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THE EUPHORBIACEAE OF SONORA, MEXICO

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ABSTRACT

This publication is an account of the Euphorbiaceae in the state of Sonora, México. Nineteen genera, 143 species, and three additional varieties are recorded for the state; three species expected within the state are also treated. One species of *Acalypha* and three species and one subspecies of *Euphorbia* are described. Dichotomous keys for the identification of genera and species are provided. Bibliographic citations, type information, synonyms, brief habit descriptions, times of reproduction, habitat preferences as well as elevational range within Sonora, geographical distribution, and representative specimens are given for each species. When appropriate, notes on uses, taxonomic or nomenclatural problems, and other points of interest are discussed.

Key words: Euphorbiaceae, México, Sonora.

RESUMEN

Esta publicación es un estudio de la familia Euphorbiaceae en el estado de Sonora, México. Se reportan 19 géneros, 143 especies y 3 variedades; se incluyen además tres especies que probablemente están presentes en Sonora. Se describe una especie de *Acalypha* y tres especies y una subespecie de *Euphorbia*. Se proporcionan claves para la identificación de géneros y especies. Para cada especie se proporcionan referencias bibliográficas, información sobre el tipo, sinónimos, época de floración y tipo de vegetación. Se presenta la distribución altitudinal para Sonora, la distribución geográfica, y los especímenes representados para cada especie. Para algunas especies se aportan notas sobre usos, problemas taxonómicos y nomenclaturales, y se discuten otros puntos de interés.

Palabras clave: Euphorbiaceae, México, Sonora.

INTRODUCTION

The Euphorbiaceae constitute a large and diverse assemblage of 317 genera and about 7,500 species (Webster 1994). The family has a nearly cosmopolitan distribution, but the greatest diversity is by far in tropical and subtropical regions. In addition to its great floristic importance, there are a number of economically important members. Among these are the Rubber Tree [*Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg.], Cassava [*Manihot esculenta* Crantz], Castor Bean [*Ricinus communis* L.], and numerous ornamentals [*Acalypha* spp., *Codiaeum variegatum* (L.) A.

Juss., and *Euphorbia* spp.]. This publication is an account of all the Euphorbiaceae species native or naturalized in the state of Sonora, México (Fig. 1).

Although a political border is not necessarily an ecological boundary, it serves the purpose of containing a study. However, the borders of Sonora are, to varying degrees, biologically significant. Most of the western boundary is the sea. The east boundary is close to the continental divide. The north boundary marks a division between the better-known continental flora of Arizona and the relatively poorly known flora of northern Sonora. The Sonora-Sinaloa border separates a continuous flora but is far enough south

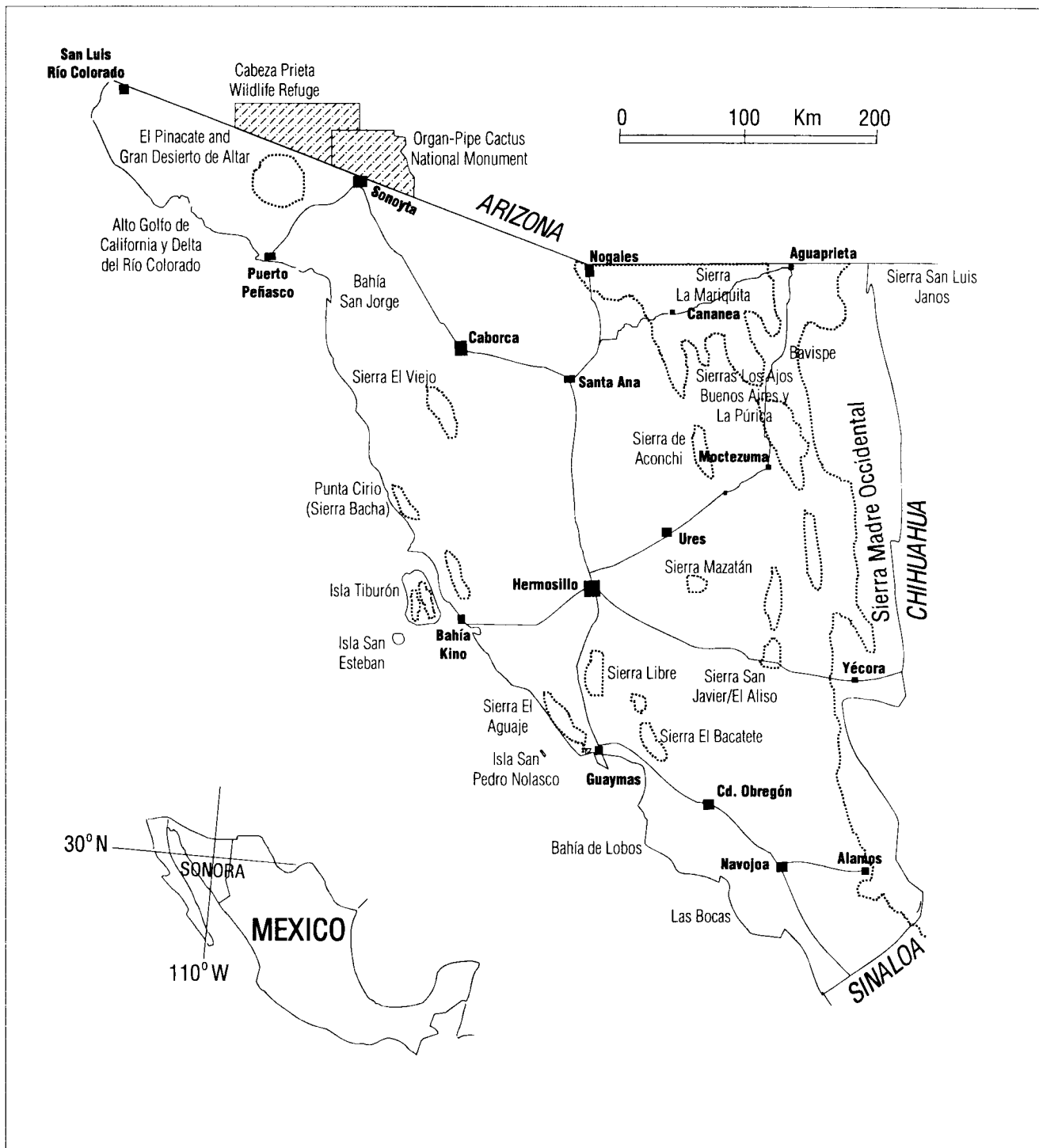


Fig. 1. Sonora, México.

to include the northern limits of the tropical Mexican flora.

Sonora encompasses 185,431 km² and is the second largest state in México after Chihuahua. It is topographically and biologically diverse. Three major river systems, the Río Colorado, the Río Yaqui, and the Río Mayo, course through the state and empty into the Gulf of California. In addition, several other minor

river systems originate in the state, e.g., the Río Sonoyta and Río Sonora. The eastern margin of the state is comprised of numerous north-south trending mountain ranges forming the western cordillera of the Sierra Madre Occidental. The highest elevation is 2,625 m in the Sierra de los Ajos in northeastern Sonora. The Sierra San Luis in the extreme northeastern corner is nearly as high, and another high peak, further south

on the Chihuahua border, near Mesa Tres Ríos may be equally high. Numerous other ranges, generally decreasing in peak elevations westward, spread across the rest of the state, interspersed with broad valleys and expansive plains.

Sonora includes the northern limits of tropical and subtropical biota as well as some of the most arid desert regions of North America. The total annual precipitation decreases from south to north, and east to west, and increases with elevation. The rainfall is largely biseasonal with summer and winter-spring rainy seasons, although summer rains generally decrease northward and westward across the state (Búrquez et al. 1992; Turner et al. 1995). Total annual precipitation varies from roughly 85 mm or less near the delta of the Río Colorado to more than 1000 mm in portions of southeastern Sonora (Felger and Wilson 1995; Yetman et al. 1995). Human population in Sonora remained low and major roads few until the mid- to late twentieth century. Much diversity and richness of basically natural habitat remains, but assaults on the environment are escalating.

While soil moisture is the principal limiting factor in this dry region, freezing temperatures limit the northern distributions of the more tropical or subtropical species (Turnage and Hinckley 1938; Turner et al. 1995). Freezing weather is infrequent, especially in the southern part of the state and at low to moderate elevations, and many habitats are essentially frost-free, but freezing becomes more frequent and severe northward and at higher elevations.

There is no listing of the total flora of the state, although at least 5000 species are probably present (Felger and Wilson 1995). Within this rich flora, we estimate that the Euphorbiaceae are the fourth largest family, following the Asteraceae, Fabaceae, and Poaceae. We list 19 genera, 143 species plus three additional varieties of Euphorbiaceae for the state; three additional species (marked by *) are known from so close to the boundary that they are expected to occur in Sonora and are therefore included in this report. We estimate that this represents nearly all the actual diversity present. Most of the taxa in Sonora are native, and we believe that only three species are definitely not native. These are *Euphorbia hypericifolia*, *E. pepulus*, and *Ricinus communis*. A few other species, e.g., *E. prostrata* and *E. serpens*, may not be native, but we are uncertain.

In comparison with adjacent areas to the north and west (Arizona, Baja California, California, New Mexico), the Euphorbiaceae are quite diverse in Sonora. This is due to the more tropical affinities of the flora. As one moves further south in México and Central America, the diversity of Euphorbiaceae continues to increase. Table 1 compares the number of native gen-

Table 1. Number of native genera and species of Euphorbiaceae in Sonora compared with other North and Central American regions.

Region	Native Species	Native Genera	Size Compared with Sonora
Sonora	140	18	—
California (Webster 1993b)	42	9	2.3
Baja California (both states) (Wiggins 1980)	77	12	0.8
Arizona (Kearney and Peebles 1960)	78	13	1.6
New Mexico (Roalson and Allred 1995)	67	11	1.7
Texas (Correll and Johnston 1970)	129	18	3.6
Nueva Galicia (McVaugh, pers. comm., 1997)	ca. 230	34	0.7
Guatemala (Standley and Steyermark 1949)	234	34	0.6
Costa Rica (Burger and Huft 1995)	ca. 160	45	0.3

era and species in Sonora with other areas in North and Central America.

Vegetation of Sonora

The major habitats or vegetation types in Sonora include mangroves and coastal vegetation, tropical deciduous forest, thornscrub, desertscrub (both Sonoran and Chihuahuan), grassland, oak woodland, pine-oak woodland, pine-oak forest, and mixed conifer forest. These vegetation types are briefly discussed below, with emphasis on their euphorbiaceous components. For more thorough discussions the reader is referred to Gentry (1942), Shreve (1951), Felger and Lowe (1976), Rzedowski (1978), Brown (1982), Búrquez et al. (in press).

Coastal vegetation.—Mangroves occur sporadically along the coastal fringe of the southern two thirds of the state but support no members of the euphorbia family. Three species of *Euphorbia* occur along the beaches. *Euphorbia incerta* is restricted to upper beaches and the plants are often washed with sea water during high tides. *Euphorbia platysperma* may extend onto the upper beaches but well above the highest tides. A substantial number of species occur on coastal dunes. *Euphorbia leucophylla* ssp. *comcaacorum* is essentially restricted to coastal dunes and sometimes occurs on upper beaches. A number of other euphorb species that occur on coastal dunes are also found farther inland, e.g., *Croton californicus*, *Jatropha cinerea*, *Euphorbia eriantha*, *E. petrina*, *E. platysperma*, and *E. polycarpa*.

Tropical deciduous forest (TDF).—The northern arm of TDF, sweeping northward from the tropics, ends in the mountains of eastern Sonora and southwestern

Chihuahua. Sonoran TDF is sandwiched between thornscrub to the west at lower elevations and oak zones eastward at higher elevations. Northward, along the east side of the Sonoran Desert, TDF merges into an inland thornscrub (Felger and Lowe 1976). In TDF the trees generally overtop the columnar cacti, while in thornscrub the columnar cacti overtop the small trees and shrubs (Gentry 1942). Undisturbed TDF in Sonora usually has 100% ground cover of forest often 10–15 m tall and made up of species of tropical origin or affinity. Tropical deciduous forest in Sonora has been variously termed by different authors. Howard Scott Gentry (1942) called it Short-tree Forest, David Brown (1982) called it Sinaloan Deciduous Forest, and others have referred to it as Tropical Dry Forest.

There is a long dry season interrupted by a short but intense rainy season generally from mid-June to October. Summers are long and hot and winters short and mild. Freezing weather is rare and most Sonoran TDF species are highly frost-sensitive. The weather gradually becomes hotter and dryer from March and April until the onset of the rains in June. Writers visiting during spring drought describe skeleton forests and the lack of greenery. The apparent difference between the dry and wet seasons in TDF is nearly as dramatic as the difference between winter and summer in temperate deciduous forests. Awesome and seemingly sudden transformation to luxuriant tropical green occurs with the onset of the summer monsoon.

In Sonora about 59 euphorb species occur here, or 41% of the total Sonoran species. All five of the arborescent euphorbs occur in TDF, and all except *Jatropha cordata* are restricted to this vegetation zone. *Drypetes gentryi* sometimes grows to 30 m in height along the bottoms of the deepest, most mesic, riparian canyons. *Sebastiania pavoniana* and *Croton* aff. *niveus* are the other two trees commonly found in TDF, but usually occupy relatively dry hillsides and are of much smaller size. *Acalypha cincta*, *Croton alamosanus*, *C. ciliatoglandulifer*, *C. flavescens*, *Ditaxis manzanilloana*, *Euphorbia colletioides*, *Jatropha malacophylla*, and *Manihot aesculifolia* are characteristic shrubs. *Dalechampia scandens* and *Tragia* sp. are frequently encountered vines. The monsoonal rains support a large number of annuals. The more common of these are *Acalypha aliena*, *A. polystachya*, *Euphorbia heterophylla*, *E. cyathophora*, and a number of members of *Euphorbia* subgenus *Agaloma*, including *E. graminea*, *E. sonorae*, *E. ocymoides*, and *E. dioscoreoides* ssp. *attenuata*.

Thornscrub.—Thornscrub in México is of tropical origin, where it might best be called tropical thornscrub. It is essentially a drier version of tropical TDF and intermediate between TDF and desertscrub. The boundaries are fuzzy. Like TDF, the plants show a

strong seasonality linked with monsoonal rains and are for the most part highly frost-sensitive. Unlike TDF, wholly natural tropical thornscrub generally does not form 100% perennial coverage. The stature of the non-riparian trees is lower, and the leaves generally smaller than those of the TDF. Thornscrub in Sonora supports 46 euphorb species (32% of the total euphorb flora).

Two thornscrub formations can be discerned in Sonora: the lowland thornscrub of southwestern Sonora, and the interior, foothill thornscrub along the east side of the Sonoran Desert and at higher elevations within the Sonoran Desert. Lowland thornscrub of southwestern Sonora—termed Sinaloan Thornscrub by Brown (1982) and Thorn Forest by Gentry (1942)—extends southward on the coastal plain from the southern margin of the Sonoran Desert in the vicinity of Guaymas into coastal, extreme northwestern Sinaloa. Southward and eastward it merges with TDF. Summer annuals or some herbaceous perennials can produce nearly 100% cover beneath the low green canopy. The diversity of winter annuals is low, and those that are present tend to be species that respond to rainfall at any season. The soil is deep and alluvial. Most of the coastal thornscrub has been converted to large-scale modern agriculture. Commonly encountered Euphorbiaceae of the coastal thornscrub in southwestern Sonora include the arborescent *Jatropha cordata*, shrubs such as *Adelia virgata*, *Bernardia viridis*, *Euphorbia californica*, *E. gentryi*, *E. tomentulosa*, *Jatropha cinerea*, *Pedilanthus macrocarpus*, herbs including *Euphorbia petrina*, *Phyllanthus evanescens*, and the vining *Tragia jonesii*.

Inland thornscrub is essentially synonymous with Shreve's (1951) Foothills of Sonora subdivision of the Sonoran Desert (Felger and Lowe 1976). It is a shrubby or semiarborescent scrub with a nearly closed canopy of small trees and large shrubs. Thornscrub extends northward along the eastern side of the Sonoran Desert like the tail of TDF narrowing in geographic width and elevation. Northward it gives out at about the vicinity of Arizpe, where elevations rise and winter freezing as well as drier conditions become pronounced. Prominent euphorb species of inland thornscrub include *Acalypha papillosa*, *Croton ciliatoglandulifer*, *C. flavescens*, *C. sonorae*, *Euphorbia colletioides*, *Jatropha cordata*, and *Manihot angustiloba*.

Sonoran Desertscrub.—The Sonoran Desert, defined and elegantly described by Forrest Shreve (1951), covers roughly the northwestern two thirds of Sonora. Shreve divided the Sonoran Desert into seven geographic vegetation zones, five of which occur in Sonora. As mentioned above, Shreve's Foothills of Sonora zone is essentially thornscrub. The other major areas of the Sonoran portion of the Sonoran Desert include the Plains of Sonora and portions of the Ari-

zona Upland, the Central Gulf Coast, and the Lower Colorado Desert. Within the span of environments in the Sonora portion of the Sonoran Desert there is great variation in vegetation cover and structure, and the number and kinds of species present. Arborescent cacti, small desert trees, and large shrubs are commonplace, but the driest region, near the Río Colorado, is devoid of trees. Approximately 63 euphorb species (44%) are recorded for the Sonora portion of the Sonoran Desert. Unlike thornscrub there is much open ground—you can usually run through the desert. Across most of the Sonoran Desert the majority of species making up the flora are annuals (ephemerals) that complete their life cycle in a single season. The numbers and percentage of annual species diminish in the other vegetation zones. In northwestern Sonora winter rains are more common than elsewhere in the state, and this region supports a considerable diversity of spring annuals (Felger 1980).

Most of the perennial Sonoran Desert plants have evolved from tropical or subtropical relatives that are today found in thornscrub and tropical deciduous forest. Many of the perennials are sensitive to winter freezing, their northern limits fixed by an invisible line of freezing temperatures and drought. The desert is essentially frost-free at its southern limits, such as near Guaymas, and the severity and duration of freezing increases northward. Similarly, drought is more severe northward and westward. For a discussion of Sonoran Desert climate and vegetation see Turner et al. (1995).

There are no truly arborescent Euphorbiaceae in the Sonoran Desert of Sonora other than *Jatropha cordata* at the desert margin. Prominent and widespread shrubs or subshrub species are *Acalypha californica*, *Croton californicus*, *C. sonorae*, *Ditaxis lanceolata*, *Euphorbia tomentulosa*, *Jatropha cardiophylla*, *J. cuneata*, *Sebastiania bilocularis*, and the less often encountered *Adelia* spp. Herbaceous euphorbs are frequent and widespread, and the Sonoran Desert is a stronghold for diversity of *Euphorbia* subg. *Chamaesyce*, including *Euphorbia abramsiana*, *E. capitellata*, *E. micromera*, *E. pediculifera*, *E. polycarpa*, and *E. setiloba*. Other characteristic herbaceous species include *Ditaxis neomexicana*, *Euphorbia eriantha*, and *Stillingia linearifolia*.

Six euphorb species in the Central Gulf Coast of Sonora (sensu Shreve 1951) otherwise occur exclusively on the Baja California Peninsula: *Cnidoscolus palmeri*, *Croton magdalenae*, *Euphorbia ceroderma*, *E. leucophylla*, *E. magdalenae*, and *E. xanti*.

Chihuahuan Desertscrub.—The northwestern corner of the Chihuahuan Desert extends into limited areas of northeastern Sonora and adjacent southeastern Arizona at elevations below about 1430 m. It is an inland desert, covering much of north-central México between

the Sierra Madre Occidental and Sierra Madre Oriental and extending into adjacent inland areas of the southwestern United States. At its northern limits freezing weather is much more severe than in the Sonoran Desert, which probably accounts for the absence of columnar cacti. Rainfall mostly occurs during the summer.

The Sonoran portion of the Chihuahuan Desert is bordered by grassland and oak woodland. As with the Sonoran Desert, there is open ground, and shrubs predominate. The substrate often consists of limestone and alkaline soils.

Only 11 euphorb species are recorded for the relatively small area of the Chihuahuan Desert in Sonora. Among these are *Bernardia myricifolia*, *Euphorbia indivisa*, *E. melanadenia*, *E. serrula*, *E. setiloba*, and *E. stictospora*.

Grassland.—Grassland habitats are primarily found across the valleys and low hills of northeastern Sonora at elevations above desertscrub and thornscrub but below oak woodland. Prime grassland in Sonora occurs from the international border west of Agua Prieta to near Cananea and also east of Agua Prieta to the foothills of the Sierra San Luis near the Chihuahua border. This grassland has been called Plains Grassland or Short-grass Prairie (Brown 1982). Winter minimum temperatures are lower and freezing weather more severe than in semidesert grassland. Winter freezing apparently excludes many members of the euphorbia family, especially woody species. The Euphorbiaceae occurring here are relatively few in number and mostly herbaceous. Eighteen species (13%) are present here and among these are *Acalypha phleoides*, *Croton pottii*, *C. texensis*, *Euphorbia chamaesula*, *E. radians*, *E. stictospora*, *Jatropha macrorhiza* var. *septemfida*, *Tragia nepetifolia* var. *dissecta*, and *T. ramosa*.

Oak woodland.—Oak woodland vegetation is widely distributed at elevations above desert, grassland, thornscrub, and tropical deciduous forest, but below pine-oak woodland. In Sonora, 43 species (30%) occur here. Across Sonora and northern México, the species composition and density of oak woodland changes both with elevation and from south to north. Although these oak zones have been called Madrean Evergreen Woodland (Brown 1982), many Sonoran oaks and associated species are deciduous during the late spring drought, and their biggest flush of new foliage occurs with the renewal of summer rains. In these regions "autumn colors" occur in late spring as the air and ground desiccate and temperatures soar.

Extensive areas in northeast and north-central Sonora are dominated by an open woodland of *Quercus emoryi* Torr. This species, with *Q. oblongifolia* Torr. and *Q. arizonica* Sarg., are among the most common low-elevation oaks in the northern part of the state. At lower elevations the oaks border grassland or desert-

scrub. There is sometimes a broad ecotone between oak woodland and grassland where the oak trees become widely spaced and grasses predominate. Such areas have been called oak-grassland or oak-savannah. Some common euphorbs of the northeastern Sonoran oak woodland are *Acalypha neomexicana*, *Cnidoscolus angustidens*, *Croton pottsii*, *C. texensis*, *Euphorbia chamaesula*, *E. indivisa*, *Tragia laciniata*, and *T. nepetifolia* var. *dissecta*.

In east-central and southeastern Sonora oak woodland sometimes forms a narrow belt between tropical deciduous forest and pine-oak woodland, or may be locally absent with pine-oak woodland occurring immediately above TDF. In these regions oak woodland sometimes occurs on acidic, hydrothermally altered soils within tropical deciduous forest where the ecotone between the two plant communities is often only a few meters wide.

Oak woodland in southeastern Sonora, called Oak Forest by Gentry (1942), shows considerable tropical affinity. The lower limits border tropical deciduous forest, and the boundaries are often remarkably well defined, apparently maintained by fire. Across mountains in the Río Mayo and Río Fuerte drainages, low fires creeping almost harmlessly through dry grasses and forbs among the leafless oaks are a common sight in May and June. These fires destroy small TDF trees and shrubs but not the perennial grasses, forbs, and oaks. Many of the oaks in east-central and southeastern Sonora and nearby southwestern Chihuahua are tropical montane oaks. In southeastern Sonora most of the characteristic euphorbs found in the oak forest also occur in pine-oak woodland and are enumerated below.

Pine-oak woodland.—There are numerous montane islands of pine-oak woodland in the mountains of eastern Sonora. However, pine-oak woodland is more extensive east of our region in Chihuahua, along the east side of the continental divide. In comparison, the western slope of the Sierra Madre Occidental the climate is generally somewhat wetter, with presumably milder winter temperatures, resulting in a more diverse flora with more tropical elements such as *Pinus ye-corensis* Debreczy and Rácz, *P. herrerae* Mart., *P. oocarpa* Schiede, and tropical-montane oaks. The pine-oak woodland has been included within the concept of Madrean Evergreen Woodland (Brown 1982). Thirty-one species (22%) occur in the Sonoran pine-oak woodland. Towards southeastern Sonora the pine-oak woodland is floristically and structurally more like Mexican pine-oak woodland than the temperate pine-oak woodland to the north. Pine-oak woodland is continuous with oak woodland at lower elevations. The pines form the overstory while the oaks generally form an understory.

At higher elevations the pines become increasingly conspicuous and the vegetation might be considered distinctive enough to be termed pine-oak forest or pine forest. Pine forest is characteristically dominated by one species of pine, usually *Pinus arizonica* Ehrenb. or *P. ayacahuite* Ehrenb. var. *brachyptera* Shaw, with scattered individuals or small groups of other trees such as oaks, especially *Q. gambelii* Nutt. and *Q. rugosa* Nee. This forest type is more widespread in Chihuahua and Durango than in Sonora, and has been called Madrean Montane Conifer Forest (Brown 1982). For our purposes it is not practical to distinguish pine-oak woodland from pine forest.

The euphorb species characteristic of northern Sonoran pine-oak woodland are essentially the same as occur in adjacent grassland and oak woodland. The majority of euphorbs frequent in Sonora's southeastern pine-oak woodland are herbaceous perennials, such as *Croton pedicellatus*, *Euphorbia anychioides*, and *E. colorata*. *Manihot isoloba* is a shrub, and *Acalypha neomexicana* and *Euphorbia subreniformis* are characteristic annuals of this vegetation.

Mixed conifer forest.—This zone is restricted to limited areas on the several highest mountain tops in northeastern Sonora and very limited areas near Yécora, in the upper Río Mayo drainage. Three conifers, *Abies*, *Pinus*, and *Pseudotsuga*, define this vegetation. Only three euphorbs, all herbaceous perennials, occur here: *Euphorbia alta*, *E. macropus*, and *E. sphaerorrhiza*.

Floristic Affinities

About 37 euphorb species known from Sonora are characteristic of the Sonoran Desert and are found either entirely or chiefly within this region. About 36 species are characteristic of the tropical/subtropical lowland vegetation of the Pacific slope of México, ranging primarily from Sonora to Oaxaca or sometimes into Central America. About 31 species are widespread in the southwest United States and adjacent northwest México, and another 13 species are widespread in the southwest United States and occur variously in mainland México. About a dozen species, the majority in *Euphorbia*, are widespread and native to the New World (mostly in tropical or subtropical regions) and have spread to the Old World in post-Columbian times. Nine species occur through México and Central America into South America. Only two species, *Euphorbia peplus* and *Ricinus communis*, are from the Old World.

Endemism and Rare/Endangered Taxa

Five species, one subspecies, and one variety are known only from Sonora. Of these, *Adelia obovata*,

Bernardia cinerea, *Euphorbia leucophylla* ssp. *com-caacorum*, and *Euphorbia pediculifera* var. *linearifolia* are probably truly endemic. Both *Euphorbia alatocaulis* and *Euphorbia chiribensis* occur close to the Chihuahua border and probably will also be found in that state. Similarly, *Croton subjuncundus* might occur in northern Sinaloa.

Although many species may be locally rare and known from few collections in Sonora, most of these are common elsewhere, and only a small number of Sonoran Euphorbiaceae appear globally rare and/or endangered. *Phyllanthus hexadactylus* is known from a single collection in Sonora and a small area in Michoacán. *Jatropha purpurea* is recorded in Sonora only from the type collected over one hundred years ago, and otherwise is known from a few collections in western Sinaloa. Much of the probable habitat for this species in Sinaloa has been converted to agriculture, and similar habitat in Sonora is threatened with the same fate. *Euphorbia sinaloensis* has been documented in Sonora only from higher elevations in the Sierra de Alamos, where it is locally common; otherwise there are a few records in Sinaloa and one in Durango. *Croton subjuncundus* is known to us from only three collections, all from the coastal plains of Sonora, where the deep, alluvial soil supports densely vegetated coastal thornscrub or thornscrublike mesquite-dominated vegetation within Sonoran desertscrub. Much of this habitat has been converted to agriculture. *Croton martinianus* is locally common in the Alamos area, but otherwise known from a single collection in northern Sinaloa and two in Jalisco. Similarly, *Euphorbia radioloides* has only been found once in Sonora; it ranges south to Guerrero but is very infrequently collected. *Euphorbia crepuscula* has been collected in Sonora three times and once in Sinaloa.

Growth Habits

About one third of our species are strictly annual, and both perennial herbs and shrubs each comprise slightly under one third of the remainder. *Euphorbia ceroderma*, *Pedilanthus bracteatus*, and *P. macrocarpus* are shrubby stem succulents. Five species are predominantly arborescent; these are *Croton* aff. *niveus*, *Drypetes gentryi*, *Jatropha cordata*, *Manihot* sp., and *Sebastiania pavoniana*. Only three species, *Dalechampia scandens*, *Tragia jonesii*, and *Tragia* sp. are vining.

SYSTEMATIC TREATMENT

Generic descriptions are brief, pointing out only the salient features, and the characteristics given are not necessarily consistent from genus to genus. The majority of descriptive terminology used in this paper is general; specialized terms for the Euphorbiaceae are

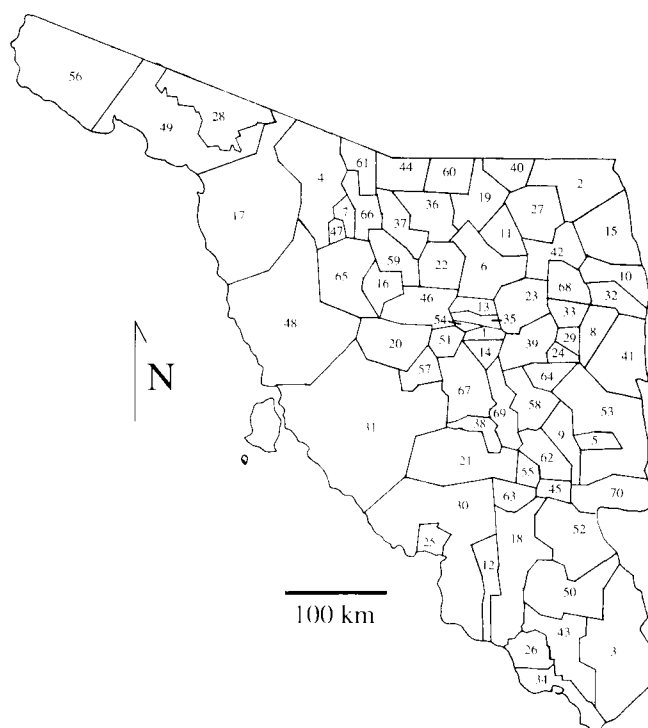


Fig. 2. Municipios of Sonora. 1. Aconchi.—2. Agua Prieta.—3. Alamos.—4. Altar.—5. Arivechi.—6. Arizpe.—7. Atil.—8. Bacadéhuachi.—9. Bacanora.—10. Bacerac.—11. Bacoachi.—12. Bábúm.—13. Banámichi.—14. Baviácora.—15. Bavispe.—16. Benjamín Hill.—17. Caborca.—18. Cajeme.—19. Cananea.—20. Caribó.—21. La Colorada.—22. Cucurpe.—23. Cumpas.—24. Divisaderos.—25. Empalme.—26. Etchojoa.—27. Fronteras.—28. General Plutarco Elías Calles.—29. Granados.—30. Guaymas.—31. Hermosillo.—32. Huachinera.—33. Huásabas.—34. Huatabampo.—35. Huépac.—36. Imuris.—37. Magdalena.—38. Mazatán.—39. Moctezuma.—40. Naco.—41. Nácori Chico.—42. Nacozi de García.—43. Navojoa.—44. Nogales.—45. Onavas.—46. Opodepe.—47. Oquitoa.—48. Pitiquito.—49. Puerto Peñasco.—50. Quiriego.—51. Rayón.—52. Rosario.—53. Sahuaripa.—54. San Felipe de Jesús.—55. San Javier.—56. San Luis Río Colorado.—57. San Miguel de Horecasitas.—58. San Pedro de la Cueva.—59. Santa Ana.—60. Santa Cruz.—61. Saric.—62. Soyopa.—63. Suaqui Grande.—64. Tepache.—65. Trincheras.—66. Tubutama.—67. Ures.—68. Villa Hidalgo.—69. Villa Pesqueira.—70. Yécora.

briefly defined where used. Brief descriptions of the habit and distinguishing or noteworthy characteristics are provided for species and infraspecific taxa. The months or seasons given after the habit description refer to the recorded times of reproduction. Flowering and fruiting usually overlap broadly, and therefore we generally do not distinguish separate flowering and fruiting times. The many species that are reproductive at various seasons do so facultatively, mostly depending on soil moisture and temperature.

A few representative specimens are cited in the last paragraph of the account of each species or infraspecific taxon. We include the Sonoran *municipio* (mpio.), as of 1995, wherever possible to help place the collection localities (see Fig. 2). We have seen all specimens except those specified as "not seen." Unless oth-

erwise indicated, specimens are from Sonora and deposited at the University of Arizona Herbarium (ARIZ); specimens in other herbaria are indicated by the abbreviations given in Holmgren et al. (1990) with the exception of the recently formed herbarium of the Universidad de Sonora in Hermosillo (USON). If a specimen is at ARIZ, we generally do not cite duplicates at other herbaria. Similarly, if we have seen a holotype or lectotype, we do not cite isotypes or isolecotypes. When a specimen lacks a collection number, it is identified by the date if available to us, for example: 30 Oct 1982, *Ezcurra s.n.* When the collec-

tion date seems significant, such as types or otherwise historically interesting specimens, both the collection number and date are given when available. The herbarium accession number is provided for type specimens and when necessary to avoid confusion.

When appropriate, references are provided for certain genera. The following references are useful for many species in a number of genera: Müller 1866; Standley 1923; Wheeler 1960; McVaugh 1961, 1995; Wiggins 1964, 1980. The reader is also referred to Pax/Pax and Hoffmann's treatments in *Das Pflanzenreich* IV, 147.

KEY TO THE GENERA

1. Latex present; flowers enclosed in a cuplike or slipper-shaped involucre of gland-bearing, united bracts, the whole structure simulating a bisexual flower by possessing a single, central ♀ flower that is surrounded by several to many ♂ flowers; ♂ flower consisting of a single, naked pedicellate stamen; ♀ flower consisting of a single, naked pedicellate pistil.
2. Cyathium spurred, strongly zygomorphic; glands enclosed by the cyathium; stems thick, green or grayish, and succulent *Pedilanthus*
- 2' Cyathium not spurred, overall appearance more or less actinomorphic; glands on the rim of the cyathium; stems various, but in ours only rarely (*Euphorbia ceroderma*) thick, green, and succulent *Euphorbia*
- 1' Latex present or absent; flowers obviously unisexual, not enclosed in a cuplike, gland-bearing involucre; ♂ and ♀ flowers with a perianth.
3. Leaves all palmately lobed, simple.
4. Plants scandent or vining; inflorescence very condensed, capitate, enclosed by 2 subopposite leaves and a number of smaller bracts; ♀ sepals 7–12, the margins bearing numerous stipitate glands; styles united; stigma peltate *Dalechampia*
- 4' Trees, shrubs or herbs, not scandent nor vining; inflorescence spiciform, racemose, cymose, or paniculate, not enclosed by leaves and bracts; ♀ sepals 3–5, with or without stipitate glands; styles, if united, then only at the base and free above; stigmas not peltate.
5. Leaves strongly peltate; stipules united and surrounding the buds; stamens numerous, fasciculate-ramified, each bearing many anthers; ovaries and capsules echinate *Ricinus*
- 5' Leaves not peltate (may appear slightly peltate in *Manihot* sp.); stipules not united around the buds; stamens 10 or fewer, each with a single anther; ovaries and capsules smooth (glabrous or pubescent).
6. Milky latex absent, the sap watery, clear or colored; petals present *Jatropha*
- 6' Milky latex present; petals absent but the calyx sometimes petaloid.
7. Inflorescences spiciform; ♀ flowers borne on an elongated pedicel; ♂ flowers highly reduced, with a single sepal wrapping around a single stamen *Dalembertia*
- 7' Inflorescences cymose, paniculate, or racemose; ♀ flowers subsessile; ♂ flowers not highly reduced, mostly with 5 sepals and 8–10 stamens.
8. Herbage and capsules with stiff, stinging hairs; leaves relatively shallowly lobed, the divisions less than half the blade; at least some of the stamens connate *Cnidoscolus*
- 8' Herbage and capsules glabrous or pubescent with soft, nonstinging hairs; leaves deeply lobed, the divisions more than half the blade; stamens free *Manihot*
- 3' Leaves not palmately lobed (long shoots of *Bernardia cinerea* sometimes with palmately trilobed leaves but the others unlobed) or if palmately lobed (*Tragia laciniata*), then evidently compound.
9. Staminate and ♀ flowers in axillary fasciculate clusters
10. Large trees; leaves 5 or more cm long; styles capitate; fruits drupaceous, 1-seeded *Drypetes*
- 10' Herbs or shrubs; leaves 0.8–4.5 cm long; styles filiform; fruits capsular, 2–6-seeded.
11. Shrubs; leaves exstipulate, mostly fasciculate; stamens 3–6; styles laciniate; ovules solitary in each cell of the ovary, the seeds 2–3 per fruit; seeds spherical *Adelia*
- 11' Shrubs or herbs; leaves stipulate, alternate; stamens ca. 8–17; styles once divided; ovules 2 in each cell of the ovary, the seeds 6 per fruit; seeds trigonous *Phyllanthus*
- 9' Staminate and ♀ flowers variously arranged but not in axillary fasciculate clusters.
12. Ovules 2 in each cell of the ovary, the seeds 6 per fruit; plants without latex; leaves entire; pubescence if present of unbranched hairs only.
13. Herbage, ovaries, and capsules densely glandular-pubescent; ♂ flowers with petals *Andrachne*
- 13' Herbage, ovaries, and capsules glabrous; ♂ flowers without petals. *Phyllanthus*
- 12' Ovules solitary in each cell of the ovary; seeds 2 or 3 (4) per fruit; plants frequently (but not necessarily) possessing one or more of the following traits: with latex; leaves toothed; pubescence malpighiaceae, stellate, or lepidote.
14. Indumentum (at least in part) stellate or lepidote.
15. Herbs, shrubs, or trees; pubescence of either stellate or lepidote hairs; leaves entire (only toothed in *Croton martinianus*, but this an herb); inflorescences bisexual (except in dioecious spp.); ♂ flowers usually with petals,

- the stamens inflexed in bud, the anther tips pointing downward and infolded against the base of the filament; seeds carunculate *Croton*
- 15' Shrubs; pubescence only of stellate hairs; leaves toothed; inflorescences unisexual; ♂ flowers without petals, the stamens erect in bud, the anther tips pointing upward; seeds ecarunculate *Bernardia*
- 14' Indumentum lacking (i.e., plants glabrous) or of unbranched or malpighiaceae hairs.
16. Pistillate flowers (except in *A. cincta* and *A. filipes*) enclosed or subtended by a toothed or lobed, foliaceous, accrescent bract; anther cells elongate and narrow, often flexuous-vermiform; styles multifid with many filiform segments *Acalypha*
- 16' Pistillate flowers not enclosed by such a bract; anther cells globose or oblong, not flexuous-vermiform; styles entire or bifid, rarely laciniate.
17. Flowers with petals; plants without stinging hairs or milky latex; malpighiaceae hairs often present.
18. Herbs or shrubs, 2 m tall or less; pubescence (except in *D. adenophora* and *D. serrata* var. *californica*), at least in part, of malpighiaceae hairs; ovary (except in *D. serrata* var. *californica*) pubescent; petals distinct; seeds less than 6 mm long, sculptured *Ditaxis*
- 18' Shrubs or small trees, often more than 2 m tall; glabrous or with unbranched hairs only; ovary glabrous; petals connate; seeds 9 or more mm long, smooth *Jatropha*
- 17' Flowers without petals; plants sometimes with milky latex and some with stinging hairs (*Cnidoscolus* and *Tragia*); hairs not malpighiaceae.
19. Annuals or herbaceous perennials, sometimes slightly woody at the base.
20. Plants with milky latex; herbage glabrous; flowers not on articulated pedicels; stamens two; sessile glands present at the base of the ♀ flower bracts; 3-horned gynobase persisting after dehiscence of the fruit *Stillingia*
- 20' Plants without milky latex; herbage with harsh, often stinging hairs; flowers on articulated pedicels; stamens 3–6 (rarely more); glands not present at base of the ♀ flower bracts (but sometimes with an indumentum of stipitate glands); 3-horned gynobase lacking *Tragia*
- 19' Shrubs, woody well above the base.
21. Leaves subfasciculate, entire, eglandular; style branches laciniate their whole length *Adelia*
- 21' Leaves alternate, entire or serrate (sometimes subfasciculate in *Sebastiania* but then the leaves serrate and glands present at the base of the blade); style branches entire or bifid, if laciniate then only at the apices.
22. Herbage with stiff, stinging hairs 1.6–7.5 mm long *Cnidoscolus*
- 22' Herbage glabrous or pubescent with nonstinging hairs mostly less than 1 mm long.
23. Plants without milky latex; leaves densely cinerous-pubescent, the lamina obscured by the hairs; stamens ca. 10; style branches with laciniate tips; capsule densely pubescent *Bernardia*
- 23' Plants with milky latex; leaves glabrous or sparsely pubescent, the lamina visible through the hairs; stamens 1–3; style branches entire; capsule glabrous.
24. Leaves palmiveined, coarsely and irregularly toothed, sometimes entire, the margins often ciliate; ♀ flowers and fruits pedicellate; ♂ flowers with a single stamen *Dalembertia*
- 24' Leaves penniveined, finely serrate their total length, the margins glabrous; ♀ flowers and fruits sessile; ♂ flowers with more than one stamen *Sebastiania*

ACALYPHA L.

Annuals to perennial herbs, shrubs (or elsewhere rarely small trees); mostly monoecious. Latex absent. Pubescence (in ours) of unbranched hairs, sometimes glandular. Leaves alternate, often long-petiolate, dentate-serrate, palmi- or penniveined. Inflorescences uni- or bisexual; ♂ inflorescences spikelike, mostly axillary but frequently a terminal extension of the ♀ inflorescence; ♀ inflorescences racemose, fasciculate, to paniculate, but usually axillary or terminal spikes. Staminate flowers minute, with a 4-lobed calyx; petals 0; stamens usually 8, filaments free, anthers characteristically pendulous and flexuous-vermiform. Pistillate

flowers usually subtended by bracts that enlarge and envelop the ovaries and capsules; sepals 3–5, much shorter than the ovary; petals 0; ovary mostly 3-locular, with 1 ovule per locule; styles 3, free or basally connate, laciniate. Seeds mostly ovoid (ours), caruncle minute or absent. Many Sonoran species possess unusual, 1-carpellate flowers and fruits at the apices of some pistillate spikes, which following Radcliffe-Smith (1973) are termed allomorphic.

Tropical with a few temperate members; widespread in the Old and New World; 450 species. Probably more than 70 species in México. Twelve species are recorded from Sonora, and two others are found very near the border and might occur within the state.

1. Shrub; all ♀ flowers long-pedicellate and 3-carpellate; ♀ bracts minute, not green and foliaceous nor divided into narrow segments *A. filipes*
- 1' Shrubs or herbs; ♀ flowers sessile or if pedicellate then these allomorphic and at the inflorescence tip, the proximal ♀ flowers regular and sessile; ♀ bracts usually foliaceous or divided into narrow segments (minute only in *A. cincta*).

2. Shrubs.
 3. Pistillate inflorescence densely stipitate glandular.
 4. Leaves mostly ovate; ♀ inflorescences usually less than 4 cm long; ♀ bracts usually crowded and obscuring the rachis, the central tooth not elongated *A. californica*
 - 4' Leaves often more lanceolate than ovate; ♀ inflorescences often more than 4 cm long; ♀ bracts usually well spaced and not obscuring the rachis, the central tooth often elongated *A. subviscida*
 - 3' Pistillate inflorescence not stipitate glandular, if any glands present, these restricted to the margins of the bracts.
 5. Largest leaves mostly more than 10 cm long, the underside of the blade often with a paler-colored margin; ♀ bracts less than 1 mm long, not enveloping the fruit *A. cincta*
 - 5' Largest leaves mostly less than 10 cm long, the underside of the blade lacking a paler-colored margin; ♀ bracts more than 2 mm long, enveloping the fruit.
 6. Pistillate bracts evenly and crenately toothed, the ca. 15–21 teeth less than 1/5 as long as the bract *A. californica*
 - 6' Pistillate bracts irregularly and coarsely toothed, at least some of the ca. 7–13 teeth 1/3 to 1/2 as long as the bract *A. papillosa*
- 2' Annuals or perennial herbs.
 7. Lobes of the ♀ bracts linear to setaceous or filiform, much longer than the undivided portion of the bract.
 8. Pistillate spikes ovoid to ellipsoid; ♀ bracts densely beset with straight, thin hairs to 2 mm long *A. alopecuroides*
 - 8' Pistillate spikes linear; ♀ bracts glabrous, glandular-granular, or with stipitate glandular hairs.
 9. Stems usually subfleshy and fistulose; ♀ bracts bearing gland-tipped hairs only; ovary smooth *A. polystachya*
 - 9' Stems not noticeably fleshy or fistulose; ♀ bracts densely granular-glandular, with or without gland-tipped hairs; ovary granular-glandular *A. ostryifolia*
 - 7' Lobes of the ♀ bracts rounded, ovate, or triangular, not longer than the undivided portion of the bract.
 10. Perennial herbs; ♂ spikes conspicuous.
 11. Herbage not glandular-stipitate; ♀ inflorescences, at least the well-developed ones, with ♂ flowers above; teeth of the ♀ bracts 5–7 *A. phleoides*
 - 11' Herbage frequently glandular-stipitate; ♀ inflorescences mostly without ♂ flowers above; teeth of the ♀ bracts 11–19 *A. subviscida*
 - 10' Annuals; ♂ spikes usually inconspicuous (sometimes conspicuous in *A. pseudalopecuroides*).
 12. Pistillate inflorescence capitate; ♀ bracts with slender, straight, spreading hairs more than 1 mm long; allomorphic flowers with spreading hairs *A. pseudalopecuroides*
 - 12' Pistillate inflorescence either elongate and spikelike or abbreviate and loose; ♀ bracts with hairs less than 1 mm long, these mostly curly and sometimes appressed; allomorphic flowers with appressed hairs only.
 13. Pistillate inflorescences mostly less than 2 cm long, apparently all axillary, mostly with fewer than 10 flowers; ♀ bracts crenate, the teeth broad and rounded at the apex *A. mexicana*
 - 13' Pistillate inflorescences (at least when mature) more than 2 cm long, terminal as well as axillary, mostly with more than 10 flowers; ♀ bracts irregularly and sometimes very shallowly serrate, the teeth pointed and acute to obtuse at the apex.
 14. Styles papillate towards the base; allomorphic flowers on a filiform pedicel and usually exerted from the subtending bract *A. burquezii*
 - 14' Styles not papillate; allomorphic flowers subsessile and closely enveloped by the subtending bract.
 15. Older stems often with long, spreading hairs reaching 2–3.5 mm, as well as smaller, curly and appressed hairs; central tooth of the ♀ bracts about equal to the lateral teeth, not more than twice as long *A. aliena*
 - 15' Stems with curly, appressed hairs but without long, spreading hairs (rarely with spreading hairs less than 1 mm); central tooth of the ♀ bracts conspicuously elongated, more than twice as long or large as the lateral teeth *A. neomexicana*

ACALYPHA ALIENA Brandegee, Proc. Calif. Acad. Sci. ser. II, 3: 172. 1891.—TYPE: México, Lower California [Baja California Sur], San José del Cabo, Sep–Oct 1890, *Brandegee s.n.* (holotype UC[#109873]!).

Acalypha simplicissima Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 417(–418). 1916.—TYPE: México, Yucatán, Progreso, in a shady coppice, *Gaumer 1182* (holotype F[#438255], not seen, photo [Field Mus. neg. 52591]!; isotype NY!).

Erect summer annual; July–October. Shaded or riparian habitats in Sonoran desertscrub, thornscrub, and tropical deciduous forest; 75–500(–900). Central and southern Sonora, from the vicinity of Hermosillo nearly to the Sinaloa border. Baja California Sur and southwestern Chihuahua to at least as far south as Oaxaca in western México and also in Yucatán and Nicaragua.

This species is a common understory herb of the tropical deciduous forest in the southeastern part of the state. While most of the specimens from this area have long, spreading hairs on the lower stems, there is a gradient to plants completely lacking these hairs (e.g., *Gentry 1613*). All of the Baja California specimens examined, including the type, lack long, spreading hairs. There is also variation in the allomorphic fruits; well-developed lateral circular projections often occur, but these can be lacking.

This species and *A. neomexicana* are very similar and undoubtedly closely related; the relationship between them should be investigated further. In addition to the somewhat subtle morphological differences given in the key, *A. aliena* usually possesses substantially more allomorphic flowers than does *A. neomexicana*,

and the herbage of *A. neomexicana* in age tends to become suffused with bright red coloration, a condition not observed in *A. aliena*. Also, these taxa have different elevational distributions. *Acalypha aliena* occurs from 75 to 500 m (with one collection at 900 m) in thornscrub and tropical deciduous forest, while *A. neomexicana* occurs from 800 to 1700 m, primarily in oak and pine-oak woodland.

Mpio. Alamos: Chorihoa, *Gentry 1613*; Alamos, *Steinmann 93-223*; Agua Salada, 27°15'N, 108°46'W, *Steinmann 93-225*. Mpio. Hermosillo: 16 mi S of Hermosillo on rd to Guaymas, *Wiggins & Rollins 194*. Mpio. Onavas: Agua Amarilla (Los Pinitos), 15 km WNW of Tepoca, *Van Devender 95-750*.

**ACALYPHA ALOPECUROIDEA* Jacq., *Collectanea* 3: 196(-197). 1791. *Ricinocarpus alopecuroides* (Jacq.) Kuntze, *Revis. Gen. Pl.* 2: 617. 1891.—TYPE: Based on material from Venezuela, no collection was cited in the protologue. This species was exquisitely illustrated in the subsequent year (Jacquin, N.J., *lc. Pl. Rar.* 3(9): plate 620. 1792.), and in the absence of a specimen, the plate could serve as type.

Annual or perhaps short-lived perennial. Tropical deciduous forest in the upper Río Mayo drainage of southwestern Chihuahua and possibly present in adjacent Sonora. Southward to South America and also in the West Indies.

CHIHUAHUA. Guasaremos, canyon, *Gentry 2424*.

Acalypha burquezii V. W. Steinm. & Felger, sp. nov.—TYPE: México, Sonora, Mpio. Sahuaripa, El Victor, on the Río Mulatos, ca. 3 km E of Mulatos, 28°39'40"N, 108°43'15"W, 920 m, 13 Oct 1994, *Felger & Búrquez 94-396* (holotype Ariz[#335469]; isotypes DAV, MEXU, NY, RSA, USON). Fig. 3-5.

Annua, 12-35 cm alta, radix non profunda, pilis incurvatis vel hispidis, pili usque 1.2 mm longi; folia plerumque alterna; stipulae triangulatae vel triangulato-subulatae, ca. 1 mm longae; petioli graciles, 3.8-7.6 cm longi; laminae ovatae, 6.1-7.2 cm longae, 3.9-7.2 cm latae, e basi 3 vel 5-nerves, basi cuneatae vel rotundatae, apice breviter acuminatae; margine serratae vel crenato-serratae; spicae ♂ axillares relative inconspicuae, 0.35-1.4 cm longae; flores ♂ arcte aggregati, 0.5-0.7 mm lati, cremei, pedicelli 0.4-0.5 mm longi; spicae ♀ terminales vel axillares, 1.7-6.5 cm longae, ca. 5-6 mm latae; bracteae usque 36, 2.5-4.5 mm longae, 3.5-4.5 mm latae, cupulatae, flabellatae; dentes (5) 7 vel 9, plerumque deltoidei; sepala ♀ 3, late subulata, 0.3-0.5 mm longa; styli laciniati, 1.6-2.7 mm longi, papilloso basem versus; capsula 3-lobata, ca. 2 mm diametro; semina late ovoidea, 0.9-1.1 mm longa, 0.7-0.9 mm diametro, reticulato-foveolata.

Erect to decumbent annual, mostly 12-35 cm tall and from a shallow root, herbage with a sparse to dense indumentum of short, mostly incurved hairs interspersed with sparser hispid hairs to 1.2 mm long; primary stem well developed, with short lateral

branches or the lateral branches sometimes as large as the primary stem when growing in dry, sunny habitats; internodes 19-28 mm long towards base, decreasing in length towards the ends of the branches; leaves primarily alternate, those of the lower 2 nodes often opposite or one leaf of the pair reduced or failing to develop; stipules triangular to triangular-subulate, ca. 1 mm long, hispid; petioles slender, 3.8-7.6 cm long, often longer than the blades; blades ovate, 6.1-7.2 cm long, 3.9-4.4 cm wide, moderately bicolored, cuneate to rounded at base, palmately 3(5)-veined, the central vein pinnately branched, sparsely hispid on both surfaces but mostly along the veins, the apex mostly short-acuminate with an acute to obtuse distal tooth; margins serrate to crenate-serrate, 9-13 teeth on each side of the blade, the basal third subentire; ♂ spikes axillary, relatively inconspicuous, 0.35-1.4 cm long including the peduncle, commonly arising from the same axil as the ♀ spikes but also solitary in the lower nodes; ♂ flowers crowded, 0.5-0.7 mm wide, cream-colored, on slender pedicels 0.4-0.5 mm long; ♀ spikes terminal and axillary, maturing basipetally, 1.7-6.5 cm long including the short peduncle, ca. 5-6 mm wide, the terminal spike often largest and with one or two associated axillary ♂ spikes or smaller associated ♀ spikes; ♀ bracts ca. 10-36 on the larger spikes, cupped, flabellate, 2.5-4.5 mm long, 3.5-4.5 mm wide, green, 1-flowered, mostly wider than long, the abaxial surface with slender stipitate-glandular hairs intermixed with hispid eglandular hairs, the adaxial surface essentially glabrous, the marginal teeth (5) 7 or 9, deltoid or sometimes very shallow, the central tooth largest with lateral teeth progressively smaller; ♀ sepals 3 (sometimes inconspicuous and appearing absent), broadly subulate, 0.3-0.5 mm long including the hispid-setose fringes, scarious-membranous; styles 3, the divisions entire and papillose towards the base, lacinate at the apices, 1.6-2.7 mm long, green to pale yellowish or reddish; ovaries and capsules setose-hispid, the capsules 3-lobed, ca. 2 mm in diameter; pedicellate allomorphic flowers terminating the ♀ spikes, the pedicel 1.1-2.8 mm long, the ovary 0.8-1.2 mm wide including a pair (one on each opposite "face" of the ovary) of broad, cup- to plate-shaped nearly entire to denticulate wings or the ovary not winged; seeds plump, broadly ovoid, 0.9-1.1 mm long, 0.7-0.9 mm in diameter, red-brown, covered with a thin and iridescent-lustrous whitish coat when mature, shallowly reticulate-foveate, the fovea concave, in longitudinal rows, less than 0.1 mm wide.

Appearing with the summer rains, mostly an undergrowth herb but sometimes also in more open areas; pine-oak forest, oak woodland, and the uppermost margin of riparian tropical deciduous forest in east-central Sonora at 920 to 1460 m (to 1800 m in adjacent Chihuahua and 1980 m in Sinaloa). Documented for

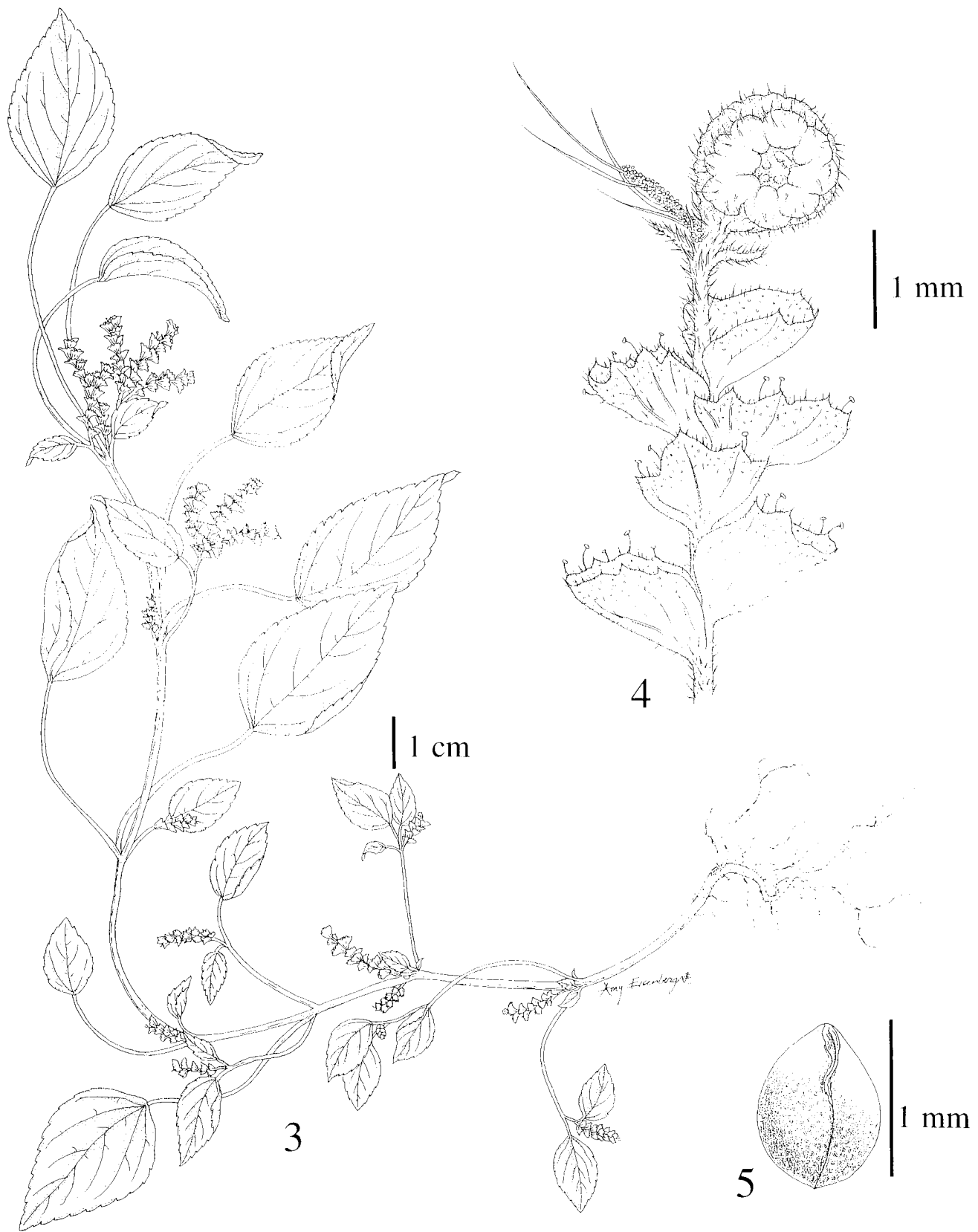


Fig. 3–5. *Acalypha burquezii*. 3. Habit.—4. Pistillate bracts and allomorphic flower.—5. Seed. All from Felger & Burquez 94–396.

east-central Sonora in the vicinity of Mulatos and east of Yécora near the Chihuahua border, also in nearby western Chihuahua in the vicinity of Nabogame and northern Sinaloa in the Sierra Surutato.

This species appears to be related to *Acalypha neomexicana*, from which it differs by the papillate style bases, less conspicuously vined and fewer-toothed pistillate bracts, and pedicellate allomorphic flowers. It is named in honor of Dr. Alberto Búrquez, of the northwest regional division of the Centro de Ecología of the Universidad Nacional Autónoma de México in Hermosillo, Sonora, who has made major contributions to the conservation and ecological and botanical knowledge of the Sonoran region.

Paratypes.—Mpio. Sahuaripa: Puerto El Victor, ca. 2 km E of Mulatos, *Felger & Búrquez* 94-491; 1.6 km S of Mulatos, canyon, 28°38'30"N, 108°45'42"W, *Felger & Búrquez* 94-734. Mpio. Yécora: Arroyo Hondo, 11.5 km E of El Kípor, 4 km W of Chihuahua border on SON 16, 28°26.5'N, 108°32.5'W, *Van Devender* 96-576 (ARIZ, RSA).—CHIHUAHUA. Mpio. Temosachic: Nabogame, 28°30'N, 108°30'W, *Laferrière* 2202 (ARIZ, SD).—SINALOA. Mpio. Badiraguato: Sierra Surutato, 3 mi N of Los Ornos along rd to Ocuahui, *Breedlove & Thorne* 18366 (CAS, RSA).

ACALYPHA CALIFORNICA Benth., Bot. Voy. Sulphur 51(-52). 1844. *Ricinocarpus californicus* (Benth.) Kuntze, Revis. Gen. Pl. 2: 617. 1891.—TYPE: México, Lower California [Baja California Sur], Magdalena Bay, Oct–Nov 1839, *Barclay* 3138 (lectotype BM[#510670]!, designated by Levin 1994, p. 263).

Acalypha pringlei S. Watson, Proc. Amer. Acad. Arts 20: 373. 1885.—TYPE: México, Sonora, [150 mi S of the United States border], ravines, shore of the Gulf of California, 29 Mar 1884, *Pringle s.n.* (holotype GH!).

Acalypha stokesiae [as *stokesii*] Pax & K. Hoffm., in Das Pflanzenreich IV. 147. xvi [Heft 85]: 138. 1924.—TYPE: United States, California, San Diego, *Stokes s.n.* (according to Levin [1994, p. 263] the holotype at B has been destroyed and no isotypes are known).

Small shrub to 1.5 m tall with slender, woody stems, the herbage often glandular and viscid; reproductive at various seasons. Sonoran desertscrub, thornscrub, and rarely arid slopes in tropical deciduous forest; near sea level to 870 m. Extreme northwestern Sinaloa through western Sonora to southwestern Arizona; Islas Tiburón, San Esteban, and Turners; and the Cape Region of Baja California Sur to southern California.

Wiggins (1964, p. 797) treated the nearly eglandular populations from the vicinity of Guaymas southward as *Acalypha vagans* Cav., a species of southern México. The tendency towards eglandular herbage and slightly larger leaves do not appear sufficient to warrant separation from *A. californica*. Such characteristics are expected in the more mesic habitats where these populations occur. In *A. vagans* the pistillate spikes are strictly axillary, but the Sonoran plants have terminal as well as axillary pistillate spikes.

In southern Sonora, *Acalypha californica* appears to intergrade with *A. subviscida*. Two collections (*Sanders* 9466 & *Martin s.n.* [21 Aug 1990]) from the vicinity of Cerro Las Tatemas near Alamos appear to have characteristics of both species. The leaves are more or less lanceolate and thus reminiscent of *A. subviscida*, but the bracts, although relatively well-spaced, are particularly large for *A. subviscida* and lack the frequently encountered elongated central tooth of that species. In these latter two characteristics, the plants resemble *A. californica*. Although *A. subviscida* is common in tropical deciduous forest, Cerro Las Tatemas is the only known tropical deciduous forest station for "true" *A. californica* (e.g., *Steinmann* 94-153). The placement of these intermediates is unclear, but they may represent hybrids between *A. californica* and *A. subviscida*. These two species are otherwise usually spatially separated with *A. californica* in desertscrub and thornscrub and *A. subviscida* in tropical deciduous forest and oak/pine-oak woodland.

Acalypha californica is also closely related to *A. comondwana* Millsp. of Baja California Sur, and a careful study of these species is desirable. A detailed study of the variation within *A. californica* was presented by Levin (1994).

Mpio. Gen. Plutarco Elías Calles: 2.6 mi W of Sonoyta on MEX 2, *Felger* 86-403. Mpio. Guaymas: Guaymas, 1887, *Palmer* 262 (UC). Mpio. Alamos: Cerro Las Tatemas, *Steinmann* 94-153. Mpio. Huatabampo: 1.5 km NW of Camahuíroa on the rd to Las Bocas, *Steinmann* 93-366.

ACALYPHA CINCTA Müll. Arg., Linnaea 34: 20. 1865. *Ricinocarpus cinctus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 617. 1891.—TYPE: According to the protologue, "In Mexico (Pavon! in hb. Boiss.)." This specimen, the holotype, is now at G-BOIS (not seen) and is surely a Sessé and Moçño collection.

Acalypha gentryi Standl., Field Mus. Nat. Hist., Bot. ser. 22: 34. 1940.—TYPE: México, Chihuahua, El Limón, 3000 ft, 25 July 1935, *Gentry* 1540 (holotype F[#809958]!).

Drought-deciduous shrub 2–4 m tall, notable in possessing leaves that usually have a distinctly paler margin and in possessing highly reduced pistillate bracts that do not envelope the fruits; mostly July to November. Riparian habitats in tropical deciduous forest in southeastern Sonora; 230–800(–1100) m. Also southwestern Chihuahua southward at least to Guerrero.

Mpio. Alamos: Cañón las Ardillas, side canyon on the E side of Río Guajaráy, ca. 2 km upstream from Los Agueros, 27°39'N 108°58'W, *Felger* 94-72; Sierra Saguaribo, Tepopa, NW of Chiribo, 22 Aug 1992, *Martin et al s.n.*

ACALYPHA FILIPES (S. Watson) McVaugh, Brittonia 13: 149(–150). 1961. *Corythea filipes* S. Watson, Proc. Amer. Acad. Arts 22: 451(–452). 1887.—TYPE:

México, Jalisco, Barranca [9 mi NE of Guadalajara], June 1886, *Palmer 90* (holotype GH!).

Acalypha coryloides Rose, Contr. U.S. Natl. Herb. 1: 357(–358). 1895.—TYPE: México, Colima, Manzanillo, 1–31 Dec 1890, *Palmer 1811* (lectotype US[#90756]!), here designated). Rose cited two collections in the protologue, the other being *Palmer 1368* (US[#46890]!). We designate the more complete specimen as lectotype.

Shrub to 2 m tall; May and December, so far as known. Tropical deciduous forest in southeastern Sonora; 260–700 m. Southward in western México to Guerrero and Puebla, Baja California Sur, and central México at least in Querétaro. This is the only Sonoran representative of the tropical, mainly New World subgenus *Linostachys* (Klotzsch) Pax & K. Hoffm. This subgenus is characterized by possessing only long-pedicellate pistillate flowers in racemes or panicles and subtended by minute, nonacrescent bracts.

McVaugh (1961, p. 149) treated *Corythea multiflora* Standl. [= *Acalypha multiflora* (Standl.) Radcl.-Sm.] as a synonym of this species, but as pointed out by Radcliffe-Smith (1976), *A. multiflora* is distinct from *A. filipes*, differing by its long-petiolate leaves and many-flowered pistillate inflorescences.

Mpio. Alamos: 1 mi ENE of El Frijole (on rd to San Bernardo), 27°17'10"N, 109°01'40"W, 16 May 1986, *Martin s.n.*; Cerro Las Tamas, ca. 14 km NW of Alamos, *Steinmann 94–157*; Güirocoba crossing of the Río Cuchujaqui, 12.3 km by air SSE of Alamos, *Van Devender 94–885*.

**ACALYPHA MEXICANA* Müll. Arg., *Linnaea* 34: 41(–42). 1865. *Ricinocarpus mexicanus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 618. 1891. *Acalypha indica* L. var. *mexicana* (Müll. Arg.) Pax & K. Hoffm., in *Das Pflanzenreich* IV. 147. xvi [Heft 85]: 35. 1924.—TYPE: Three Mexican collections were cited in the protologue: *Pavón* [probably a Sessé and Mocino collection], *Ehrenberg*, and *Uhde*. The latter two specimens were probably at B. There is a photo (Field Mus. neg. 7143) of a specimen at G-DC that appears to be the “*Pavón*” collection. We are unaware of a lectotypification.

Annual, often with rather large, crenately margined pistillate bracts. Not recorded for Sonora but known nearby from one collection in southeastern Arizona and one in west-central Chihuahua; it may occur in adjacent Sonora. Generally ruderal and most likely not native to the region.

This species is frequently treated as a New World variety of the otherwise Old World *A. indica*. Pax and Hoffmann, when relegating *A. mexicana* to varietal status, gave no explanation why they were making the change in rank. Similarly, no subsequent author has given justification for recognizing this taxon as a variety. The New World plants differ from Old World *A.*

indica by being more delicate, by the possession of pistillate bract margins that are crenate (vs. shallowly repand-dentate), and by shorter pistillate inflorescences that are borne in the axils of nearly all of the main-stem nodes. In light of no evidence suggesting a close relationship between the Old World and New World plants, we believe that this taxon is best treated at the rank of species.

CHIHUAHUA. Mpio. Temosachic: Nabogame, 28°30'N, 108°30'W, 1800 m, *Laferrière 2087* (SD).—ARIZONA. Chiricahua Mts., near Cedar Gulch, Paradise, 5300 ft, 21 Sep 1907, *Blumer 1710*.

ACALYPHA NEOMEXICANA Müll. Arg., *Linnaea* 34: 19(–20). 1865. *Ricinocarpus neomexicanus* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 618. 1891.—TYPE: United States, New Mexico, *Wright 1817 & 1818* (syntypes G, not seen; isosyntypes NY!). According to McVaugh (1995, p. 187), *Wright 1817* at G was annotated as the lectotype by G. L. Webster in 1964. However, it appears that Webster's designation has not been formally published.

Erect summer annual, characterized by the possession of rhomboid-ovate pistillate bracts with a markedly elongated central tooth, the plant tending in age to become suffused with bright-red coloration; August–October. Upper margin of Sonoran desertscrub and oak/pine-oak woodland in eastern Sonora; 800–1700 m.

With the recent circumscription of *A. neomexicana* var. *jaliscana* (McVaugh 1995, pp. 186–187), the Sonoran plants belong to var. *neomexicana*. However, var. *jaliscana* (= *A. salvadorensis* Standl.) is quite distinct from *A. neomexicana* and may best be treated at the rank of species. Typical *A. neomexicana* ranges from Arizona to Texas and Chihuahua south to San Luis Potosí and Aguascalientes; it is also reported from Jalisco and Michoacán (McVaugh 1995, p. 187). This species is closely related to *A. aliena* (see note under that species).

Mpio. Cucurpe: Palm Canyon, 17.7 mi SE of Magdalena, Cerro Cinta de Plata, 2 Oct 1976, *Van Devender et al. s.n.* Mpio. Agua Prieta: Colonia Morelos, *White 4138*. Mpio. Alamos: Sierra de Alamos, *Steinmann 93–443*. Mpio. Sahuaripa: vicinity of Mulatos, *Felger 94–584*.

ACALYPHA OSTRYIFOLIA [as *ostryafolia*] Riddell, Syn. Fl. West. States 33. 1835.—TYPE: United States, according to the protologue, this species was “Found by Mr. T. G. Lea, on one of the Kentucky hills opposite Cincinnati. Aug.–Sept.” At NY [!] there is a specimen that bears a label stating “Cincinnati, *Lea 19*.” On this specimen Lea comments that it was from his garden and Riddell was mistaken as to the type-locality. Although this specimen appears to represent type material, we are uncertain of its status.

Erect summer annual with deeply divided, glandular-granular pistillate bracts; August–October. Thornscrub, tropical deciduous forest, and lower oak woodland in north-central, eastern, and southern Sonora; 75–940 m. Eastern United States to Arizona, Baja California Sur, and much of mainland México to central America.

Acalypha ostryifolia frequently has been referred to as *A. caroliniana* Elliot, but this latter name is invalid because Elliot was not describing a new species. Instead, he was misapplying the name *Acalypha caroliniana* Walter to plants of *A. ostryifolia*.

Sonoran specimens from tropical deciduous forest and thornscrub lack gland-tipped hairs on the pistillate bracts and herbage, while specimens from elsewhere in the state possess long, gland-tipped hairs. Both morphs are present in southern Arizona, sometimes at the same locality.

Mpio. Cucurpe: Saracachi Ciénaga on Río Saracachi just W of Rancho Agua Fria, 12.4 mi by rd NNE of Cucurpe, *Van Devender* 91–675. Mpio. Navojoa: Arroyo Masiaca, ca. 0.5 km N of Teache de Masiaca, *Van Devender* 93–965. Mpio. Alamos: Sierra de Alamos, N side of the range, *Steinmann* 93–316.

ACALYPHA PAPILLOSA Rose, Contr. U.S. Natl. Herb. 1: 358. 1895.—TYPE: México, Sonora, [Mpio. Huatabampo], Agiabampo, [3–15 Oct] 1890, *Palmer* 778 (lectotype US[#208982]!, here designated; isotype US[#208983]!). Rose based this species on a single collection, but neither sheet at US is identifiable as the holotype; we designate the better of the two specimens as lectotype.

Shrub to 2.5 m; June–October. Thornscrub, tropical deciduous forest, grassland, and oak woodland from north-central Sonora to the Río Mayo region; near sea level to 1300 m. Also adjacent Chihuahua and northern Sinaloa. In Sonora, this species is primarily one of oak woodland with a few lowland collections, including the type.

Acalypha papillosa appears closely related to *A. schiedeana* Schltdl., the type of which is from Veracruz. This complex needs further review, but at present we maintain *A. papillosa* as distinct.

Mpio. Imuris: along MEX 2, 28 km by rd NE of the junction with MEX 15, ca. 30°53'N, 110°40'30"W, *Steinmann* 942. Mpio. Cucurpe: Palm Canyon, 25 km SE of Magdalena on rd to Cucurpe, Sierra Babiso, *Van Devender* 95–681. Mpio. Guaymas: Sierra Libre, Cañada El Tetabejo, *Van Devender* 95–1045. Mpio. Bavispe: Cañón de Bavispe, *White* 3001. Mpio. Sahuaripa: 1.6 km S of Mulatos, *Felger & Búrquez* 94–735. Mpio. Cajeme: Cerro Bojihuacame SE of Cd. Obregón, *Gentry* 14508. Mpio. Alamos: 7 mi by rd N of Güirocoba, 4 Aug 1988, *Salmon s.n.*

ACALYPHA PHLEOIDES Cav., Anales Hist. Nat. 2: 139(–140). 1800. *Ricinocarpus phleoides* (Cav.) Kuntze, Revis. Gen. Pl. 2: 618. 1891.—TYPE: México, Guerrero, Tixtla, *Née* (probably MA, not seen).

Acalypha lindheimeri Müll. Arg., Linnaea 34: 47. 1865. *Ricinocarpus lindheimeri* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 618. 1891.—TYPE: In the protologue Müller cites many specimens, including *Lindheimer* 520 from Texas. At NY there is a specimen of *Lindheimer* 520 [!] that was labeled as the lectotype by Lilian Miller in 1964. Since Müller almost surely did not see this specimen, it should not serve as lectotype. According to Rogers McVaugh (pers. comm., 1995), *Lindheimer* 520 at G, which Müller did see and study, was labeled as the lectotype by G. L. Webster, also in 1964, but this lectotypification was apparently never published.

Acalypha lindheimeri Müll. Arg. var. *major* Pax & K. Hoffm., in Das Pflanzenreich IV. 147. xvi [Heft 85]: 25. 1924.—TYPE: United States, Arizona, Chiricahua Mts., Miss Rhoda Riggs' Ranch, 5500 ft, 31 Oct 1906, *Blumer* 1498 (Pax and Hoffmann did not indicate in which herbarium they saw *Blumer* 1498. If the specimen was at B, it has likely been destroyed. There is an isotype at ARIZ[#69303]!).

Herbaceous perennial with numerous stems arising from a central rootstock; July–November. Arroyos and riparian montane canyons in grassland and oak woodland, ca. 1500–1650 m. Northeastern Sonora including the Sierra de los Ajos and Sierra del Tigre. It is also in the upper Río Mayo region of southwestern Chihuahua at 2000 m and may occur in adjacent southeastern Sonora. Texas to southeastern Arizona and southward to Guatemala. We follow McVaugh (1961, pp. 150–151; pers. comm., 1995) in treating *A. lindheimeri* as a synonym.

Mpio. Cananea: Cañón Evans, Sierra de los Ajos, *Fishbein* 649. Mpio. Bavispe: Arroyo Carretas, Carretas, *White* 1097.

ACALYPHA POLYSTACHYA Jacq., Pl. Hort. Schoenbr. 2: 64; pl. 246. 1797. *Ricinocarpus polystachyus* (Jacq.) Kuntze, Revis. Gen. Pl. 2: 618. 1891.—TYPE: This species was based on plants growing in the Schönbrunn Garden near Vienna; its native land and collectors were unknown to Jacquin. We are unaware of Jacquin's original material, but it should be looked for at BM. In the absence of specimens, the excellent plate included in the protologue could serve as the type. There is a widely distributed photo of a specimen at G-DC (Field Mus. neg. 7125) that is reported to be the type of this species. The label states "Nueva España Herb. Pavon," and the collector is said to be Pavón. This is undoubtedly a Sessé and Moçño collection. Although the source of the seeds grown at the Schönbrunn Garden may have been Sessé and Moçño, we see no strong evidence supporting this specimen as original material.

Acalypha filifera S. Watson, Proc. Amer. Acad. Arts 22: 451. 1887.—TYPE: México, Jalisco, barranca near Guadalajara, June 1886, *Palmer* 111 (holotype GH!).

Acalypha matudai Lundell, Contr. Univ. Michigan Herb. 4: 10(–11). 1940.—TYPE: México, Chiapas, Las Garzas, Acapet, 4–7 June 1938, *Matuda* 2717 (holotype MICH!).

Rank, turgid summer annual with robust, thick, semi-succulent stems and large leaves; August–October. Ri-

parian and mesic habitats in grassland, oak woodland and tropical deciduous forest; 240–900 m. Sonora from the vicinity of Imuris southward. Also southwestern Chihuahua to northern South America.

This species is sometimes confused with *A. ostryifolia*, but the two are quite distinct and readily distinguished by the characteristics given in the key.

Mpio. Imuris: 11 mi (by rd, MEX 15) N of Imuris, *Felger* 80–8. Mpio. Bacerac (or perhaps Huachineras): Horconcitos, *White* 2716 (RSA). Mpio. Alamos: San Bernardo, *Gentry* 1623. Mpio. Onavas: along MEX 16, ca. 30 km SE of the Río Yaqui crossing, 28°29'07"N, 109°21'29"W, *Steinmann* 1002.

ACALYPHA PSEUDALOPECUROIDES Pax & K. Hoffm., in *Das Pflanzenreich* IV. 147. XVI [Heft 85]: 86(–87). 1924.—TYPE: México, Guerrero, Iguala Canyon, 2500 ft, 22 Sep 1905, *Pringle* 10055 (isotype GH!), annotated by McVaugh, in 1994, as to be designated lectotype in forthcoming *Flora Novo-Galiciana* 7); Puebla, Coxcatlán, 1800–2000 m, *Purpus* 4159 (isotype UC!).

Huevos de Conejo. Leafy summer-fall annual. Relatively common and often ruderal in the thornscrub and tropical deciduous forest of southern Sonora; 75–500 m. Southward to Nicaragua.

Mpio. Alamos: Sierra de Alamos, *Gentry* 17817; *Steinmann* 963. Mpio. Navojoa: Arroyo Masiaca, ca. 0.5 km N of Teachive de Masiaca, *Van Devender* 93–966. Mpio. Onavas: Onavas, *Rea* 1267 (SD).

ACALYPHA SUBVISCIDA S. Watson, *Proc. Amer. Acad. Arts* 21: 440. 1886.—TYPE: México, Chihuahua, Hacienda San José, 25 mi S of Batopilas, Aug 1885, *Palmer* 39 (holotype GH!).

Perennial herb to shrub 2 m tall; mostly July to October. Tropical deciduous forest, oak woodland, and pine-oak woodland in southeastern Sonora; 240–1700 m. Guatemala (Standley and Steyermark 1949, p. 44) to Sonora and southwestern Chihuahua.

This is a highly variable species in our region, unless more than one taxon is represented. The plants are shrubs to perennial herbs but can even appear as annuals (probably perennials flowering in first year); the inflorescences can be densely glandular-pubescent to nearly eglandular, and the pistillate bracts can lack their characteristic slightly elongated central tooth. Some collections are unusual in possessing small, heavily congested pistillate flowers (e.g., *Steinmann* 93–226).

In addition, this species is similar to and sometimes difficult to distinguish from *A. californica* (see note under that species). The pistillate inflorescence of *A. subviscida* is frequently terminated by a long-pedicellate allomorphic flower, but we have not observed this character in *A. californica*. *Acalypha subviscida* is also

very similar to *A. langiana* Müll. Arg. (see doubtful and excluded taxa), but in the latter the spikes are strictly axillary; in *A. subviscida* there is a terminal spike that develops before, and is larger than, any lateral spikes.

Mpio. Alamos: Agua Salida, 27°15'N 108°46'W, near Arroyo Taymuc, *Steinmann* 93–226; Sierra de Alamos, N side of the range, *Steinmann* 93–440. Mpio. Yécora: above Tepoca, ca. 9 km NW of San Nicolás, *Van Devender* 95–496.

ADELIA L.

Trees or shrubs, the twigs often spinescent; dioecious. Latex absent. Pubescence unbranched or lacking. Leaves penniveined, entire, mostly alternate or (as in ours) fasciculate. Inflorescences unisexual; ♂ inflorescences axillary, fasciculate; ♀ inflorescence usually an axillary pair of ♀ flowers. Staminate flowers with 4–5 sepals; petals 0; stamens 6–60, filaments united at the base. Pistillate flowers often long-pedicellate; calyx 5–7-lobed; petals 0; ovary 2 or 3-locular, with 1 ovule per locule; styles 3, free, lacinate. Fruits capsular. Seeds carunculate or ecarunculate.

Tropical and subtropical regions of the New World; 10–12 species, with five or six species in México.

1. Adaxial surfaces of the leaves pubescent *A. obovata*
1' Adaxial surfaces of the leaves glabrous (at least when mature) *A. virgata*

ADELIA OBOVATA Wiggins & Rollins, *Contr. Dudley Herb.* 3: 271(–272); pl. 62, fig. 2. 1943.—TYPE: México, Sonora, [Mpio. Hermosillo], near a range of low rocky hills, 8 mi W of Hermosillo, about 1 mi NW of the rd to Kino Bay, 27 Aug 1941, *Wiggins & Rollins* 109 (holotype DS[285344]!).

Hardwood shrub to 2 m tall, bark gray, branches rigid and scraggly; August and September, as far as known. Sonoran desertscrub; 250–650 m. Known only from northwest and central Sonora, from the vicinity of Caborca and Altar to the vicinity of Hermosillo.

Adelia obovata is scarcely distinguishable from the more southern *A. virgata*, consistently differing only by its pubescent leaves. However, even this character appears questionable when Baja Californian material is considered. The other characteristics mentioned in the protologue, such as cocci pubescence, number, and size, do not serve to distinguish them, although there seems to be a weak north-south clinal variation. Both species can have pubescent fruits with 2 or 3 cocci. Flowering material of these taxa is scarce, and a comparison between well-preserved flowers is needed to resolve their taxonomic status. At present, we diffidently maintain *A. obovata* as distinct.

Mpio. Pitiquito: S end of Sierra del Viejo (S of Caborca), *Felger* 6109; Low pass between Cerro Aquituni and Cerro Calaveras, SE

of Bamori [Bámuri] on rd from Caborca to Puerto Libertad, *Felger* 20287; Distr. Altar, 50-mile Pass, W of Rancho Verruga, *Shreve* 5447. Mpio. Hermosillo: 7 mi S of Hermosillo, Cerro del Yeso, 7 Feb 1978, *Van Devender* s.n.; 22 mi by rd E of Hermosillo on rd to Mazatán, *Hastings & Turner* 65-149.

ADELIA VIRGATA Brandegee, *Zoe* 4: 406. 1894.—
TYPE: México, Lower California [Baja California Sur], Sierra de la Laguna, 20 Jan 1890, *Brandegee* s.n. (holotype UC[#173938]!).

Hardwood shrub, sometimes reaching 5 m tall, with thick, multiple trunks and straight, brittle branches, apparently dioecious; reproductive at various seasons. Thornscrub and southern margin of Sonoran desertscrub; 10–350 m. Western Sonora from the vicinity of Bahía San Pedro and San Carlos southward to western Sinaloa, also Baja California Sur.

Mpio. San Carlos: Bahía San Pedro, *Felger* 12116. Mpio. Navojoa: Cerro Terucuchi, 3 km N of Teachive de Masiaca, *Van Devender* 93-936. Mpio. Alamos: 14 km E of Navojoa, rd to Alamos, *Mason* 3043.

ANDRACHNE L.

Shrubs, perennial herbs, or rarely (as in ours) annuals; monoecious. Latex absent. Pubescence of unbranched hairs, sometimes glandular. Leaves alternate, entire, penniveined. Staminate inflorescences axillary, mostly fasciculate; ♀ flowers mostly solitary in the leaf axils. Staminate flowers with 5(–6) sepals and petals; stamens 5(–6), opposite the sepals, filaments free or connate to halfway. Pistillate flowers with 5(–6) sepals; petals minute or 0; ovary 3-locular, with 2 ovules per locule; styles bifid or bipartite. Fruit capsular. Seeds ecarunculate.

About 15 species in tropical and subtropical regions of both hemispheres; two species in México.

ANDRACHNE MICROPHYLLA (Lam.) Baill., *Étude Euphorb.* 577. 1858. *Croton microphyllus* [as *microphyllum*] Lam., *Encycl.* 2: 212. 1786.—TYPE: Peru, near Huánuco, *Dombey* (holotype P, not seen).

Phyllanthus ciliatoglandulosus Millsp., *Proc. Calif. Acad. Sci.* ser. II, 2: 219. 1889. *Andrachne ciliatoglandulosa* (Millsp.) Croizat, *J. Wash. Acad. Sci.* 33: 11. 1943.—TYPE: México, Lower California [Baja California Sur], Magdalena Island, 25 Feb 1889, *Brandegee* s.n. (holotype F[#194933]!).

Winter and early-spring annual, the herbage glandular stipitate; December–March. Sonoran desertscrub, mostly in shaded habitats; near sea level to 200 m. In Sonora it is restricted to the Gulf of California region: Isla Tiburón and the opposite mainland coast, and the coast north of San Carlos. Also Baja California Sur to southern Baja California (norte) and Isla Angel de la Guarda; disjunct in northwestern South America.

When transferring *Phyllanthus ciliatoglandulosus* to

Andrachne, Croizat states “This annual, endemic to Lower California, so closely resembles *A. microphylla* as to be very easily confused with it.” However, he does not say how the two are distinguished. We find no differences between specimens from México and Peru and treat *A. ciliatoglandulosa* as a synonym, as indicated by Webster (1994, p. 43).

Isla Tiburón: *Felger* 12330. Mpio. Guaymas: Bahía San Pedro, *Felger* 12127; Cañón las Barajitas, *Felger* 95-178.

BERNARDIA Houst. ex Mill.

Small trees, shrubs (ours), or rarely annuals, dioecious (ours) or monoecious. Latex absent. Pubescence of unbranched or more frequently stellate hairs. Leaves alternate, dentate-serrate, palmi- or penniveined. Inflorescences unisexual; ♂ inflorescence spikelike, axillary, the ♂ flowers in clusters and subtended by bracts; ♀ inflorescence (in ours) a terminal or pseudoterminal spike of 1–4 flowers. Staminate flowers with 3–5 sepals; petals 0; stamens 3–30, filaments free. Pistillate flowers with 4–6 minute sepals; petals 0; ovary 3-locular, with 1 ovule per locule; styles 3, mostly lacinate in ours. Fruit capsular. Seeds carinate, ecarunculate.

New World, mostly tropical with 50 species, 20–25 in México. Our species can usually be identified to genus (even in a sterile condition) by the presence of crateriform, annular glands on the leaf blades. As discussed by McVaugh (1961, pp. 154–155; 1995, p. 191) this genus is poorly understood taxonomically, and because most species are dioecious, collectors are urged to secure staminate and pistillate specimens from the same population and at different times of the year.

1. Leaf surfaces densely sericeous-villous, the hairs not obviously stellate; leaf blades lacking crateriform glands; ♀ flowers long-pedicellate, lacking closely subtending bracts; styles united at least 1/2 their length and lacinate only at the apex *B. cinerea*
- 1' Leaf surfaces glabrate to finely or densely stellate-pubescent; leaf blades mostly with crateriform glands; ♀ flowers sessile, closely subtended by bracts; styles either biparted or lacinate most of their length.
2. Stipules 0.7–1.0(–1.2) mm long; larger leaves mostly less than 3 cm long; ♀ flowers solitary *B. myricifolia*
- 2' Stipules (1.2–)1.4–2.2 mm long; larger leaves more than 3 cm long; ♀ flowers 1–4 per inflorescence.
3. Abaxial surface of the leaves usually nearly glabrous between the major veins (rarely with stellate hairs and if so the hairs on the veins nearly twice as long as those between the veins); ♂ inflorescences elongate, with a conspicuous rachis between the bracts; keels (external angles) of the ovaries and fruits lacking parallel ridges; seeds 4.0–5.5 mm long *B. gentryana*
- 3' Abaxial surface of the leaves beset with numerous stellate hairs between the major veins, the majority of which do not differ significantly from those on the veins; ♂ inflorescences densely congested, the rachis between the bracts not apparent; keels of the fruits with two parallel ridges; seeds 6.5–7.5 mm long *B. viridis*

BERNARDIA CINEREA Wiggins & Rollins, Contr. Dudley Herb. 3: 273(–274); pl. 61, figs. 2 & 3. 1943.—**TYPE:** México, Sonora, [Mpio. Guaymas], 15 mi S of La Palma, basaltic hill, *Wiggins & Rollins* 227 (holotype DS[#285347]!).

Monoecious or dioecious shrub to 3 m; May–September. Ecotone of Sonoran desertscrub and thornscrub, often on rhyolitic rock outcrops; 110–600+ m. Endemic to west-central Sonora.

This species is distinctive because of the dense velvety indumentum of mostly unbranched hairs on its stems, leaves, and capsules. The leaves are usually ovate but sometimes can be three-lobed on vigorous growth. Although it was described and placed in *Bernardia*, it does not appear to belong in the genus and its affinities are not obvious. Our retention of it here is provisional. The axillary, long-pedicellate pistillate flowers and the styles that are united most of their length and lacinate only at the apex are characteristics apparently otherwise unknown in *Bernardia*. In addition, the leaves of this species lack the characteristic annular, crateriform glands frequently present in members of this genus. Also, the stamens and anthers are black-purple (vs. yellow), and there is a united inner whorl of stamens (vs. completely free stamens).

Mpio. Guaymas: Sierra Libre, Microondas Avispas, vicinity of 28°28'50"N, 111°01'43"W [this is the type locality or very close to it], *Felger* 85–808, *Steinmann* 904; Guaymas, 1887, *Palmer* 103 (US). Mpio. Cajeme: E side of Presa Alvaro Obregón, 27°58'N, 109°44'W, *Reichenbacher* 1463; Cerro La Antena, Microondas La Cubana, *Van Devender* 94–601.

BERNARDIA GENTRYANA Croizat, J. Arnold Arbor. 24: 165. 1943.—**TYPE:** México, Sinaloa, cerro by Nuevo Mundo, 26 Jan 1940, *Gentry* 5372 (holotype GH!).

Dioecious shrub to 5 m; September–March. Rocky areas in tropical deciduous forest in east-central and southeastern Sonora, 220–700 m. Southward to Oaxaca.

Mpio. Alamos: Arroyo Gochico, ca. 3 km E of San Bernardo, 27°24'15"N, 108°47'10"W, *Steinmann* 587; Cerro Las Tatemas (Microondas La Luna), 27°07'N, 109°02'15"W, *Steinmann* 93–152A, 93–152B; Tres Marías limestone quarry, 27°06'46"N, 109°09'45"W, *Van Devender* 95–1118. Mpio. San Javier: San Javier, SW side of Cerro San Juan, 6 Aug 1995, *Búrquez* s.n. (personal herbarium of Alberto Búrquez, in Hermosillo, Sonora).

BERNARDIA MYRICIFOLIA (Scheele) S. Watson, Bot. California 2: 70. 1880. *Tyria myricifolia* [as *myricaefolia*] Scheele, Linnaea 25: 581. 1852. *Ricinella myricifolia* (Scheele) Müll. Arg., Linnaea 34: 154. 1865–1866.—**TYPE:** United States, Texas, according to the protologue collected at forest margins on rocky ground at the edge of plateau north of Neubraunfels [= New Braunfels], June–Sep 1846, *Lindheimer*. We

do not know the location of Scheele's original material, but there is a specimen of *Lindheimer* 523 at US [#1814966]! labeled as an isotype.

Monoecious or dioecious shrub 1(–3) m tall; in Sonora flowering and fruiting March to October. Canyon slopes at the ecotone of Chihuahuan desertscrub and oak woodland in northeastern Sonora, where it is known for certain only from two localities but possibly more widespread; 800–1300 m. Also New Mexico, Texas, and adjacent northern México.

Based on material from Durango, Marshall Johnston (1980) described *B. myricifolia* var. *incanoides*. Following his circumscription, our material belongs to var. *myricifolia*, but the distinction between these two varieties has not been critically considered in our work.

Webster (1993b, p. 568) treated *B. incana* C. V. Morton as a synonym of *B. myricifolia*, but we disagree. *Bernardia incana* is distinguished by its black-purple, thicker, glanduliform stipules (vs. green to yellow or brownish, membranous stipules); very close, short-rayed hairs on the undersides of the leaves (vs. looser, long-rayed hairs); fewer stamens (5–7 vs. 11–20); and less-divided styles. *Yatskievych* 82–46 (provisionally referred here below) is intermediate in that the stamen number is of *B. myricifolia*, but the styles are less divided and the stipules are slightly black-purple but not to the extent as is typical in *B. incana*.

Mpio. Bavispe: Cañón de la Bota, N end of Sierra del Tigre, *Yatskievych* 82–46. Mpio. Huásabas: Cañón Cruz de Peñasco, 6.3 mi by rd E of Río Bavispe–El Coyote rd, *Felger* 3647; Cruz del Diablo, E of Guasabas, *Turner* 79–20; Cruz del Diablo (Cañada Maimodochi), 7.5 km by air NE of Huásabas on rd to El Coyote, *Van Devender* 95–535. Mpio. Agua Prieta: Vega Azul, SW of Colonia Morelos, *White* 4870 (MICH).

BERNARDIA VIRIDIS Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 223. 1889.—**TYPE:** México, Lower California [Baja California Sur], San Pablo, 22 Apr 1889, *Brandege* s.n. (holotype F[#280917]!).

Croton crenulatus M. E. Jones, Contr. W. Bot. 18: 1933. —**TYPE:** México, Lower California [Baja California Sur], Cayuca Ranch, Loreto, 23 Oct 1930, *Jones* 27499 (holotype POM[#191581]!).

Dioecious shrub 1–5 m tall with stiff, woody branches, the ovary keels often with two broad, lengthwise parallel ridges; October–March. Sonoran desertscrub on Isla San Pedro Nolasco, and thornscrub and tropical deciduous forest in southern Sonora; 30–930 m. Also southwestern Chihuahua, Sinaloa and Baja California Sur.

This species previously has been treated as a synonym of *B. mexicana* (Hook. & Arn.) Müll. Arg. (e.g., Wiggins 1964, p. 790). However, a photo of the type of *B. mexicana* (Univ. Mich. neg. 527) shows a plant possessing leaves with small, very close marginal teeth

and relatively long staminate inflorescences. In *B. viridis* the teeth of the leaves are larger and well-spaced, and the staminate inflorescences are very congested. The leaf pubescence of Sonoran material here referred to *B. viridis* varies from nearly glabrous to densely pubescent with short- or long-rayed hairs. Most specimens are sterile, and more flowering material will be needed before this complex can be thoroughly resolved.

Isla San Pedro Nolasco: E side of island at higher elevations, *Felger 9643*. Mpio. Huatabampo: 15.3 mi N of Sinaloa border on MEX 15, *Felger 3136*. Mpio. Alamos: Güirocoba crossing of the Río Cuchujaqui, 12.3 km by air SSE of Alamos, *Steinmann 95-11*.

CNIDOSCOLUS Pohl

Trees, shrubs, or perennial herbs; monoecious. Latex milky. Pubescence unbranched, often of large, stinging hairs capable of inflicting painful wounds, or rarely glabrous (especially several cultivars). Leaves alternate, usually long-petiolate and with glands at the base of the blade, often palmately divided-dissected with shallow to deep sinuses, mostly palmiveined. Inflorescences bisexual, terminal or pseudo-axillary, usually long pedunculate, composed of open dichasia. Staminate flowers relatively large; calyx white, united below and with 5 distally imbricate lobes; petals 0; stamens mostly 8-10, the outer filaments free and the inner ones connate, or all connate. Pistillate flowers relatively large; calyx white, divided nearly to the base into 4-5 lobes; petals 0; ovary 3-locular, with 1 ovule per locule; styles free, connate at the base, usually several time bifid or lacinate. Fruits capsular. Seeds carunculate.

New World, ca. fifty species, mostly dry tropical regions; about 22 species in México and except for two, all are members of section *Calyptosolon* (includes both Sonoran species). Reference: Breckon 1975.

1. Herbaceous perennial; leaf surfaces glabrous to glabrate between the margins and main veins; leaf blades (6-)10-15+ cm long, often 3-5-lobed nearly to the middle, the margins coarsely incised-dentate, the larger teeth mostly 1-2.5 cm long *C. angustidens*
- 1' Shrub; leaf surfaces evenly covered with a velvety indumentum of small soft hairs; leaf blades 2-5.5 cm long, unlobed, margins shallowly dentate, the larger teeth 2-6 mm long *C. palmeri*

CNIDOSCOLUS ANGUSTIDENS Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 198. 1858. *Jatropha angustidens* (Torr.) Müll. Arg. in DC., Prodr. 15(2): 1102. 1866.—TYPE: Sonora [or perhaps present day Arizona], Valley of the Santa Cruz River, *Schott s.n.* (lectotype NY!, here designated).

Cnidocolus pringlei I. M. Johnst., Contr. Gray Herb. 68: 85(-86). 1923. *Jatropha pringlei* (I. M. Johnst.) Standl., Contr. U.S. Natl.

Herb. 23: 1670. 1926.—TYPE: México, Jalisco, Barranca near Guadalajara. June 1886, *Palmer 141* (holotype GH!).

Mala mujer, ortiguilla. Winter-deciduous herbaceous perennial from multiple tuberous roots and with nasty stinging hairs on the herbage and inflorescences; reproductive from shortly before the summer rains until fall. Oak woodland, oak woodland-thornscrub ecotone, and tropical deciduous forest; 310-1300 m. North-central to southeastern Sonora.

Four subspecies were distinguished by Breckon (1975), but these have not been formally published. Our plants would belong to ssp. *angustidens*, which ranges from southeastern Arizona through western México to Puebla; the three other undescribed subspecies occur in southern México. References to this species in Baja California Sur apply to *C. maculatus* (Brandeggee) Pax & K. Hoffm., distinguished in part by its much larger seeds; other differences are enumerated by Breckon (1975, p. 172).

Mpio. Bavispe: Santa Rosa Canyon near Bavispe, *White 531*. Mpio. Alamos: Sierra de Alamos, Barranca del Salto, *Gentry 11065*. Mpio. Cucurpe: Palm Canyon, 17 mi SE of Magdalena, 9 Sep 1978, *Van Devender et al. s.n.* Mpio. Onavas: Agua Amarilla, 28°27'58.5"N, 109°20'23.5"W, *Felger 94-163*.

CNIDOSCOLUS PALMERI (S. Watson) Rose, Contr. U.S. Natl. Herb. 12: 282. 1909. *Jatropha palmeri* S. Watson, Proc. Amer. Acad. Arts 24: 76(-77). 1889.—TYPE: México, Sonora. [Mpio. Guaymas], mountains above Guaymas, Oct 1887, *Palmer 302* (lectotype GH!, here designated). This species is based on two collections, both *Palmer 302*, one from June and the other from October. The October collection is the more complete specimen and the only one we have found at GH. The June specimen is at NY [!].

Mala mujer, ortiguilla, zumaque venenoso. Small drought-deciduous shrub with multiple tuberous roots and painful stinging hairs; May-December. Sonoran desertscrub in rocky habitats on granitic and rhyolitic hills and mountains of Isla Tiburón, Isla Turners, the Sierra Seri, and coastal mountains between Tastiota and Guaymas; near sea level to ca. 500 m. Also Baja California Sur. The tuberous roots are edible fresh or cooked (Felger and Moser 1985, pp. 292-293). *Cnidocolus palmeri* has its closest relative in *C. shrevei* I. M. Johnst. from Durango (Johnston 1940).

Mpio. Guaymas: Cerro el Vigía, Guaymas, *Felger 84-175*. Mpio. Hermosillo: Sierra Seri, 29°17'N, 112°08'W, *Felger 18140*; La Cadena, first cove south of Cholludo, 28°18'38.9"N, 111°27'00.4"W, granitic mountain adjacent to sea, *Felger 96-92*.

CROTON L.

Trees, shrubs, or herbs, often strongly scented; mostly monoecious but sometimes dioecious. Latex often present, usually watery or colored. Pubescence

mostly stellate to lepidote. Leaves alternate, or rarely opposite at congested distal or flowering nodes, unlobed in ours, entire to variously toothed, palmi- or penniveined. Inflorescences usually bisexual, terminal or axillary, spicate to racemose, usually with a few ♀ flowers proximally and numerous, often clustered ♂ flowers distally. Staminate flowers (in ours) with a 5-lobed calyx; petals (in ours) 5 or rarely (e.g., *C. californica*, *C. wigginsii*) absent or vestigial; receptacle usually pilose; stamens 8–50, filaments free, inflexed in bud. Pistillate flowers with a 5-lobed calyx, petals

mostly absent (rarely present, e.g., *C. aff. niveus*) ovules 1 per locule; styles 3, free, bifid to several times divided. Fruits capsular. Seeds usually smooth but sometimes minutely pitted, carunculate.

A large and diverse genus of at least 800 species, mostly tropical to warm temperate regions, the center of diversity in South America. Near 100 species in México, 14 in Sonora. Croton oil is obtained from *C. tiglium* L. References: Ferguson 1901; Webster 1993a; Martínez 1996.

1. Leaf margins toothed; short-lived perennial herb *C. martinianus*
- 1' Leaf margins entire; habit various.
2. Dioecious: ♂ flowers apetalous.
3. Annual; adaxial leaf surfaces green, sparsely pubescent, the rays of the stellate hairs slender and not overlapping *C. texensis*
- 3' Perennial herbs to shrubs; adaxial leaf surfaces usually densely silvery-pubescent (sometimes green in southwestern Sonora), the rays of the stellate hairs relatively stout and overlapping.
4. Stems divergent, the branches spreading, the plant often as wide as tall or wider; seeds 4.0–4.5 mm long ... *C. californicus*
- 4' Stems mostly erect, the branching pattern strict, the plant usually taller than wide; seeds 4.4–7.8 mm long *C. wigginsii*
- 2' Monoecious: ♂ flowers with well-developed petals (although sometimes deciduous).
5. Stipules represented by conspicuous long-stalked glands at some or most of the nodes.
6. Abaxial leaf surfaces sparsely pubescent to glabrate *C. subjuncundus*
- 6' Abaxial leaf surfaces densely pubescent.
7. Leaves linear-lanceolate; styles each bifid (stigmas 6) *C. yecorensis*
- 7' Leaves lanceolate to ovate; styles each 3- or 4-times divided (stigmas 12 or more) *C. ciliatoglandulifer*
- 5' Nodes eglandular, the stipules various but not stipitate glandular.
8. Styles each 3- or 4-times divided (stigmas 12 or more).
9. Shrub; abaxial surfaces of sepals stellate pubescent; ♀ sepals accrescent and more than half the length of the mature fruit; ♀ flowers apetalous *C. alamosanus*
- 9' Small tree; abaxial surfaces of sepals lepidote; ♀ sepals not accrescent and less than half the length of the mature fruit; ♀ flowers with petals *C. aff. niveus*
- 8' Styles each bifid (stigmas 6).
10. Leaves more than 2.5 cm wide.
11. Rays of the stellate hairs on the ovary 0.2–0.4 mm long; styles divided 1/3–3/4 their length; locules of the capsules keeled *C. flavescens*
- 11' Rays of the stellate hairs on the ovary 0.7–2.2 mm long; styles divided nearly to the base; locules of the capsules rounded *C. magdalenae*
- 10' Leaves less than 2.5 cm wide.
12. Shrub; ♀ sepals glabrous or with few scattered hairs *C. sonorae*
- 12' Herbaceous or suffrutescent perennials; abaxial surface of ♀ sepals densely pubescent.
13. Leaves linear-lanceolate to narrowly lanceolate; ♀ sepals linear-oblong; young ovary visible between the sepals *C. pedicellatus*
- 13' Leaves mostly lanceolate to oblong to ovate; ♀ sepals ovate; young ovary covered by the sepals ... *C. pottsii*

CROTON ALAMOSANUS [as *alamosanum*] Rose, Contr. U.S. Natl. Herb. 1: 111(–112). 1891.—TYPE: México, Sonora, [Mpio. Alamos], near Alamos, 16–30 Sep 1890, *Palmer 742* (syntype ?US, not found; iso-syntype NY!); same locality, 26 Mar–8 Apr 1890, *Palmer 324* (syntype US[#47748]!).

Croton blasianus M. E. Jones, Contr. West. Bot. 18: 49. 1933.—TYPE: México, Sinaloa, San Blas, 28 Jan 1927, *Jones 23304* (holotype POM[#162160]!).

Vara prieta. Shrub to 4 m tall, the leaves drought deciduous, turning orange as they fall; reproductive more or less throughout the year except during extreme drought. Very common in open areas of tropical deciduous forest, and less common in thornscrub and

the southern margin of Sonoran desertscrub; 200–800 m. Southward to Guerrero.

The summer (rainy season) leaves of *C. alamosanus* tend to be relatively narrow and have large, conspicuous, foliaceous stipules, while the spring (dry season) leaves tend to be broader and lack such stipules. In the sterile condition, this species can be difficult to distinguish from *C. flavescens*, and the two frequently grow intermixed. *Croton alamosanus* flowers throughout the year, while *C. flavescens* flowers only during the summer rainy season and lacks large, conspicuous stipules at any season.

Mpio. Moctezuma: rocky ridge 10 km SW of Moctezuma on rd to Mazocahui, *Hastings 71–198*. Mpio. Alamos: 3.4 km N of Alamos,

27°03'55"N, 108°56'W, *Van Devender* 93–1041. Mpio. Guaymas: Sierra Libre, rd to Microondas Avispas, *Steinmann* 578.

CROTON CALIFORNICUS Müll. Arg. in DC., Prodr. 15(2): 691. 1866. *Oxydectes californica* (Müll. Arg.) Kuntze, Revis. Gen. Pl. 2: 611. 1891. Based on *Hendecandra procumbens* Eschsch., Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 10: 287. 1826; not *Croton procumbens* Jacq., 1760.—TYPE: United States, collected in California (without specific locality) by *Eschscholtz* in 1824 (holotype presumably at LE, not seen).

Hierba del pescado. Suffrutescent perennial, dioecious or, according to Martin (1995), rarely monoecious; reproductive more or less year round. Sonoran desertscrub and thornscrub on sandy soils; near sea level to 70 m. Northwestern Sonora on low stabilized dunes, sand flats, the riverbed/floodplain of the Río Sonoyta east and southeast of the Pinacate lava shield, and from the vicinity of El Desemboque San Ignacio southward mostly along beach dunes and coastal strand habitats of western Sonora into western Sinaloa at least as far south as Mazatlán. Also western and southern Arizona, southwestern Utah, southern Nevada, and California to Baja California Sur.

A number of varieties, based mostly on leaf shape, have been recognized by various authors (e.g., Ferguson 1901, pp. 263–266; Wiggins 1964, pp. 779–780). However, these are difficult to distinguish, and the variation between them is often continuous. It is beyond the scope of our work to undertake a revision of the *C. californicus* complex throughout its range, but most of the Sonoran material does not appear to differ significantly from plants traditionally referred to the typical variety, although many collections from northwestern Sonora possess narrow leaves and may be referable to var. *tenuis* (S. Watson) A. M. Ferguson. Upon further study it may be concluded that the previously recognized varieties are best treated within a single, variable taxon.

Isla Tiburón: E shore, *Felger* 12533. Mpio. Guaymas: Bahía San Pedro, *Johnston* 4323 (CAS). Mpio. Huatabampo: Playa Huatabampito, 8.5 mi SSE of Huatabampo, 26°42'N, 109°36'W, *Sanders* 4227. Mpio. Navojoa: 3 mi N of Navojoa, *Breedlove* 1482 (RSA). Mpio. Puerto Peñasco: Río Sonoyta, 13.5 mi N of Puerto Peñasco, 31°25'05"N, 113°27'30"W, *Felger* 91–50.

CROTON CILIATOGLANDULIFER [as *ciliato-glanduliferum*] Ortega, Nov. Pl. Descr. Dec. 51. 1797. *Oxydectes ciliatoglandulifera* (Ortega) Kuntze, Revis. Gen. Pl. 2: 611. 1891.—TYPE: Based on material grown at Madrid from seed obtained by the Sessé and Moçino expedition of the late 1700s. In the protologue the seeds were reported to be from Cuba, but according to Alain (1953, p. 66), reports of this species occurring in Cuba are possibly erroneous, and Wheeler

(1981, p. 110) states that the seeds were likely of Mexican origin. Grady Webster (pers. comm., 1995) has been unable to locate original material.

Croton penicillatus [as *penicillatum*] Vent., Choix Pl. 12. 1803. A nomen superfluum giving in synonymy the earlier *Croton "ciliato-glanduliferum"*.

Trucha, ortiga. Shrub 1–1.5(–4) m tall; herbage beset with conspicuous stalked glands, the fresh foliage sticky and smelling strongly of fruit-punch; reproductive more or less throughout the year. Frequently in disturbed areas in tropical deciduous forest, thornscrub, lower oak woodland, and the margin of Sonoran desertscrub (e.g., east of Magdalena). Eastern and southern Sonora from near sea level to 1400 m. Santa Cruz County, Arizona, and Texas to Nicaragua, also Baja California Sur.

Mpio. Magdalena: Magdalena Canyon, 9 mi NE of Imuris, *Shreve* 6616. Mpio. Yécora: Santa Ana, along arroyo in town, 28°22'40"N, 109°09'W, *Steinmann* 888. Mpio. Huatabampo: Camahuíroa, *Van Devender & Van Devender* 93–311. Mpio. Alamos: Sierra de Alamos, *Gentry* 4871.

CROTON FLAVESCENS Greenm., Proc. Amer. Acad. Arts 39: 81. 1903.—TYPE: México, Michoacán, Monte León Station, volcanic hills, 20 Aug 1902, *Pringle* 8667 (holotype GH!).

Croton flavescens Greenm. var. *brandegeanus* Croizat, J. Arnold Arbor. 26: 187(–188). 1945.—TYPE: México, Sonora, [Mpio. Villa Pesqueira], 4 mi N of Nacori, between Mazatán and Mátape, 8 Sep 1941, *Wiggins & Rollins* 391 (holotype A!).

Drought-deciduous shrub to 4 m; July–September. Relatively open areas in thornscrub, tropical deciduous forest, and rarely oak woodland. Central eastern and southeastern Sonora; 110–1250 m. Also southwestern Chihuahua south along the Pacific slope to Oaxaca.

Croton flavescens is closely related to *C. fragilis* H. B. K., and we agree with Croizat (1945, p. 187) that the classification of these two species and their relatives (i.e., *C. morifolius* Willd. and *C. sphaerocarpus* H. B. K.) is "controversial" and would benefit from further study. *Croton flavescens* is distinguished from these species primarily by the distinctly keeled (vs. rounded) ovaries and capsules. Wiggins (1964, p. 778) recognized this difference and recorded both *C. flavescens* and *C. fragilis* for Sonora. However, all the Sonoran specimens we examined possess keeled ovaries, and *C. fragilis* is thus excluded from this treatment.

Variety *brandegeanus* was described as differing from var. *flavescens* by having smaller seeds. Wiggins (1964, pp. 778, 782) also uses broader leaves as a distinguishing characteristic of this variety. However, var. *brandegeanus* is here considered synonymous with the typical variety. The variation in both leaf width and

seed size is continuous, and there appears to be no correlation between the two.

Mpio. Nácori Chico: El Río Bonito about La Nopalera, *Muller* 3687 (UC). Mpio. San Javier: Arroyo El Tuseral, 14 mi E of Tecoripa on Hermosillo-Yécora rd, 28 July 1988, *Sundt s.n.* Mpio. Alamos: E side of Sierra de Alamos, *Jenkins* 89-75; Sierra Saguaribo, S of and below El Chiribo, 27°18'N, 108°42'W, *Steinmann* 93-289. Mpio. Cajeme: E side of Presa Alvaro Obregón, 27°58'N, 109°44'W, *Reichenbacher* 1456.

CROTON MAGDALENÆ Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 220. 1889.—TYPE: México, Lower California [Baja California Sur], Magdalena Island, 17 Jan 1889, *Brandege s.n.* (holotype F[194946]!).

Shrub to ca. 1.5 m tall; reproductive in response to the summer rains as well as in spring. Sonoran desertscrub in riparian canyons on Isla Tiburón and at Las Barajitas and the nearby Bahía San Pedro. This species is otherwise restricted to the Baja California Peninsula, where it is widespread in Baja California Sur.

The relationship between *Croton magdalenæ* and the Baja Californian *C. caboensis* Croizat and *C. boregensis* M. E. Jones needs to be critically reviewed.

Isla Tiburón: SE side of Sierra Kunkaak, *Felger* 6995. Mpio. Guaymas: Bahía San Pedro, *Johnston* 4301 (CAS); Sierra el Aguaje, Cañón las Barajitas, *Felger* 95-187.

CROTON MARTINIANUS V.W. Steinm., Novon 8: in press.

Erect to ascending perennial herb (also flowering in the first year) to 30 cm tall, the only Sonoran *Croton* with serrate-dentate leaf margins; reproductive in the spring as well as summer/fall. Southeastern Sonora, mostly in rocky, red-orange soils on relatively dry hillsides in tropical deciduous forest and lower oak woodland; 400-950 m. Otherwise known from a single collection in northern Sinaloa and two collections in the vicinity of San Cristóbal de la Barranca in Jalisco.

Mpio. Alamos: Arroyo Gochico, along the trail from San Bernardo to Gochico Nuevo, *Steinmann* 606; N of Güirocoba along the rd to Choquincahui, *Steinmann* 613; Sierra de Alamos, N side of the range ca. 2 km SW of Alamos along the trail from El Chalotón to La Huerta, 27°00'N, 108°58'W, *Steinmann* 952.

CROTON aff. NIVEUS Jacq.

Vara blanca. Drought-deciduous large shrub or small tree to 8 m tall; November-May. Undisturbed, rocky, relatively dry hillsides of tropical deciduous forest in the vicinity of Alamos in southeastern Sonora where it is often dominant and occurs in thick stands; 300-700 m. Also northern Sinaloa. The slender trunks, commercially cut for tomato stakes, fence posts, and sidewalls of thatch houses, are being seriously overharvested.

This species belongs to section *Eluteria* Griseb. and is unique among Sonoran crotons in being arborescent

and having pistillate flowers with well-developed petals. We are uncertain as to the identity of our material, and it may represent an undescribed taxon. Croizat (1945, p. 187) stated that the Sonoran plants of sect. *Eluteria* are *C. reflexifolius* H. B. K., but this appears incorrect. The ovaries of *C. reflexifolius* are especially warty and often lepidote. However, all of the Sonoran specimens with pistillate flowers possess ovaries that are essentially smooth with long-rayed stellate hairs, thus ruling out *C. reflexifolius* and allying our material to *C. niveus*. The Sonoran and northern Sinaloan material appears to differ from other plants of this species farther south by their shorter pedicels and flowers densely crowded rather than loosely arranged. In addition, the leaves are less shiny below and relatively broader than material throughout the rest of the range of *C. niveus*. In fact, the leaves of Sonoran specimens look more like those of *C. pseudoniveus* Lundell. This latter species, described from nearby in Sinaloa, is very similar to *C. niveus* and conceivably could occur in the tropical deciduous forest of southeastern Sonora. Reproductive collections of *C. pseudoniveus* can be easily separated from both *C. niveus* and our plants by the lepidote (vs. stellate) pubescence of the ovary.

Mpio. Alamos: ca. 2 km upstream from El Guayabo crossing of Río Cuchujaqui, vicinity of 27°00'05"N, 108°47'08"W, *Felger* 94-116, *Steinmann* 93-106; N of Mocúzari, 4 Apr 1992, *Martin & O'Rourke*; Cerro Las Tatemas, near microwave station, *Steinmann* 94-154.

CROTON PEDICELLATUS H. B. K., Nov. Gen. Sp. 2 [folio]: 60, [quarto]: 75(-76); tab. 104. 1817.—TYPE: Peru, "in ripa fluminis Amazonum juxta cataractam Rentemæ in Provincia Bracamorensi," Aug 1802, *Humboldt & Bonpland* (holotype P, not seen).

Croton tenuilobis S. Watson, Proc. Amer. Acad. Arts 21: 439. 1886.—TYPE: México, southwestern Chihuahua, Hacienda San José, Aug-Nov 1885, *Palmer* 29 (holotype GH!).

Herbaceous or suffrutescent perennial with narrow leaves; reproductive at various seasons. Oak and pine-oak woodland and upper margins of tropical deciduous forest; 450-1400 m. In México this species ranges from southeastern Sonora and southwestern Chihuahua along the Pacific slope to Chiapas. It is disjunct in northern South America. See McVaugh (1961, p. 164) for a discussion concerning the reduction of *C. tenuilobus* to a synonym of *C. pedicellatus*.

Mpio. Alamos: Güirocoba, *Gentry* 2950; Sierra de Alamos, Rancho La Sierrita, *Wiens* 93-153. Mpio. Rosario: Sierra de la Cebollita, 6.4 mi S of Nuri along rd from Tesopaco, 28°04'N, 109°20'W, *Sanders* 3691B.

CROTON POTTSII (Klotzsch) Müll. Arg. in DC., Prodr. 15(2): 561. 1866. *Lasiogyne pottsii* Klotzsch in Seem., Bot. Voy. Herald 278. 1853. *Oxydectes pott-*

sii (Klotzsch) Kuntze, Revis. Gen. Pl. 2: 612. 1891.—TYPE: México, Chihuahua, near the city of Chihuahua, *Potts s.n.* (holotype BM[#80187]!).

Croton corymbulosus Engelm. in Rothr., Rep. U.S. Geogr. Surv., Wheeler 6: 242(–243). 1878.—TYPE: United States, Arizona, Cochise Co., Camp Bowie in Apache Pass, Chiricahua Mts., 5000 ft, July 1874, *Rothrock 506* (lectotype MO[#210458]!, here designated). Five collections were cited in the protologue, none of which has been previously designated lectotype.

Croton eremophilus Wooton & Standl., Contr. U.S. Natl. Herb. 16: 144(–145). 1913.—TYPE: United States, New Mexico, Dog Mts., Dog Spring, 16 Sep 1893, *Mearns 2336* (holotype US[#234163]!).

Perennial herb; August–November. Northeastern Sonora in grassland and oak woodland; 1250–1500 m. Texas to Arizona, southward to San Luis Potosí and eastward to Tamaulipas.

Mpio. Villa Pesqueira: 2 mi N of Nacori, between Mazatán and Mátape, dry somewhat limy hillside, *Wiggins & Rollins 386*, Mpio. Cananea: 7.7 km E of Cananea, 31°01'N, 110°12'W, *Felger 93–638*, Mpio. Fronteras: 9.3 mi by rd WSW of Fronteras, 30°51'19"N, 109°41'11"W, *Felger 94–834*.

CROTON SONORAE Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 194. 1858. *Oxydectes sonorae* (Torr.) Kuntze, Revis. Gen. Pl. 2: 613. 1891.—TYPE: México, Sonora, [Mpio. Gen. Plutarco Elías Calles], Sierra de Nariz, July 1855, *Schott s.n.* (holotype NY!).

Croton pringlei S. Watson, Proc. Amer. Acad. Arts 20: 373(–374). 1885.—TYPE: México, northwestern Sonora, [perhaps Mpio. Pitiquito], low range of hills about 30 mi from the coast, August 1884, *Pringle s.n.* (holotype GH!).

Croton gonzalezii Greenm., Proc. Amer. Acad. Arts 39: 81. 1903.—TYPE: México, Oaxaca, Cuicatlán, 600 m, 16 Sep 1899, *González 980* (holotype GH, not seen; isotype MEXU[#532417]!).

Croton attenuatus M. E. Jones, Contr. W. Bot. 18: 47(–48). 1933.—TYPE: México, Lower California [Baja California Sur], Loreto, Cayuca Ranch, 23 Oct 1930, *Jones 27500* (holotype POM [#192853]!).

Small shrub, the leaves varying greatly in size depending upon soil moisture and turning orange as they age and fall; flowering mostly during the summer rainy season; July–October. Sonoran desertscrub and thornscrub; near sea level to 800 m. Southern Arizona through western and central Sonora to Sinaloa and Baja California Sur; and disjunct in Guerrero, Puebla, and Oaxaca.

Mpio. Guaymas: Cañón del Nacapule, *Felger 85–861*. Mpio. Santa Ana: hills between Magdalena and Santa Ana, 7 mi S of Magdalena, *Wiggins 7193*. Mpio. Puerto Peñasco: 11.3 mi by rd S of Sonoyta, granitic mountain, *Felger 16728*. Mpio. Huatabampo: Los Cerillos, S of Navojoa, *Gentry 14394*.

CROTON SUBJUNCUNDUS Croizat, Bull. Torr. Bot. Club 69: 451(–452, 457). 1942.—TYPE: México, Sonora, [Mpio. Navojoa], Navojoa, in thickets by rd near

Río Mayo, 9 Dec 1939, *Drouet & Richards 3923* (holotype A, not seen; isotype DS[#273545]!).

Small shrub resembling *Croton sonorae* in habit but readily distinguished by the multifid styles and large, conspicuous stipitate glands on the herbage, inflorescences, and flowers; flowering recorded in December and February (*C. sonorae* flowers during the summer rainy season). Endemic to Sonora, ca. 5–50 m, and known to us from only three collections, all from coastal plains where the deep, alluvial soil supports a densely vegetated coastal thornscrub or thornscrublike mesquite-dominated vegetation within Sonoran desertscrub. Much of this habitat has been converted to agriculture.

As the name implies, this species is closely related to the Sinaloan *Croton juncundus* Brandegee, and more material of both taxa will be needed to evaluate whether *C. subjuncundus* is best treated as distinct or as a synonym of *C. juncundus*. The only differences between them appears to be the shorter styles and calices of *C. subjuncundus*.

Mpio. Huatabampo: Bachoco, arroyo 1 km NE of town, 26°44'N, 109°21'W, 27 Dec 1986, *Martin & O'Rourke s.n.* Mpio. Hermosillo: ca. 5 mi N of Punta Baja at ca. 2.5 mi inland (between Tastiota and Bahía Kino), coastal plain, shade of mesquite, *Felger 12619*.

CROTON TEXENSIS (Klotzsch) Müll. Arg. in DC., Prodr. 15(2): 692. 1866. *Hendecandra texensis* Klotzsch in Wiegmann, Arch. Naturgesch. 7: 252(–253). 1841. *Oxydectes texensis* (Klotzsch) Kuntze, Revis. Gen. Pl. 2: 613. 1891.—TYPE: United States, Texas, 1835, *Drummond* (The specimen seen by Klotzsch was presumably at B and is likely destroyed. A probable isotype, *Drummond 256*, is at GH [!]).

For synonymy see Johnston 1959: 196.

Tortolita. Erect to ascending dioecious annual, often very leafy and sometimes reaching more than 1 m tall; February–October. Thornscrub, grassland, and oak woodland in north-central and northeast to east-central Sonora; 150–1350 m. Also Chihuahua and the southwestern and midwestern United States from Arizona, New Mexico, and Texas to South Dakota.

In many respects similar to *C. californicus* and distinguished by the annual, less-branched habit. Also, the hairs on *C. texensis* tend to be less dense with the rays more slender. Their distributions are allopatric.

Mpio. Bacoachi: Sierra de los Ajos, 13.0 mi by rd N of Bacoachi, 30°49'N, 109°54'W, *Fishbein 1277*. Mpio. Nogales: 7–9 mi S of Nogales along MEX 15, *Gentry 19352*. Mpio. Benjamín Hill: near Rancho Polvadera, W of Noria, *Shreve 6045*. Mpio. Soyopa: Río Yaqui, across from Tonichi, *Toolin 277*.

CROTON WIGGINSII L. C. Wheeler, Contr. Gray Herb. 124: 37(–38). 1939. Based on *Croton arenicola* Rose & Standl., Contr. U.S. Natl. Herb. 16: 12.

1912; not *Croton arenicola* Small, 1905.—TYPE: México, Sonora, [Mpio. Puerto Peñasco], Adair Bay, sandhills, 20 Nov 1908, Sykes 62 (holotype US[#574267]!).

Dioecious shrub or subshrub 1–2.5 m tall with strict or sharply ascending straight branches; variously reproductive nearly any time of the year. The Gran Desierto in northwestern Sonora on low and stabilized to high and shifting dunes and sometimes on sand flats; also along the international border in adjacent Yuma County, Arizona, and the Algodones Dunes in southeastern California. Endemic to the Lower Colorado Valley of the Sonoran Desert.

Croton wigginsii is a segregate of *C. californicus*, and relationships between these and among other members of the *C. dioicus* Cav. complex are unresolved. In *C. wigginsii* there is an unusually large range in seed size; the larger seeds are from large-leaved, robust plants, whereas the smaller seeds are from relatively stunted, drought-stressed plants (see Felger 1980, pp. 105–106).

Mpio. San Luis R. C.: 25.3 mi E of San Luis on MEX 2, at border marker 198, granitic hills, Felger 16702; high shifting dunes 3 km N of Sierra del Rosario, Felger 75–30.

CROTON YECORENSIS V. W. Steinm. & Felger, Novon 8: in press.

Subshrub (but flowering in first season) to ca. 1 m tall, with linear-lanceolate leaves and stipules represented by stalked glands; reproductive in the spring as well as during the summer/fall. So far known only from a small area of east-central Sonora in oak and pine-oak woodland; 1250–1700 m. It is very common in the vicinity of Yécora and expected in adjacent Chihuahua.

Mpio. Sahuaripa: 2 km SE of airfield, ca. 4 km SSW of Mulatos, 28°37'49.1"N, 108°45'38.2"W, Felger & Búrquez 94–574. Mpio. Yécora: 7 mi W of Yécora, Goldberg 76–183; Rancho La Pinosa, 10.1 km W of Maycoba on MEX 16 and ca. 1.5 km N of hwy, 28°24'46.6"N, 108°43'23.7"W, Felger 94–237, 94–331.

DALECHAMPIA L.

Vines or lianas, rarely subshrubs to shrubs, sometimes with urticating hairs; monoecious. Latex absent. Pubescence simple or nearly absent, sometimes urticating. Leaves alternate, simple and often lobed (ours) or compound, palmi- or penniveined. Inflorescence pseudanthial, usually borne on an axillary branch consisting of 2 large, subopposite, often colorful bracts; ♂ portion usually a pedunculate pleiochasium of 5–7 sessile 1–3 flowered cymes and a resiniferous gland, the whole being surrounded by an involucre of 4 bracts; ♀ portion a subsessile (1–)3-flowered cyme situated abaxially at the base of the ♂ peduncle. Stami-

nate flowers on articulated pedicels; sepals 4–6; petals 0; stamens mostly 9–30, filaments very short and connate into a stiff column. Pistillate flowers usually with a 5–12-parted pinnatifid and often gland-tipped calyx that encloses the fruits; petals 0; ovary usually 3-locular, with 1 ovule per locule; styles united into a column and often with an expanded peltate stigma. Fruits capsular. Seeds ecarunculate.

A pantropical genus of about 110 species, the majority of these New World with the center of diversity in Brazil. Six species in México. References: Webster and Armbruster 1991, Webster and Webster 1972.

DALECHAMPIA SCANDENS L., Sp. Pl. 1054. 1753. var. SCANDENS.—TYPE: According to Gillespie (1993, p. 76) and Webster and Armbruster (1991, p. 160), from the West Indies, plate 101 in Plumier, Pl. Amer. fasc. 5. 1757.

For synonymy see Webster and Armbruster 1991, pp. 160–161.

Robust perennial vine or scandent shrub (in the Guaymas region sometimes a facultative, nonvinning annual) with 3-lobed leaves; reproductive at various seasons but mostly in response to summer rains. Tropical deciduous forest of southeastern Sonora and in the Guaymas region (Sierra el Aguaje) and the Sierra Baviso in riparian canyons surrounded by Sonoran desert-scrub; 15–750 m. South to subtropical South America.

Wiggins (1964, p. 800) refers the Sonoran plants to var. *fimbriata* (H. B. K.) Müll. Arg., but according to Webster and Armbruster (1991, p. 161) this is a synonym of var. *scandens*. The three other varieties of *D. scandens* recognized by Webster and Armbruster are restricted to South America.

Mpio. Guaymas: Cañón del Nacapule, Felger 85–848; Sierra el Aguaje, Las Barajitas, Felger 95–183A; Cañón la Pintada, Van Devender & Van Devender 84–33. Mpio. Alamos: Sierra de Alamos, Steinmann 93–312.

DALEMBERTIA Baill.

Shrubs, sometimes herbaceous; monoecious. Latex milky. Pubescence simple or lacking. Leaves alternate, long-petiolate, entire to toothed or lobed, palmiveined. Inflorescences bisexual, spicate, with a few ♀ flowers at the base and numerous ♂ flowers above. Staminate flowers short-pedicellate, consisting of a single stamen enwrapped by a solitary sepal. Pistillate flowers pedicellate, with 3 imbricate, basally biglandular sepals; petals 0; ovary 3-locular, with 1 ovule per locule; styles entire, connate at the base into a column. Fruit capsular. Seeds ecarunculate.

A Mexican and Central American genus of about five species. Reference: Pax and Hoffmann 1912.

DALEMBERTIA POPULIFOLIA Baill., étude Euphorb.

(545–)546; pl. V, fig. 11–15. 1858.—TYPE: México, Oaxaca, Tehuantepec, *Andrieux 107* (holotype P, not seen; isotype G, not seen, photo [Field Mus. neg. 7207!]).

Alcoceria pringlei Fernald, Proc. Amer. Acad. Arts 36: 493. 1901.—TYPE: México, Guerrero, limestone mountains above Iguala, 26 Sep 1900, *Pringle 8433* (lectotype GH!, here designated). There are two sheets of this collection at GH. The first has fruits, while the second has both fruits and flowers. Fernald carefully described floral traits in the protologue, so we designate the second sheet as lectotype.

Drought-deciduous shrub to ca. 3 m tall; reproductive during the summer rainy season. Known in Sonora only from the southeastern part of the state in shaded canyon habitat of tropical deciduous forest in the vicinities of Güirocoba and Santa Bárbara; 550–1000 m. Sonora to Oaxaca and Puebla.

Wiggins (1964, p. 810) initially reported this species for Sonora as *Dalembertia hahniana* Baill. According to Miranda (1943, p. 34), *D. hahniana* is poorly defined with respect to *D. populifolia* and may be a synonym.

Mpio. Alamos: Güirocoba, *Gentry 2956*; Santa Bárbara, canyon, 27°06.3'N, 108°43.1'W, *Jenkins 95–285*; Arroyo El Cobre, near Choquincahui, 26°58'48"N, 108°40'53"W, *Van Devender 94–739*.

DITAXIS Vahl ex A. Juss.

Shrubs or herbs; monoecious. Latex absent. Pubescence of unbranched or more often of malpighiaceae hairs (appressed and attached by the middle), rarely absent. Leaves alternate, entire to serrate-dentate, usually palmately 3-veined. Inflorescences bisexual, axillary, racemose, few-flowered, ♀ flowers at the base and ♂ flowers above. Staminate flowers with a 5-lobed calyx; petals 5, adnate to the staminal column or free; stamens usually 10, in two whorls and united into a column (androphore). Pistillate flowers with 5 sepals and (4–)5 free petals; ovary 3-locular, with 1 ovule per locule; styles free or connate at the base, bifid, sometimes dilated at the apex. Fruit capsular. Seeds ecarunculate, often reticulate-foveolate.

A mostly tropical to subtropical New World genus of 50 species, ca. 20 in México. Often (e.g., Ingram 1980; McVaugh 1995, p. 189) treated as a subgenus of *Argythamnia*.

1. Stems glabrous.
2. Robust perennial herb to shrub, more than 40 cm tall and more than 3 times as tall as wide; stems erect, the first season stems 4.0–6.5 mm wide, semi-succulent; capsules pubescent *D. brandegeei* var. *intonsa*
- 2' Annual or perhaps short-lived perennial, less than 30 cm tall and about as wide as tall or wider; stems spreading, larger first season stems ca. 1.7–3.0 mm wide, tough and wiry, not at all succulent; capsules glabrous *D. serrata* var. *californica*
- 1' Stems pubescent.
3. Leaf margins, stipules, and ♀ sepals bearing numerous

tack-shaped glands; plant (except the ovaries) lacking malpighiaceae hairs *D. adenophora*

- 3' Leaf margins, stipules, and ♀ sepals eglandular; plants usually with many malpighiaceae hairs.
4. Plants herbaceous; stems mostly ascending to spreading or sometimes the main axis at first erect but the branches spreading and seldom straight; ♂ petals free from the staminal column, appearing to arise between and alternating with the glands; styles branches terete at the apex.
5. Leaves mostly ovate-elliptic, the apex (at least on the majority of leaves) pointed; adaxial surface of the young leaves with hairs uniform in thickness *D. neomexicana*
- 5' Leaves mostly obovate to spatulate, the apex mostly broadly obtuse to truncate (pointed on plants from Isla San Esteban); abaxial surface of the young leaves with some hairs usually thinner than others *D. serrata* var. *serrata*
- 4' Plants subshrubby; stems mostly erect and straight; ♂ petals united to the staminal column at base, appearing to arise above the glands; style branches sometimes dilated and flattened at the apex.
6. Leaves entire (rarely with one or a few scattered, inconspicuous teeth) *D. lanceolata*
- 6' Leaves manifestly toothed.
7. Pistillate petals green-brown in age, linear-lanceolate, 3.2–3.8 mm long, and although narrowed at the base, scarcely clawed; seeds 2.9–3.3 mm long *D. guatemalensis*
- 7' Pistillate petals white-yellow, ovate rhomboid, 1.8–3.0 mm long and with a distinct, narrow claw; seeds 2.1–2.4 (–2.7) mm long *D. manzanilloana*

DITAXIS ADENOPHORA (A. Gray) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. VI [Heft 57]: 65. 1912. *Argythamnia adenophora* A. Gray, Proc. Amer. Acad. Arts 8: 294. 1870.—TYPE: México, Sonora, 1869, *Palmer 32* (holotype GH!).

Argythamnia bicolor M. E. Jones, Contr. W. Bot. 15: 127. 1929.—TYPE: México, Sonora, [Mpio. Hermosillo], Hermosillo, 26 Oct 1926, *Jones 22727* (holotype POM[#162602!]).

Herbaceous perennial to subshrub ca. 1 m tall, the leaves and bracts with obviously glandular, tack-shaped marginal teeth, herbage usually pubescent with only spreading hairs, the malpighiaceae hairs restricted to the ovaries; reproductive more or less throughout the year. Sonoran desertscrub and thornscrub; near sea level to 650 m. Western Sonora from the vicinity of Navojoa to southwestern Arizona. It was also reported from northeastern Baja California by Wiggins (1980, p. 119), but we have not been able to locate specimens verifying its presence there.

Although usually treated as a synonym of *D. adenophora*, *Ditaxis clariana* (Jeps.) G. L. Webster¹ is a

¹ *Ditaxis clariana* (Jeps.) G. L. Webster, comb. nov. BASIONYM. *Argythamnia clariana* Jeps., Fl. Calif. 2: 419(–420). 1936.—TYPE: United States, California, foot of Santa Rosa Mts., ca. 10 mi W of Coachella and 3 mi W of Coral Reef Ranch, ca. 300 ft., 24 Oct 1936, *Clary 1707* (isotype RSA[#521740!]).

Since this combination has not been made previously, Grady Webster has graciously consented to publish it here.

distinct species distinguished by its herbage with numerous malpighiaceae hairs and by the generally more slender and not tack-shaped glands. *Ditaxis clariana* occurs in southeastern California and southwestern Arizona.

Mpio. Navojia: 4 mi E of Navojia, *Gentry 4756*. Mpio. Guaymas: 2 mi NE of San Carlos, *Wiggins & Rollins 183*. Mpio. Pitiquito: vicinity of Rancho Arivaipa, ca. 8 mi ENE of Pozo Coyote, ca. 29°37'N, 112°17'W, *Felger 17823*. Mpio. Caborca: Caborca, limestone hills, 25 Aug 1884, *Pringle s.n.* (POM).

DITAXIS BRANDEGEEI (Millsp.) Rose & Standl. var. *INTONSA* I. M. Johnst., Proc. Calif. Acad. Sci. ser. IV, 12: 1062. 1924. *Argythamnia brandegeei* Millsp. var. *intonsa* (I. M. Johnst.) J. W. Ingram in L. D. Benson & Darrow, Trees and shrubs of southwestern deserts 394. 1954.—TYPE: México, Gulf of California [Baja California Sur], Coronados Island, 18 May 1921, *Johnston 3764* (holotype CAS [#81341!]).

Slender, sparsely branched perennial herb to small shrub, the stems of the first one or two seasons thick, herbaceous, pithy, brittle, and semisucculent; reproductive at various seasons. Sonoran desertscrub in northwestern Sonora in rock habitats or rocky soils on the northwestern side of the Pinacate volcanic complex and granitic ranges west of the Pinacate region; ca. 240–400 m. Also southwestern Arizona, the Baja California Peninsula, and adjacent Gulf of California islands.

The Sonora and Arizona plants belong to var. *intonsa*, distinguished by the possession of scattered malpighiaceae hairs on the herbage and by the densely setose-hispid ovaries and capsules. Both varieties occur in the Baja California Peninsula and do not appear to be geographically segregated, although var. *brandegeei* seems to be more widespread. The growth habit and lacinate-margined petals of this species are unique in *Ditaxis*.

Mpio. Puerto Peñasco: MacDougal Crater, *Turner 59–308*. Mpio. San Luis R. C.: Sierra Nina, steep granitic slopes, *Felger 89–49*; slope of granite hill, 65 mi W of Sonoyta, *Shreve 7606*.

DITAXIS GUATEMALENSIS (Müll. Arg.) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. vi [Heft 57]: 59. 1912. *Argythamnia guatemalensis* Müll. Arg., Linnaea 34: 145. 1865.—TYPE: México, Puebla, Tehuacán, 1841, *Liebmann 5717* (lectotype [designated by Ingram 1964, p. 274] C, not seen).

Ditaxis discolor Brandege, Zoe 5: 242. 1908. *Ditaxis guatemalensis* (Müll. Arg.) Pax & K. Hoffm. var. *discolor* (Brandegee) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. vii [Heft 63]: 426. 1914.—TYPE: México, Sinaloa, Culiacán, 1904, *Brandegee s.n.* (holotype UC[#109919!]).

Shrub 1–2 m tall with weak, openly spreading branches; September–November, so far as known.

Thornscrub and tropical deciduous forest; 150–220 m. Southeastern Sonora to Central America. Following McVaugh's circumscription (1995, pp. 189–191), our plants are var. *guatemalensis*, which differs from his var. *barrancana* by having distinctly pitted seeds.

Mpio. Alamos: N of Alamos, near Agua Caliente, rocky outcropping in foothills, *Gentry 4844*; Tres Marias limestone quarry, ca. 28 km E of MEX 15 in Navojia, 27°06'46"N, 109°09'45"W, *Van Devender 95–1103*.

DITAXIS LANCEOLATA (Benth.) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. vi [Heft 57]: 71. 1912. *Serophyton lanceolatum* Benth., Bot. Voy. Sulphur 52(–53). 1844. *Aphora lanceolata* (Benth.) Engelm. & A. Gray, Pl. Lindheim. 25. 1845. *Argythamnia lanceolata* (Benth.) Müll. Arg., Linnaea 34: 148. 1865.—TYPE: México, Lower California [Baja California Sur], Magdalena Bay, *Barclay 3111* (holotype K, not seen, photo RSA!; isotype BM[#80183!]).

Argythamnia sericophylla A. Gray ex S. Watson, Bot. California 2: 70. 1880. *Ditaxis sericophylla* (A. Gray) A. Heller, Cat. N. Amer. Pl. 5. 1898.—TYPE: México, Lower California [Baja California, Sierra de Juárez] big cañon of the Tantillas, 10 Sep 1875, *Palmer 446* (lectotype GH!, here designated). This name is based on two collections; the other is: Arizona, on the Verde River, 4 May 1867, *Smart s.n.* (GH!). We lectotypify the better of the two specimens.

Argythamnia palmeri S. Watson, Proc. Amer. Acad. Arts 24: 77. 1889. *Ditaxis palmeri* (S. Watson) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. vi [Heft 57]: 64(–65). 1912.—TYPE: México, Sonora, [Mpio. Guaymas], mountains above Guaymas, 1887, *Palmer 247* (holotype GH!).

Argythamnia sericophylla A. Gray ex S. Watson var. *verrucosemima* Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 221(–222). 1889.—TYPE: México, Lower California, [Baja California Sur], San Gregorio, 2 Feb 1889, *Brandegee s.n.* (holotype F[#280918!]).

Sparsely to densely branched perennial herb to subshrub; reproductive at various seasons. This is one of the more common plants in the Sonoran desertscrub of western Sonora and occurs nearly throughout the Sonoran Desert, from southeastern California and western Arizona through the Baja California Peninsula. In Sonora south at least to the Guaymas region; near sea level to 650 m.

Plants in shaded canyon bottoms tend to have larger, broader, greener, and less-pubescent leaves. In the vicinity of Guaymas, such plants have been segregated as *Ditaxis palmeri*, but we treat these within *D. lanceolata*.

Mpio. Guaymas: Cañón del Nacapule, *Felger 84–134*. Probably Mpio. Pitiquito: Cerro del Viejo SW of Caborca, *Gentry 1443*. Mpio. Puerto Peñasco: rocky hill, E side of Sierra Pinacate, 31°45'N, 113°22'W, *Webster 22377*. Mpio. San Luis R. C.: Sierra del Rosario, *Felger 20720*.

DITAXIS MANZANILLOANA (Rose) Pax & K. Hoffm., in Das Pflanzenreich IV. 147. vi [Heft 57]: 59. 1912.

Argythamnia manzanilloana Rose, Contr. U.S. Natl. Herb. 1: 357. 1895.—TYPE: México, Colima, Manzanillo, 1–31 Dec 1890, *Palmer 1073* (holotype US[#208924]!).

Argythamnia gentryi J. W. Ingram, Bull. Torr. Bot. Club 80: 421 (–422). 1953. *Ditaxis gentryi* (J. W. Ingram) Radcl.-Sm. & R. Govaerts, Kew. Bull. 52: 497. 1997. TYPE: México, Sinaloa, Cerro Tecomate, W of Pericos, 100 ft, 29 Feb 1940, *Gentry 5761* (holotype UC[#651767]!).

Suffrutescent perennial or subshrub with straight, erect to ascending branches, distinctive in possessing conspicuously reticulate-ridged seeds and styles united below into a column. Rocky areas in the tropical deciduous forest of southeastern Sonora; 240–500 m. South along the Pacific slope to Oaxaca.

Argythamnia gentryi is here treated as a synonym of *D. manzanilloana*. In the protologue, Ingram distinguished it from *D. manzanilloana* on the basis of stamens included within the petals and stems with malpighiaceous hairs, but these characteristics are not well marked and, in our opinion, within the range of variation of *D. manzanilloana*.

Mpio. Alamos: NW of Alamos, Cerro Verde, on rd between Los Tanques and Piedras Verdes, *Jenkins 90*–252; Arroyo Gochico, 11 km by air E of San Bernardo, 27°23'45"N, 108°43'30"W, *Steinmann 93*–60; Güirocoba crossing of Río Cuchujaqui, 12.3 km by air SSE of Alamos, 27°56'15"N, 108°53'W, *Van Devender 92*–521.

DITAXIS NEOMEXICANA (Müll. Arg.) A. Heller, Cat. N. Amer. Pl. 5. 1898. *Argythamnia neomexicana* Müll. Arg., Linnaea 34: 147. 1865.—TYPE: United States, New Mexico, Upper Rio Grande, 1851–52, *Wright 1797* (syntype ?G, not seen; isosyntype MO[#1906372]!); Western Texas to El Paso, New Mexico, May–Oct 1849, *Wright 643* (syntype ?G, not seen; isosyntype MO[#1906373]!). Müller based his description on these two collections, presumably now at G. We find no reference to a lectotypification.

Argythamnia gracilis Brandegee, Zoe 5: 242(–243). 1908.—TYPE: México, Sinaloa, Culiacán, 14 Sep 1904, *Brandegee s.n.* (holotype UC[#110830]!).

Ditaxis gracilis Rose & Standl., Contr. U.S. Natl. Herb. 16: 12(–13). 1912.—TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, 1887, *Palmer 624* (holotype US[#45193]!).

Nonseasonal annual to short-lived herbaceous perennial. Widespread and common in Sonoran desertscrub, thornscrub, and tropical deciduous forest throughout much of lowland Sonora from near the Sinaloa border to the Pinacate region, and also in grassland in northeastern Sonora; near sea level to ca. 900 m. Southern Nevada, California to Texas, and Baja California (both states), to Coahuila, Sinaloa, and Durango.

This species is closely allied to and perhaps not always separable from *D. serrata* (see note under that

species). Interestingly, both *Argythamnia gracilis* and *Ditaxis gracilis*, here treated as synonyms of *D. neomexicana*, are independently based on separate collections of the same phenotypic variant with relatively longer pistillate sepals and large (5–8 cm long), subglabrate to sparsely pubescent leaves. Such plants appear to be nothing more than robust individuals growing under highly favorable conditions during the summer rainy season. The variation in both leaf size and pistillate sepal length is continuous. In addition to the type of *Ditaxis gracilis*, we have only seen a few Sonoran specimens of this variant, e.g., *Gentry 4717*, *Gentry 4835*, *Van Devender 93*–871.

Mpio. Bavispe: 7 mi E of Colonia Morelos, rd to Colonia Oaxaca, *White 4428* (RSA). Mpio. Puerto Peñasco: rocky mesa S of Pinacate Peak, *Felger 19345*. Mpio. Guaymas: Cañón del Nacapule, *Felger 85*–836; Guaymas, basaltic shade slopes on brushy hills, *Gentry 4717*. Mpio. Alamos: N of Alamos, near Tepistate, *Gentry 4835*; Río Guajaray between La Junta and Guajaray, *Steinmann 93*–145a. Mpio. Huatabampo: Huatabampito, 9 Mar 1988, *Martin s.n.* Mpio. Navojoa: Teachive de Masiaca, Arroyo Masiaca, *Van Devender 93*–871.

DITAXIS SERRATA (Torr.) A. Heller, Cat. N. Amer. Pl. 5. 1898. var. *SERRATA*. *Aphora serrata* Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 197. 1858. *Argythamnia serrata* (Torr.) Müll. Arg., Linnaea 34: 147. 1865.—TYPE: United States, California [the label gives Sonora], sandy plains near Fort Yuma, Jan 1855, *Schott s.n.* (lectotype NY! ex herb. Torrey, here designated). Torrey cited two specimens in the protologue. Of these, only the above corresponds to the current concept of *D. serrata*. The other specimen (Arizona, on the Gila River, Mar 1852, *Parry s.n.*, NY!) represents *D. neomexicana*.

Argythamnia serrata (Torr.) Müll. Arg. var. *magdalenae* Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 221. 1889. *Ditaxis serrata* (Torr.) A. Heller var. *magdalenae* (Millsp.) Eastw., Proc. Calif. Acad. Sci. ser. IV, 18: 474. 1929. TYPE: México, Lower California [Baja California Sur], Magdalena Island, 13 Jan 1889, *Brandegee s.n.* (holotype F[#280919]!).

Ditaxis odontophylla Rose & Standl., Contr. U.S. Natl. Herb. 16: 12. 1912.—TYPE: México, Sonora, [Mpio. Puerto Peñasco], Papago Tanks [Pinacate region], 14 Nov 1908, *MacDougal 36* (holotype US[#574248]!).

Robust nonseasonal annual to short-lived herbaceous perennial with a well-developed tap root. Lower Colorado Desert in Sonoran desertscrub on sandy soils including lower dunes and occasionally on rocky slopes adjacent to sandy habitats; generally replacing *D. neomexicana* on sandy soils. Northwestern Sonora southward to the vicinity of El Desemboque Río de la Concepción, and Isla San Esteban; near sea level to 225 m. Also southwestern Arizona, southeastern California, and both states of Baja California.

Ditaxis serrata and *D. neomexicana* are very simi-

lar, and the boundaries between the two can be indistinct. *Ditaxis serrata* is usually distinguishable from *D. neomexicana* by its more robust growth habit, stouter and deeper tap root, usually obovate to spatulate leaves that are broadly obtuse to truncate at the apex, denser indumentum consisting of hairs of varying thickness, and differences in the seed surfaces; the seeds of *D. neomexicana* usually have deeper, more conspicuous depressions, the sides of which bear fine but conspicuous radiating lines. Leaves of *D. serrata*, which are broadly obtuse to truncate, are rarely like those of *D. neomexicana*. In a similar fashion, some leaves of *D. neomexicana*—although usually just a few on an unusual individual—can have broadly obtuse leaves, but in our experience, these are not truncate to the extent that is common in *D. serrata*. The local distributions of these species in northwestern Sonora are narrowly separated by the differences in habitat, and in places of contact, such as the alluvium of the floor of MacDougal Crater, there are plants which vegetatively look like *D. serrata* but have seeds somewhat intermediate in character; in these plants the seeds have shallow depressions and very faint radiating “lines” on the shallow crateriform depressions as seen in *D. neomexicana*. To further confound matters, plants from Isla San Esteban differ from those of northwestern Sonora by having acute rather than obtuse to truncate leaf apices, and may represent hybrids or an undescribed taxon.

Ingram (1970, p. 942) states that *D. neomexicana* is doubtfully distinct from *D. serrata*, “apparently forming an intergrading complex that needs further intensive study.” We agree that a thorough investigation of the relationship between these two taxa is highly desired, but in our opinion the concept of *D. serrata* should be restricted to the sand-adapted taxon discussed here.

Isla San Esteban: *Felger 17534*. Mpio. San Luis R. C.: 10 mi N of El Golfo, sandy plain, *Felger 75–78*. Mpio. Puerto Peñasco: MacDougal Crater, *Felger 10461*; Gulf coast at Punta Peñasco, *Shreve 7596*. Mpio. Caborca: 12.3 mi by rd NE of Desemboque del Río de la Concepción, vicinity of 30°40'N, 112°57'W, *Felger 16790*.

DITAXIS SERRATA (Torr.) A. Heller var. CALIFORNICA (Brandege) V. W. Steinm. & Felger, Madroño 42: 456(–457). 1996. *Ditaxis californica* (Brandege) Pax & K. Hoffm., in *Das Pflanzenreich* IV. 147. VI [Heft 57]: 70. 1912. *Argythamnia californica* Brandege, *Zoe* 5: 230. 1906.—TYPE: United States, California, Riverside Co., Marshall Canyon, 7 mi W of Coachella, 100 ft, Apr 1905, *Hall 5796* (holotype UC[#110733]!).

Glabrous spring annual. The single collection from Sonora consists of two individuals from a coastal dune near Puerto Peñasco. Intensive searches have failed to turn up additional plants at Puerto Peñasco and else-

where in the region. Otherwise known from southeastern California and reported by Wiggins (1980, p. 119) for the east flanks of the Sierra Juárez in northeastern Baja California. Endemic to the Lower Colorado Desert in Sonoran desertscrub.

Mpio. Puerto Peñasco: Puerto Peñasco, Casa García (ca. 3 km E of center of town), 50 ft, 28 Mar 1980, *Yatskievych 80–43*.

DRYPETES Vahl

Trees or shrubs; mostly dioecious. Latex absent. Glabrous or pubescent with unbranched hairs. Leaves alternate, often coriaceous and asymmetrical at the base, entire to serrate, penniveined. Inflorescences unisexual, axillary, fasciculate. Staminate flowers with 4–5 sepals; petals 0; stamens 3 to many, filaments free. Pistillate flowers with 4–5 sepals; ovary 1–4-locular, with 2 ovules per locule; styles short to absent, stigma thick and flattened. Fruit drupaceous, single seeded (by abortion). Seeds ecarunculate. Noteworthy in being the only genus of Euphorbiaceae having mustard oils.

Pantropical; 200 species, 20 of these Neotropical with four species in México.

DRYPETES GENTRYI Monach., Phytologia 3: 32(–33). 1948.—TYPE: México, Sinaloa, Capadero, Sierra Tacuichamona, rocky canyon under basalt rim, 3500 ft, 13 Feb 1940, *Gentry 5597* (holotype NY, not seen; isotypes ARIZ[#69724 & #272706]!).

Cortopico, palo verde. Large densely foliated hardwood evergreen tree attaining heights of 20(–30) m, the trunk gray and fissured; flowering at least October–March, the fruits maturing March–May. Southeastern Sonora along riparian canyons in tropical deciduous forest; 310–1200 m. Also adjacent southwestern Chihuahua to Colima and Jalisco. This is one of the tallest trees in Sonora, and the only large euphorbiaceous tree in the state.

Mpio. Alamos: Río Guajaráy, between Los Aguaros and Cajón del Ardilla, 27°38'30"N 108°58'W, *Felger 94–56*; Arroyo Gochico, deep canyon bottom, *Gentry 3618*; Arroyo el Cobre, Choquincahui, 7.0 mi by rd N of Güirocoba, 14 May 1993, *Meyer s.n.*

EUPHORBIA L.

Great variation in growth form, including ephemerals to herbaceous perennials, shrubs, trees, and, especially in drier regions of Africa, a fantastic diversity of succulents of growth forms often convergent with New World cacti; monoecious or rarely dioecious. Latex milky. Pubescence absent or of unbranched hairs. Leaves alternate, opposite, or verticillate, palmi- or penniveined, entire or variously toothed; stipules absent or present. Flowers arranged in a cuplike, gland-bearing involucre consisting of a solitary ♀ flower surrounded by clusters of ♂ flowers (the whole inflores-

cence structure termed a cyathium). Staminate flowers reduced to a single pedicellate stamen. Pistillate flowers reduced to a single pedicellate pistil; ovary 3-locular, the locules uniovulate; styles 3, usually at least partially united. Fruit (in ours) capsular. Seeds carunculate or not.

Cosmopolitan; 2000+ species. The subgenera (especially *Chamaesyce*) are sometimes treated as genera, but in light of the often ambiguous distinctions between the subgenera of *Euphorbia*, we maintain a traditional stance and include them within a broad concept of *Euphorbia*. References: Boissier 1862; McVaugh 1993.

KEY TO THE SUBGENERA

1. Plants prostrate or not; leaves always opposite, the blades usually markedly asymmetrical at the base; stipules usually present, not glandular *Chamaesyce* p. 35
- 1' Plants not prostrate; leaves alternate, opposite, or verticillate, the blades symmetrical at the base; stipules absent or glandular (well developed only in *E. sonorae*).
1. Leaves manifestly serrate. *E. exstipulata*
- 1' Leaves entire (rarely with one or a few scattered, inconspicuous teeth in *E. eriantha*).
2. Shrubs.
 3. Stems succulent, straight, spinescent-tipped, leafless or with leaves few, sessile, and less than 1 cm long; subcyathial leaves filiform; seeds carunculate *E. ceroderma*
 - 3' Stems woody or semi-succulent, not spinescent, seasonally leafy, the leaves at least 1 cm long and petiolate; subcyathial leaves variously shaped but not filiform; seeds carunculate.
 4. Stem leaves ternate.
 5. Appendages shorter than the involucre, less than 2 mm long, not tinged with pink *E. colletioides*
 - 5' Appendages longer than the involucre, more than 2 mm long, often becoming pink-tinged with age *E. xanti*
 4. Stem leaves alternate.
 6. Herbage, involucre, ovaries, and capsules pubescent *E. misera*
 - 6' Herbage, involucre, ovaries, and capsules glabrous.
 7. Petioles equaling or longer than the blades; leaf blades obovate to broadly ovate, the apex obtuse to emarginate; appendages green to yellowish green, 1 mm or less in length *E. californica*
 - 7' Petioles mostly shorter than the blades; leaf blades linear, lanceolate, to narrowly ovate, the apex acute; appendages white, more than 1 mm long *E. gentryi*
- 2' Herbs.
 8. Appendages arching over and concealing the glands; styles not divided; capsules noticeably longer than broad; caruncle conspicuous, nearly as broad as the seed *E. eriantha*
 - 8' Appendages not concealing the glands; styles divided or not; capsules as broad as or broader than long; seeds lacking a caruncle or the caruncle relatively inconspicuous and not nearly as broad as the seed.
 9. Appendages bi- or tripartite or palmately or fimbriately parted to the base.
 10. Leaves of the primary branches predominantly opposite, usually linear; appendages bipartite; seeds lacking deep pits *E. bilobata*
 - 10' Leaves of the primary branches predominantly alternate, ovate to lanceolate to orbicular; appendages 3 or more parted; seeds with several rows of deep pits, the bottoms of which frequently contain a minute, sharply punctiform pit.
 11. Stipules conspicuous, subulate; styles not divided *E. sonorae*
 - 11' Stipules inconspicuous, glanduliform; styles divided.
 12. Petioles attached subpeltately above the base; cyathia arranged in monochasial cymes; subcyathial leaves linear-filiform, very different in shape from the vegetative leaves *E. dioscoreoides* ssp. *attenuata*
 - 12' Petioles not peltate, attached at the base of the blade; cyathia arranged in dichasial cymes; subcyathial leaves generally orbicular to ovate, resembling the vegetative leaves only smaller in size.
 13. Involucre, glands, and appendages green; glands 5; divisions of the appendages 3(–4), linear, fingerlike *E. ocymoidea*
 - 13' Involucre, glands, and appendages usually suffused with red-purple; glands 4; divisions of the appendages 3–6, filiform, threadlike *E. subreniformis*
 - 9' Appendages not divided, at most broadly and shallowly lobed.
 14. Leaves linear; glands 5.

2. Involucral appendages present. *Agaloma* p. 29
- 2' Involucral appendages absent.
 3. Involucral glands rounded, bicornuate, or truncate, 4–5 per involucre, the cyathia solitary in the axils of opposite, nonshowy, green leaves *Esula* p. 51
 - 3' Involucral glands deeply cupped or bilabiate, 1 per involucre (rarely 2 or 4 on some involucre), if consistently 4–5 (in *E. radians*) then the cyathia in dense capitate clusters at the ends of branches and subtended by a verticil of showy, white to pink subcyathial leaves. *Poinsettia* p. 55

Subgenus *Agaloma* (Raf.) House [= *Agaloma* Raf.]

Herbs, shrubs, rarely succulent or arborescent. Leaves alternate, opposite, or verticillate; stipules mostly minute and glanduliform, rarely (as in *E. sonorae*) subulate-filiform. Involucral glands with appendages. Seeds carunculate or not.

About 150 species, restricted to the New World with the center of diversity in México and Central America where about 85 mostly endemic species occur; 20 species in Sonora.

- 15. Ovaries pubescent *E. sphaerorrhiza*
- 15' Ovaries glabrous.
 - 16. Annual; appendages ovate to triangular, portion extending beyond the gland 0.8–1.5 mm long *E. hexagonoides*
 - 16' Perennial herb; appendages linear to narrowly ovate, portion extending beyond the gland 1.7–2.9 mm long *E. sp. 1*
- 14' Leaves elliptic, lanceolate, ovate, or oblong (rarely linear in unusual morphs of *E. graminea*, but then the glands 2–4); glands (1)2–5.
- 17. Perennial from an underground tuber; leaves opposite, those at the base of the "inflorescence" sometimes ternate *E. macropus*
- 17' Annuals; cauline leaves alternate but the floral leaves often opposite.
 - 18. Herbage glandular pilose; appendages usually green. *E. humayensis*
 - 18' Herbage not glandular; appendages white to purple.
 - 19. Glands mostly 2–4, often tinged with purple; seeds with several rows of deep pits *E. graminea* var. *graminea*
 - 19' Glands 5, not tinged with purple; seeds lacking deep pits *E. sinaloensis*

EUPHORBIA BILOBATA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 190. 1858. *Zygophyllidium bilobatum* (Engelm.) Standl., Contr. U.S. Natl. Herb. 13: 199, 227. 1910.—TYPE: México, Sonora, Santa Cruz [presumably the town on the Río Santa Cruz, near the Arizona border], 1851–1852, Wright 1831 (lectotype MO[#2963877]!, designated by Wolf 1988, p. 1626).

Erect annual with linear, mostly opposite leaves and bilobate appendages; August–October. Grassland to oak and pine-oak woodland in eastern Sonora; 1250–1800 m. Also southeastern Arizona to western Texas and Chihuahua.

The appendages vary from small, green, and inconspicuous to relatively large, white, and obvious. This variation is continuous and does not show geographic segregation. Plants of the large-appendaged phase strongly resemble some species of *Drymaria* (Caryophyllaceae).

Mpio. Nogales: Nogales, 23 Oct 1926, Jones 22740 (POM). Mpio. Yécora: Los Pílares, Arroyo Los Pílares, ca. 23 km E of Yécora, 28°23'N, 108°47'30"W, Van Devender 95–923; hills ca. 1.5 km W of Yécora, 28°22'30"N, 108°56'45"W, Steinmann 1012.

EUPHORBIA CALIFORNICA Benth., Bot. Voy. Sulphur 49(–50); pl. 23, figs. B1–5. 1844. *Trichosterigma californicum* (Benth.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 42. 1860.—TYPE: México, Lower California [Baja California Sur], Bay of Magdalena, probably 1841, Hinds s.n. (holotype K, not seen, photo RSA!).

Euphorbia comonduana Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 229. 1889. *Aklema comonduana* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 416. 1916.—TYPE: México, Lower California [Baja California Sur], Comondú, 23 Mar 1889, Brandegee s.n. (holotype F[#196141]!).

Highly branched shrub 1.5–3 m tall; reproductive at various seasons. Thornscrub and the southern edge of the Sonoran Desert; near sea level to ca. 300 m. Sonora from the vicinity of Hermosillo and mountains

around Guaymas southward in Sinaloa at least to the Sierra Tacuichamona. Also the Baja California Peninsula (see Wiggins 1955, pp. 345–346) and disjunct in Zacatecas.

On both sides of the Gulf of California this species is replaced to the north by the closely related *E. misera*. *Euphorbia misera* has thicker, more succulent and gnarled stems; pubescent herbage, involucre, and capsules; and shorter, stouter petioles. *Euphorbia hindsiana* Benth., known only from the Cape Region of Baja California Sur, has been treated as *E. californica* var. *hindsiana* (Benth.) Wiggins, but it is quite distinct and best recognized at the rank of species.

Mpio. Hermosillo: 5 mi N of Hermosillo, Shreve 6067. Mpio. Huatabampo: Las Bocas, 26°35'30"N, 109°20'30"W, Van Devender & Van Devender 93–135.

EUPHORBIA CERODERMA I. M. Johnst., Proc. Calif. Acad. Sci. ser. IV, 12: 1066. 1924.—TYPE: México, Sonora, [Mpio. Guaymas], San Pedro Bay, rocky cañón sides, 7 July 1921, Johnston 4304 (holotype CAS[#81338]!).

Shrub forming closely tufted clumps often 1–1.5 m tall, with succulent, spinose-tipped stems and few, small, very quickly deciduous leaves; reproductive mostly with the summer rains. Previously reported in Sonora only from the type collection at Bahía San Pedro (Johnston 1924, p. 1066). It is common on rhyolite hills and mountains to peak elevations on Cerro el Vigía at Guaymas and Bahía San Carlos northward in the coastal mountains to the vicinity of 28°08'N. Also Baja California Sur.

Euphorbia ceroderma is one of the few succulent Euphorbiaceae in the Sonoran Desert and is a very distinctive plant. Though reported to be closely related to *E. antisyphilitica* Zucc. of the Chihuahuan Desert (Huft 1984, pp. 1026–1027), their stem architecture is conspicuously different. The stems of *E. ceroderma* are usually branched, greener, and thicker, while those of *E. antisyphilitica* are usually unbranched, ashy-gray,

and narrower. In addition, *E. ceroderma* has unusual, long filiform bracteate leaves subtending the cyathia. In cultivation *E. ceroderma* is highly frost-sensitive, whereas *E. antisiphilitica* tolerates moderate winter freezing. Other differences are given by Huft (1984, pp. 1026–1027).

Mpio. Guaymas: 1 mi N of Bahía San Carlos, *Felger* 9585; Cerro el Vigía, *Turner* 75–28; Cerro Algodones, ca. 5 mi W of Bahía San Carlos on rd to Bahía Algodones, *Phillips* 75–87; Caleta Venecia, 28°07'50.5"N, 111°17'34.5"W, *Felger* 96–100.

EUPHORBIA COLLETIODES Benth., Bot. Voy. Sulphur 163. 1844. *Aklema colletioides* (Benth.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 416. 1916.—TYPE: The protologue only states Acapulco [México, Guerrero] without identifying a collector. Acapulco, *Sinclair s.n.* (K, not seen, photo RSA!) was annotated as “lectotype” by Rogers McVaugh in 1994.

Euphorbia recta Klotzsch in Seem., Bot. Voy. Herald 277. 1856.—TYPE: México, Sierra Madre, on the rd from Durango to Tepic, *Seemann* 2161 (holotype probably BM, not seen; isotype K, not seen, photo [Univ. Mich. neg. 534!]).

Euphorbia ligustrina Boiss., Cent. Euphorb. 21. 1860. *Aklema ligustrina* (Boiss.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 416. 1916.—TYPE: “Nova Hispaniâ” [presumably a Mexican Sessé and Mocino collection] (holotype G, not seen, photo [Field Mus. neg. 34104!]).

Euphorbia plicata S. Watson, Proc. Amer. Acad. Arts 21: 438(–439). 1886. *Aklema plicata* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 417. 1916.—TYPE: México, southwestern Chihuahua, Hacienda San Miguel near Batopilas, Sep 1885, *Palmer* 181 (lectotype GH!, here designated).

Euphorbia padifolia Brandegee, Univ. Calif. Publ. Bot. 6: 54. 1914.—TYPE: México, Oaxaca, San Geronimo, according to the protologue, “dry rocky plains, Pichacho-San Geronimo.” Oct 1913, *Purpus* 6950 (holotype UC[#173014!]).

Candelillo, Jumete. Shrub 1.5–4 m tall with weak, wandlike, terete stems, and quickly drought-deciduous ternate leaves; usually reproductive when leafless, October–May. Sonoran desertscrub, thornscrub, tropical deciduous forest, and rarely in oak-pine woodland; 25–1300 m. North-central Sonora to Central America.

This species is very similar to the West Indian *E. cymosa* Poir. (= *E. nudiflora* Jacq.), and possibly the two should be considered conspecific. The only difference appears to be a tendency for looser “inflorescences” and slightly smaller cyathia in the West Indian plants. The sap of *E. colletioides* is reportedly very poisonous, with as little as one drop said to produce serious diarrhea (*Joyal* 2113 and from local guide in Alamos).

Mpio. Carbó: microondas 5 mi N of El Oasis and 47 mi N of Hermosillo, *Phillips* 75–134. Mpio. Cumpas: 16 mi by rd E of Moctezuma, *Hastings & Turner* 65–100. Mpio. Guaymas: Sierra Libre, rd to Microondas Avispas, near summit, *Felger* 85–828. Mpio. Yécora: Yécora hwy 2.6 mi W of old Yécora turn-off, 28°21'N, 109°03'–04'W, *Joyal* 2113 (ASU). Mpio. Alamos: Alamos, *Gentry* 2920.

EUPHORBIA DIOSCOREOIDES Boiss. ssp. *ATTENUATA* V. W. Steinm., Aliso 14: 222(–223); fig. 3. 1996.—TYPE: México, Chihuahua, Guasaremos, 20 Aug 1936, *Gentry* 2401 (holotype ARIZ[#313757!]).

An erect, leafy annual, noteworthy among the Sonoran *Euphorbia* in possessing subpeltate leaves and linear-filiform subcyathial leaves; July–October. Moist shady ravines and understory, with many records from tropical deciduous forest and one from pine-oak woodland. Eastern Sonora from the vicinity of Nacori Chico southward; 350–950(–1250) m. Also western Chihuahua to western Michoacán. Subspecies *dioscoreoides* occurs in eastern Michoacán and the state of México.

Mpio. Nacori Chico: Nacori Chico, El Río Bonito about La Nopalera, *Muller* 3628 (GH, LL). Mpio. Onavas: along MEX 16, ca. 30 km SE of the Río Yaqui crossing, 28°29'07"N, 109°21'29"W, *Stenmann* 1003. Mpio. Alamos: Arroyo El Cobre, near Choquincahui, *Van Devender* 94 732; 3 km SW of Santa Bárbara, 27°06.5'N, 108 44'W, *Jenkins* 90–153.

EUPHORBIA ERIANTHA Benth., Bot. Voy. Sulphur 51. 1844. *Poinsettia eriantha* (Benth.) Rose & Standl., Contr. U.S. Natl. Herb. 16: 13. 1912.—TYPE: México, Lower California [Baja California Sur], Bay of Magdalena, 1841, *Hinds s.n.* (holotype K, not seen, photo [Kew neg. 17895!]; fragment F[#196504!]).

Euphorbia exclusa S. Watson, Proc. Amer. Acad. Arts 18: 150. 1883.—TYPE: México, Coahuila, 22–27 leagues SW of Parras, San Lorenzo de Laguna, May 1880, *Palmer* 1218 (holotype GH!).

Nonseasonal annual or sometimes short-lived perennial herb, the leaves linear, the lower ones alternate, the upper ones forming whorls beneath the cyathia. Sonoran desertscrub and thornscrub in western Sonora; near sea level to ca. 875 m. Baja California Sur to southeastern California, eastward to southwestern Texas, and southward to Coahuila and Durango.

Mpio. Puerto Peñasco: Sierra Pinacate, *Felger* 19353. Mpio. Hermosillo: 5 mi by rd E of Bahía Kino, *Felger* 9055. Mpio. Guaymas: strand at Estero Soldado, *Felger* 84–406. Mpio. Huatabampo: Estero Santa Bárbara, 3 km W of Huatabampito, 26 Dec 1986, *Martin & O'Rourke s.n.*

EUPHORBIA EXSTIPULATA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 189. 1858. *Chamaesyce exstipulata* (Engelm.) Rydb., Bull. Torr. Bot. Club 40: 54. 1913. *Zygophyllidium exstipulatum* (Engelm.) Wootton & Standl., Contr. U.S. Natl. Herb. 16: 146. 1913.—TYPE: United States, “Novo-Mexicanae,” gravelly banks of the Rio de Norte near Santa Fe, 24 May 1847, *Fendler* 790 (lectotype MO[#1911306!], designated by Wolf 1988, p. 1626).

Euphorbia aliciae A. Nelson, Bot. Gaz. 42: 50. 1906.—TYPE: United States, Wyoming, Hartville, 15 July 1894, *Nelson* 549 (holotype RM[#4856!]).

Euphorbia exstipulata Engelm. var. *lata* Warnock & M. C. Johnst., SouthW. Naturalist. 14: 127(–128). 1969.—TYPE: United States, Texas, Brewster Co., Big Bend National Park, W side of Chisos Mts., Ward Spring, 4000 ft, 18 Aug 1955, Warnock 13104 (holotype SRSC!).

Summer-fall annual, noteworthy among our species of subgenus *Agaloma* by possessing serrate-dentate leaves; northeastern Sonora, ca. 1700 m. Uppermost edge of Sonoran and Chihuahuan desertscrub, grassland, and oak woodland in Arizona along the Sonora border from the Baboquivari Mountains eastward, and probably in similar habitat in adjacent Sonora. In the protologue Engelm reports three collections from Sonora: “Thurber, Bigelow, Parry.” Of these, we have only located the Thurber collection (Mex. Sonora, Sept. 1851, *Thurber 1020* [NY!]). Since this date is one year before the Gadsden Purchase, the specimen might have been from present-day southern Arizona. Primarily a Chihuahuan Desert and grassland species; Texas to Arizona, rare in California and southward to Sonora, San Luis Potosí, and Zacatecas.

Broad-leafed plants have been segregated as var. *lata*, but this taxon is weakly defined. The variation in leaf-shape is continuous, and there are collections with both broad-leafed and narrow-leafed plants on the same sheet (e.g., *McLaughlin 3858*, *Waterfall 6706* [MO]).

Mpio. Cananea: Carr. Cananea-Bocoachi, Cañón de Evans, 5 Oct 1990, *López E. s.n.* (USON); Carr. Cananea-Bocoachi, Mesa Cieneguita, 5 Oct 1990, *López E. s.n.* (USON). Mpio. Bavispe: Sierra de la Cabellera, Cañón de la Mescalera, *White 4714* (MICH).

EUPHORBIA GENTRYI V. W. Steinm. & T. F. Daniel, *Madroño* 42: 450(–454). 1996.—TYPE: México, Sonora, Mpio. Navojoa, Mesa Masiaca, 6.5 km WNW of San José de Masiaca, ca. 26°46'N, 109°17'W, ca. 200 m, 22 Nov 1993, *Steinmann 93–357* (holotype CAS[#918030]!).

Multiple-stem shrub to 3 m tall, during peak flowering topped by showy white clusters of cyathia; reproductive at various seasons. Thornscrub of southwestern Sonora, restricted to basaltic slopes and especially fond of boulder fields; ca. 200–350 m. Also northwestern Sinaloa.

Mpio. Cajeme: cerro about 10 mi S of Cd. Obregón, *Gentry 14281*. Mpio. Navojoa: microwave tower rd on Cerro Prieto, ca. 9 mi E of Navojoa on Alamos rd, *Van Devender & Van Devender 92–167*.

EUPHORBIA GRAMINEA Jacq., *Select. Stirp. Amer. Hist.* 151. 1763. var. GRAMINEA. *Adenopetalum gramineum* (Jacq.) Klotzsch & Garcke, *Abh. Königl. Akad. Wiss. Berlin* 1859 [Phys. Abh.]: 47. 1860. *Eumecanthus gramineus* (Jacq.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 413. 1916.—TYPE: Columbia, Cartagena, *Jacquín s.n.* (lectotype BM[#510672]!), designated by McVaugh 1993, p. 233).

Euphorbia colimae Rose, *Contr. U.S. Natl. Herb.* 1: 356. 1895. *Eumecanthus colimae* (Rose) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 414. 1916.—TYPE: México, Colima, 9 Jan–6 Feb 1891, *Palmer 1170* (holotype US[#208933]!).

Euphorbia longipetiolata M. E. Jones, *Contr. W. Bot.* 18: 55. 1933.—TYPE: This was based on two collections: “No. 27514a, la Barranca, Guadalajara, Jalisco, Nov. 12 1930 and same loc. No. 27538.” At POM we have been able to locate only *Jones 27914* collected on 19 Nov 1930 from the location given in the protologue. This specimen (#191687) was annotated as the probable type (i.e., lectotype) by both Louis Wheeler (in 1942) and Rogers McVaugh (in 1992), and we are in agreement with them.

Erect leafy annual; mostly in the summer/fall rainy season but also in the spring. Characteristically in tropical deciduous forest but sometimes lower margins of oak and pine-oak woodland; 200–1260 m in east-central and southeastern Sonora. Widespread in tropical and subtropical México to northern South America and the West Indies.

With many varieties and likely synonymous species having been named, the *E. graminea* complex is enigmatic and awaits a careful revision. McVaugh (1993) places most of the western Mexican populations, including those from Sonora, in var. *graminea*, and we follow his circumscription.

Mpio. Alamos: Tepopa, *Gentry 1430*; canyon above La Aduana, N side of Sierra de Alamos, *Van Devender 93–1371*. Mpio. Yécora: Santa Ana de Yécora, *Goldberg 77–198*. Mpio. Nacori Chico: Agua Caliente drainage between Rancho El Alamo and Buena Vista, 29°36'N, 108°56'W, *Joyal & Silva 1779* (MEXU).

EUPHORBIA HEXAGONOIDES S. Watson, *Proc. Amer. Acad. Arts* 25: 161. 1889.—TYPE: México, Chihuahua [mistakenly given as Nuevo León in the protologue], foothills of the Sierra Madre [Arroyo Ancho], 5 Oct 1888, *Pringle 2016* (holotype GH!).

Erect summer/fall annual with slender stems and narrow, linear leaves, notable for its undivided styles. Known in Sonora from a single collection in pine-oak woodland in the upper Río Mayo region near Yécora. Otherwise known from western Chihuahua and Sinaloa; usually in open areas on very moist soils.

Mpio. Yécora: 10.0 mi NW of Yécora on “old” rd to La Trinidad/Santa Rosa, 28°27'47.5"N, 109°00'47.5"W, 1700 m, *Wilson 95–74*.

EUPHORBIA HUMAYENSIS Brandegee, *Zoe* 5: 208. 1905. *Eumecanthus humayensis* (Brandegee) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 414. 1916.—TYPE: México, Sinaloa, Culiacán, 1 Oct 1904, *Brandegee s.n.* (lectotype [designated by Huft 1984, p. 1025] UC[#110009], not seen, photo [Field Mus. neg. 58287]!; isolectotype F[#196158]!).

Erect leafy summer/fall annual closely resembling *E. graminea* but readily separable by the possession of a glandular-pilose indumentum. Tropical deciduous forest; 400 m. In Sonora known from a single collec-

tion; also Sinaloa to Michoacán, the Cape Region of Baja California Sur, and reported by Huft (1984, p. 1025) for Venezuela.

Mpio. Alamos: SE edge of Sierra de Alamos, Arroyo las Rastras, *Van Devender* 93–1467.

EUPHORBIA MACROPUS (Klotzsch & Garcke) Boiss. in DC., *Prodr.* 15(2): 52. 1862. *Anisophyllum macropum* Klotzsch & Garcke, *Abh. Königl. Akad. Wiss. Berlin* 1859 [Phys. Abh.]: 33(–34). 1860.—TYPE: México, [Hidalgo, Real del Monte et Cerro Vento], *Ehrenberg* (B, probably destroyed).

Euphorbia plummerae S. Watson, *Proc. Amer. Acad. Arts* 18: 195. 1883.—TYPE: United States, Arizona, Huachuca Mts., Sentinel, Tanner's Canyon, July 1882, *Lemmon* 2874 (holotype GH!).

Euphorbia biformis S. Watson, *Proc. Amer. Acad. Arts* 18: 151. 1883. *Zygophyllidium biforme* (S. Watson) Arthur, *Torreya* 11: 260. 1912.—TYPE: México, San Luis Potosí, San Miguelito Mts., 1876, *Schaffner* 860 & 862 (syntypes GH!). 860 was annotated by McVaugh to be chosen lectotype in the forthcoming *Flora Novo-Galiciana*. Another syntype, [San Luis Potosí], region of San Luis Potosí, 22°N, 6000–8000 ft, *Parry & Palmer* 806 (GH!), is not *E. macropus* but instead appears to be a species near *E. graminea*.

For additional synonymy see Huft 1979, pp. 233–234.

Perennial herb from a thickened, tuberous root, the leaves opposite or rarely ternate; July–September. Eastern Sonora; pine-oak woodland and mixed conifer forest; 1400–2100 m. Southeastern Arizona to Central America.

Euphorbia macropus is highly variable in size and in leaf shape. *Euphorbia muscicola* Fern. has been treated as a synonym, but it is a distinct species known only from the vicinity of Tepoztlán, Morelos. It differs by the possession of alternate, serrate to serrulate lower leaves and less tuberculate seeds.

Mpio. Yécora: hills ca. 1.5 km W of Yécora, 28°22'30"N, 108°56'45"W, *Steinmann* 1011. Mpio. Alamos: Sierra Charuco, *Gentry* 1730; Sierra Sagaribo, NW of Chiribo, Tepopa, 22 Aug 1992, *Martin et al. s.n.*

EUPHORBIA MISERA Benth., *Bot. Voy. Sulphur* 51. 1844. *Trichosterigma miserum* (Benth.) Klotzsch & Garcke, *Abh. Königl. Akad. Wiss. Berlin* 1859 [Phys. Abh.]: 42. 1860.—TYPE: San Diego [California, United States] and San Quentín [Baja California, México], 1841, *Hinds s.n.* (holotype K, not seen, photo RSA!).

Euphorbia benedicta Greene, *Pittonia* 1: 263(–264). 1889. *Trichosterigma benedictum* (Greene) Millsp., *Addisonia* 2: 3. 1917.—TYPE: México, [Baja California], Islas San Benito, 1889, *Pond s.n.* (holotype NDG[#29536]!).

Multiple-stemmed shrub with thick, semisucculent, flexible stems appearing gnarled due to the knobby short-shoots; reproductive at various seasons. Sonoran

desertscrub in northwestern Sonora from Puerto Peñasco and Bahía de la Cholla southward to Cerro Tepopa and on Isla Tiburón, near sea level to ca. 650 m; farther south, in the Hermosillo-Guaymas region, it is replaced by the closely related *E. californica*. Also southern California and both states of Baja California.

Plants from Islas San Benito tend to have slightly larger appendages and seeds. They have been segregated as *Euphorbia benedicta*, but the differences are slight, and we treat them within *E. misera*.

Mpio. Puerto Peñasco: Punta Peñasco, *Felger* 90–63, *Shreve* 7597; Bahía de la Cholla, sand dunes, *Lehto* 3714 (ASU). Mpio. Caborca: dunes 2 mi N of Puerto Lobos, *Turner* 60–45. Mpio. Pitiquito: Cerro Tepopa, *Felger* 20264.

EUPHORBIA OCYMOIDEA L., *Sp. Pl.* 453. 1753. *Anisophyllum ocymoides* (L.) Haw., *Syn. Pl. Succ.* 161(–162). 1812. *Leptopus ocymoides* (L.) Klotzsch & Garcke, *Abh. Königl. Akad. Wiss. Berlin* 1859 [Phys. Abh.]: 45. 1860. *Eumecanthus ocymoides* (L.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 414. 1916.—TYPE: “Habitat in Campechia. Hous[ton]” (neotype [selected by McVaugh 1993, pp. 228–229] BM, not seen, photocopy RSA!).

Euphorbia astroites Fisch. & C. A. Mey., *Ind. Sem. Hort. Petrop.* 2: 44(–45). 1835. *Eumecanthus astroites* (Fisch. & C. A. Mey.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 414. 1916.—TYPE: Grown in St. Petersburg, apparently from seed collected by Karwinsky at “Tampacoala” [México, San Luis Potosí, Tampacualab] (holotype presumably LE, not seen).

Euphorbia astroites Fisch. & C. A. Mey. var. *heterappendiculata* Millsp., *Field Mus. Nat. Hist., Bot. ser.* 1: 28. 1895.—TYPE: México, Yucatán, E slopes of Cerro Grande, Izamal, 13 Jan 1895, *Millspaugh* 64 (holotype F[#196971]!).

Euphorbia cofradiana Brandegee, *Zoe* 5: 207. 1905. *Eumecanthus cofradianus* (Brandegee) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 414. 1916.—TYPE: México, Sinaloa, Cofradía, 20 Oct 1904, *Brandegee s.n.* (holotype UC[#110044] not seen, photo US!; isotype F[#196159]!).

Delicate annual notable for the fingerlike divisions of the appendages; reproductive at various seasons. Mostly shaded areas in tropical deciduous forest of southeastern Sonora; 270–850 m. Through México to at least southern Central America.

This species was first reported from Sonora as *Euphorbia ocymoides* var. *barnesii* (Millsp.) McVaugh (Van Devender et al. 1995, pp. 413–414), but upon further study the Sonoran plants appear best accommodated within var. *ocymoides*, as defined by McVaugh (1993, pp. 227–228). It is our opinion, however, that the entities McVaugh treats as varieties are best recognized as species (see note under *E. subreniformis*).

Mpio. Alamos: hill with a microwave tower, 9 mi by air NW of Alamos, *Sanders* 9462; El Guayabo crossing of the Río Cuchujaqui, 2.6 km NE of Sabinito Sur, 14 km by air ESE of Alamos, *Van Devender & Van Devender* 91–906; N side of Sierra de Alamos, canyon above La Aduana, *Van Devender & Van Devender* 90–622.

EUPHORBIA SINALOENSIS Brandege, Zoe 5: 208. 1905. *Eumecanthus sinaloensis* (Brandegee) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 415. 1916.—TYPE: México, Sinaloa, Cerro Colorado, 1 Nov 1904, Brandegee s.n. (holotype UC[#110010], not seen, photo GH!; isotype F[#196160]!).

Summer-fall annual with relatively conspicuous white appendages. In Sonora known only from oak and pine-oak woodland on the Sierra de Alamos where it is frequent at elevations of ca. 1100–1700 m. Also Sinaloa and western Durango.

Mpio. Alamos: Sierra de Alamos, Steinmann 93–409, Fishbein 1931.

EUPHORBIA SONORAE Rose, Contr. U.S. Natl. Herb. 1: 356; fig 10. 1895.—TYPE: México, Sonora, [Mpio. Huatabampo], Agiabampo, 3–15 Oct 1890, Palmer 760 (holotype US[#208911]!).

Leafy summer-fall annual, notable for the long, setaceous stipules and undivided styles; mostly August to December. Shady understory in thornscrub and tropical deciduous forest; 200–750 m. Central Sonora to at least as far south as Michoacán; disjunct in northern South America.

The relationship between *E. sonorae* and the very similar *E. multiseta* Benth., from tropical México and Central America, is puzzling and should be investigated. Furthermore, *E. sonorae* is probably synonymous with the South American *E. adiantoides* Lam. Specimens from Ecuador and Peru are indistinguishable from Sonoran specimens, and the descriptions of *E. adiantoides* given by both Lamarck (1788, p. 426) and Boissier (1862, p. 57) are very similar to that of *E. sonorae*. However, we are hesitant to reduce *E. sonorae* to synonymy without first comparing it with original material of *E. adiantoides*.

Mpio. Imuris: Cerro Agua Caliente, along Río de los Alisos, 2 km W of Imuris, 28 Nov 1939, Drouet & Richards 3782 (F). Mpio. La Colorada: 11 mi NE of Colorado on the rd to Mazatán, Wiggins & Rollins 344. Mpio. Navojua: 10 mi E of Navojua off rd to Alamos, 1 mi S, 21 Oct 1967, Krizman s.n. Mpio. Alamos: Sierra de Alamos, ca. 2 km SW of Alamos, Steinmann 93–311.

EUPHORBIA SPHAERORHIZA Benth., Pl. Hartw. 8(–9). 1839. *Tithymalopsis sphaerorhiza* (Benth.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 45. 1860.—TYPE: México, [Jalisco], Lagos [de Moreno, 17 June–13 July 1837], Hartweg 36 (holotype K, not seen, photo [Kew neg. 17893]!; isotype GH!).

Perennial herb from a spherical tuber, the leaves linear; June–September. Pine-oak woodland/forest and mixed conifer forest, often on the shaded forest floor among dense pine- and oak-leaf litter; 1600–2050 m.

East-central and southeastern Sonora and western Chihuahua to Morelos, northern Guerrero and San Luis Potosí.

Mpio. Yécora: upper Barranca El Salto, Río Yaqui drainage, edge of Mesa El Campañero, Felger 94–188, Steinmann 1020. Mpio. Alamos: Sierra Saguaribo, ca. 3 km W of Saguaribo (by rd to El Chiribo), vic. of 27°19'N, 108°41'W, Steinmann 93–238.

EUPHORBIA SUBRENIFORMIS [as *subreniforme*] S. Watson, Proc. Amer. Acad. Arts 21: 439. 1886. *Eumecanthus subreniformis* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 415. 1916. *Euphorbia ocymoides* L. var. *subreniformis* (S. Watson) McVaugh, Contr. Univ. Michigan Herb. 19: 229. 1993.—TYPE: México, southwestern Chihuahua, Hacienda San José, 25 mi S of Batopilas, Aug 1885, Palmer 60 (syntype GH!). Another collection is cited in the protologue: Southwestern Chihuahua, Frayles, 1885, Palmer 292; we were unable to find this at GH, but there is a specimen at NY [!].

Delicate erect annual; August–November, rarely in spring. Oak and pine-oak woodland; 700–1800 m. North-central to southeastern Sonora. Also Chihuahua south to Chiapas and Veracruz.

McVaugh (1993, pp. 228–229) treated *E. subreniformis* as a variety of *E. ocymoides*, but in light of their morphological and habitat differences, we maintain the two as distinct species. Both occur in Sonora, *E. ocymoides* at lower elevations in tropical deciduous forest and *E. subreniformis* at higher elevations in oak and pine-oak woodland. The involucre of *E. subreniformis* are purple-tinged, usually with four glands, and the divisions of appendages are very slender and filiform. In contrast, *E. ocymoides* tends to have larger leaves and the involucre are green, with five glands, and the appendages are obviously broader and finger-like. We have seen no intermediates among material from northwestern México.

Euphorbia fimbriifera Mart. (Linnaea 19, p. 407. 1847) was based on material grown in Munich from seeds collected in México by C. A. Uhde. This species was considered synonymous with *E. ocymoides* by Boissier (1862, p. 57), but he gave no indication of having seen original material. The “involucris appendicibus subulatis ciliiformibus numerosis purpureis,” described in the protologue, suggest that *E. fimbriifera* may be an older name for *E. subreniformis*. Type material should be sought at BR or M.

Mpio. Cucurpe: 2 km N of Rancho la Brisca on Río Santo Domingo (a tributary of the Río Saracachi and Río San Miguel), 7 km N of Rancho Agua Fría, 30°25'30"N, 110°33'W, 10 Sep 1978, Van Devender et al. s.n. Perhaps Mpio. Cuppas: La Mina Verde, 31 km de Cuppas, Wiggins 7412 (DS). Mpio. Yécora: Santa Ana de Yécora, 28°23'N, 109°19'W, Goldberg & McLaughlin 77–197. Mpio. Alamos: Sierra de Alamos, Gentry 4908; vicinity of Choquinahui (El Cobre), 26°59'30"N, 108°40'30"W, Steinmann 629.

EUPHORBIA XANTI Engelm. ex Boiss. in DC., Prodr. 15(2): 62. 1862. Based on *Euphorbia gymnoclada* Engelm. in A. Gray, Proc. Amer. Acad. Arts 5: 171(–172). 1861; not *Euphorbia gymnoclada* Boiss. 1860. *Aklema xanti* (Engelm. ex Boiss.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 415. 1916.—TYPE: México, Lower California [Baja California Sur], Cape San Lucas, Aug 1859–Jan 1860, *Xántus III* (holotype MO!).

Euphorbia corallifera M. E. Jones, Contr. W. Bot. 18: 50. 1933.—TYPE: México, Lower California [Baja California Sur], Sierra Gigante, Loreto, Cayuca Ranch, 23 Oct 1930, *Jones 27545* (holotype POM[191186]!).

Shrub to 2.5 m tall with semisucculent stems and quickly drought-deciduous leaves, the appendages showy, white aging to pink; October–May. Sonoran desertscrub along the Gulf Coast of Sonora in sandy-gravelly soils from Bahía San Carlos and Miramar near Guaymas also farther north from the vicinity of Bahía Kino to the vicinity of Puerto Libertad; near sea level to ca. 500 m. Otherwise known from Baja California and Baja California Sur.

Mpio. Guaymas: adjacent to Estero Soldado, *Felger 84–523*. Mpio. Hermosillo: “Seri Pass,” 4.1 mi by rd W of Rancho Noche Buena, *Felger 16972*. Mpio. Pitiquito: 14 mi by rd E of Puerto Libertad, *Hastings & Turner 65–12*.

EUPHORBIA sp. 1

Erect, perennial herb to ca. 0.5 m high, leaves opposite, linear; reproductive at least in October. This

species is known in Sonora from a single collection made in the shade of tropical deciduous forest with *Ipomoea arborescens*, *Hamelia xorulensis*, and *Quercus tuberculata*; 940 m. It appears to represent an undescribed species allied to *Euphorbia hexagonoides* but differs in being perennial and having longer and narrower appendages. We know of only two collections of this *Euphorbia*.

Mpio. Alamos: E-facing slope in Arroyo Santa Bárbara, above “Ranchito” camp, 27°05.8'N, 108°43.3'W, *Jenkins 95–333*.—SINALOA. Mpio. Sinaloa de Leyva: Cañada Verde 19 km al E de Agua Caliente [de Cebada], 1050 m, *Tenorio L. 10247* (MEXU, RSA).

Subgenus *Chamaesyce* Raf. [= *Chamaesyce* S. F. Gray]

Annuals, perennial herbs (these usually also flowering in the first season), or rarely shrubs; growth sympodial, seedling apex abortive just above the cotyledons. Photosynthetic pathway C₄. Leaves opposite, with Kranz anatomy and usually with asymmetrical bases; stipules usually conspicuous and membranous. Glands (2–)4; appendages usually present; seeds (in ours) ecarunculate.

Subcosmopolitan with 250–300 species, reaching its greatest diversity in México where about 100 species occur; 36 species and two additional varieties documented for Sonora. Seeds are diagnostic and often necessary for identification; fortunately they are usually present with a specimen. Most herbaceous species are commonly known as *golondrina*. References: Wheeler 1936, 1941.

1. Cyathia in dense, subcapitate, leafless cymose clusters.
2. Shrub; stipules subtended by numerous small glands *E. tomentulosa*
- 2' Herbs; stipules not subtended by glands.
3. Herbage with pilose, frequently yellow hairs mostly 0.5–1.2 mm long *E. hirta*
4. Cymes terminal as well as axillary; seeds 0.7–0.9 mm long, pale and pinkish *E. hirta* var. *hirta*
- 4' Cymes usually only terminal; seeds 1.1–1.2 mm long, dark and brownish *E. hirta* var. *nocens*
- 3' Herbage glabrous or with white, mostly appressed hairs less than 0.5 mm long.
5. Perennial herb (but reproductive in the first year); herbage and capsules glabrous or pubescent; stipules lacinate-pubescent, slender, separate or questionably united at base; seeds narrowly ovoid, the angles sharp *E. capitellata*
- 5' Annual; herbage and capsules glabrous; stipules entire, broadly deltoid, clearly united; seeds corpulently ovoid, the angles rounded *E. hypericifolia*
- 1' Cyathia solitary in the axils of leafy shoots.
6. Leaves strictly entire.
7. Stems prostrate, often rooting at nodes; stipules united into a glabrous, white membranous scale.
8. Herbage pubescent. *E. alatocaulis*
- 8' Herbage glabrous.
9. Perennial; involucre more than 1 mm wide, with 15–30 staminate flowers; appendages usually conspicuous to the naked eye *E. albomarginata*
- 9' Annual; involucre 0.6–1.0 mm wide, with 10 or fewer staminate flowers; appendages inconspicuous *E. serpens*
- 7' Stipules not united into a glabrous, white membranous scale.
10. Herbage glabrous; leaves linear (rarely narrowly spatulate), 1.5 mm or less in width, the base not noticeably asymmetrical.
11. Ultimate branches ca. 0.1 mm or less in diameter (sorry, see discussion); styles divided *E. gracillima*
- 11' Ultimate branches 0.15–0.25 mm in diameter; styles evidently undivided *E. revoluta*
- 10' Herbage glabrous or pubescent; leaves variable, seldom linear, more than 1.5 mm wide, the base usually asymmetrical.
12. Herbage with appressed hairs only.

- 13. Seeds quadrangular, smooth to rugulose *E. melanadenia*
- 13' Seeds terete, encircled by conspicuous transverse ridges *E. pediculifera*
- 14. Leaves ovate to obovate or lanceolate *E. pediculifera* var. *pediculifera*
- 14' Leaves linear *E. pediculifera* var. *linearifolia*
- 12' Herbage glabrous or with at least some spreading hairs.
- 15. Ovaries and capsules pubescent.
- 16. Appendages divided into triangular, pointed segments, the involucre thus appearing "star-shaped" *E. setiloba*
- 16' Appendages rounded to broadly lobed or absent.
- 17. Hairs glandular; involucre urceolate or narrowly turbinate, narrowed or constricted at apex *E. arizonica*
- 17' Hairs not glandular; involucre obconic to campanulate, not narrowed or constricted at apex.
- 18. Seed smooth to rugulose.
- 19. Glands oval, 0.3 or more mm wide, with petaloid appendages but these sometimes reduced or rarely absent *E. polycarpa*
- 19' Glands usually round and punctiform, 0.1–0.2(–2.5) mm wide, without petaloid appendages *E. micromera*
- 18' Seeds strongly rugose and usually with conspicuous ridges.
- 20. Capsules uniformly pubescent *E. petrina*
- 20' Capsules most densely pubescent along the keels and glabrate between.
- 21. Annual; stems terete or merely flattened; appendages glabrous *E. prostrata*
- 21' Perennial herb; stems winged; appendages pubescent *E. alatocaulis*
- 15' Ovaries and capsules glabrous.
- 22. Seeds more than 2 mm long.
- 23. Seeds flattened, about twice as long as wide, the back smooth, the ventral face with an elevated mid-ridge *E. platysperma*
- 23' Seeds ovoid to nearly oblong, not at all flattened, the back smooth to rough, the ventral face lacking an elevated mid-ridge.
- 24. Stems encased in a sand-jacket; seeds round in cross-section, the surfaces smooth *E. incerta*
- 24' Stems not encased in sand; seeds 4-angled, the surfaces rough *E. trachysperma*
- 22' Seeds less than 2 mm long.
- 25. Annuals or perennials; stipules usually pubescent with very short, stiff hairs; seeds smooth or rugulose.
- 26. Glands oval, 0.3 or more mm wide, with petaloid appendages but these sometimes reduced or rarely absent *E. polycarpa*
- 26' Glands usually round and punctiform, 0.1–0.2(–2.5) mm wide, without petaloid appendages *E. micromera*
- 25' Annuals; stipules often divided into filiform divisions but generally without hairs; seeds with transverse ridges.
- 27. Plants mostly spreading to prostrate; leaves less than 15 mm long; stipules distinct; glands 0.1–0.15 mm wide; seeds white-gray, narrowly ovoid, the angles sharp *E. abramsiana*
- 27' Plants erect to ascending; leaves usually more than 15 mm long; stipules on larger stems often united into a triangular sheath; glands 0.2–0.4 mm wide; seeds usually blackish (only the angles consistently white-gray), corpulently ovoid, the angles rounded *E. hyssopifolia*
- 6' Leaves (at least when mature) serrate to serrulate, although sometimes obscurely so or only at the apex.
- 28. Ovaries and capsules pubescent.
- 29. Glands 2 or 4; appendages markedly dissimilar in size, or one pair absent.
- 30. Involucre usually with only 2 glands; appendages pubescent *E. densiflora*
- 30' Involucre with 4 glands; appendages glabrous.
- 31. Annual; appendages of the larger pair 0.9–1.5 mm long; capsules exerted from the involucre; seeds with transverse sulci *E. indivisa*
- 31' Annual or perennial; appendages of the larger pair less than 0.6 mm long; capsules not exerted, the lower portion enclosed by and maturing within the involucre; seeds lacking sulci, merely dimpled or rippled *E. thymifolia*
- 29' Glands 4; appendages subequal or absent.
- 32. Perennial; glands 0.8–1.5 mm wide; capsules uniformly pubescent; seeds 1.5–1.7 mm long *E. leucophylla* ssp. *comcaacorum*
- 32' Annuals or perennial herbs; glands 0.5 mm wide or less; capsules uniformly pubescent or most densely pubescent along the keels and towards the base; seeds 1.4 mm long or less.
- 33. Styles undivided *E. stictospora*
- 33' Styles divided at least part of their length.
- 34. Stems winged; appendages present and pubescent *E. alatocaulis*
- 34' Stems terete or slightly flattened; appendages glabrous or absent.
- 35. Perennial with a thickened rootstock; appendages 0.4–0.9 mm wide; capsules glabrous to uniformly pubescent or very rarely most densely pubescent along the keels; seeds corpulently ovoid, merely rugose *E. anychioides*
- 35' Annual, the root not thickened; appendages mostly less than 0.3 mm wide; capsules most densely

- pubescent along the keels and glabrate between; seeds narrowly ovoid, with obvious transverse ridges
 *E. prostrata*
- 28' Ovaries and capsules glabrous.
36. Shrub; stipules united *E. magdaleneae*
- 36' Annuals or perennial herbs; stipules distinct or united.
37. Seeds 1.5–2.4 mm long.
38. Stems with pilose white hairs *E. serrula*
- 38' Stems glabrous.
39. Leaves linear, symmetrical at the base; appendages conspicuous to the naked eye; seeds 1.7–2.0 mm long, the facets smooth between the 1 to few transverse ridges *E. florida*
- 39' Leaves linear to ovate-lanceolate, mostly asymmetrical at base; appendages mostly inconspicuous to the naked eye; seeds 2.0–2.4 mm long, the facets granulated and without transverse ridges ... *E. trachysperma*
- 37' Seeds less than 1.5 mm long.
40. Facets of the seeds with concave depressions separated by distinct ridges.
41. Cocci of capsules laterally compressed, the tangential length greater than the width, the keel acute *E. crepuscula*
- 41' Cocci of capsules not laterally compressed, the tangential length equal to, or less than the width, the keel obtuse.
42. Stipules on larger stems often united into a triangular sheath; leaves often serrate to serrulate their entire length; mature seeds usually blackish (only the angles consistently white-gray) ... *E. hyssopifolia*
- 42' Stipules distinct, linear-subulate; leaves serrate or serrulate only at the apex; mature seeds white-gray.
43. Herbage glabrous or pubescent; stems terete; leaf serrations inconspicuous even under magnification, not visible to the naked eye; transverse ridges on the seeds deep, often interrupting the dorsal angle *E. abramsiana*
- 43' Herbage glabrous; stems terete or winged; leaf serrations conspicuous, often visible to the naked eye; transverse ridges on the seeds shallow, not interrupting the dorsal angle *E. serpyllifolia*
- 40' Facets of the seeds smooth to rugulose.
44. Perennial; capsules and involucre usually pubescent *E. anychioides*
- 44' Annuals; capsules and involucre glabrous.
45. Leaves of the branchlets entire, those of the main stems serrate; seeds 0.6–0.8 mm long *E. radioloides*
- 45' Leaves of the branchlets and stems with similar margins; seeds 1.1–1.4 mm long.
46. Plants less than 30 cm tall; herbage glabrous; stems terete or winged; stipules linear-subulate, distinct; seeds narrowly ovoid, whitish, gray, to light brown *E. serpyllifolia*
- 46' Plants often more than 30 cm tall; herbage glabrous or pubescent; stem terete; stipules deltoid, with age usually united into a sheath; seeds copulently ovoid, blackish (only the angles whitish).
47. Seeds rugose *E. nutans*
- 47' Seeds smooth or faintly transversely ridged *E. pionosperma*

EUPHORBIA ABRAMSIANA L. C. Wheeler, Bull. S. Calif. Acad. Sci. 33: 109(–110). 1934. *Euphorbia pediculifera* Engelm. var. *abramsiana* (L. C. Wheeler) Ewan in Jeps., Fl. Calif. 2: 427. 1936. *Chamaesyce abramsiana* (L. C. Wheeler) Koutnik, Madroño 32: 188. 1985.—TYPE: United States, California, Heber, June 1904, *Abrams 4097* (holotype DS[#33555]!).

Prostrate annual; mostly growing in response to summer/fall rains but in southern Sonora sometimes also in the spring. Sonoran desertscrub and thornscrub in western Sonora, often disturbed areas; near sea level to 915 m. Extending into open or weedy woodland vegetation in southern Arizona and expected in similar habitats of northeastern Sonora. Southeastern California, the Baja California Peninsula, and southern Arizona to Sinaloa.

Mpio. Gen. Plutarco Elías Calles: Sonoyta, *Felger 85–932*. Mpio. Bavispe: Colonia Oaxaca, *White 642*. Mpio. Guaymas: Bahía San Carlos, *Felger 85–1101*. Mpio. Alamos: Yocogüa, *Van Devender 93–1150*.

Euphorbia alatocaulis V. W. Steinm. & Felger, sp.

nov.—TYPE: México, Sonora, Mpio. San Javier, along MEX 16, 15.2 km by rd W of the Río Yaqui crossing, 28°34'33"N, 109°41'04"W, ca. 700 m, 25 May 1996, *Steinmann 861* (holotype ARIZ[#335468]; isotypes BM, DAV, ENCB, LSU, MICH, NY, IBUG, MEXU, RSA, USON). Fig. 6–9.

Herba perennis, prostrata; radix cylindrica, saepe crassa; caules usque 31 cm longi, valde alati, supra puberuli infra glabri; petioli 0.3–1.1 mm longi, 0.3–0.5 mm diametro; laminae ovatae vel ellipticae, pilosae, 0.2–1.6 cm longae, 0.15–1.1 cm latae, basi obliquae, apice obtusae, margine integrae vel serrulatae; cyathia axillaria solitaria; pedunculi 0.7–2.3 mm longi, ca. 0.2–0.3 mm diametro; involucre obconica vel campanulata, pilosa, 0.7–1.3 mm longa, 0.6–0.8 mm diametro; glandulae 4, rubiginosae, 0.1–0.15 mm longae (tangentialiter), 0.2–0.5 mm latae (radialiter); appendices semiorbiculatae vel ovoides, integrae vel sinuatae, 0.2–0.3 mm longae, 0.3–0.5 mm latae, margo ciliato-hirsutae; flores ♂ ca. 3–10; ovarium 3-angulatum; styli 3, ca. 0.2 mm longi, bifidi, clavati; capsula valde 3-angulata, 1.4–1.6 mm longa, 1.5–1.9 mm diametro ad basi, carinae laxae pilosae; columella 1.2–1.5 mm longa; semina ovoideo-quadrangularia, 1.0–1.2 mm longa, 0.5–0.6 mm diametro, valde rugosa.

Prostrate perennial herb often from a thick, gnarled, cylindrical root with many sprawling stems arising from a common crown; stems to 31 cm long, conspic-

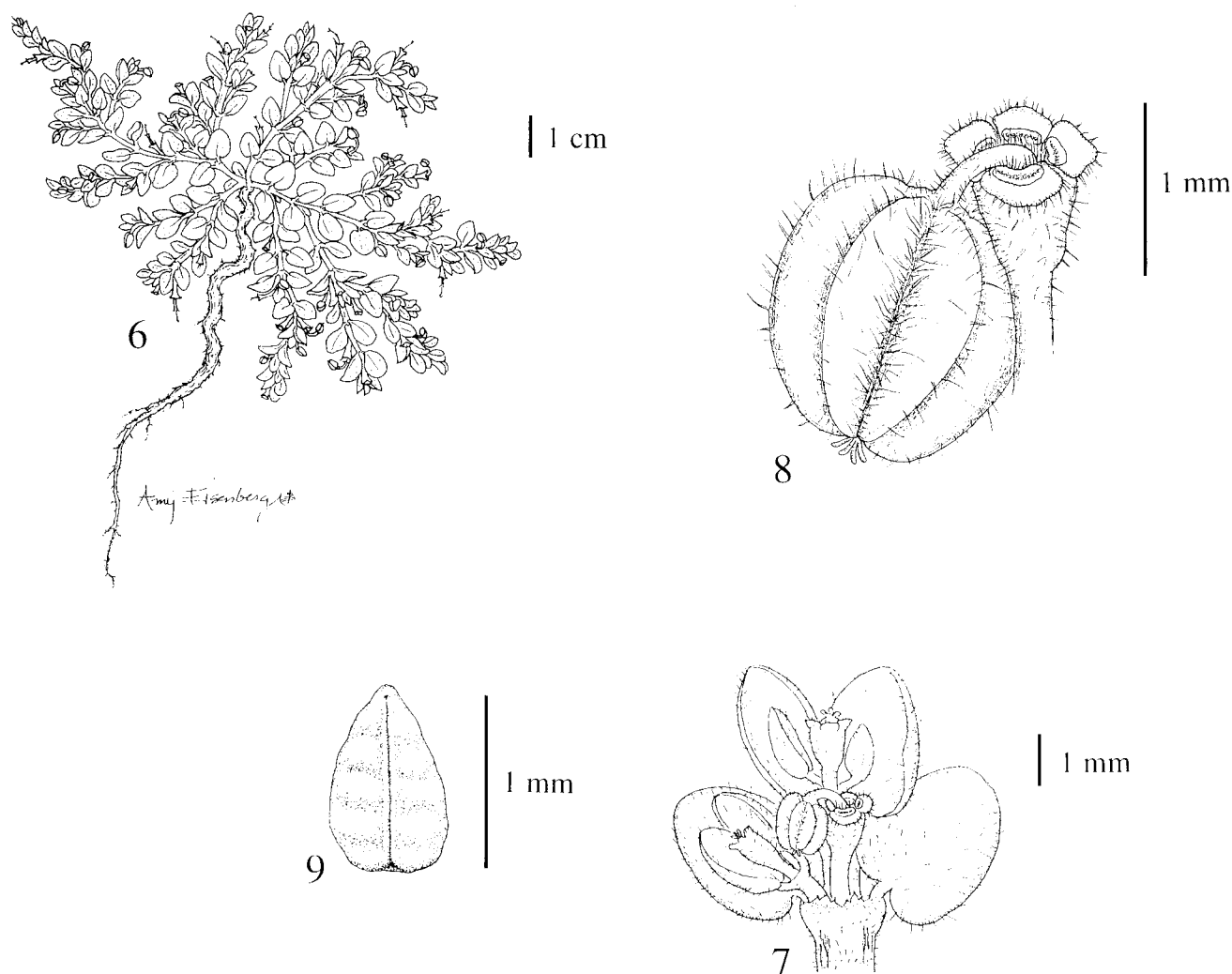


Fig. 6–9. *Euphorbia alatocaulis*. 6. Habit.—7. Flowering branchlet.—8. Cyathium.—9. Seed. All from Steinmann 861.

uously winged, the lower surface mostly glabrous, the upper surface puberulent with hairs mostly under 0.1 mm long, glabrate in age; stipules distinct or united into a deciduous white to hyaline membranous, triangular scale 0.2–0.5 mm long and 0.4–0.7 mm wide, the margin subentire to lacerate; leaves opposite; petioles 0.3–1.1 mm long, 0.3–0.5 mm in diameter; blades ovate to broadly elliptic, 0.2–1.6 cm long, 0.15–1.1 cm wide, inconspicuously palmately 3–5-veined from the base, oblique at base, apex obtuse, pilose with hairs 0.2–0.8 mm long; margin entire to minutely serrulate; cyathia solitary in the distal axils and forks of the stem, on peduncles 0.7–2.3 mm long, ca. 0.2–0.3 mm in diameter; involucre obconic to campanulate, 0.7–1.3 mm long, 0.6–0.8 mm in diameter just below the glands, pilose on the outside, the lobes triangular, ca. 0.1 mm long, pubescent within, the sinus broadly U-shaped, not depressed; glands 4, yellow-green to red-brown, reniform with a conspicuous tangential trough, 0.1–0.15 mm long (tangential axis), 0.2–0.5 mm wide (radial axis); appendages forming a ring

around the distal portion of the gland, semicircular to oval, 0.2–0.3 mm long, 0.3–0.5 mm wide, entire to sinuate, white aging to pink, ciliate along the margin; bracteoles relatively numerous, included, entire or fimbriate towards the apex; ♂ flowers ca. 3–10, androphores glabrous; gynophore sparsely pubescent below the ovary, reflexed or erect, exserted 0.7–2.1 mm in fruit; ovary 3-angled; styles 3, ca. 0.2 mm long, bifid ca. 3/4 of their length, the divisions clavate; capsule broadly ovoid in profile, trigonus in cross-section, 1.4–1.6 mm long, 1.5–1.9 mm in diameter at the base, loosely pilose on the keels of the carpels (especially below the equator) but glabrate between the keels, a deep furrow in each sinus between the carpels; columella 1.2–1.5 mm long; seeds narrowly ovoid-quadrangular, 1.0–1.2 mm long, 0.5–0.6 mm in diameter, orange-tan to pink-brown, with a high dorsal keel, base truncate, apex acute, the facets strongly rugose.

Tropical deciduous forest and pine-oak woodland in central eastern and southeastern Sonora; 325–1300 m. It often grows in the disturbed area along roadsides

and on rocks in riparian habitats. So far known only from Sonora but expected also in northern Sinaloa and southwestern Chihuahua. Reproductive from at least March to October.

Euphorbia alatocaulis is evidently related to *Euphorbia mendezii* Boiss., a widespread species occurring in Florida, the Caribbean, Central America, and tropical México as far north as Tamaulipas in the east and Jalisco and Zacatecas in the west. The two species are united by possessing strongly winged stems and ovaries with the hairs mostly restricted to the keels of the carpels, characteristics uncommonly encountered in subgenus *Chamaesyce*. *Euphorbia alatocaulis* is distinguished from *E. mendezii* by its ciliate involucrel appendages, strongly rugose seeds, and lack of long, spreading hairs along the stems.

The specific epithet *alatocaulis* refers to the conspicuously winged stems.

Paratypes.—Mpio. Alamos: Río Cuchujaqui, 12.4 km by air S of Alamos, Rancho el Conejo (= R. El Corcovado), 26°54'35"N, 108°55'W, *Van Devender* 92–593; Río Cuchujaqui, 2.6 km NE of Sabinito Sur, 27°00'05"N, 108°47'08"W, *Van Devender* 93–1183; Canyon of the Río Guajaray, ca. 4 km upstream (northward) from Los Aguaros, 27°39'36"N, 108°57'58"W, *Felger* 94–74. Mpio. Yécora: along MEX 16, 1.5 km by rd W of Río Maycoba crossing, *Steinmann* 902; ca. 23 km E of Yécora, Los Pilares, Arroyo Los Pilares, 28°23'N, 108°47'30"W, *Van Devender* 95–483; 15.5 mi E of Yécora on MEX 16, 28°23'N, 108°46'W, *Fishbein* 1756. Mpio. San Javier: Cañón Lo de Campa, 28°32'N, 109°44'33"W, *Varela* 96–301 (RSA); Cerro Verde, SW of San Javier, 28°33'55"N, 109°44'10"W, *Varela* 96–416 (RSA); Puerto San Juan, Cerro San Juan near San Javier, 28°35'N, 109°44'48"W, *Varela* 97–112 (RSA).

EUPHORBIA ALBOMARGINATA Torr. & A. Gray, *Pacif. Railr. Rep.* 2: 174(–175), 1857. *Chamaesyce albomarginata* (Torr. & A. Gray) Small, *Fl. S.E. U.S.* 710, 1333, 1903.—TYPE: United States, Texas, Rio Pecos, Nov 1850, *Thurber* 98 (lectotype NY!, chosen by Wheeler 1941, pp. 202, 205).

Euphorbia hartwegiana Boiss. in DC., *Prodr.* 15(2): 31, 1862. *Chamaesyce hartwegiana* (Boiss.) Small, *Fl. S.E. U.S.* (ed. 2) 1349, 1913.—TYPE: México, Guanajuato, field near Guanajuato, probably spring 1837 [fide McVaugh on sheet at GH], *Hartweg* 33 (holotype G!).

Perennial herb often from a deeply set and somewhat thickened root, frequently carpeting the ground with prostrate stems rooting at the nodes; reproductive nearly any time of year. Usually in heavy, poorly drained, fine-textured soils and disturbed habitats; Chihuahuan desertscrub, Sonoran desertscrub, thornscrub, tropical deciduous forest, grassland, and oak woodland; nearly statewide from near sea level to 1300 m. Western United States, widespread in northern México, and less common southward to Oaxaca; naturalized in Hawaii.

Euphorbia albomarginata is closely related to, and often confused with *E. serpens*. Both are very similar

in habit, produce roots at the nodes, and possess united sheathlike stipules. *Euphorbia serpens* differs by its strictly annual habit, somewhat more glaucous leaves, slightly smaller cyathia (less than 1 mm wide), narrower appendages, smaller capsules, fewer stamens per cyathium (fewer than 10 vs. 15–30), and slightly smaller and thicker seeds (1.0–1.2 mm long). An easy and reliable way to distinguish between them is by the size of the appendages. The appendages of *E. albomarginata* are conspicuous to the naked eye, while those of *E. serpens* are inconspicuous.

Mpio. Puerto Peñasco: Pinacate region, Sykes Crater, *Felger* 20020. Mpio. Guaymas: Guaymas airport, *Felger* 85–413. Mpio. Nacozari: El Rancho de la Nacha, 25 mi W of La Angostura, *White* 3914. Mpio. Alamos: El Ranchería crossing of Río Cuchujaqui, ca. 22.5 km S of Alamos on rd to El Chinal, *Van Devender* & *Van Devender* 92–1177.

EUPHORBIA ANYCHIOIDES Boiss., *Cent. Euphorb.* 12, 1860. *Chamaesyce anychioides* (Boiss.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 408, 1916.—TYPE: México, Guanajuato, Villalpando, 1829, *Méndez* (holotype G-DC, not seen, fragment F[#196844]!).

Euphorbia pilosula Engelm. ex Boiss. in DC., *Prodr.* 15(2): 39, 1862. *Chamaesyce pilosula* (Engelm. ex Boiss.) Arthur, *Torreyana* 11: 260, 1912. TYPE: México, Michoacán, Tiristiran [ca. 20 km WNW of Morelia], *Gregg* 792 (holotype G-DC, not seen; isotype NY!).

Euphorbia rubida Greenm., *Proc. Amer. Acad. Arts* 39: 83, 1903. *Chamaesyce rubida* (Greenm.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 396(–397), 1914.—TYPE: México, E. de México, Tulténango Cañón, 9 Oct 1902, *Pringle* 8673 (holotype GH!).

Euphorbia chalicophila Weath., *Proc. Amer. Acad. Arts* 45: 426, 1910. *Chamaesyce chalicophila* (Weath.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 408, 1916.—TYPE: México, Jalisco, near Guadalupe [according to Pringle's diary "an hour's walk to the NW of Zapopan"], 12 Oct 1903, *Pringle* 11846 (holotype GH!).

Low erect to ascending perennial herb; May–December. Pine-oak woodland in southeastern Sonora; 1200–2000 m. Also southwestern Chihuahua southward to Guatemala.

Mpio. Alamos: Sierra Saguaribo, El Chiribo, 17 km SE of San Bernardo, 23 Aug 1993, *Martin* s.n.; Sierra de Alamos, along trail from La Huerta to Aduana Peak, *Steinmann* 93–417. Mpio. Yécora: 16 km by rd NW of Yécora along the rd to La Huerta Nueva Galicia, ca. 28°25'N, 108°58'W, *Steinmann* 1018.

EUPHORBIA ARIZONICA Engelm. in Torr., *Botany of the Boundary*, [in Emory, *Rep. U.S. Mex. Bound.* 2, pt. 1]: 186, 1858. *Chamaesyce arizonica* (Engelm.) Arthur, *Torreyana* 11: 260, 1912.—TYPE: A single collection is cited in the protologue: "Sierra Yanos, Sonora, July, *Schott*." According to White (1948, p. 232), this location is probably Janos, Chihuahua. The only specimen at MO (ex. Herb. Engelmann) representing this collection is a scrappy fragment consisting of a few leaves and involucres. Wheeler

(1941, p. 243) lectotypified this species with a collection made by Schott in Arizona during November, 1856. The lectotype and aforementioned fragment are mounted on the same sheet (MO[#46906]!). Despite the fact that the November, Arizona material may have been available to Engelman at the time of description and that the July, Sonora specimen is far from complete (though readily identifiable as *E. arizonica*), we do not see how another collection could justifiably serve as lectotype when only the July, Sonora specimen was cited by Engelman.

- Euphorbia versicolor* Greene, Bot. Gaz. 6: 184(–185). 1881. *Chamaesyce versicolor* (Greene) Norton in Tidestrom, Contr. U.S. Natl. Herb. 25: 345. 1925.—TYPE: United States, Arizona, San Francisco Mts., 3 Sep 1880, *Greene s.n.* (holotype NDG[#29617]!).
- Euphorbia portulana* S. Watson, Proc. Amer. Acad. Arts 24: 75. 1889. *Chamaesyce portulana* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916.—TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, island in harbor, Oct 1887, *Palmer 321* (holotype GH!).
- Euphorbia purisimana* Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 225(–226). 1889. *Chamaesyce purisimana* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916.—TYPE: México, Lower California [Baja California Sur], Purísima, 12 Feb 1889, *Brandegee s.n.* (holotype F[#196127]!).
- Euphorbia collina* Brandegee, Univ. Calif. Publ. Bot. 4: 184. 1911.—TYPE: México, Durango, Cerro de San Ignacio, July 1910, *Purpus 4599* (holotype UC[#144767]!).

Herbaceous perennial but sometimes annual; reproductive at any season. Sonoran desertscrub in western Sonora at least as far south as Isla Tiburón, and northern Sonora in grassland and oak woodland at least as far south as the Río de Bavispe region; often in rocky habitats and washes from near sea level to 1500 m. Also western Texas and southern California to Baja California Sur, and Chihuahua, Durango, and Coahuila.

Isla Tiburón: Ca. 13 mi S of Tecamate, *Felger 12423*. Mpio. Puerto Peñasco: Sierra Pinacate, *Felger 18676*. Mpio. Bavispe: Sierra de la Cabellera, *White 4726*.

EUPHORBIA CAPITELLATA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 188. 1858. *Chamaesyce capitellata* (Engelm.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 408. 1916.—TYPE: México, Sonora [or perhaps present-day Arizona], Low Valley at San Bernardino, [E of Agua Prieta on the Arizona-Sonora border], 3 Oct 1851, *Wright 1849* (holotype MO[#144672]!).

Euphorbia pycnanthemum Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 188. 1858. *Chamaesyce pycnanthemum* (Engelm.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916.—TYPE: México, Chihuahua, mountain-sides near Lake Sta. María, 20 Apr 1852, *Wright 186* (holotype MO[#144666]!).

Euphorbia rusbyi Greene, Bull. Calif. Acad. Sci. 2: 57. 1886. *Chamaesyce rusbyi* (Greene) Millsp., Field Mus. Nat. Hist., Bot. ser.

2: 411. 1916.—TYPE: United States, Arizona, near Prescott, 19 June 1883, *Rusby 822* (holotype possibly destroyed in the 1906 fire at CAS because there is no specimen either there or at NDG; isotype US[#22176]!).

Euphorbia capitellata Engelm. var. *laxiflora* S. Watson, Proc. Amer. Acad. Arts 24: 74. 1889.—TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, high mountains, 1887, *Palmer 210* (lectotype GH!, chosen by Wheeler 1941, p. 174).

Euphorbia pycnanthemum Engelm. forma *serrata* Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 224. 1889.—TYPE: Apparently the same collection as the type of *E. geminiloba* (below) and possibly the same specimen.

Euphorbia geminiloba Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 228. 1889.—TYPE: México, Lower California [Baja California Sur], Pozo de los Dolores, 5 Apr 1889, *Brandegee s.n.* (holotype F[#196142]!).

Euphorbia gladiosa M. E. Jones, Contr. W. Bot. 15: 144. 1929.—TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, 2 Nov 1926, *Jones 22613* (lectotype POM[#162575], the plant marked "A"!, here designated). Wheeler (1935; 1941, p. 174) treated *E. gladiosa* as a synonym of *E. capitellata*. What he did not mention and possibly did not notice is that the holotype sheet (i.e., the one at POM ex Jones's herbarium) contains pieces of both *E. capitellata* and *E. pediculifera* var. *linearifolia*. Similarly, Jones's description, while based primarily on *E. capitellata*, does contain elements of *E. pediculifera*. The seeds with "cross-ribs which form rather deep pits, and which go through the angles" applies only to *E. pediculifera*. Because the largest plant on the type sheet of *E. gladiosa* is *E. capitellata*, and because Jones's description applies mostly to *E. capitellata* we follow Wheeler in treating *E. gladiosa* as a synonym of that species and formally designate the plant marked "A" as the lectotype. Another specimen of *Jones 22613* (RSA) is entirely *E. pediculifera* var. *linearifolia*.

Herbaceous perennial, the cyathia in dense, showy clusters at the ends of the branches; flowering more or less throughout the year. Widespread in Sonora except the northwestern part of the state; Sonoran desertscrub, grassland, thornscrub, and tropical deciduous forest; near sea level to 1900 m. Northwestern México from Coahuila to the Baja California Peninsula and Durango, and the southwestern United States from Arizona to Texas.

Euphorbia chamberlinii I. M. Johnst. (1924, p. 1066), from the Sierra Giganta in Baja California Sur, was treated as a synonym of *E. capitellata* by Wheeler (1941, p. 174) and various later authors. However, it is quite distinct from *E. capitellata*, differing by its dense spreading pubescence, broader leaves with strictly entire margins, and smoother seeds. In addition to the original collection (*Johnston 4136*, holotype CAS[#639907]!), *Gentry 3629* (ARIZ, UC), a topotype, is also *E. chamberlinii*.

Mpio. Bacerac (or perhaps Huachineras): N of Horconciitos, *Phillips 851*. Mpio. Guaymas: Guaymas harbor, 1887, *Palmer 317*; Cañón del Nacapule, *Felger 84–569*. Mpio. Navjoa: rd below microwave tower on Cerro Prieto, ca. 9 mi E of Navjoa, *Van Devender & Van Devender 92–172*.

EUPHORBIA CREPUSCULA (L. C. Wheeler) V. W. Steinm. & Felger, Madroño 42: 455(–456). 1996. *Euphorbia villifera* Scheele var. *crepuscula* L. C. Wheeler,

Contr. Gray Herb. 127: 61; plate 3C. 1939.—TYPE: México, Sonora, [Mpio. Alamos], Güirocoba, 13 Nov 1933, *Gentry 789M* (holotype GH!).

Warm-season erect to ascending annual with the cocci of the capsules laterally compressed (appearing somewhat winged). Tropical deciduous forest and oak woodland in southeastern Sonora; 400–1000 m. Also Sinaloa.

This species is closely related to *E. hyssopifolia*, consistently differing only by the very narrow cocci of the capsules.

Mpio. Rosario: Mesa la Lagunita, 27°58'20"N, 109°06'30"W, 6 Nov 1986, *Martin et al. s.n.* Mpio. Alamos: 3 km by rd N of Güirocoba along the rd to Choquinahui, 26°56'N, 108°41'45"W, *Steinmann 633*.

EUPHORBIA DENSIFLORA (Klotzsch & Garcke) Klotzsch in Peters, *Naturw. Reise Mossambique* 6: 94–95. 1861. *Anisophyllum densiflorum* Klotzsch & Garcke, *Abh. Königl. Akad. Wiss. Berlin* 1859 [Phys. Abh.]: 28(–29). 1860. *Chamaesyce densiflora* (Klotzsch & Garcke) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2*: 391(–392). 1914.—TYPE: México, Veracruz, Papantla, *Schiede 1123* (lectotype B [chosen by Millspaugh 1914, p. 391], probably destroyed; fragment of the lectotype F[#413593]!).

Prostrate annual to perennial herb with the cyathia in dense clusters towards the ends of the branches, involucre usually with only two glands, the appendages pubescent; reproductive nearly all year. Tropical deciduous forest to pine-oak woodland in southeastern and east-central Sonora; 200–1750 m. Southwestern Chihuahua to Costa Rica and according to Burger and Huft (1995, p. 74) also northern South America.

This species has been characterized as having four glands, the proximal pair being much larger than the distal pair. However, in the fragment of the lectotype as well as all specimens from northwestern México, the involucre possess just two glands, the distal pair being absent or much reduced. The four-glanded form occurs in other regions of México and Central America. The significance of the difference in gland number is not apparent.

Mpio. Alamos: El Guayabo (upper) crossing of the Río Cuchujaqui, ca. 3 km NE of Sabinito Sur and 15 km by air ESE of Alamos, *Sanders 12929*; Sierra de Alamos, just E of Aduana Peak, *Steinmann 93–446*. Mpio. Sahuaripa: 1.6 km S of Mulatos, 28°38'30"N, 108°45'42"W, *Felger 94–736*.

EUPHORBIA FLORIDA Engelm. in Torr., *Botany of the Boundary*, [in Emory, *Rep. U.S. Mex. Bound.* 2, pt. 1]: 189. 1858. *Chamaesyce florida* (Engelm.) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2*: 409. 1916.—TYPE: United States, Arizona, [valley W of the Chiricahua Mts.], 8 Sep 1851, *Wright 1829* (lec-

totype MO[#149820]!, chosen by Wheeler 1941, p. 138).

Erect to ascending annual with large, conspicuous appendages and narrow leaves that become revolute with age; July–December. Widespread in Sonora except the northwestern portion of the state; Sonoran desertscrub, thornscrub, tropical deciduous forest, and grassland; near sea level to 900 m. Jalisco to southern Arizona.

Mpio. Alamos: San Bernardo, *Gentry 2279*; Sierra de Alamos, along the rd opposite Parque El Chalatón, 27°00'45"N, 108°56'40"W, *Steinmann 950*. Mpio. Guaymas: strand at Estero Soldado, *Felger 84–405*. Mpio. Caborca: Cerro del Viejo southwest of Caborca, *Gentry 14476*. Probably Mpio. Villa Hidalgo: 9 mi W of Angostura, *White 4027*.

EUPHORBIA GRACILLIMA S. Watson, *Proc. Amer. Acad. Arts* 21: 438. 1886. *Chamaesyce gracillima* (S. Watson) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2*: 409. 1916.—TYPE: México, Chihuahua, near Batopilas, Hacienda San Miguel [published incorrectly as Hacienda San José], Aug 1885, *Palmer 68* (holotype GH!).

Delicate summer annual with slender erect to ascending dichotomously branching stems; July–October. Sonoran desertscrub, thornscrub, and tropical deciduous forest; 120–1100 m. North-central to southern Sonora, but not known from coastal regions. Arizona and Chihuahua to Jalisco.

This species is very similar to *E. revoluta* but is more delicate, is more branched, and possesses very slender upper stems and evidently divided styles. Characteristics used by previous authors such as leaf and appendage length, involucre diameter, and seed texture generally do not distinguish these taxa.

Mpio. Trincheras: bajada S of Trincheras, *Shreve 6375*. Mpio. Hermosillo: 8 mi W of Hermosillo, *Wiggins & Rollins 93*; 25 mi S of Hermosillo, rocky cerro, shade slope, *Gentry 4570*. Mpio. Alamos: Arroyo Mentidero at El Chinal Rd, 11.3 km S of Alamos, *Van Devender & Van Devender 92–1043*.

EUPHORBIA HIRTA L., *Sp. Pl.* 454. 1753. var. *HIRTA*. *Chamaesyce hirta* (L.) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2*: 303. 1909.—TYPE: India, Linnaean Herbarium 630: 5,6,7 (syntypes LINN, not seen, Linnaean Herbarium microfiche!).

Euphorbia pilulifera L. var. [as B] *discolor* Engelm. in Torr., *Botany of the Boundary*, [in Emory, *Rep. U.S. Mex. Bound.* 2, pt. 1]: 189. 1858.—TYPE: [presumably present-day Arizona, Santa Cruz Co.], "on the Sonoita [River] near Deserted Rancho," 16 Sep 1851, *Wright 1842* (lectotype MO[#144667]!, chosen by Wheeler 1939, p. 68).

Chamaesyce rosei Millsp., *Field Mus. Nat. Hist., Bot. ser. 2*: 402(–403). 1916.—TYPE: México, Sonora, [Mpio. Alamos], along an arroyo in the vicinity of Alamos, 13 Mar 1910, *Rose, Standley, & Russell 12728* (holotype NY!).

For additional synonymy see Wheeler 1939, p. 68.

Annual or short-lived perennial herb, mostly erect to ascending but sometimes prostrate, the stems often densely pubescent with conspicuous long, yellow, multicellular, spreading hairs; reproductive nearly any time of year. Tropical deciduous forest, grassland, oak woodland, and the eastern edge of the Sonoran Desert; most of Sonora except the northwestern and west-central part of the state, characteristically in disturbed areas; 40–1400 m. Warmer regions of the world.

Mpio. Nacozari: Rancho de la Nacha, *White* 4087. Probably Mpio. La Colorada: 11 mi E of Willard, between Hermosillo and Colorado, *Wiggins & Rollins* 293. Mpio. Cucurpe: Palm Canyon, ca. 17 mi SE of Magdalena on rd to Cucurpe, 14 Aug 1983, *Van Devender & Eiber s.n.* Mpio. Alamos: El Guayabo crossing of the Río Cuchujauqui, 14 km by air ESE of Alamos, *Steinmann* 93–347.

EUPHORBIA HIRTA L. var. *NOCENS* L. C. Wheeler, *Contr. Gray Herb.* 127: 70(–71). 1939.—TYPE: México, Michoacán, vicinity of Morelia, Loma del Zapote, 1850 m, 11 July 1909, *Arsène* 3038 (holotype US[#1002124]!).

Annual, apparently prostrate to weakly erect. Pine-oak forest; ca. 1500–1800 m. Mountains in eastern Sonora from the vicinity of Yécora eastward to adjacent Chihuahua; ranging to Michoacán, Estado de México, and San Luis Potosí.

This well-marked variety differs from var. *hirta* by the characteristics given in the key, and occurs at higher elevations. In addition, plants of var. *nocens* from our region tend to have a more fibrous, wiry, and better developed root system but with the tap root obscure. It is sometimes confused with *Euphorbia lineata* S. Watson, from which it is distinguished by the narrowly ovoid (vs. corpulently ovoid) seeds with sharp (vs. rounded) angles.

Mpio. Yécora: 4.1 mi W of the Chihuahua border, 9.4 mi E of Maycoba on MEX 16, in Arroyo La Ciénaga de Camilo, a tributary of the Río Yepachic, 28°26'06.3"N, 108°33'36.8"W, *Felger* 94–326; Yécora, *Steinmann* 1005; below Mesa Grande, closer to Yécora, 12 Aug 1987, *Martin s.n.*

EUPHORBIA HYPERICIFOLIA L., *Sp. Pl.* 454. 1753. *Anisophyllum hypericifolium* (L.) Haw., *Syn. Pl. Succ.* 161. 1812. *Chamaesyce hypericifolia* (L.) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2:* 302. 1909.—TYPE: From Jamaica, tab. 127 in Sloane, *Voy. Jamaica* 1: 197(–198). 1707 (lectotype, designated by Burch 1966, pp. 163–164).

Chamaesyce glomerifera Millsp., *Field Mus. Nat. Hist., Bot. ser. 2:* 377. 1913. *Euphorbia glomerifera* (Millsp.) L. C. Wheeler, *Contr. Gray Herb.* 127: 78. 1939.—TYPE: Guatemala, Dept. Jalapa, El Rancho, 20 Jan 1908, *Kellerman* 8053 (holotype F[#224827]!).

Robust erect to ascending warm-season annual. A

pantropical weed known in Sonora by a single collection from a ruderal area in tropical deciduous forest.

Mpio. Alamos: Waste area beside a street in Alamos, 400 m, *Jenkins* 93–100.

EUPHORBIA HYSSOPIFOLIA L., *Syst. Nat.* (ed. 10) 2: 1048. 1759. *Anisophyllum hyssopifolium* (L.) Haw., *Syn. Pl. Succ.* 161. 1812. *Chamaesyce hyssopifolia* (L.) Small, *Bull. New York Bot. Gard.* 3: 429. 1905.—TYPE: Jamaica, *Brown* in *Linnaean Herbarium* 630: 9 (holotype LINN, not seen, *Linnaean Herbarium microfiche*!).

Euphorbia jonesii Millsp., *Pittonia* 2: 89(–90). 1890. *Chamaesyce jonesii* (Millsp.) Millsp., *Field Mus. Pub. Bot.* 2: 410. 1916.—TYPE: United States, Arizona, Bowie, 17 Sep 1884, *Jones* 4247 (holotype F[#196592]!).

For additional synonymy see Wheeler 1941, p. 141.

Warm-weather annual to ca. 1 m tall with one to several erect to ascending main axes. Sonoran desertscrub, tropical deciduous forest, and oak woodland; widespread in Sonora, mostly disturbed areas; near sea level to 1500(1900) m. Southern Arizona to the southeastern United States, southward to South America; adventive in the Old World.

Mpio. Puerto Peñasco: Puerto Peñasco, *Felger* 91–143. Mpio. Nacozari: El Rancho de la Nacha, 25 mi W of La Angostura, *White* 3918. Mpio. Yécora: Puerto de la Cruz, N base of Mesa Campanero, 28°22'41"N, 109°02'20"W, *Van Devender* 96–476. Mpio. Guaymas: Guaymas, 1887, *Palmer* 82. Mpio. Alamos: Sierra Saguaribo, ca. 1 km by air SE of El Chiribo, ca. 27°17'30"N, 108°41'W, *Steinmann* 93–290.

EUPHORBIA INCERTA Brandege, *Proc. Calif. Acad. Sci.* ser. II, 3: 171. 1891. *Chamaesyce incerta* (Brandegee) Millsp., *Field Mus. Nat. Hist., Bot. ser. 2:* 409. 1916.—TYPE: México, Lower California [Baja California Sur], La Paz, 5 Nov 1890, *Brandegee s.n.* (holotype UC[#110518]!).

Semiprostrate nonseasonal annual to possibly short-lived perennial. Sonoran desertscrub and thornscrub on sandy beaches, usually just above high-tide level but the plants sometimes washed with sea water. Vicinity of Bahía Kino southward at least to Nayarit, the Islas Tres Marías and Revillagigedo, also Baja California Sur.

An encasement of sand sticks to the stems and roots but the plants are not glandular, being instead covered by a glutinous substance. This species is one of relatively few halophytic species of Euphorbiaceae. It seems allied to *E. platysperma*.

Mpio. Hermosillo: Bahía Kino Nuevo, *Felger* 20950. Mpio. Guaymas: Bahía Algodones, *Felger* 85–372. Mpio. Huatabampo: Camahuíroa, *Van Devender & Van Devender* 92–1070.

EUPHORBIA INDIVISA (Engelm.) Tidestr., *Proc. Biol. Soc.*

Wash. 48: 40. 1935. *Euphorbia dioeca* H. B. K. var.? *indivisa* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 187. 1858. *Euphorbia adenoptera* Bertol. var. [as β] *indivisa* (Engelm.) Boiss. in DC., Prodr. 15(2): 49. 1862. *Chamaesyce indivisa* (Engelm.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 387(–388). 1914.—TYPE: United States, New Mexico, Copper Mines [near Bayard, ca. 25 km E of Silver City], 20 Aug 1851, *Wright 1845* (lectotype MO[#144670]!). Two collections were cited in the protologue, including the one above. Millspaugh (1914, p. 387) stated that the “type [is] in [the] Gray Herbarium,” but since Engelm. probably did not see this specimen, it should not serve as the lectotype. Instead, we treat *Wright 1845* at MO (ex Herb. Engelm.) as the lectotype.

Euphorbia multifoliola M. E. Jones, Contr. W. Bot. 18: 54. 1933.

TYPE: México, Jalisco, Guadalajara, La Barranca, 17 Nov 1930, *Jones 27517* (holotype POM[#191633], not seen, photo DAV!; isotype MO[#1034339]!).

Prostrate to weakly ascending summer annual with the proximal pair of the appendages markedly larger than the distal pair, seeds with pits resembling deeply sunken lines. Upper margins of Sonoran desertscrub, Chihuahuan desertscrub, mesquite grassland, and pine-oak woodland; 700–2000 m. Northeastern and east-central Sonora. Southeastern Arizona to western Texas, and widespread through México to northern Central America.

Mpio. Cucurpe: Palm Canyon, Cerro Cinta de Plata, 17.7 mi SE of Magdalena, 4–5 Sep 1976, *Van Devender & Miksicek s.n.* Mpio. Naco: N side and base of Sierra San José, ca. 5 km SSW of Naco, *Felger 93–561*. Mpio. Villa Pesqueira: 2.5 mi N of Mátape on rd to Batuc, *Wiggins & Rollins 468*. Mpio. Yécora: Arroyo El Kípor (Quípor), just E of El Kípor on trail to Tierra Panda (Las Taunas), 28°24'N, 108°33'35"W, *Van Devender 95–944*.

EUPHORBIA LEUCOPHYLLA Benth. ssp. *comcaacorum* V. W. Steinm. & Felger, ssp. nov.—TYPE: México, Sonora, Mpio. Hermosillo, Bahía Kino, ca. 3 km N of the point where the highway starts to run parallel to the coast, 28°50'15"N, 111°58'W, near sea level, 01 June 1996, *Steinmann 911* (holotype ARIZ[#335466]; isotypes BM, DAV, ENCB, LSU, MICH, NY, IBUG, MEXU, RSA, USON). Fig. 10 and 12.

Herba perennis prostrata vel decumbens; a spp. leucophyllae foliis petiolatis et seminibus majoribus differt.

Herbaceous perennial with prostrate to ascending stems and deep, thick, often gnarled roots; reproductive more or less throughout the year depending on soil moisture. Endemic to Sonora, occurring on coastal dunes in Sonoran desertscrub on Isla Tiburón and the opposite shores of the Canal del Infiernillo southward to Tastiota. Subspecies *leucophylla* occurs on the Baja California Peninsula.

Subspecies *comcaacorum* consistently differs from ssp. *leucophylla* by possessing larger seeds (1.5–1.7 mm long vs. 0.9–1.3 mm long). In addition, the leaves of Sonoran plants have well-developed petioles and blades with oblique bases. These characteristics are only rarely encountered in the Baja California plants, on which the leaves usually lack conspicuous petioles and are amplexicaulis with cordate bases. Otherwise the two subspecies are very similar, and both are restricted to coastal dunes. They are compared in figures 10–13.

The subspecific epithet *comcaacorum* honors the Seri Indians, who call themselves the Comcaac (“The People”). The taxon’s geographic range is within the traditional territory of the Comcaac.

Paratypes.—Isla Tiburón: Palo Fierro, *Felger 12534*; ca. 1 km N of Punta Willard, *Felger 17749* (RSA); Canal del Infiernillo, *Tenorio 10887* (RSA). Mpio. Hermosillo: ca. 1 mi NW of Tastiota, *Felger 20871*; 2 mi N of fishing village on Bahía Kino, *Wiggins & Rollins 168* (ARIZ, RSA); 35 km N of Bahía Kino, *Sommer 11*; Punta Chueca, ca. 20 mi N of Bahía Kino, 10 Nov 1974, *Van Devender et al. s.n.*; ca. 1 km N of Bahía Kino, *Felger 84–85*; 1 km S of Punta Ona, 29°05'N, 112°10'W, 17 Mar 1987, *Henze s.n.*; W end of Cerro San Nicolás at S end of Hueso de Ballena beach (S end of Bahía Kino), *Felger 9507*.

EUPHORBIA MAGDALENAE Benth., Bot. Voy. Sulphur 50. 1844. *Chamaesyce magdalenae* (Benth.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 410. 1916.—TYPE: México, Lower California, [Baja California Sur], Bay of Magdalena, 1841, *Hinds s.n.* (holotype K, not seen, photo RSA!, fragment MO[#1909973]!).

Euphorbia blepharostipula Millsp. in Vasey & Rose, Contr. U.S. Natl. Herb. 1: 77. 1890.—TYPE: México, Lower California [Baja California Sur], near La Paz, on stony ridges, 20 Jan–5 Feb 1890, *Palmer 43* (holotype F[#197115]!).

Euphorbia watsonii Millsp., Zoe 1: 347(–348). 1891. *Chamaesyce watsonii* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 412. 1916.—TYPE: México, Lower California [Baja California Sur], Todos Santos, 20 Jan 1890, *Brandege s.n.* (lectotype F[#196149]!, here designated). This name is based on two collections, the other is from the same locality, collected 29 Jan 1890: *Brandege s.n.* (F!).

Euphorbia espiituensis M. E. Jones, Contr. W. Bot. 18: 50. 1933.—TYPE: México, Lower California [Baja California Sur], Espíritu Santo Island, 30 Sep 1930, *Jones 27505* (holotype POM[#25505]!).

Shrub with slender, woody stems; probably reproductive at any season. Sonoran desertscrub; near sea level to 300 m. Baja California Sur and adjacent islands to extreme southern Baja California. On the Sonora side of the Gulf of California it is known only from two islands; it is rare on the east side of Isla San Pedro Nolasco near peak elevation, but there is a well-established, although apparently localized, population on the southeast side of Isla Tiburón. Johnston (1924, p. 1069) reported it for Bahía San Pedro, but it has not been recorded at this area by anyone else, and we did not find a specimen at CAS. This species and *E. to-*

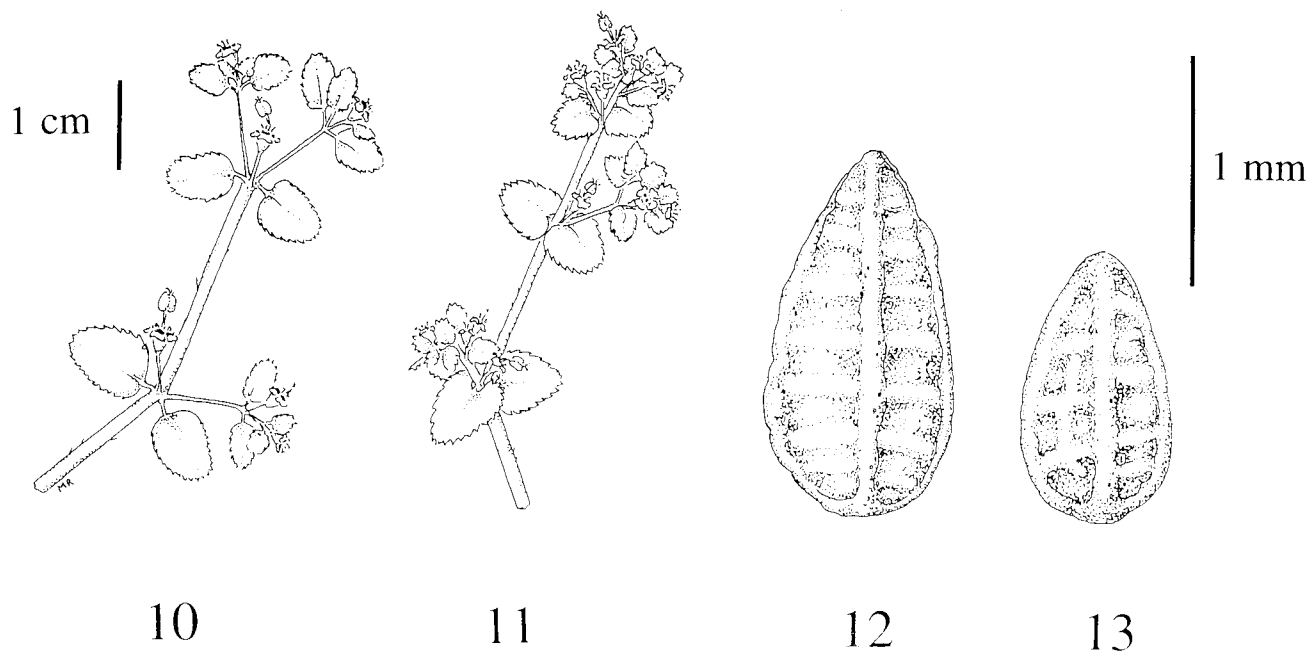


Fig. 10–13. *Euphorbia leucophylla*. 10. Branchlet of ssp. *comcaacorum*.—11. Branchlet of ssp. *leucophylla*.—12. Seed of ssp. *comcaacorum*.—13. Seed of ssp. *leucophylla*. 10 and 12 from Steinmann 911; 11 and 13 from Petryszyn 48.

mentulosa are the only subg. *Chamaesyce* shrubs in northwestern México.

Isla San Pedro Nolasco: NE side of island, rocky ridge ca. 20 m below summit, Felger 9657. Isla Tiburón: SW side of island, Ensenada de la Perra, Felger 17711.

EUPHORBIA MELANADENIA Torr., Pacif. Railr. Rep. 4: 135. 1857. *Anisophyllum melanadenium* (Torr.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 23. 1860. *Euphorbia polycarpa* Benth. var. *vestita* S. Watson, Bot. California 2: 73. 1880. *Chamaesyce melanadenia* (Torr.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 410. 1916.—TYPE: United States, California, near San Gabriel, 1853–54, Bigelow s.n. (holotype NY!).

Euphorbia cinerascens Engelm. var. [as β] *appendiculata* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 186(–187). 1858. *Euphorbia polycarpa* Benth. var. *appendiculata* (Engelm.) Munz, Bull. S. Calif. Acad. Sci. 31: 68. 1932.—TYPE: United States, California, San Filipe, May 1852, Thurber 628 (lectotype MO[#46716]!, chosen by Wheeler 1941, p. 188).

Chamaesyce aureola Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 406. 1916.—TYPE: United States, California, Azusa, 800 ft, 3 May 1912, Smith 4933 (holotype F[#389282]!).

Small rounded and bushy perennial herb; reproductive at various seasons. Northern Sonora in oak woodland and upper margins of both Chihuahuan and Sonoran desertscrub; 1050–1550 m. Central and southern Arizona; disjunct in southern California, Baja California, and Baja California Sur.

Mpio. Fronteras: 9.3 mi by rd WSW of Fronteras, 30°51'19"N, 109°41'11.3"W, Felger 94–833. Mpio. Bacoachi: 17.8 mi by rd N

of Bacoachi, SE of Cerro la Cieneguita, 30°51.5'N, 109°55'W, Fishbein 1249a. Mpio. Saric: granitic hills 2 mi S of Sasabe, Wiggins 5915 (US).

EUPHORBIA MICROMERA Boiss. in DC., Prodr. 15(2): 44. 1862. *Chamaesyce micromera* (Boiss.) Wooton & Standl., Contr. U.S. Natl. Herb. 16: 144. 1913.—TYPE: United States, [Arizona, creek descending to the San Pedro River], 8 Sep 1851, Wright 1854 (holotype G-DC, not seen; isotype NY!).

Euphorbia podagrica L. M. Johnst., Univ. Calif. Publ. Bot. 7: 440(–441). 1922.—TYPE: United States, Nevada, Gold Mt., 1898, Purpus 6437 in part (holotype UC[#110920], not seen).

Euphorbia pseudoserpyllifolia Millsp., Pittonia 2: 87(–88). 1889. *Chamaesyce pseudoserpyllifolia* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916.—TYPE: United States, Arizona, Gila River Valley, 1873, Mohr s.n. (lectotype F, not seen, chosen by Wheeler 1936, p. 433).

Euphorbia pseudoserpyllifolia Millsp. forma *villosa* J. T. Howell, Leaf. W. Bot. 1: 53. 1933.—TYPE: United States, California, S of Palm Springs near Cathedral City, Howell 6651 (holotype CAS[#188849]!).

Euphorbia setiloba Engelm. ex Torr. var. *nodulosa* Jeps., Fl. Calif. 2: 427. 1936.—TYPE: United States, California, Salton Basin, between Brawly and Salton Sea, 15 Oct 1912, Parish 8301 (holotype JEPS[#2597]!).

Small, nonseasonal facultative annual to herbaceous perennial. Northwestern Sonora in Sonoran desertscrub and northeastern Sonora probably in Chihuahuan desertscrub; near sea level to 1100 m. Southeastern California to Utah and western Texas, both states of Baja California, and the Chihuahuan Desert in north-central México to the Nueva Galicia region. According to Brako and Zarucchi (1993, p. 436), Wheeler's

(1941, p. 196) report of it from Peru seems to be in error.

Contrary to Wheeler (1941, p. 194) and various other authors, *Euphorbia micromera* was first validly published by Boissier and not by Engelmann. By stating that Boissier "perhaps justly" segregated *Wright 1854* as distinct from *E. polycarpa* and then going on to express doubt about the taxonomic significance of some characteristics Boissier used to distinguish *E. micromera* from *E. polycarpa*, Engelmann (1861, pp. 170–171) did not meet the required criterion of accepting the validity of this taxon. Thus, in Engelmann's paper *E. micromera* is only a provisional name. It was validly published by Boissier one year later.

Euphorbia micromera and *E. polycarpa* are closely related, and their seeds appear identical. Especially in arid situations, *E. polycarpa* may produce glands lacking petaloid appendages, and the glands may be smaller than usual, making the plants somewhat difficult to distinguish from *E. micromera*. In such cases, *E. polycarpa* can be distinguished by its larger and oval rather than smaller and nearly circular glands. Both species vary from annual to perennial and glabrous to pubescent. In Sonora, *Euphorbia micromera* tends to be slightly more numerous in drier habitats, while *E. polycarpa* tends to prefer less arid habitats.

Mpio. San Luis R. C.: 25 mi E of San Luis on MEX 2, granitic hill, *Felger 16708B*. Mpio. Gen. Plutarco Elías Calles: 4.5 mi N of Cerro Colorado, cinder flat, *Felger 10416B*. Mpio. Puerto Peñasco: Puerto Peñasco, *Felger 85–769*. Mpio. Agua Prieta: Puerto del Molino Quemado, E of Colonia Morelos, *White 4535* (MICH).

EUPHORBIA NUTANS Lag., Gen. Sp. Pl. 17. 1816. *Chamaesyce nutans* (Lag.) Small, Fl. S.E. U.S. 712, 1333. 1903.—TYPE: "Habit. in N[ueva]. H[ispania]." Presumably a Mexican Sessé and Mocino collection (probably at MA, not seen).

Euphorbia prestlii Guss., Fl. Sicul. Prodr. 1:539. 1827. *Chamaesyce prestlii* (Guss.) Arthur, Torreya 11: 260. 1912.—TYPE: According to Wheeler 1941, p. 144, "Palermo, Italia, *Todaro* (Praha?)."

Euphorbia hypericifolia L. var. *communis* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 188. 1858.—TYPE: United States, New Mexico, 1851–52, *Wright 1842* in part (lectotype ?MO, not found, chosen by Wheeler 1941, p. 144; isoelectotype NY!).

Euphorbia langsingii Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 376. 1913.—TYPE: United States, Illinois, Chicago, 6 Aug 1898, *Lansing 402* (holotype F[#196688]!).

Erect to ascending annual; August–October. Oak and pine-oak woodland in the Yécora region; 1520–1740 m. Widespread from Central America to southern Canada.

The name *E. maculata* L. has been applied to this species (e.g., Wheeler 1941, pp. 143–150), but as clarified by Burch (1966), the correct name is *E. nutans*. *Euphorbia maculata* (= *E. supina* Raf.) is a prostrate

species with densely pubescent ovaries; it has not been documented for Sonora, although it is known from southern Arizona.

Plants vary greatly in size and can be glabrous to densely pubescent. Material from Arizona and New Mexico previously recognized as *Euphorbia vermiculata* Raf. is essentially identical to, and appears best treated within *E. nutans*. As pointed out by Wheeler (1941, p. 153), *E. vermiculata* is distinct in New England and its vicinity, but is ill-defined in Arizona and New Mexico, and a study of *E. nutans* and its relatives will be necessary before the proper position of *E. vermiculata* can be ascertained.

Mpio. Cucurpe: E of Cucurpe, on Río Saracachi, cienega near Rancho Agua Fria, 5 Sep 1976, *Van Devender & Miksicek s.n.*. Mpio. Yécora: along MEX 16, 4.8 km by rd SW of Puerto de la Cruz, near El Aguajito, 28°22'16"N, 109°02'51"W, *Steinmann 1037*; Arroyo El Kípor (Quípor), just E of El Kípor on trail to Tierra Panda (Las Taunas), 28°24'N, 108°33'35"W, *Van Devender 95–967*.

EUPHORBIA PEDICULIFERA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 186. 1858. var. **PEDICULIFERA**. *Chamaesyce pediculifera* (Engelm.) Rose & Standl., Contr. U.S. Natl. Herb. 16: 12. 1912.—TYPE: [presumably present-day Arizona, Santa Cruz Co.], on the Sonoita [River], 15 Sep 1851, *Wright 1848* (lectotype MO[#144671]!), chosen by Wheeler 1941, p. 183).

Euphorbia involuta Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 227(–228). 1889. *Chamaesyce involuta* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 410. 1916. *Euphorbia pediculifera* Engelm. var. *involuta* (Millsp.) I. M. Johnston, Proc. Calif. Acad. Sci. ser. IV, 12: 1070. 1924.—TYPE: México, Lower California [Baja California Sur], Comondú, Apr 1889, *Brandegee s.n.* (holotype F[#196145]!).

Euphorbia conjuncta Millsp., Proc. Calif. Acad. Sci. ser. II, 2: 227. 1889. *Chamaesyce conjuncta* (Millsp.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 408. 1916.—TYPE: México, Lower California [Baja California Sur], Purísima, 12 Feb 1889, *Brandegee s.n.* (holotype F[#196147]!).

Euphorbia pediculifera Engelm. var. *inornata* Brandegee, Zoe 5: 209. 1905.—TYPE: México, Sinaloa, Cofradía, 1904, *Brandegee s.n.* (holotype UC, not seen).

Euphorbia vermiformis M. E. Jones, Contr. W. Bot. 16: 23. 1930.—TYPE: United States, Arizona, Ajo, 18 Sep 1929, *Jones 24856* (holotype POM[#195929]!).

Annual to short-lived herbaceous perennial, prostrate to ascending; reproductive nearly any time of year. Sonoran desertscrub, thornscrub, sometimes in oak-grassland, and occasional in tropical deciduous forest; near sea level to 1150 m. Northeastern Sonora, and widespread and common in western Sonora, except the Guaymas region where it is replaced by var. *linearifolia*. Southeastern California and Arizona southward to Sinaloa and the Cape Region of Baja California Sur.

Brandegee's variety *inornata* was proposed on the basis of its appendage-less glands. We have observed

this characteristic on some Sonoran plants (e.g., *Steinmann s.n.*) and do not interpret it as taxonomically significant. Although the type has not been available for study, we treat var. *inornata* as a synonym of var. *pediculifera*.

Isla Tiburón: Tordillitos, *Felger 15470*. Mpio. Bacoachi: Sierra de los Ajos, 3 mi SE of Mututucachi, 30°44'N, 109°59'W, *Fishbein 2261a*. Mpio. Puerto Peñasco: Pinacate region, 0.5 km S Carnegie Peak, *Felger 19906*; 21 mi W of Sonoyta on MEX 2, *Lehto 19237*. Mpio. Guaymas: Sierra Libre, ca. 2 km by rd E of junction with MEX 15 along rd to Microondas Avispas, 28°28'50"N, 111°01'43"W, *Steinmann 977b*. Mpio. Alamos: Mocúzari, 27°13'10"N, 109°06'30"W, *Van Devender & Van Devender 92-1396*; Sierra de Alamos, 18 Aug 1992, *Steinmann s.n.*

EUPHORBIA PEDICULIFERA Engelm. var. **LINEARIFOLIA** S. Watson, Proc. Amer. Acad. Arts 24: 76. 1889.—**TYPE:** México, Sonora, [Mpio. Guaymas], Guaymas, high mountains, Sep 1887, *Palmer 215* (lectotype GH, not seen, chosen by Wheeler 1936, p. 443; isoelectotype CAS[#370597]!).

Annual or perennial herb consistently differing from var. *pediculifera* by its much narrower leaves; reproductive more or less throughout the year. The bracteoles of var. *linearifolia* are said to be smaller than the typical variety (Wheeler 1936), but we detect little or no difference. Endemic to the Guaymas region where all specimens are this subspecies; near sea level to 715 m. Plants found growing together in the Sierra Libre (*Steinmann 977a* and *b*), near the north end of the Guaymas region, are identifiable to both varieties.

Some collections from Arizona (e.g., *Jones 24856*, the type of *E. vermiformis*) have narrow leaves which approach those of var. *linearifolia*. However, such specimens appear to be rare and anomalous examples of var. *pediculifera*. Nearly all collections outside of the Guaymas region are clearly var. *pediculifera*. Wiggins (1980, p. 126) reports var. *linearifolia* from the Cape Region of Baja California Sur, but we have not seen any specimens verifying its presence there.

Mpio. Guaymas: hills 3 mi S of Ortiz, *Shreve 6107*; Cañón del Nacapule, *Felger 85-564*; Guaymas, *Gentry 4703*; Sierra Libre, ca. 2 km by rd E of junction with MEX 15 along rd to Microondas Avispas, 28°28'50"N, 111°01'43"W, *Steinmann 977a*.

EUPHORBIA PETRINA S. Watson, Proc. Amer. Acad. Arts 24: 75. 1889. *Chamaesyce petrina* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916. *Euphorbia polycarpa* Benth. var. *petrina* (S. Watson) I. M. Johnst., Proc. Calif. Acad. Sci. ser. IV, 12: 1072(-1073). 1924.—**TYPE:** México, Gulf of California, San Pedro [Mártir] Island, October 1887, *Palmer 412* (holotype GH!).

Nonseasonal annual to short-lived perennial herb, the appendages small and inconspicuous or absent. Sonoran desertscrub, thornscrub, and tropical deciduous

forest, mostly on sandy soils; sea level to 925 m. El Golfo at the mouth of the Río Colorado and Puerto Peñasco southward in western Sonora to Sinaloa, islands in the Gulf of California, and the Baja California Peninsula.

One collection from north of Bahía Kino (13 mi SE of Rancho Noche Buena, *Felger 14015*) also appears to be this species but is anomalous in possessing conspicuous appendages.

Isla Tiburón: Tecamate, dunes near beach, *Felger 8908*. Mpio. Alamos: E slopes of Sierra de Alamos, Saucito Canyon, Rancho la Sierrita, 6 km by air SSW of Alamos, *Van Devender 93-1396*. Mpio. Empalme: Playa del Sol [SE of Empalme], *Felger 85-1129*. Mpio. San Luis R. C.: 2.0 km W from El Golfo de Santa Clara, ca. 100 m inland from beach, *Felger 93-05*.

Euphorbia pionsperma V. W. Steinm. & Felger, sp. nov.—**TYPE:** México, Sonora, Mpio. Yécora, hills ca. 1.5 km W of Yécora, 28°22'30"N, 108°56'45"W, 1600 m, 5 Sep 1996, *Steinmann 1006* (holotype ARIZ [#335467]; isotypes BM, DAV, ENCB, LSU, MICH, NY, IBUG, MEXU, RSA, USON). Fig. 14-17.

Annual, erecta vel ascendens, gracilis, laxa ramosa, glabra, usque 20 cm alta; caules teretes; folia opposita; petioli 0.2–0.8 mm longi, ca. 0.2–0.3 mm diametro; laminae lineares, oblongae, vel ovatae, 0.5–1.6 cm longae, 0.2–0.5 cm latae, e basi trinerves, basi obliquae, apice acutae, margine serratae vel serrulatae saltem apicem versus saepe integrae basem versus; cyathia axillaria solitaria, subsessilia vel peduncularia; pedunculi (ubi adsunt) usque 1.7 mm longi, ca. 0.2 mm diametro; involucra obconica, 0.8–1.2 mm longa, 0.5–0.8 mm diametro, interne pubescentia; glandulae 4 (raro 2 vel 3), rubidae, punctiformes vel transverse ovoides, 0.1–0.15 mm longae (tangentialiter), 0.1–0.25 mm latae (radialiter); appendices semiorbiculatae vel rotundae, usque 0.3 mm longae, usque 0.6 mm latae, margine integrae; flores ♂ ca. 10–25; ovarium 3-lobatum; styli 3, 0.4–0.8 mm longi, bifidi, filiformes, ad apices leviter dilatati; capsula leniter 3-lobata, 1.8–2.1 mm longa, 1.9–2.3 mm diametro; columella 1.6–1.8 mm longa; semina obesa ovoidea, 1.2–1.4 mm longa, 0.8–1.0 mm diametro, laevia vel leviter transverse porcata.

Slender, loosely branching, erect to ascending annual to ca. 20 cm tall, generally forking dichotomously from near the base to the apex, glabrous, often suffused with reddish pigmentation; stems terete (substriate when dried); stipules distinct when young, united with age into a white to red accrescent membranous scale 0.4–1.7 mm long, often lacerate into attenuate-filiform divisions; leaves opposite, generally decreasing in size and tending to become proportionately narrower towards the ends of the branches; petioles 0.2–0.8 mm long, ca. 0.2–0.3 mm in diameter; blades linear, oblong, to ovate, 0.5–1.6 cm long, 0.2–0.5 cm wide, palmately 3-veined, oblique and often subcordate at base, apex acute; margin serrate to serrulate at least towards the apex, often proximally entire; cyathia solitary in the axils of the upper leaves, subsessile or on peduncles to 1.7 mm long and ca. 0.2 mm in diameter; involucres obconic, 0.8–1.2 mm long, 0.5–0.8 mm in diameter below the glands, glabrous on the out-

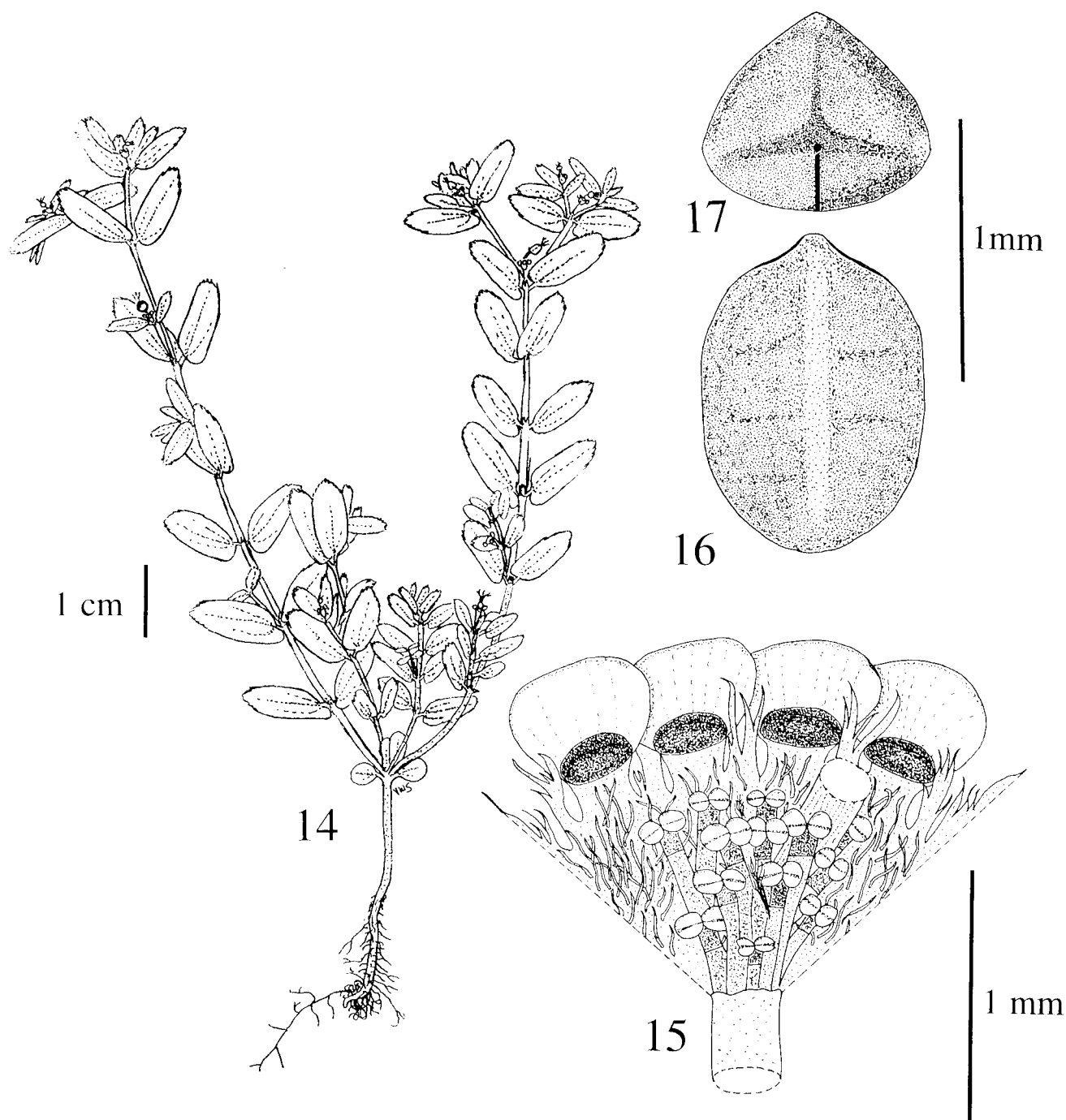


Fig. 14–17. *Euphorbia pionsperma*. 14. Habit.—15. Cyathium.—16. Seed, dorsal view.—17. Seed, apical view. All from Steinmann 1006.

side, pubescent within, the lobes triangular, 0.3–0.6 mm long, often lacerate into attenuate-filiform divisions, the sinus U-shaped, slightly depressed; glands 4 (sometimes reduced to 2 or 3), dark pink to red, punctiform to transversely oval, 0.1–0.15 mm long (tangential axis), 0.1–0.25 mm wide (radial axis); appendages absent or forming a rim around the distal portion of the gland, semicircular to rotund, to 0.3 mm long and 0.6 mm wide, entire, white aging to dark pink; bracteoles included, relatively few, filiform, entire to

fimbriate at the apex; ♂ flowers ca. 10–25, androphores glabrous; gynophore glabrous, reflexed or erect, exserted to 0.6–1.8 mm in fruit; ovary 3-lobed; styles 3, 0.4–0.8 mm long, bifid $\frac{1}{3}$ – $\frac{1}{2}$ their length, filiform, slightly dilated at the apex; capsule gently 3-lobed, 1.8–2.1 mm long, 1.9–2.3 mm in diameter; columella 1.6–1.8 mm long; seeds plumply ovoid, 1.2–1.4 mm long, 0.8–1.0 mm in diameter, blackish to gray to brown, base rounded, apex obliquely obtuse, roundly trigonous in cross-section with the two abaxial facets

serving as sides and the two adaxial facets together serving as a side, facets convex, smooth or with (1–)2(–3) faint transverse ridges, the angles of the seeds cordlike, often whitened, the adaxial surface with a conspicuous darkened line running from the apex to the base and a dark punctiform spot at the hilum.

Oak and pine-oak woodland, often in open grassy areas and rock outcrops, 1260–1700 m (to 1900 m in adjacent Chihuahua); August–October. Eastern Sonora and adjacent Chihuahua.

This species belongs to the *Euphorbia hyssopifolia* complex, and as with other members of this group, the seeds are diagnostic. They are comparatively corpulent and nearly smooth in *E. pionsperma*. In Sonora it could be confused with *E. hyssopifolia* and *E. nutans*, but seeds of these species are conspicuously wrinkled or transversely ridged. In addition to the seminal differences, *E. pionsperma* is completely glabrous while *E. nutans* and *E. hyssopifolia* are often, although not necessarily always, pubescent.

The specific epithet *pionsperma*, is derived from Greek *piono* (fat or plump) and *spermus* (seeded).

Paratypes.—Mpio. Sahuaripa: 1.4 mi NW of Matarachi, 28°42'05.1"N, 108°50'13.0"W, low hills at NW side of the Matarachi valley, *Felger* 94–379. Mpio. Yécora: ca. 23 km E of Yécora, Los Pilares, Arroyo Los Pilares, 28°23'N, 108°47'30"W, *Van Devender* 95–886 (ARIZ, RSA); 10 rd mi NW of Yécora on "old" rd to La Trinidad/Santa Rosa, 28°27'47.5"N, 109°00'47.5"W, *Wilson* 95–75. Mpio. Alamos: El Rayo, near Chihuahua border on the rd from Taymucio to Las Chinacas, 18 Aug 1991, *Martin* s.n. (a mixed sheet with *E. anychioides*): ca. 5 km SSW of La Lobera on the rd to Las Chinacas, 27°15'N, 108°38'W, *Steinmann* 93–228.—CHIHUAHUA. Mpio. Moris: Mesa de Horcones, N of El Pilar, 19 Aug 1989, *Martin* s.n. Probably Mpio. Temosachic: along MEX 16, 30 km by rd E of the Sonora/Chihuahua border, 28°23'49"N, 108°19'52"W, *Steinmann* 1029 (RSA).

EUPHORBIA PLATYSERMA Engelm. ex S. Watson, Bot. California 2: 482(–483). 1880. *Chamaesyce platysperma* (Engelm. ex S. Watson) Shinnars, Field & Lab. 20: 25. 1952.—TYPE: Arizona, [perhaps actually from Sonora], near the mouth of Colorado River, 1869, *Palmer* 2 (holotype GH!).

Euphorbia eremica Jeps., Man. Fl. Pl. Calif. 600. 1925.—TYPE: United States, California, Coachella Desert [= Coachella Valley], ca. 200 ft, May 1914, *Jepson* 6047 (holotype JEPS[#2595]!).

Annual and probably facultatively short-lived perennial with deeply buried roots; the seeds are large, and the unusual ventral ridge and curved, overhanging raphe are unique among the seeds of subg. *Chamaesyce*; mostly October to April. Sonoran desertscrub on dunes in the Gran Desierto and just above the high tide zone at El Golfo northward to the border region in adjacent southwest Arizona; near sea level to 190 m. Also northeastern Baja California and known from a single southern California collection made over 70 years ago.

Mpio. Puerto Peñasco: 1 mi S of Moon Crater, shifting dunes, *Felger* 19011. Mpio. San Luis R. C.: El Golfo, beach dunes, *Felger* 75–84.

EUPHORBIA POLYCARPA Benth., Bot. Voy. Sulphur 50. 1844. *Chamaesyce polycarpa* (Benth.) Millsp., Pub. Field Mus. Bot. ser. 2: 411. 1916.—TYPE: México, Lower California, [Baja California Sur], Bay of Magdalena, 1841, *Hinds* s.n. (holotype K, not seen, photo RSA!).

Euphorbia polycarpa Benth. var. [as *B*] *hirtella* Boiss. in DC., Prodr. 15(2): 44. 1862. *Chamaesyce polycarpa* var. *hirtella* (Boiss.) Millsp. ex Parish, Carnegie Inst. Wash. Publ. 193: 110. 1913. *Chamaesyce tonsita* Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 412. 1916. —TYPE: United States, "California" [probably from the Colorado Desert, Wheeler 1936, p. 409], 1846, *Emory* s.n. (lectotype G, not seen, chosen by Wheeler 1941, p. 191; isolecotype NY!).

Euphorbia intermixta S. Watson, Proc. Amer. Acad. Arts 24: 74. 1889. *Chamaesyce intermixta* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 409. 1916. *Euphorbia polycarpa* Benth. var. *intermixta* (S. Watson) L. C. Wheeler, Bull. Torr. Bot. Club 63: 412. 1936. —TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, June 1887, *Palmer* 187 in part (holotype GH!).

Nonseasonal annual to small perennial herb; reproductive any time of year. Sonoran desertscrub and thornscrub in western Sonora south to the delta region of the Río Mayo; near sea level to 450+ m. Also southern California to Baja California Sur, southern Nevada, and Arizona.

The herbage and capsules vary from glabrous to pubescent. The pubescent plants have often been segregated as var. *hirtella*, but the variation in pubescence shows no geographic segregation, ranges along a continuum from glabrous to densely pubescent, and glabrous to pubescent branches sometimes occur on the same plant (e.g., *Wiggins* 5537, RSA).

The type collection of *Euphorbia intermixta* appears to be nothing more than first-season plants, and *E. intermixta* is here treated as a synonym of *E. polycarpa*. Many authors have used the presence of variable-sized leaves on the same plant to distinguish *E. intermixta*, but we find this characteristic unreliable and of doubtful taxonomic significance. We have observed larger leaves associated with periods of higher moisture. Wheeler (1936, pp. 406–412) and Wiggins (1964, p. 833–835) recognized several additional varieties of *E. polycarpa*, all from the Baja California Peninsula and adjacent islands. Some of these (e.g., var. *mejamia* L. C. Wheeler) may be worthy of continued recognition but are not considered here.

Euphorbia polycarpa is closely related to *E. micromera* (see note under that species).

Isla San Esteban: *Felger* 7043. Mpio. San Luis R. C.: Sierra del Rosario, *Felger* 20730. Mpio. Guaymas: vicinity of Cañón del Nacapule, *Felger* 85–1183A. Mpio. Huatabampo: Las Bocas, 26°35'30"N, 109°20'30"W, *Van Devender* & *Van Devender* 92–134.

EUPHORBIA PROSTRATA Aiton, Hort. Kew. 2: 139. 1789. *Anisophyllum prostratum* (Aiton) Haw., Syn. Pl. Succ. 163. 1812. *Chamaesyce prostrata* (Aiton) Small, Fl. S.E. U.S. 713, 1333. 1903.—TYPE: "Nat. of the West Indies," cultivated by Miller in England in 1758 (holotype BM[#510671]!).

Euphorbia callitrichoides H. B. K., Nov. Gen. Sp. 2 [folio]: 42, [quarto]: 52(–53). 1817.—TYPE: México, "in arenosis maritimis... prope portum Veræ Crucis," 1804, *Humboldt & Bonpland* (holotype P, not seen; Humboldt & Bonpland Herbarium microfiche!).

Euphorbia tenella H. B. K., Nov. Gen. Sp. 2 [folio]: 42(–43), [quarto]: 53. 1817.—TYPE: Venezuela, "regione ferventissima ad ripas Orinoci prope Maypures et Carichana," 1800, *Humboldt & Bonpland* (holotype P, not seen; Humboldt & Bonpland Herbarium microfiche!; fragment ex B at MO[#2238534]!).

Chamaesyce malaca Small, Fl. S.E. U.S. 713, 1333. 1903. *Euphorbia malaca* (Small) Little in Jeffs & Little, Publ. Univ. Oklahoma Biol. Surv. 2: 70. 1930.—TYPE: United States, Texas, Kerr Co., Kerrville, 1600–2000 ft, 26–30 June 1894, *Keller 1918* (holotype NY!).

Prostrate warm-weather annual to short-lived herbaceous perennial. Known from a few widely separated localities in western Sonora including Sonoran desertscrub and tropical deciduous forest; mostly disturbed areas, near sea level to 700 m. Probably originally native to the West Indies and South America, but now widespread in warm regions of the world. Possibly not native in Sonora.

Mpio. Puerto Peñasco: Pinacate Junction [MEX 2 and rd to Elegante Crater], *Felger 86–343B*. Mpio. Hermosillo: Hermosillo, *Steinmann 577*. Mpio. Guaymas: San Carlos, *Felger 96–3*. Mpio. Alamos: hill 9 mi by air NW of Alamos and 4 mi SSW of Piedras Verdes, *Sanders 9457*.

EUPHORBIA RADIOLOIDES Boiss. in DC., Prodr. 15(2): 45. 1862. *Chamaesyce radioloides* (Boiss.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 411. 1916.—TYPE: México, [Sinaloa], Cerro de Pinal, Dec 1848, *Seemann 1522* (holotype K, not seen, photo RSA!; fragment F[#197557]!).

Euphorbia radioloides Boiss. var. *rubra* Millsp., Bull. Torr. Bot. Club. 16: 65. 1889.—TYPE: México, Jalisco, near Guadalajara, 11 Dec 1888, *Pringle 2066* in part (probable holotype F[#197328]!).

Delicate prostrate to ascending warm-weather annual. Known in Sonora from a single collection on an outcrop in pine-oak forest on acidic, hydrothermally altered soil. South to Guerrero. An infrequently collected species throughout its range.

Mpio. Onavas: Agua María [= Agua Amarilla], 14 Nov 1987, *Martín s.n.*

EUPHORBIA REVOLUTA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 186. 1858. *Chamaesyce revoluta* (Engelm.) Small, Fl. S.E. U.S. 711, 1333. 1903.—TYPE: Unit-

ed States, New Mexico, between Santa Fe and Moro River in the mountains, 10–16 Aug 1847, *Fendler 789* (lectotype MO[#200216]!, chosen by Wheeler 1941, p. 137).

Erect to ascending annual with linear leaves, the styles undivided; August–October. Known from oak and pine-oak woodland in east-central and northeastern Sonora, 1050–1500 m. In adjacent Chihuahua and southeastern Arizona it also occurs in grassland and the upper margin of Chihuahuan desertscrub. Also Baja California and California to Texas, Coahuila, and Zacatecas.

The central Sonoran and adjacent Chihuahuan plants probably deserve infraspecific recognition. They possess nearly smooth, brick-red to brown seeds that are very similar to those of *E. gracillima* but quite different from *E. revoluta* elsewhere which regularly possess transversely ridged, light gray to whitish seeds.

Mpio. Yécora: Arroyo El Otro Lado, 1–2 km NNE of Yécora on old rd to Maycoba, 28°23'49"N, 108°54'48"W, *Van Devender 95–820*; ca. 23 km E of Yécora, Los Pilares, Arroyo Los Pilares, 28°23'N, 108°47'30"W, *Van Devender 95–916* (RSA). Mpio. Agua Prieta: Colonia Morelos, Agua Zarca, *White 4446* (MICH).

EUPHORBIA SERPENS H. B. K., Nov. Gen. Sp. 2 [folio]: 41(–42), [quarto]: 52. 1817. *Anisophyllum serpens* (H. B. K.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 23. 1860. *Chamaesyce serpens* (H. B. K.) Small, Fl. S.E. U.S. 709, 1333. 1903.—TYPE: Venezuela, "in umbrosis Cumanæ prope Bordones et Punta Araya," 1800, *Humboldt & Bonpland* (holotype P, not seen; Humboldt and Bonpland Herbarium microfiche!).

For synonymy see Wheeler 1941, p. 199.

Prostrate nonseasonal annual, rooting at the nodes; widespread in lowland Sonora in Sonoran desertscrub, thornscrub, and tropical deciduous forest, mostly weedy and in sandy soils; near sea level to ca. 450 m. A cosmopolitan weed, in the New World from Illinois to California to South America. Possibly not native in Sonora.

Euphorbia serpens is closely related to and often confused with *E. albomarginata* (see note under that species).

Mpio. San Luis R. C.: Lerdo [along the lower Río Colorado], 1889, *Palmer 954* (F). Mpio. Santa Ana: hwy about 5 mi S of Santa Ana, *Wiggins & Rollins 67* (RSA). Mpio. Guaymas: E of San Carlos, 0.5 km NW of Estero Soldado, 15 Aug 1992, *Steinmann s.n.* Mpio. Alamos: Sierra de Alamos, Aduana, 18 Aug 1992, *Steinmann s.n.* Mpio. Navojoa: 0.6 mi NE of turnoff to Bacobampo and 8 mi SW of Navojoa, 26°59'N, 109°32.5'W, *Sanders 8929* (RSA).

EUPHORBIA SERPYLLIFOLIA [as *serpyllifolia*] Pers., Syn. Pl. 2: 14. 1806. *Chamaesyce serpyllifolia* (Pers.)

Small, Fl. S.E. U.S. 712, 1333. 1903.—TYPE: “Hab. in Amer. calidiore” (possibly at L, not seen).

For synonymy see Wheeler 1941, pp. 229–231.

Prostrate warm-weather annual with leaves characteristically serrate only towards the apex. Known from one Sonoran collection but probably more widespread; Chihuahuan desertscrub in northeastern Sonora, 1350 m, and possibly in grassland or woodland habitats. Widespread in North America including Arizona and Chihuahua. Watson's (1889, p. 75) report of this species from Guaymas is based on a misidentified collection of *E. abramsiana*.

Mpios. Agua Prieta/Naco boundary: Along MEX 2, 16 km by rd ESE of Agua Prieta, 31°16'45"N, 109°43'45"W, Steinmann 948.

EUPHORBIA SERRULA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 188. 1858. *Chamaesyce serrula* (Engelm.) Wootton & Standl., Contr. U.S. Natl. Herb. 16: 144. 1913.—TYPE: Sonora, [or perhaps present-day New Mexico], Guadalupe Pass, on mountains (between San Bernardino and Sierra de las Animas), 4 Oct 1851, Wright 1843 (lectotype MO[#144668]!, chosen by Wheeler 1941, p. 248).

Prostrate summer-fall annual with large, chalky white seeds. Chihuahuan desertscrub in northeastern Sonora; 1200–1350 m. Southeastern Arizona to western Texas and Zacatecas, also in Puebla and Oaxaca.

Mpio. Agua Prieta: 6 mi by rd S of Agua Prieta, Felger 3767; 16 km ESE of Agua Prieta, 31°16'45"N, 109°43'45"W, Steinmann 949.

EUPHORBIA SETILOBA Engelm. ex Torr., Pacif. Railr. Rep. 5: 364. 1857. *Chamaesyce setiloba* (Engelm. ex Torr.) Millsp. ex Parish, Carnegie Inst. Wash. Publ. 193: 110. 1913.—TYPE: United States, California, Ft. Yuma, Thomas s.n. (holotype NY!).

Euphorbia floccosiuscula M. E. Jones, Contr. W. Bot. 15: 145. 1929.—TYPE: México, Sonora, [Mpio. Hermosillo], Hermosillo, 27 Oct 1926, Jones 22739 (holotype POM[#162576]!).

Nonseasonal annual, often prostrate, the stipules reduced to “spurs” 0.2 mm long or often absent and the appendages sharply lacerated into 3–5 toothlike segments. Sonoran desertscrub, Chihuahuan desertscrub, thornscrub, and tropical deciduous forest; widespread in Sonora from near sea level to 1300 m. Southeastern California to Baja California Sur, Nevada to western Texas and Sinaloa.

Mpio. Agua Prieta: 16.3 mi by rd N of Fronteras, Río Moctezuma, Felger 4008. Mpio. San Luis R. C.: Sierra del Rosario, Felger 20729. Mpio. Guaymas: Cañón del Nacapule, Felger 85–1330. Mpio. Alamos: between Rancho La Junta on Río Mayo and Guajaráy on Río Guajaráy, 27°35'30"N, 108°53'30"W, Van Devender & Van Devender 93–522.

EUPHORBIA STICTOSPORA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 188. 1858. *Chamaesyce stictospora* (Engelm.) Small, Fl. S.E. U.S. 714, 1334. 1903.—TYPE: United States, Kansas, steep bank of the Pawnee River, 8 Sep 1847, Fendler 798 (lectotype MO[#200482]!, chosen by Millspaugh 1898, p. 266).

Anisophyllum senile Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 28. 1860.—TYPE: México, [Hidalgo], Los Baños [de Atotonilco el Grande], Ehrenberg (B, not seen and possibly destroyed, photo DAV!; isotype MO, not seen).

Annual to herbaceous perennial; mostly following summer rains. Chihuahuan desertscrub, mesquite-grassland, grassland, and oak woodland in northeastern and probably north-central Sonora; 1200–1450 m. Midwestern United States to Arizona and México including Chihuahua to Zacatecas, San Luis Potosí, and the state of México.

Marshall Johnston's (1975, pp. 142–143) var. *sublaevis* appears sufficiently distinct from typical *E. stictospora* and is probably best treated at the rank of species.

Mpio. Agua Prieta: Agua Prieta, 12 Sep 1948, Jones s.n. (RSA). Mpio. Fronteras: Rancho Mababi, 22 mi by rd WSW of Fronteras, 30°47'24.2"N, 109°47'42.6"W, Felger 94–860.

EUPHORBIA THYMIFOLIA L., Sp. Pl. 454. 1753. *Anisophyllum thymifolium* (L.) Haw., Syn. Pl. Succ. 160. 1812. *Chamaesyce thymifolia* (L.) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 412. 1916.—TYPE: India, Linnaean Herbarium 630: 10 (holotype LINN, not seen, Linnaean Herbarium microfiche!).

For synonymy see Thellung 1917, pp. 474–475.

Prostrate, mat-forming perennial herb, the proximal pair of appendages larger than the distal pair; reproductive more or less throughout the year. Natural and disturbed habitats in tropical deciduous forest and the margin of thornscrub. Southeastern Sonora; 120–1000 m. Southward in México to South America and in the Old World.

Mpio. San Javier: along MEX 16, 12.3 km by rd W of the Río Yaqui crossing, 28°34'21"N, 109°39'52"W, Steinmann 862. Mpio. Alamos: Mocúzari Dam on the Río Mayo, WNW of Alamos, Van Devender & Van Devender 92–1394; El Guayabo crossing of the Río Cuchujaqui, 14 km by air ESE of Alamos, Steinmann 93–355.

EUPHORBIA TOMENTULOSA S. Watson, Proc. Amer. Acad. Arts 22: 476. 1887. *Chamaesyce tomentulosa* (S. Watson) Millsp., Field Mus. Nat. Hist., Bot. ser. 2: 412. 1916.—TYPE: México, Northern Lower California [Baja California], Rosario, 4 May 1886, Orcutt 1351 (holotype GH!).

Dichotomously much-branched shrub 1–1.5 m tall,

the cyathia in dense clusters at the ends of the branches; reproductive at various seasons. Rocky soils and slopes in Sonoran desertscrub and thornscrub; near sea level to at least 425 m. Western Sonora from Altar and Caborca southward to northwestern Sinaloa, islands in the Gulf of California, and through much of the Baja California Peninsula.

Mpio. Pitiquito: Picú Mts., along mountain top, *Gentry 4485*; 12 mi E of Puerto Libertad, *Shreve 5497*. Mpio. Guaymas: Guaymas, Cerro el Vigía, *Felger 11761*. Mpio. Navojoa: 1.2 mi by rd E of MEX 15 at 11 mi by rd S of Bacabachi, ca. 20 mi N of Sinaloa boarder, 26 Aug 1964, *Soule s.n.*

EUPHORBIA TRACHYSPERMA Engelm. in Torr., *Botany of the Boundary*, [in Emory, *Rep. U.S. Mex. Bound.* 2, pt. 1]: 189. 1858. *Chamaesyce trachysperma* (Engelm.) Millsp., *Field Mus. Nat. Hist., Bot. ser.* 2: 412. 1916.—TYPE: United States, Arizona, near the San Pedro River, 9 Sep 1851, *Wright 1832* (holotype MO[#200493]!).

Summer annual often with robust, mostly ascending and straight branches, the seeds relatively large. Often locally abundant in playas, low-lying flats, and savannalike habitats subject to flooding in Sonoran desertscrub and thornscrub where the plants are locally abundant; western Sonora from the Pinacate region to Sinaloa; sea level to 230 m. Also southern Arizona and Baja California Sur. Although recorded only from the western part of Sonora, it is found across southeastern Arizona and may occur in adjacent northeastern Sonora.

Mpio. Puerto Peñasco: 2 mi by rd S of Tinaja de los Pápagos, *Felger 86-491*. Mpio. Hermosillo: 16 mi S of Hermosillo on rd to La Palma, *Wiggins & Rollins 2010*. Mpio. Guaymas: 3.6 mi on MEX 15 S of rd to Pitahya [between Guaymas and Cd. Obregón], *Felger 85-204*. Mpio. Huatabampo: ca. 3.3 km SSE of Camahuiroa, Laguna Barochipa on the coast, 26°31'N, 109°16'20"W, *Steinmann 93-371*.

Subgenus *Esula* Pers. [= *Tithymalus* Hill]

Annual or perennial herbs (in ours), sometimes shrubs or trees. Cauline leaves alternate, the ends of the branches characteristically terminating in a whorl of leaves (subumbel leaves) followed by branches (rays) with dichotomous branching and opposite leaves (ray leaves), the rays sometimes also arising from the axils of the cauline leaves. Involucres solitary in the axils of the ray leaves; glands rounded or more often bicornuate to truncate, without appendages. Seeds ecarunculate or not.

With as many as 400 species, *Esula* is the largest subgenus within *Euphorbia* and has a nearly worldwide distribution, although most diverse in north temperate regions, especially in the Old World. About 20–30 species in México and eight in Sonora. The Mexican species of this subgenus are often ill-defined and

in much need of further revision. Reference: Norton 1900.

1. Leaves serrate to serrulate; glands rounded; ovary and capsules roughened.
2. Annual or more often perennial; ovaries and capsules papillate, the papillae rising sharply above the surface *E. alta*
- 2' Annual; ovaries and capsules verrucose, the verrucae generally low and broad *E. spathulata*
- 1' Leaves entire (rarely serrulate in *E. chamaesula*); glands truncate to bicornuate; ovary and capsules smooth.
3. Sterile, dense, leafy shoots arising from axils of some of the leaves of the primary stem (after the initiation of flowers and then mostly along the upper portion) or from the tips of the inflorescences *E. chamaesula*
- 3' Sterile leafy shoots lacking.
4. Annual; keels of the ovaries and capsules with two parallel, thin membranous ridges *E. pepulus*
- 4' Perennials; keels of the ovaries and capsules lacking ridges.
5. Longest leaves more than 3.5 cm; both ray and cauline leaves linear *E. chiribensis*
- 5' Longest leaves less than 3.2 cm; cauline leaves variously shaped but rarely linear; ray leaves not linear.
6. Cauline leaves oblanceolate to spatulate, attenuate at the base *E. sp.* 2
- 6' Cauline leaves linear, lanceolate, ovate, elliptic-oblong to rarely obovate, rounded to attenuate at the base.
7. Rays and ray leaves 5 (in ours) *E. lurida*
- 7' Rays and ray leaves 3, or the ray structure not well-developed and fertile branches arising from the axils of some of the upper leaves *E. brachycera*

EUPHORBIA ALTA Norton, *Rep. (Annual) Missouri Bot. Gard.* 11: 108. 1900; preprint: 24. 1899. *Tithymalus altus* (Norton) Wooton & Standl., *Contr. U.S. Natl. Herb.* 16: 145. 1913.—TYPE: United States, Arizona, Huachuca Mts., 3 July 1884, *Pringle s.n.* (lectotype US[#19636]!, here designated). This specimen is annotated by Norton as "*E. alta* n. sp., type specimen, J.B.S.N., 6-1-99." An isoelectotype at GH [!] is simply annotated "type" by Norton.

Perennial herb, the capsules papillate. Pine-oak and mixed conifer forest in northeastern Sonora; 1800–2450 m. Southeastern Arizona, New Mexico, Chihuahua, Durango, also Hidalgo, E. de México, Puebla, and Veracruz. The plants in southern México are generally smaller than the plants in the north.

This species is very similar to *E. spathulata*, with which it is frequently confused and sometimes difficult to distinguish. In comparison to that species, the seeds of *E. alta* are slightly larger, and their surface reticulations are less sharp. Also, *E. alta* tends to be a biennial or perennial while *E. spathulata* is strictly annual. The most consistent characteristic to separate these two taxa is that the ovaries and capsules of *E. alta* are distinctly papillate, the papillae rising sharply

above the surface, while the ovaries and capsules of *E. spathulata* are merely verrucose, the verrucae generally being low and rounded.

Mpio. Cananea: Sierra de los Ajos, upper Arroyo Frijolito, N slope of Cerro de las Flores, growing below spring in arroyo bottom, *Fishbein* 699. Mpio. Naco: San José Mts., 5 mi S of Naco, 6 July 1928, *Wolf* 2517 (RSA).

EUPHORBIA BRACHYCERA Engelm. in Torr., *Botany of the Boundary*, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 192. 1858. *Tithymalus brachycerus* (Engelm.) Small, Fl. S.E. U.S. (ed. 2) 1349. 1913.—TYPE: United States, New Mexico, Doña Ana, above El Paso, 1851, *Wright 1821* (holotype MO[#149763]!).

Erect perennial herb; summer-fall. The two collections cited here give no habitat information, but this species is frequent in oak woodland and conifer forests in extreme southeastern Arizona and presumably occurs in similar habitat in northeastern Sonora. Also New Mexico, Texas, and Chihuahua. Mearn's collection from the San Luis Mountains is from the Chihuahua-Sonora border and could be from either state.

Euphorbia brachycera is closely related to *E. chamaesula*. The two can be difficult to distinguish from each other, and their relationship is indeed puzzling. In general, *E. brachycera* lacks dense sterile branches arising from the leaf axils of the primary stems, lacks leaves that are appressed upwards to the stem, has a looser inflorescence, and possesses slightly smaller seeds. Also, the rays and subumbel leaves of *E. brachycera* are almost invariably three, while in *E. chamaesula* these vary from three to five. Even within the traditionally recognized concept of *E. brachycera* there is a great deal of variation in leaf shape, and plants vary from glabrous to pubescent; *Euphorbia chamaesula* is always glabrous.

Perhaps Mpio. Agua Prieta: San Luis Mts., 2 June 1892, *Mearns* 155 (NY). Mpio. unknown: "Sonora," [probably 1851, perhaps in Sept and NE Sonora near the Arizona border], *Capt. E.K. Smith s.n.* (NY).

EUPHORBIA CHAMAESULA Boiss., *Cent. Euphorb.* 38. 1860. *Tithymalus chamaesula* (Boiss.) Wootton & Standl., *Contr. U.S. Natl. Herb.* 16: 145. 1913.—TYPE: United States, New Mexico, valleys and hills near Copper Mines [near Bayard, ca. 25 km E of Silver City], 1851, *Wright 1820* (holotype G!).

Erect perennial herb characteristically with densely leafy, sterile shoots arising from the axils of some of the stem or inflorescence leaves; reproductive mostly in the summer-fall; grassland and pine-oak forest, 1300–2000 m. Also Arizona, New Mexico, Chihuahua and Durango.

Euphorbia chamaesula var. *subdentata* (Engelm.)

(see note under doubtful and excluded species) differs from typical plants by possessing markedly dentate-serrate leaves. We are uncertain if it is best treated as distinct or a synonym of the typical variety. The Smith collection cited below possesses very inconspicuous serrulations on the leaf margins and appears intermediate between the two varieties.

Mpio. Nacozari: Río Fronteras, El Tajo, *White* 4071. Mpio. Agua Prieta: San Luis Mts., [probably 1851], *Smith s.n.* (MO). Mpio. Yécora: Mesa del Campanero, Arroyo Largo at the head of Barranca El Salto, 28°20'44"N, 109°01'30"W, *Steinmann* 1023.

Euphorbia chiribensis V. W. Steinm. & Felger, sp. nov.—TYPE: México, Sonora, Mpio. Alamos, Sierra Saguaribo, ca. 1 km E of El Chiribo by the rd to Saguaribo, ca. 27°17'30"N, 108°42'W, 1400 m, 24 Aug 1993, *Steinmann* 93–270 (holotype ARIZ-#335471); isotypes MEXU, RSA, TEX). Fig. 18–20.

Herba perennis erecta 16–32 cm alta, caules glabrit; internodia 2–23 mm longa; folia caulium spiralia, exstipulata, laminae effusae vel valde deflexae, lineares vel anguste lanceolato-ellipticae, integrae, basi attenuatae, apice acutae, petioli ca. 1 mm longi vel nulli; umbella 3-radiata, radiis 2.8–7.6 cm longis, 2–4-bifidis; folia basalia inflorescentiae ternata; folia radiorum opposita linearia, elliptica vel anguste lanceolata, acuta, subsessilia; pedunculi 0.6–1.3 mm longi; involucra late obconica, 1.3–2.1 mm longa, 1.0–2.0 mm diametro, interne pubescentia; glandulae 4, semicirculares vel leviter lunares, 0.3–0.6 mm longae (tangentialiter), 0.7–1.1 mm latae (radialiter), margo glandulae integer vel leviter sinuatus, cornua nulla vel usque ad 0.15 mm longa; flores ♂ ca. 10–15; ovarium 3-lobatum; styli 3, 0.8–1.0 mm longi, connati ad basim, bifidi; capsula subglobosa, 3-lobata, 2.8–4.0 mm longa, 3.3–3.9 mm diametro; semina ovoideo-oblonga, 2.0–2.5 mm longa, 1.7–1.9 mm diametro, alveolata, carunculata; caruncula cucullatiformis, 0.6 mm longa, 0.4–0.5 mm lata, cremea.

Perennial herb from a narrow, horizontal rhizome, glabrous except for the insides of the involucre and the base of the adaxial surface of the leaf blade; shoots slender, leafy, erect to strongly ascending, 16–32 cm tall, mostly unbranched below but sometimes with 1–5 secondary shoots arising from near the base, surmounted by a terminal inflorescence; internodes 2–23 mm long, these short on young, developing shoots but long on the reproductive shoots; cauline leaves exstipulate, spirally arranged, subsessile or on petioles to ca. 1 mm long; blades spreading to strongly deflexed, linear to narrowly lanceolate-elliptic, those of the lower nodes 4–11 mm long and ca. 1.0–1.4 mm wide, those of the upper nodes 1.8–5.8 cm long and 1–4 mm wide, attenuate at the base, acute with a small mucro at the apex, rarely with a few scattered microscopic hairs on the adaxial surface just above the where it meets the stem; margin entire; inflorescences distinctly differentiated at the ends of the primary shoots, reproductive axillary shoots 2.6–8.1 mm long also often arising from the 4–6 nodes directly below the umbel; whorled subumbel leaves 3, resembling those of the stems but

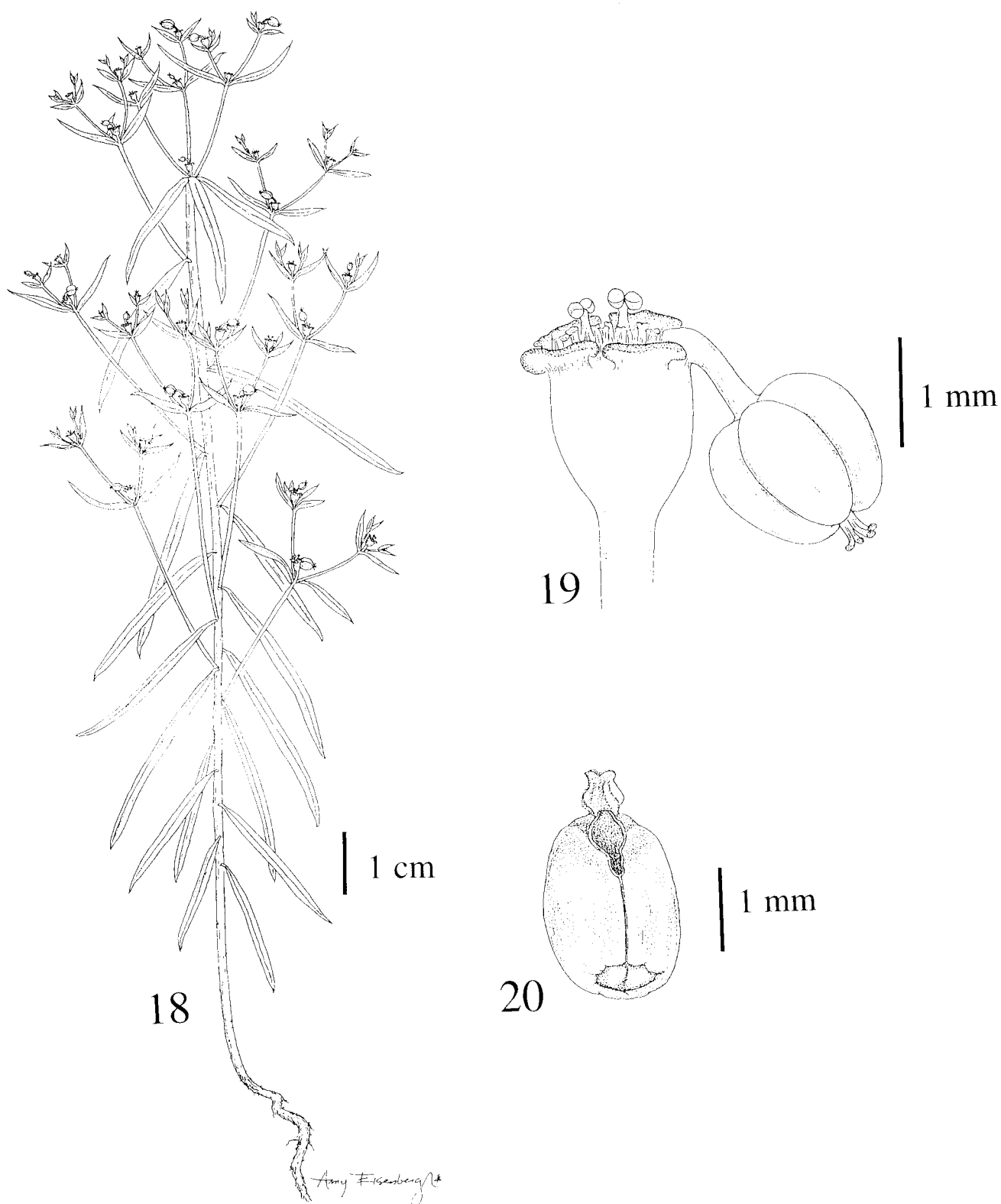


Fig. 18–20. *Euphorbia chiribensis*. 18. Habit.—19. Cyathium.—20. Seed. All from Steinmann 93–270.

slightly smaller; ray leaves opposite, subsessile, their blades linear, elliptic, to narrowly lanceolate, 7–16 mm long, 1.5–4.0 mm wide, apex and base as in the cauline leaves; rays of the umbel 3, 2.8–7.6 cm long, 2–4 times bifurcating with cyathia borne in the axils of the

opposite ray leaves, the peduncles 0.6–1.3 mm long; involucre broadly obconic, 1.3–2.1 mm long, 1.0–2.0 mm wide just below the glands, glabrous on the outside, pubescent within, the lobes rounded, ciliate, to ca. 0.5 mm long, the sinus shallow; glands 4, yellow-

green to red-brown, slightly crescent-shaped to semi-circular, 0.3–0.6 mm long (tangential axis), 0.7–1.1 mm wide (radial axis), the distal margin smooth to slightly sinuate, the lateral sides sometimes possessing hornlike projections to ca. 0.15 mm long, appendages absent; bracteoles ca. 4 per involucre, included, filiform and with a few hairlike divisions at the apex; ♂ flowers ca. 10–15, androphores glabrous; gynophore glabrous, reflexed and emerging through the sinus during maturation of the ovary, erect and extending to ca. 3.0 mm long in fruit; ovary roundly 3-lobed; styles 3, 0.8–1.0 mm long, connate at the base to ca. $\frac{1}{2}$ their length, free above, bifid ca. $\frac{1}{3}$ to $\frac{2}{3}$ their length, the tips slightly dilated; capsule subglobose, distinctly 3-lobed, 2.8–4.0 mm long, 3.3–3.9 mm in diameter; seeds ovoid-oblong, 2.0–2.5 mm long, 1.7–1.9 mm in diameter, dull gray black, alveolate, rounded to truncate at the base, obliquely angled at the apex, with a well-marked adaxial line and a cream colored, hood-shaped caruncle 0.6 mm long, 0.4–0.5 mm wide.

Known only from pine-oak woodland on the Sierra Saguaribo in southeastern Sonora where the plants are uncommon understory components; 1400–1600 m. Collected fertile in March and August. *Euphorbia chiribensis* is readily distinguished from other northwestern Mexican species of subgenus *Esula* by virtue of the long, linear leaves that are often strongly deflexed. Its relationship to other *Esula* is not obvious. The specific epithet refers to the town of El Chiribo near the western edge of the Sierra Saguaribo in southeastern Sonora and pays homage to the friendly residents of that town.

Paratypes. – Mpio. Alamos: shallow canyon (Arroyo El Reventón?) below Saguaribo, but above cascada, 27°20'N, 108°39'W. *Fishbein* 149; waterfall at Saguaribo, 17 Mar 1992, *Martin et al. s.n.*

EUPHORBIA LURIDA Engelm. in A. Gray, Proc. Amer. Acad. Arts 5: 173. 1861. *Tithymalus luridus* (Engelm.) Wooton & Standl., Contr. U.S. Natl. Herb. 16: 145. 1913.—TYPE: United States, Arizona, near Leroux Spring, foot of Bill Williams's Mountain, between it and San Fransico Mountain, 7000–8000 ft., 27 Apr 1858, *Newberry s.n.* (holotype MO[#149770]!).

Low perennial herb. Known in Sonora from a single collection made in April on a south slope in pine-oak woodland at 2080 m. The specimen is immature, and is provisionally placed under this species. Otherwise *Euphorbia lurida* is known from Utah, New Mexico, and Arizona.

Mpios. Cananea/Bacoachi boundary: Sierra de los Ajos, 30°53'N, 109°55'W, *Jenkins* 95–54.

EUPHORBIA PEPLUS L., Sp. Pl. 456. 1753. *Tithymalus peplus* (L.) Hill, Hort. Kew. 172. 1768. *Esula peplus* (L.) Haw., Syn. Pl. Succ. 158. 1812.—TYPE: Eu-

rope, Linnaean Herbarium 630: 24. (syntype LINN, not seen, Linnaean Herbarium microfiche!); Hort. Cliff. 16 (BM syntype, not seen).

Spring annual, noteworthy in possessing ovaries and capsules with two thin, parallel membranous ridges along the keels. Known in Sonora from a single collection made in March from a yard at San Bernardo; 200 m. It is expected elsewhere around habitations throughout the state. Native to Europe and eastern Asia, now nearly worldwide.

Mpio. Alamos: San Bernardo, *Steinmann* 584.

EUPHORBIA SPATHULATA Lam., Encycl. 2: 428. 1788. *Tithymalus spathulatus* (Lam.) W. A. Weber, Phytologia 58: 384. 1985.—TYPE: Brazil, near Montevidéo, *Commerson* (holotype P, not seen, photo RSA!).

Euphorbia dictyosperma Fisch. & C. A. Mey., Ind. Sem. Hort. Petrop. 2: 37. 1836. *Tithymalus dictyospermus* (Fisch. & C. A. Mey.) A. Heller, Muhlenbergia. 1: 56. 1904.—TYPE: Grown in St. Petersburg from seeds collected in California at Bodega Bay (?LE, not seen). See Croizat (1943, p. 180) regarding synonymy. *Euphorbia multicaulis* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 191. 1858. *Euphorbia dictyosperma* Fisch. & C. A. Mey. var. *multicaulis* (Engelm.) J. M. Coult., Contr. U.S. Natl. Herb. 2: 393. 1894.—TYPE: Las Playas [stated as Sonora in the protologue, but according to White (1948, p. 232) it is probably in New Mexico], June 1851, *Thurber* 381 (holotype MO[#149774]!).

Euphorbia dictyosperma Fisch. & C. A. Mey. var. *mexicana* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 191. 1858. *Euphorbia mexicana* (Engelm.) Norton, Rep. (Annual) Missouri Bot. Gard. 11: 105(106). 1900; preprint: 21(–22). 1899. *Tithymalus mexicanus* (Engelm.) Wooton & Standl., Contr. U.S. Natl. Herb. 16: 145. 1913. TYPE: México, [Durango], Bolsón de Mapimí (Valley of Nazas), 15 Apr 1847, *Gregg* 456 (lectotype MO[#149772]!), apparently first designated by Wolf 1988, p. 1626).

For additional synonymy see Correll and Johnston 1970, p. 965.

Erect to ascending annual reaching ca. 45 cm tall, capsules verrucose; mostly March to June. Apparently rare in Sonora and known for certain only from Chihuahuan desertscrub in the northeastern part of the state at ca. 1050 m. It has also been found in Sonoran desertscrub along the Sonora border in southwestern Arizona by Annita Harlan (Yuma County, Las Playas, Cabeza Prieta National Wildlife Refuge) where it was rare. This species usually occurs on water-retentive soils along the edges of drying pools and in lake beds. Widely distributed in the United States and northern México; also South America.

Mpio. Fronteras: playa 5.1 mi N of Fronteras, 12 May 1948, *Wiggins* 11784 (US).

EUPHORBIA sp. 2

Weak-stemmed perennial herb to ca. 0.4 m tall; Feb-

ruary–April. Understory of pine-oak woodland; 1300–1580 m. Documented in Sonora from only two localities. Otherwise known from adjacent southwestern Chihuahua, with many collections from the Basaseachic area.

Apparently this is an undescribed species related to *Euphorbia brachycera* and possibly also to *Euphorbia campestris* Cham. & Schldtl. The relationships among species in this complex are enigmatic and in need of critical study.

Mpio. Alamos: Sierra Saguariño. Barranca Huicochic, ca. 27°18'30"N, 108°39'30"W, *Steinmann* 484. Mpio. Yécora: Ciénaga de Camilo, 6.3 km E of El Kípor, 11.2 km W of the Chihuahua border, 28°43'05"N, 108°34'05"W, *Van Devender* 97–404.

Subgenus *Poinsettia* (Graham) House [= *Poinsettia* Graham]

Annuals to perennial herbs (in ours), or with *E. pulcherrima* Willd. ex Klotzsch a shrub or small tree. Cauline leaves alternate or less frequently opposite, lacking conspicuous stipules; subcyathial leaves pseudowhorled and often infused with white to red pigments. Glands cuplike or bilabiate, usually 1–3 per cyathium; appendages absent. Seeds ecarunculate or not.

New World; ca. 20 species, the center of diversity in México where about 13 species occur; seven species in Sonora. The commonly cultivated Christmas Poinsettia is *E. pulcherrima*. Reference: Dressler 1961.

1. Annuals; reproductive July to December, rarely overwintering.
 2. Ovaries and capsules pubescent *E. cuphosperma*
 - 2' Ovaries and capsules glabrous.
 3. Glands cylindric, the opening circular . . . *E. heterophylla*
 - 3' Glands bilabiate, the opening oblong.
 4. Subcyathial leaves red to pink at the base (often fading and difficult to distinguish in dry specimens); caruncle absent or minute and punctiform *E. cyathophora*
 - 4' Subcyathial leaves green at the base; caruncle conspicuous, reniform *E. davidii*
- 1' Perennial herbs from tubers; variously reproductive throughout the year, often in the spring.
 5. Subcyathial leaves white to light pink, sometimes reduced *E. radians*
 - 5' Subcyathial leaves intense red, at least at the base.
 6. Subcyathial leaves linear, the margins entire; stems glabrous *E. colorata*
 - 6' Subcyathial leaf-shape various but rarely linear, the margins serrate; stems pubescent *E. strigosa*

EUPHORBIA COLORATA Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 190(–191). 1858. *Poinsettia colorata* (Engelm.) Dressler, Ann. Missouri Bot. Gard. 48: 336. 1962.—TYPE: The protologue states “Dry arroyas[sic], Agua Zarco, Sonora, May; and Santa Cruz, Sept.; Thurber, & Capt. E.K. Smith.” In 1961 Dressler

stated that the type was *Thurber* 265 at GH. This specimen bears the label “Sta Cruz, Sonora, Mexico, ?Sept. 1851.” The “265” was added later and refers to the number given by Boissier (1862, p. 73) to this species. According to Mark Mayfield (pers. comm., 1996) and Wolf (1988) the only original material in Engelmann’s herbarium is Smith’s specimen (also numbered 265) from Agua Zarco. It is unlikely that Engelmann ever saw the Thurber specimen at GH, and possibly he was aware of this collection’s existence only through communication with one of his contemporaries. Therefore, Dressler’s designation of this specimen as the type (i.e., lectotype) should be considered invalid. The Smith collection at MO (ex herb. Engelmann) is the only one that we are aware of suitable to serve as lectotype.

Euphorbia tuberosa Rose, Contr. U.S. Natl. Herb. 1: 111. 1891; not *E. tuberosa* L., 1753.—TYPE: México, Sonora, [Mpio. Alamos], Sierra de Alamos, 25 Mar–8 Apr 1890, *Palmer* 356 (holotype US[#47798]!).

Contra hierba. Elegant perennial herb with linear leaves, those subtending the cyathia with bright red bases, involucre and capsules also partly bright red; March–October. Oak grassland to pine forest in eastern Sonora; 800–1600 m. Also Chihuahua, Sinaloa, Durango, and Zacatecas.

The Santa Cruz collection made by Thurber is presumably from the town on the Río Santa Cruz, in the present-day Municipio de Santa Cruz, and Smith’s “Agua Zarco” is probably Agua Zarca south of Colonia Morelos in the present-day Municipio de Agua Prieta. Both these collections are close to the Arizona border, however, this species is not known from Arizona, and such a showy plant is unlikely to be overlooked.

Mpio. Huachineras: Piedra Parada, *White* 3646. Mpio. Yécora: 21.3 km W of Maycoba on MEX 16, 28°23'35"N, 108°47'W, *Van Devender* 95–358. Mpio. Alamos: Sierra de Alamos, *Wiens* 93–157; Tepopa, *Gentry* 2229.

EUPHORBIA CUPHOSPERMA (Engelm.) Boiss. in DC., Prodr. 15(2): 73. 1862. *Euphorbia dentata* Michx. var. [as τ] *cuphosperma* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 190. 1858. *Poinsettia cuphosperma* (Engelm.) Small, Fl. S.E. U.S. 721(–722), 1334. 1903. *Euphorbia dentata* Michx. forma *cuphosperma* (Engelm.) Fernald, Rhodora 50: 148. 1948.—TYPE: United States, New Mexico, Copper Mines [near Bayard, ca. 25 km E of Silver City], 1851–1852, *Wright* 1834 (lectotype MO, not seen, designated by Wolf 1988, p. 1626).

Annual with predominantly opposite leaves, the ovaries and capsules pubescent; August–October. Pine-oak woodland in northeastern and east-central

Sonora; 1600–1900 m. Southeastern Arizona and southwestern New Mexico to Coahuila and Oaxaca.

Dressler (1961, pp. 338–339) treated this and a number of other species as synonyms of an inclusive *E. dentata* Michx. However, according to Mark Mayfield (pers. comm., 1996), who is preparing a revision of the subgenus *Poinsettia*, there are five North American species within the *E. dentata* complex. We follow his suggestion to recognize *E. cuphosperma* as distinct.

Mpio. Santa Cruz: microwave tower above Puerto Cananea, Sierra Cananea ca. 9 mi W of Cananea on MEX 2, *Van Devender* 90–512, *Steinmann* 945. Mpio. Yécora: Arroyo El Kípor (Quípor), just E of El Kípor on trail to Tierra Panda (Las Taunas), 28°24'N, 108°33'35"W, *Van Devender* 95–940.

EUPHORBIA CYATHOPHORA Murray, *Commentat. Soc. Regiae Sci. Gott. Recent.* 7: 81; tab. 1. 1786. *Tithymalus cyathophorus* (Murray) Moench, *Methodus* 667. 1794. *Poinsettia cyathophora* (Murray) Klotzsch & Garcke, *Monatsber. Königl. Preuss. Akad. Wiss. Berlin* 1859: 253. 1859. *Euphorbia heterophylla* L. var. *cyathophora* (Murray) Boiss. in DC., *Prodr.* 15(2): 72. 1862. *Euphorbia heterophylla* L. forma *cyathophora* (Murray) Voss, *Vilm. Blumengärtn.* (ed. 3) 1: 898. 1895.—TYPE: Based on cultivated material grown at the Göttingen Garden, the origin of the seeds was unknown to Murray. In the absence of a specimen, the illustration in the protologue serves as type.

For synonymy see Dressler 1961, p. 338.

Summer-fall annual, rarely overwintering, the subcyathial leaves with red to pink bases. Oak grassland, thornscrub, and tropical deciduous forest; 240–1400 m. Eastern Sonora from the vicinity of Imuris and the Río de Bavispe region southward. Also eastern United States to New Mexico, widespread in México, the West Indies and South America; naturalized in the Old World.

Resembling and often confused with *E. heterophylla*; both show considerable variation in leaf size and shape, even on the same plant.

Mpio. Cucurpe: Magdalena Canyon, 9 mi NE of Imuris, *Shreve* 6617. Mpio. Bavispe: Cañón de la Bellota, Sierra de la Caballera, *White* 4685. Mpio. San Pedro de la Cueva: mountainside N of pass in Sierra de Batuc, between Mátape and Batuc, *Wiggins & Rollins* 441. Mpio. Alamos: Arroyo Mentidero at El Chinal Rd. 11.3 km S of Alamos, *Van Devender & Van Devender* 92–967.

EUPHORBIA DAVIDII Subils, *Kurtziana* 17: 125(–130); fig. 1, 2:h–j. 1984.—TYPE: Argentina, Prov. Córdoba, Río Cuarto, Alpa Corral, Arroyo las Moras, 19 Nov 1982, *Subils & Moscone* 3115 (holotype CORD, not seen).

Euphorbia dentata Michx. var. *gracillima* Millsp., *Pittonia* 2: 90.

1890.—TYPE: United States, Arizona, Bowie, 1 Sep 1884, *Jones s.n.* (holotype F, not seen; isotype POM[#85489]!).

Leafy erect to ascending summer-fall annual. Grassland to oak and pine-oak woodland in southeastern Arizona, and presumably similar habitat in northeastern Sonora where it is known from a single collection that does not give habitat information.

This species, a member of the *Euphorbia dentata* complex, is very similar to *E. cuphosperma* but can be distinguished by the glabrous ovaries and capsules and the larger reniform (vs. smaller and punctiform) caruncle. Originally ranging from the Great Lakes region through the Great Plains to southeastern Arizona, Sonora, Chihuahua, and Coahuila; introduced among other places into the eastern United States, California, and Argentina (Mark Mayfield, pers. comm., 1996).

Mpio. Agua Prieta: Cabullona, Aug 1947, *Jones s.n.* (SD).

EUPHORBIA HETEROPHYLLA L., *Sp. Pl.* 453. 1753. *Tithymalus heterophyllus* (L.) Haw., *Syn. Pl. Succ.* 141. 1812. *Cyathophora heterophylla* (L.) Raf., *Fl. Tellur.* 4: 117. 1838. *Poinsettia heterophylla* (L.) Klotzsch & Garcke, *Monatsber. Königl. Preuss. Akad. Wiss. Berlin* 1859: 253. 1859.—TYPE: Tab. 112, fig. 6 in *Plukenet, Phytographia*. 1691; text on page 369 of *Almagestum Botanicum*. 1696.

For synonymy see Dressler 1961, pp. 339–340.

Annual with highly variable leaves (see *E. cyathophora*); August–November. Grassland, oak woodland, tropical deciduous forest, and occasionally washes in Sonoran desertscrub; 240–1600 m. Eastern and central Sonora. Southeastern Arizona, to extreme southern Texas and south Florida to South America; naturalized in the Old World. Plants with predominantly linear leaves have been treated as var. *graminifolia* Engelm., but leaf variation in this species is not of taxonomic value, and as pointed out by Dressler (1961, p. 338), the type of this variety is a specimen of *E. cyathophora*.

Mpio. Bacerac (or perhaps Huachineras): Horconitos, *White* 835. Mpio. Hermosillo: 16 mi S of Hermosillo on rd to La Palma, *Wiggins & Rollins* 198. Mpio. Alamos: San Bernardo, *Gentry* 1673.

EUPHORBIA RADIANs Benth., *Pl. Hartw.* 8. 1839. *Poinsettia radians* (Benth.) Klotzsch & Garcke, *Monatsber. Königl. Preuss. Akad. Wiss. Berlin* 1859: 253. 1859.—TYPE: México, Guanajuato, Jan–Apr 1837, *Hartweg* 34 (holotype K, not seen, photo [Univ. Mich. neg. 553]!; isotype BM[#80143]!).

Herbaceous perennial from thick rootstocks, flowering in spring on short stems at which time the cauline leaves are reduced or absent and the subcyathial leaves showy and white to pink; subsequently with leafy, decumbent vegetative stems in the summer and

fall. In Sonora known only from grassland and oak-juniper woodland in the northeastern part of the state; 1300–1625 m. Arizona to west Texas, south to Oaxaca.

Rzedowski and Calderón de Rzedowski (1987) segregate some of the southern Mexican plants as var. *stormiae* (Croizat) Rzed. & Calderón (= *E. stormiae* Croizat), and thus ours belong to var. *radians*. Variety *stormiae* differs from the typical variety by its less conspicuous subcylindrical leaves that tend to be more elliptic than linear and by 5–6 (vs. 1–4) glands per involucre.

Mpio. Cananea: 10 km al S de Cananea, Carr. a Arizpe, Tenorio L. 13564 (RSA); along MEX 2, 3.5 km by rd WNW of Cananea, 31°00'30"N, 110°18'45"W, Steinmann 944 (RSA). Mpio. Naco: 12 mi by rd S of Naco on the Naco-Cananea rd, Turner 59–43.

EUPHORBIA STRIGOSA Hook. & Arn., Bot. Beechey Voy. 310. 1838. *Poinsettia strigosa* (Hook. & Arn.) Arthur, Torrey 11: 260. 1912.—TYPE: The protologue only provides a very brief morphological description. The presumed holotype at K ex herb. Hooker (not seen, photo [Univ. Mich. neg. 528]!) shows a specimen labeled “Tepic, Barclay.” Hooker and Arnott’s introduction tells that Mr. Lay, the voyage’s naturalist, remained at Tepic, Nayarit, between December 1827 and February 1828. It is likely that he collected the type then.

Poinsettia pedunculata Klotzsch in Seem., Bot. Voy. Herald 277–(278). 1856. TYPE: México, Sierra Madre, [Nayarit], in a barranca near the village of Santa Teresa, on the rd from Durango to Tepic, [ca. 12 Jan 1850], Seemann 2162 (holotype BM[80173]!).

“*Euphorbia nigro-purpurea*” M. E. Jones, Contr. 15: (144) 145. 1929. A nomen provisorium based on Jones 23310 (POM!) from Tepic, Nayarit, collected 14 February 1926.

Low herbaceous perennial from deeply buried tubers, the subcylindrical leaves broad and intensely red. Like *E. radians*, the Sonoran plants produce flowering stems in spring and are very attractive during this time; vegetative growth presumably occurs in the summer. Pine-oak woodland on Sierra Saguaribo in southeastern Sonora; 1300–1600 m. Also adjacent southwestern Chihuahua to Jalisco and Colima.

Mpio. Alamos: ca. 3 km by rd W of Las Chinacas, along rd to Taymucó, 27°14'45"N, 108°41'15"W, Steinmann 94–31; Saguaribo to Curogui, 18 Mar 1992, Yetman s.n.

JATROPHA L.

Trees, shrubs, perennial herbs, or rarely (not ours) annuals, the stems usually flexible; monoecious or dioecious. Latex clear or colored but not milky, bleeding profusely when cut. Pubescence absent, unbranched, or glandular. Leaves alternate, frequently crowded and fasciculate on short shoots, blades often lobed, entire

to dentate-serrate, mostly palmiveined; stipules often modified into glands. Inflorescences usually bisexual, axillary or terminal, often corymbiform, dichotomously cymose with a solitary ♀ flower terminating the proximal nodes of the major axes and lateral ♂ cymes. Staminate flowers with 5 often basally connate sepals; petals 5, free or united into a short tube; stamens usually 6–10 (rarely more), the filaments partially fused into a column and often arranged in 2 whorls (usually 5 + 3). Pistillate flowers with sepals and petals as in the ♂; ovary usually 1–3-locular, the ovules 1 per locule; styles usually united at the base, simple or bifid distally. Fruits capsular or somewhat fleshy, subdrupaceous, and indehiscent. Seeds carunculate or not.

About 175 species in tropical America, Africa, and south Asia. About 45 species occur in México, with seven in Sonora. References: McVaugh 1945; Dehgan 1976; Dehgan and Webster 1979.

1. Herbaceous perennial from a single tuberous root; leaves incised-serrate, the teeth ending in a hairlike bristle *J. macrorhiza* var. *septemfida*
- 1' Shrubs or small trees; leaves entire, crenate to serrate but the teeth not bristle-tipped.
2. Leaf margins stipitate-glandular or with glands nearly sessile but clearly separate from the leaf margin.
3. Large shrub or tree with a well-formed trunk and papery-peeling bark; leaf bases usually cordate *J. cordata*
- 3' Caespitose shrub, bark not peeling; leaf bases often hastate *J. purpurea*
- 2' Leaf margins not stipitate-glandular, glands absent or imbedded in the margin.
4. Leaves sessile to subsessile, or the long-shoot leaves with petioles less than half as long as blades; leaf blades spatulate, about twice as long as wide, mostly less than 2 cm long *J. cuneata*
- 4' Petioles about as long as the blades; leaf blades variously shaped but not spatulate, nearly as broad or broader than long, mostly more than 2 cm long.
5. Leaves shiny and glabrous *J. cardiophylla*
- 5' Leaves dull and pubescent at least along the midrib.
6. All leaves palmately 5- or 7-lobed, with acute to acuminate apices *J. malacophylla*
- 6' Leaves not lobed or the long-shoot leaves 3-lobed but the apices broad and obtuse *J. cinerea*

JATROPHA CARDIOPHYLLA (Torr.) Müll. Arg. in DC., Prodr. 15(2): 1079. 1866. *Mozinna cardiophylla* Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 198. 1858.—TYPE: Near Tucson and Sierra Verde, Sonora, 1855, Schott s.n. (holotype NY!).

Sangrengado. Caespitose shrub with numerous spreading flexible stems mostly ca. 1 m tall (occasionally to 2+ m east of Hermosillo) arising from the base, the petals white. Small leaves are put out shortly before the summer rains, and plants are leafy only during

the summer rainy season; reproductive in early summer. Sonoran desertscrub, mesquite-grassland, thornscrub, and lower margins of tropical deciduous forest; 50–900 m. Widespread in arid areas of Sonora but not west of MEX 8 in the northwestern part of the state. Also southern Arizona.

Mpio. Trincheras: Cerro Quelitosa, Trincheras, *Brown* 84–14. Mpio. Arizpe: Arizpe, *Turner* 195. Mpio. Bavispe: Cañón de las Bellotas, *White* 3578 (RSA). Mpio. Guaymas: Sierra Libre, 0.3 mi E of MEX 15 on rd to Microondas Avispas, *Felger* 85–1082. Mpio. Alamos: N of Alamos, near Tepistate, *Gentry* 4836. Mpio. Navojua: Francisco I. Madero, ca. 26 km SSE of Navojua on MEX 15, *Steinmann* 93–382.

JATROPHA CINEREA (Ortega) Müll. Arg. in DC., Prodr. 15(2): 1078(–1079). 1866. *Mozinna cinerea* Ortega, Nov. Pl. Descr. Dec. 108. 1798.—TYPE: Based on material grown at Madrid from seed obtained in México by the Sessé and Moçino expedition of the late 1700s (probably MA, not seen).

Mozinna canescens Benth., Bot. Voy. Sulphur 52: pl. 25. 1844. *Jatropha canescens* (Benth.) Müll. Arg. in DC., Prodr. 15(2): 1079. 1866.—TYPE: México. Lower California [Baja California Sur], Bay of Magdalena, 1841, *Hinds s.n.* (holotype K, not seen, photo RSA!).

Sangrengado. Flexible shrub 1–3 m tall, the flowers pink to reddish or white; May–January. Sonoran desertscrub and thornscrub in western Sonora; near sea level to 925 m. Southwestern Arizona (only in Organ Pipe Cactus National Monument along the Sonora border) to Sinaloa, and both states of Baja California.

Our synonymizing of *J. canescens* under *J. cinerea* deserves comment. McVaugh (1945, pp. 289–290) similarly reached such a conclusion, but more recently Dehgan and Webster (1978, pp. 32–35) maintained the two as distinct species. We have trouble distinguishing these taxa using the characters given by Dehgan and Webster. For example, the drawing in the protologue of *J. canescens* shows a plant with obviously lobed leaves and “pedicellate” inflorescences. However, according to Dehgan and Webster these traits are key characteristics of *J. cinerea* and absent in *J. canescens*. Other key characters appear ambiguous, and in our opinion the two are best accommodated within a single variable taxon.

Mpio. Huatabampo: Agiabampo, *Gentry* 7036. Mpio. Guaymas: San Carlos Bay, *Johnston* 4355 (CAS). Mpio. Pitiquito: Desemboque San Ignacio, *Felger* 6186. Mpio. Puerto Peñasco: 1.3 km NE of Pinacate Peak, *Felger* 86–422.

JATROPHA CORDATA (Ortega) Müll. Arg. in DC., Prodr. 15(2): 1078. 1866. *Mozinna cordata* Ortega, Nov. Pl. Descr. Dec. 107. 1798.—TYPE: Based on material grown at Madrid from seed obtained in México by the Sessé and Moçino expedition of the late 1700s (probably MA, not seen).

Loureira glandulosa Cav., Icon. 5: 18; tab. 430. 1799. A nomen superfluum listing the earlier *Mozinna cordata* in synonymy.

Miguelito, torote papelillo. Shrub or narrow tree to ca. 10 m tall with exfoliating, papery bark, the leaves present only during the summer rainy season, the flowers pink or sometimes white; June–August(–October). Sonoran desertscrub, thornscrub, and tropical deciduous forest. Sonora northward to the Sierra el Aguaje near the coast, and inland northward to the vicinity of Magdalena and the Río de Bavispe region; near sea level to 900 m. Also southwestern Chihuahua south to Jalisco and Zacatecas. *Hinton* 1485 (MICH), from Temescaltepec, Estado de México, also appears to belong to this species.

Mpio. Alamos: Alamos, *Gentry* 2274. Mpio. Guaymas: Cañón del Nacapule, *Felger* 85–858. Probably Mpio. Carbó: 60 mi S of Santa Ana on the rd to Hermosillo, *Shreve* 6680. Mpio. Moctezuma: ca. 5 mi N of Moctezuma, *White* 404.

JATROPHA CUNEATA Wiggins & Rollins, Contr. Dudley Herb. 3: 272(–273); pl. 62, fig. 1. 1943.—TYPE: México, Sonora, 1.5 mi N of the village of Bahía Kino, 29 Aug 1941, *Wiggins & Rollins* 162 (holotype DS[#285345]!).

Sangrengado. Multiple-stemmed shrub to 3 m tall with drought-deciduous leaves appearing with rains at various seasons and white flowers appearing with the summer or early fall rains, wounds oozing bloodlike sap when cut—hence the common name; July–October. Sonoran desertscrub and thornscrub; near sea level to 875 m. Southwestern Arizona southward through western Sonora to northwestern Sinaloa, most of the Baja California Peninsula, and islands in the Gulf of California.

Mpio. Puerto Peñasco: Pinacate region, MacDougal Crater, *Felger* 10751. Mpio. Guaymas: 1 km W of Estero Soldado, *Felger* 85–884. Mpio. Navojua: Cerro Bayajuri, ca. 10 mi SE of Navojua, 28 Dec 1985, *Martin & O'Rourke s.n.*

JATROPHA MACRORHIZA Benth. var. *SEPTEMFIDA* Engelm. in Rothr., Rep. U.S. Geogr. Surv., Wheeler 6: 243(–244). 1878.—TYPE: United States, Arizona, [Cochise Co.], Sulphur Springs, 4500 ft, Aug 1874, *Rothrock* 546 (lectotype MO[#1907057]!, here designated).

Jatropha arizonica I. M. Johnst., Contr. Gray Herb. 68: 89. 1923.—TYPE: United States, Arizona, foothills of the Santa Rita Mts., 25 June 1882, *Pringle s.n.* (holotype GH!).

Winter-deciduous herbaceous perennial from a large, single, tuberous root, the leaves with 5–7 deeply incised lobes; July–December. Grassland and oak woodland in northeastern Sonora; 1200–1750 m. Also southeastern Arizona to western Texas and Chihuahua.

Variety *septemfida* differs from the typical variety in possessing leaves that are 5–7-lobed (vs. unlobed to

5-lobed) with deeper divisions, narrower lobes, and more sharply incised margins. The two varieties are geographically disjunct with var. *macrorhiza* occurring in Aguascalientes and Zacatecas.

Mpio. Bavispe: between Santa Rosa Canyon and Bavispe, *White* 623. Mpio. Bacoachi: 17.8 mi by rd N of Bacoachi, SE of Cerro la Cieneguita, *Fishbein* 1260.

JATROPHA MALACOPHYLLA Standl., Proc. Biol. Soc. Wash. 37: 45(–46). 1924.—TYPE: México, Sinaloa, Mpio. Mazatlán, El Zapote, 1923, *Ortega* 5208 (holotype US[#1111320]!).

Jatropha platanifolia Standl., Field. Mus. Nat. Hist., Bot. ser. 22: 38. 1940. TYPE: México, Sonora, [Mpio. Alamos], San Bernardo, 26 June 1935, *Gentry* 1449 (holotype F not seen; isotypes ARIZ[#70140 & #272857]!).

Sangregado. Large shrub or rarely small tree 2–5 m tall with thick, semisucculent stems. The large, pale-green, velvety pubescent leaves resemble those of *Platanus* and are arranged at the ends of the branches; flowers and foliage present May to October, or some leaves rarely persisting until December or January. Tropical deciduous forest in southeast and east-central Sonora; 260–900 m. Also southwestern Chihuahua to Oaxaca.

Mpio. Yécora: ca. 2 km SW of Santa Ana by rd to Guadalupe de Tayopa, *Steinmann* 889. Mpio. Alamos: Sierra de Alamos, *Gentry* 4873.

JATROPHA PURPUREA Rose, Contr. U.S. Natl. Herb. 1: 357. 1895.—TYPE: México, Sonora, [Mpio. Huatabampo], Agiabampo, Oct 3–15, 1890, *Palmer* 785 (holotype US[#208908]!).

Caespitose, multiple-stem, glabrous shrub, the margins of the leaves and pistillate bracts with stipitate glands; leafy during the summer rainy season, reproductive August to October. Known in Sonora only from the type collection made near sea level in coastal thornscrub; also western Sinaloa. It was reported for Baja California Sur (Standley 1923, p. 637; Wiggins 1964, p. 802), but according to Dehgan and Webster (1978, p. 36) these reports appear to refer to *J. moranii* Dehgan & Webster.

MANIHOT Adans.

Trees, shrubs, large herbaceous perennials or rarely clambering vines, the roots often tuberous; monocious. Milky latex usually present. Pubescence unbranched or absent. Leaves alternate, usually (as in ours) long-petiolate and deeply palmately lobed. Inflorescences usually bisexual, terminal or pseudoaxillary, racemose or paniculate, mostly with proximal ♀ flowers and distal ♂ flowers. Staminate flowers with a petaloid 5-lobed calyx that is usually united in the lower

portion; petals 0; stamens usually 10, in two unequal series of 5 longer and 5 shorter free filaments. Pistillate flowers with a petaloid calyx of five sepals united only at or near the base; petals 0; ovary 3-locular, with 1 ovule per locule; styles 3, short, united at the base, branches broadly dilated and multilobed. Fruits capsular. Seeds carunculate.

New World in tropical and subtropical areas, ca. 100 species; ca. 20 species in México and five in Sonora. The Cassava, *Manihot esculenta* Crantz, is widely cultivated in tropical areas for its edible tuberous root. Reference: Rogers and Appan 1973.

1. Larger leaf lobes with a terminal, hairlike bristle more than (2–)5 mm long.
2. Leaf lobes linear to linear-oblong (rarely linear-obovate), secondary lobes absent *M. rubricaulis*
- 2' Leaf lobes obovate, secondary lobes present or absent.
3. Primary leaf lobes often with secondary lobes, the apex acute *M. aesculifolia*
- 3' Primary leaf lobes without secondary lobes, the apex broadly obtuse to truncate or emarginate *M. sp.*
- 1' Leaf lobes without a terminal bristle.
4. Leaf lobes linear-lanceolate, broadest below the middle *M. angustiloba*
- 4' Leaf lobes obovate, broadest at or above the middle.
5. Leaf blades (13–)15–24 cm long, paler beneath; inflorescence a highly branched panicle; seeds moderately flattened, with a cordlike, angled lateral margin *M. aesculifolia*
- 5' Leaf blades 7–13(–15) cm long, not noticeably paler beneath; inflorescence an unbranched (rarely little-branched) raceme; seeds not flattened, the margins not cordlike nor angled *M. davisiae*

MANIHOT AESCULIFOLIA (H. B. K.) Pohl, Pl. Bras. Icon. Descr. 1: 55. 1827. *Janipha aesculifolia* H. B. K., Nov. Gen. Sp. 2 [folio]: 85, [quarto]: 107(–108); tab. 109. 1817.—TYPE: México, “in litore Sinus Campechensis,” 1804, *Humboldt & Bonpland* (holotype P, not seen; Humboldt and Bonpland Herbarium microfiche!).

For synonymy see Rogers and Appan (1973, p. 41).

Shrub or rarely small tree to 5 m tall with relatively large broad-lobed leaves, the inflorescences characteristically diffuse panicles; July–October. Tropical deciduous forest in southeastern Sonora; 200–450 m. South to Panama.

Mpio. Alamos: ca. 7 km by air ESE of Alamos, 26°59'45"N, 108°52'W, *Steinmann* 94–59; Güirocoba crossing of the Río Cuchujaqui, 12.3 km by air SSE of Alamos, Aug 1992, *Meyers s.n.*

MANIHOT ANGUSTILOBA (Torr.) Müll. Arg. in DC., Prodr. 15(2): 1073(–1074). 1866. *Janipha manihot* H. B. K. var. *angustiloba* Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 199. 1858.—TYPE: Three collections are cited in the protologue, including the following: Sonora, Sierra W de Sta. Cruz y Tubac, 1855, *Schott* [Tubac

is along the Santa Cruz River in Arizona; this location was included in the Gadsden Purchase, so the type may have been collected in present-day Arizona.]. According to Rogers and Appan (1973, p. 57), Torrey's variety was based on two different species, with one of the syntypes (Nuevo León, near Monterrey, *Gregg*) not belonging to the commonly interpreted circumscription of *M. angustiloba*. Croizat (1942, p. 224) stated that the *Schott* collection at NY [!] was the "holotype" and annotated the specimen as such. Rogers and Appan (1973, p. 57) rejected the holotype status of this specimen, but by not designating a lectotype and instead "designating syntypes," they did little to clarify the situation. Croizat's association of the Schott specimen as "holotype," although semantically incorrect under current usage of the word, indicates his intention for it to serve as the nomenclatural type. Thus, we attribute to him the lectotypification of *M. angustiloba* by the Schott specimen.

Herbaceous perennial or subshrub; July–October. Sonoran desertscrub, thornscrub, tropical deciduous forest, grassland, and oak woodland; 30–1200 m. North-central Sonora southward at least to Sinaloa. Also southern Arizona, Chihuahua, and Baja California Sur.

Specimens from coastal areas of Sonora and northwestern Sinaloa often have notably broad leaf lobes with entire margins or broad, shallow secondary lobes. In contrast, specimens from inland Sonora as well as Arizona and western Chihuahua have slender leaf lobes with narrow, attenuate secondary lobes. The significance of these differences is not apparent.

Mpio. Trincheras: bajada S of Las Trincheras, *Shreve* 6371. Mpio. Cucurpe: Palm Canyon, SE of Magdalena, 16–17 July 1977, *Van Devender et al. s.n.* Mpio. Guaymas: Bahía San Carlos, narrow canyon, *Johnston* 4738 (CAS); Sierra Libre, ca. 2 km by rd E of the junction with MEX along the rd to Microondas Las Avispas, 28°28'50"N, 111°01'43"W, *Steinmann* 986. Mpio. Alamos: San Bernardo, *Gentry* 17802.

MANIHOT DAVISIAE Croizat, J. Arnold Arbor. 23: 224(–225). 1942.—TYPE: United States, Arizona, Santa Catalina Mts., 27 Aug 1883, *Lemmon s.n.* (holotype US[#62129]!).

Shrub 1–2.5 m tall; July–October. Thornscrub, upper margins of Sonoran desertscrub, and lower margins of oak woodland in north-central, eastern, and southern Sonora; 100–1200 m. Southeastern Arizona to Sinaloa.

Rogers and Appan (1973, p. 53) recorded this species for Chihuahua, based on *Gentry* 2450 from Sawakoa. This specimen lacks secondary leaf lobes and in this feature differs from other collections of *M. davisiae*. We are unsure whether it is simply an anomalous

collection or belongs to a separate taxon. Unfortunately, flowers are lacking.

Mpio. Bavispe: Santa Rosa Canyon near Bavispe, *White* 542. Near boundaries of Mpios. Guaymas and Hermosillo: 5 mi E of main hwy between La Palma and Cienegueta, *Wiggins & Rollins* 221. Mpio. Cucurpe: Palm Canyon, SE of Magdalena, 16–17 July 1977, *Van Devender et al. s.n.* Mpio. Alamos: Mesa Masiaca along the rd to microwave tower, 6.5 km by air NNW of San José de Masiaca, 2.5 km NE of MEX 15, *Van Devender & Van Devender* 92–1108.

MANIHOT RUBRICAULIS I. M. Johnst., Contr. Gray Herb. 68: 90. 1923.—TYPE: México, Durango, near Durango City, E slope of Iron Mt., 1896, *Palmer* 224 (There are two sheets of this collection at GH [!], both of which were identified as "type" by I. M. Johnston. McVaugh in 1994 annotated the sheet labeled "1" as the lectotype).

Manihot isoloba Standl., Field Mus. Nat. Hist., Bot. ser. 17: 197. 1937. *Manihot rubricaulis* I. M. Johnst. ssp. *isoloba* (Standl.) D. J. Rogers & Appan, Fl. Neotrop. Monogr. 13: 46. 1973.—TYPE: México, Chihuahua, Guasaremos, slopes, 10 Aug 1936, *Gentry* 2372 (holotype F[#863581]!).

Pata de gallo. Shrub to 5 m tall, the leaves often ashy blue-green and glaucous, leaf lobes usually slender and with a soft bristle-tip; June–October. Tropical deciduous forest, oak woodland, and the upper margin of Sonoran desertscrub. Eastern Sonora from Arizpe and Magdalena Palm Canyon southward and eastward; 900–1550 m. Also Chihuahua, Sinaloa, Durango, and Nayarit.

The subspecies as defined by Rogers and Appan (1973, p. 46) do not seem distinguishable. These authors separated the two by the narrower leaf lobes and smaller fruits and seeds of ssp. *rubricaulis*, referring only two collections to this subspecies. We find no consistent differences in seed/fruit size and leaf-lobe width. Croizat (1942, p. 223) likewise seems to have had some reservation about their distinctiveness, saying "*M. isoloba* Standley... is quite near *M. rubricaulis* Johnst., although the two binomials are not manifestly synonymous."

Mpio. Cucurpe: Palm Canyon, Cerro Cinta de Plata, 16–17 July 1977, *Van Devender & Miksicek s.n.* Mpio. Bavispe: Cañón de Bavispe, *White* 3103; 21 mi E of Nuri, *Goldberg & Warren* 76–209. Mpio. Alamos: 5.1 mi NE of El Taymucio, *Burgess* 5944; Baka-chaka, hill slopes, *Gentry* 1468; E slopes of Sierra de Alamos, Saucito Canyon, *Van Devender* 93–1334.

MANIHOT sp.

Shrub or small tree 5–6 m tall with a thick *Bursera*-like trunk and red, exfoliating, papery bark; leaves glabrous to moderately pubescent, the bases often subpeltate, the leaf lobes 7 or 9, obovate, entire, the apex rounded to truncate or emarginate and with a hairlike bristle 5–18 mm long; seeds to 13.5 mm long; July–September. Central-eastern and southeastern Sonora in

tropical deciduous forest, 200–760 m; also southwestern Chihuahua. It is especially common on some mountainsides, canyon slopes, and slopes above the Río Mayo between Mesa Colorado and Chorihoa.

The identity of this unusual manihot is unresolved, due in part to a paucity of specimens with flowers and fruits. It does not fit any of the six species of truly arborescent manihots known from México, all of which were placed in section *Foetidae* as proposed by Rogers and Appan (1973). It appears to be the same entity as *Palmer 201* (GH!) which was collected at Hacienda San Miguel near Batopilas, Chihuahua, in September of 1885. This collection is a syntype of *Manihot caudata* Greenm., but we are not convinced that it represents the same taxon as the other syntype: Michoacán, Monte León, volcanic hills, 21 Aug 1902, *Pringle 8687* (GH!). The leaves of plants in Chihuahua and Sonora possess seven or nine lobes, while those of plants from Zacatecas, Jalisco, Guanajuato, and Michoacán possess 5 lobes. The lack of flowering specimens from Chihuahua and Sonora prevents a more complete comparison. We are unaware a lectotypification for *M. caudata*, and to best conform to current usage we designate as lectotype the Pringle collection from Michoacán. The taxonomic disposition of the plants in Sonora and Chihuahua will have to await the procurement of more complete material.

This poorly known taxon also bears a resemblance to *M. rubricaulis*, from which it differs by the well-developed trunk and broader leaf lobes.

Mpio. Alamos: 34.2 mi from Alamos on rd through San Bernardo, *Perrill & Phelps 5241*; Río Mayo, between Mesa Colorado and Chorihoa, *Jenkins 91–88*; between Chorihoa and Mesa Colorado, on steep mountain slope overlooking the Río Mayo to west, 24°29.8'N, 108°50.94'W, *Felger 96–182*. Mpio. Rosario: 13.3 mi NE of Tesopaco on paved rd to Nuri, *Goldberg 77–113*. Probably Mpio. Soyopa: steep hillside at km marker 141, 50 mi W of Sahuaripa and 4 mi W of El Novillo, *Mason 3125*.

PEDILANTHUS Neck. ex Poit.

Succulent or semisucculent perennial herbs or shrubs, rarely small trees; monoecious. Latex milky to yellowish. Pubescence of unbranched hairs. Leaves alternate, often subfleshy (highly reduced in *P. macrocarpus*), entire, penniveined. Inflorescences cyathia (see *Euphorbia*), these bilaterally symmetric and with an elongated spur at the distal portion; cyathia usually relatively large in comparison to our species of *Euphorbia*. Staminate flowers consisting of a single, pedicellate stamen. Pistillate flowers consisting of a single, pedicellate pistil; ovary 3-locular, with 1 ovule per locule; styles 3, united for most of their length, and entire to bifid at the apex. Fruits capsules or indehiscent. Seed ecarunculate.

New World, mostly tropical; 15 species, all except one confined to México. Reference: Dressler 1957.

1. Latex yellow; leaves 4.5–10+ cm long; fruits dehiscent, globose, and not spurred at the base *P. bracteatus*
- 1' Latex white; leaves to about 1 cm long; fruits indehiscent, angled, and spurred at the base *P. macrocarpus*

PEDILANTHUS BRACTEATUS (Jacq.) Boiss. in DC., Prodr. 15(2): 6. 1862. *Euphorbia bracteata* Jacq., Pl. Hort. Schoenbr. 3: 14, pl. 276. 1798.—TYPE: Based on material growing in the Schönbrunn Garden near Vienna; its native land and collectors were unknown to Jacquin. The type is the plate in the protologue.

Pedilanthus rubescens Brandegee, Zoe 5: 209. 1905.—TYPE: México, Sinaloa, Culiacán, 12 Oct 1904, *Brandegee s.n.* (holotype UC[#110158]!).

For additional synonymy see Dressler 1957, pp. 125–126.

Candelilla. Shrubby, much-branched, stem-succulent to 2.5 m tall with large, drought-deciduous leaves, the involucre glands reported by Dressler (1957, p. 126) as 2 (3 or 4); for Sonora recorded in flower May, October, and December. Uncommon in the tropical deciduous forest and oak woodland of southeastern Sonora, 300–600 m. South to Oaxaca.

Mpio. Alamos: Canyon Estrella, in the undergrowth, *Gentry 385*. 5 mi NE of Alamos, *Jenkins 91–48*; rd from Alamos NE to Cuchuhari, 29 Dec 1991, *Martin & O'Rourke s.n.*

PEDILANTHUS MACROCARPUS Benth., Bot. Voy. Sulphur 49; pl. 23A. 1844. *Hexadenia macrocarpus* (Benth.) Klotzsch & Garcke, Abh. Königl. Akad. Wiss. Berlin 1859 [Phys. Abh.]: 107. 1860.—TYPE: México, Lower California [Baja California Sur], Magdalena, *Barclay 3114* (holotype BM[#80185]!).

Candelilla. Stem succulent to ca. 1 m tall with several to many thick gray-green stems and reduced, quickly deciduous leaves, the involucre glands reported by Dressler (1957, p. 120) as 6; at least April to October. Fine-textured soils of thornscrub on the coastal plains from near Empalme southward into Sinaloa; a northern disjunct population occurs in Sonoran desertscrub on the alluvial plain near Estero Tastiota and nearby coastal dunes. Mostly near sea level to ca. 25 m; on Isla San Pedro Nolasco to ca. 300 m, on rocky slopes on the east side and near summit on the west side. Also in both states of Baja California.

Isla San Pedro Nolasco: *Felger 9634*. Mpio. Hermosillo: 18 mi W of Los Arrieros on rd to Tastiota, *Wiggins & Rollins 249*; 1 km N of Cholludo, or ca. 5 km S of Tastiota, *Felger 96–89*. Mpio. Guaymas: 1 km S of Peón, *Turner 61–31*. Mpio. Huatabampo: Agiabampo, *Gentry 7039*.

PHYLLANTHUS L.

Trees, shrubs, or herbs; monoecious (ours) or dioecious; often with a specialized branching pattern of persistent axes with spiral phyllotaxy without flowers

and of deciduous axes with distichous phyllotaxy often floriferous. Latex absent. Pubescence usually unbranched or absent. Leaves (in ours) alternate, often distichous, entire, penniveined. Inflorescences usually axillary (or the flowers solitary in the leaf axils), fasciculiform cymes. Staminate flowers usually with 4–6 sepals; petals 0, stamens mostly 2–6, the filaments free or connate. Pistillate flowers with 5 or 6 sepals; petals 0; ovary usually 3-locular, with 2 ovules per locule; styles usually 3, free or united, variously divided. Fruits usually capsular (ours), sometimes fleshy. Seeds ecarunculate.

A large and diverse genus of trees, shrubs, and herbs containing approximately 750 species in about 50 sections. The species are almost exclusively tropical with the majority in the Old World. About 50 species in México. Reference: Webster 1970.

1. Shrub; leaves broadly ovate to nearly orbicular, more than 2 cm wide *P. mocinianus*
- 1' Annuals or perennial herb; leaves elliptic to oblanceolate, less than 1 cm wide.
2. Perennial herb often with several to many whiplike stems arising from the caudex; filaments united into a column *P. polygonoides*
- 2' Annuals, usually unbranched or little-branched at the base; filaments free.
3. Disc of the ♀ flowers crenulate; seeds verruculose *P. evanescens*
- 3' Disc of the ♀ flowers with 3 pairs of fingerlike lobes; seeds striate *P. hexadactylus*

PHYLLANTHUS EVANESCENS Brandege, *Zoe* 5: 207. 1905.—TYPE: México, Sinaloa, Culiacán, Sept/Oct 1904, *Brandegee s.n.* (holotype UC, not seen).

Erect to ascending annual; mostly summer-fall. Locally and seasonally abundant on silty-muddy soils in seasonal ciénagas (swamps) in coastal plains inundated with summer rainfall and drying in other seasons; Sonoran desertscrub and thornscrub in southwestern Sonora; near sea level to 25 m. Also Sinaloa to Nicaragua and Baja California Sur.

Mpio. Hermosillo: 5 mi N of El Sahuaral on SON 24, *Felger* 85–1322. Mpio. Guaymas: 1.7 mi on MEX 15 SE of rd to Pitahaya (Belem, Río Yaqui), *Felger* 85–1249. Mpio. Huatabampo: Agiabampo, 1890, *Palmer* 767 (US); ca. 12 km NW of Agiabampo, 2 km NE of Las Aguilas near Arroyo Los Barros, *Sanders* 13562 (UCR).

PHYLLANTHUS HEXADACTYLUS McVaugh, *Brittonia* 13: 195(–196); fig. 29. 1961.—TYPE: México, Michoacán, old lava flows 4 mi NW of Apatzingán, ca. 300 m, 16 Sep 1958, *McVaugh* 17945 (holotype MICH!).

Delicate spreading summer annual. Known in Sonora from a single collection in shady understory of tropical deciduous forest in southeastern Sonora; 320 m. This species is apparently rare. We are aware of

only three collections, the one from Sonora and two others from Michoacán.

Mpio. Alamos: ca. 7 km by air ESE of Alamos, 26°59'45"N, 108°52'W, *Steinmann* 94–60.

**PHYLLANTHUS MOCINIANUS* Baill., *Adansonia* 1: 35(–36). 1860.—TYPE: Some unknown location in México, *Sessé & Moçino* (holotype “h. Less.” [Delessert’s herbarium now at G-DEL], not seen).

Bushy, spreading, luxuriant shrub to ca. 2 m tall; probably reproductive June to September. Documented for adjacent southwestern Chihuahua and possibly present in the tropical deciduous forest or lower oak woodland of southeastern Sonora. Southwestern Chihuahua to Central America.

This species is often confused with *Phyllanthus micrandus* Müll. Arg., but according to Grady Webster (pers. comm., 1997), *P. micrandus* is restricted to South America and differs from *P. mocinianus* by possessing smaller, rounder leaves and generally longer pistillate pedicels.

CHIHUAHUA. Batopilillas, oak country, canyon, in shady moist bank of shaded stream side, *Gentry* 2619.

PHYLLANTHUS POLYGONOIDES Nutt. ex Spreng., *Syst. Veg.* 3: 23. 1826. *Maschalanthus polygonoides* (Nutt. ex Spreng.) Nutt., *Trans. Amer. Philos. Soc.* II, 5: 175. 1837.—TYPE: United States, [Arkansas, on calcareous rocks in the plains of Red river] *Nuttall* (We are unaware of the location of Sprengel’s original material, but there is an isotype at NY!).

Low herbaceous perennial with several to many whiplike stems arising from the caudex. Known in Sonora from three collections, two from oak and mesquite woodland-grassland in the northern part of the state and the other from southeastern Sonora. Mostly limestone areas from the Mexican Plateau (as far south as Querétaro) to the Great Plains, Louisiana, and Arizona.

Mpio. Alamos: Cañón Saucito, scattered sparingly through the grass of the canyon bottom, much eaten by livestock-pack trains, *Gentry* 689 (F). Mpio. Cucurpe: canyon in limestone rocks, SW side of Babiso Mts., 18 mi SE of Magdalena, *Wiggins* 7144 (DS). Mpio. Bacerac (or perhaps Huachineras): Horconcitos, Arroyo del Salto, *White* 3800 (MICH).

RICINUS L.

Large annual to small tree; monoecious. Latex watery. Glabrous; extrafloral nectaries often present at the nodes. Leaves alternate, long petiolate, peltate, palmately lobed, serrate with gland-tipped teeth, palmately veined; stipules large, united into a sheath and covering the buds. Inflorescences bisexual, leaf-opposed or subterminal, paniculate with ♀ flowers in the lower

portion and ♂ flowers in the upper portion. Staminate flowers with a 3–5-lobed calyx; petals 0; stamens numerous, the filaments much branched and bearing numerous (up to ca. 1000) anthers. Pistillate flowers with 5 sepals; petals 0; ovary usually echinate, 3-locular, with 1 ovule per locule; styles 3, free or connate at the base, bipartite, papillose-plumose. Fruit capsular. Seeds carunculate.

Monotypic; native to northeast tropical Africa (Radcliffe-Smith 1987, p. 322). Widely cultivated and now naturalized throughout much of the tropics. The seeds are the source of Castor Oil, for which there are many medicinal and industrial uses.

RICINUS COMMUNIS L., Sp. Pl. 1007. 1753.—TYPE: Sheet 450, *Ricinus* 1 from the Herbarium of Hortus cliffortianus (lectotype [designated by Seeger 1983, p. 212] BM, not seen, photocopy RSA!).

More than 50 species (see *Index Kewensis*) and varieties have been proposed, but most recent authors treat these within a monotypic *Ricinus communis*.

Higuerilla, Castor Bean. Large annual to shrub, occasionally a small tree; reproductive almost any time of year. Occasional in Sonoran desertscrub but frequent in thornscrub and tropical deciduous forest where it is sometimes cultivated and often weedy or naturalized in disturbed habitats; essentially frost free areas from near sea level to 1050+ m. A red-leaved cultivar, often grown as an ornamental, is sometimes encountered as a waif.

Mpio. Guaymas: Bahía San Carlos, roadside, *Felger* 84–549. Mpio. Moctezuma: Río Moctezuma, Moctezuma, *White* 296. Mpio. Etchojoa: Paredoncito on Bahía Tobarí, ca. 28 mi W of Navojoa, *Sanders* 8966.

SEBASTIANIA Spreng.

Trees or shrubs (in ours), rarely herbs; monocious. Latex (at least in ours) milky. Pubescence mostly unbranched or absent. Leaves usually alternate, serrate (in ours) to rarely entire, penniveined. Inflorescences bisexual, terminal (rarely axillary), spicate bracteate thyrses; ♀ flowers solitary or rarely in few-flowered groups at the lower nodes of the thyse; ♂ flowers clustered in the upper nodes of the thyse; bracts biglandular at the base. Staminate flowers with a 3-lobed calyx; petals 0; stamens 2 or 3, the filaments free or connate at the base. Pistillate flowers with a 3-lobed calyx; petals 0; ovary 2 or 3-locular, with 1 ovule per locule; styles 2 or 3, entire, usually connate at the base. Fruit capsular. Seeds usually minutely carunculate.

About 100 species, all but a few Neotropical, the center of diversity in Brazil; eight to ten species in México.

1. Petioles eglandular *S. pavoniana*
- 1' Adaxial side of the petioles bearing conspicuous, annular, flat to patelliform glands just below the base of the blade.
2. Leaves usually more than 3 cm wide, the petioles 2 or more cm long; glands absent from leaf margins; ovary 3-celled with 3 styles *S. cornuta*
- 2' Leaves (in ours) less than 1.5(–2.5) cm wide, the petioles less than 1 cm long; glands often present along leaf margins; ovary mostly 2-celled with 2 styles ... *S. bilocularis*

SEBASTIANIA BILOCULARIS S. Watson, Proc. Amer. Acad. Arts 20: 374. 1885. *Sapium biloculare* (S. Watson) Pax, in Das Pflanzenreich IV. 147. v [Heft 52]: 221. 1912.—TYPE: México, Sonora, by water-courses northwestern mountains, 27 Mar 1884, *Pringle s.n.* (lectotype GH!, here designated). Another specimen is cited in the protologue: Sonora, hills between Rayón and Ures, Oct 1851, *Thurber* 901; we were unable to find a specimen at GH, but there is a specimen at NY [!].

Sapium biloculare (S. Watson) Pax var. *amplum* I. M. Johnston, Proc. Calif. Acad. Sci. ser. IV. 12: 1077. 1924.—TYPE: México, Baja California [Sur], Loreto, frequent on sandy plain back of town, 19 May 1921, *Johnston* 3772 (holotype CAS[#81358]!).

Hierba de la flecha. Many-stemmed shrub to rarely treelike and 6 m tall; reproductive more or less throughout the year. Sonoran desertscrub, less often in thornscrub, and rarely entering tropical deciduous forest. Southwestern Arizona south to the Guaymas region and eastward to the Río de Bavispe region and the Río Yaqui drainage southeast of Hermosillo; near sea level to 950 m. Also Baja California and Baja California Sur. The seeds, like those of *Sebastiania pavoniana*, are sometimes parasitized by a moth larva and sold as Mexican jumping beans.

Sebastiania bilocularis has previously been treated in *Sapium*, but it lacks the fleshy seed testa characteristic of that genus. Following the circumscriptions of *Sapium* and *Sebastiania* adopted by Webster (1994) and McVaugh (1995, pp. 204–205), this species is best accommodated within *Sebastiania*, where it is also placed by Kruijt (1996, p. 83). Specimens previously referred to as var. *amplum* appear to differ solely by the possession of slightly broader leaves, and we believe that it is best submerged within the circumscription of a monotypic species.

Mpio. Gen. Plutarco Elías Calles: 35 mi W of Sonoyta on MEX 2, *Webster* 19700. Mpio. Granados or Bacadéhuachi: Aguaje de Bacatejaca, between Granados and Bacadéhuachi, *White* 2916. Mpio. Guaymas: Cañón del Nacapule, *Felger* 85–854. Mpio. Yécora: Puente La Pila, ca. 20 km by air E of Onavas [on MEX 16], 28°29'N, 109°22'W, *Joyal* 2067 (ASU). Mpio. Arivechi: 9.6 mi by rd E of Arivechi, *Felger & Búrquez* 94–368.

SEBASTIANIA CORNUTA McVaugh, Contr. Univ. Michigan Herb. 20: 205(–208); fig. 4. 1995.—TYPE: México, Durango, Mpio. Otaez, Otaez, frente al

Rancho La Lechuguilla, 1270–1700 m, *Guízar N.* 2347 (holotype MEXU, not seen).

Hierba de la flecha. Large shrub to small tree; reproductive in December, March, July to September, so far as known. Tropical deciduous forest in southeastern Sonora, 225–600 m. Also nearby southwestern Chihuahua to northern Nayarit.

The Sonoran plants have been called *Sapium appendiculatum* (Müll. Arg.) Pax & K. Hoffm., but according to McVaugh (1995, pp. 207–208) this appears to have been an error. *Sapium appendiculatum* [now treated as *Sebastiania appendiculata* (Müll. Arg.) Kruijt] reportedly differs by lacking the large petiolar glands that are present on our plants.

Mpio. Alamos: roadside near Rancho La Junta, at the junction of Río Guajaráy and the Río Mayo, *Steinmann 93–141*; rd to Las Chincas 1 km NE of El Taymuco, 25 Aug 1993, *Martin et al. s.n.*

SEBASTIANIA PAVONIANA (Müll. Arg.) Müll. Arg. in DC., Prodr. 15(2): 1189. 1866. *Gymnanthes ? pavoniana* Müll. Arg., Linnaea 32: 106(–107). 1863.—TYPE: Collected at some unknown locality in México by *Sessé & Moçño* (holotype G, not seen, photo [Field Mus. neg. 34162]!).

Sebastiania palmeri Rose, Contr. U.S. Natl. Herb. 1: 112. 1891.—TYPE: México, Sonora. [Mpio. Alamos], Alamos, 26 Mar–8 Apr 1890, *Palmer 403*. At US there are four sheets of this collection. The one that is in the type collection (#931099!) and labeled as the type (= lectotype) is a sterile branch. An isoelectotype (#47593!) possesses mature fruit.

Sebastiania ramirezii Maury, La Naturaleza 2: (405–)406(–407). 1894.—TYPE: México, Sonora. [Mpio. Alamos], Alamos, the collector and date not given (probably at P. not seen).

Brincador, jumping bean. Large shrub to slender tree 10–12 m tall. Flowering March, and June to August; fruiting mostly at the beginning of the summer rainy season in July. Tropical deciduous forest in east-central and southeastern Sonora; 275–925 m. To Jalisco and Veracruz, and in Baja California Sur. The seeds are often parasitized by moth larvae and sold as Mexican jumping beans.

Both Wiggins (1964, p. 807) and Standley (1923, p. 648) list *Sebastiania pringlei* S. Watson as a synonym of *S. pavoniana*. However, according to Grady Webster (pers. comm., 1993), *S. pringlei* is a separate species but does not occur in Sonora.

Mpio. Mazatán: Sierra de Mazatán, *Gentry 16594*. Mpio. Onavas: 6.3 by rd W of Tepoca, ca. 2 km SW of MEX 16, 28°27'36.4"N, 109°19'11"W, *Wilson 94–1*. Mpio. Alamos: Sierra de Alamos, *Gentry 4870a*; Río Guajaráy between Todos Santos and Los Aguaros, 27°38'N, 108°57.5'W, *Felger 94–55*.

STILLINGIA Garden ex L.

Trees, shrubs, herbaceous perennials, or rarely annuals; monoecious. Latex milky. Pubescence absent.

Leaves alternate, opposite or verticillate, usually serrate, penniveined; stipules glanduliform. Inflorescences mostly bisexual, terminal, spicate, bracteate thyrses; bracts biglandular at the base; ♀ flowers at the lower few nodes of the thyrses, 1 per bract; ♂ flowers at the upper nodes of the thyrses, 1–several per bract. Staminate flowers with a 2-lobed calyx; petals 0; stamens 2 (3), the filaments connate at the base. Pistillate flowers usually with 3 distinct sepals; petals 0; ovary 2 or 3 locular, with 1 ovule per locule; styles 2 or 3, entire, united at the base. Fruit capsular, with a hardened, 3-horned gynobase persisting after dehiscence. Seeds carunculate or ecarunculate.

About 30 species mostly in tropical and arid regions of the Americas, but several in the Old World; ca. 12 species in México. Reference: Rogers 1951.

1. Leaves linear, the margins entire or minutely toothed at the apex *S. linearifolia*
- 1' Leaves ovate, the margins strongly spinose-toothed *S. spinulosa*

STILLINGIA LINEARIFOLIA S. Watson, Proc. Amer. Acad. Arts 14: 297. 1879. *Stillingia gymnogyna* Pax & K. Hoffm., in Das Pflanzenreich IV. 147. v [Heft 52]: 196. 1912.—TYPE: United States, California, San Diego near boundary monument, 1875, *Palmer 449* (lectotype GH!, chosen by Rogers 1951, p. 248)].

Herbaceous perennial (although flowering in the first season), sometimes woody at the base; reproductive nearly throughout the year. Widespread in the Sonoran desertscrub of northwestern Sonora eastward to the vicinity of Quitovac and southward along the coast to the vicinity of Puerto Libertad; commonly on sandy soils, near sea level to 225 m. Also southeastern California, Baja California, Baja California Sur, western Arizona, and southern Nevada.

Mpio. San Luis R. C.: Sierra del Rosario, in small wash, *Felger 20698*. Mpio. Gen. Plutarco Elías Calles: 30 mi SW of Sonoyta on rd to Puerto Peñasco, *Shreve 7591*. Mpio. Pitiquito: 1.8 km NNE of Punta Cirio, Sierra Bacha, 7.2 km by air SE of Puerto Libertad, *Van Devender 91–25*.

STILLINGIA SPINULOSA Torr. in Emory, Not. Milit. Recon. 151. 1848.—TYPE: United States, California, desert west of the Colorado [River], 28 Nov 1846, *Emory s.n.* (holotype NY!).

Sapium ? annuum Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 201. 1858. *Stillingia annua* (Torr.) Müll. Arg. in DC., Prodr. 15(2): 1160. 1866. A nomen superfluum listing the earlier *Stillingia spinulosa* in synonymy.

Spring/early summer annual, sometimes quite robust. Sonoran desertscrub; 125–150 m. Northwestern Sonora in the open sandy desert west of the Pinacate volcanic complex. Also extreme southwestern Ariz-

na, southeastern California, and northeastern Baja California.

Mpio. San Luis R. C.: 30 mi E of San Luis on MEX 2, *Felger 5764*; 10 mi N of El Golfo, sandy plain, *Felger 75-73*; sand plain 7 mi NE of Sierra del Rosario, *Felger 20357*.

TRAGIA L.

Shrubs, herbs, or vines (ours are perennial herbs or vines); monoecious. Latex absent. Pubescence of unbranched, often urticating hairs. Leaves alternate, simple (or rarely, as in *T. laciniata*, palmatisect), sharply serrate to dentate (in ours), palmiveined. Inflorescences mostly bisexual, axillary or terminal, racemose with a few proximal ♀ flowers and few to numerous ♂ flowers. Staminate flowers on articulated pedicels; sepals 3-6; petals 0; stamens usually 3 (rarely 2-6 or more), the filaments free or united at the base. Pistillate flowers on articulated pedicels; sepals 3-6; petals 0; ovary usually 3-locular, with 1 ovule per locule; styles 3, entire, united at the base. Fruits capsular. Seeds ecarunculate.

Mostly tropical and subtropical regions in both hemispheres but best represented in the New World and Africa; 150 species with ca. 20 in México and five in Sonora. The Sonoran representatives are erect to ascending, trailing, or twining perennial herbs that frequently possess urticating hairs. The species here treated are variable and often difficult to distinguish from one another (especially in a dichotomous key). Their distinctions are further obscured by the presence of intermediates. Thus, our treatment of this taxonomically difficult group should be considered preliminary. References: Miller and Webster 1967; Urtecho 1996.

1. Leaves (at least the upper ones) compound, 3-parted *T. laciniata*
- 1' Leaves simple, not divided.
2. Inflorescence rachis usually with tack-shaped glandular hairs; pedicel of the ♀ flower relatively long and slender, the persistent base 4.5 mm or longer; seeds 2.0 mm or less in diameter. Plant vinelike and twining; desertscrub and thornscrub mostly in coastal Sonora *T. jonesii*
- 2' Inflorescence rachis lacking tack-shaped glandular hairs (sometimes granular-glandular or rarely with stalked, glandular hairs in *Tragia* sp.); pedicel of the ♀ flower relatively stout, the persistent base mostly less than 4.0 mm (rarely to 5.5 mm in *Tragia* sp.); seeds 2.2 mm or more in diameter. Plants twining, decumbent, ascending or erect; habitat and range various.
3. Plants vinelike and vigorously twining. *T. sp.*
- 3' Plants erect to decumbent, if twining then only very weakly so at the ends of the branches.
4. Young ♀ flowers with little-exserted styles, these shorter than the sepals; stigmatic surface lacerate-papillose *T. nepetifolia* var. *dissecta*
- 4' Young ♀ flowers mostly with well-exserted styles, these often equaling or longer than the sepals; stigmatic surfaces nearly smooth to irregularly roughened.
5. Leaves towards the ends of the branches ovate

- to triangular, smaller than but similar in shape to the lower leaves; terminal ♂ flowers usually with 3 stamens *T. sp.*
- 5' Leaves at the branch ends linear and proportionally narrower than the lower leaves; terminal ♂ flowers mostly with 4-6 stamens *T. ramosa*

TRAGIA JONESII Radcl.-Sm. & R. Govaerts, Kew. Bull. 52: 480. 1997. Based on *Tragia scandens* M. E. Jones, Contr. W. Bot. 18: 49. 1933; not *Tragia scandens* L., 1754.—TYPE: México, Sonora, [Mpio. Guaymas], Guaymas, 27 Jan 1927, Jones 23300 (lectotype POM[#162552]!, here designated).

Quemador. Vigorously twining perennial herb, the inflorescence rachis characteristically possessing tack-shaped, stipitate glands (rarely nearly glandless, e.g., *Wiggins 5972*); reproductive at various seasons. Often in shaded habitats in Sonoran desertscrub and thornscrub, from the vicinity of Altar and coastal Sonora to the southwest portion of the state; sea level to 425 m. Also Baja California Sur, and to southern México.

These Sonoran plants have been treated as *Tragia amblyodonta* (Müll. Arg.) Pax & K. Hoffm. (e.g., Wheeler 1945, p. 109; Wiggins 1955, pp. 346-347; Wiggins 1964, p. 798) but represent a species quite different from *T. amblyodonta*. *Tragia jonesii* is similar to *Tragia* sp., from which it differs by its longer, more slender pedicels, stipitate glands on the inflorescences, and smaller seeds. Rarely, exceptions can be found that blur the distinctions between them.

Isla Tiburón: SW part of central valley, ca. 13 mi S of Tecamate, vicinity of 28°57'N, 112°27'W, *Felger 17330*. Mpio. Oquitoa: 6 mi E of Altar. Hacienda Oquitoa (Cutting's Ranch), *Wiggins 5972* (US). Mpio. Huatabampo: 1.5 km NW of Camahuiroa on rd to Las Bocas, *Steinmann 93-369*. Mpio. Guaymas: Playa la Manga, Bahía Algodones, 29 Dec 1982 *Van Devender et al. s.n.*; Cañón del Nacapule, *Felger 85-550*.

TRAGIA LACINIATA (Torr.) Müll. Arg., Linnaea 34: 182. 1865. *Tragia urticifolia* Michx. var. ? *laciniata* Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 200. 1858.—TYPE: [presumably present-day Arizona, Santa Cruz County], on the Sonoita [River], 15 Sep 1851, *Wright 1795* (lectotype NY!, designated by Miller and Webster 1967, p. 294).

Erect to decumbent or somewhat trailing perennial herb, unique among the Sonoran Euphorbiaceae in possessing evidently compound, palmatisect, three-parted leaf blades; May-October. Northeastern and east-central Sonora in oak woodland, pine-oak woodland, and pine forest; 1350-2050 m. Also Chihuahua and southeastern Arizona.

Mpio. Yécora: upper Barranca El Salto, at the edge of Mesa El Campañero, 28°21'36"N, 109°01'44"W, *Felger 94-187*; along Ar-

royo El Kípor, just E of El Kípor on trail to Tierra Panda (Las Taunas), 28°24'N, 108°33'35"W, *Van Devender* 95–965. Mpio. Cananea: Sierra de los Ajos, Las Cabañas, Cañón de Evans, 31°00'N, 110°00'30"W, *Felger* 92–805. Mpio. San Felipe de Jesús: northern Sierra Aconchi, Cajón Infierno, 7 mi by rd, W of San Felipe, 29°50'N, 110°21'W, *Reichenbacher* 1115.

TRAGIA NEPETIFOLIA Cav. var. [as α] *DISSECTA* Müll. Arg. in DC., *Prodr.* 15(2): 933. 1866.—TYPE: México [location and collector not stated, but possibly made by *Sessé & Mocino*] (holotype G-BOIS, not seen, photo DAV!).

Ortiguilla. Ascending to trailing perennial herb with slender stems; reproductive in response to spring and summer-fall rains. Sonoran desertscrub, grassland, oak woodland, and pine-oak woodland in the eastern part of the state; ca. 500–1680 m. According to Urtecho (1996, p. 164), the Sonoran plants belong to var. *dissecta*, which differs from the other three recognized varieties of *T. nepetifolia* by its deeply toothed leaves and red staminate flowers. Variety *dissecta* is known from southeastern Arizona, Sonora, Chihuahua to Zacatecas and San Luis Potosí.

Wiggins & Rollins 69 from 7 miles south of Santa Ana generally resembles this species in habit, but the stigmatic surfaces are smooth, and the inflorescence rachis is unusually glandular. The disposition of this collection remains uncertain, and it possibly represents a hybrid between *T. nepetifolia* and some other species, maybe *Tragia jonesii*.

Mpio. Yécora: arroyo 3–4 km NNW of El Kípor (Quípor), *Van Devender* 95–410. Mpio. Alamos: Sierra Saguaribo, ca. 4 km by rd W of Las Chinacas along rd to Taymucio, *Steinmann* 93–305. Mpio. Cucurpe: 8.7 mi ENE of Cucurpe, along rd to Agua Fria, 3 Oct 1979, *Van Devender & Toolin* s.n. Mpio. Arivechi: 2.2 mi by rd E of Arivechi, 28°55'N, 109°20'W, *Felger* 94–365. Mpio. Imuris: along MEX 2, 28 km by rd NE of the junction with MEX 15, ca. 30°53'N, 110°40'30"W, *Steinmann* 943.

TRAGIA RAMOSA Torr., *Ann. Lyc. N.Y.* 2: 245. 1827.—TYPE: United States, Sources of the Canadian [River, evidently in SE Colorado], Long's Expedition, summer 1820, *James* s.n. (holotype NY!).

For synonymy see Miller and Webster 1967, pp. 231–233.

Ascending to decumbent perennial herb, rarely twining at the branch tips; time of reproduction inadequately known for Sonora, elsewhere mostly April to October. Dry grasslands in northeastern Sonora where it is known from a single collection at 1300 m. Widespread across the Great Plains to California and northern México.

This species is very similar in appearance to *T. nepetifolia*, with which it is frequently confused. Both are trailing perennial herbs. However, in *T. ramosa* the styles of the young ovaries are relatively long and slender, the stigmatic surfaces are not strongly papil-

late, and the terminal staminate flowers often possess 5 or 6 stamens. Also, the upper leaves are characteristically narrow (the bases are essentially as wide as the middle) and very sharply and finely toothed.

Mpio. Fronteras: 5 mi S of Esqueda on rd to Río de la Tierra, *Wiggins* 11768 (SD).

TRAGIA sp.

Rama quemadora, ortija. Perennial herb, trailing to twining, and sometimes severely stinging; mostly December to March. Sonoran desertscrub, thornscrub, tropical deciduous forest and the lower edge of oak woodland; 75–1300 m. Ranging from Isla Tiburón to southern Sonora. Also adjacent Chihuahua and south at least as far as Oaxaca. Roberto Urtecho (1996) has proposed naming these plants *T. macvaughii*, but this is still unpublished.

There are two distinct morphological forms of this species in Sonora. Most collections are twining, vine-like perennial herbs, but occasionally low, ascending to decumbent plants are encountered. These latter collections also differ from the more robust, twining plants in being covered with long, stiff, spreading hairs reaching more than 2 mm in length. The two forms are superficially quite different, but we interpret the variation as environmentally induced. The trailing, densely armed plants are mostly from disturbed areas, and their habit and pubescence appear to be the result of growing in an open and "adverse" habitat. Besides the growth form and pubescence, there appears to be no differences of taxonomic merit between the forms, but common-garden experiments are desired to gain further insights into the cause of this variation. We have also seen Sinaloan specimens of the low, densely armed form.

Steinmann 93–280 from the Sierra Saguaribo is noteworthy in possessing exceptionally large leaves and conspicuously papillate stigmatic surfaces that resemble those of *T. nepetifolia*. The stigmatic surfaces of *Tragia* sp. are otherwise smooth to undulate. The significance of these differences is not yet apparent, but the plant may represent a hybrid with *T. nepetifolia*, which was found nearby.

Densely armed, ascending to decumbent specimens. Mpio. Alamos: El Paso, just above Río Cuchujaqui, 26°40'35"N, 108°49'30"W, *Van Devender* 95–100; Sierra de Alamos, *Rose, Standley, & Russell* 12879 (US).

Twining specimens. Isla Tiburón: waterhole at SE base of Sierra Kunkaak, *Felger* 9290. Mpio. Alamos: Arroyo Gochico, 11 km by air E of San Bernardo, 27°23'45"N, 108°43'30"W, *Steinmann* 603. Mpio. Navjoa: Arroyo Masiaca, ca. 0.5 km N of Teachive de Masiaca, 26°47'45"N, 109°13'50"W, *Van Devender* 93–961. Mpio. Moctezuma: between Huásabas and Moctezuma, 29°50'N, 109°30'W, *Joyal* 1553 (ASU).

DOUBTFUL AND EXCLUDED TAXA

Acalypha langiana Müll. Arg.

McVaugh (1995, p. 177) lists Sonora in the distribution of this species. We have not seen any specimens of this taxon from Sonora, but it conceivable could be represented in the flora. *Acalypha langiana* is very similar to *A. subviscida*, but among other differences the pistillate spikes are only axillary.

Acalypha obscura Müll. Arg.

Wiggins (1964, p. 793) implies that this species occurs in Sonora. However, he is almost surely referring to *Acalypha phleoides*, of which *A. obscura* is possibly a synonym. A photo of the type (Field Mus. neg. 7127) shows a plant very similar to *A. phleoides*.

Acalypha vagans Cav.

Wiggins (1964, p. 797) incorrectly applies this name to the nearly eglandular plants of *Acalypha californica* (see note under that species). We have not seen any specimens of true *A. vagans* from Sonora.

Bernardia mexicana (Hook. & Arn.) Müll. Arg.

Reports of this species in Sonora refer to *Bernardia viridis*.

Croton fragilis H. B. K.

Reported for Sonora by both Gentry (1942, p. 164) and Wiggins (1964, p. 782), but these are based on specimens of *C. flavescens* (see note under that species).

Croton soliman Cham. & Schltdl.

Hemsley (1882–1886, p. 116) cites a collection from “Sonora, Alta (Coulter, 1508).” We have not seen the specimen, but it is almost certainly misidentified. *Croton soliman* is primarily a southern Mexican species.

Dalembertia hahniana Baill.

Reported for Sonora by Wiggins (1964, p. 810), but this refers to *D. populifolia*.

Ditaxis tinctora (Millsp.) Pax & K. Hoffm.

Gentry’s reference (1942, p. 165) to this species is based on a misidentified collection of *Ditaxis guatemalensis*.

Euphorbia bartolomaei Greene

Listed by Oudejans (1990, p. 70) as occurring in Sonora. It is known to us only from the Baja California Peninsula and unlikely to be present in Sonora.

Euphorbia chamaesula Boiss. var. *subdentata* (Engelm.) Norton, Annual Rep. Mo. Bot. Gard. 11: 131. 1900; separate issued 1899. *Euphorbia esuliformis* S. Schauer var. *subdentata* Engelm. in Torr., Botany of the Boundary, [in Emory, Rep. U.S. Mex. Bound. 2, pt. 1]: 192. 1858.—TYPE: San Francisco Springs, Mar 1852, Parry s.n. (holotype MO[#149764]!).

Although the protologue gave the location as Sonora, White (1948, p. 232) states that this location is probably Ojo de San Francisco, in northwestern Chihuahua. However, according to maps in vol. 12 of the United States War Department’s reports of the Pacific Railroad survey, there is also a San Francisco Springs at roughly 35°15’N, 111°40’W, in present-day Coconino County, Arizona. Although the type and the only other collection that we have seen of this variety (Arizona, Mason 2715) are probably only aberrant forms, they are highly distinctive and easily recognized by the markedly dentate or serrate upper leaves. We are hesitant to treat it as a synonym of typical *E. chamaesula* pending further studies. The collection from the Sierra San Luis cited by Norton (1900, p. 131) possesses only inconspicuous serrulations, and thus is somewhat intermediate with typical *E. chamaesula*.

Euphorbia cinerascens Engelm. [= *Euphorbia melanadenia* Torr. var. *subinappendiculata* Engelm.]

Engelmann in the protologue of this taxon cites the following specimen: “Chihuahua and Sonora, Thurber.” We have otherwise seen no collections of this species from Sonora, and Thurber’s specimen probably was collected in Chihuahua, where this species is common.

Euphorbia cumbrae Boiss.

Reported for Sonora by Gentry (1942), but the specimens are *E. hyssopifolia*.

Euphorbia esuliformis S. Schauer

Boissier (1862, p. 147) cites a collection from Sonora by Smith. He did not see this record but reported it on the basis of communication with Engelmann. Apparently he is referring to *Euphorbia chamaesula*. This conclusion is based on the fact that Boissier also cites under *E. esuliformis*, again based on communication with Engelmann, Wright 1820 (the type collection of *E. chamaesula*). Also, a Smith collection of *E. chamaesula* from Sonora at MO (apparently the one to which Boissier refers) was originally labeled as *E. esuliformis*.

Euphorbia esuliformis S. Schauer var. *subdentata* Engelm.

See *Euphorbia chamaesula* var. *subdentata* above.

Euphorbia fendleri Torr. & A. Gray

Hemsely (1882–1886, p. 93) cites a Thurber specimen (K, not seen) from Sonora. We have not seen Sonoran collections of this species, and Thurber's collection was probably made before the Gadsden Purchase and from present-day Arizona, where this species is common.

Euphorbia glyptosperma Engelm.

First reported for Sonora by Watson (1889, p. 74), but the plants that he referred to are *E. abramsiana*. *Euphorbia glyptosperma* was also listed for the state by Oudejans (1990, p. 176), but we have not seen any Sonoran specimens, and it is unlikely to be present.

Euphorbia hirta L. var. *procumbens* (DC.) N. E. Br. (= *Euphorbia ophthalmica* Pers.)

Reported for the Río de Bavispe region by White (1948, p. 285), but the specimen cited (White 2679, GH) is var. *hirta*. Variety *procumbens* is distinguished from the typical variety by its low, decumbent habit; generally smaller leaves; and inflorescences that are usually only terminal on the main stem axes. Although some Sonoran collections superficially resemble var. *procumbens* [e.g., Steinmann 614 (RSA)], in our opinion these are only stressed plants of var. *hirta*. In fact, the concept of var. *procumbens* may be nothing more than a phenotypical morph of var. *hirta* growing under unfavorable conditions such as water stress or grazing.

Euphorbia melanadenia Torr. var. *subinappendiculata* Engelm.

See *Euphorbia cinerascens* above.

Euphorbia maculata L.

Cited from "Sonora, Alta, Coulter, 1449" (K) by Hemsley (1882–1886, p. 97), the specimen is *E. capitellata*. Although *E. maculata* has been a "weed" in Tucson since at least 1917, and conceivably could be present in Sonora, it is here excluded for lack of a specimen.

Euphorbia ocymoidea L. var. *barnesii* (Millsp.) McVaugh

The report of this variety for Sonora by Van Dender et al. (1995, pp. 413–414) is based on typical *Euphorbia ocymoidea*. Variety *barnesii*, which we believe is best treated as *E. barnesii* (Millsp.) Oudejans, does not occur in the state.

Euphorbia parryi Engelm.

Reported from the Río de Bavispe region by White (1948), but the specimen cited is *E. florida*. Also reported for the state by Oudejans (1990, p. 306), but we have no evidence that it is present.

Euphorbia serpyllifolia Pers. var. *hirtula* (Engelm.) L. C. Wheeler

According to Wheeler (1941, p. 235), there is an Edward Palmer collection of this variety reportedly from Sonora, but the locality information is probably incorrect. This taxon is otherwise known from California and Baja California.

Euphorbia uniglandulosa S. Watson

Gentry's reference (1942, p. 170) to this species is based on misidentified material of *Euphorbia dioscoreoides* ssp. *attenuata*. *Euphorbia bifurcata* Engelm., of which *E. uniglandulosa* is a synonym, is widespread in México, including Chihuahua, but it is not known from Sonora.

Hura polyandra Baill.

Pennington and Sarukán (1968, p. 258) state that this species occurs in southwestern Sonora. However, we have no evidence that it is either native or naturally persisting. Known otherwise from central Sinaloa to Nicaragua, it is occasionally cultivated in southwestern Sonora, and a grove of these trees is reported to occur near Navojoa, perhaps derived from planted trees (Alberto Búrquez, pers. comm., 1993).

Manihot caudata Greenm.

Gentry (1942, p. 167) reports this species for Sonora but does not cite a collection. The specimen that he lists for Chihuahua was annotated by Rogers and Appan as *Manihot davisiae* (see note under this species). See also discussion under *Manihot* sp.

Manihot chlorosticta Standl. & Goldman

Reported for Sonora by Wiggins (1964, p. 806), but these plants are *M. davisiae*.

Phyllanthus galeottianus Baill.

The report of this species from the "vicinity of Magdalena, Sonora" by Wiggins (1964, p. 776) is based on a misidentified specimen of *P. polygonoides*.

Sapium appendiculatum (Müll. Arg.) Pax & K. Hoffm.

Recorded for Sonora by Gentry (1942, p. 168), but this is apparently a misapplication of the name, and

these plants belong to *Sebastiania cornuta* (see note under this species).

Tragia amblyodonta (Müll. Arg.) Pax & K. Hoffm.

Sonoran plants referred to this taxon (e.g., Wiggins 1964, p. 798) represent *Tragia jonesii*, a species very different from true *T. amblyodonta*.

Tragia urticifolia Michx.

Recorded by Wiggins (1980, p. 135), but this species occurs in eastern United States, and we have seen no specimens from Sonora. We are uncertain to which taxon Wiggins is referring.

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LITERATURE CITED

- ALAIN, HERMANO (E. E. LIOGIER). 1953. Euphorbiaceae, pp. 38–139. In Hermano León (J. S. Sauget) and Hermano Alain (E. E. Liogier) [eds.], Flora de Cuba, vol. 3. (*Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle"* 13: 1–502).
- BOISSIER, P. E. 1862. Euphorbiae, pp. 3–188. In A. P. De Candolle, *Prodromus Systematis Naturalis Regni Vegetabilis* 15(2). Treuttel & Würtz, Paris, Strasbourg & London.
- BRako, L., AND J. L. ZARUCCI. 1993. Catalogue of the flowering plants and gymnosperms of Peru. *Missouri Bot. Gard., St. Louis* 1286 p.
- BRECKON, G. J. 1975. *Cnidoscolus* section *Calyptosolen* (Euphorbiaceae) in Mexico and Central America. Unpublished Ph.D. dissertation. University of California, Davis. 463 p.
- BROWN, D. E. [ed.]. 1982. Biotic Communities of the American Southwest—United States and Mexico. *Desert Pl.* 4:1–342.
- BURCH, D. 1966. The application of the Linnaean names of some New World species of *Euphorbia* subgenus *Chamaesyce*. *Rhodora* 68: 155–166.
- BURGER, W., AND M. HUFT. 1995. Euphorbiaceae, pp. 1–169. In W. Burger [ed.], Flora Costaricensis # 113 (*Fieldiana, Bot.* 36).
- BÚRQUEZ, A., A. MARTÍNEZ-YRÍZAR, AND R. S. FELGER. In Press. Biodiversity at the Southern Desert Edge in Sonora, Mexico. In R. Robichaux [ed.], Ecology and conservation of the Sonoran Desert flora: a tribute to the Desert Laboratory. University of Arizona Press, Tucson.
- , AND P. S. MARTIN. 1992. From the high Sierra Madre to the coast: changes in vegetation along highway 16, Maycoba-Hermosillo, pp. 239–252. In K. F. Clark, J. Roldan-Quintana and R. Schmid [eds.], Northern Sierra Madre Occidental Province, México, guidebook. El Paso Geological Society, El Paso.
- CORRELL, D. S., AND M. C. JOHNSTON. 1970. Manual of the Vascular Plants of Texas. Texas Research Foundation, Renner. 1881 p.
- CROIZAT, L. 1942. A study of *Manihot* in North America. *J. Arnold Arbor.* 23: 216–225.
- . 1943. Novelties in American Euphorbiaceae. *J. Arnold Arbor.* 24: 165–189.
- . 1945. New or critical Euphorbiaceae from the Americas. *J. Arnold Arbor.* 26: 181–196.
- DEHGAN, B. 1976. Experimental and evolutionary studies of relationships in the genus *Jatropha* L. (Euphorbiaceae). Unpublished Ph.D. dissertation. University of California, Davis. 436 p.
- , AND G. L. WEBSTER. 1978. Three new species of *Jatropha* (Euphorbiaceae) from western Mexico. *Madroño* 25: 30–39.
- , AND ———. 1979. Morphology and infrageneric relationships of the genus *Jatropha* (Euphorbiaceae). *Univ. Calif. Publ. Bot.* 74: 1–73.
- DRESSLER, R. L. 1957. The genus *Pedilanthus* (Euphorbiaceae). *Contr. Gray Herb.* 182: 1–188.
- . 1961. A synopsis of *Poinsettia* (Euphorbiaceae). *Ann. Missouri Bot. Gard.* 48: 329–341.
- ENGELMANN, G. 1861. Euphorbiae, pp. 168–173. In A. Gray, Enumeration of a collection of dried plants made by L. J. Xantus, at Cape San Lucas, &c. in Lower California, between August, 1859, and February, 1860, and communicated to the Smithsonian Institution. *Proc. Amer. Acad. Arts* 5: 153–173.
- FELGER, R. S. 1980. Vegetation and flora of the Gran Desierto, Sonora, Mexico. *Desert Pl.* 2: 87–114.
- , AND C. H. LOWE. 1976. The island and coastal vegetation and flora of the Gulf of California, Mexico. *Contr. Sci. Nat. Hist. Mus. Los Angeles County* 285: 1–59.
- , AND M. B. MOSER. 1985. People of the desert and sea: ethnobotany of the Seri Indians. University of Arizona Press, Tucson. 435 p.
- , AND M. F. WILSON. 1995. Northern Sierra Madre Occidental and Its Apachian Outliers: A Neglected Center of Biodiversity, pp. 36–59. In L. F. DeBano, P. F. Folliott, and R. H. Hamre [eds.], Biodiversity and management of the Madrean Archipelago: The Sky Islands of the Southwestern United States and northern Mexico. Rocky Mountain Forest and Range Experiment Station, U.S.D.A. Forest Service, Ft. Collins.
- FERGUSON, A. M. 1901. Crotons of the United States. *Rep. (Annual) Missouri Bot. Gard.* 12: 33–73; plates 4–31.
- GENTRY, H. S. 1942. Rio Mayo plants. *Carnegie Inst. Wash. Publ.* 527. Washington, D.C. 328 p.
- GILLESPIE, L. J. 1993. Euphorbiaceae of the Guianas: annotated species checklist and key to the genera. *Brittonia* 45: 56–94.
- HEMSLEY, W. B. 1882–1886. Botany, vol. 3, pp. 1–711. In F. D.

- Godman and O. Salvin [eds.], *Biologia Centrali-Americana*. R. H. Porter and Dulau & Co., London.
- HOLMGREN, P. K., N. H. HOLMGREN, AND L. C. BARNETT. 1990. Index Herbariorum, 8th ed. (Regnum Veg. 120). 693 p.
- HUFT, M. J. 1979. A monograph of *Euphorbia* section *Tithymalopsis*. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor. 276 p.
- . 1984. A review of *Euphorbia* (Euphorbiaceae) in Baja California. *Ann. Missouri Bot. Gard.* **71**: 1021–1027.
- INGRAM, J. 1964. *Argythamnia guatemalensis* and *A. tinctoria* (Euphorbiaceae). *Brittonia* **16**: 271–275.
- . 1970. *Argythamnia*, pp. 939–942. In D. S. Correll and M. C. Johnston, *Manual of the Vascular Plants of Texas*. Texas Research Foundation, Renner. 1881 p.
- . 1980. The generic limits of *Argythamnia* (Euphorbiaceae) defined. *Gentes Herb.* **11**: 427–436.
- JOHNSTON, I. M. 1924. Expedition of the California Academy of Sciences to the Gulf of California in 1921: the botany (vascular plants). *Proc. Calif. Acad. Sci. ser. IV*, **12**: 951–1218.
- . 1940. New phanerogams from Mexico, III. *J. Arnold Arbor.* **21**: 253–265.
- JOHNSTON, M. C. 1959. The Texas species of *Croton* (Euphorbiaceae). *Southw. Naturalist* **3**: 175–203.
- . 1975. Studies of the *Euphorbia* species of the Chihuahuan Desert region and adjacent areas. *Wrightia* **5**: 120–143.
- . 1980. *Bernardia myricifolia* var. *incanoides* (Euphorbiaceae), new variety from the Chihuahuan Desert region. *Phytologia* **46**: 281–282.
- KEARNEY, T. H., AND R. H. PEEBLES. 1960. Arizona Flora. 2nd edition with supplement by J. T. Howell and E. McClintock. University of California Press. Berkeley. 1085 p.
- KRUIJT, R. C. 1996. A taxonomic monograph of *Sapium* Jacq., *Anomostachys* (Baill.) Hurus., *Duvigneaudia* J. Léonard and *Sclerocroton* Hochst. (Euphorbiaceae tribe Hippomaneae). *Biblioth. Bot.* **146**: 1–109.
- LAMARCK, J. B. A. P. M. 1788. Euphorbes, pp. 411–440. In *Encyclopédie Méthodique Botanique* Vol. 2. Chez Panckouck, Paris. 774 p.
- LEVIN, G. 1994. Systematics of the *Acalypha californica* complex (Euphorbiaceae). *Madroño* **41**: 254–265.
- MARTIN, B. D. 1995. Monoecious morphs in *Croton californicus* (Euphorbiaceae). *Madroño* **42**: 323–331.
- MARTÍNEZ GORDILLO, M. 1996. Contribución al conocimiento del género *Croton* (Euphorbiaceae), en el estado de Guerrero, México. Contribuciones del Herbario de la Facultad de Ciencias, UNAM, no. 2. 109 p.
- MCVAUGH, R. 1945. The genus *Jatropha* in America: principal intrageneric groups. *Bull. Torr. Bot. Club* **72**: 271–294.
- . 1961. Euphorbiaceae novae Novo-Galicianae. *Brittonia* **13**: 145–205.
- . 1993. Euphorbiae Novo-Galicianae revisae. *Contr. Univ. Michigan Herb.* **19**: 207–239.
- . 1995. Euphorbiacearum sertum Novo-Galicianarum revisarum. *Contr. Univ. Michigan Herb.* **20**: 173–215.
- MILLER, K. I., AND G. L. WEBSTER. 1967. A preliminary revision of *Tragia* (Euphorbiaceae) in the United States. *Rhodora* **69**: 241–305.
- MILLSPAUGH, C. F. 1898. Notes and new species of the genus *Euphorbia*. *Bot. Gaz.* **26**: 265–270.
- . 1914. Contributions to North American Euphorbiaceae-V. *Field Mus. Nat. Hist., Bot. ser.* **2**: 383–397.
- MIRANDA, F. 1943. Plantas notables del s. o. del Estado de Puebla. *Anales Inst. Biol. Univ. Nac. México* **14**: 29–36.
- MÜLLER, J. 1866. Euphorbiaceae, pp. 189–1261; 1269–1273. In A. P. DeCandolle, *Prodromus Systematis Naturalis Regni Vegetabilis* 15(2). Treuttel & Würtz, Paris, Strasbourg & London.
- NORTON, J. B. S. 1900. A revision of the American species of *Euphorbia* of the section *Tithymalus* occurring north of Mexico. *Rep. (Annual) Missouri Bot. Gard.* **12**: 85–144; plates 11–52.
- OUDEJANS, R. C. H. M. 1990. World catalogue of species names published in the tribe Euphorbieae with their geographical distribution. Oudejans (self published), Utrecht. 444 p.
- PAX, F., AND K. HOFFMANN. 1912. *Dalembertia*, in *Das Pflanzenreich* IV. 147. v [Heft 52]: 268–270.
- PENNINGTON, T. D., AND J. SARUKHÁN. 1968. Arboles tropicales de México. Instituto Nacional de Investigaciones Forestales, México D. F. 413 p.
- RADCLIFFE-SMITH, A. 1973. Allomorphic female flowers in the genus *Acalypha* (Euphorbiaceae). *Kew Bull.* **28**: 525–529.
- . 1976. A new combination in *Acalypha* (Euphorbiaceae). *Kew Bull.* **31**: 226.
- . 1987. Euphorbiaceae, part 1, pp. 1–407. In R. M. Polhill [ed.], *Flora of Tropical East Africa*. A. A. Balkema, Rotterdam.
- ROALSON, E. H., AND K. W. ALLRED. 1995. A working index of New Mexico vascular plant names. 1st ed. New Mexico Agricultural Experiment Station Research Report 702. Las Cruces.
- ROGERS, D. J. 1951. A revision of *Stillingia* in the New World. *Ann. Missouri Bot. Gard.* **38**: 207–259.
- , AND S. G. APPAN. 1973. *Manihot*, *Manihotoides* (Euphorbiaceae). *Fl. Neotrop. Monog.* **13**: 1–272.
- RZEDOWSKI, J. 1978. Vegetación de México. Editorial Limusa, México. D. F. 432 p.
- , AND G. Calderón de Rzedowski. 1987. Nota sobre *Euphorbia stormiae* (Euphorbiaceae). *Cact. Suc. Mex.* **32**: 75–77.
- SEEGELER, C. J. P. 1983. Oil plants in Ethiopia, their taxonomy and agricultural significance. Agricultural research report 921. Centre for Agricultural Publishing and Documentation. Wageningen, Netherlands.
- SHREVE, F. 1951. Vegetation of the Sonoran Desert. *Carnegie Inst. Wash. Publ.* 591. In F. Shreve and I. L. Wiggins, *Vegetation and Flora of the Sonoran Desert*, vol. 1. Washington, D.C. 192 p.
- STANDLEY, P. C. 1923. Euphorbiaceae, pp. 595–653. In *Trees and Shrubs of Mexico*. *Contr. U.S. Natl. Herb.* **23**: 1–1721.
- , AND J. A. STEYERMARK. 1949. Euphorbiaceae, pp. 25–170. In *Flora of Guatemala*, part 6 (*Fieldiana, Bot.* **24**).
- THELLUNG, A. 1917. *Euphorbia* sect. *Anisophyllum*, pp. 422–479. In P. Ascherson and P. Graebner [eds.], *Syn. Mitteleur. Fl.*, vol. 7.
- TURNAGE, W. V., AND A. L. HINCKLEY. 1938. Freezing weather in relation to plant distribution in the Sonoran Desert. *Ecol. Monogr.* **8**: 529–550.
- TURNER, R. M., T. L. BURGESS, AND J. E. BOWERS. 1995. Sonoran Desert Plants: an ecological atlas. University of Arizona Press. Tucson. 504 p.
- URTECHO, R. J. 1996. A taxonomic study of the Mexican species of *Tragia* (Euphorbiaceae). Unpublished Ph.D. dissertation. University of California, Davis. 358 p.
- VAN DEVENDER, T. R., ET AL. 1995. Noteworthy collections from Sonora. *Madroño* **42**: 411–418.
- WATSON, S. 1889. Contributions to American Botany. Upon a collection of plants made by Dr. Edward Palmer in 1887, about Guaymas, Mexico, at Muleje and Los Angeles Bay in Lower California, and on the Island of San Pedro Martin in the Gulf of California. *Proc. Amer. Acad. Arts* **24**: 36–82.
- WEBSTER, G. L. 1970. A revision of *Phyllanthus* (Euphorbiaceae) in the continental United States. *Brittonia* **22**: 44–76.
- . 1993a. A provisional synopsis of the sections of the genus *Croton* (Euphorbiaceae). *Taxon* **42**: 793–823.
- . 1993b. Euphorbiaceae, pp. 567–577. In J. C. Hickman [ed.], *The Jepson manual: higher plants of California*. University of California Press. 1400 p.
- . 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Ann. Missouri Bot. Gard.* **81**: 33–144.

- , AND W. S. ARMBRUSTER. 1991. A synopsis of the neotropical species of *Dalechampia* (Euphorbiaceae). *Bot. J. Linn. Soc.* **105**: 137–177.
- , AND B. D. WEBSTER. 1972. The morphology and relationships of *Dalechampia scandens* (Euphorbiaceae). *Amer. J. Bot.* **59**: 573–586.
- WHEELER, L. C. 1935. *Euphorbia capitellata*, its synonymy and range. *Bull. Torr. Bot. Club* **62**: 537–538.
- . 1936. Revision of the *Euphorbia polycarpa* group of the southwestern United States and adjacent Mexico: a preliminary treatment. *Bull. Torr. Bot. Club* **63**: 397–416, 429–450.
- . 1939. A miscellany of New World Euphorbiaceae:—II. *Contr. Gray Herb.* **127**: 48–78.
- . 1941. *Euphorbia* subgenus *Chamaesyce* in Canada and the United States exclusive of southern Florida. *Rhodora* **43**: 97–154, 168–205, 223–286; plates 654–668.
- . 1945. Euphorbiaceae, pp. 105–109. In C. V. Morton, Mexican phanerogams described by M. E. Jones. *Contr. U.S. Natl. Herb.* **29**: 87–116.
- . 1960. Euphorbiaceae, pp. 501–520; 1058–1059. In T. H. Kearney and R. H. Peebles, Arizona flora with supplement. University of California Press, Berkeley and Los Angeles. 1085 p.
- . 1981. Euphorbiaceae, pp. 107–117. In L. Benson and R. A. Darrow. Trees and shrubs of the southwestern deserts, 3rd ed. University of Arizona Press, Tucson. 416 p.
- WHITE, S. S. 1948. The vegetation and flora of the region of the Río de Bavispe in northeastern Sonora, Mexico. *Lloydia* **11**: 229–302.
- WIGGINS, I. L. 1955. Notes on certain Euphorbiaceae in the Sonoran Desert. *Contr. Dudley Herb.* **4**: 343–353.
- . 1964. Euphorbiaceae, pp. 773–838. In Flora of the Sonoran Desert, pp. 189–1740. In F. Shreve and I. L. Wiggins, Flora and Vegetation of the Sonoran Desert, 2 vols. Stanford University Press, Stanford. 1740 p.
- . 1980. Euphorbiaceae, pp. 112–135. In Flora of Baja California. Stanford University Press, Stanford. 1025 p.
- WOLF, S. J. 1988. George Engelmann type specimens in the Herbarium of the Missouri Botanical Garden. *Ann. Missouri Bot. Gard.* **75**: 1608–1636.
- YETMAN, D., T. R. VAN DEVENDER, P. JENKINS, AND M. FISHBEIN. 1995. The Río Mayo: a history of studies. *J. SouthW.* **37**: 294–345.