usually pubescent. *Leaves* alternate, lanceolate, several times as long as wide, the margins irregularly denticulate (rarely serrate), pubescent or rarely glabrous, usually slightly recurved or revolute, venation reticulate, the midrib and nerves usually prominent beneath, petiolate, subsessile or sessile. *Inflorescence* terminal, usually compound (corymbose or paniculate heads rarely solitary at branch tips). *Heads* appearing disciform or radiate, cylindrical; involucre uniseriate subtended by 3–7 spreading accessory bracts, the involucral bracts 7–10, linear to oblong, usually equal, convex or keeled, the margins pubescent and tightly connivent; receptacle flat, alveolate, fimbriate; florets all perfect, usually 11–15 or 17–25, the inner florets similar to the outer ones but usually smaller, the corollas yellow becoming whitish, bilabiate, the outer lip elliptical or oblong, usually spreading in the outer flowers, always revolute in the inner flowers, apically 3-toothed, the inner lip 2-parted, the anthers with oblong tips, basally auriculate, the style branches flattened, truncate and with a crown of sweeping hairs at the apex. *Achenes* fusiform with a short beak or an apical constriction, 5-ribbed, covered with colorless double hairs that release mucilage when wetted (except in *T. inula*) and with small glands; pappus of numerous, tawny or white, setose bristles in 3 or 4 series.

Literature:

Anderson, C. 1972. A monograph of the Mexican and Central American species of *Trixis* (Compositae). Mem. New York Bot. Gard. 22: 1–68.

Cabrera, A. L. 1936. Las especies, argentinas y uruguayas del género *Trixis*. Revista Mus. La Plata, Secc. Bot. 1: 31–86.

1. ***Trixis inula*** Crantz, Inst. Rei. Herb. 1: 329. 1766. TYPE: Jamaica, Browne, Herb. Linn. 1003.3, "*Perdicium radiale*" (LINN, not seen, US, microfiche).—FIG. 106.

Inula trixis L., Amoen. Acad. 5: 406. 1759. TYPE: Jamaica, Browne, Herb. Linn. 1003.3, "*Perdicium radiale*" (LINN, not seen, US, microfiche).

⁶⁶ Parts of this treatment were adapted from the treatment for *Trixis* prepared by Dr. Christiane Anderson for North American Flora (in press).

- Perdicium radiale* L., Sp. Pl., ed. 2. 1248. 1763. TYPE: Jamaica, *Browne*, Herb. Linn. 1003.3, "*Perdicium radiale*" (LINN, not seen, US, microfiche).
- Solidago fruticosa* Miller, Gard. Dict., ed. 8. *Solidago* no. 31. 1768. TYPE: Mexico, Veracruz, *Houston* (BM, holotype, not seen).
- Perdicium laevigatum* Bergius, Kongl. Vetensk. Acad. Handl. 33: 238, pl. 7. 1772. TYPE: Panama, Portobelo, *Pihl* (SBT, holotype, not seen).
- P. havanense* H.B.K., Nov. Gen. Sp. Pl. 4: 155. 1820 (1818). TYPE: Cuba, Havana, *Humboldt & Bonpland* (P, holotype, not seen).
- Trixis berterii* Colla, Hort. Ripul. 137. 1824. TYPE: Colombia, Santa Marta, *Bertero* (TO, holotype, not seen).
- T. frutescens* P. Browne ex Spreng., Syst. Veg. 3: 501. 1826. TYPE: Jamaica, *Browne*, Herb. Linn. 1003.3, "*Perdicium radiale*" (LINN, not seen, US, microfiche).
- T. laevigata* (Bergius) Lag. ex Spreng., Syst. Veg. 3: 501. 1826.
- T. havanense* (H.B.K.) Spreng., Syst. Veg. 3: 501. 1826.
- T. corymbosa* D. Don, Trans. Linn. Soc. London 16: 188. 1830. TYPE: "in Mexico," *Sessé & Mociño* (G, holotype, not seen).
- T. glabra* D. Don, Trans. Linn. Soc. London 16: 297. 1830. TYPE: Mexico, Veracruz, prope Laguna Verde, *Schiede & Deppe* (location of type unknown).
- T. frutescens* var. *obtusifolia* Less., Linnaea 6: 411. 1831. TYPE: Mexico, Veracruz, prope Laguna Verde, *Schiede & Deppe* (location of type unknown).
- T. frutescens* var. *glabrata* Less., Syn. Gen. Comp. 414. 1832. TYPE: Panama, Portobelo, *Pihl* (SBT, holotype, not seen).
- T. frutescens* β *angustifolia* DC. in DC., Prodr. 7: 69. 1838. LECTOTYPE: Cuba, Havana, *de la Varga* (G-DC, not seen).
- T. ehrenbergii* Kunze, Linnaea 16: 317. 1842. TYPE: Grown from seed sent by Ehrenberg from Mexico (LZ, destroyed).
- T. radialis* (L.) Kuntze, Rev. Gen. Pl. 1: 370. 1891.
- T. radialis* α *pubescens* Kuntze, Rev. Gen. Pl. 1: 370. 1891. TYPE: Venezuela, La Guayra—Caracas, *Kuntze* 1409 (NY, holotype, not seen).
- T. radialis* β *subglabrata* Kuntze, Rev. Gen. Pl. 1: 370. 1891. TYPE: unknown.
- T. deamii* B. L. Robinson, Proc. Amer. Acad. Arts 45: 411. 1910. TYPE: Guatemala, Zacapa, *Deam* 6359 (GH, holotype; MICH, US, isotypes).
- T. adenolepis* Blake, Contr. U.S. Natl. Herb. 22: 654. 1924. TYPE: Guatemala, Gualan, *Deam* 324 (US, holotype; GH, isotype).
- T. chiantlensis* Blake, Brittonia 2: 359. 1937. TYPE: Guatemala, Chiantla, Huehuetenango, *Skutch* 1957 (GH, holotype, US, photo and fragment of holotype).

Perennial herbs 0.5–3 m tall, erect, much branched with glandular trichomes on the vegetative parts. *Leaves* petiolate; blades 24–70(–165) mm long, 5–22 mm wide, linear-lanceolate to elliptical, acute, attenuate or slightly truncate at the base, glabrate above with scattered glands and hairs, beneath strigose to pilose, rarely villous and sparsely glandular; petioles 1–7 mm long. *Inflorescences* paniculate or corymbose; peduncles sparsely glandular, strigose to pilose or glabrous, rarely sericeous. *Heads* hermaphrodite; involucre bracts 7–9, 8–13(–15) mm long, linear or oblong, acute, convex, sparsely glandular, sparsely strigose to strigose, rarely glabrous; receptacle fimbriate; florets 8–15 per head, the outer florets 5–9 mm long, the corolla yellow. *Achenes* (4–)5(–9) mm long, beaked, covered with double hairs that are usually not mucilage-releasing, and glandular trichomes, the beak about $\frac{1}{4}$ the length; pappus, 7–11 mm long, of setose tawny bristles. Chromosome number $2n = 54$ (Federov, 1969).

Trixis inula is common in sandy open areas, along roadsides, and in thickets of secondary growth, generally in lowland regions of deciduous forest. It occurs from the southeastern tip of Texas south throughout Central America, east to northern Colombia and Venezuela, and in the West Indies.



FIGURE 106. *Trixis inula* Crantz.—A. Habit ($\times \frac{1}{2}$).—B. Floret ($\times 2\frac{1}{2}$).—C. Achene ($\times 2\frac{1}{2}$). [After Croat 21892 (MO).]

CHIRIQUÍ: 8 km W from Puerto Armuelles, 150 m, *Busey 444* (MO). 1 mi W of airport at Puerto Armuelles, sea level, *Croat 21892* (MO). DARIÉN: Second large point just before Punto Alegre, NE of Garachine, *Gentry 4054* (MO). HERRERA: Vic. of Las Minas along Río Las Trancas, *Stern et al. 1785* (MO). LOS SANTOS: Tonosí, Guánico, 117 ft, *Stern et al. 1843* (MO). Road from Tonosí to Guánico (at Río Guánico), *Tyson et al. 3113* (MO). PANAMÁ: Sea Beach from Panamá Vieja to Bella Vista, *Allen 823* (MO). Cerro Campana, 850 m, *Busey 858* (MO); *Dwyer et al. 4852* (MO). VERAGUAS: Cordillera Central, headwaters of Río Cañazas, 300–600 m, *Allen 201* (MO).

XIII. LACTUCEAE

W. G. D'ARCY⁶⁷ AND A. SPENCER TOMB⁶⁸

Lactuceae Cass., Jour. Phys. 88: 151. 1819. TYPE: *Lactuca* L.

Chichorieae Dumort., Anal. Fam. Pl. 30. 1829. TYPE: *Cichorium* L.

Herbs or rarely *trees* or *shrubs*; pubescence various; sap mostly milky. *Leaves* alternate or in a basal rosette, mostly dentate, often variously incised or dissected, the bases often clasping. *Inflorescences* various. *Heads* ligulate, rarely almost discoid; involucre bracts herbaceous or nearly hyaline, often basally thickened in fruit, in 1–several, unequal, mostly graded series, the innermost series sometimes subequal and valvate or basally connate; receptacle mostly flat or slightly convex, naked or paleaceous; paleas hyaline; florets all ligulate, all perfect, all fertile, the outer series often with larger corollas or differentiated fruits, the corollas bilaterally symmetric, a slender and flat, 5-dentate ligule (limb) mostly exerted from the involucre, glabrous or pubescent, the anthers 5, appendaged, basally sagittate or auriculate, the style branches slender, papillose or puberulent, apically narrowed, obtuse or truncate, ventrally stigmatic for the whole length, the shaft often apically pubescent, the ovary terete or compressed, sometimes with an apical nectary surrounding the style base. *Fruit* an achene, smooth, rugose or tuberculate, sometimes ribbed or sulcate, apically truncate or beaked, sometimes compressed; carpodium mostly inconspicuous; pappus mostly of numerous fine, strigose bristles but sometimes of hairs, stout bristles, or plumose bristles, rarely of scales or wanting.

This is the most distinct of the tribes of Compositae, readily separated by the all-ligulate corollas, all-perfect florets, and milky sap. While usually homogamous, the florets should not be interpreted as all alike, for the outer corollas are frequently longer, broader, and of slightly different color than the inner corollas, and the outer achenes are also sometimes of different color, texture, or shape.

The tribe is best represented in temperate regions of the northern hemisphere. The genera occurring in Panama are best developed in temperate regions. Only *Hieracium* includes species native to the New World. With the exception of *Cichorium*, which may be cultivated in Panama, all Panamanian members of this tribe have yellow flowers.

In addition to the species treated here, *Launaea intybus* (Jacq.) Beauv. is to be expected. It is a pan-tropical weed of lowlands often occurring in areas with dry periods. It has yellow corollas, coarsely toothed, pandurate leaves and dimorphic achenes, the outermost compressed and the inner series terete, the pappus of numerous fine hairs and strigulose bristles. In upland Chiriquí, *Lactuca sativa* L. (lettuce, lechuga) is a year-round crop plant, but only one collection, *Mori & Bolten 7250* (MO) from 5 km NW of Cerro Punta at Las Nubes, is known.

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Lowland Panama is not suitable for cultivation of traditional strains of *Lactuca sativa* but recently developed strains may be satisfactory and are perhaps grown for salads. *Lactuca* may be recognized by its flattened and beakless achenes (achenes of *Sonchus* are flattened but lack beaks), and pappus of strigose bristles. In upland regions, endive, *Cichorium endiva* L., and chicory, *C. intybus* L., are probably grown from time to time. *Cichorium* may be recognized by its pappus of small scales and its sky-blue corollas.

- a. Achenes with long beaks.
 - b. Pappus bristles plumose, at least in part; receptacle paleaceous; involucre bracts overlapping in several similar graded series 108. *Hypochoeris*
 - bb. Pappus bristles not plumose; receptacle naked; involucre bracts dimorphic, composed of several, short outer series and a long, valvate inner series 110. *Taraxacum*
- aa. Achenes all unbeaked.
 - c. Leaves entire or dentate but not incised; achenes columnar or wanting; stems and leaves with long, tawny hairs (over 2.5 mm long) 107. *Hieracium*
 - cc. Leaves mostly incised or dissected; achenes much compressed; plants without long tawny hairs (sometimes with gland-tipped bristles).
 - d. Heads less than 6 mm tall; involucre bracts few in 2 unlike series, each equal, only slightly overlapping; leaves mostly basal in a rosette 111. *Youngia*
 - dd. Heads more than 6 mm tall; involucre bracts numerous in several graded, overlapping series; leaves mostly cauline 109. *Sonchus*

107. *HIERACIUM*

***Hieracium* L., Sp. Pl. 799. 1753; Gen. Pl., ed. 5. 350. 1754. TYPE: *H. murorum* L.**

Perennial *herbs*; stems mostly with long hairs, often also with short hairs, dendritic hairs, glandular hairs, or bristles; sap milky. *Leaves* often in a basal rosette, cauline leaves present or not, obovate or oblanceolate, entire, dentate or undulate, petiolate or not, sometimes clasping the stem. *Inflorescence* scapose, paniculate, or rarely of a solitary sessile head; peduncles or pedicels often pubescent, sometimes subtended by narrow bracts. *Heads* ligulate; involucre bracts in 2–several, graded, imbricate series, the innermost often subequal, nearly valvate; receptacle flat or slightly convex, naked; florets all perfect, all fertile, the corollas yellow (Panama), white, orange or purplish, the ligule short or long, 5-dentate, the tube sometimes apically pubescent, the anthers appendaged, with sagittate or auriculate bases, the style branches slender, papillose, sometimes dark. *Achene* cylindrical or fusiform, often prominently ribbed or sulcate; pappus of numerous, mostly tawny bristles in 1 series. *Pollen* echinolphate, usually 3-colporate. Base chromosome number $x = 9$.

Hieracium comprises more than 1000 apomictic “species” in Europe and perhaps a dozen sexual species in the New World north of Colombia.

In Panama, species of *Hieracium* may be recognized by their stout, long, tawny hairs and their inconspicuous, ligulate corollas. “Hawkweed,” “Hierba del Gavilán.”

Literature:

Robinson, B. L. & J. M. Greenman. 1904. Revision of the Mexican and Central American species of *Hieracium*. Proc. Amer. Acad. Arts 40: 14–24.

Zahn, K. H. 1923. *Compositae-Hieraceum*. In A. Engler (editor), *Das Pflanzenreich IV*. 280 (Heft. 79): 1100–1108, 1115–1124.

- a. Leaves narrow, mostly less than 2 cm wide, more than 7 times as long as wide, the minute teeth conspicuous; achenes columnar to the apex; upland plants.
- b. Involucral bracts puberulent with small, whitish, eglandular hairs, a few dark, glandular hairs sometimes present, the margins mostly herbaceous; inflorescence much-branched, many-headed; leaves cauline and basal 1. *H. absissum*
- bb. Involucral bracts with copious long, black, often glandular hairs, the margin hyaline at both sides and tips; inflorescence crowded, little-branched, few-headed; leaves mostly basal 3. *H. irasuense*
- aa. Leaves spatulate, often more than 2 cm wide, mostly less than 7 times as long as wide, the teeth, if present, inconspicuous; achenes tapering in the upper half; lowland plants 2. *H. gronovii*

1. ***Hieracium absissum*** Less., *Linnaea* 5: 132. 1830. TYPE: Mexico, *Schiede & Deppe* 190 (MO).—FIG. 107A–C.

Slender, erect *herb* to 60 cm tall; stems hirsute with stout, strigose hairs to 8(–10) mm long, more so near the base; rootstock of stout fibers, short; sap milky. *Leaves* narrow, oblong or lanceolate, subentire, with widely separated minute, ?glandular teeth, to 11 cm long, ca. 1 cm wide, smaller upwards, sometimes discolorous, both sides sparingly pilose, apically acute, basally narrowed but not forming a distinct petiole, the base slightly clasping. *Inflorescence* a many-headed panicle, the branching not truly dichotomous; peduncle glabrate below; pedicels slender, 5–10 mm long with gland-tipped short bristles and short, weak, dendritic hairs, subtended by elongate, linear bracts, and sometimes with minute scales along the length. *Heads* small, 7–8 mm long, ligulate; involucre cylindrical, narrow, spreading in fruit, of ca. 15 inner, subequal, basally imbricate, narrow bracts with margins hyaline only sometimes in the lower half, and several, smaller, graded outer bracts; florets numerous, all ligulate, all perfect, all fertile, the corollas yellow, ca. 6 mm long, with a few long hairs near the apex of the tube, exerted ca. 3 mm from the involucre, the ligule broad, with 5 rounded, short teeth, the anthers ca. 1.5 mm long, the appendages prominent, the bases sagittate, the style apically puberulent, the branches slender, dark, puberulent. *Achene* black, cylindrical, prominently many-ribbed, 2 mm long; pappus of numerous, tawny strigose bristles in 1 series, persistent.

The species may be recognized by its inflorescence of numerous small heads and linear, often pilose stems. A few long black hairs may be present on the involucral bracts, as in *H. irasuense*, but this pubescence is not dominant. It ranges from Mexico to Panama, where it occurs in upland Chiriquí.

CHIRIQUÍ: Volcán de Chiriquí, Boquete District, 7000 ft, *Davidson* 871 (MO). 6.7 mi W of Boquete, 8000 ft, *Luteyn* 1481, 1507 (both MO). 3 mi N of El Volcán, 5000 ft, *Tyson* 5837 (MO).

2. ***Hieracium gronovii*** L., *Sp. Pl.* 802. 1753. TYPE: America, *Kalm*, *Herb. Linn.* 954.16 (LINN, not seen, MO, microfiche).

H. panamense Blake, *Contr. U.S. Natl. Herb.* 22: 658. 1924. TYPE: Panama, *Busch* 1 (US).

Perennial, scapose *herbs*; stems glabrate above with dense or sparse long hairs on the lower portion; roots coarsely fibrous with a short, ill-defined caudex.



FIGURE 107. *Hieracium*.—A-C. *H. absissum* Less.—A. Base of plant ($\times \frac{2}{5}$).—B. Inflorescence ($\times \frac{2}{5}$).—C. Involucral bract ($\times 5$). [After Tyson 5837 (MO).]—D. *H. irasuense* Benth. Involucral bract ($\times 5$). [After Allen 4770 (MO).]

Leaves basal, forming a (sometimes ephemeral) rosette and cauline, spatulate, to 15 cm long, apically rounded or obtuse, basally cuneate, sessile, the midvein prominent with ca. 4 lateral veins on each side, conspicuously hirsute-pilose with abundant, scattered tawny or reddish hairs 3–5 mm long, the cauline leaves sometimes in alternate fascicles, mostly smaller. *Inflorescence* an open, scapose panicle to 60 cm tall; peduncle and pedicels with scattered stalked glands and tomentulose with fine simple hairs; pedicels 5–10 mm long with minute bractlets at the base or along the length. *Heads* ligulate, ca. 10 mm long; involucre sometimes drying dark, of numerous linear bracts in an inner, subequal series and 1 or 2 short, outer series, dorsally pilose with simple hairs and sometimes with gland-tipped bristles, the broad margins glabrate; receptacle naked; florets all ligulate, all perfect, all fertile, the corollas yellow, slightly exceeding the involucre, the ligule with short, rounded, sometimes fimbriate teeth. *Achene* nearly black, 3–4 mm long, linear, prominently many-striate, puberulent; pappus of numerous strigose, tawny bristles.

This species may be recognized by its wide leaves, narrow achenes, and fimbriate corolla lobes. It is a native of the eastern United States but has been collected in Honduras as well as in Panama.

PANAMÁ: Near Alhajuela, *Busch 1* (US).

3. ***Hieracium irasuense*** Benth. in Örst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1851: 113. 1853. TYPE: not seen.—FIG. 107D.

Hieracium maxonii Blake, Contr. U.S. Natl. Herb. 22: 660. 1924. TYPE: Panama, *Maxon 5351* (US).

Perennial *herbs*; roots numerous, coarse; sap milky; stems with scattered or dense, long, stout, tawny hairs. *Leaves* mostly basal, oblanceolate or obovate, to 10 cm long, subentire or undulate, mostly denticulate with minute glandular teeth, apically acute or obtuse, basally cuneate, sometimes broadly so and clasping, sometimes narrowed into a distinct petiolar region, midvein prominent, the pinnate venation often irregular, the cauline leaves often smaller, narrower, acute. *Inflorescence* scapose, several-headed, elongate (to 40 cm tall) sparingly branched, linear bracts sometimes subtending the branches, the upper portion tomentose with gland-tipped bristles and whitish, simple or sparingly dendritic hairs. *Heads* 8–10 mm long, ligulate; involucre drying dark, of numerous linear bracts in an inner, subequal series and several, similar, graded outer bracts, dorsally pilose with dark glandular hairs, the margins sometimes conspicuously lighter; receptacle naked; florets all ligulate, all perfect, all fertile, the corollas yellow, slightly exceeding the involucre, the ligule with short rounded teeth, the anthers with conspicuous appendages, basally sagittate, the style branches slender, puberulent. *Achene* nearly black, 3 mm long, cylindrical, prominently many-striate; pappus of numerous, strigose, tawny bristles.

This species resembles *H. absissum*, but apparent differences are in the pubescence of the involucreal bracts, in the more elaborate inflorescence with

larger heads, and in the more pubescent pedicels. Both species are known in Panama mainly from upland Chiriquí.

CHIRIQUÍ: Forested ridges S of Finca Lérída, 6000–7000 ft, Allen 4770 (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, Woodson & Schery 395 (MO). Near Casita Alta, Volcán de Chiriquí, 1500–2000 m, Woodson *et al.* 818 (MO). Loma Larga to summit, Volcán de Chiriquí, 2500–3380 m, Woodson *et al.* 1086 (MO). Summit of Chiriquí Volcano, 3374 m, Maxon 5351 (US).

108. HYPOCHOERIS

Hypochoeris L., Sp. Pl. 810. 1753; Gen. Pl., ed. 5. 352. 1754. TYPE: *H. glabra* L.

Hypochaeris auct., non L., Gen. Pl., ed. 5. 352. 1754.

Annual or perennial *herbs*, often scapose rosette plants; roots fibrous or stout; sap milky. *Leaves* alternate, often in a basal rosette, mostly oblanceolate, entire or variously dentate to pinnatisect, glabrate to pubescent, the hairs sometimes stout. *Inflorescence* a simple or branched, leafless scape, or an open panicle; small bracts sometimes present. *Heads* sometimes large, the florets all ligulate, all perfect, all fertile, but sometimes dimorphic; involucre cylindrical to campanulate, enlarging in fruit, the bracts numerous in several graded, imbricate series, sometimes apically differentiated; receptacle flat or convex; paleas hyaline, partly enfolding the ovaries, apically slender, about as long as the outer ligules; corollas yellow, orange or white, glabrate or pubescent at the base of the throat, the outer series exceeding the involucre, broad, apically narrowed, with 5 prominent narrow teeth, inner series narrow, mostly not exceeding the involucre, stamens 5, the anthers appendaged, the style ascending-pubescent, basally glandular, the style branches slender. *Achenes* of peripheral florets truncate in some species, those of the inner florets long-beaked, sulcate, tuberculate-hispid; pappus of numerous bristles, in one or more similar or dissimilar series, in some species differentiated into stout or slender, strigose or plumose, or short or long series. *Pollen* echinolphate. Base chromosome numbers $x = 4, 5, 6, 7$.

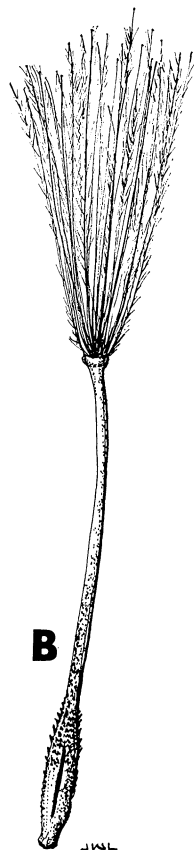
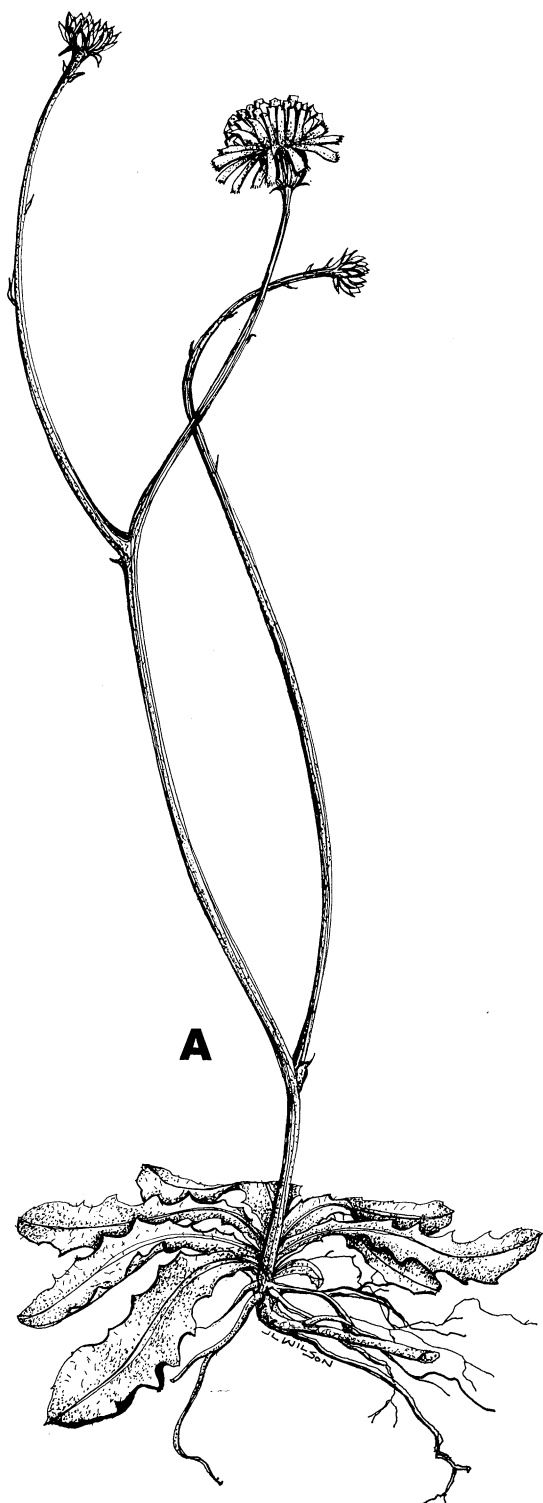
Hypochoeris is best represented in temperate South America and Europe. The species treated here is widespread. It is a member of subgenus *Hypochoeris*, characterized by a pappus differentiated in 2 unlike series, the innermost plumose and the outer series shorter and strigose.

Literature:

Hegi, G. 1954. Illustrierte Flora von Mittel-Europa. 6(2): 1008–1016, fig. 274.

1. *Hypochoeris radicata* L., Sp. Pl. 811. 1753. TYPE: not seen.—FIG. 108.

Perennial rosette *herbs*; stems scapose, sometimes branched to 60 cm tall; rootstock sturdy, sometimes branched; sap milky. *Leaves* mostly basal, numerous, sessile, to 8 cm long, oblanceolate, crenate to lacerate, the sinuses mostly rounded, pilose-hispid above and beneath with stout, unicellular hairs, the midvein prominent, the lateral veins obscure, leaves of the scape mostly reduced to scales or wanting. *Inflorescences* of 1–several, branched, scapose peduncles to 25 cm tall, pilose, peduncles green, glabrate upwards; scalelike bracts often present.



Heads showy, yellow, ligulate; involucre ca. 10 mm high, the bracts numerous in several graded series, acute with slightly differentiated, reddish, ciliate tips, glabrous but the midvein often with bristles; receptacle convex, ca. 3 mm across; paleas hyaline with a prominent, double costa, basally half-enfolding the achene, apically slender, exceeding the ligules; florets numerous, all ligulate, perfect and fertile, the corollas dimorphic, the outer series ca. 15 mm long, the ligule ca. 4 mm wide, apically narrowed with 5 acute, prominent, red-tipped teeth, glabrous, drying green, the inner series shorter, narrower, yellow, the anthers yellow, the style apically ascending-pilose, the style branches linear, yellow. *Achene* dark, sulcate, tuberculate, long-beaked; pappus of numerous bristles in several series, the innermost plumose, the outermost strigose.

This species is perhaps of European origin but now occurs widely in temperate and cool tropical regions. It is distinct from related genera in the conspicuous paleas of the heads. In Panama, *Hypochoeris radicata* is known only from one fragmentary collection, hence the present description is incomplete in some details. "Cat's Ears," "Hierba de Halcón."

CHIRIQUÍ: Valley of the upper Río Chiriquí Viejo, White & White 92 (MO).

109. SONCHUS

Sonchus L., Sp. Pl. 793. 1753; Gen. Pl., ed. 5. 347. 1754. TYPE: *S. oleraceus* L.

Robust *herbs* (Panama) or trees; stems, often hollow, glabrous or pubescent, often with gland-tipped bristles; rootstock fibrous or stout, sometimes divided, sometimes creeping; sap milky, bitter. *Leaves* alternate, in a basal rosette or cauline, dentate to dissected, often incised, the teeth with callose or spinose tips, often glabrous, basally auriculate or not. *Inflorescence* mostly paniculate, sometimes scapose but not solitary; peduncles glabrous to pilose, sometimes with gland-tipped bristles; pedicels often subtended by foliaceous bracts. *Heads* ligulate, mostly about as broad as long, slightly broader after anthesis; involucre of numerous similar bracts in several graded series, imbricate or the innermost series sometimes valvate, narrow and acute, often basally swollen in fruit; receptacle flat or convex, mamilllose, naked; florets numerous, all ligulate, all perfect, all fertile, the corolla yellow, rarely white, with 5 acute teeth, the tube apically pilose, the outer series sometimes pinkish dorsally, exceeding the involucre, the inner series smaller, the anthers 5, connate, with deltoid appendages, basally sagittate, the style apically pubescent, the branches narrow, puberulent, sometimes dark. *Achenes* mostly alike but sometimes the outermost series lighter and differing in texture, cylindrical or compressed, sometimes flat, oblong, ellipsoidal or lachrymiform, beakless, sulcate or ribbed, rugose or smooth; pappus of strigulose, silky, white bristles or of numerous, persistent, capillary hairs and fewer, stouter, deciduous bristles. *Pollen* echinolophate, mostly 3-colporate, with a tendency to extra lacunae at the poles. Base chromosome numbers $x = 7, 8, 9$.

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FIGURE 108. *Hypochoeris radicata* L.—A. Habit ($\times \frac{1}{2}$).—B. Achene ($\times 5$). [After White 92 (MO).]

Sonchus is an Old World genus of about 50 species centered in Europe and Africa. About 4 species are now widespread and 2 of these are naturalized in Panama. Robust, yellow-headed weeds with stout rootstocks, they may become troublesome weeds. Not known to be toxic, they are unpalatable to cattle and have reputed medicinal value in some countries. "Sow thistles," "Cerraja."

Literature:

Boulos, L. 1960. The genus *Sonchus*, a general systematic treatment. Bot. Not. 113: 400–420.

- a. Leaves incised, the apical segment truncate, the auricles clasping the stem pointed, the margins not decidedly prickly to the touch; achene compressed but not flat, rugose with ribs on the sides 2. *S. oleraceus*
- aa. Leaves dentate, if incised then lacking a conspicuous apical segment, the auricles clasping the stem rounded (dentate), the margins prickly; achene flat, smooth, with narrow sulci on the sides 1. *S. asper*

1. *Sonchus asper* (L.) Hill, Herb. Brit. 1: 47. 1769.

Sonchus oleraceus var. *asper* L., Sp. Pl. 792. 1753. TYPE: not seen.

Robust, short-lived perennial *herb* to 1 m tall; stems hollow; rootstock fibrous or stout, sometimes divided; sap milky. *Leaves* alternate, cauline, obovate, oblanceolate or spatulate, copiously spinulose-dentate, sometimes divided, apically acute, the basal portion often narrowed into a broadly winged, mostly dentate region, the basal auricles rounded and clasping the stem, glabrous, often bluish or slightly glaucous. *Inflorescence* an open, many-headed panicle; peduncle elongate or much abbreviated (Panama), sometimes with gland-tipped bristles; pedicels glabrous or with gland-tipped bristles, to 10 mm long; bracts leaflike but small. *Heads* 15–25 mm across, ligulate; involucre ca. 15 mm tall, the bracts lanceolate, in several similar, graded, overlapping series, glabrate or apically ciliolate, sometimes with a few subsessile glands; receptacle flat or convex, mamilllose, naked; florets all ligulate, all perfect, all fertile, the corollas yellow, those of the outer series exceeding the involucre, often reddish or grayish beneath, with 5 conspicuous obtuse teeth, the tube apically pilose, those of the inner series mostly shorter than the involucre, smaller, yellow with rounded teeth, the anthers with yellow or black appendages, basally sagittate, the style branches dark, narrow, dorsally puberulent, the shaft apically ascending-hispid, the ovary turning bright yellow or orange, the apical nectary cylindrical. *Achene* flat, lachrymiform, smooth or basally rugulose, each side with 2–4 distinct, low ridges ca. 3 mm long, reddish brown or sometimes a few tan colored; pappus strigulose, silky white, of numerous capillary hairs and fewer persistent bristles.

This species is known in Panama only in the Chiriquí uplands. Native of Europe, it is a widespread weed of temperate regions, and is established in some tropical areas. Similar to *S. oleraceus*, it grows in similar habitats. The leaves are usually less divided and more conspicuously dentate with longer, spinose mucros. "Prickly sow thistle," "Cerraja."

CHIRIQUÍ: Above Cerro Punta on slope of Cerro Respinga, 8000 ft, *D'Arcy & D'Arcy 6527* (MO). Bajo Mona, mouth of Quebrada Chiquero along Río Caldera, 1500–2000 m, *Woodson et al. 1001* (MO).

2. ***Sonchus oleraceus* L., Sp. Pl. 794. 1753. TYPE: not seen.—FIG. 109.**

Robust, short-lived *herb* to 1(?–1.5) m tall; stems terete, striate, hollow; rootstock stout, sometimes branched; sap milky. *Leaves* mostly cauline, obovate to oblanceolate, to 30 cm long, mostly incised, denticulate, the apical segment truncate to hastate, apically obtuse or rounded, the basal portion often narrowed into a distinct, winged, mostly entire-margined petiole, expanded into denticulate, pointed auricles clasping the stem, the teeth callose-mucronate, glabrous. *Inflorescence* an open panicle; peduncles with gland-tipped bristles; pedicels bracteate, mostly 1–3 cm long, glabrous. *Heads* showy, ligulate; involucre 10–20 mm tall, the bracts numerous in several, graded, imbricate series, narrow, herbaceous, glabrate or with a few bristles; florets all ligulate, all perfect, all fertile, the corollas yellow, the outermost series slightly exceeding the involucre bracts, yellow but sometimes dorsally reddish, the inner series slightly smaller, yellow, pilose at the base of the limb, glabrate above and below, apically mostly 5-denticulate, the anthers with yellow or darkened appendages, basally sagittate, the style apically ascending-pubescent, the branches narrow, puberulent. *Achenes* compressed lachrymiform, rugose with 2 fine sulci on each side, russet, the outermost achenes sometimes slightly thicker and lighter colored, beak wanting; pappus of numerous silky, persistent hairs and fewer, stouter, strigulose, deciduous bristles.

A native of temperate regions of the Old World, *Sonchus oleraceus* is widely distributed as a ruderal weed in temperate and cool tropical regions. It closely resembles *S. asper*, but in Panama it is the more common species. “Sow thistle,” “Cerraja.”

CHIRIQUÍ: Finca Collins, Boquete vicinity, *Dwyer* 1966 (MO). Trail N of Cerro Punta, *Croat* 10488 (MO). 2 mi N of El Hato del Volcán, *Croat* 10639 (MO). Near Methodist Camp near Nueva Suisa, *Croat* 13531 (MO). Between Boquete and Monte Rey, *Croat & Porter* 15645 (MO). Near Las Nubes, 2.7 mi NW of Río Chiriquí Viejo W of Cerro Punta, 2200 m, *Croat* 22422 (both MO). Across river from town of Cerro Punta, 6000 ft, *D'Arcy & D'Arcy* 6526, 6530, 6531 (all MO). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke* 9006 (MO). Boquete, Finca Collins, 5000 ft, *Dwyer & Hayden* 7684A (MO); *Ebinger* 703 (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al.* 628 (MO). Quebrada Velo, 1800 m, *Woodson & Schery* 278 (MO). COCLÉ: Hills NE of El Valle de Antón, 2000 ft, *Lewis et al.* 1793 (MO).

110. TARAXACUM

Taraxacum⁶⁹ Wiggers, Prim. Fl. Hols. 56. 1780. TYPE: *T. officinale* Wiggers, typ. cons.

Small, perennial *herbs*; rootstock sometimes sturdy; sap milky. *Leaves* alternate, often in a basal rosette, variously incised or rarely entire, glabrous or pubescent, sometimes basally narrowed into a petiole. *Inflorescence* one or several scapes; peduncle hollow, terete; mostly ebracteate. *Heads* ligulate; involucre of dimorphic bracts, the outermost in 2–3 spiral, calyculate series, short, free, applied, porrect or reflexed, the innermost in 2 series, subequal, linear, valvate and basally connate or slightly imbricate, glabrous or ciliolate; receptacle naked, flat, areolate;

⁶⁹ For a list of synonyms, see Hendel-Mazzetti (1907). Only the name *Taraxacum* has been used for Panamanian material.



florets all perfect and fertile but sometimes dimorphic, the corollas yellow, white, orange, purplish or red, those of the outer florets larger, often grayish or brown, the anthers with appendages basally connate and basally sagittate, the style apically pubescent, the branches pubescent, a large nectary sometimes present, the ovaries of the outer and inner florets sometimes differing in size and ornamentation. *Achenes* all alike, oblong, sulcate, apically tuberculate, the beak elongate, basally thickened and sometimes sulcate; pappus of numerous, strigose bristles in many similar series. *Pollen* echinolophate, 3-4-colpate, often irregularly shaped. Base chromosome number $x = 8$.

Much of the genus *Taraxacum* is apomictic and comprises many local and morphologically similar elements which have been recognized as species. Depending on the circumscription of these segregates, the genus includes from 23 to over 1000 species, centered mainly in Europe and the Mediterranean basin. Several species are naturalized in North America, and the species found in Panama is almost worldwide in distribution.

Literature:

Hendel-Mazzetti, H. von. 1907. Monographie der Gattung *Taraxacum*. Leipzig.
 ———. 1923. Nachträge zur Monographie der Gattung *Taraxacum*. Oesterr.
 Bot. Zeitschr. 72: 254-275.

1. ***Taraxacum officinale*** Weber ex Wiggers, Prim. Fl. Holst. 56. 1780, based on *Leontodon taraxacum* L.

Leontodon taraxacum L., Sp. Pl. 798. 1753. TYPE: not seen.

L. vulgare Lam., Fl. Francoise 2: 113. 1778, renaming of *L. taraxacum* L.

Taraxacum vulgare (Lam.) Schrank, Baiersche Reise 11. 1786.

T. dens-leonis Desf., Fl. Atlant. 2: 228. 1799.

Herbs with a stout rootstock and milky sap. *Leaves* mostly basal, alternate, oblong, to 15(-25) cm long, lacerate, the lobes and teeth acute, often reflexed, narrowed into a distinct, flattened petiole, glabrate, the midvein prominent and the lateral veins weak; petiole slightly winged at the base, sometimes ciliate. *Inflorescence* scapose; peduncle terete, hollow, 1-20 cm long, yellowish or reddish, or sparingly pilose with arachnoid hairs, ebracteate. *Heads* showy yellow, ligulate, 3(-4) cm across; involucre of numerous, dimorphic bracts, the outermost in ca. 3 series, short, acute, recurving, free, sometimes reddish-tipped, the innermost in ca. 1 series, linear-acute, ciliolate, 10-15 mm long, slightly overlapping and valvate, connate in the basal half, glabrate, the tips often reddish, deflexed in fruit; receptacle naked, white, 5-10 mm across, alveolate, the persistent carpodia sometimes conspicuous; florets numerous, 15-20 mm long, all fertile, dimorphic, the outermost 1-3 series with corollas much exceeding the involucral bracts, the ligule linear, 5-denticulate, dorsally brown with yellow margins, ventrally yellow,

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FIGURE 109. *Sonchus oleraceus* L.—A. Habit ($\times \frac{4}{5}$).—B. Achene ($\times 3\frac{1}{3}$). [After Croat 22422 (MO).]

the base of the tube and apex of the limb sparingly pilose outside, the stamens brownish yellow, the appendages dark, acute, basally connate, basally sagittate, the filaments glabrous, the ovary tuberculate, the beak apically expanded to the diameter of the cylindrical nectary, the style apically darker, pubescent, the branches dark, ascending-pubescent; inner florets with corollas not exceeding the involucre bracts, yellow, glabrate, the anthers yellow, the appendages yellow, obtuse, basally tailed, the style branches scarcely darkened, ascending-pilose, the ovary larger than that of the outermost floret, less tuberculate, the nectary similar. *Achenes* all alike, yellowish, sulcate, apically tuberculate-barbed, the body ca. 3 mm long, the beak ca. 8 mm long, basally thickened and sulcate, terete above, basally broader; pappus of numerous, white, strigose bristles in several similar series surrounding the naked, flat beak apex.

This species may be recognized by its showy, yellow heads and beaked achenes. Native of the Old World, it is a near cosmopolitan weed, of frequent occurrence in temperate regions and in upland Chiriquí. The leaves are used in other countries for salads and for making wine. The immature heads have been pickled for a condiment or boiled as a vegetable, and the root has been used as a coffee adulterant. Latex of another Old World species has been used for rubber. The flowers are reported as a good nectar source for honey bees. This species is normally apomictic, and although showy with rich pollen and nectar rewards, plants are seldom fertilized by their frequent insect visitors. Outcrossing is exceptional. "Dandelion," "Diente de León."

CHIRIQUÍ: Boquete, *D'Arcy & D'Arcy 4659* (MO); *Dwyer 7041* (MO).

111. YOUNGIA

Youngia Cass., Ann. Sci. Nat. 23: 88. 1831. TYPE: *Y. lyrata* Cass. = *Y. japonica* (L.) DC.

Annual or perennial rosette *herbs*; pubescence of weak, uniseriate hairs; rooting by a taproot; sap milky. *Leaves* obovate or lanceolate, often runcinate or lyrate-dissected, sometimes dentate; distinct petiole often present. *Inflorescence* scapose, paniculate; peduncles slender, often pubescent; pedicels slender, subtended by scalelike bracts. *Heads* small, ligulate; involucre cylindrical, mostly glabrous, the bracts in 2 series, the outermost few, deltoid, short, mostly slightly overlapping, the innermost 6–12, lanceolate, twice as long or more than the outer series, thickening at the base in fruit; florets (5–)15(–30), all ligulate, all perfect, all fertile, the corolla yellow, the outer series sometimes dorsally reddish, the ligule with 5 short, sometimes reddish teeth, the tube apically pilose, the anthers with ill-defined appendages, basally tailed, style branches slender, puberulent, style apex pubescent. *Achene* compressed, ellipsoidal or lachrymiform, conspicuously many-ribbed, rugose; pappus of many fine, persistent, strigulose, white or buff bristles. *Pollen* echinolophate, 3-colporate. Base chromosome numbers $x = 5, 8$.

Youngia is a genus primarily Asian in origin with some three dozen species. It is often considered to be conspecific with *Crepis* L. Recognition of *Youngia* as a distinct genus is based on the work of Babcock & Stebbins (1937) who

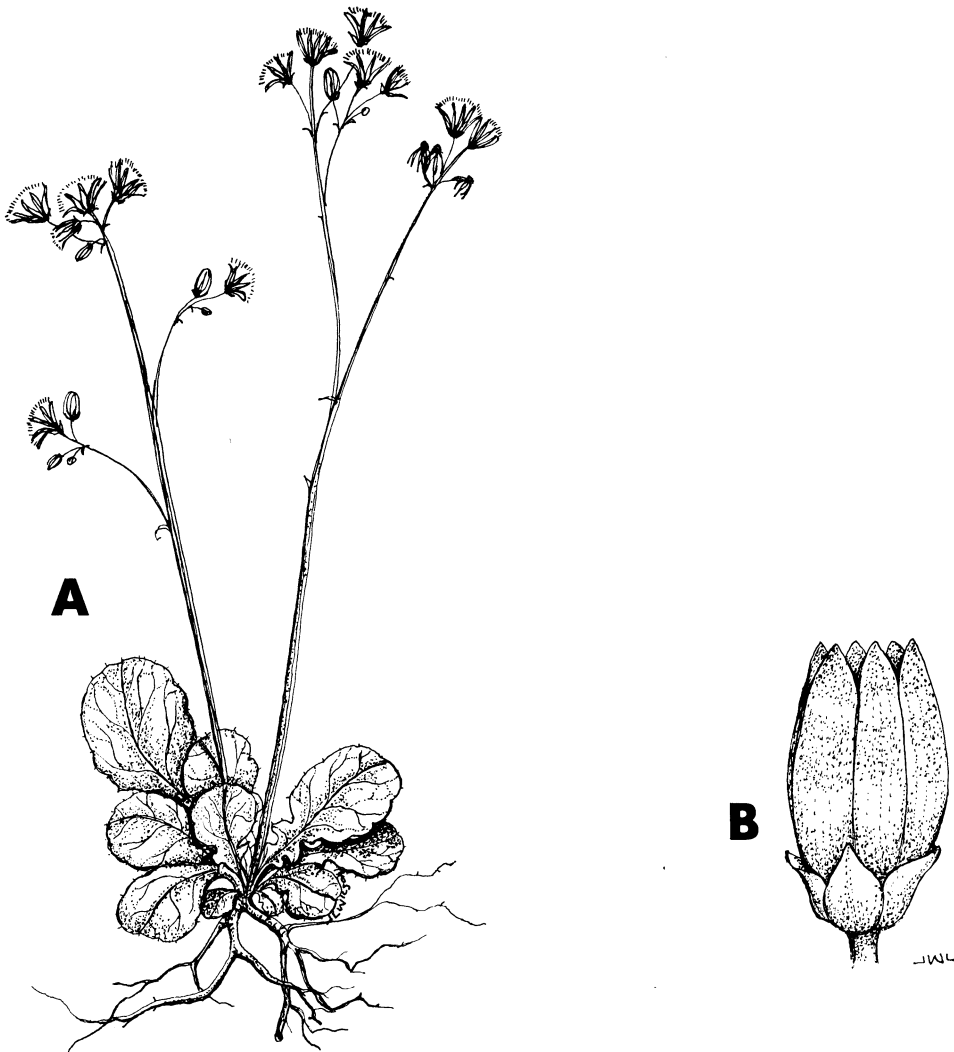


FIGURE 110. *Youngia japonica* (L.) DC.—A. Habit ($\times \frac{1}{10}$).—B. Unopened head ($\times 6\frac{3}{10}$).
[After D'Arcy & D'Arcy 6655 (MO).]

considered *Youngia* and *Crepis* to be only distantly related. In the Panamanian flora it is distinct by the milky sap, the involucral bracts in 2 series, the diminutive heads, and the scapose habit.

Literature:

Babcock, E. B. & G. L. Stebbins, Jr. 1937. The genus *Youngia*. Publ. Carnegie Inst. Wash. 484: 1-106.

1. *Youngia japonica* (L.) DC., Prodr. 7: 194. 1838.—FIG. 110.

Prenanthes japonica L., Mant. Pl. 107. 1767. TYPE: not seen.

Crepis japonica (L.) Benth., Fl. Hongk. 194. 1861.

Short-lived, mostly scapose *herb* to 50 cm tall; stems puberulent with long, multicellular hairs; rootstock short; sap milky. *Leaves* obovate, oblanceolate, or rotund, lyrate or runcinate, the terminal segment mostly rotund, apically rounded, dentate, crenate or entire, the basal portion narrowed into a narrow, wingless petiole, or with more or less deltoid segments, to 6(-25) cm long, the midvein often reddish, evenly pubescent overall. *Inflorescence* a scapose, several-headed panicle to 25 cm tall; peduncle glabrate, often reddish, slender, somewhat branched; pedicels filiform, ca. 5 mm long, subtended by scalelike bracts. *Heads* small, ca. 5 mm tall, slightly taller than broad; involucre bracts in 2 distinct series, the outer series of ca. 5, slightly imbricate or valvate, pinkish, deltoid bracts ca. 1 mm long, the inner series of ca. 8 lanceolate bracts ca. 6 mm long, glabrous, green with purplish costa, apically darkened, basally swollen in fruit, deflexed in age; receptacle flat, yellow, naked; florets all ligulate, all perfect, all fertile, the corolla yellow, 5-7 mm long, the ligule broad, the 5 short teeth darkened, the tube apically pilose, the anthers dark green, the appendages black, poorly defined, basally long-sagittate, the style apically pilose, the branches slender, pubescent, truncate, yellow. *Achene* brown, 2 mm long, compressed, ellipsoidal or conical, apically narrowed into an indistinct beak, many-ribbed, the ribs ascending-scabrid; pappus silky white of numerous, fine strigose bristles.

This species may be recognized by its diminutive size and the bright yellow corollas forming a disc only 3-4 mm across. It is a widespread weed of tropical and warm temperate regions, occurring in Panama in disturbed situations. Plants collected in Panama are smaller than those seen from Costa Rica.

CANAL ZONE: Summit Garden, *Croat 13475* (MO). CHIRIQUÍ: E side of Cerro Pando, 6000 ft, *D'Arcy & D'Arcy 6655* (MO).

INDEX OF LATIN NAMES

Numbers in **boldface** type refer to descriptions; numbers in roman type refer to synonyms; numbers with dagger (†) refer to names incidentally mentioned.

Acanthospermum 842†, 846†, 851†, **1062**,
 1082†
australe 1062†
brasilum 1062†
hispidum 1062†
humile **1063**
Aciphyllaea 1222
Acmella
hirta 1210†, 1211
Acocotli 1175
Adenocyclus 862
Adenolepis 1186
pulchella 1186†
Adenophyllum 1222
Adenostemma 845†, 847†, **891**, 994†
berteri 892†
lavenia 892†

platyphyllum **891**
viscosa 891†
Adventina
ciliata 1207
Aganippea 1210
bellidiflora 1210†
Ageratina 845†, 847†, 848†, **892**, 937†
adenophora 894†
anisochroma 839†, **895**
aschenborniana **896**
bimatra 941
chiriquensis **898**
costaricensis 899†
croatii **898**
ixioclodon 898†, **899**, 901†
molinae **900**
riparia 894†

- tonduzii 901†
 vulcanica 897, 897†
 whitei **900**
Ageratiopsis 892
Ageratum 845†, 847†, 849†, **901**
 —sect. *Coelestina* 908†
 album 903
 benjamin-lincolni 903†
 chiriquense **902**
 coeruleum 952
 conyzoides 901†, **903**, 906†, 907†
 cordifolium 903
 febrifugum 992
 guianense 952
 hirsutum 903
 hirtum 903
 houstonianum 901†, 904†, **904**, 907†, 908†
 humile 903
 latifolium 904†
 mexicanum 904
 microcarpum **906**
 oliveri **907**
 panamense 908
 petiolatum 909†
 reedii 909†
 riparium 909†
 rivale 908†, 908
 wendlandii 904
Aldama 1130†
Allocarpus 1200
 caracasana 1200†
Alloispermum 1200
Alomia 907†
 chiriquensis 902
 guatemalensis 903†
 microcarpa 906
Amania 1136
Ambrosia 839†, 846†, 853†, 1053†, **1091**,
 1095†
 cumanensis **1092**
 maritima 1091†
Ambrosiinae 846†, **1091**, 1094†
Amellus 1113, 1215
 asper 1116
 —var. *glabriusculus* 1116
 pedunculatus 1217†, 1218
 umbellatus 1253†
Ampherephis 857
Amphibecis 857
Anaphalis 1037†
Anthemideae 840†, 841†, 842†, 846†, **1241**
Anthemis 1241†
 americana 1143
 buphthalmoides 1096
 oppositifolia 1143
Apherephis
 aristata 858
Archibaccharis 845†, 854†, 855†, **1005**
 flexilis 1007†, 1009†
 irazuensis **1006**
 panamensis **1007**
 schiedeana **1009**
 serratifolia 1007†
 torquis 1009
Arnica
 gerbera 1281†
Aspilia 1157†
 costaricensis 1157
Aster 845†, 853†, 1004†, **1010**, 1025†, 1286†
 amellus 1010†
 aurantius 1222†
 crocatus 1284
 spinosus **1010**
Astereae 837†, 839†, 840†, 842†, 843†, 845†,
1004, 1013†, 1018†, 1033†
Athenaea 864
Austroeupatorium 845†, 849†, **909**
 inulaefolium **910**
 mapirensis 911†
 monardifolium 911†
Ayapana 842†, 845†, 848†, **912**, 949†, 951†,
 958†
 amygdalina **913**
 elata **915**
 officinalis 912†
 pyramidalis 916
 squarrosa 912†
 stenolepis 915†, **916**
 triplinervis 912†
Baccharis 836†, 845†, 853†, **1011**
 cinnamomifolia 1013
 halimifolia 1011†, 1013†
 pedunculata **1013**
 scandens 1009, 1009†
 splendens 1013
 schiedeana 1009
 trinervis **1015**
 —var. *rhexioides* 1016†
 —var. *trinervis* 1016†
Baccharoides
 punctatum 858
Baillieria 1070†
 aspera 1069
Balbisia 1215
 canescens 1218
 divaricata 1218
 elongata 1215†, 1217
 pedunculata 1218
Baltimora 846†, 850†, **1063**
 recta 1063†, **1065**, 1167†
 scolospermum 1065
 —var. *panamensis* 1065
Barrattia 1136
 calva 1136†
Bartlettina 839†, 845†, 848†, 849†, **916**, 951†
 maxonii **917**
 platyphylla **918**
 prionophylla 918†, **918**
Bartolina 1215
Batschia 892
 nivea 892†
Baziasa 1214
 humilis 1214†

- Bellis*
 ramosa 1102
Bidens 846†, 847†, **1175**, 1178†, 1187†, 1194†
 andicola 1182
 bipinnata **1176**
 —var. *bipinnata* 1177†
 —var. *cynapiifolia* **1176**, 1182†
 costaricensis 1177
 cynapiifolia 1176
 frutescens 1110
 fruticosa 1110
 humilis
 —var. *macrantha* 1182
 leucantha 1178
 mitis 1175†
 mollis 1182
 nivea 1113†
 ocymifolia 1140
 ostruthioides **1177**, 1183†
 —var. *costaricensis* **1177**
 pilosa 1175†, **1178**
 —f. *minor* 1179†
 refracta 1181
 reptans 1179
 riparia **1181**
 —var. *refracta* **1181**
 scandens 1128
 segetum 1179, 1181†
 squarrosa 1179
 tereticaulis 1179
 tripartita 1175†
 triplinervia 1177†, **1182**
 —var. *macrantha* 1182
 —var. *mollis* 1182
 verticillata 1199
 vulgata 1194†
Blumea 845†, 854†, **1033**
 —sect. *Paniculatae* 1035†
 aurita 1034†
 balsamifera 1033†, 1034†
 lyrata 1035
 mollis 1034†, 1035†
 viscosa 1034†, **1034**, 1035
 —var. *lyrata* 1035†
Boerbastrum 1222
Boebera 1221
 chrysanthemoides 1221†
Boraginaceae 892†
Bowmannia 1289
 verbascifolia 1289†
Brickellia 845†, 848†, **920**, 921†
 cavanillesii 920†
 cordifolia 920†
 diffusa **921**, 921†
Bulbostylis 920
 diffusa 921
 elegans 913
 glandulosa 913
 micrantha 913
 microcephala 913
 tomentosa 913
Buphthalmum
 helianthoides 1096†
Cacalia
 brachiata 867
 bullata 869
 canescens 869
 coccinea 1246
 cordifolia 970
 glandulosa 1234
 lanceolaris 871
 mentrasto 903
 parasitica 1270
 patens 871
 porophyllum 1232†, 1234
 ruderalis 1234
 sagittata 1246
 seemanniana 871
 sonchifolia 1247
 triflosculosa 872
Caenotus 1017
Calea 846†, 848†, **1200**
 aspera 116, 116†
 axillaris 1204
 —var. *urticaefolia* 1204
 cacosmioides 1204
 jamaicensis 1200†
 oppositifolia 957†, 958
 pellucidinerva 1204
 pittieri **1201**
 prunifolia 1201†, **1203**
 urticifolia **1204**
 —var. *axillaris* 1204
Caleacte 1200
 urticifolia 1204
Calebrachys 1200
 peduncularis 1200†
 magellanica 1031†
Caloseris 1286
 rupestris 1286†, 1287
Calydermos 1200
 scaber 1200†
Calyptocarpus 1167†
 vialis 1167†
Campuloclinium
 surinamense 955
Cardueae 837†, 840†, 842†, 843†, 846†, **1272**
Carduus 1272†, 1273†, 1286†
 cernuus 1284
 mexicanus 1273
 subcoriaceus 1275
Carelia 901, 905
 houstoniana 904
 satureiaefolia 965†
Carlina 1272†
Carlineae 1272
Carphobolus 860
Carphostephium 1217
Castra 1289
 regia 1289†
Cataleuca 1286
 rubicunda 1286†, 1287

- Centaurea* 1272†
Centaureae 1272
Centratherum 845†, 855†, **857**
 intermedium 858†
 punctatum 857†, **858**
Centroclinium 1286
 albicans 1286†
Ceratocephalus 1175
 diffusus 1142
Chaetanthera 1276†
Chaetanthereae 1276
Chaetospora 879
 funkii 882
Chalarium 1104
Chaptalia 846†, 852†, **1277**
 carduacea 1278
 diversifolia 1278
 erosa 1278
 exscapa 1277†
 leonina 1278
 majuscula 1278
 nutans 1277†, **1278**, 1280†
 —var. *texana* 1278
 piloselloides 1277†
 runcinata 1277†, 1278†, **1280**
 subcordata 1278
 texana 1278
 tomentosa 1277†
Cheilodiscus 1225
 littoralis 1225†, 1229
Chenopodiaceae 842†
Chlaenobolus 1048
 virgatum 1048†
Chromolaena 845†, 848†, **923**
 horminoides 923†
 ivaefolia **924**
 laevigata **924**
 odorata 839†, 923†, **925**
Chrysanthellina 1183
Chrysanthellum 846†, 850†, 852†, 854†, **1183**
 americanum 1183†, **1184**
 —var. *americanum* 1186†
 var. *integrifolium* **1184**
 integrifolium 1184
 procumbens 1183†
Chrysanthemum 841†, 846†, 852†, 853†, 854†, **1242**
 coronarium 1242†
 leucanthemum **1243**
 parthenium **1243**
Chthonia 1225
 glauescens 1225†
Cichorium 1292†, 1293†
 endiva 1293†
 intybus 1293†
Cirsium 839†, 846†, 952†, **1272**
 cernuum 1275†
 costaricensis 1273
 heterolepis 1275
 maximum 1275
 mexicanum **1273**
 pinnatisectum 1275
 subcoriaceum **1275**
 vulgare 1273†
Cladoseris 1286
 annua 1286†
Clavigera 920
 corymbosa 920†
Clibadium 843†, 846†, 850†, 851†, 853†, 854†, **1067**, 1074†, 1075†, 1080†
 —sect. *Clibadium* **1068**
 —sect. *Euclibadium* 1068†
 —sect. *Trixidium* **1078**
 anceps **1069**, 1074†
 apressipilum 1069
 asperum **1069**, 1071†, 1075†
 erosum 1078†
 glomeratum 1074†
 grande 1071, 1071†
 grandifolium **1071**
 lanceolatum 1075
 latifolium 1069
 leiocarpum **1072**
 —var. *strigosum* 1072, 1072†
 pilonicum **1073**
 pittieri **1078**
 —f. *phrixium* 1078, 1078†
 schulzii 1072, 1072†
 subauriculatum **1074**
 surinamense 1067†, 1070†, **1075**
 sylvestre 1070†
 villosum 1075, 1075†
Clomenocoma 1222
 montana 1223
Clusia 986†
Cnicus 1273†
 costaricensis 1273
 heterolepis 1275
 mexicanus 1273
 pinnatisectus 1275
 subcoriaceus 1275
Coelestina
 microcarpa 906
Coenotus 1017†
Coleosanthus 920
 cavanillesii 920†
 diffusus 921
 tiliaefolius 952
Collaea 1183
 procumbens 1183†
Comaclinium 1222
 aurantiacum 1222†, 1223†
Compositae **835**, 1126†, 1132†, 1221†, 1292†
 —tribe *Ambrosieae* 1053
 —tribe *Anthemideae* 840†, 841†, 842†, 846†, **1241**
 —tribe *Arctoteae* 837†
 —tribe *Astereae* 837†, 839†, 840†, 842†, 843†, 845†, **1004**, 1013†, 1018†, 1033†
 —subtribe *Bellidinae* 1031†
 —subtribe *Grangeinae* 1031†
 —tribe *Asteroideae* 1004

- subtribe Ecliptae 1101†
- subtribe Ecliptinae 1101
- tribe Calenduleae 837†
- tribe Cardueae 837†, 840†, 842†, 843†, 846†, **1272**
- tribe Carduineae 1272†
- tribe Chichorieae 1292
- tribe Coreopsideae 1174†
- tribe Eupatorieae 836†, 839†, 840†, 841†, 842†, 843†, 845†, **888**, 948†, 958†, 960†, 1054†, 1128†
- tribe Helenieae 837†, 1221†
 - subtribe Pectidinae 1221†
 - subtribe Tagetinae 1221†
 - subtribe Tagetineae 1220
- tribe Heliantheae 836†, 837†, 839†, 840†, 842†, 843†, 845†, 912†, 918†, 957†, 958†, **1053**, 1058†, 1082†, 1221†, 1245†
 - subtribe Ambrosieae 1091†
 - subtribe Ambrosiinae 846†, **1091**, 1094†
 - subtribe Coreopsideae 1174†
 - subtribe Coreopsidinae 846†, **1174**
 - subtribe Galinsoginae 836†, 846†, **1199**, 1207†, 1217†
 - subtribe Heliantheae 1101†
 - subtribe Helianthinae 836†, 846†, 1065†, **1101**
 - subtribe Melampodieae 1062†
 - subtribe Melampodiinae 846†, **1062**, 1065†, 1068†, 1087†, 1094†, 1125†
 - subtribe Millerieae 1057†
 - subtribe Milleriinae 845†, **1057**, 1068†
 - subtribe Trichospirinae 1174
 - subtribe Zinniinae 846†, **1096**
- tribe Helianthoideae
 - subtribe Verbesineae 1101
- tribe Inuleae 837†, 840†, 841†, 842†, 843†, 845†, 1018†, **1033**
- tribe Lactuceae 839†, 840†, 841†, 842†, 843†, 846†, **1292**
- tribe Liabieae 1244†
- tribe Madieae 1053
- tribe Mutisieae 839†, 840†, 841†, 843†, 846†, **1276**
 - subtribe Gochnatiinae 1276†, 1287†
 - subtribe Mutisiinae 1276†
 - subtribe Nassauviinae 1276†, 1282†
- tribe Senecioneae 836†, 837†, 839†, 840†, 841†, 842†, 843†, 846†, 1054†, **1244**
 - subtribe Ambroseae 1091
 - subtribe Tagetineae 1220
- tribe Tageteae 837†, 839†, 840†, 842†, 843†, 846†, **1220**, 1223†, 1225†
 - subtribe Pectidinae 1221†
- tribe Tagetineae 1220†
- tribe Trichospireae 1174†
- tribe Vernonieae 837†, 840†, 841†, 842†, 843†, 845†, **856**, 1054†
 - subtribe Elephantopeae 873†
 - subtribe Elephantopodinae 839†, 845†, 856†, 857†, **873**
 - subtribe Lychnophorinae 873
 - subtribe Vernonieae 857†
 - subtribe Vernoniinae 845†, 856†, **857**
- Condylidium 845†, 848†, **927**
 - iresinoides **928**
- Conyza 845†, 854†, 1013†, **1017**, 1025†, 1035†
 - alopecuroides 1048
 - apurensis **1018**, 1021†
 - arabidifolia 1023
 - bonariensis **1021**, 1022†, 1024†
 - var. bonariensis 1021†
 - var. leiosthea 1021†
 - canadensis 1021†, **1022**
 - var. pusillus 1023†
 - carolinensis 1045
 - catharinensis 1023
 - chilensis 1017†, 1018†, 1019†, **1023**
 - cinerea 870
 - floribunda 1021, 1021†
 - gnaphalioides 1017†
 - lobata 1256†
 - lyrata 1034
 - myosotifolia 1023
 - odorata 1045, 1046, 1046†
 - pedunculata 1013
 - polystachya 1048
 - purpurascens 1046, 1046†
 - riparia 1051
 - schiediana **1024**
 - spatulata 1018†
 - squarrosa 1018†
 - virgata 1048
 - viscosa 1034
 - yungasensis 1023
- Coreopsidaceae 1274
- Coreopsidinae 846†, **1174**
- Coreopsis 1174†, 1175†, 1187†
 - amplexicaulis 1135†
 - baccata 1170
 - reptans 1179
- Corynanthelium 965
 - moronoa 965†
- Cosmea 1186
- Cosmos 847†, 1175†, **1186**
 - bipinnatus 1187†, 1190†
 - caudatus **1187**
 - crithmifolius 1187†, **1188**
 - gracilis 1190, 1191†
 - sulphureus 1187†, 1188†, **1190**
- Cosmus 1186
- Crantzia 857
- Crepis 1304†, 1305†
 - japonica 1305
- Critonia 845†, 848†, 849†, **930**, 960†
 - billbergiana **931**
 - dalea 930†
 - daleoides **933**
 - morifolia **933**
 - sexangularis 934†
- Cryptopetalon 1225
 - ciliare 1225†

- Cursonia 1286
 peruviana 1286†
 Cynara 1272†
 Cynareae 1272
 Dahlia 841†, 856†, 847†, 1187†, **1191**, 1194†
 coccinea 1191†
 imperialis **1192**
 pinnata 1191†, **1192**
 Decachaeta 839†, 845†, 851†, **856†**, **934**, 951†, 960†
 haenkeana 934†
 thieleana **935**
 Decaneurum 857
 Delilia 842†, 845†, 851†, **1057**, 1057†
 berteri 1057, 1058†
 biflora **1057**, 1057†
 Delucia 1175
 ostruthioides 1175†
 Diadonta 1175
 Dialesta 862
 discolor 862
 Diazeuxis 1284
 latifolia 1284
 trinervis 1284†
 Diglossus 1235
 variabilis 1235†, 1238
 Diodonta 1175, 1175†
 leptophylla 1175†
 Distreptus 879
 spicatus 879
 spiralis 882
 Doellia 1034
 kotschy 1034†
 Dolichlasium 1289
 lagascae 1289†
 Dumerilia 1282
 axillaris 1282†
 paniculata 1282
 Dyssodia 846†, 847†, **1221**, 1221†
 acerosa 1222†
 anthemidifolia 1222†
 integrifolia 1223
 montana 1222†, **1223**
 papposa 1221†
 tagetoides 1222†
 Dysodiopsis 1222
 Dysodium
 divaricatum 1083
 Echinocephalum 1113
 latifolia 1113†
 Echinops 1272†
 fruticosus 883†, 883
 nodiflorus 883
 Echinopseae 1272
 Eclipta 839†, 841†, 846†, 849†, 1101†, **1101**,
 1105†, 1214
 alba 1101†, **1102**
 bellidioides 1101†
 erecta 1102
 humilis 1214†
 prostrata 1102
 punctata 1102
 Edwardsia 1175
 Elephantopodinae 839†, 845†, 856†, 857†, **873**
 Elephantopus 845†, 855†, 873†, **873**, 879†
 angustifolius **874**
 carolinianus
 —var. mollis 876
 dilatatus **875**
 hypomalacus 876, 878†
 mollis **876**
 riparius 875†
 scaber 873†, 876†
 —var. tomentosus 878†
 spicatus 879†, 879
 tomentosus 876†
 —var. carolinianus 878†
 Eleutheranthera 841†, 846†, 849†, 855†, **1104**,
 1105†, 1106†, 1107†, 1139†
 ovata 1105
 prostrata 1105
 ruderalis 1104†, **1105**
 Eleuthrantheron 1104
 Elichrysum 1043†
 Elvira 1057, 1057†
 biflora 1058
 martyni 1057
 Emilia 846†, 855†, **1245**
 coccinea 1245†, **1246**
 flammea 1245†
 fosbergii **1246**
 javanica 1246
 sagittata 1246
 sonchifolia 1246†, **1247**
 Enalcida 1235
 pilifera 1235†
 Encelia
 —sect. Simsia 1136
 Erechites 846†, 853†, 854†, **1249**
 hieracifolia **1250**
 —var. cacalioides **1250**
 —var. hieracifolia 1250†
 —var. megalocarpa 1250†
 praelta 1249†
 valerianaefolia **1251**
 —f. valerianaefolia 1251†
 Eremosia 866, 873†
 triflosculosa 872
 Erigeron 845†, 853†, 1018†, **1025**, 1026†,
 1244†
 —sect. Caenotus 1017
 annuum 1019†
 annuus **1026**
 bellidioides 1028
 bonariensis 1021
 canadensis 1017†, 1022
 chilensis 1023
 chiriquensis 1029
 cuneifolius **1028**
 dissectus 1029
 divaricatus 1017†
 domingensis 1028
 gaudichaudii 1029

- jamaicensis 1028†
karvinskianum
—var. mucronatum 1029
karvinskianus 1028†, **1028**
maxonii 1029
mucronatum 1028
schiedianus 1024
spathulatum 1018
subspicatus 1024
uniflorus 1025†
Ernstia
 lyrata 1035
Eschenbachia
 lyrata 1035
Ethulia
 sparganophora 864
 struchium 864
Euchiton 1037
 pulchellus 1037†
Eupatorieae 836†, 839†, 840†, 841†, 842†, 843†,
 845†, **888**, 948†, 958†, 960†, 1054†,
 1128†
Eupatoriophalacron 1101
Eupatorium 888†, 951†
 —sect. *Cylindrocephala* 923
 —sect. *Hebeclinium* 951†
 adpersum 895
 ageratoides 892†
 altiscandens 983
 amygdalinum 913
 —var. *revolutum* 916†
 anisochromum 895
 araliaefolium 981†, 983
 aromaticum 892†
 arthodes 984
 aschenbornianum 896
 barclayanum 913
 billbergianum 931
 bimatrum 941
 brenesii 991
 chiriquense 898
 cinereum 910
 conyzoides 925
 costaricense 948†, 949
 critonioides 933
 daleoides 933
 decemflorum 910
 decussatum 962
 diffusum 921
 divergens 925
 dodoneaeefolium 913
 dodoneaeefolium 913†
 donnell-smithii 897
 dryadeum 952
 durandii 895
 ecuadorae 955
 elatum 915
 eximium 987
 filicaule 962
 floribundum 925
 fruticosum 973
 glandulosissimum 913
 glumaceum 928
 graciliflorum 925
 guadalupense 941
 heterolepis 983
 hitchcockii 988
 horsfieldii 910
 houstonianum 973
 houstonis 973
 hymenophyllum 940
 hypomalacum
 —var. *wetmorei* 963
 inulaefolium 909†, 910
 iresinoides 927†, 928
 ivaefolium 924
 ixioclodon 899
 ixodes 913
 klattii 925
 laevigatum 924
 loniceroides 913
 macrophyllum 949†, 952
 macrum 928
 marquezianum 970
 maxonii 917
 megaphyllum 933
 microstemon 941
 miserum 943
 molle 910, 952, 970†
 morifolium 933
 myrianthum 935
 myriocephalum 935
 odoratum 923†, 925
 omphaliaefolium 983
 oxychlaenum 913
 pacacatum 944, 945†
 pallescens 910
 pallidum 910
 paniculatum 941
 paranense 910
 platyphyllum 918
 polanthum 895
 populifolium 933, 952, 952†
 pratense 944
 prionophyllum 918
 psiadiaefolium 924
 pycnocephala 945†
 pyramidale 916
 ramosissimum 910
 roseum 944
 salzmannianum 913
 sartorii 933
 scandens 965†
 scoparioides 962
 sideritidis 946
 silphiifolium 910
 sinclairii 946
 solidaginoides 962
 sprucei 915
 standleyi 991
 stenolepis 916
 sauveolens 910

- subobtusum 913
 syringaeifolium 962
 thieleaenum 935
 trichosantheum 921
 tuerckheimii 916†
 valerianum 940, 941†
 vitalbae 954†, 955
 vulcanicum 896
 wagneri 928
Fingalia 1104
 hexagona 1104†
Fleischmannia 845†, 848†, 849†, **937**
 allenii **938**
 arguta 937†
 capillipes 947†
 chiriquensis **939**, 948†
 croatii **940**
 granatensis 940†
 haughtii 943†
 hymenophylla **940**
 imitans 946†
 microstemon 900†, 937†, **941**, 944†
 misera **943**, 947†
 panamensis 940†, **944**
 plectranthifolia 939†
 pratensis 940†, **944**, 944†
 pycnocephala 945†
 rhodostyla 937†
 sideritidis **946**
 sinclairii 941†, 943†, **946**
 tysonii 939†, **947**
 valeriana 940
Gaillardia 1221†
Galinsoga 846†, 850†, 1199†, **1206**, 1208†,
 1210†, 1217†
 aristulata 1208
 bicolorata 1208
 brachystephana 1207
 caracasana 1207
 ciliata 1208
 hispida 1207
 hispida β *purpurascens* 1207
 humboldtii 1207
 parviflora 1206†, 1207†
 —var. *caracasana* 1207
 —var. *hispida* 1208†
 parviflora γ *hispida* 1207
 quadriradiata 1210†
 —var. *hispida* 1207
 —f. *albiflora* 1207
 —f. *purpurascens* 1207
 trilobata 1217†
 urticaefolia 1207†, **1207**
Galinsogaea 1206
Galinsogea 1206, 1217
 serrata 1204
Galinsoginae 836†, 846†, **1199**, 1207†, 1217†
Camochaeta 1037
 americana 1037†, 1038
Garcilassa 846†, 850†, 855†, **1107**
 rivularis 1107†, **1107**
 Georgia 1191
 Georgina 1191
 purpurea 1191†
Gerbera 846†, 852†, 1277†, **1281**
 jamesonii **1281**
 linnaei 1281†
 nutans 1278
Gerberia 1281†
Gnaphalieae 1033
Gnaphalium 1037
 dysodes 1037†
Gnaphalium 845†, 854†, 1033†, **1037**
 americanum **1038**
 attenuatum **1039**, 1041†
 domingense 1040†, **1040**
 luteo-album 1037†
 obtusifolium 1041†
 oxyphyllum 1041†
 poepigianum 1040
 portoricense 1040
 roseum 1040†, **1041**
 spicatum 1038, 1039†
 uliginosum 1037†
 undulatum 1048
 virgatum 1048
 viscosa 1040
Gnaphalopsis 1222
 micropoides 1222†
Gongrostylus 845†, 848†, **948**
 costaricensis **949**
Gordonia 1108†
Gramineae 836†
Gymnolaena 1222†
 integrifolia 1223
Gymnolomia 1156†
 microcephala 1157
 rudbeckioides 1156†
Gymnopsis
 costaricensis 1157
 divaricata 1130
 vulcanica 1157
Gynoxys
 berlandieri 1265
 cumingii 1265
Gyptis 951†
Hebeclinium 845†, 848†, **949**, 954†
 costaricense **951**
 macrophyllum **952**
 reedii **954**
Helenium 1221†
Heliantheae 836†, 837†, 839†, 840†, 842†, 843†,
 845†, 912†, 918†, 957†, 958†, **1053**,
 1058†, 1082†, 1221†, 1245†
Helianthinae 836†, 846†, 1065†, **1101**
Helianthus 1053†, 1101†, 1156†
Helichrysum 845†, 852†, 1037†, **1043**
 bracteatum **1043**
 orientale 1043†
Heliogenes 1210
 reglae 1210†
Heliopsis 840†, 846†, 851†, **1096**

- buphthalmoides **1096**
 helianthoides 1096†
 Helioreos 1225
 Hemibaccharis
 irazuensis 1006
 salmeoides 1009
 torquis 1009
 Heterocondylus 845†, 848†, **954**
 vitalbae **955**
 Heterolaena 923
 Hidalgo 846†, 847†, 1054†, **1194**
 ternata 1194†, **1195**
 Hieracium 837†, 846†, 852†, 1292†, **1293**
 absissum **1294**, 1296†
 gronovii **1294**
 irasuense 1294†, **1296**
 javanicum 1246†
 maxonii 1296
 murorum 1293†
 panamense 1294
 Hilairia
 paniculata 1287†
 Hipposeris 1286
 salicifolia 1286
 Hopkirkia 1126
 eupatoria 1126†
 fruticulosa 1136†
 Hunteria 1232
 Hymenatherum 1222
 tenuifolium 1222†
 Hymenostephium 1156
 cordatum 1157, 1159†
 mexicanum 1156†
 microcephalum 1157
 Hymenostephium 1132†
 Hypochaeris 1297
 Hypochaeris 846†, 852†, **1297**
 glabra 1297†
 radicata **1297**
 Ichthyothere 846†, 850†, 1068†, **1079**
 cunabi 1079†
 scandens **1080**
 terminalis 1080†
 Inula
 saturejaoides 1225†
 trixis 1289
 Inuleae 837†, 840†, 841†, 842†, 843†, 845†,
 1018†, **1033**
 Ismaria 920
 glandulosa 920†
 Isocarpha 836†, 845†, 849†, **957**
 oppositifolia **958**
 Isotypus
 onoseroides 1286†, 1287, 1287†
 Iva 1053†, 1091†
 Jaegeria 836†, 846†, 850†, **1210**
 bellidioides 1211
 discoidea 1211
 hirta 1210†, **1211**
 —var. glabra 1211
 mniooides 1210†, 1211
 parviflora 1211
 repens 1211
 Jungia 846†, 852†, **1282**
 ferruginea 1282†, **1282**
 revoluta 1282†
 Kegelia 1104
 ramossissima 1105
 ruderalis 1104†, 1105, 1105†
 Kerneria 1175
 trigona 1175†
 Kleinia 1232
 glandulosa 1235
 porophyllum 1234
 ruderalis 1232†, 1234
 Koanophyllon 845†, 848†, 935†, **958**
 dukei **961**
 hylonomum 961†, 965†
 hypomalacum 964†
 panamense **961**
 pittieri 962†, 964†
 solidaginoides **962**
 wetmorei 962†, **963**
 Kuhnia 920
 eupatorioides 920†
 Kyrstenia 892
 donnell-smithii 897
 Lactuca 1292†, 1293†
 sativa 836†, 1292†, 1293†
 Lactuceae 839†, 840†, 841†, 842†, 843†, 846†,
 1292
 Laennecia 1017
 gnaphalioides 1017†
 Laestadia 1031†
 Lagenifera 845†, 854†, **1031**
 andina 1031†
 cuchumatana 1031†
 maviensis 1031†
 nodicaulis 1031†
 panamensis 1031†, **1032**
 Lagenophora 1031
 Laggera 1033, 1034†
 kotschy 1034†
 purpurascens 1033†
 Lasianthaea 850†, 854†, **1108**, 1123†
 fruticosa **1110**
 helianthoides 1108†
 nowickeana **1111**
 Lasianthus 1108†
 Launaea
 intybus 1292†
 Lavenia 891
 erecta 891†
 spathulatum 891†
 Lebetina 1222
 cancellata 1222†
 Leguminosae 892†, 1206†
 Lemmatium 1200
 rotundifolium 1200†
 Leontodon
 taraxacum 1303
 vulgare 1303

- Leontophthalmum* 1200
 peruvianum 1200†
Lepidesmia 912, 912†
 squarrosa 912†
Leptilon 1017
Leria 1277
 lyrata 1278
 nutans 1277†, 1278
Leucanthemum 1242
 vulgare 1242†, 1243
Leucosyris 1010, 1010†
 carnosa 1010†
 spinosa 1010
Liabum 836†, 839†, 846†, 847†, 1244†, **1253**
 bourgeau **1253**
 homogamum 988
 polyanthum **1255**
 sagittatum **1256**
 umbellatum 1253†
Lieberkuhna 1277
 bracteata 1277†
Liliaceae 1126†
Lipotriche 1113
 brownei 1113†
Lorentea 1225
 multiflosculosa 1229
Lowellia 1222
 aurea 1222†
Loxodon 1277
 brevipes 1277†
 longipes 1280
Lychnophora 873†
Lycoseris 846†, 852†, 853†, **1284**
 crocata 1284
 latifolia **1284**
 mexicana 1284†
 oblongifolia 1284
 squarrosa 1284
Macella 1210
Madia 1053
Mallinoa 892
 corymbosa 892†
Mandonia 1217
 boliviensis 1217†
Matricaria
 parthenium 1243
Melampodiinae 846†, **1062**, 1065†, 1068†,
 1087†, 1094†, 1125†
Melampodium 840†, 842†, 846†, 851†, 852†,
 1062†, **1080**, 1085†, 1089†
 —sect. *Serratura* **1082**
 —sect. *Zarabellia* **1085**
 americanum 1080†
 camphoratum 1089
 costaricense **1082**
 divaricatum 1082†, **1083**, 1083†
 humile 1063
 longifolium 1085†
 paludosum 1083
 panamense 1083
 paniculatum **1086**
 ruderales 1105
Melananthera
 deltoidea 1116, 1116†
 urticaefolia 1116
Melanthera 846†, 849†, **1113**, 1169†, 1171†
 amellus
 —var. *subhastata* 1119
 angustifolia 1115†, 1119
 —var. *subhastata* 1119
 aspera 1115†, **1116**, 1116†, 1116, 1120†
 —var. *aspera* **1116**
 —var. *glabriuscula* 1117†
 —var. *subhastata* 1115†, **1119**
 biflora 1115†
 brevifolia 1116
 calicicola 1116
 confusa 1116
 crenata 1116
 hastata 1113†, 1116†
 —var. *cubensis* 1116
 latifolia 1113†, 1115†
 linearis 1119
 microphylla 1119
 nivea 1113†, 1115†, 1116†
 panduriformis 1115†
 scandens 1113†
 —subsp. *dregei* 1113†
Menispermaceae 892†
Meratia 1057
 sprengelii 1058
Meyeria 1200
Micrelidium 1101
 tolak 1101†, 1102
Microlecanium 1183
 abyssinica 1183†
Mikania 845†, 847†, **965**, 1128†
 almagroi 968
 amara 965†
 —var. *guaco* 971
 amblyolepis **967**
 angularis 973†
 antioquiensis 968
 badiieri 972
 —var. *kittsiana* 972
 banisteriae **967**
 —f. *lehmanniana* 968
 —f. *subglabra* 968
 bergantinensis 968
 canaquensis 968
 caudata 967
 convolvulacea 970
 cordifolia **970**
 eriphora 970†
 ferruginea
 —var. *subglabra* 968
 globosa 979†
 gonoclada 970
 gracilis 972
 guaco **971**, 981†
 hookeriana **972**

- var. *badieri* 972
- var. *cardiophylla* 972
- var. *crassicaulis* 972
- var. *kittsiana* 972
- var. *platyphylla* 972
- houstoniana* **973**, 974†
- houstonis* **973**
- imrayana* 972
- karuaiensis* 978
- kavanayensis* 968
- lanuginosa* 970
- leiostachya* 974†, **974**
- lucida* 980†
- meridana* 968
- miconioides* **975**
- micrantha* 967†, 971†, **975**
- molinensis* 968
- mollis* 970, 970†
- monagasensis* 970†
- nubigena* 977
- olivacea* 971
- oniaensis* 968
- orinocensis* 975
- panamensis* 967
- parviflora* 972†
- pittieri* **977**
- platyphylla* 972
- poepigii* 970
- psilostachya* **978**
 - var. *racemulosa* 978
 - var. *scabra* 978
- ptaretepuiensis* 968
- pyramidata* 970
- racemulosa* 978, 979†
- ruiziana* 967
 - var. *lehmanniana* 968
- sanjacimntensis* 972
- scabra* 978, 979†
- scandens* 976†
- sinuata* 976
- skutchii* 968, 970†
- suaveolens* 970
- subcrenata* 975
- subcymosa* 976
- sylvatica* 975†
- tonduzii* **979**
- trinitaria* 972†
- tysonii* **980**
- umbellifera* 975
- vitifolia* 973†
- vitrea* 972
- wedelii* 980
- zonensis* **980**
- Milleria* 843†, 845†, 851†, 1057†, **1058**
 - biflora* 1057, 1057†
 - quinqueflora* 1058†, **1061**
- Millerinae* 845†, **1057**, 1068†
- Mirasolia* 1145
 - diversifolia* 1146
- Mocinna* 1200
 - serrata* 1200†, 1204, 1204†
- Monanthemum* 860
- Monarrhenus* 1048†
- Monenteles* 1048†
- Montagnaea* 1120
 - hibiscifolia* 1120
- Montanoa* 846†, 849†, **1120**, 1122†, 1132†
 - hibiscifolia* **1120**, 1120
 - thomasi* 1157, 1159†
 - tomentosa* 1120†
- Moronoa* 965
- Morrenia* 965, 965†
 - odorata* 965†
- Munnozia*
 - sagittata* 1256
- Mustelia* 995
 - eupatoria* 995†
- Mutisia* 1276†
- Mutisieae* 839†, 840†, 841†, 843†, 846†, **1276**
- Narvalina*
 - fruticosa* 1110
- Nassauvieae* 1276
- Nassauvia* 1276†
- Neobartlettia* 916†, 916
 - maxonii* 917
 - platyphylla* 918
 - prionophylla* 919
- Neohintonia* 960†
- Neomirandea* 845†, 847†, **981**
 - subg. *Critoniopsis* 982†, 984†
 - allenii* **982**, 986†, 988†
 - angularia* 990†
 - araliaefolia* **983**
 - arthodes* **984**
 - biflora* 990†
 - burgeri* 990†
 - chiriquensis* **986**, 987†
 - croatii* **986**
 - eximia* **987**, 988†
 - gracilis* **987**, 987†
 - grosvenorii* 990†
 - guevarii* 991†
 - hitchcockii* 988
 - homogana* **988**, 991†
 - panamensis* **989**
 - pseudopsoralea* **990**
 - psoralea* 990†
 - standleyi* 989†, **991**
 - turrialbae* 990†
- Neurolaena* 846†, 854†, 855†, 856†, 1245†, **1256**
 - lobata* 1256†, **1257**
- Nothites* 995
 - latifolia* 995†
- Odontoloma* 862
- Ogiera* 1104
 - triplinervis* 1104†
- Oliganthes* 862, 862†
 - discolor* 862
- Omalotheca* 1037
 - supinum* 1037†
- Onoserideae* 1276

- Onoseria* 846†, 852†, 1276†, **1286**
conspicua 1287
isotypus 1287
onoseroides **1287**
paniculata 1287
purpurea 1286†
rupestris 1287
salicifolia 1286†
Ophryosporus
solidaginoides 962
Orchidaceae 836†, 916†
Orthopappus 873, 874†
angustifolius 874
Osmia 923
divergens 925
graciliflorum 925
ivaefolia 924
odorata 925
Oxydon 1277
bicolor 1277†, 1280
Oxylobus 894†
Oyedaea 846†, 851†, **1122**, 1172†
verbesinoides 1122†, **1123**
Paleista 1101
flexuosa 1101†
Parthenium 846†, 853†, **1094**, 1095†
argentatum 1094†
cinaraceum 1094†
glomeratum 1094†
hysterophorus **1094**, 1094†
Pascalia
glauca 1115†
Pectidium 1225
Pectidopsis 1225
Pectis 837†, 846†, 847†, 849†, 1220†, 1221†, 1223†, **1225**, 1230†
angustifolia 1225†
arenaria 1229
bibracteata 1229
carthusianorum 1225†
ciliaris 1225†
costata 1230
elongata **1226**
—var. *floribunda* 1227†, **1229**
—var. *oerstediana* 1227†, **1227**, 1229†
falcata 1230
floribunda 1229
grandiflora 1229
lehmannii 1230
linifolia 1225†
maritima 1229
multiflosculosa **1229**
multisetosa 1230, 1231†
oerstediana 1227
panamensis 1232
plumieri 1229
pratensis 1231
prostrata 1225†, **1230**
—var. *urceolata* 1230
punctata 1225†
swartziana **1231**
uniaristata 1225†
urceolata 1230
Perdicium
havanense 1290
laevigatum 1290
radiale 1289†, 1290
Perezziopsis 1286
donnell-smithii 1286†
Phyllocephalum 857
Piptocarpha 845†, 855†, 856†, **860**
brasiliانا 860†
chontalensis **860**
costaricensis 860
Piqueria 841†, 845†, 850†, **991**
luxurians 992
ovata 992
trinervia 991, **992**
—var. *luxurians* 992
Placus 1034, 1034†
tomentosus 1034†
Platycheilus 1289
ochroleucus 1289†
Pleocarpus 1282, 1282†
revolutus 1282†
Pluchea 845†, 854†, **1044**, 1046†
carolinensis 836†, **1045**
marylandica 1044†
odorata 1044†, 1045†, **1046**
purpurascens 1046
Pluridens 1175
Pollalesta 845†, 855†, **862**
discolor **862**
vernonioides 862†
Polyanthina 912†, 951†
nemorosa 912†
Polymnia 846†, 847†, **1086**, 1089†, 1125†, 1126†
canadensis 1086†
maculata **1087**
—var. *adenotricha* 1087†
—var. *glabricaulis* 1087†
—var. *maculata* **1087**
Porophyllum 846†, 847†, 1221†, **1232**
ellipticum 1234
ellipticum β *intermedium* 1234
—var. *genuinum* 1234
—var. *ruderales* 1234
latefolium 1234, 1235
macrocephalum 1235
macrolepidium 1234
porophyllum 1234
ruderales 1232†, **1233**
—subsp. *macrocephalum* 1235
—var. *angustifolia* 1234
—var. *ellipticum* 1234
—var. *glandulosum* 1234
—var. *macrocephalum* 1234†, **1235**
—var. *macrolepidium* 1234
—var. *ruderales* **1234**
—f. *suffruticosa* 1234

- Prenanthes*
 japonica 1305
Prionanthes 1289
 antimenorrhoea 1289†
Psathurochaeta 1113
 dregei 1113†
Pseudelephantopus 845†, 855†, **879**
 funckii 882
 spicatus 879†, **879**
 spiralis **882**
PseudoElephantopus 879†
Pseudoconyza 1034, 1034†
 lyrata 1034†, 1035
 viscosa 1035
Pseudogynoxys 1266†
 berlandieri 1265
Pterocaulon 845†, 854†, **1048**
 alopecuroides 1048, 1049†
 polystachyum 1048
 undulatum 1048, 1049†
 virgatum 1048†, **1048**
 —var. *alopecuroides* 1048
 —f. *alopecuroides* 1048
Ptilostephium 1217
 coronopifolium 1217†
 trifidum 1217†
Randeria 1035†
Rhanactina 1282
 cinerarioides 1282†
Rhodoseris 1286
 conspicus 1286†, 1287
Rolandra 845†, 855†, **883**, 886†
 argentea 883
 fruticosa 883†, **883**
Roldana
 heterogama 1268†
Rolfinkia 857
Rosalesia 920
 glandulosa 920†
Rosilla 1222
 lutea 1222†
Rubiaceae 1108†
Rumfordia 846†, 851†, **1125**, 1132†
 aragonensis 1126†
 floribunda 1125†
 polymnioides **1125**
Sabazia 836†, 846†, 850†, **1214**
 humilis 1214†
 sarmentosa **1214**
 —var. *papposa* **1214**
 —var. *triangularis* 1214
 triangularis 1214
 —var. *papposa* 1214
 urticaefolia 1207
 —var. *venezuelensis* 1208
Salmea 846†, 849†, **1126**
 eupatoria 1126†
 grandiceps 1128
 scandens 1126†, **1128**
Salmia 1126

Schaetzelia 1286
 deckeri 1286†, 1287
Schistocarpa 836†, 839†, 846†, 848†, 918†, 1245†, **1259**
 bicolor 1259†
 croatii **1259**
 hoffmannii 1259
 oppositifolia **1259**
Schizotrichia 1222†
Schlectendalia 1221
Sciadocephala 845†, 847†, **944**
 dressleri **994**
 schultze-rhnhofiae 994†, 995†
Sclerocarpus 842†, 846†, 852†, 853†, 1125†, **1128**
 africanus 1128†
 divaricatus **1130**
Scolospermum 1063
 baltimoroides 1063†, 1065, 1065†
Seala 1225†
Sebastiana 1183
 heterophylla 1183†
Senecio 846†, 854†, **1261**
 —sect. *Convolvuloidei* 1266†
 angustiradiatus **1263**
 arborescens **1264**
 benthamii 1265
 berlandieri 1265, 1265†
 boquetensis **1264**
 cacalioides 1250
 calocephalus 1265
 chenopodioides 1266†
 confusus 1265
 cooperi **1266**
 copeyensis 1264†
 cumingii 1265†
 hemsleyi 1265
 heterogamus **1268**
 megaphyllus **1269**
 oerstedianus **1270**
 parasiticus **1270**
 valerianaefolius 1251
 vulgaris 1261†
Seneciodes 866
 cinereum 870
Senecioneae 836†, 837†, 839†, 840†, 841†, 842†, 843†, 846†, 1054†, **1244**
Seris 1286
 conspicua 1287
 onoseroides 1286†, 1287
 rupestris 1287
Siegesbeckia 1132
Sigesbeckia 846†, 849†, 1125†, **1132**
 agrestis 1135†
 zorullensis **1133**
 orientalis 1132†
Silphium
 trilobatum 1168
Simsia 846†, 851†, 853†, **1135**, 1156†
 amplexicaulis 1135†
 calva 1136†

- dombeya 1138†
 panamensis **1136**
 polycephala 1138†
 pubescens 1138†
Sinclairia
 polyantha 1255
Sogalginia 1217
Solenotheca 1235
 tenella 1235†
Solidago
 fruticosa 1290
 urticifolia 1204
Sonchus 846†, 852†, 1293†, **1299**
 asper **1300**, 1301†
 oleraceus 1299†, 1300†, **1301**
 —var. asper 1300
Sparganophorus 864
 fasciatus 864
 struchium 864
Sphixia 875
Spilanthus 846†, 849†, 850†, **1138**, 1150†
 alba 1139†, **1140**, 1144†
 americana 1142†, 1143
 ciliata
 —var. diffusa 1142
 diffusa **1142**
 ecliptoides 1211
 exasperata 1140
 karvinskiana 1211
 macrophylla 1143
 mariannae 1211
 ocymifolia 1140
 —f. radifera 1140
 oppositifolia **1143**
 paniculata **1144**, 1140†
 radicans 1140
 sessilifolia 1211
 uliginosa 1139†, 1140†
 urens 1138†
Spilanthus
 albus 1140†
Spiracantha 845†, 855†, **886**
 cornifolia 886†, **886**
Spirochaeta 879
 funkii 879†, 882
Stemmatella 1206
 congesta 1206†
 urticifolia 1207
 —var. eglandulosa 1207
Stenophyllum 1200
Stevia 845†, 849†, **995**, 1107†, 1128†
 —ser. Fruticosae 1000†
 benthamiana 1000
 caracasana **997**
 compacta 1001
 ehrenbergiana 1000
 elliptica 997
 elongata
 —var. caracasana 997
 fascicularis 1000
 fastigiata 998
 febrifuga 992
 glutinosa 998
 grandidentata 998
 hirtiflora 997
 lucida **998**
 —var. oaxacana 1000†
 melissaefolia 995†
 nervosa 1000
 nitida 998
 ovata 998†, **1000**, 1000, 1001†, 1002†
 oaxacana 998
 paniculata 1000
 quitensis 1000
 reglensis 1000
 rhombifolia 1000
 —var. stephanocoma 1001
 salicifolia 995†
 serrata 995†
 ternifolia 1000
 triflora **1001**
 uniaristata 1000
Struchium 845†, 855†, **864**
 americanum 864
 herbaceum 864
 sparganophorum **864**
Syncephalanthia 1222
 decipiens 1222†
Synedrella 846†, 850†, 1105†, **1196**
 nodiflora 1196†, **1196**
Tageteae 837†, 839†, 840†, 842†, 843†, 846†,
 1220, 1223†, 1225†
Tagetes 841†, 846†, 847†, 1220†, 1221†,
 1223†, **1235**
 anisata 1238
 dichotomum 1238
 erecta **1237**, 1237†, 1239, 1241†
 filifolia 1237†, **1238**
 foeniculacea 1238
 integrifolia 1234
 macroglossa 1239
 major 1237
 microglossa 1237†, **1239**, 1239†
 multifida 1238
 papposa 1221†
 patula 1235†
 pauciloba 1238
 pusilla 1238
 rotundifolia 1146
 scabra 1238
 silenoides 1238
Tamayoa 912
 paraguanensis 912†
Taraxacum 846†, 852†, **1301**
 dens-leonis 1303
 officinale 1301†, **1303**
 vulgare 1303
Telanthophora
 arborescens 1264
Tenorea 1289
 berteri 1289†
Tessaria 845†, 854†, **1049**

- integrifolia 1049†, 1051†, **1051**
 sericea 1051†
 Tetracanthus 1225
 linearifolius 1225†
 Tetrachyron 1200
 manicatum 1200†
 Tetragonotheca 1125†
 Theaceae 930†, 1108†
 Thymelaeaceae 930†
 Thymophylla 1222
 setifolia 1222†
 Thysanthera 1277
 nutans 1278
 Tithonia 846†, 850†, 853†, 1123†, **1145**
 calva 1145†
 diversifolia **1146**, 1147†
 rotundifolia 1145†, 1146†, **1146**
 splendens 1223
 tagetiflora 1145†
 Tonalanthus 1200
 aurantiacus 1200†
 Tragoceros 1099†
 Trichospira 836†, 839†, 846†, 849†, 855†,
 1198
 menthoides 1198†, 1199
 verticillata 1198†, **1199**
 Tridax 846†, 847†, **1215**
 procumbens 1215†, **1217**
 —var. canescens 1218
 —var. ovatifolia 1218
 Trinacte 1282
 ferruginea 1282†
 Triocline 1277†
 Trixis 837†, 846†, 852†, 1282†, **1289**
 adenolepis 1290
 antimenorrhoea 1289†
 berteri 1290
 chiantlensis 1290
 corymbosa 1290
 deamii 1290
 ehrenbergii 1290
 frutescens 1290
 —var. glabrata 1290
 —var. obtusifolia 1290
 frutescens β angustifolia 1290
 glabra 1290
 havanense 1290
 inula 1289†, **1289**
 laevigata 1290
 radialis 1290
 radialis α pubescens 1290
 radialis β subglabrata 1290
 Tuberostylis 845†, 849†, **1002**
 rhizophorae **1002**, 1002†
 Tussilago
 lyrata 1278
 nutans 1277†, 1278
 vaccina 1278
 Ucacau
 nodiflorum 1196
 Ucaea 1196
 Ucacou 1196
 nodiflorum 1196†
 Ukakou 1196
 Unxia 842†, 846†, 850†, **1089**
 camphorata **1089**, 1089†
 digyna 1089
 Urbanisol 1145
 tagetiflorus 1145†
 Urolepis 951†
 Urticaceae 842†
 Vargasia 1206
 caracasana 1206†, 1207
 Verbesina 839†, 842†, 846†, 855†, 1101†,
 1147, 1163†
 alata 1147†
 alba 1102, 1102†
 fruticosa 1110
 fuscasicans **1149**
 gigantea **1150**, 1152†, 1155†
 guatemalensis **1151**
 lanata **1152**, 1153†
 myriocephala 1150
 nodiflora 1196
 oerstedia 1152†, **1152**
 prostrata 1102
 sublobata 1152†, **1153**
 turbacensis 1151†, **1155**
 Vernonia 836†, 845†, 856†, 857†, **866**
 aschenborniana 871
 brachiata **867**
 bullata 869, 869†
 canescens **869**
 cinerea 866†, **870**
 dumeta 872
 lanceolares 871
 luxensis 872
 noveboracensis 866†
 pacchenis 871
 patens **871**
 salamana 871
 scorpioides 866†
 seemanniana **871**
 triantha 872
 triflosculosa **872**
 —subsp. palmeri 873†
 —subsp. triflosculosa 873†
 Vernoniaceae 856
 —subtribe Pectideae 1220
 Vernoniaceae 837†, 840†, 841†, 842†, 843†,
 845†, **856**, 1054†
 Vernoniinae 845†, 856†, **857**
 Viborgia 1206†
 Vigolina 1206
 acmella 1206†
 Viguiera 846†, 849†, 851†, 853†, **1156**
 cordata 1156†, **1157**, 1160†
 dentata 1156†
 helianthoides 1156†
 sylvatica **1159**
 tenuis **1160**

- Wedelia 846†, 851†, 1065†, 1106†, 1115†,
 1132†, **1161**, 1167†, 1172†, 1174†
 acapulcensis 1162
 acuminata 1163
 aequatoreale 1163†
 brasiliensis 1168†
 calycina 1162†, **1162**, 1165†, 1167†
 caracasana 1162
 carnosa 1168
 cordata 1157
 fruticosa 1161†, 1162†, 1163†
 gracilis 1168†
 hookeriana 1163
 inconstans **1164**
 jacquini 1163
 keatingii 1163†, **1165**
 paludosa 1168†
 parviceps **1167**
 parviflora 1165†, 1167†
 scaberrima 1163
 trilobata 1162†, **1168**
 villosa 1163
 Wiborgia 1206
 acmella 1206†
 brachystephana 1207
 urticaefolia 1207
 Wightia 857
 Wikstroemia 930
 glandulosa 930†
 Willdenowa 1221
 glandulosa 1221†, 1222†
 Willoughbya 965
 cordifolia 970
 ferruginea 968
 guaco 971
 houstonia 973
 imrayana 972
 platyphylla 972
 Wuerschmittia 1113
 abyssinica 1113†
 Wulffia 842†, 843†, 846†, 851†, 1115†, **1169**
 baccata 1169†, **1170**, 1174†
 platyglossa 1170
 Xeranthemum
 bracteatum 1043
 Xetoligus 995
 Youngia 841†, 846†, 852†, **1304**
 japonica 1304†, **1305**
 lyrata 1304†
 Zarabellia 1085
 Zexmenia 846†, 850†, 1108†, 1109†, 1110†,
 1169†, **1172**
 costaricensis 1110
 frutescens 1110
 —var. frutescens 1110†
 —var. genuina 1110
 fruticosa 1110†
 nicaraguensis 1110
 serrata 1110†, 1172†
 virgulata 1171†, **1172**
 Zinnia 840†, 846†, 851†, 1096†, **1097**
 elegans **1099**
 multiflora 1099†
 peruviana 1097†
 Zinniinae 846†, **1096**
 Zyconia
 oppositifolia 1259