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THE ACANTHACEAE OF CALIFORNIA AND THE PENINSULA
OF BAJA CALIFORNIA

By

Thomas F. Daniel

Department of Botany, California Academy of Sciences
Golden Gate Park, San Francisco, California 94118

Twenty-four species in 10 genera of Acanthaceae are treated as occurring in the states of California (United States), Baja California (Mexico), and Baja California Sur (Mexico). Two species (*Carlowrightia arizonica* and *Justicia californica*) occur in southern California; four species (*C. arizonica*, *Holographis virgata*, *J. californica*, and *Ruellia californica*) occur in the state of Baja California; and all 24 species (*Aphanosperma sinaloensis*, *C. arizonica*, *C. pectinata*, *Dicliptera resupinata*, *Dyschoriste decumbens*, *Elytraria imbricata*, *Henrya insularis*, *Holographis virgata*, *J. austrocapensis*, *J. californica*, *J. candicans*, *J. hians*, *J. insolita*, *J. palmeri*, *J. purpusii*, *J. spicigera*, *R. californica*, *R. cordata*, *R. intermedia*, *R. inundata*, *R. leucantha*, *R. nudiflora*, *Tetramerium fruticosum*, and *T. nervosum*) occur in Baja California Sur. Twelve of the species are widespread in their overall distributions and six are endemic to Baja California Sur. Among the phytogeographic regions covered by this treatment, the Cape Region of southern Baja California Sur has the greatest number of species of Acanthaceae.

Occurrences of *Aphanosperma sinaloensis*, *Justicia candicans*, *Ruellia intermedia*, *R. inundata*, and *R. nudiflora* are documented from the peninsula of Baja California for the first time. *Siphonoglossa incerta* is treated in *Justicia* and a new name, *J. austrocapensis*, is provided for it. Based on minor morphological differences and an allopatric distribution, the varieties of *J. insolita* are elevated to the rank of subspecies. *Ruellia peninsularis* and *R. californica* have suballopatric distributions and differ primarily by a single pubescence character. They are treated as two subspecies of a single species. *Dicliptera formosa*, previously treated as a species endemic to Baja California Sur, is considered to be conspecific with *D. resupinata*. *Holographis virgata* comprises two subspecies, one of which comprises two varieties. All species are described and their geographic ranges are plotted on maps. Illustrations of macromorphological characteristics are provided for each genus and photographs of pollen are provided for each species. Chromosome numbers are reported for the first time for *Justicia insolita* subsp. *lastensis*, *J. palmeri*, and *Ruellia leucantha*.

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The Acanthaceae comprise some 4,000 species in about 275 currently recognized genera. The family is worldwide in distribution with most taxa occurring in the tropics. Plants occur in most tropical habitats except those at very high elevations (i.e., above 3,000 m). About 50 species of Acanthaceae occur in the United States, mostly

in the southern tier of states (especially Texas, Florida, and Arizona). More than 350 species of the family are known from Mexico with major centers of diversity in southwestern Mexico (Nayarit through Guerrero) southeastern Mexico (Veracruz) and southern Mexico (Oaxaca and Chiapas). The region covered in this treatment

consists of the southernmost portion of the state of California (i.e., the only part of the state in which Acanthaceae occur) in the United States, and the Mexican states of Baja California and Baja California Sur. The latter two states comprise the peninsula of Baja California, one of the most prominent and isolated physiographic features of western North America.

The Acanthaceae of California were most recently treated by Heckard (1993) and those of the peninsula of Baja California by Wiggins (1980). In order to resolve several taxonomic problems, to add species not previously documented from Baja California Sur, and to document more thoroughly the distributions of species in these regions, a regional taxonomic treatment of the family was undertaken.

The region under consideration here is generally understood to include all or portions of three broad phylogeographic regions: the California Floristic Province, the Sonoran Desert, and the Cape Region of southern Baja California Sur. In addition, the Sierra de la Giganta in Baja California Sur is treated here as a separate region (see discussion below). Treatment of the boundaries of phylogeographic regions in the peninsula of Baja California varies with authors and Figure 1 presents a rather traditional scheme incorporating information from Brown and Lowe (1980), Turner and Brown (1982), and Zippin and Vanderwier (1994).

One of the most conspicuous features of North American Acanthaceae is the apparent radiation of taxa into the arid regions of northern Mexico and the adjacent United States resulting in considerable local and regional endemism. For example, fifty percent of the species (17 of 34) of Acanthaceae occurring in the Chihuahuan Desert of north-central Mexico and south-central United States are endemic there (Daniel 1985). The region covered by this geographic treatment is dominated by one of these distinctive arid regions, the Sonoran Desert, which occurs from southeastern California southward along the gulf coast of Baja California to about lat. 30°N where

it extends westward to the Pacific Ocean and continues southward to about lat. 24°N in Baja California Sur where it continues as isolated patches along the Gulf coast of the Cape Region to the southeastern tip of the peninsula (Fig. 1).

Sonoran Desert vegetation is characterized by a great diversity of life forms, especially arboreal elements, large cacti, and succulent plants. In many respects it is an arid expression of the adjacent tropical dry forests and thornscrub to the south from which it is undoubtedly derived. The tropical dry forests of western Mexico are particularly rich in species of Acanthaceae (Daniel 1993) and likely have served as sources for taxa that either persisted in or dispersed into the lands which, through increasing aridity over time, came to support a regional Sonoran Desert.

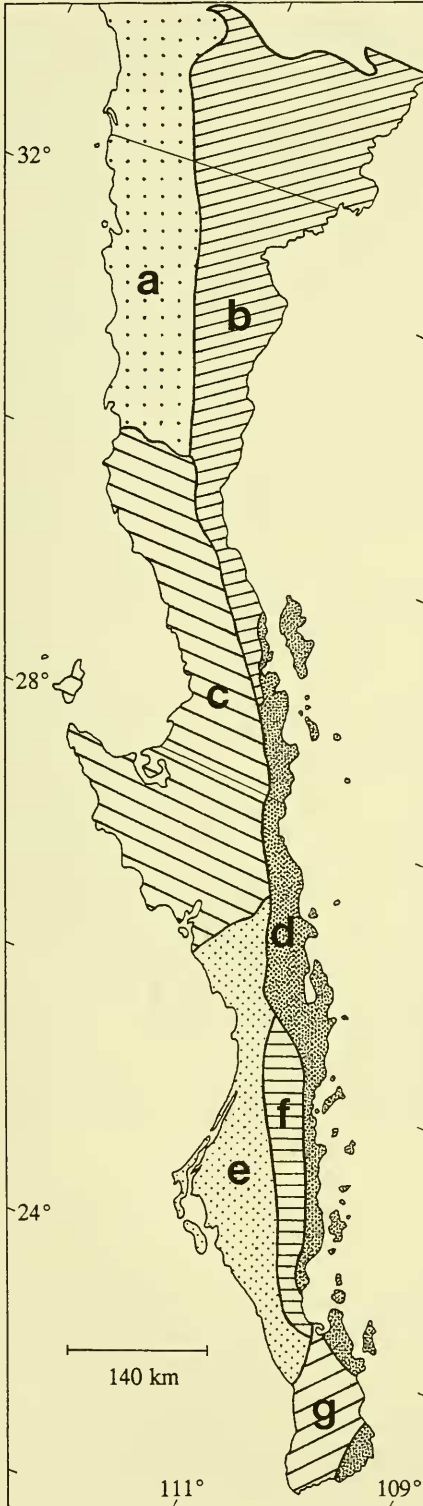
Of the six subdivisions of the Sonoran Desert, four occur in the region under consideration here (Fig. 1): Lower Colorado River Valley, Central Gulf Coast, Vizcaíno, and Magdalena subdivisions (Turner and Brown 1982). The latter two are restricted to the peninsula of Baja California. Each subdivision has a distinctive climatic pattern and vegetational physiognomy (Turner and Brown 1982). At least 14 species of Acanthaceae in our region occur in at least one subdivision of the Sonoran Desert.

The Lower Colorado River Valley is the largest and driest subdivision of the Sonoran Desert. It includes much of southeastern California and most of eastern Baja California. Vegetation tends to be open and simple in structure. Two species of Acanthaceae occur in the Lower Colorado River Valley subdivision in our region. These comprise the only two Acanthaceae known from California, *Carlwrightia arizonica* and *Justicia californica*.

In the peninsula of Baja California the Central Gulf Coast subdivision occurs as a relatively narrow and disconnected band along much of the Gulf coast. Its vegetation is commonly dominated by stem succulents and generally lacks a low shrub layer. All 14 species of Acanthaceae that occur in the Sonoran Desert in our region

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FIGURE 1. Map of southern California and the peninsula of Baja California with adjacent islands showing the distribution of major phylogeographic regions: California Floristic Province (a), Lower Colorado River Valley subdivision of the Sonoran Desert (b), Vizcaíno subdivision of the Sonoran Desert (c), Central Gulf Coast subdivision of the Sonoran Desert (d), Magdalena subdivision of the Sonoran Desert (e), Sierra de la Giganta (f), and Cape Region (g).



have been found in this subdivision. This number is considerably greater than that for any other subdivision of the Sonoran Desert in our region. All but four of these species also occur in the mainland (Sonoran) portion of this subdivision.

Most of the Vizcaíno subdivision of the west-central portion of the peninsula is low (less than 500 m) in elevation. Vegetationally, this subdivision contains many stem succulents but is dominated by fleshy-leaved plants. Near the Pacific coast, fog ameliorates the effects of low rainfall in the spring and summer resulting in a conspicuous covering of epiphytes on many plants. At least eight species of Acanthaceae occur here: *Carlowrightia arizonica*, *Dicliptera resupinata*, *Holographis virgata*, *Justicia californica*, *J. hians*, *J. palmeri*, *Ruellia californica*, and *Tetramerium fruticosum*. All of these species have relatively widespread distributions on the peninsula.

The Magdalena subdivision occupies the Pacific slopes and plains of the southern third of the peninsula. This subdivision has abundant, large cacti together with many small trees resulting in an equality of dominance between trees and large succulents (Shreve 1964). In the south, it intergrades and interdigitates with subtropical and tropical scrub of the Cape Region. At least seven species of Acanthaceae have been collected in this subdivision of the Sonoran Desert: *Dicliptera resupinata*, *Elytraria imbricata*, *Justicia californica*, *J. insolita*, *Ruellia californica*, *R. nudiflora*, and *Tetramerium fruticosum*. Most of these species have relatively widespread distributions on the peninsula.

The region of nondesert vegetation in the Cape Region and the Sierra de la Giganta of Baja California Sur is sometimes referred to as a phytogeographic "Cape Region" (e.g., Cody et al. 1983). Brown et al. (1979) refer to this phytogeographic region as the San Lucan biotic province [modified from Dice's (1943) larger region with the same name], a distinct biogeographic province of North America. Because of the floristic and vegetational differences between the Cape Region proper and the Sierra de la Giganta, and because numerous Acanthaceae are restricted to the former, these two regions are treated separately here.

Geographically and geologically the Cape Region is commonly delimited as that portion of the peninsula to the south and east of the La Paz

Fault, which runs approximately from Punta Coyote to Todos Santos near the northwestern foot of the mountains. This single, predominately granitic, fault block may have been an island in the Pliocene (Gastil et al. 1983). The region receives considerably more precipitation than areas to the north. Because of its separation from other areas of similar climate, the Cape Region remains today an isolated mountainous region. Vegetation of the Cape Region comprises two isolated regions of Sonoran Desert (Central Gulf Coast subdivision, which is discussed above), a large area of subtropical to tropical deciduous scrub and forest, and montane oak and pine-oak woodlands. Twenty-one of the 24 species of Acanthaceae occurring in our region inhabit the Cape Region; eight of these occur only there in our region; two species (*Justicia austrocapensis* and *J. purpusii*) are endemic to the Cape Region; and four total taxa of Acanthaceae are endemic there (i.e., the two species of *Justicia* mentioned above along with *J. insolita* subsp. *tastensis* and *Ruellia leucantha* subsp. *leucantha*). Although several species occurring in the Cape Region are found in portions of the Sonoran Desert there, none is restricted in distribution to these isolated desert regions. Indeed, the large number of Acanthaceae in the Cape Region is undoubtedly attributable to the wetter regions of scrub, forest, and montane woodland in which most of the species there are found.

Scrub vegetation similar to that of the Cape Region extends along the axis of the largely volcanic Sierra de la Giganta. This rugged montane region exhibits many similarities with adjacent regions of Sonoran Desert as well. It lacks coniferous woodlands at higher elevations, but does support scattered pinyon pines. At least 13 species of Acanthaceae are known from the Sierra de la Giganta, including *Ruellia cordata* which is endemic to the northwestern edge of this region.

That portion of the California Floristic Province in southwestern California and northwestern Baja California includes both coastal and montane communities that are sometimes treated as separate regions (e.g., Zippin and Vanderwier 1994). This region is characterized by a Mediterranean climate with winter rains and summer drought. Among Acanthaceae only the widespread *Justicia californica* is known from this region; it has been collected several times both

near Lakeside in California and at Valle las Palmas in Baja California. According to R. Moran (pers. comm.), *J. californica* occurs naturally at both of these localities. Dr. Moran indicates that the southern portion of the California Floristic Province is drier than portions to the north and occasionally harbors plants more typical of the desert to the east. For example, Valle las Palmas has the only natural occurrence of palms (*Washingtonia*) west of the montane divide. The presence of *J. californica* at both of these sites likely represents either relatively recent incursions from the Sonoran Desert into regions of the California Floristic Province with ecologically suitable habitats or relictual colonies indicative of a formerly more widespread distribution. Further evidence of the apparent ability of *J. californica* to survive in portions of the California Floristic Province is the persistence of this species over many years in native plant gardens in various parts of southern California. The only two Acanthaceae known from California occur primarily (or exclusively in the case of *Carlowrightia arizonica*) in the Sonoran Desert to the east of the California Floristic Province and comprise the northernmost extent of the distribution of the family on the west coast of North America. This distribution suggests that the Mediterranean climate is an effective barrier to the northwestward advancement of Acanthaceae in North America.

Twelve of the 24 species of Acanthaceae occurring in the region covered by this revision are widespread in their overall distributions, that is, they occur in diverse regions of the United States and/or Mexico and/or elsewhere in Latin America. There are no endemic genera of Acanthaceae in our region; however, six of the 24 species of Acanthaceae (25%) occurring in the peninsula of Baja California are endemic there. These six species (*Justicia austrocapensis*, *J. hians*, *J. insolita*, *J. palmeri*, *J. purpusii*, and *Ruellia cordata*) are restricted to Baja California Sur, and two of them (*J. austrocapensis* and *J. purpusii*) occur only in the Cape Region. In order to compare the percentage of endemism of Acanthaceae with that noted by Wiggins (1980) for the entire vascular flora of the peninsula, infraspecific taxa must be considered. Eleven of the 28 taxa of Acanthaceae (39%) are endemic to the peninsula. This percentage is considerably higher than the 23% noted by Wiggins (1980) for the total flora. Four other species can be considered as near

endemics, i.e., species with a distribution that is primarily peninsular but which are represented on the adjacent mainland by a single small population (*Tetramerium fruticosum*), by one subspecies that also occurs on the peninsula (*Holographis virgata* and *Ruellia californica*), or by a different subspecies (*Ruellia leucantha*). Two additional species (*Aphanosperma sinaloensis* and *Justicia californica*) are regional endemics (i.e., endemic to the southwestern United States and/or northwestern Mexico).

An interesting outcome of this study is the recognition of infraspecific taxa in four species, all of which are endemic to the peninsula of Baja California and adjacent regions of the Mexican mainland. Good evidence for geographically or elevationally distinct infraspecific taxa with minor morphological distinctions is not usually encountered among Acanthaceae elsewhere in Mexico. Several factors that might help to explain their presence here include: the geologic history of our region (including the peninsula's separation from the mainland, periods of insularity, etc.), the rugged physiography of a narrow and isolated peninsula that extends across nearly ten degrees of latitude, and the juxtaposition in our region of an array of ecological zones (and their displacements through time with changes in global climate and movements of the earth's crust). Both the endemic species and infraspecific taxa recognized in this treatment likely owe their origin and/or continued presence in the peninsula to a combination of these, and other, factors. Because we understand the processes of speciation and the genesis of infraspecific taxa so inadequately, one can only speculate as to the myriad environmental and evolutionary factors that have made this extensively collected region of Mexico ripe for recognition of infraspecific taxa in the Acanthaceae.

MATERIALS AND METHODS

The following geographic revision treats all Acanthaceae known to occur in the three politically delimited states of western North America noted above. Islands in the Pacific Ocean and the Gulf of California that comprise parts of these states are also included (Fig. 1). Islands comprising portions of other states (e.g., Isla Tiburón, in the Gulf of California, and the Islas Revillagigedo, in the Pacific Ocean) are excluded. Use

of "Baja California" in this treatment refers only to the Mexican state of that name. When considering both Mexican states (i.e., Baja California and Baja California Sur) simultaneously, the phrase "peninsula of Baja California" is utilized.

More than 1,000 collections of Acanthaceae from California and the peninsula of Baja California were studied from the following institutions: CAS, DAV, DS, GH, HCIB, JEPS, LA, POM, RSA, SD, UC, and UCR. Selected collections from several additional herbaria were also studied (e.g., A, ARIZ, ASU, DES, DUKE, ENCB, F, G, K, LL, MEXU, MICH, MIN, MO, MSC, NY, TEX, US). Observations and collections were made by me during five field trips to the region between 1978 and 1994. The species descriptions are derived from those observations and the collections cited unless there is an indication that other materials were used to supplement them. Pollen was studied and photographed with a scanning electron microscope. Chromosome numbers were determined using the methodology described by Daniel and Chuang (1993). In addition to chromosome numbers reported herein, previously reported chromosome numbers are cited for each taxon and one or more references in which the numbers were reported are provided. Complete synonymies are provided for most taxa. In several cases (i.e., *Carlwrightia arizonica*, *Elytraria imbricata*, *Henrya insularis*, *Ruellia nudiflora*, and *Tetramerium nervosum*) where the taxa are widespread, many names have been applied to them, and a full synonymy has been recently published elsewhere, only names based on types from northwestern Mexico and the United States are included. In these instances a reference to the full synonymy is provided.

TAXONOMIC TREATMENT ACANTHACEAE

Terrestrial (rarely aquatic) herbs or shrubs, less often trees or vines, vegetative and floral organs glabrous or pubescent with various types of eglandular (simple and compound), subglandular (i.e., lacking a conspicuous capitate gland at apex but apically enlarged), and glandular trichomes, often beset with cystoliths visible in epidermis (these absent in *Elytraria* and *Holographis*) and sometimes beset with sessile lenticular glands mostly 0.05–0.2 mm in diam-

eter (glandular punctate). Young stems with nodes usually swollen. Leaves opposite and decussate or sometimes quaternate, simple, estipulate, sessile to petiolate, margin usually entire. Inflorescence in leaf axils (axillary) or terminating shoots (terminal), cymose (e.g., dichasia solitary in leaf axils) or thyrsoid (i.e., with the main axis indeterminate and with lateral axes determinate), the basic unit a variably reduced or expanded dichasium, dichasia borne in axils of leaves or bracts, alternate (= solitary) or opposite (= paired) at nodes, sessile or pedunculate, 1-many-flowered, when in axils of bracts then usually forming dichasiate spikes (i.e., dichasia and flowers sessile to subsessile), racemes (i.e., dichasia sessile to subsessile and flowers pedicellate), or thyrses (i.e., dichasia pedunculate), these inflorescences sometimes branched and then forming panicles. Bracts large and brightly colored or small and green. Flowers sessile or pedicellate, usually subtended by 2 bracteoles, complete, bisexual, chasmogamous and often cleistogamous. Calyx synsepalous, comprising 5 sepals, usually deeply 4-5-lobed, lobes equal to unequal in length. Corolla sympetalous, comprising 5 petals, tube cylindrical or funnelform (i.e., gradually or abruptly expanded distally into a \pm distinct throat), sometimes twisted 180° (i.e., corolla resupinate) or 360° , limb subactinomorphic to zygomorphic, commonly bilabiate with an upper lip of 2 lobes and a lower lip of 3 lobes, corolla lobes imbricate (including cochlear and quincuncial) or con-

torted in bud. Stamens epipetalous, included in corolla tube or exerted from mouth of corolla, usually 2 or 4 and didynamous, filaments free or connate in pairs proximally, anthers 1-theous or 2-theous, thecae usually dehiscent by longitudinal slits, sometimes with basal or apical appendages, thecae of a pair parallel to perpendicular, collaterally attached to filament to superposed to widely separated by a modified connective, pollen extremely diverse, spheric to prolate, 2-many-aperturate (apertures simple or compound) or inaperturate, staminodes 0-3, comprising minute projections or sterile filaments. Nectariferous disk usually present around base of ovary, annular. Gynoecium 2-carpellate, ovary superior, generally 2-locular, placentation usually axile, ovules 2-many in each locule, style simple, terminal, filiform, included within corolla tube or exerted from mouth of corolla, stigma funnelform, 2-lobed, or with one lobe suppressed, 1 or both lobes sometimes recurved or recoiled. Fruit usually a loculicidal, explosively dehiscent, stipitate or estipitate, 2-valved capsule, septa sometimes separating from inner wall of mature capsule. Seeds usually 2-many, each usually subtended by a prominent hook-shaped retinaculum (retinacula borne along septa, lacking or papilliform in *Elytraria*), globose to lenticular, often asymmetrically notched at base, glabrous or pubescent, trichomes often hygroscopic or becoming mucilaginous when wet, surfaces smooth or variously ornamented. ($x = 7$).

KEY TO GENERA OF ACANTHACEAE IN CALIFORNIA AND BAJA CALIFORNIA

1. Leaves alternate, often crowded at stem apices; inflorescence borne on scapes covered with coriaceous and clasping scales; corollas 4-8.5 mm long; stigma touch-sensitive; capsule 2.8-4.1 mm long; seeds irregularly blocky, borne on papilliform placentae (hooklike retinacula lacking)..... *Elytraria*
1. Leaves opposite, usually \pm evenly distributed along stems; inflorescence not borne on scaly scapes; corollas 5.5-90 mm long; stigma not touch-sensitive; capsule 4.4-24 mm long; seeds subglobose to lenticular, borne on hooklike retinacula.
 2. Fertile stamens 4.
 3. Cystoliths absent; corolla 9-14 mm long, strongly bilabiate, lobes imbricate in bud; anthers 1-theous; pollen 3-colpate..... *Holographis*
 3. Cystoliths present; corolla 15-90 mm long, subactinomorphic, lobes contorted in bud; anthers 2-theous; pollen otherwise.
 4. Corolla 15-17 mm long; calyx tube with weak (i.e., rupturing when capsule matures) hyaline regions proximal to sinuses of lobes; thecae basally awned; pollen 3-colpate, mesocolpia multi-striate with pseudocolpi *Dyschoriste*

4. Corolla 20–90 mm long; calyx lacking weak hyaline regions; thecae lacking basal awns; pollen 3-porate, exine coarsely reticulate *Ruellia*
2. Fertile stamens 2.
5. Stems hexagonal in cross-section; inflorescence of axillary bracteate cymes bearing (1–) 3 (–5) pedunculate cymules; cymules consisting of 1 or more flowers subtended by an involucre of 2 or more pairs of bracteoles; outer pair of cymule bracteoles cordate to deltate, conspicuous and larger than inner pair(s); septa with attached retinacula separating from inner capsule wall at maturity and protruding prominently from each valve of capsule, the mature capsule conspicuously ruptured near base of head; corolla resupinate 180° *Dicliptera*
5. Stems terete to quadrate-alate in cross-section; inflorescence various but not as described above; cymules never present; flowers subtended by 1 pair of bracteoles; retinacula remaining attached to inner capsule wall at maturity or separating slightly near base of head (i.e., *Henrya* and *Tetramerium*) but not protruding prominently from each valve of capsule, mature capsule not or barely ruptured near base of head; corolla not resupinate.
6. Upper lip of corolla rugulate (i.e., with a stylar furrow); stamens appressed to upper lip of corolla, anthers dehiscing toward lower lip (i.e., flower nototribal); thecae sometimes unequally inserted and sometimes with basal appendages; pollen 2–4 aperturate, apertures flanked on each side by 1–several rows of \pm circular insulae and/or peninsulae (i.e., lacking pseudocolpi) *Justicia*
6. Upper lip of corolla not rugulate (i.e., lacking a stylar furrow); stamens appressed to lower lip of corolla, anthers dehiscing toward upper lip (i.e., flower stenotribal); thecae equally to subequally inserted and lacking basal appendages; pollen 3-aperturate, apertures flanked on each side by a solid band of exine and a pseudocolpus (i.e., 6-pseudocolpate).
7. Capsules completely reflexed at maturity, expanded and truncate (to subemarginate) at apex, base of stipe covered with uncinuate trichomes; seeds fused to and permanently retained within capsule valves; pollen with 3-pronged polar apertures *Aphanosperma*
7. Capsules erect at maturity, narrowed and acute at apex, base of stipe lacking uncinuate trichomes; seeds free from capsule valves and ejected therefrom at maturity; pollen lacking polar apertures.
8. Either bracts or bracteoles conspicuous, concealing calyx; capsule 4.5–6.5 mm long, septa with attached retinacula separating slightly from inner wall of mature capsule near base of head; seeds 1.3–2 mm long.
9. Bracteoles fused, if at all, only at base for a distance up to 1 mm, not forming an involucre; bracts longer than bracteoles; seeds 4, lacking trichomes; pollen with colpi narrow, not or barely exceeding width of centrally positioned ora *Tetramerium*
9. Bracteoles fused along 1 side from base to near apex, forming a conspicuous involucre; bracts shorter than bracteoles; seeds 2, pubescent with stiff, interwoven, hygroscopic trichomes to 0.5 mm long; pollen with colpi broad, far exceeding width of centrally positioned ora. *Henrya*
8. Neither bracts nor bracteoles conspicuous, not concealing calyx; capsule 6.5–14 mm long, septa with attached retinacula remaining attached to inner wall of mature capsule; seeds 2.5–4.5 mm long. *Carlowrightia*

APHANOSPERMA

Aphanosperma T. F. Daniel, Amer. J. Bot. 75:547. 1988. TYPE. — *Aphanosperma sinaloensis* (Leonard & Gentry) T. F. Daniel.

Erect perennial herbs to shrubs with cystoliths. Older stems with epidermis exfoliating. Leaves opposite, petiolate, margin entire. Inflorescence of dichasiate spikes; dichasia (alternate to) opposite, 1-flowered, sessile, subtended by a bract. Bracts and bracteoles small, green, inconspicuous, their margins entire. Flowers homostylous, sessile to subsessile, subtended by 2 homomorphic bracteoles. Calyx deeply 5-lobed, lobes equal to subequal in size. Corolla cream to white with purple markings on upper lip, tube subcylindric, shorter than limb, limb bilabiate (although sometimes appearing nearly regular), upper lip comprising 2 fused lobes, emarginate at apex, lower lip 3-lobed. Stamens 2, inserted at apex of corolla tube, exerted from mouth of corolla, anthers 2-theous, thecae equal in size, subsagittate to subparallel, equally to subequally inserted on filament, lacking basal appendages, dehiscing toward upper lip of corolla (i.e., flower stenotribal); pollen (Fig. 2a, b) prolate, 3-colporate, 6-pseudocolpate, pseudocolpi 2 per mesocolpium, poles sometimes with a 3-pronged aperture, arms aligned with colpi and extending from pole toward equator, exine reticulate; staminodes 0. Style exerted from mouth of corolla, stigma 2-lobed. Capsule stipitate, cuneiform, reflexed at maturity, stipe densely pubescent at base with uncinat trichomes, head truncate to \pm emarginate at apex, retinacula not visible in mature capsule. Seeds 2, permanently invested in capsule valves. ($x = 18$).

A single species from tropical dry forests in northwestern Mexico is known.

REFERENCE. — DANIEL, T. F. 1988. *Aphanosperma*, a new genus of Acanthaceae from Mexico with unusual diaspores. Amer. J. Bot. 75:545-550.

1. *Aphanosperma sinaloensis* (Leonard & Gentry) T. F. Daniel, Amer. J. Bot. 75:548. 1988. *Carlwrightia sinaloensis* Leonard & Gentry, Brittonia 6:327. 1948. TYPE. — MEXICO. Sinaloa: slope at Cerro Prieto, vicinity of Culiacán, 30 Nov 1944, H. Gentry 7111 (holotype: US!;

isotypes: CAS!, DES!, DS!, F!, GH!, MICH!, NY!, RSA!, UC!).

Erect perennial herbs to shrubs to 1 m tall. Young stems subterete to subquadrate, striate, pubescent with a mixture of erect to flexuose glandular and eglandular trichomes 0.05–0.8 mm long, trichomes \pm evenly disposed to mostly concentrated in 2 vertical lines, mature stems becoming glabrate as the epidermis exfoliates in thin papery strips. Leaves petiolate, petioles to 45 mm long, blades lance-ovate to ovate to subcordate (rarely elliptic to obovate), (10–) 25–140 mm long, (5–) 15–75 mm wide, 1.3–2.6 times longer than wide, acute to truncate to subcordate at base, (rounded to) acute to acuminate at apex, surfaces sparsely pubescent with mostly flexuose to antrorse eglandular trichomes, margin entire. Inflorescence of terminal and axillary (from axils of distal, often considerably reduced, leaves) slender dichasiate spikes forming a terminal leafy panicle; spikes alternate or usually opposite, 1 (–2) per axil, to 200 mm long, pedunculate, rachis pubescent with glandular and eglandular trichomes 0.05–0.30 mm long and sometimes with an overstorey of straight to flexuose eglandular trichomes 0.4–0.7 mm long as well; dichasia (alternate to) opposite, 1–2-flowered, subtended by a bract (or proximalmost ones sometimes borne in axils of reduced distal leaves). Flowers sessile to subsessile (i.e., borne on pedicels to 0.5 mm long). Bracts triangular to subulate, 1–4 mm long, 0.5–1 mm wide, pubescent like rachis, eglandular, or nearly glabrous. Bracteoles triangular to subulate, 0.5–2.5 mm long, 0.2–0.5 mm wide, pubescent like bracts or nearly glabrous. Calyx 1.5–3 mm long (sometimes accrescent, up to 4.5 mm long, in fruit), lobes subulate, 1.5–2.5 mm long, pubescent like bracts. Corolla cream (with a white chevron outlined and streaked with maroon on the upper lip) on the inner surface, white (sometimes with a maroon tinge) on the outer surface, 5.5–10 mm long, externally pubescent with erect eglandular trichomes to 0.3 mm long, tube 1.8–2.6 mm long, upper lip obovate, 4–7.5 mm long, 2–2.8 mm wide, emarginate and usually reflexed at apex, the chevron papillate, lower lip 4–7.5 mm long, lateral lobes elliptic to obovate, 4–7.5 mm long, 1.5–4 mm wide, often reflexed at apex, lower-central lobe elliptic, 4–7 mm long, 1.8–3 mm wide, reflexed at apex. Stamens 3.7–6.5 mm

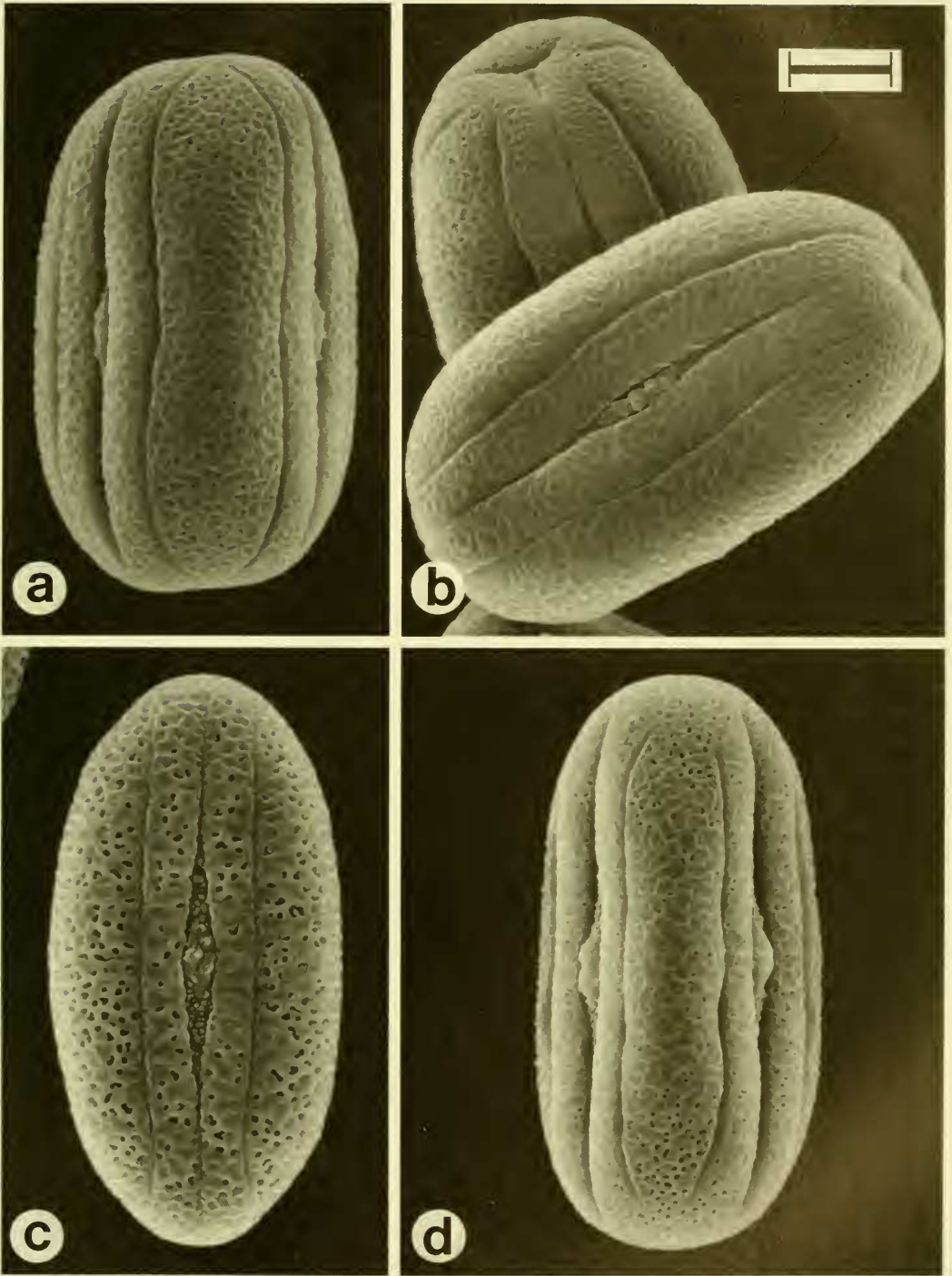


FIGURE 2. Pollen. a. *Aphanosperma sinaloensis* (Daniel et al. 6866), intercolpal view; b. *A. sinaloensis* (Daniel et al. 6866), colpal and subpolar views; c. *Carlowrightia arizonica* (Daniel et al. 6845), colpal view; d. *C. pectinata* (Daniel et al. 6846), intercolpal view. Scale for a-d = 7.5 μ m.

long, filaments white, sparsely pubescent proximally, glabrous distally, thecae dark maroon (turning blackish), 0.7–0.9 mm long, glabrous. Style 4–8 mm long, glabrous, stigma lobes 0.2 mm long. Capsule 9–14 mm long, stipe 6–8 mm long, densely pubescent near base with eglandular apically hooked trichomes 0.2–0.3 mm long, glabrous or pubescent with retrorse trichomes to 0.2 mm long distally, head 4–5 mm long, nearly glabrous to densely pubescent with retrorse eglandular trichomes to 0.2 mm long. Seeds 2, seed coat fused to inner wall of capsule except for a small portion across the slight opening of the valve, that portion tuberculate with subconic tubercles. ($n = 18$, Daniel et al. 1990). Fig. 3.

PHENOLOGY. — Flowering and fruiting: December (elsewhere: October–March).

DISTRIBUTION AND HABITAT. — Western Mexico (Baja California Sur, Sinaloa, Sonora); in our region the species is known only from the western escarpment of the Sierra de la Laguna in the Cape Region (Fig. 4), where plants occur in floodplains and on rocky slopes in tropical deciduous forest at 450–500 m elevation.

ADDITIONAL SPECIMEN EXAMINED. — MEXICO. Baja California Sur: Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, T. Daniel et al. 6866 (BR, CAS, ENCB, HCIB, K, MEXU, MICH, MO, SBBG, US).

This is the first report of *Aphanosperma* from the peninsula of Baja California. The region in which it was found (Rancho La Burrera) is a well-collected area of Baja California Sur; more than forty collections of Acanthaceae have been made there in this century. The region has excellent examples of tropical deciduous forest that are reminiscent of some of those in southern Sonora and Sinaloa where this species also occurs. Additional species of Acanthaceae that are known from the dry forests of northwestern Mexico might also eventually be found in the Cape Region of Baja California Sur.

Aphanosperma is a monotypic genus with flowers similar to those of some species of *Carlowrightia* and with unique capsules. Aspects of the reproductive biology of this species were discussed by Daniel (1988). The above description includes data from specimens collected in Sinaloa and Sonora. Our plants differ from those

on mainland Mexico by their generally smaller corollas (5.5–6.8 vs. 7–10 mm long), shorter stamens (3.7–4.3 vs. 4.5–6.5 mm long), and pollen with a polar aperture (vs. lacking a polar aperture). Vesture of the head of the capsule varies from densely pubescent to nearly glabrous among plants from the single population sampled in Baja California Sur.

CARLOWRIGHTIA

Carlowrightia A. Gray, Proc. Amer. Acad. Arts 13:364. 1878. nom. cons. LECTOTYPE (Bremekamp, Ind. Nom. Gener. Card 01197. 1956). — *Carlowrightia linearifolia* (Torr.) A. Gray (≡ *Schaueria linearifolia* Torr.).

Cardiakanthus Nees & S. Schauer in A. DC., Prodr. 11:331. 1847. nom. rej. TYPE. — *Cardiakanthus neesianus* S. Schauer ex Nees. (≡ *Carlowrightia neesiana* (S. Schauer ex Nees) T. F. Daniel).

Croftia Small, Fl. s.e. U. S. 1088. 1903, (not *Croftia* King & Prain, 1896). TYPE. — *Croftia parvifolia* (Torr.) Small (≡ *Schaueria parvifolia* Torr.).

Erect to ascending or decumbent perennial herbs or shrubs with cystoliths. Older stems with epidermis exfoliating. Leaves opposite (in ours, elsewhere rarely subopposite), sessile or petiole, margin entire (to sinuate). Inflorescence of dichasia in leaf axils, or, more commonly, of dichasiate spikes, racemes, thyrses, or panicles; dichasia alternate or opposite, 1–3 (or more)-flowered, sessile or pedunculate, subtended by a leaf or bract. Bracts and bracteoles small, green, inconspicuous, margin entire. Flowers homostylous, subtended by 2 homomorphic bracteoles, sessile or pedicellate. Calyx deeply 5-lobed, lobes homomorphic. Corolla white to cream to yellowish to rose-purple to blue, usually with yellow and maroon or purple markings on upper lip, tube cylindrical to subcylindrical, shorter than limb, throat indistinct, limb pseudopapilionaceous (in ours, elsewhere also bilabiate to subactinomorphic), upper lip comprising 2 fused lobes, (entire to) emarginate at apex, lower lip consisting of 2 similar lateral lobes and a lower-central lobe that is either similar in form to lateral lobes or ± recurved or conduplicate-keeled and enclosing stamens and distal portion of style during anthesis, corolla lobes imbricate in bud.

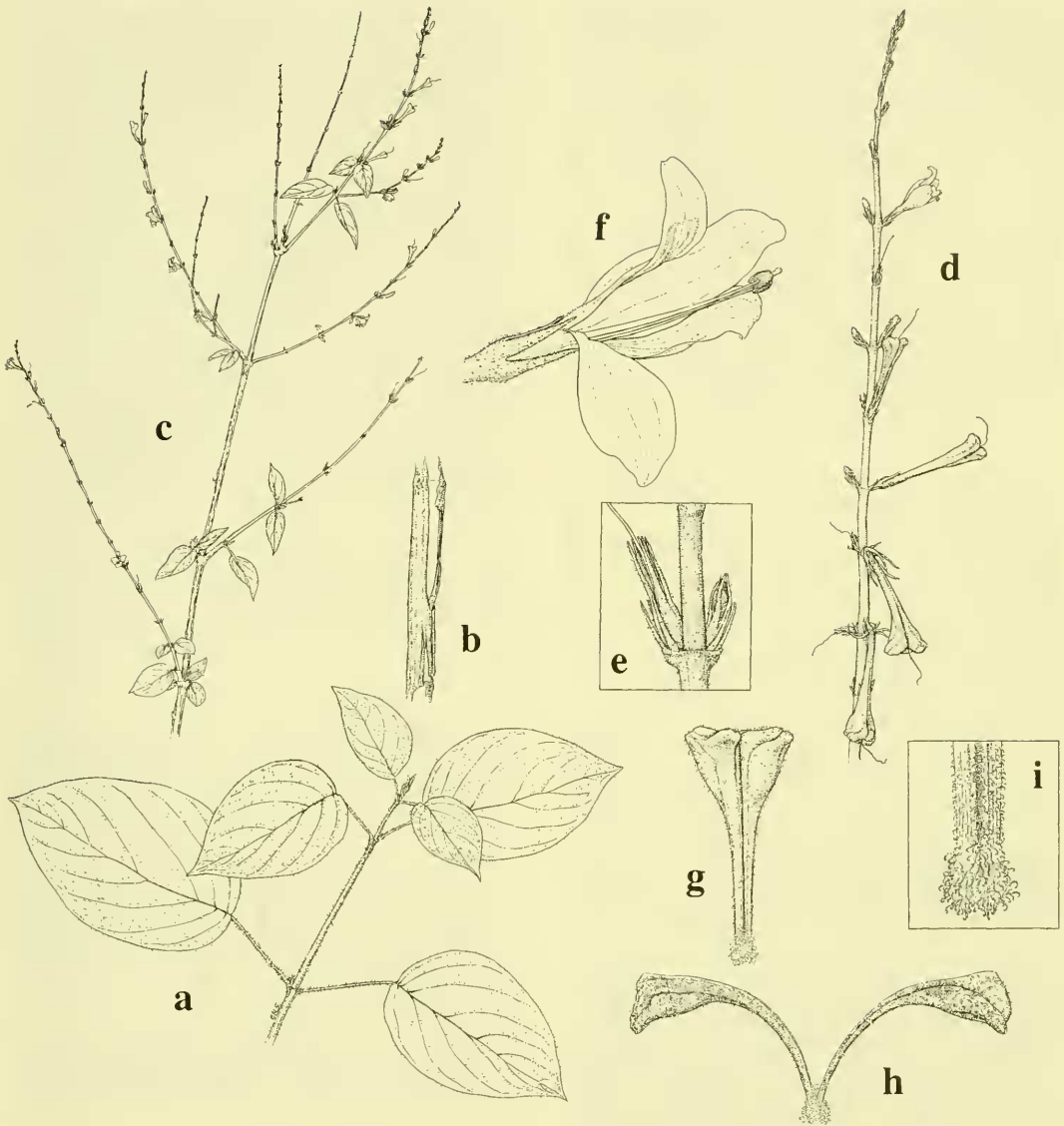


FIGURE 3. *Aphanosperma sinaloensis*. (all from *Daniel 4070cv*). a. vegetative shoot, $\times 0.5$; b. mature stem with exfoliating epidermis, $\times 1.2$; c. distal portion of shoot with inflorescences, $\times 0.4$; d. inflorescence showing progressive reflexing of capsules with age, $\times 1.3$; e. inflorescence node, $\times 6.5$; f. flower, $\times 6$; g. undehisced capsule, $\times 2.5$; h. dehiscent capsule with valves attached by uncinete trichomes at base of stipe, $\times 2.5$; i. base of stipe, $\times 11$. Drawn by Carolyn Rendu.

Stamens 2, inserted in distal portion of corolla tube, exerted from mouth of corolla, anthers 2-theous, thecae equal in size, parallel or subsagittate, subequally inserted on filament, lacking basal appendages, dehiscing toward upper lip of corolla (i.e., flowers stenotribal); pollen (Fig. 2c, d) prolate to subspheric, 3-colporate, 6-

pseudocolpate, pseudocolpi 2 per mesocolpium, exine reticulate; staminodes 0. Style exerted from mouth of corolla, stigma 2-lobed. Capsule stipitate, head flattened to nearly spheric, circular to ovate-elliptic in outline, retinacula present, septae with attached retinacula remaining attached to inner wall of mature capsule. Seeds

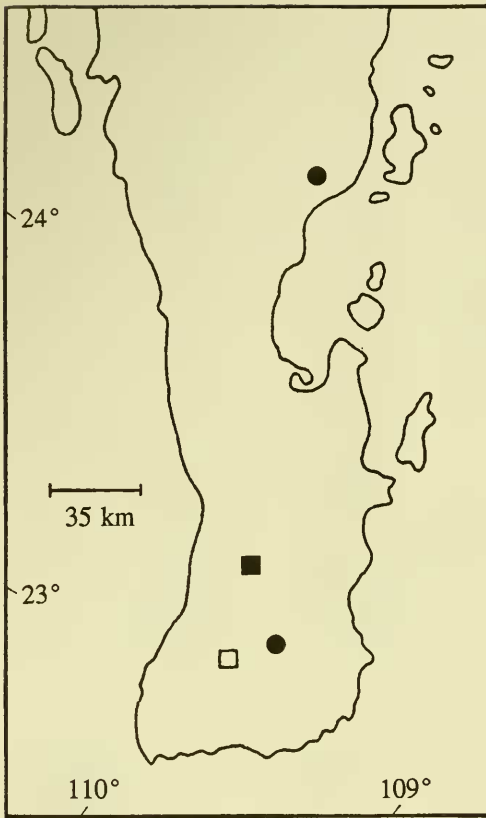


FIGURE 4. Distribution of *Aphanosperma sinaloensis* (square), *Dyschoriste decumbens* (open square), and *Justicia spicigera* (circles) in southern Baja California Sur.

2–4, homomorphic or heteromorphic, flat to concavoconvex, smooth or variously ornamented, lacking trichomes. ($x = 18$).

Twenty-four species are recognized in this New World genus. They occur from the southwestern United States throughout Mexico to northwestern Costa Rica and disjunctly to southwestern Ecuador. With 23 species, Mexico is the center of diversity for *Carlowrightia*. Seven species occur in the United States.

REFERENCES. — DANIEL, T. F. 1983. *Carlowrightia* (Acanthaceae). *Fl. Neotrop. Monogr.* 34:1–116; DANIEL, T. F. 1988. Taxonomic, nomenclatural, and reproductive notes on *Carlowrightia* (Acanthaceae). *Brittonia* 40:245–255.

Key to Species of *Carlowrightia*

1. Leaf blades petiolate, ovate to elliptic, 1.6–2.5 times longer than wide, margin flat;

lower-central lobe of corolla conduplicate-keeled, enclosing stamens and style; thecae maroon turning black; capsule glabrous, head 5.5–7.5 mm long; seeds 4, homomorphic *C. arizonica*

1. Leaf blades sessile to subsessile, linear to narrowly elliptic-lanceolate, 6–29 times longer than wide, margin revolute; lower-central lobe of corolla neither conduplicate nor keel-like, not enclosing stamens and style; thecae golden yellow; capsule pubescent (sometimes only sparsely so at apex), head 3.5–5.5 mm long; seeds 2–4, the third and fourth seeds (when present) usually markedly different in form from others (i.e., partially conduplicate and with a conspicuous pectinate margin) *C. pectinata*

1. *Carlowrightia arizonica* A. Gray, *Proc. Amer. Acad. Arts* 13:364. 1878. TYPE. — UNITED STATES. Arizona: Pinal Co., near Camp Grant, 1867, *E. Palmer* 165 (holotype: GH!).

Carlowrightia cordifolia A. Gray, *Proc. Amer. Acad. Arts* 21:406. 1886. TYPE. — MEXICO. Chihuahua: mountains above Batopilas, 1885, *E. Palmer* 224 (holotype: GH!; isotypes: K!, NY!, US!).

Carlowrightia glabrata Fernald, *Bot. Gaz. (Crawfordsville)* 20:536. 1895. TYPE. — MEXICO. Sinaloa: Villa Union, Jan 1893, *F. Lamb* 420 (lectotype, designated in *Fl. Neotrop. Monogr.* 34:76. 1983: GH!; isolectotypes: DS!, F!, G!, MO!, MSC!, NY!, US!).

Carlowrightia californica Brandegee, *Zoe* 5:172. 1903. TYPE. — MEXICO. Baja California Sur: Comondú, 22 Mar 1889, *T. Brandegee s.n.* (holotype: UC!).

Carlowrightia californica var. *pallida* I. M. Johnst., *Proc. Calif. Acad. Sci.*, ser. 4, 12:1169. 1924. TYPE. — MEXICO. Baja California: San Esteban Island, 20 Apr 1921, *I. Johnston* 3195 (holotype: CAS!; isotypes: GH!, US!).

See Daniel (1995) for a complete listing of synonyms for this species.

Erect to ascending perennial herbs to shrubs to 1 m tall. Young stems subterete to subquadrate, usually multistriate, variously pubescent with eglandular and sometimes glandular trichomes (see discussion). Leaves (plants sometimes

leafless or nearly so during anthesis) petiolate, petioles to 32 mm long, blades ovate to elliptic, 8–69 mm long, 5–35 mm wide, 1.6–2.5 times longer than wide, (rounded to) acute to acuminate at apex, acute to rounded to truncate to cordate at base, surfaces pubescent with eglandular and sometimes glandular trichomes, 2 or more orders of venation evident, margin flat. Inflorescence of axillary and terminal spicate axes or panicles of spicate axes, rachises variously pubescent with glandular and often eglandular trichomes (see discussion); dichasia sessile in axils of reduced leaves or bracts, solitary or opposite at nodes; flowers 1–3 per dichasium, sessile. Bracts (ovate to) lanceolate to subulate, 2–4 (–5) mm long, 0.6–1.7 mm wide, abaxial surface pubescent like rachis or pubescent with eglandular trichomes additionally or exclusively. Bracteoles linear to subulate, 1.5–3.6 mm long, 0.3–0.7 mm wide, abaxial surface pubescent like bracts. Calyx 2–4.6 mm long, abaxially pubescent like rachis (and sometimes with eglandular trichomes near apex of lobes when eglandular trichomes are absent from rachis), lobes subulate, 1.3–3.7 mm long. Corolla pseudopapilionaceous, cream to white with maroon and yellow markings on inner surface of upper lip (and sometimes with a yellowish region on outer surface of lower-central lobe), 10–19 mm long, externally pubescent with erect to flexuose eglandular trichomes, tube 2–7 mm long, upper lip obovate to spatulate, 6–13 mm long, 2.2–6.7 mm wide, lower lip 7–13.5 mm long, lobes heteromorphic, lateral lobes ovate-elliptic, 5.5–13 mm long, 2.4–7.5 mm wide, lower-central lobe conduplicate-keeled, enclosing stamens and style, 6–14 mm long, 2–5 mm wide. Stamens 4.5–9 mm long, thecae maroon turning black, 0.5–1.4 mm long. Style 7.5–15 mm long, glabrous. Capsule 9.5–14 mm long, glabrous, stipe 4–6.5 mm long, head flattened, 5.5–7.5 mm long. Seeds 4, homomorphic, flat, 3.5–4.5 mm long, 3–3.8 mm wide, surfaces nearly smooth to papillose, margin papillose-dentate. ($n = 18$, Daniel et al. 1984).

PHENOLOGY. — Flowering and fruiting: October–June.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona, California, Texas), Mexico (Baja California, Baja California Sur, Chiapas, Chihuahua, Coahuila, Colima, Guerrero, Jalisco, México, Michoacán, Nayarit,

Oaxaca, Puebla, San Luis Potosí, Sinaloa, Sonora), Guatemala, Nicaragua, and Costa Rica; in our region (Fig. 5) the species is abundant in the Cape Region and has been collected much less frequently northward in the Sierra de la Giganta and the Sonoran Desert (Lower Colorado River Valley, Vizcaño, and Central Gulf Coast subdivisions); the species is not known from the Magdalena subdivision of the Sonoran Desert and is very rare in the Vizcaño subdivision; plants occur along watercourses, on rocky slopes and rocky or sandy plains, and in artificially disturbed areas (e.g., roadcuts) in deserts scrub, thornscrub, tropical deciduous forest, and oak woodland at 3–750 (–1100) m elevation.

ADDITIONAL SPECIMENS EXAMINED. — UNITED STATES. California: San Diego Co: Anza Borrego Desert State Park, Borrego Palm Canyon, ca. 2 km NW of Borrego Springs, *M. Bourell 3509* (CAS).

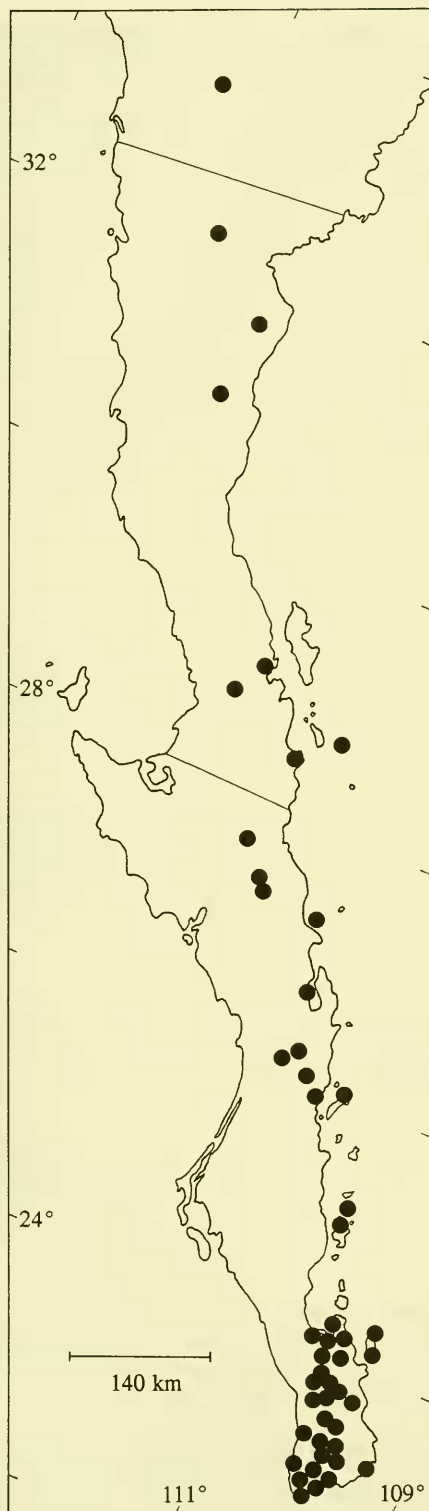
MEXICO. Baja California: San Julio, *T. Brandegee s.n.* (UC); along Hwy 5, 5.9 mi S of La Ventana, *T. Daniel 1545* (ASU, CAS); 7 mi W of San Francisquito Bay, *C. Harbison 41674* (DS, SD); Mpio. Ensenada, San Borja, 28°46'N, 113°55'W, *P. Tenorio L. & C. Romero de T. 13095* (CAS); Cañón de Guadalupe, above resort area, ca. 32°09'N, 115°48'W, *R. Thorne et al. 61769* (RSA); 14 mi N of Los Angeles, *I. Wiggins 5427* (DS, MICH, UC, US); W margin of San Felipe Desert, El Cajón, SW of San Felipe, *I. Wiggins 9837* (DS). Baja California Sur: San José del Cabo, *A. Anthony 351* (DS, F, GH, MO, UC, US); near San José, *Bailey Herbarium 220* (F); N Sierra de la Giganta, on track to San José Comondú, 23 mi S of rd to San Isidro, 11 mi W of Hwy 1, ca. 26°15'N, 111°45'W, *S. Boyd & T. Ross 5925* (RSA); W side Cape Region, *T. Brandegee s.n.* (GH, UC); Comondú, *T. Brandegee s.n.* (UC); Sierra de Laguna, *T. Brandegee s.n.* (UC); 2.6 mi S of Todos Santos on hwy. to Cabo San Lucas, *D. Breedlove & D. Axelrod 43135* (CAS); 23 km S de San José del Cabo, carr. a Cabo San Lucas, 22°55'N, 109°52'W, *A. Campos V. et al. 4504* (CAS); 12 km NW of San Bartolo, 23°46'N, 109°50'W, *A. Carter 2656* (DS, LL, UC); Sierra de la Giganta, Arroyo Gabilán, ca. 25°55'N, 111°23'W, *A. Carter 4072* (UC); Sierra de la Victoria, between "Tapon" and Rancho Poza Larga, Arroyo de San Francisquito, ca. 23°29–31'N, 109°47–55'W, *A. Carter & R. Ferris 3378* (DS, UC); Sierra de la Victoria, La Spila, Arroyo Santa Rita, 23°29–31'N, 109°47–55'W, *A. Carter & R. Ferris 3410* (DS, SD, UC); Sierra de la Giganta, between La Victoria and portezuelo to the E, ca. 25°52'N, 111°25'W, *A. Carter & R. Ferris 3918* (UC); Sierra de la Giganta, Valle de

Los Encinos (S side of Cerro Giganta), ca. 26°04'N, 111°34'W, A. Carter & R. Ferris 4023 (UC); 13 km E of Cabo San Lucas, A. Carter et al. 2250 (DS, UC, US); Cape Region, opposite dam above Boca de la Sierra, ca. 23°21'N, 109°49'W, A. Carter et al. 5799 (CAS, UC); La Paz, Collins et al. 63 (US); 2 mi N of Miraflores, L. Constance 3181 (CAS, DS, F, GH, LL, MICH, MO, NY, SD, UC, US); Cape San Lucas, 1 mi from beach, T. Craig 755 (POM); S end of Bahía Coyote, across from Rancho El Coyote, 16.7 mi S of Puente Mulegé, ca. 26°42'N, 111°55'W, T. Daniel 207 (CAS, DUKE, F, GH, MEXU, MICH, MO, NY, UC, US); Isla Bargo in Bahía Coyote, ca. 26°42'N, 111°55'W, T. Daniel 209 (ENCB, MEXU, MICH); along Hwy 1, 4.1 mi E of San Ignacio, T. Daniel 1882 (CAS); near jct Hwy 1 and rd to Sta. Marta, near Alfredo V. Bonfil, ca. 27°22'N, 112°43'W, T. Daniel & M. Butterwick 6774 (CAS); Arroyo La Huerta, near Hwy 286 between La Paz and San Juan de los Planes, 2.7 km E of La Huerta, ca. 24°03'N, 110°09'W, T. Daniel & M. Butterwick 6835 (CAS, HCIB, MEXU); along rd to Microondas San Antonio, 2.7 km S of San Antonio, ca. 23°47'N, 110°04'W, T. Daniel & M. Butterwick 6867 (CAS, HCIB); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 1 km W of Hwy 1, ca. 23°14'N, 109°45'W, T. Daniel & M. Butterwick 6897 (CAS, MEXU); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 3.5 km NE of San Pedro de la Soledad, ca. 23°15'N, 109°57'W, T. Daniel & M. Butterwick 6944 (CAS, HCIB); along Hwy 11, 2.1 mi S of ferry terminal at Pichilingue, T. Daniel et al. 2470 (ASU, CAS); along Hwy 1, 4.4 mi NW of El Triunfo, T. Daniel et al. 2487 (ASU); near Hwy 1 SE of San Bartolo, 28.2 mi SE of El Triunfo, T. Daniel et al. 2513 (ASU); along Hwy 19 just S of Microondas El Carizal, ca. 5.6 km S of jct Hwy 1 S of San Pedro, ca. 23°50'N, 110°14'W, T. Daniel et al. 6845 (CAS, K, MEXU, SBBG, US); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, T. Daniel et al. 6855 (CAS); Punta Frailes, E. Dawson 1133 (MICH, RSA), 1146 (RSA); San José del Cabo, E. Dawson 1196 (F, MICH, RSA); Cape San Lucas, E. Dawson 6422 (RSA); 2 mi S of San Pedro along Rte. 19 toward Todos Santos, T. Elias 10721 (RSA); Isla Cerralvo, lado S de la isla, 1 km de la playa, G. Flores F. 540 (RSA); Cape District, El Triunfo, H. Gentry 4331 (DES, DS, GH, MO, UC); Rancho La Huerta area, ca. 12 km SE of La Paz toward San Juan de los Planes, ca. 24°02'N, 110°09'W, D. Harder & W. Appleby 1092

(RSA); 16 km N of La Paz, 2 km S of Pichilingue, J. Henrickson 2185 (MICH, RSA); Cerralvo Island, Ruffo's Ranch, I. Johnston 4052 (CAS); Miraflores, M. Jones 24170 (A, F, GH, LA, MICH, MO, NY, POM, SD, UC, US); Todos Santos, M. Jones 24199 (F, GH, MO, POM); Laguna Mts, 14 mi E of Todos Santos, M. Jones 24200 (NY, POM); ramal a Los Naranjos, ca. 7 km W of Hwy 1, 23°10'N, 109°45'W, G. Levin 1748 (SD); Cerralvo Island, middle of S coast, 24°09'N, 109°54'W, R. Moran 3573 (A, DS, LL, SD, UC); San José Island, N side of Amartajada Bay near village, 24°55'N, 110°38'W, R. Moran 3798 (DS); Carmen Island, Ballandra Bay, 26°00'N, 111°10'W, R. Moran 3929 (DS); Cape Region, Arroyo de los Pozos, 24°11'N, 110°12'W, R. Moran 6883 (SD); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, R. Moran 6929 (CAS, DS, SD); Cape Region, Arroyo San Bernardo, ca. 3 km above Boca de la Sierra, ca. 23°23'N, 109°49'W, R. Moran 7087 (CAS, DS, GH, SD, TEX); Cape Region, 12 km SE of San Pedro, ca. 23°50'N, 110°11'W, R. Moran 7131 (CAS, DS, ENCB, GH, RSA, SD, US); Cape Region, S fork of Cañón San Pedro, ca. 23°19'N, 109°55'W, R. Moran 7414 (CAS, DS, ENCB, GH, SD, US); San Marcos Island, Arroyo de los Chivos, 27°15'N, 112°06'W, R. Moran 8988 (SD); Cerralvo Island, Arroyo Aguaje, ca. 24°18'N, 100°55'W, R. Moran 9458 (DS, SD); La Paz, E. Palmer 107 (GH, US); Cape District, Santiago, 3 mi S of Caduano, R. Peters 18 (UC); ca. 1 mi up hillside S of main arroyo, 3.5 mi E of San Bartolo, D. Porter 286 (CAS, DS, GH); Cape Region, San Felipe, C. Purpus 508 (GH, UC); 4 mi NW of El Triunfo, J. Reeder & C. Reeder 6746 (ARIZ); Cape San Lucas, J. Rose 16417 (US); San José del Cabo, J. Rose 16912 (US); 28.7 km N of Cabo San Lucas toward Todos Santos, ca. 23°05'N, 110°05'W, A. Sanders et al. 3443 (CAS, RSA, UCR); 16 mi S of La Paz, F. Shreve 7205 (DS, MICH, US); between Todos Santos and Cabo San Lucas; ca. 4 mi N of the Cape, R. Spjut 5405 (CAS); Arroyo San Lázaro, from its mouth (ca. 10 mi NW of San José del Cabo) to 3 mi upstream, J. Thomas 7775b (DS), 7775c (DS); ca. 10 mi W of La Paz, R. Turner et al. 77-82 (ARIZ); 8 mi SE of San Antonio, 23°45'N, 109°50'W, G. Webster 19505 (SD); 17 mi S of La Paz, J. Whitehead 850 (DS); N of Comondú, I. Wiggins 5481 (DS); between La Paz and San Pedro, I. Wiggins 5596 (DS, MICH, UC, US); 4 mi E of La Paz along rd to Las Cruces, I. Wiggins 14479 (CAS, DS, UC); 39.5 mi S of La Paz on rd to Todos Santos, I. Wiggins 14498 (DS,

→

FIGURE 5. Distribution of *Carlowrightia arizonica* in California, Baja California, and Baja California Sur.



GH, TEX); 3.4 mi S of El Valle Perdido on rd to La Junta, ca. 23°41'N, 110°06'W, *I. Wiggins 15383* (DS, UC); 15.5 mi SE of La Paz, on rd to Las Cruces, *I. Wiggins 15669-B* (DS); 10 mi SE of La Paz along rd to Los Planes, *I. Wiggins 15685* (DS, CAS); Isla San Diego, ca. 25°12'N, 110°40'W, *I. Wiggins 17821* (DS); along rd to Los Planes, 5.5 mi SE of La Paz, *I. Wiggins et al. 440* (DS, UC).

Daniel (1983a, 1984, 1988, 1995) discussed some of the morphological variation, and its geographic basis, in this widely distributed species. Since publication of a monograph of the genus (Daniel 1983a) *Carlowrightia arizonica* has been collected in the northeastern portion of Baja California and in southern California. The description above is derived from specimens collected in California and the peninsula of Baja California only. Five forms can be readily distinguished from among collections occurring in these regions. All but one are restricted to the Cape Region of Baja California Sur. Most of these forms do not correspond well to plants treated by Wiggins (1980) as *C. arizonica*, *C. californica*, and *C. cordifolia*.

Form A. Young stems evenly puberulent with retrorse eglandular trichomes 0.05–0.1 (–0.2) mm long; inflorescences of unbranched spikes; and rachises pubescent with subglandular to glandular (rarely absent) and eglandular trichomes. This is the most widespread form with plants occurring from southern California southward throughout most of the peninsula of Baja California to the Cape. The type of *C. californica* conforms to this form and most specimens corresponding to this form have been so annotated. The following collections are representative of this form: *Anthony 351*; *Brandege s.n.* (19 Apr 1889); *Breedlove & Axelrod 43135*; *Carter 4023, 4072*; *Daniel 1882, 2470*; *Harbison 41674*; *Jones 24199*; *Moran 3798, 3929*; *Tenorio L. & Romero de T. 13095*; *Wiggins 5427, 9837, 17821*.

An extreme expression of this form from Isla San Esteban in the Gulf of California was described as *C. californica* var. *pallida*. In these plants the stems are so densely pubescent that the epidermis is not visible and they appear very pale in color. Collections from hills near Bahía Concepción (*Daniel 207, 209*) resemble Johnston's type specimen from Isla San Esteban. Additional information on plants grown from seeds of

Daniel 207 was provided by Daniel (1983a). Collections from southern California (*Bowell 3509*), northeastern Baja California (*Daniel 1545*), and northeastern Baja California Sur (*Daniel & Butterwick 6774*) approach the density of cauline pubescence evident in Johnston's type specimen.

Form B. Young stems pubescent with (flexuose to) retrorse eglandular trichomes 0.05–0.3 (–0.5) mm long (or up to 0.8 mm long at nodes) and sometimes with erect inconspicuous glandular trichomes 0.05–0.1 mm long as well, the internodal trichomes \pm concentrated in 2 lines; inflorescences of unbranched (or rarely once-branched at the base) spikes; and rachises pubescent with subglandular, glandular, and usually eglandular trichomes. This form occurs only in the Cape Region (i.e., vicinity of La Paz and southward) and is represented by the following collections: *Brandegee s.n.* (Nov. 1902); *Campos V. et al. 4504*; *Carter et al. 2250*; *Daniel & Butterwick 3865*; *Daniel et al. 6845*; *Gentry 4331*; *Moran 7131*; *Sanders et al. 3443*; *Shreve 7205*, *Spjut 5405*; *Whitehead 850*, *Wiggins 14479*, *14498*, *15669-B*, *15685*; *Wiggins et al. 440*. Wiggins identified material here referred to this form as both *C. californica* and *C. cordifolia*.

Form C. Young stems \pm evenly (or soon bifariously) pubescent with (erect to) flexuose to retrorse eglandular trichomes 0.3–1 mm long and sometimes with an understory of subglandular to glandular trichomes 0.05–0.1 mm long as well; inflorescences of mostly unbranched spikes (or in *Constance 3181*, the inflorescences appear to branch several times); and rachises pubescent with subglandular, glandular, and usually some eglandular trichomes. The form occurs primarily in the Cape Region south of latitude 24°N, but is also known from the Sierra de la Giganta at ca. lat. 25°53'N as well. The following collections are representative of this form: *Brandegee s.n.* (27 Jan. 1890); *Carter 2656*; *Carter & Ferris 3918*; *Constance 3181*; *Daniel & Butterwick 6867*, *6897*, *6944*; *Daniel et al. 2487*, *2513*, *6855*; *Jones 24170*; *Moran 6929*, *7131*; *Thomas 7775b*, *7775c*; *Wiggins 5596*, *15383*. *Purpus 508* (UC) contains a shoot of Form A and one of Form C.

Form D. Young stems evenly pubescent with erect to flexuose glandular and eglandular trichomes 0.3–1 mm long; inflorescences of much branched (the branching mostly dichoto-

mous) spikes; and rachises pubescent with subglandular and glandular trichomes. It occurs in the Cape Region south of latitude 24°N and has usually been identified as *C. californica*. The following collections are representative of this form: *Carter & Ferris 3378*, *3410*; *Carter et al. 5799*; *Moran 7087*, *7414*; and *Porter 286*.

Form E. Young stems evenly pubescent with retrorse eglandular trichomes 0.05–0.1 mm long; inflorescences of much branched spikes; and rachises pubescent with subglandular, glandular, and eglandular trichomes. This is the most restricted of the forms, occurring only on Cerralvo Island in the southern portion of the Gulf of California. It is represented by the following collections: *Flores F. 540*; *Johnston 4052*; *Moran 3573*, *9458*.

Information on the reproductive biology and pollination ecology of this species was provided by Daniel (1983a).

Carlowrightia arizonica is treated in section *Pseudopapilionaceae* T. F. Daniel (Daniel 1983a) where it appears to be most similar to *C. neesiana* (S. Schauer ex Nees) T. F. Daniel, a species of eastern and southern Mexico with more glandular pubescence.

2. *Carlowrightia pectinata* Brandegee, Proc. Calif. Acad. Sci., ser. 2, 3:160. 1891. TYPE. — MEXICO. Baja California Sur: San José del Cabo, 24 Sep 1890, *T. Brandegee 452* (holotype: UC!; isotypes: F!, GH!, US!).

Carlowrightia fimbriata Brandegee, Proc. Calif. Acad. Sci., ser. 2, 3:161. 1891. TYPE. — MEXICO. Baja California Sur: San Pedro, 29 Oct 1890, *T. Brandegee 453* (holotype: UC!; isotypes: CAS!, F!, G!, GH!, MIN!, US!).

Carlowrightia lanceolata Leonard, Kew Bull. 1938:66. 1938. TYPE. — MEXICO. México: Distr. Temascaltepec, Tejupilco, 21 Dec 1932, *G. Hinton 2672* (holotype: K; isotypes: ENCB!, F!, G!, GH!, MO!, NY!, TEX!, RSA!, US!).

Erect to ascending perennial herbs to shrubs to 1 m tall. Young stems quadrate, glabrous or bifariously pubescent with retrorse to retrorse-appressed eglandular trichomes 0.05–0.2 (–0.5) mm long (strigillose), the nodes frequently pubescent with flexuose eglandular trichomes to 0.8 mm long. Leaves sessile (to subsessile with petioles to 1 mm long), blades linear to narrowly

elliptic-lanceolate, (5-) 30-85 mm long, 0.5-13 mm wide, 6-29 times longer than wide, long-acuminate at apex, acute to long-attenuate at base, surfaces glabrous (or strigillose on adaxial surface), only midvein evident on most leaves (at least adaxially; several orders of venation evident on wider leaves), margin revolute. Inflorescence of numerous spicate axes from axils of distal (sometimes greatly reduced) leaves, collectively forming a ± leafy, often dichotomously branched, panicle to 40 cm long, rachises glabrous or pubescent with straight glandular (and sometimes eglandular as well) trichomes 0.05-0.2 mm long (glandular puberulent); dichasia sessile or rarely short (to 0.5 mm long) pedunculate in the axil of a bract, solitary or opposite at nodes; flowers 1 (-2) per dichasium, sessile to short (to 1 mm long) pedicellate. Bracts linear to subulate, 0.8-5 mm long, 0.2-1 mm wide, abaxial surface glabrous or glandular puberulent. Bracteoles linear to subulate, 0.8-2.2 mm long, 0.3-0.5 mm wide, abaxial surface glabrous or glandular puberulent. Calyx 2-3.5 mm long, abaxially glabrous or glandular puberulent, lobes subulate, 1.5-3 mm long. Corolla subactinomorphic, bright yellow (rarely light purplish), 7.5-12 mm long, externally pubescent (rarely glabrous) with trichomes 0.2-0.4 mm long, tube 1.7-2.5 mm long, upper lip oblanceolate-obovate to spatulate, 5.5-8.5 mm long, 1.8-2.5 mm wide, lower lip 6-8 mm long, lobes homomorphic, obovate to elliptic, 5-9.5 mm long, 1.5-4.5 mm wide. Stamens 5-8 mm long, thecae golden yellow, 1-1.3 mm long. Style 6-7.5 mm long, glabrous. Capsules 6.5-9 mm long, pubescent (often sparsely so at apex only) with eglandular trichomes 0.2-0.3 mm long, stipe 3-5 mm long, head spheric to partially flattened, 3.5-5.5 mm long. Seeds 2-4 per capsule, concavoconvex, 2.5-3.5 mm long, 2.3-3 mm wide, tuberculate with prominent conical tubercles on concave side, smooth to papillose on convex side, margin entire or dentate, teeth widely scattered or restricted to the base, usually with retrorse barbs (third or fourth seeds, when present, partially conduplicate with exaggerated winglike marginal teeth). ($n = 18$, Daniel et al. 1990). Fig. 6.

PHENOLOGY. — Flowering: December-May; fruiting: December-March.

DISTRIBUTION AND HABITAT. — Western Mexico (Baja California Sur, Colima, México, Oaxaca, Sinaloa, and Sonora); in our region the

species is known only from the Cape Region and the Sierra de la Giganta in Baja California Sur (Fig. 7); plants occur in and along watercourses and on slopes in thornscrub and tropical deciduous forest at 200-750 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: San José del Cabo, *T. Brandegeae* s.n. (UC); brecha a Alvaro Obregón, 7.5 km de la carr. La Paz-El Triunfo, 23°52'N, 110°08'W, *A. Campos V. et al. 4517* (CAS); Sierra de la Giganta, between La Esperanza and Arroyo Peloteado (near Rancho El Potrero), ca. 25°49'N, 111°27'W, *A. Carter 4371* (MICH, RSA, UC); Sierra de la Giganta, Cerro Gabilán, S of Portezuelo de Gabilán, ca. 25°51'N, 111°25'W, *A. Carter 5052* (SD, UC); Sierra de la Giganta, Cerro Gabilán, S of Portezuelo de Gabilán, ca. 25°51'N, 111°25'W, *A. Carter 5052a* (MICH, UC); Sierra de la Giganta, Cañada del Quemado, NE end of Valle de Los Encinos (S side of Cerro Giganta), ca. 26°05'N, 111°33'W, *A. Carter & R. Moran 5313* (UC); along Hwy 19 just S of Microondas El Carrizal, ca. 5.6 km S of jct Hwy 1 S of San Pedro, ca. 23°50'N, 110°14'W, *T. Daniel et al. 6846* (BR, CAS, HCIB, MEXU, MICH, SBBG, US); Rancho San Andreas, Sierra de las Palmas, *H. Gentry & Fox 11810* (LL); Cape Region, 4.5 km W of La Palmilla, ca. 23°01'N, 109°45'W, *R. Moran 7071* (CAS, DS, SD); San José del Cabo, *C. Purpus 418* (MO, UC); San José del Cabo, *J. Rose 16429* (NY, US); between La Paz and San Pedro, *I. Wiggins 5597* (DS).

Considerable variation in color of the corolla is evident from throughout the range of this species. Most collections from our region note a yellowish corolla, but data on *Moran 7071* notes "orchid" (i.e., light reddish purple) colored corollas and a dried corolla on this collection at DS is indeed purple.

Carlowrightia pectinata is treated in section *Tuberculosperma* T. F. Daniel (Daniel 1983a) where it appears most similar to *C. albiflora* T. F. Daniel and *C. parvifolia* Brandegeae, species of Tamaulipas and the Chihuahuan Desert respectively.

DICLIPTERA

Dicliptera Juss., Ann. Mus. Natl. Hist. Nat. 9:267. 1807, nom. cons. TYPE. — *Dicliptera chinensis* (L.) Juss. (= *Justicia chinensis* L.).

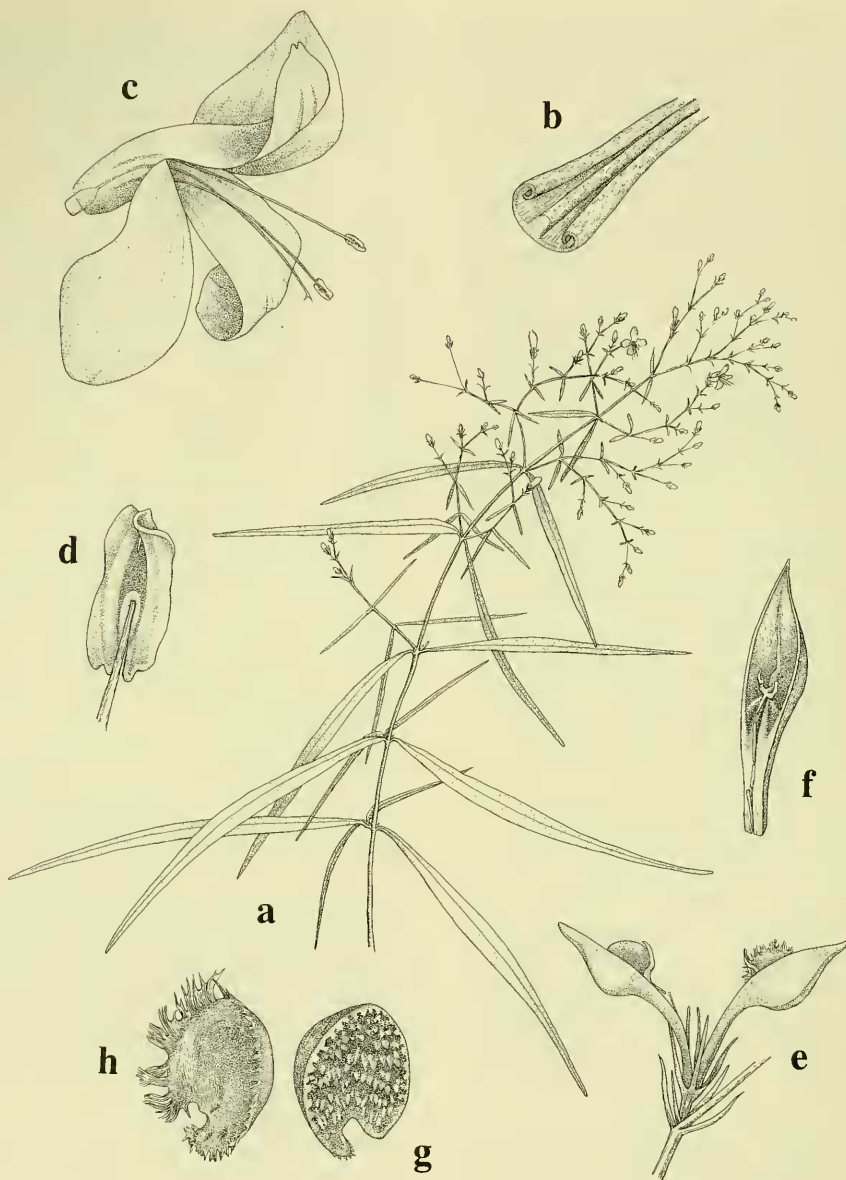


FIGURE 6. *Carlowrightia pectinata*. (a, b from Van Devender *et al.* 93-1449, c-h from Daniel 3345). a. habit, $\times 0.5$; b. portion of sectioned leaf, $\times 10$; c. flower with calyx removed, $\times 5$; d. anther, $\times 19$; e. inflorescence node with capsule, $\times 3$; f. capsule valve, $\times 4$; g. concavoconvex seed, $\times 7.5$; h. partially conduplicate seed with marginal teeth, $\times 7.5$. Drawn by Jenny Speckels.

Diapedium K. D. Koenig, Ann. Bot. 2:189. 1805 ("1806"), nom. rej. TYPE. — *Diapedium chinense* (L.) K. D. Koenig (\equiv *Justicia chinensis* L.).

Solenochasma Fenzl in J. Jacq., Ecl. pl. rar. 2:1. 1844. TYPE. — *Solenochasma assurgens* (L.) Fenzl (\equiv *Justicia assurgens* L.).

Dactylostegium Nees in Mart., Fl. bras. 9:162. 1847. TYPE. — *Dactylostegium sparsiflorum* Nees.

Erect to ascending or decumbent perennial herbs or shrubs with cystoliths. Young stems \pm distinctly 6-angled in cross-section. Leaves opposite, petiolate, margin entire to subsinuate. In-

florescence of axillary cymes (= modified dichasia ?) bearing 1 or more, bracteolate cymules; cymes alternate or opposite, subtended by paired bracts, sessile or pedunculate in leaf axils or in axils of inflorescence bracts forming a terminal spikelike thyrses or panicle of thyrses; cymules sessile or pedunculate, comprising an involucre of several pairs of bracteoles, outermost pair usually conspicuous and larger than inner, often hyaline, pair(s), cymule bracteoles of a pair equal or unequal in size. Flowers 1–several per cymule, homostylous, sessile. Calyx deeply 5-lobed, usually reduced (shorter than outer cymule bracts in ours) and hyaline, lobes equal to subequal. Corolla often resupinate (i.e., tube twisted 180°, elsewhere sometimes twisted 360°), pink to purple, red, or whitish (elsewhere also blue), often with pink to purple markings, tube cylindrical to gradually expanded distally but lacking a distinct throat (in ours), limb bilabiate, upper lip entire to emarginate, lower lip entire to shallowly 3-lobed (normal position of lips reversed when corolla resupinate), corolla lobes imbricate in bud. Stamens 2, inserted in proximal or distal 1/2 of corolla tube, exserted from mouth of corolla or rarely included in corolla tube, anthers 2-theous, thecae equal to subequal in size, parallel to perpendicular, equally to unequally inserted on filament, lacking basal appendages (in ours; elsewhere rarely with lower theca minutely appendaged at base), dehiscent toward lower lip (i.e., flower nototribal) in species with corollas either not resupinate or twisted 360°, dehiscent toward upper lip (i.e., flower stenotribal) in species with resupinate corollas; pollen (Fig. 8a, b) perprolate to prolate, 3-colporate, 6-pseudocolpate, pseudocolpi 2 per mesocolpium, exine reticulate; staminodes 0. Style exserted from mouth of corolla or rarely included in corolla tube, stigma 2-lobed, lobes equal. Capsule substipitate to stipitate, head ellipsoid to obovoid, retinacula present, septa with attached retinacula separating elastically and rising from inner wall of mature capsule. Seeds 2–4, homomorphic, subreniform to lenticular. ($x = 40$ in New World taxa, $x = 13$ or 15? in Old World taxa).

Although about 300 species have been described from tropical and temperate regions of the world, the number of species usually given is about one-half that number or fewer. The genus is in need of critical taxonomic study. About 15

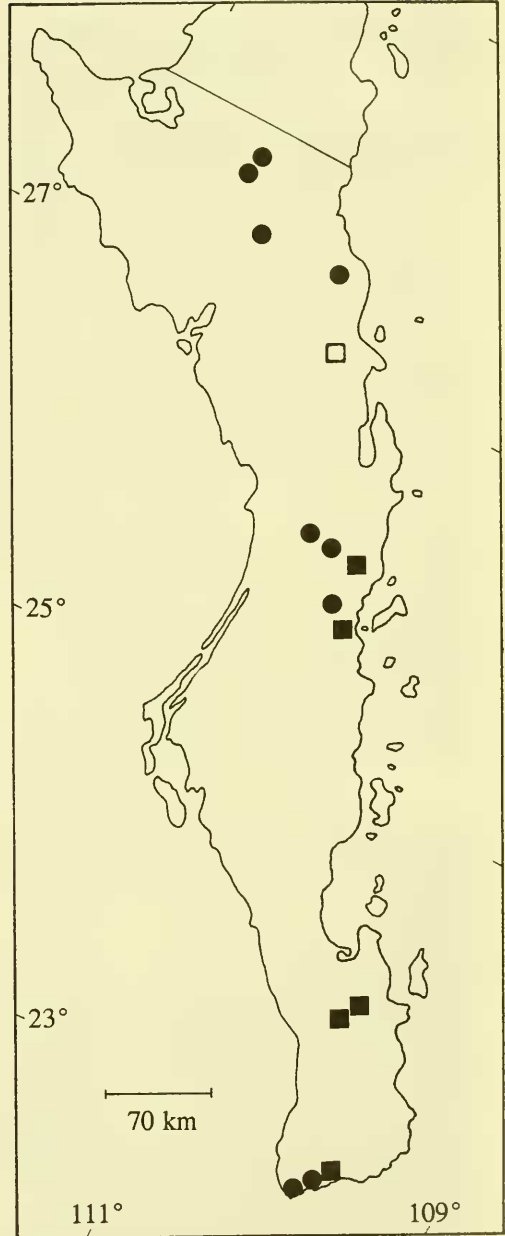


FIGURE 7. Distribution of *Carlowrightia pectinata* (squares), *Justicia cardicans* (open square), and *J. hians* (circles) in the peninsula of Baja California.

species occur in Mexico and three occur in the United States.

1. *Dicliptera resupinata* (Vahl) Juss., Ann. Mus. Natl. Hist. Nat. 9:268. 1807. *Justicia sexangularis* Cav., Icon. 3:2. 1795, non L. (1753). *Justicia resupinata* Vahl, Enum. pl. 1:114. 1804. *Diapedium resupinatum* (Vahl) Kuntze, Revis. gen. pl. 2:485. 1891. TYPE. — Not designated (see discussion below).

Dicliptera pseudoverticillaris A. Gray, Proc. Amer. Acad. Arts 20:308. 1885. TYPE. — MEXICO. Sonora: valley of the Altar, 2 Apr 1884, C. Pringle 27 (lectotype, designated here: GH!).

Dicliptera torreyi A. Gray, Proc. Amer. Acad. Arts 20:309. 1885. *Diapedium torreyi* (A. Gray) A. Heller, Cat. N. Amer. pl. 7. 1898. TYPE. — UNITED STATES. Arizona: unspecified collections of Thurber, Wright, Schott, Rothrock, Lenmon, and Pringle were cited (syntypes, see discussion below).

Dianthera sexangularis Sessé & Moc., Pl. nov. Hisp. 5. 1887. TYPE. — Icones Florae Mexicanae no. 22. Original plate preserved at Hunt Institute for Botanical Documentation, Pittsburgh, Pennsylvania, USA (lectotype, designated here), see discussion.

Dicliptera formosa Brandegee, Proc. Calif. Acad. Sci., ser. 2, 3:162. 1891. TYPE. — MEXICO. Baja California Sur: summit of Sierra de San Francisquito, 20 Oct 1890, T. Brandegee 455 (holotype: UC!; isotypes: GH!, NY).

Dicliptera resupinata var. *orbicularis* B.L. Rob. & Seaton, Proc. Amer. Acad. Arts 28:114. 1893. TYPE. — MEXICO. Jalisco: barranca near Guadalajara, Oct 1891, C. Pringle 5169 (holotype: GH; isotype: MEXU!).

Ascending to erect annual to perennial herbs to 5 (–8) dm tall. Young stems hexagonal, nearly glabrous or pubescent (especially just proximal to nodes) with flexuose to retrorse to retrorsely appressed eglandular trichomes 0.1–0.4 mm long, the trichomes restricted to ridges, or ± densely and evenly pubescent with erect to downward-pointing to retrorse eglandular trichomes 0.2–1.2 mm long (see discussion). Leaves (plants sometimes leafless or nearly so during anthesis) petiolate, petioles to 35 mm long, blades ovate to lanceolate, 11–95 mm long, 3–44 mm wide, 1.6–6.7 times longer than wide, acute to acuminate to attenuate at apex, rounded

to acute to subtruncate at base, surfaces pubescent with eglandular trichomes, trichomes sometimes restricted to major veins. Inflorescence of subsessile to pedunculate cymules and/or cymes of cymules from leaf axils, cymules and/or cymes (alternate to) opposite, 1–2 per axil, cymes consisting of (1–) 3 (–5) cymules, terminal (i.e., central) cymule of cymes sometimes modified into a branch bearing pedunculate cymules or cymes of cymules in axils of leaves or reduced leaflike bracts, peduncles of cymes 0.05–7 (–28) mm long, pubescent with cauline type trichomes, paired bracts subtending cymes subulate to linear to lanceolate to oblanceolate (to ovate), often curved, 2–11 (–13) mm long, 0.2–2 (–4.5) mm wide, abaxial surface glabrous, or with a few antrorse eglandular trichomes 0.1–0.2 mm long, or covered with erect to antrorse eglandular trichomes 0.2–0.6 mm long, margin ciliate with erect to antrorse eglandular trichomes 0.1–0.6 mm long (solitary cymules in axils of leaves or bracts usually not subtended by paired bracts); cymules pedunculate, peduncles 1.5–5.1 mm long, pubescent (often more densely so) with cauline type trichomes. Outer cymule bracteoles sometimes tinged with maroon at margin and apex, cordate to deltate, 5–18 (–24) mm long, equal to subequal (i.e., one up to 1.2 times longer than the other), 4–15 (–20) mm wide, (acute to rounded to truncate to) emarginate at apex, abaxial surface glabrous, or pubescent with a few antrorse eglandular trichomes 0.1–0.2 mm long, or pubescent with erect to flexuose to antrorse eglandular trichomes 0.1–0.7 mm long. Inner cymule bracteoles elliptic to lance-ovate, 1.5–3.5 (–4.5) mm long, 0.8–1.5 mm wide, abaxial surface glabrous or pubescent like outer cymule bracteoles. Calyx 2–3.5 (–4.8) mm long, abaxially pubescent with antrorse to antrorsely appressed eglandular trichomes 0.2–0.4 mm long, lobes triangular to lanceolate to lance-ovate, 1–3 (–3.8) mm long. Corolla resupinate 180°, pink to purplish red with a white region bordered by darker pink markings on upper lip, 12–26 (–30) mm long, externally pubescent with erect to flexuose to retrorse eglandular trichomes 0.1–0.2 (–0.5) mm long, tube 6–11 (–17) mm long, 1.1–1.7 (–2.5) mm in diameter near midpoint, upper lip curved to recurved, 6–15 (–18) mm long, 3-lobed at apex, lobes 0.6–2 mm long, lower lip 6–15 (–18) mm long, entire to emarginate at apex. Stamens 5.5–15 (–22) mm long,

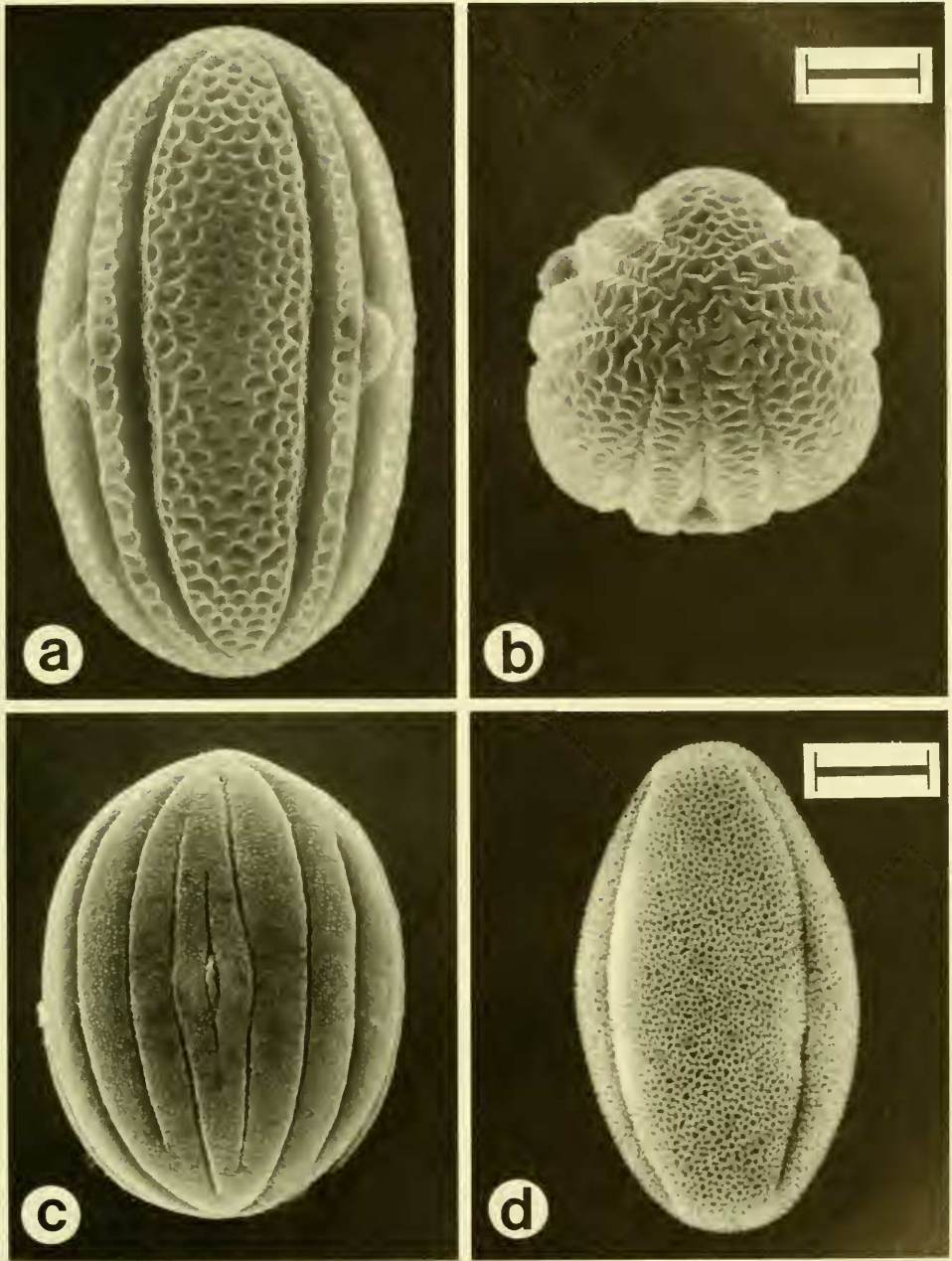


FIGURE 8. Pollen. a. *Dicliptera resupinata* (Daniel et al. 6865), intercolpal view; b. *D. resupinata* (Daniel et al. 6865), polar view; c. *Dyschoriste decumbens* (Jones 24437), colpal view; d. *Elytraria imbricata* (Porter 297), intercolpal view. Scale for a and b = 7.5 μ m; scale for c and d = 10 μ m.

inserted near apex of corolla tube (or in distal 1/2 of tube), filaments distally pubescent with eglandular trichomes, thecae 0.5–1.1 (–1.6) mm long, equal in length, parallel to subperpendicular, superposed (contiguous or with a gap up to 0.1 mm long) or unequally inserted (overlapping by up to 0.4 mm), dehiscent toward upper lip. Style 10.5–22 (–32) mm long, sparsely pubescent (at least proximally) with eglandular trichomes, stigma lobes 0.2–0.3 mm long. Capsule 4.4–7.5 (–9) mm long, glabrous, stipe 0.5–1.5 mm long. Seeds subreniform, 1.3–2.6 mm long, 1.8–3 mm wide, surface covered with tubercles bearing retrorse barbs (or these becoming low rounded encrustations). (n = 40, Daniel et al. 1990). Fig. 9.

PHENOLOGY. — Flowering and fruiting: September–May.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona, New Mexico) and western Mexico (Baja California Sur, Chihuahua, Colima, Guerrero, Jalisco, Michoacán, Sinaloa, Sonora, Zacatecas); in our region the species is known from the Cape Region, the Sierra de la Giganta, and much of the Sonoran Desert (Central Gulf Coast, Vizcaíno, and Magdalena subdivisions) in Baja California Sur (Fig. 10); plants occur along watercourses, on rocky slopes, and in artificially disturbed areas (e.g., roadsides) in desertscrub, thornscrub, tropical deciduous forest, and oak woodland from near sea level to 1900 m elevation.

LOCAL NAME. — “Huachichila” (*Peters 21*).

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. **Baja California Sur:** N Sierra de la Giganta, S of Mulegé, base of Mesa San Felipe, 1.7 mi S of rd to San Isidro, 11 mi W of Hwy 1, ca. 26°20'N, 111°46'W, *S. Boyd & T. Ross 5898* (RSA); N Sierra La Giganta, S of Mulegé, on track to San José Comondú, 23 mi S of rd to San Isidro, 11 mi W of Hwy 1, ca. 26°15'N, 111°45'W, *S. Boyd & T. Ross 5924* (CAS, RSA, UCR); Agua Caliente, *T. Brandegee 454* (UC), *s.n.* (DS); Sierra de la Laguna, *T. Brandegee 455* (UC), *s.n.* (UC); El Taste, *T. Brandegee s.n.* (UC); Cape Region, *T. Brandegee s.n.* (UC); San José del Cabo, *T. Brandegee s.n.* (UC, GH); Comondú Viejo, *T. Brandegee s.n.* (UC); Saucito, *T. Brandegee s.n.* (GH, POM, UC); Sierra El Taste, *T. Brandegee s.n.* (UC); Río del Salada along rd from Puerto Chale to Santa Rita, *D. Breedlove & D. Axelrod 43122* (CAS); Sierra La Laguna, interior valley (La Laguna) S of Pico La Aguja, *D. Breedlove & D. Axelrod 43365* (CAS); brecha a Alvaro Obregón,

7.5 km de la carr. La Paz–El Triunfo, 23°52'N, 110°08'W, *A. Campos V. et al. 4516* (CAS); Sierra de la Giganta, W slope of Cerro Gabilán, ca. 25°50'N, 111°24'W, *A. Carter 5112* (CAS); E side of Sierra de la Victoria, near “Tapon” (jct with La Chuparosa trail), Arroyo de San Francisquito, 23°29–31'N, 109°47–55'W, *A. Carter & R. Ferris 3370* (DS, SD, UC); Sierra de la Giganta, Cañón de Tiojo, S of La Victoria, ca. 25°51'N, 111°25'W, *A. Carter & R. Ferris 3940* (CAS); Cerro de la Giganta, ridge NW of main peak, 26°08'N, 111°36'W, *A. Carter et al. 2045* (DS); Llano de Magdalena, 11.5 km S of San Domingo, *A. Carter et al. 2146* (DS); San Francisco Mts, Rancho Los Corralitos, 2.8 mi W of Rancho San Francisco, *D. Charlton 88* (RSA, UCR); Llanos de Yres (Madgalena Plain) 11 mi N of Salada (Medano), *L. Constance 3157* (CAS, DS, SD, UC); Cape San Lucas, *T. Craig 743* (POM); along Hwy 1 between San Antonio and San Bartolo, ca. 4 km SE of San Antonio, ca. 23°48'N, 110°01'W, *T. Daniel & M. Butterwick 6868* (BR, CAS, HCIB, MEXU, MICH, SBBG, US); along Hwy 1, 4.4 mi NW of El Triunfo, *T. Daniel et al. 2489* (ASU, CAS); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, *T. Daniel et al. 6865* (CAS, ENCB, HCIB, K, MO); Puerto Escondido, SW side of lagoon, *E. Dawson 6400* (RSA); Cerro El Picacho, 23°35'N, 110°02'W, *R. Domínguez C. 46R* (HCIB); Isla San José, lado O de la isla, 2 km de la playa, 25°00'N, 110°35'W, *G. Flores F. 438* (RSA); San Bartolo, *F. Gander 9650* (CAS, SD); Cerro de la Giganta, *H. Gentry 4285* (DS); S end of Vizcaíno Desert, ca. 15 mi N of San Ignacio, *B. Hammerly 93* (CAS); Sierra de la Laguna, base of El Picacho Peak, *B. Hammerly 328* (CAS); Cape Region, Boca de Tinaja, *D. Johansen 547* (DS); Laguna Mts, Cota Ranch, 14 mi E of Todos Santos, *M. Jones 24153* (SD), *24155* (DS, GH, POM), *24156* (DS); W side of the Lagunas, *M. Jones 27392* (POM, UC); Cañón de la Burrera, Ojo de Agua, 23°32'N, 110°04'W, *J. León de la Luz 937* (HCIB); tramo Las Palapas–Las Playitas, cerca de Todos Santos, *J. León de la Luz 1010* (HCIB); “El Comitán,” 17 km NW de La Paz, 24°13'N, 110°20'W, *J. León de la Luz 2140* (HCIB, SD); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, *R. Moran 6926* (CAS, DS, RSA, SD); Cape Region, ca. 4.5 km W of La Palmilla, ca. 23°01'N, 109°45'W, *R. Moran 7067* (CAS, DS, SD); San José Island, Arroyo de Aguada, ca. 25°03'N, 110°39'W, *R. Moran 9408* (DS, SD); Cerralvo Island, Ruffo Ranch Canyon, ca. 24°11'N, 109°50'W, *R. Moran 9536* (DS, SD); Arroyo Tabor (E slopes of Sierra de la Giganta, W of Puerto Escondido), ca. 25°48'N, 111°21–23'W, *R. Moran 18209* (CAS, UC); Sierra San Francisco, Rancho La Laguna, 27°35'N, 113°02'W, *R. Moran 23819* (SD);

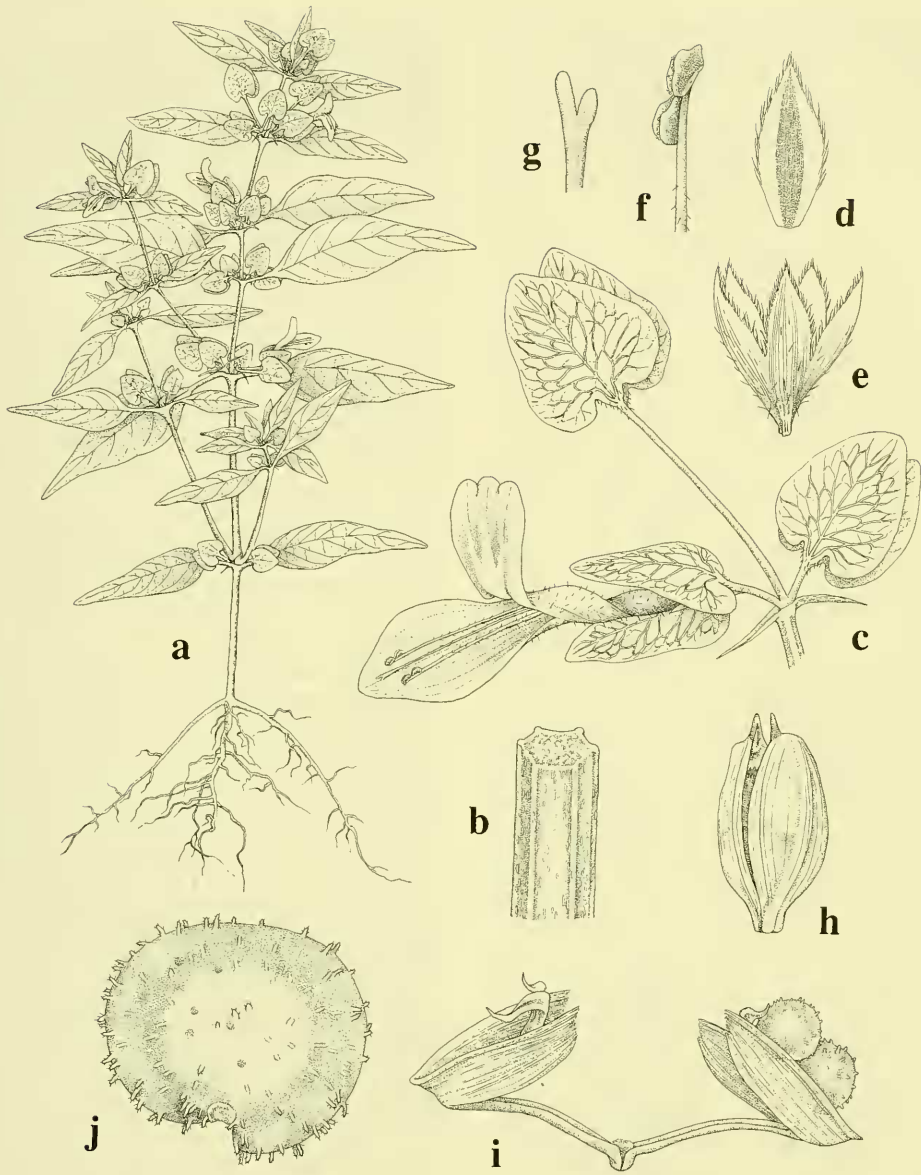


FIGURE 9. *Dicliptera resupinata*. a. habit (Daniel & Butterwick 6868), $\times 0.5$; b. portion of sectioned stem (Daniel et al. 2489), $\times 7$; c. cyme with three cymules and a flower (Daniel & Butterwick 6868), $\times 2.2$; d. inner cymule bracteole (Daniel & Butterwick 6868), $\times 9$; e. calyx (Daniel & Butterwick 6868), $\times 7$; f. distal portion of stamen (Daniel & Butterwick 6868), $\times 10$; g. distal portion of style with stigma (Daniel & Butterwick 6868), $\times 18$; h. capsule (Daniel et al. 2489), $\times 4$; i. fully opened capsule (Daniel 5178), $\times 5$; j. seed (Carter & Ferris 3940), $\times 11.5$. Drawn by Jenny Speckels.

La Paz, *E. Palmer 119* (GH); Santiago, 3 mi S of Caduano, *R. Peters 21* (UC); 4 mi SE of Agua Caliente on rd to Los Frailes, *D. Porter 296* (CAS, DS); San Pablo, *C. Purpus 84* (CAS, DS, UC); Sierra de la Laguna, Cañón de la Zorra, between "Las Pozas" and

"La Punta del Ancón Grande," ca. $23^{\circ}30'N$, $109^{\circ}53'W$, *T. Ross et al. 2000* (RSA); Sierra de la Laguna, Cañón de la Zorra, vicinity of "La Punta del Ancón Grande," ca. $23^{\circ}30'N$, $109^{\circ}54'W$, *T. Ross et al. 2061* (RSA), *T. Ross et al. 2095* (RSA); 2 km SE of

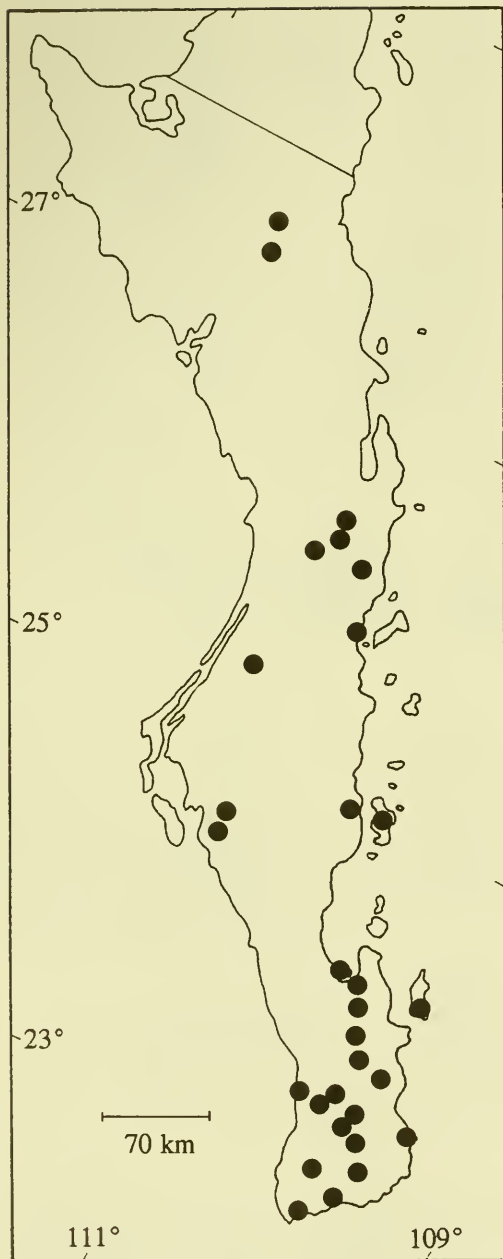


FIGURE 10. Distribution of *Dicliptera resupinata* in the peninsula of Baja California.

La Ribera, SW of Punta Arena, ca. 23°31'N, 109°29'W, A. Sanders et al. 3355 (UCR); near Santiago de las Cosas, 23°30'N, F. Shreve 7285 (DS); vicinity of San José del Cabo, I. Wiggins 5686A (DS, POM, UC); 6 mi W of Canipolé, I. Wiggins 11450

(CAS, DS, RSA, UC); 4.8 mi E of La Paz-Todos Santos rd, along rd to El Triunfo, I. Wiggins 14690 (CAS, DS, UC); ca. 15 mi S of La Paz, along rd to Todos Santos, ca. 24°01'N, 110°06'W, I. Wiggins 15308 (CAS, DS); Sierra de la Giganta, Cañada de los Leones, between La Presa and Laguna Caquihui, 24°55'N, 110°53'W, I. Wiggins 15540 (CAS, DS); ca. 10 mi S of Mission Dolores, 25°00'N, 110°47'S, I. Wiggins et al. 313 (DS, UC).

The species as described by Vahl (1804) is based, at least in part, on Cavanilles' description and figure of *J. sexangularis* Cav. (1795). Vahl listed Cavanilles' name as a synonym and cited the figure. The epithet was presumably altered by Vahl owing to the prior existence of *J. sexangularis* L. Cavanilles' protologue was based on plants, which flowered in September at some time prior to 1795 at the Real Jardín Botánico. The provenance of the garden plants was listed as "Nova-Hispania" (i.e., Mexico). Subsequently, Cavanilles (1798:71) noted that Née had found this species at Acapulco (i.e., during the Malespina Expedition of 1789–1794). The description and accompanying figure (tab. 203) in the protologue concur with plants from western North America commonly treated as *D. resupinata* in most characteristics except for the outer cymule bracteoles which are described and figured as ovate. There are no specimens labeled as *J. sexangularis* nor any resembling *D. resupinata* in Cavanilles' herbarium at MA. There are several specimens in the general herbarium at MA labeled as *J. sexangularis* that were grown at the Real Jardín Botánico in the early nineteenth century (i.e., 1803–1819 and possibly earlier as several specimens lack the date of collection; none of these collections notes the month of collection). These comprise similar plants with relatively small outer cymule bracteoles (i.e., 5–9 mm long), but with slight differences in the shape of the outer cymule bracteoles. In some individuals, the bracteoles vary from elliptic to ovate to broadly ovate whereas in others they vary from ovate to deltate to subcordate. Plants with the subcordate bracteoles are indistinguishable from plants usually treated as *D. resupinata*. They resemble some of the individuals with smaller bracteoles encountered in Baja California Sur (e.g., Moran 9408 at DS), on the Islas Marías (i.e., Mason 1798), and on the mainland of western Mexico (e.g., Abrams 13283 from Sonora,

Breedlove 1546 from Sinaloa, *Daniel & Butterwick 3226* from Jalisco). Individuals with elliptic to broadly ovate bracteoles, which more closely resemble Cavanilles' tab. 203, likely exhibit an extreme expression of bracteolar shape in the species.

A specimen at MA with individuals of each bracteolar form noted above, and labeled as *J. sexangularis* Cav., is noted to have been collected by Née "ex nov. Hispania et Bonxia." Seeds from this material likely provided the source material for plants subsequently grown in Madrid. Seeds from this same source, or seeds obtained from plants grown at Madrid, likely also served as the source for plants of *D. resupinata* grown at the Botanical Garden of Copenhagen. Two specimens grown at that institution are extant in Vahl's herbarium at C. Microfiche images of these specimens agree with the specimens at MA (i.e., with outer cymule bracteoles varying from broadly ovate to deltate to subcordate). These specimens (or other plants cultivated at the garden in Copenhagen) undoubtedly were used by Vahl in drawing up his protologue of *J. resupinata*, which is more detailed than (and thus not derived solely from) that of Cavanilles. Indeed, the handwriting of the names on these specimens matches that of Vahl (Burdet 1979). Because he did not cite a type, a lectotype would need to be designated from among those materials used by Vahl in formulating his protologue (i.e., Cavanilles' figure 203, the two specimens in the Vahl herbarium, and any other pertinent materials at C).

Gray (1885) noted two collections in his protologue of *D. pseudoverticillaris*. It is clear that Pringle's collection formed the greater part of Gray's concept of the species, and this collection at GH is here designated as the lectotype. In the protologue of *D. torreyi*, Gray (1885) cited unspecified collections from Arizona of Thurber, Wright, Schott, Rothrock, Lemmon, and Pringle. *Pringle s.n.* 15 May 1881 at GH conforms to the description and bears, in Gray's handwriting, "*Dicliptera torreyi* n.sp." Lectotypification is postponed until the other collections have been studied.

In the protologue of *Dianthera sexangularis*, a plate (number 22 of the *Icones Florae Mexicanae*) and a locality ("in Australis Oceani littore prope Coahuayanam," i.e., vicinity of Coahuayana, Michoacán) were cited. The plate repre-

sents *Dicliptera resupinata* which occurs in the region of Coahuayana. Specimens labeled as *Dianthera sexangularis* in the Sessé and Mocifio herbarium at MA are referable to *Dicliptera peduncularis* Nees. Because the plate agrees with the description in the protologue, it is designated above as the lectotype of *Dianthera sexangularis*.

Plants previously recognized as *Dicliptera formosa* are here treated as conspecific with *D. resupinata* for the first time. A specimen in the Brandegee herbarium at UC bears the same number as the type (i.e., "455," see above), but was collected on a different date at a different locality. To the holotype at UC, a subsequent collection from Saucito (*Brandegee s.n.* 14 Oct. 1893) has been added. The three shoots of this subsequent collection resemble one another, but differ from the type, by their shorter outer cymule bracteoles (13–18 mm long vs. 18–23 mm long on type). All collections resembling the type of *D. formosa* (i.e., *Brandegee s.n.* 14 Oct. 1893, *Carter & Ferris 3370*, *Ross et al. 2000, 2061, 2095*) come from the eastern slope of the Sierra de la Laguna between lat. 23°25' to 23°31'N and long. 109°47' to 109°53'W. They differ from *D. resupinata* in Baja California Sur by the following combination of characters: longer corolla (28–30 vs. 12–26 mm long), longer corolla tube (14–17 vs. 6–11 mm long) with a wider (2–2.5 vs. 1.1–1.7 mm) diameter near midpoint, longer stamens (18–22 vs. 5.5–15 mm long) that are inserted in distal 1/2 (vs. near apex) of corolla tube, longer thecae (1.3–1.6 vs. 0.5–1.1 mm long), and longer style (26–32 vs. 10.5–22 mm long). Furthermore, they differ from most peninsular specimens of *D. resupinata* by their evenly and more or less densely pubescent (vs. nearly glabrous to sparsely pubescent) young stems, leaves, and outer cymule bracteoles; by their generally larger (13–24 vs. usually 5–18 mm long) outer cymule bracteoles; and by their longer (3.5–4.8 vs. 2–3 mm long) calyces. These distinctions are inadequate for discerning species when the total variation in *D. resupinata* from Baja California Sur and from other portions of its range is considered, however.

Most collections of *D. resupinata* from Baja California Sur have the young stems either nearly glabrous or very sparsely pubescent with flexuose to retrorse to retrorsely appressed eglandular trichomes restricted to the ridges, the leaves with

trichomes restricted to the major veins, and the abaxial surface of the outer cymule bracteoles glabrous or with a few antrorse eglandular trichomes 0.1–0.2 mm long. Several collections from the southern portion of the Cape Region (i.e., *Brandegee* 454, *Brandegee* s.n. 21 Oct. 1890, *Brandegee* s.n. 9 Mar. 1892, *Moran* 6926, *Peters* 21, *Porter* 296, *Sanders et al.* 3355, *Shreve* 7285, and *Wiggins* 5686A) differ by having the young stems evenly and more or less densely pubescent with erect to flexuose to retrorse eglandular trichomes 0.3–0.7 mm long, the leaf surfaces evenly pubescent with eglandular trichomes, and the abaxial surface of the outer cymule bracteoles pubescent with erect to flexuose to antrorse eglandular trichomes to 0.6 mm long. (In *Wiggins* 5686A even some of the capsules are sparsely pubescent with erect to retrorse eglandular trichomes 0.1–0.2 mm long.) In vesture, these collections resemble those previously treated as *D. formosa*. *Porter* 296 is somewhat intermediate in pubescence between the other collections noted above and more typical collections of *D. resupinata*. Like the more pubescent plants, *Porter* 296 has a denser pubescence with longer trichomes, but like the more typical form, the trichomes are concentrated on, or restricted to, the ridges.

These pubescent collections are readily associated with the more common (and less pubescent) specimens of *D. resupinata* because they have the shorter bracteolar and floral characteristics usually encountered in that species. Other collections lack the prominent pubescence characteristic of plants previously treated as *D. formosa*, but resemble them in other ways. For example, *Brandegee* s.n. Nov. 1902 from the Sierra El Taste (UC 190888) has relatively large outer cymule bracteoles (15–21 mm long) and calyces (4.5 mm long). Mature corollas are not present on this specimen, but buds (ca. 20 mm long) present suggest that mature corollas would be relatively large. Another *Brandegee* collection (UC 102696) from this same locale, also collected in November 1902, resembles more typical *D. resupinata* (e.g., outer cymule bracteoles 10–15 mm long, and calyces to 3.5 mm long). Similarly, *Brandegee* 455 from the “Sierra de la Laguna” (UC 102690), *Brandegee* s.n. without date (UC 185704) from the “Cape Region,” and *Brandegee* s.n. 15 Sep 1893 (UC 139097) from “El Taste” lack the pubescence characteristic of

D. formosa but have outer cymule bracteoles 14–20 mm long, calyces 4.5 mm long, and corollas to 30 mm long. These collections thus resemble *D. resupinata* in some features and *D. formosa* in others. Also, plants from at least two coastal regions on the mainland in Sonora (i.e., *Daniel* 1947, *Moran* 4039 both from the vicinity of Guaymas) and Sinaloa (i.e., *Blakley* B-1680, *Gentry* 14319, *Hastings & Turner* 64-121, and *Moran* 7585 all from the vicinity of Topolobampo) resemble the type of *D. formosa* in their outer cymule bracteoles (13–22 mm long), corollas (25–35 mm long), stamens (15–23 mm long) which are also inserted in the distal half of the corolla tube, thecae (1.2–2 mm long), and style (25–30 mm long). They differ from plants previously treated as *D. formosa* by their vesture which concurs with that of the common form of *D. resupinata* with shorter bracteoles and floral organs.

Thus the putative distinctions of *D. formosa* are combined in various ways among individuals of *D. resupinata* from Baja California Sur and the adjacent mainland. The lack of a suite of mutually exclusive characteristics between *D. formosa* and *D. resupinata*, combined with the general overlap in ranges of most character states that have been used to distinguish them, precludes recognition of two species at this time. Until *D. resupinata* and its relatives are better known, the pubescent, large-bracteoled, and long-flowered plants from the eastern slope of the Sierra de la Laguna (i.e., plants previously treated as *D. formosa*) are treated here as a localized expression of the species in a manner similar to the nearly glabrous, large-bracteoled, and long-flowered plants from coastal Sonora and Sinaloa.

Dicliptera resupinata var. *orbicularis* is also treated as a synonym of *D. resupinata* for the first time. In the protologue, Robinson and Seaton (1893) indicated that the type from Jalisco differed from the typical form by its larger, thinner, and more deeply cordate outer cymule bracteoles (as “involucral bracts”). The species exhibits considerable variation in these attributes throughout its range.

There is no recent taxonomic treatment of *Dicliptera*. *Dicliptera resupinata* shows similarities to *D. inutilis* Leonard in Mexico and Central America and to *D. sanctae-martae* Leonard in South America.

DYSCHORISTE

Dyschoriste Nees in Wall., *Pl. asiat. rar.* 3:75, 81. 1832. LECTOTYPE (Britton & Brown, *Ill. fl. n. U.S.*, ed. 2, 3:240. 1913). — *Dyschoriste depressa* Nees.

Calophanes D. Don in Sweet, *Brit. fl. gard. ser.* 2, 2:t. 181. 1833. TYPE. — *Calophanes oblongifolia* (Michx.) D. Don in Sweet (\equiv *Ruellia oblongifolia* Michx.).

Linostylis Fenzl ex Sond., *Linnaea* 23:94. 1850. TYPE. — *Linostylis ovata* Sond.

Decumbent to erect perennial herbs with cystoliths. Leaves opposite, sessile or petiolate, margin entire to crenate. Inflorescence of dichasia in leaf axils throughout plant or restricted to axils of distal leaves or bracts and forming a spicate or capitate thyrs; dichasia alternate or opposite, 1–many-flowered, sessile to pedunculate. Bracts (if present) opposite, green, margin entire. Flowers homostylous, subtended by 2 homomorphic bracteoles, sessile to subsessile (in ours). Calyx 5-lobed, tube often as long as or longer than lobes during anthesis, regions between lobes usually subhyaline, often splitting nearly to base in fruit, lobes equal to subequal in length, usually somewhat setaceous. Corolla blue to blue-purple to white (in ours, elsewhere also pinkish purple, red, and yellow), tube gradually or abruptly expanded distally into a \pm distinct throat, limb subactinomorphic to bilabiate, upper lip 2-lobed, lower lip 3-lobed, corolla lobes contorted in bud. Stamens 4, didynamous, filaments connate in pairs (i.e., a long and a short stamen connate) proximally, inserted at or near base of throat of corolla, exerted from mouth of corolla (at least longer pair and usually with at least a portion of anthers of shorter pair also), anthers 2-theous, thecae equal in length, parallel to subsagittate, equally inserted, appendaged at base with awns or stout trichomes (in ours, elsewhere sometimes unappendaged at base), dehiscing toward lower lip (i.e., flower nototribal); pollen (Fig. 8c) subprolate to prolate, 3-colporate, mesocolpia multi-striate with 4–15 pseudocolpi of irregular lengths, colpi often very short (often shorter than pseudocolpi), exine minutely verrucate; staminodes 0. Style exerted from mouth of corolla, stigma unequally 2-lobed, 1 lobe greatly

reduced, rudimentary, or sometimes not evident. Capsule substipitate, subellipsoid to ellipsoid, retinacula present, septae with attached retinacula remaining attached to inner wall of mature capsule. Seeds 2–4, homomorphic, lenticular, covered with appressed hygroscopic trichomes. ($x = 15$).

A genus of approximately 75 species occurring in tropical and warm-temperate regions of America, Africa, and Asia. The genus is best developed in the New World where it has a discontinuous distribution from the southern United States southward through Mexico and Central America to northern Argentina. Major concentrations of species are found in west-central and southern Mexico and southeastern Brazil. The actual number of Mexican species is likely fewer than the 22 presently recognized. Six species are reported as occurring in the United States. *Dyschoriste* is a complex genus whose species offer few characters for their recognition. Kobuski's (1928) treatment of the American species is now outdated and inadequate both for delimiting and identifying taxa.

REFERENCE. — KOBUSKI, C. E. 1928. A monograph of the American species of the genus *Dyschoriste*. *Ann. Missouri Bot. Gard.* 15:9–91.

1. *Dyschoriste decumbens* (A. Gray) Kuntze, *Revis. gen. pl.* 2:486. 1891. *Calophanes decumbens* A. Gray, *Syn. fl. N. Amer.* 2(1):325. 1878. TYPE. — In the protologue, Gray mentioned unspecified collections of Wright from western Texas and Thurber, Wright, and Rothrock from southern Arizona. To my knowledge, a lectotype has not been designated from among the syntypes, which are presumably all at GH.

Decumbent to ascending perennial herbs to 1.3 dm tall. Young stems quadrate, evenly pubescent with retrorse eglandular trichomes 0.05–0.1 mm long. Leaves sessile to petiolate, petioles to 2 mm long, blades (linear to) narrowly elliptic to broadly elliptic to obovate, (3.5–) 8–28 mm long, 2–6 mm wide, 1.5–7 times longer than wide, rounded to acute at apex, acute to attenuate at base, surfaces pubescent with mostly erect eglandular trichomes 0.05–0.1 mm long (occasionally with flexuose eglandular trichomes to 0.5 mm long as well), margin entire, pubescent like surfaces except with trichomes mostly antrorse. Inflorescence of dichasia in leaf axils from near

base of plant to apex; dichasia alternate, 1-flowered, sessile to subsessile (i.e., borne on peduncles to 1 mm long). Bracteoles subfoliose, usually petiolate, linear to narrowly elliptic, 5–9 mm long, 1–2 mm wide, abaxial surface and margin pubescent like leaves. Flowers sessile to subsessile (i.e., borne on pedicels to 1 mm long). Calyx 11–15.5 mm long, tube 3–5.5 mm long, lobes lance-subulate, 7–10 mm long, 1.3–2.7 times longer than tube, abaxially and marginally pubescent with flexuose eglandular trichomes 0.05–0.2 mm long. Corolla pale purple with darker purple markings in throat, 15–17 mm long, externally pubescent with erect to flexuose to retrorse eglandular trichomes 0.1–0.2 mm long, tube expanded distal to midpoint, 10–11 mm long, 1.5–2.5 mm in diameter near midpoint, limb subactinomorphic, 10–12 mm in diameter, upper lip 5.5–6.5 mm long, lobes 4.5 mm long, 2.5–3.3 mm wide, lower lip 6–6.5 mm long, lobes 4.5 mm long, 2.5–3.4 mm wide. Longer pair of stamens 7.5 mm long, shorter pair of stamens 6 mm long, thecae parallel, 1.5–1.7 mm long (including basal appendage), awned at base, awns pointed, 0.3–0.5 mm long. Style 8–10 mm long, pubescent with eglandular trichomes, stigma unequally 2-lobed, 1 lobe 1.8–2 mm long, other lobe 0.1–0.2 mm long. Capsule 9–10 mm long, glabrous, stipe 2.5 mm long, head ellipsoid. Seeds 4, 2.9–3 mm long, 1.8–2 mm wide. ($n = 15$, Grant 1955). Fig. 11.

PHENOLOGY. — Flowering and fruiting: March–May.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona, New Mexico, Texas) and Mexico (Baja California Sur, Chihuahua, Coahuila, Durango, Hidalgo, Querétaro, San Luis Potosí, Sonora, Zacatecas); in our region the species is known only from the eastern escarpment of the Sierra de la Laguna in the nondesert portion of the Cape Region (Fig. 4) where plants occur in dry rock crevices at an elevation of about 1000 m. According to Moran's field notes, plants collected in the vicinity included: *Justicia austrocapensis*, *Nolina beldingii*, *Lepechinia hastata*, and *Erythra brandegeei*.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Laguna Mountains, *M. Jones* 24437 (POM); Cape Region, Protrero de Almenta near head of S fork of Cañón San Pedro, ca. 23°19'N, 109°56'W, *R. Moran* 7392 (DS).

Marcus Jones collected this species in the Sierra de la Laguna on 2 March 1928. According to Lenz (1986), Jones departed from Miraflores by horseback for the Sierra de la Laguna to the west on 1 March 1885 and returned to Miraflores on 3 March. The ascent was presumably via the Cañón San Pedro (as "San Pedro y San Pablo canyon" in Lenz 1986) in which the specimen of *D. decumbens* was collected on 2 March. Moran recollected this species 31 years later in the same or a nearby locale.

The description above is derived solely from the Baja California collections. This species forms a major component of a taxonomically unresolved complex that also includes *D. linearis* (Torr. & A. Gray) Kuntze, *D. schiedeana* (Nees) Kuntze, *D. crenulata* Kobuski, *D. poliodes* Leonard & Gentry, *D. greenmanii* Kobuski, and others. The putative distinctions among taxa in this assemblage involve habit, vestiture, leaf shape, and corolla size. *Dyschoriste decumbens* was considered to be distinctive in the genus on the basis of its cinereous pubescence consisting of strictly eglandular and very short trichomes, axillary inflorescences, and generally nonlinear leaves with entire margins (Kobuski 1928).

ELYTRARIA

Elytraria Michx., Fl. bor.-amer. 1:8. 1803, nom. cons. TYPE. — *Elytraria virgata* Michx., nom. illegit. (= *E. caroliniensis* (J. F. Gmel.) Pers.).

Tubiflora J. F. Gmel., Syst. nat. 2:27. 1791, nom. rej. TYPE. — *T. caroliniensis* J. F. Gmel.

Erect to ascending, acaulescent to caulescent perennial herbs lacking cystoliths. Leaves alternate, mostly in basal rosettes or crowded at apices of branches, sometimes \pm diffuse along stems, subsessile to petiolate, margin entire to crenate (in ours, elsewhere also pinnatifid). Inflorescence of scapose or pedunculate densely bracteate axillary and terminal dichasiate spikes, spikes slender, cylindrical, simple or sometimes branched, scapes or peduncles covered with imbricate, coriaceous, clasping scales; dichasia alternate (spirally arranged), 1-flowered, sessile in axil of a bract. Bracts alternate (spirally arranged), green or partially hyaline, coriaceous, sometimes apically toothed and/or winged. Brac-

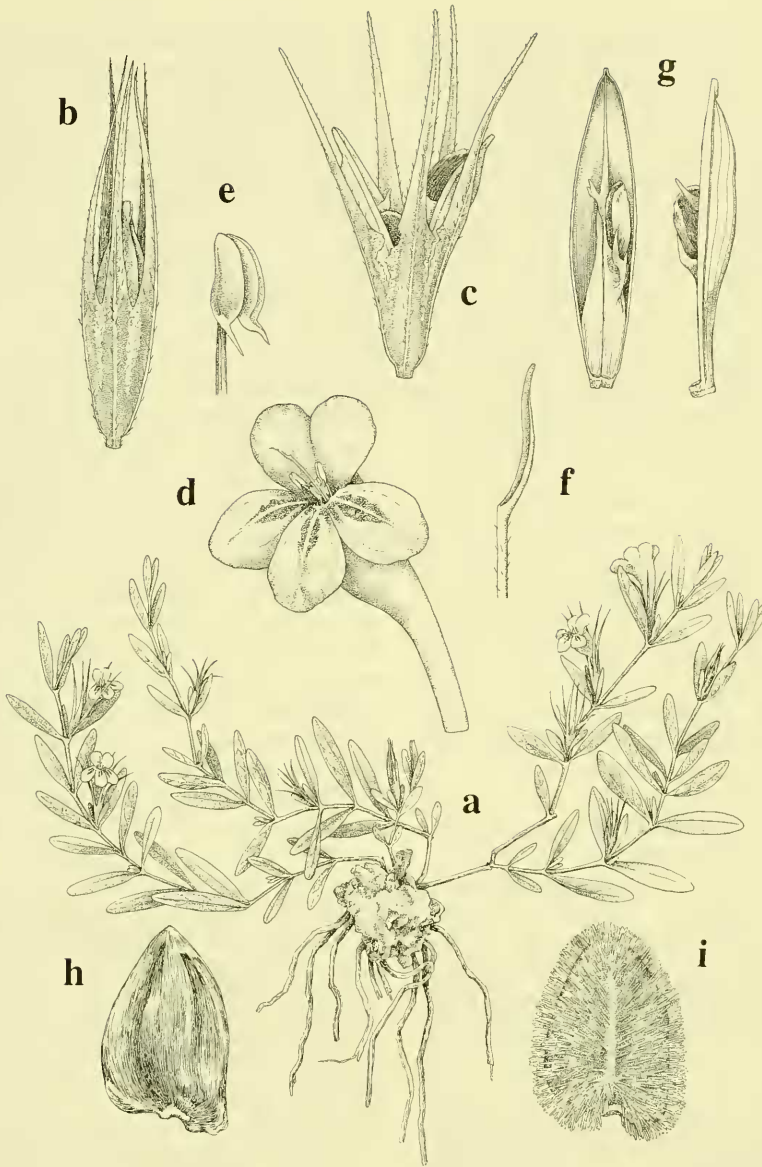


FIGURE 11. *Dyschoriste decumbens*. a. habit (Moran 7392), $\times 0.7$; b. calyx with unopened capsule (Jones s.n., 4 Sep 1903), $\times 3$; c. calyx with opened capsule (Parfitt & Christy 4593), $\times 2.8$; d. flower with calyx removed (Moran 7392), $\times 2.8$; e. distal portion of stamen with anther (Moran 7392), $\times 12$; f. distal portion of style with stigma (Daniel 591), $\times 12$; g. capsule valves (Jones 24437), $\times 4.5$; h. dry seed (Jones 24437), $\times 10$; i. moistened seed (Jones 24437), $\times 10$. Drawn by Jenny Speckels.

teoles often mostly hyaline. Flowers homostylous, subtended by 2 homomorphic bracteoles, sessile. Calyx deeply 4-lobed, mostly hyaline, lobes heteromorphic, anterior and posterior lobes external, anterior lobe 2-dentate to \pm deeply 2-cleft. Corolla relatively small, pinkish or blue or

white or yellow, often with colored markings near mouth, tube cylindric or slightly expanded near mouth, throat indistinct or evident only near mouth, limb bilabiate, upper lip 2-lobed, lower lip 3-lobed, corolla lobes often apically divided or 2-cleft, imbricate in bud. Stamens 2, inserted

at or near apex of corolla tube, anthers partially exerted from mouth of corolla, 2-theous, thecae (covered by stigma during anthesis) equal in size, parallel, equally inserted, lacking basal appendages (at least in ours), dehiscing toward lower lip (i.e., flower nototribal); pollen (Fig. 8d) prolate, 3-colpate, exine minutely verrucate to foveolate-reticulate; staminodes 0–2, minute. Style exerted from mouth of corolla, stigma unlobed, expanded, flat, subelliptic to subspatulate, folded over anthers during anthesis and straightening when touched (touch-sensitive) and gradually refolding. Capsule estipitate, subconic to ovoid, sometimes irregularly proximally constricted, retinacula absent, placentae minute, papilliform. Seeds numerous (up to 20 per capsule), irregularly shaped (often blocky or cube-like), lacking trichomes. ($x = 11$ or $12?$).

A genus of about 15 species occurring in the tropics and subtropics of both Old and New Worlds. The majority of species are American; four are known from Mexico and three occur in the United States.

REFERENCE. — LEONARD, E. C. 1934. The American species of *Elytraria*. J. Wash. Acad. Sci. 24:443–447.

1. *Elytraria imbricata* (Vahl) Pers., Syn. pl. 1:23. 1805. *Justicia imbricata* Vahl, Ecl. amer. 1:1. 1796. TYPE. — Not located, based on material from “herbario Marcgravii.” In his Enum. pl. of 1804, Vahl cited a Marcgrav collection from Brazil and a collection of von Rohr from Santa Marta, Colombia. The latter collection in the Vahl herbarium at C pertains to our species.

Verbena squamosa Jacq., Pl. hort. schoenbr. 1:3. 1797. *Tubiflora squamosa* (Jacq.) Kuntze, Revis. gen. pl. 2:500. 1891. *Elytraria squamosa* (Jacq.) Lindau, Anales Inst. Fis.-Geogr. Nac. Costa Rica 8:299. 1895. TYPE. — Unknown.

Elytraria tridentata Vahl, Enum. pl. 1:107. 1804, nom. illegit. (*Justicia imbricata* Vahl cited as synonym).

See Daniel (1995) for a complete listing of synonyms for this species.

Ascending to erect caulescent perennial herbs to 3.5 dm tall. Stems subterete to subquadrate, often irregularly fissured or angled, sparsely pubescent with flexuose to appressed glandular

trichomes to 0.5 mm long or glabrate. Leaves (sometimes absent or nearly so during anthesis) mostly clustered near stem apices, petiolate, petioles to 50 mm long (naked portion to 12 mm long), blades narrowly to broadly elliptic to oblanceolate to obovate, (9–) 13–120 mm long, (3–) 5–33 mm wide, 1.7–4.9 times longer than wide, acute to acuminate at apex, long-attenuate at base (often tapered along petiole nearly to node), adaxial surface pubescent with coarse flexuose eglandular trichomes to 1 mm long, abaxial surface with pubescence mostly restricted to major veins, margin entire. Peduncles to 130 (–260) mm long (sometimes nearly absent), often branching distally, scales conduplicate, lanceolate, 2–4.5 mm long, 0.7–1.2 mm wide, acuminate-mucronate at apex, abaxial surface glabrous or scabrous along midvein with retrorse eglandular trichomes to 0.05 mm long, margin ciliate with silky-crenate eglandular trichomes to 1.5 mm long (villous). Spikes 3–7 mm in diameter near midpoint, rachis ridged, villous. Bracts usually \pm conduplicate, ovate to subelliptic to rectangular, 5–6.5 mm long, 1.5–2.2 mm wide, margin proximally and distally hyaline, central portion of bract (including margin) green, apex 3-dentate, lateral teeth hyaline and winglike, central tooth awnlike, abaxial surface of bracts glabrous, margin \pm villous-ciliate. Bracteoles lanceolate, 2.3–3 mm long, 0.5–0.6 mm wide, surface mostly hyaline except for green central portion (keel), abaxial surface glabrous except keel pubescent with antrorse eglandular trichomes. Calyx 3.5 mm long, anterior lobe constricted proximally, linear, 2.6–3 mm long, 0.5–0.6 mm wide, 2-lobed at apex, lobes 0.1–0.3 mm long, posterior and lateral lobes linear to lanceolate, 2.3–3 mm long, 0.5–0.9 mm wide, all lobes abaxially glabrous, margin ciliate distally with straight to flexuose eglandular trichomes to 1 mm long. Corolla blue with a yellow spot in a white region at the base of the lower lip, 4–9.5 mm long, externally glabrous, tube 2.3–4.5 mm long, upper lip 1–1.9 mm long, lobes 0.5–0.7 mm long, lower lip 1.7–5 mm long, lobes 1.2–3.2 mm long, central lobe largest, lobes of lower lip apically cleft. Stamens 1.2–1.5 mm long, thecae 0.5–0.6 mm long. Style 2.5–2.7 mm long, glabrous, stigma 0.7–0.9 mm long, 0.4 mm wide. Capsule 2.8–4.1 mm long, glabrous. Seeds 10, irregularly shaped, often \pm blocky, 0.4–0.8 mm long, surfaces minutely

papillose. ($n = 12$, Daniel et al. 1990; $n = 11$, Ward 1984). Fig. 12.

PHENOLOGY. — Flowering and fruiting: September–June.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona, Texas), Mexico (Baja California Sur, Campeche, Chihuahua, Chiapas, Coahuila, Colima, Guerrero, Jalisco, México, Michoacán, Nayarit, Oaxaca, Sinaloa, Sonora, Veracruz, Yucatán, Zacatecas), Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Argentina, and West Indies; in our region the species is restricted to the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Magdalena subdivisions) of Baja California Sur (Fig. 13); plants occur in and along watercourses, in valley bottoms, on rocky slopes and plains, and on sandy beaches in desertscrub, thornscrub, tropical deciduous forest, and oak woodland from near sea level to 1400 m elevation.

LOCAL NAMES. — “Cordoncello” [*Palmer 6* from the vicinity of La Paz fide Vasey and Rose (1890)]; “cordoncillo” (numerous herbarium labels).

USE. — A hot tea made from the plant is used for stomach pains [*Palmer 6* fide Vasey and Rose (1890)].

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Purísima, *T. Brandege* 440 (DS); San José del Cabo, *T. Brandege* 440 (UC); Río del Salada along rd from Puerto Chale to Santa Rita, *D. Breedlove & D. Axelrod* 43123 (CAS); 3 km E de San Pedro de la Soledad, entrando por la carr. Cabo San Lucas-Todos Santos, 23°15'N, 109°56'W, *A. Campos V. et al.* 4514a (CAS); 12 km NW of San Bartolo, 23°46'N, 109°50'W, *A. Carter* 2655 (DS, UC); Cape Region, Sierra El Taste, arroyo NE of La Carrerita, ca. 23°11'N, 109°55'W, *A. Carter & F. Chisaki* 3574a (UC); between Rancho Palmilla and headwaters of arroyo NW of El Encinal, ca. 23°10'N, 109°58'W, *A. Carter & F. Chisaki* 3597 (UC); Sierra de la Giganta, Cuesta de Chuenque, ca. 22 km S of Loreto on rd to Puerto Escondido, ca. 25°51'N, 111°20'W, *A. Carter & R. Ferris* 4725 (CAS, UC); Sierra de la Giganta, Cañón del Cayuco, E base of Cerro de la Giganta, 26°05'N, 111°33'W, *A. Carter & L. Kellogg* 3114 (DS, UC); Sierra de la Giganta, vic. of Portezuelo de Peloteado (SW of Notrí), ca. 25°49'N, 111°23'W, *A. Carter & F. Leal* 4685 (UC); Sierra de la Giganta, vic. of Rancho Tasajera, ca. 3.5

km NE of San José de Agua Verde, ca. 25°30'N, 111°10'W, *A. Carter & H. Sharsmith* 4930 (UC); W branch of Arroyo Hondo, N side of Cerro de la Giganta, 26°10'N, 111°36'W, *A. Carter et al.* 2066 (DS, UC); Cape San Lucas, 1 mi from beach, *T. Craig* 733 (POM), 751 (POM); Arroyo La Huerta near Hwy 286 between La Paz and San Juan de los Planes, 2.7 km SE of La Huerta, ca. 24°03'N, 110°09'W, *T. Daniel & M. Butterwick* 6837 (CAS, ENCB, MICH, US); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, *T. Daniel et al.* 6854 (BR, CAS, HCIB, K, MEXU, MO, SBBG); Rancho La Burrera, cuesta “El Arado,” 23°30'N, 110°04'W, *R. Domínguez C.* 357 (HCIB); San Bartolo, *F. Gander* 9675 (CAS, SD); Sierra Giganta, Arroyo Hondo, *H. Gentry* 4113 (DS); Sierra de la Laguna, Las Animas, ranch at river-fork near base of El Picacho Peak, *B. Hammerly* 271 (CAS, DS); Rancho La Huerta area, ca. 12 km SE of La Paz toward San Juan de los Planes, ca. 24°02'N, 110°09'W, *D. Harder & W. Appleby* 1096 (RSA); Agua Verde Bay, *I. Johnston* 3897 (CAS); San Antonio, *M. Jones* 22522 (POM); Laguna Mts, Cota Ranch, *M. Jones* 24050 (POM); Todos Santos, *M. Jones* 24654 (POM); Loreto, Cayuca Ranch, *M. Jones* 27353 (POM), 27444 (UC); abajo del Rancho San Pedro de la Soledad, *J. León de la Luz s.n.* (HCIB); El Comitán, 24°13'N, 110°20'W, *J. León de la Luz* 2139 (HCIB); Rancho La Burrera, NE de Todos Santos, 23°30'N, 110°04'W, *J. León de la Luz* 2344 (HCIB); Sierra de La Laguna, Cañón La Burrera, El Palmillar, 23°28'N, 109°55'W, *J. León de la Luz* 2569 (HCIB); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, *R. Moran* 6921 (DS, RSA, SD); Cape Region, 3 km N of Cabo San Lucas, ca. 22°55'N, 109°55'W, *R. Moran* 7039 (CAS, DS, SD); Cape Region, S fork of Cañón San Pedro, ca. 23°19'N, 109°55'W, *R. Moran* 7415 (CAS, DS, SD, UC); Sierra de Guadalupe, San Sebastián, 27°01'N, 112°24'W, *R. Moran* 18781 (SD); Santiago, 3 mi S of Caduano, *R. Peters* 22 (UC); 8.5 mi SE of La Ribera on rd to Los Frailes, *D. Porter* 297 (CAS, DS); 4 mi S of Miraflores, *J. Whitehead* 924 (DS); N of Comondú, *I. Wiggins* 5481 (DS); between La Paz and San Pedro, *I. Wiggins* 5594 (CAS, DS, UC); 15.5 mi S of La Paz, along rd to Todos Santos, ca. 24°01'N, 110°06'W, *I. Wiggins* 15309 (CAS, DS, UC); 2.5 mi N of Rancho El Obispo, ca. 24°44'N, 111°10'W, *I. Wiggins* 15469 (DS).

The closest relative of *Elytraria imbricata* appears to be *E. mexicana* Fryxell & S.D. Koch, a morphologically similar species from southwestern Mexico that differs by its bracts with merely a spinose tip and its cream to white corollas with the lobes of the upper lip dark purple.

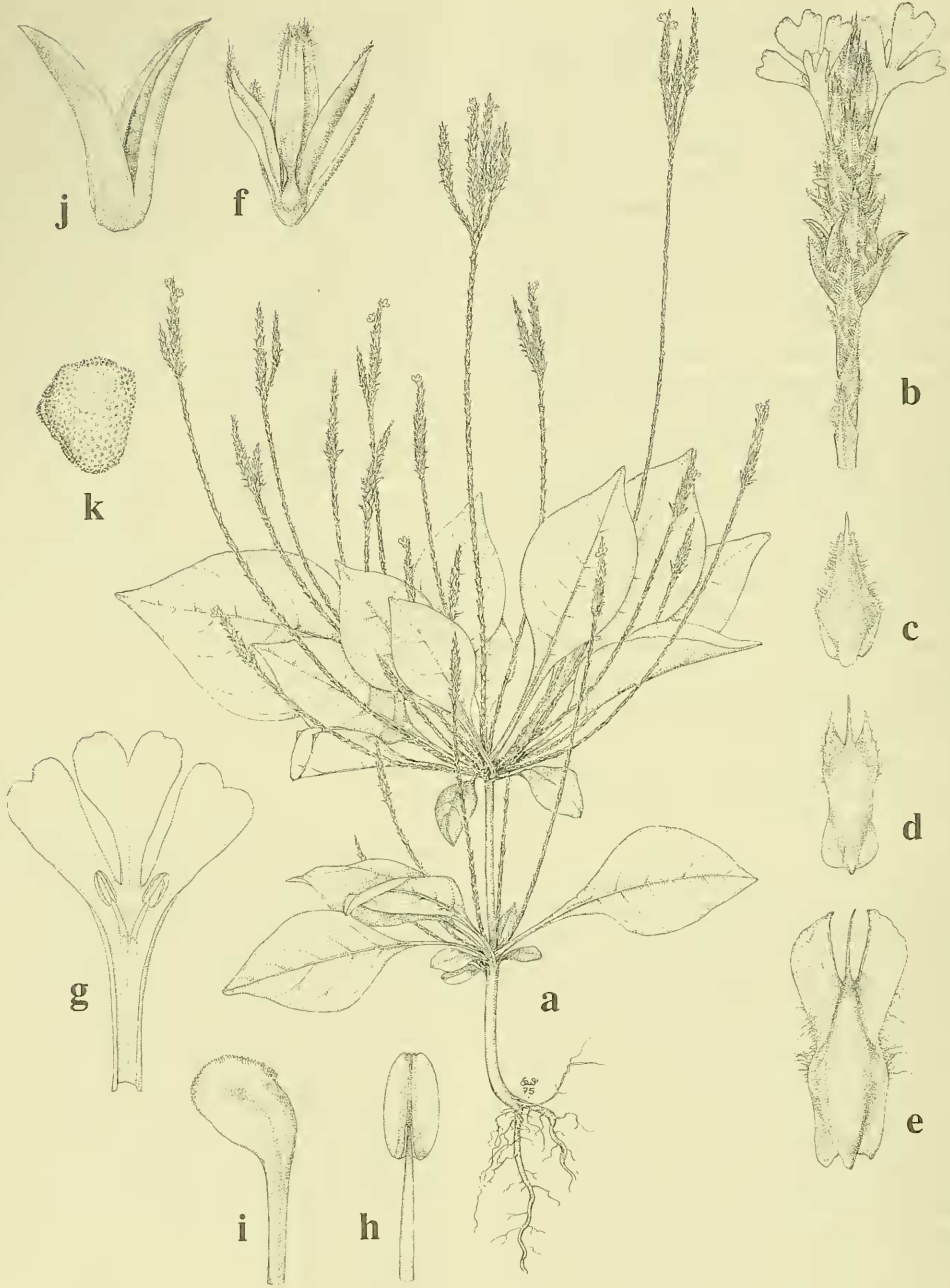


FIGURE 12. *Elytraria imbricata*. (a–d, f–k from Feddema 2736, e from González 80-A). a. habit, $\times 0.5$; b. inflorescence, $\times 2.5$; c. bract from proximal portion of inflorescence, $\times 5$; d. bract from distal portion of inflorescence, $\times 5$; e. bract with typical winglike lateral teeth, $\times 5$; f. bracteoles and calyx, $\times 7.5$; g. corolla with upper lip removed showing stamens, $\times 5$; h. stamen, $\times 15$; i. distal portion of style with stigma, $\times 15$; j. capsule, $\times 10$; k. seed, $\times 30$. Drawn by Karin Douthit. Copyright reserved to University of Michigan Herbarium, used with permission.

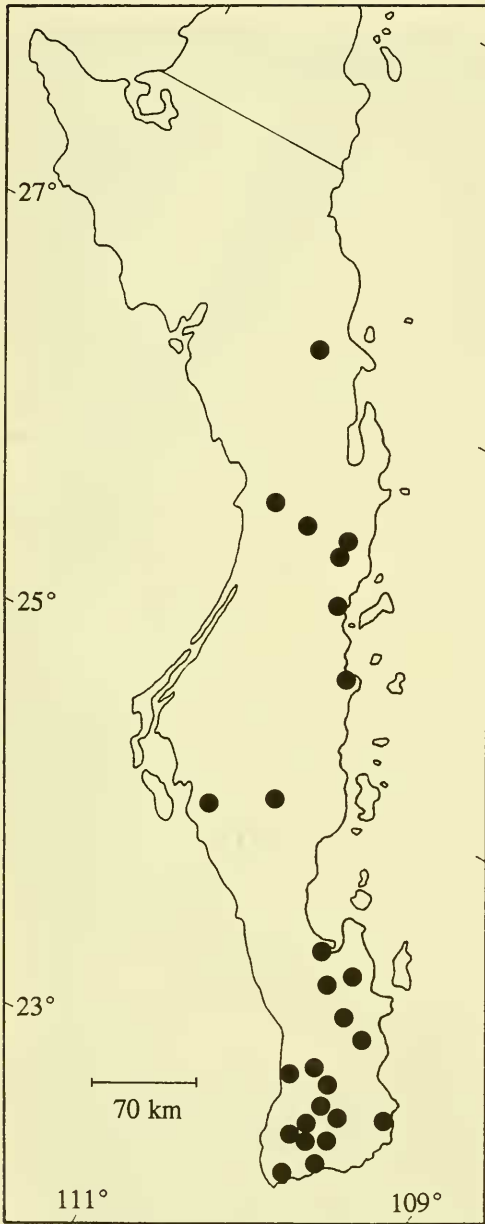


FIGURE 13. Distribution of *Elytraria imbricata* in the peninsula of Baja California.

HENRYA

Henrya Nees ex Benth., Bot. voy. *Sulphur*, t. 49. 1845. TYPE. — *H. insularis* Nees ex Benth.

Solenoruellia Baill., Hist. pl. 10:445. 1891. TYPE. — *S. galeottiana* Baill. (= *Henrya insularis* Nees ex Benth.).

Erect or ascending perennial herbs or shrubs with cystoliths. Older stems with epidermis exfoliating. Leaves opposite, subsessile to petiolate, petioles detaching at junction with stem, margin entire. Inflorescences of axillary and terminal stout to lax dichasiate spikes (to thyrses) collectively forming leafy terminal panicles; dichasia alternate or opposite, 1–3-flowered, sessile or short-pedunculate in axils of bracts. Bracts opposite, green, usually less conspicuous than bracteoles, margin entire. Bracteoles oblanceolate to obovate, concavoconvex, fused from base to near apex along side adjacent to rachis, rounded to acute at apex, mucronate with straight, apical or dorsal, erect or divergent pointed projection, secondary bracteoles, if present, much reduced. Flowers homostylous, sessile, subtended by 2 homomorphic bracteoles. Calyx deeply 5-lobed, lobes homomorphic or heteromorphic (i.e., posterior lobe reduced in size). Corolla white, cream, or yellow, with maroon, purple, yellow, and/or white markings on upper lip, externally glabrous, tube subcylindric to cylindric, shorter than limb, throat indistinct, limb pseudopapilionaceous, upper lip obovate to spatulate, bifid, lower lip 3-lobed, lateral lobes obovate, lower-central lobe obovate to broadly obovate and keeled, corolla lobes imbricate in bud. Stamens 2, inserted at or near mouth of corolla, anthers 2-theous, thecae subequal, parallel, equally to subequally inserted, lacking basal appendages, dehiscing toward upper lip (i.e., flower stenotribal); pollen (Fig. 14a; from extralimital material) prolate, 3-colporate, colpi broad (i.e., far exceeding width of centrally positioned ora), 6-pseudocolpate, pseudocolpi 2 per mesocolpium, exine reticulate; staminodes 0. Style exerted from mouth of corolla, glabrous, stigma 2-lobed, lobes triangular, equal, often inconspicuous. Capsule stipitate, head subspheric to broadly ellipsoidal, retinacula present, septae with attached retinacula separating slightly from inner wall of mature capsule. Seeds 2, homomorphic, planoconvex, subcircular to subelliptic in outline, flat surface smooth to bumpy, convex surface and margin either pubescent with hygroscopic trichomes or covered with stout, branched or barbed tubercles. ($x = 18$).

Henrya comprises two species occurring in dry regions from the southwestern United States southward to Costa Rica. Both species occur in Mexico.

REFERENCE. — DANIEL, T. F. 1990. Systematics of *Henrya* (Acanthaceae). *Contr. Univ. Michigan Herb.* 17:99–131.

1. *Henrya insularis* Nees ex Benth., *Bot. voy. Sulphur*, t. 49. 1845. TYPE. — Plate 49 of Bentham's *The Botany of the Voyage of H. M. S. Sulphur*, see Daniel (Taxon 38:265–270. 1989.)

Henrya costata A. Gray, *Proc. Amer. Acad. Arts* 21:406. 1886. *Tetramerium costatum* (A. Gray) Millsp., *Publ. Field Columbian Mus., Bot. Ser.* 1:47. 1895. TYPE. — MEXICO. Chihuahua: near Batopilas, Aug–Nov 1885, *E. Palmer 211* (holotype: GH!; isotypes: K!, LE!, MEXU!, NY!, PH!, US!).

Henrya grandifolia Fernald, *Bot. Gaz. (Crawfordsville)* 20:537. 1895. TYPE. — MEXICO. Sinaloa: Esquinapa, Jan 1895, *F. Lamb 505* (holotype: GH!).

Henrya costata A. Gray var. *glandulosa* Brandegee, *Zoe* 5:171. 1903. TYPE. — MEXICO. Baja California Sur: Cape Region, Santa Anita, 1901, *C. Purpus 266* (lectotype, *Contr. Univ. Michigan Herb.* 17:117. 1990: UC!; isoelectotypes: ARIZ!, MO!, US!).

Henrya brevifolia Happ, *Ann. Missouri Bot. Gard.* 24:547. 1937. TYPE. — MEXICO. Sonora: Las Durasnillas, 18 May 1892, *T. Brandegee s.n.* (holotype: UC!; isotypes: DS!, GH!, NY!, PH!, US!).

Henrya ortegana Happ, *Ann. Missouri Bot. Gard.* 24:552. 1937. TYPE. — MEXICO. Sinaloa: Sind. San Juan, San Ignacio, Mar 1931, *J. Ortega 6868* (holotype: MO!; isotypes: CAS!, F!, MIN!).

See Daniel (1995) for a complete listing of synonyms for this species.

Ascending to erect perennial herbs to 8 dm tall. Young stems subterete to terete, sometimes multistriate, densely and evenly pubescent with erect glandular trichomes 0.2–0.7 mm long (glandular pubescent). Leaves petiolate, petioles to 15 mm long, blades ovate to elliptic, 16–90 mm long, 9–55 mm wide, 1.4–2.8 times longer than wide, acute to subacuminate at apex, rounded to subacute at base, surfaces glandular pubescent when young, older leaves becoming mostly eglandular.

Spikes to 150 mm long, rachises glandular pubescent; dichasia alternate or opposite at inflorescence nodes, sessile to subsessile (i.e., borne on peduncles to 1 mm long). Bracts near mid-spike obovate to linear-elliptic, 2.5–4 mm long, 0.8–1.3 mm wide, abaxial surface glandular pubescent, apically mucronate. Bracteoles obovate, 7–9 mm long, unfused for 2–3 mm along side adjacent to rachis, abaxially glandular pubescent, subacute and mucronate at apex, mucro erect, 0.1–0.4 mm long. Flowers sessile to subsessile (i.e., borne on pedicels to 0.3 mm long). Calyx 1.5–1.8 mm long, lobes homomorphic or heteromorphic, abaxial surface nearly glabrous or sparsely pubescent with glandular and eglandular trichomes 0.05–0.1 mm long, margins of lobes ciliate with longer trichomes. Corolla cream to pale yellow with a whitish spot outlined with purple on upper lip, 9–11 mm long, tube 3–4 mm long, upper lip 6–6.5 mm long, 1–2 mm wide, lower lip 5–7 mm long, lobes 5–6.2 mm long, 2–3 mm wide. Stamens 6–8.5 mm long, filaments pubescent proximally, thecae 1.5–2 mm long. Style 9–10 mm long, glabrous. Capsule 5–6 mm long, glabrous or sparsely pubescent proximally with glandular (and sometimes eglandular) trichomes. Seeds 1.7–2 mm long, 1.4–1.7 mm wide, flat surface smooth to bumpy, convex surface and margin covered with dense, appressed, flexuose, hygroscopic trichomes 0.3–0.7 mm long. ($n = 18$, Daniel 1990, Daniel and Chuang 1993, Daniel et al. 1984, 1990). Fig. 15.

PHENOLOGY. — Flowering and fruiting: February–May.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona), Mexico (Aguascalientes, Baja California Sur, Chiapas, Chihuahua, Colima, Guanajuato, Guerrero, Jalisco, México, Michoacán, Nayarit, Oaxaca, San Luis Potosí, Sinaloa, Sonora, Tamaulipas, Veracruz, Yucatán), Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica; in our region the species is restricted to southern, nondesert portions of the Cape Region (Fig. 16); plants occur on rocky slopes and along trails in thornscrub, tropical deciduous forest, and oak woodland at 600–1140 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Sierra de Laguna, *T. Brandegee s.n.* (GH, PH, UC); Rancho Poza Larga, Arroyo de San

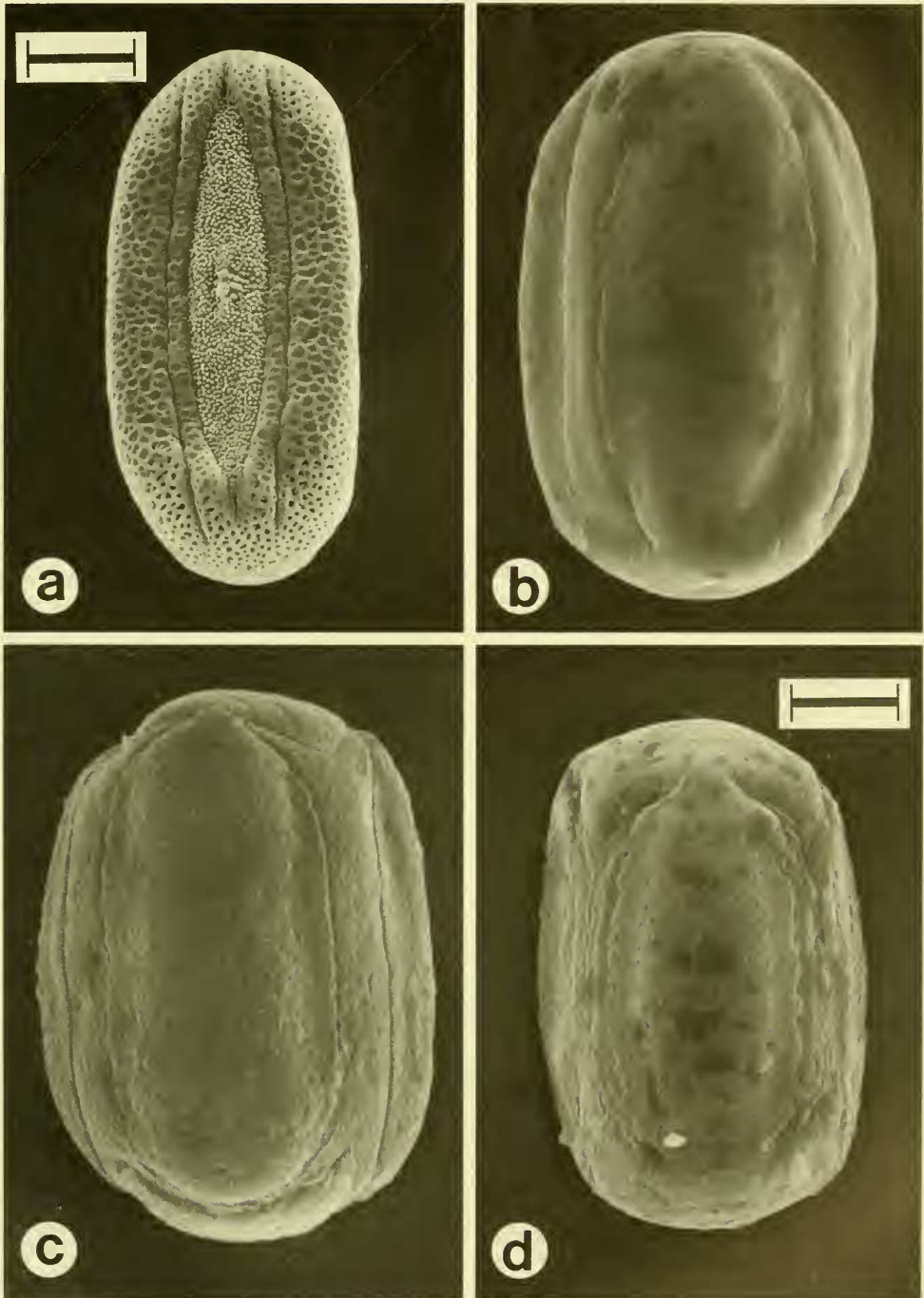


FIGURE 14. Pollen. a. *Henrya insularis* from Nayarit (Daniel & Bartholomew 4731), colpal view; b. *Holographis virgata* subsp. *virgata* (Breedlove 60981), intercolpal view; c. *H. virgata* subsp. *glandulifera* var. *glandulifera* (Moran 3928), intercolpal view; d. *H. virgata* subsp. *glandulifera* var. *palmeri* (Carter & Ferris 3819), intercolpal view. Scale for a and c = 11.5 μm ; scale for b and d = 7.5 μm .

Francisquito, E side Sierra de la Victoria, 23°29–31'N, 109°47–55'W, A. Carter & R. Ferris 3388 (DS, SD, UC); "La Parrita," Rancho La Burrera, NE de Todos Santos, 23°35'N, 110°00'W, M. Domínguez L. 251 (HCIB); cerca del Rcho. San Pedro de la Soledad, SE de Todos Santos, 23°15'N, 109°58'W, J. León de la Luz 1052 (CAS, HCIB); Sierra de la Laguna, Vereda, fondo del Cañón La Burrera, 23°29'N, 110°01'W, J. León de la Luz 2496 (HCIB); Cape Region, trail above La Burrera, ca. 23°32'N, 110°02'W, R. Moran 7454 (ARIZ, CAS, DS, ENCB, GH, MEXU, RSA, SD, UC, US); W slope of Sierra de la Victoria between La Burrera and La Laguna, J. Thomas 7931 (ARIZ, CAS, DS, GH, MEXU, MICH, SD, UC, US).

As here treated, this is an extremely variable species with a broad distribution. A detailed discussion of the various forms of the species and their distributions was provided by Daniel (1990). Based on the few collections from the peninsula of Baja California, it appears that plants there are rather homogeneous in morphological attributes. The description above pertains only to specimens from Baja California Sur. During the dry season (e.g., March–May) this species can form a dominant element of the herbaceous understory in regions of tropical dry forest whereas at other times of the year (e.g., December) traces of it are difficult to locate. Information on reproductive biology and pollination ecology were provided by Daniel (1990).

The closest relative of this species, and the only other species in the genus, is *H. tuberculosperma* T. F. Daniel. It occurs in western Mexico and differs by its longer calyx, reddish or dark brown mature stems, and seeds that lack trichomes but have the convex surface and margin covered with conical tubercles bearing barbs.

HOLOGRAPHIS

Holographis Nees in A. DC., Prodr. 11:728. 1847. TYPE. — *Holographis ehrenbergiana* Nees.

Berginia Harv. ex Benth. & Hook. f., Gen. pl. 2:1096. 1876. TYPE. — *Berginia virgata* Harv. ex Benth. & Hook. f. (≡ *Holographis virgata* (Harv. ex Benth. & Hook. f.) T. F. Daniel).

Pringleophytum A. Gray, Proc. Amer. Acad. Arts 20:292. 1885. TYPE. — *Pringleophytum lanceola-*

tum A. Gray. (= *Holographis virgata* (Harv. ex Benth. & Hook. f.) T. F. Daniel).

Lundellia Leonard, Wrightia 2:1. 1959. TYPE. — *Lundellia argyrea* Leonard (≡ *Holographis argyrea* (Leonard) T. F. Daniel).

Erect to ascending perennial herbs or shrubs lacking cystoliths. Leaves opposite (rarely subopposite) or quaternate, sessile to petiolate, sometimes anisophyllous, margin entire (in ours, elsewhere also subsinuate and spinose-dentate). Inflorescence of axillary or terminal dichasiate spikes (in ours, elsewhere also reduced to 2 flowers); dichasia opposite (in ours, elsewhere also alternate), 1-flowered, sessile in axil of a bract. Bracts opposite (in ours, elsewhere also alternate), green or somewhat reddish, margin entire (in ours, elsewhere also spinose-dentate). Flowers homostylous, sessile, subtended by 2 homomorphic bracteoles. Calyx deeply 5-lobed, lobes homomorphic. Corolla greenish white to white or pinkish or purplish or yellow, often with colored nectar guides, long axis horizontally to vertically oriented, tube subcylindric to ± abruptly expanded distally into a throat, limb bilabiate, upper lip 2-lobed, lower lip 3-lobed, corolla lobes imbricate in bud. Stamens 4, inserted in distal 2/3 of corolla tube, equally inserted to ± didynamous, anthers slightly exerted from mouth of corolla, anthers 1-theous, often connivent, pubescent, lacking basal appendages, dehiscent toward lower lip (i.e., flower nototribal); pollen (Fig. 14b-d) prolate, 3-colpate, colpi often bifurcate near poles, exine foveolate to fossulate to fossulate-reticulate; staminode 1, borne between posterior pair of stamens, short. Style slightly exerted from mouth of corolla, stigma subfunnelform or 2-lobed, lobes equal or unequal. Capsule substipitate, ellipsoid to obovoid, retinacula present, septae with attached retinacula remaining attached to inner wall of mature capsule. Seeds 4 (or fewer by abortion), homomorphic, lenticular. ($x = 13$).

A genus of 15 species restricted to, but occurring nearly throughout, the dry regions of Mexico.

REFERENCES. — DANIEL, T. F. 1983. Systematics of *Holographis* (Acanthaceae). J. Arnold Arbor. 64:129–160. DANIEL, T. F. 1988. Three new species of *Holographis* (Acan-

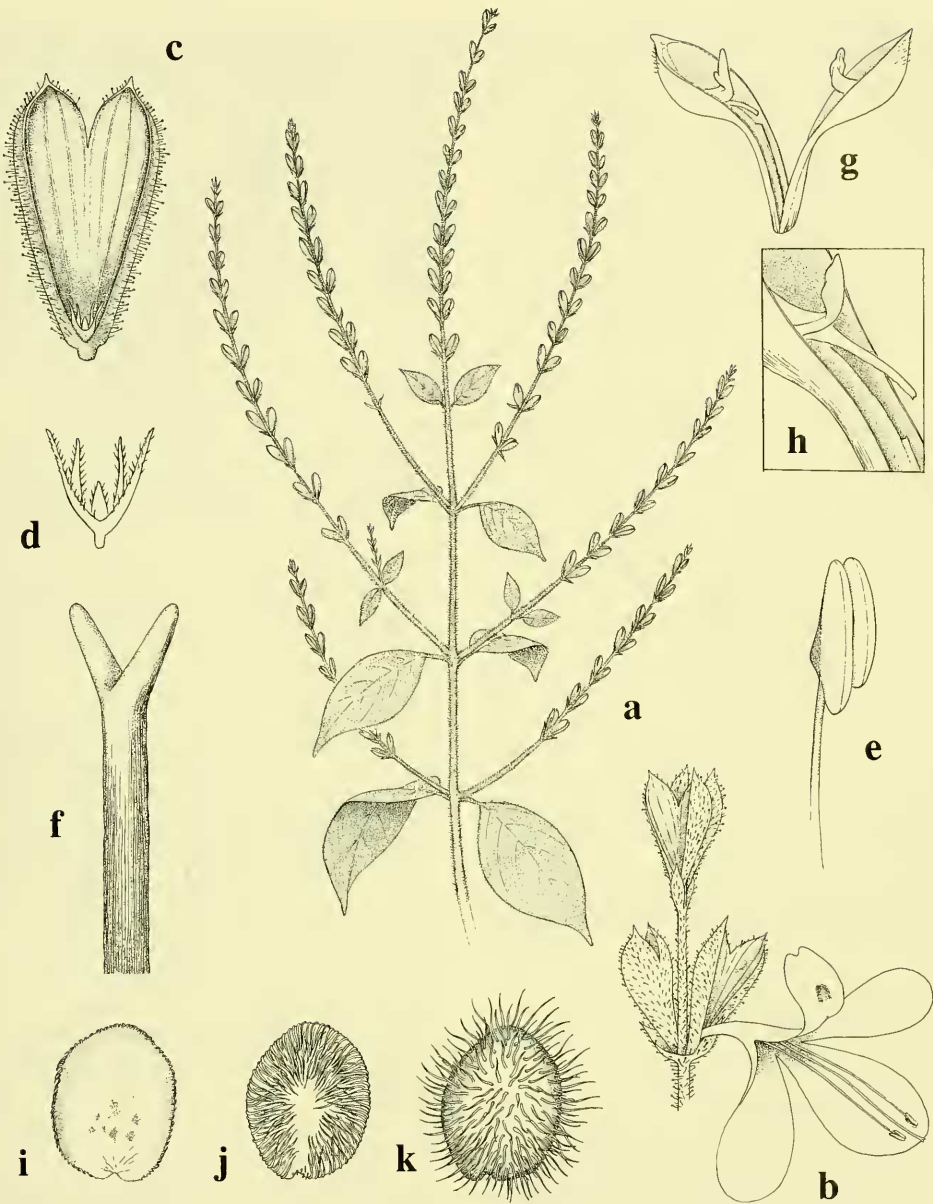


FIGURE 15. *Henrya insularis*. a. habit (Breedlove 31276), $\times 0.5$; b. inflorescence nodes (Moran 7454 and Daniel 4072), $\times 2.5$; c. bracteoles opened to show calyx (Moran 7454), $\times 4.7$; d. calyx (Ton 3897), $\times 11$; e. distal portion of stamen with anther (Daniel & Bartholomew 5027gh), $\times 14$; f. distal portion of style with stigma (Gallagher 294), $\times 62$; g. capsule (Breedlove 50470), $\times 5$; h. septum and retinaculum in one capsule valve (Breedlove 50470), $\times 8.5$; i. dry seed, flat surface (Breedlove 50470), $\times 8.5$; j. dry seed, convex surface (Breedlove 50470), $\times 8.5$; k. moistened seed, convex surface (Breedlove 50470), $\times 8.5$. Drawn by Ellen del Valle and Jenny Speckels.

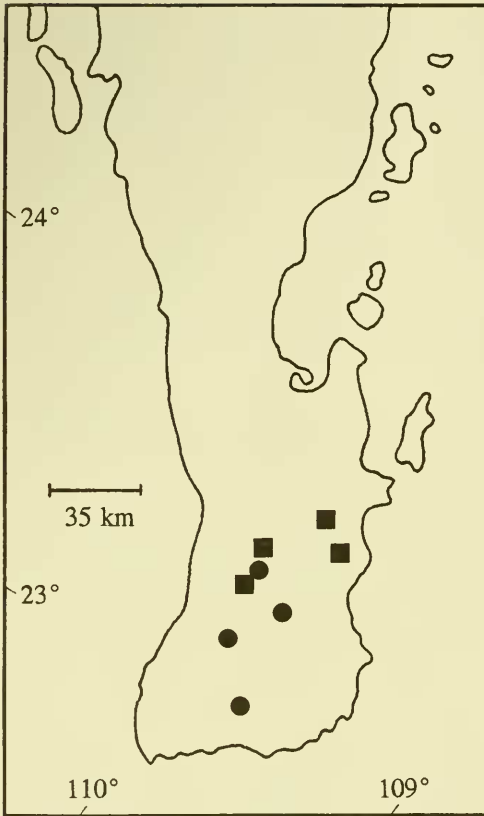


FIGURE 16. Distribution of *Henrya insularis* (circles) and *Ruellia intermedia* (squares) in the peninsula of Baja California.

thaceae) from Mexico. Proc. Calif. Acad. Sci., ser. 4, 46:73–81.

1. *Holographis virgata* (Harv. ex Benth. & Hook. f.) T. F. Daniel, J. Arnold Arbor. 64:139. 1983. *Berginia virgata* Harv. ex Benth. & Hook. f., Gen. pl. 2:1097. 1876. TYPE. — “California incola,” without date, *T. Coulter 603* (holotype: K!; isotypes: GH!, K!).

Shrubs to 2 m tall. Young stems subquadrate to quadrate, evenly pubescent with erect, flexuose, or retrorse eglandular trichomes 0.05–0.7 (–1) mm long. Leaves opposite (or subopposite), sessile to petiolate, petioles to 5 mm long, blades linear-lanceolate to obovate, (4–) 6–50 mm long, 2–26 mm wide, 1.1–9.2 (–17) times longer than wide, acute to rounded (rarely emarginate) at

apex, acute to attenuate at base, surfaces pubescent, margin entire, flat to revolute, ciliate. Inflorescences terminal, loosely or densely bracteate dichasiate spikes to 15 cm long, rachises pubescent with eglandular trichomes or with a mixture of eglandular and glandular trichomes; dichasia opposite (to subopposite) at nodes. Proximal bracts (up to 6 series) often sterile, triangular to circular, distal bracts fertile, somewhat foliaceous, lance-ovate to ovate to elliptic to circular, 3–8 mm long, 1.5–5 mm wide, usually pubescent like rachis. Bracteoles lance-subulate to linear to lanceolate, \pm equal to or shorter than subtending bract, 2–6 mm long, 0.5–1.5 mm wide, pubescent with eglandular or a mixture of eglandular and glandular trichomes. Calyx 5–8 mm long, lobes lanceolate or oblanceolate, pubescent like bracteoles. Corolla reddish pink with white markings, 9–14.5 mm long, externally pubescent with eglandular trichomes (rarely with glandular trichomes as well in subsp. *glandulifera* var. *glandulifera*), tube 5–8 mm long, expanded distally, upper lip (2.5–) 3–5 mm long, lobes 1.5–4 mm long, lower lip 4–8 mm long, lobes spatulate, 2.5–6 mm long, 1.5–3.5 mm wide. Stamens 2.8–5 mm long, filaments pubescent or nearly glabrous, thecae 1.6–2.5 mm long; staminode 0.5–0.8 mm long. Style 5–7 mm long, glabrous or pubescent, stigma subequally 2-lobed, 0.3–0.5 mm long. Capsules 7–12 mm long, 3–5 mm in diameter, pubescent or essentially glabrous, trichomes eglandular, 0.05–0.3 mm long, often restricted to apex. Seeds obliquely cordate to widely elliptic, 2–3.5 mm long, 2–3 mm wide, pubescent with dendritic trichomes to 0.3 mm long. ($n = 26, 39$, Daniel et al. 1984). Fig. 17.

PHENOLOGY. — Flowering: October–June; fruiting: February–June.

DISTRIBUTION. — Northwestern Mexico (Baja California, Baja California Sur, and Sonora); in our region (Figs. 18, 19) the species occurs in the Cape Region, the Sierra de la Giganta, and parts of the Sonoran Desert (Central Gulf Coast and Vizcaíno subdivisions).

This species was treated from throughout its range by Daniel (1983b) who also presented a rationale for the infraspecific classification that is utilized here. Subspecies are recognized on the basis of a geographic discontinuity between eglandular populations in Baja California and Sonora and glandular populations in Baja Cali-

fornia Sur. Two varieties within the southern subspecies are recognized on the basis of minor differences in pubescence that are largely correlated with elevation.

Relationships within *Holographis* remain to be fully resolved. Morphologically, *H. virgata* appears most similar to *H. tamaulipica* T. F. Daniel from Tamaulipas and *H. tolantongensis* T. F. Daniel from Hidalgo; however, neither of these species should be regarded as a particularly close relative at the present time.

Key to Intraspecific Taxa of *Holographis virgata*

- 1. Inflorescence rachises, bracts, bracteoles, and calyx eglandular (rarely with inconspicuous glands on bracteoles and calyx); bracteoles 0.5–1 mm wide; north of lat. 28°N 1a. subsp. *virgata*.
- 1. Inflorescence rachises, bracts, bracteoles, and calyx conspicuously glandular; bracteoles 1–1.5 mm wide; mostly south of lat. 28°N.
 - 2. Leaves and young stems scaberulous, trichomes retrorse, 0.05–0.1 mm long; usually below 600 m elev 1b'. subsp. *glandulifera* var. *glandulifera*.
 - 2. Leaves and young stems hirtellous, trichomes straight to flexuose, 0.1–1 mm long; usually above 600 m elev 1b". subsp. *glandulifera* var. *palmeri*.

1a. *Holographis virgata* subsp. *virgata*

Pringleophytum lanceolatum A. Gray, Proc. Amer. Acad. Arts 20:293. 1885. TYPE. — MEXICO. Sonora: 50 mi below Altar and 30 mi from Gulf of California, 13 Mar 1884, C. Pringle s.n. (holotype: GH!; isotypes: A!, F!, MA!, NY!, US!).

Trichomes of younger stems erect to retrorse, 0.05–0.1 mm long. Leaves sessile to subsessile, blades linear-lanceolate to lanceolate to elliptic (to obovate), (4–) 7–43 mm long, 2–9 (–14) mm wide, (1.6–) 3–17 times longer than wide. Inflorescence rachises pubescent with eglandular trichomes 0.05–0.2 (–0.5) mm long. Bracts 1.5–3 mm wide, pubescent like rachis. Bracteoles 0.5–1 mm wide, pubescent like rachis (rarely also with scattered glandular trichomes to 0.2 mm long). Calyx pubescent like bracteoles. Lower lip of corolla 5–8 mm long, lobes 4–6 mm

long, 2.5–3.5 mm wide. Capsule essentially glabrous to pubescent, trichomes (if present) often restricted to apex. (n = 26, Daniel et al. 1984). Fig. 17d, f.

DISTRIBUTION AND HABITAT. — Western and central Sonora and southern Baja California; in our region the subspecies is known only to the north of latitude 28°N in the Vizcaino and Central Gulf Coast subdivisions of the Sonoran Desert (Fig. 18); plants occur on slopes and along watercourses in desertscrub at 15–1300 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California: S base of Mesa El Portezuelo, 63 mi S of Bahía de Los Angeles toward San Francisco, ca. 28°23'N, 113°06'W, S. Boyd & T. Ross 5694 (RSA); 5 km NE of San Borja on rd to Bahía de Los Angeles, D. Breedlove 60981 (CAS, RSA); Mina Desengaña, ca. 16 mi N of Punta Prieta, H. Gentry & Cech 8887 (MEXU, MICH, RSA, US); ca. 22 mi from Bahía Los Angeles toward San Borja, H. Gentry & L. McGill 23313 (ASU, DES, MICH); 7 mi W of San Francisco Bay, C. Harbison 41665 (RSA, SD); Las Animas Bay, I. Johnston 3509 (CAS, GH, NY, UC); 6.4 mi S of Rancho de Mesquital, 5.3 mi S of site of Manuela, ca. 28°11'N, 113°48'W, D. Michener et al. 4255 (CAS, RSA); Mesa de Mesquital, ca. 1.3 mi S of Rancho de Mesquital, ca. 28°15'N, 113°49'W, D. Michener et al. 4260 (RSA); Paredones, Montufar 42 (ENCB); near Agua de Higuera, ca. 28°57'N, 113°51'W, R. Moran 7956 (ARIZ, DS, MICH, RSA, SD, UC); Sierra San Borja, San Juan Mine, ca. 28°43'N, 113°38'W, R. Moran 8060 (DS, SD, UC); Sierra San Borja, canyon above El Terminal, 28°45'N, 113°35'W, R. Moran 8511 (SD); Viscaíno Region, Llano Berrendo, 6.4 mi S of Rancho de Mesquital, ca. 28°11'N, 113°46'W, B. Prigge et al. 4676 (LA, SD, UCR); Calmallí, C. Purpus 56 (DS, F, NY, UC pro parte, US); 8 mi N of Mission San Borja, R. Thorne & J. Henrickson 32677 (MICH, RSA); near El Infierno, J. Whitehead 708 (LA); 3 mi S of Agua Higuera, along rd to Misión San Borjas, I. Wiggins & D. Wiggins 14830 (CAS, DS, MEXU, MICH).

This is the most widely distributed subspecies of *H. virgata*. It occurs primarily to the north and east of the range of *H. virgata* subsp. *glandulifera*, but the ranges of the two subspecies overlap slightly in southern Baja California between about lat. 28°00'N and lat. 28°30'N. Intermediates (e.g., *Purpus 56 pro parte* at UC; *Boyd & Ross 5694*, cited above), with sparsely glandular inflorescence rachises, have been collected in

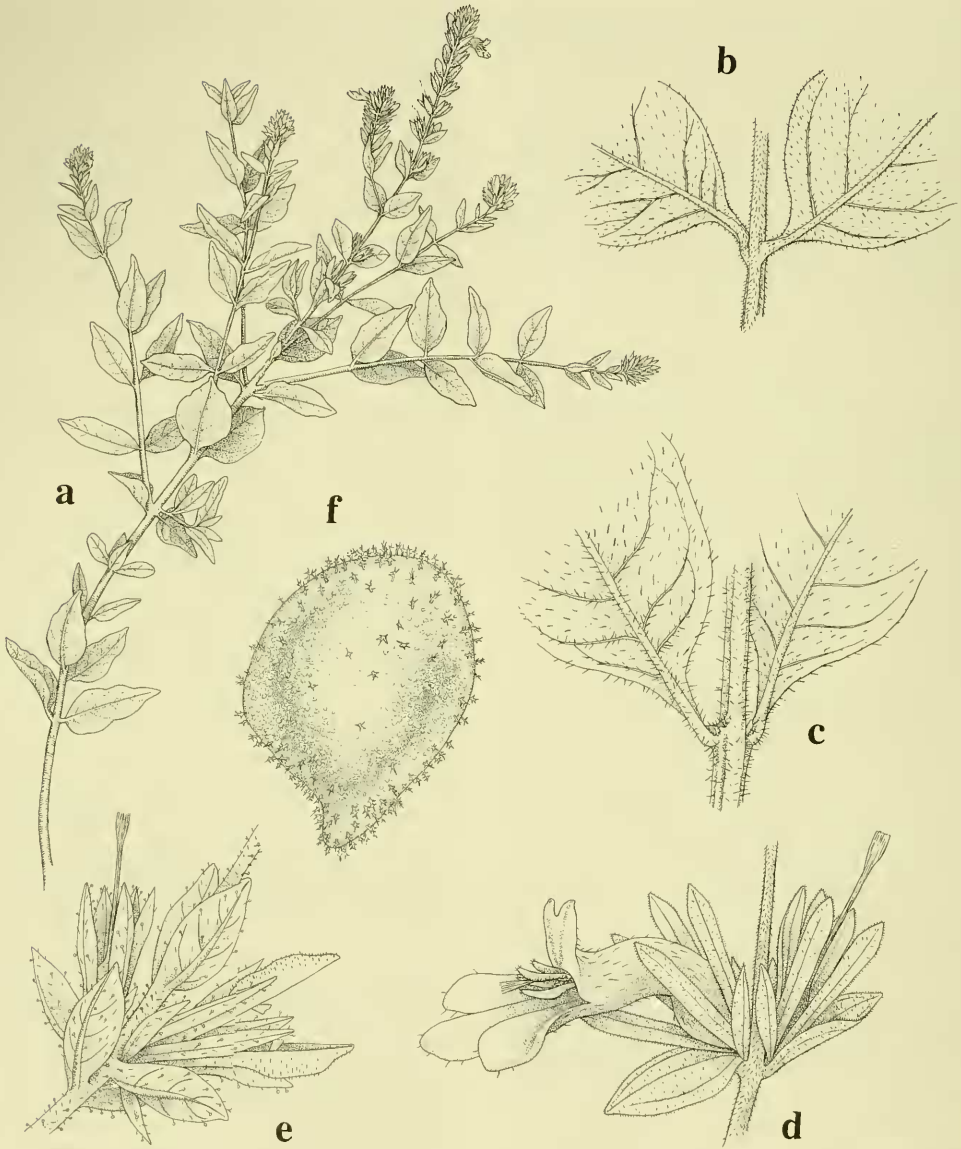


FIGURE 17. *Holographis virgata*. (a, b, e from subsp. *glandulifera* var. *glandulifera*, c from subsp. *glandulifera* var. *palmeri*, d, f from subsp. *virgata*). a. habit (Gentry 7872), $\times 0.5$; b. vegetative node (Carter 5420), $\times 2.5$; c. vegetative node (Carter & Reese 4574), $\times 2.5$; d. inflorescence node with flower (Moran 7956), $\times 3.3$; e. inflorescence node with capsule (Johnston 3820), $\times 2.5$; f. seed (Lott & Atkinson 2518), $\times 11.5$. Drawn by Jenny Speckels.

this zone of overlap. Daniel (1993b) provided additional information on this subspecies and intermediates with subsp. *glandulifera*.

1b. *Holographis virgata* subsp. *glandulifera*
(Leonard & C.V. Morton) T. F. Daniel, J. Arnold

Arbor. 64:143. 1983. *Berginia virgata* var. *glandulifera* Leonard & C.V. Morton, Contr. Dudley Herb. 4:24. 1950. TYPE. — MEXICO. Baja California Sur: 32 mi S of Mulegé, 15 Mar 1935, F. Shreve 7101 (holotype: US!; isotypes: ARIZ!, DS!, F!, MICH!).

Trichomes of younger stems retrorse to flexuose to erect, 0.05–0.7 (–1) mm long. Leaves sessile to petiolate, petioles (if present) to 5 mm long, blades lance-ovate to oblanceolate to obovate, 6–50 mm long, 3–26 mm wide, 1.1–3.8 times longer than wide. Inflorescence rachises pubescent with glandular and eglandular trichomes 0.05–1 mm long. Bracts (2–) 2.5–5 mm wide, pubescent like rachis or proximal ones pubescent like leaves. Bracteoles 1–1.5 mm wide, pubescent like rachis or with glands more numerous. Calyx pubescent like bracteoles. Lower lip of corolla 4–7 mm long, lobes 2.5–5 mm long, 1.5–3 mm wide. Capsules pubescent. ($n = 26, 39$, Daniel et al. 1984).

DISTRIBUTION. — Endemic to southern Baja California and Baja California Sur (Figs. 18, 19); the subspecies occurs mostly to the south of lat. 28°N in the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Vizcaíno subdivisions).

1b'. *Holographis virgata* subsp. *glandulifera* var. *glandulifera*.

Trichomes of younger stems retrorse, 0.05–0.1 mm long. Leaves subsessile, petioles to 3 mm long, blades lance-ovate to oblanceolate, 6–50 mm long, 3–22 mm wide, 1.3–3.8 times longer than wide. Inflorescence rachises pubescent with glandular trichomes 0.1–0.3 mm long and erect to flexuose eglandular trichomes 0.05–0.3 mm long. Proximal bracts pubescent like leaves, distal bracts pubescent like rachis. ($n = 26, 39$, Daniel et al. 1984). Fig. 17a, b, e.

DISTRIBUTION AND HABITAT. — Southern Baja California and eastern and central Baja California Sur (Fig. 19); the variety is known from desert areas of the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Vizcaíno subdivisions); plants occur on rocky slopes and along watercourses in desert scrub and thornscrub at 15–600 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. **Baja California:** 20 mi W of Bahía San Francisquito, *Humphrey 6830a* (ARIZ); Calmallí, *C. Purpus 56* (UC pro parte). **Baja California Sur:** Arroyo San Bruno, SE of Santa Rosalía, 4.8 mi W of Hwy 1 toward San José de Magdalena, ca. 27°04'N, 112°12'W, *S. Boyd & T. Ross 5837* (RSA, UCR); N Sierra La Giganta, S of Mulegé, 11.2 mi W of Hwy 1 on rd from Rosarito

to San Isidro, ca. 26°21'N, 111°45'W, *S. Boyd & T. Ross 5958* (CAS, RSA); Comondú, *T. Brandegees s.n.* (F, GH); Purísima to Comondú, *T. Brandegees s.n.* (UC); 12.4 km SE of La Paz on rd to Los Planes, *A. Carter 2625* (DS, MEXU, MICH, SD, UC, US); Sierra de la Giganta, ridge S of Tinaja de Naucajoa, Cerros de Naucajoa (W of Llanos de San Juan), ca. 26°15'N, 111°38'W, *A. Carter 4502* (UC); Sierra de la Giganta, between Rancho San Mártir and summit of grade, rd from Loreto to San Javier, ca. 25°56'N, 111°32'W, *A. Carter & F. Chisaki 1315* (UC); near Rancho Los Burros, E of Llanos de San Pedro, NE of Comondú, 26°05'N, 111°40'W, *A. Carter & R. Ferris 3430* (DS, MEXU, SD, UC); Arroyo Carrizal, E of Rancho El Horno (NE of San Xavier), ca. 25°53'N, 111°31'W, *A. Carter & R. Ferris 3829a* (CAS, UC); Isla Carmen, Puerto Balandra, ca. 26°05'N, 111°10'W, *A. Carter & J. Reese 4548* (UC); arroyo upstream (E) from Rancho Agua Escondido, ca. 25°06'N, 111°00'W, *A. Carter et al. 5724* (CAS, UC); 11.9–14.5 mi W of Hwy 1 in Rosarito, *T. Daniel 1929* (ASU, CAS), *1940* (ASU, CAS); along Hwy 286 between La Paz and San Juan de los Planes, near Paraje Los Chinos (8.3 km NW of La Huerta), ca. 24°06'N, 110°15'W, *T. Daniel & M. Butterwick 6833* (CAS); along Hwy 1 in S end of Sierra de la Giganta, 38.3 mi NW of jct Hwy 11 in La Paz, *T. Daniel et al. 2453* (ASU, CAS, MICH, NY); Puerto Escondido, *E. Dawson 1098* (F, MICH, RSA), *6399* (RSA); 1–2 mi inland from Agua Verde Bay, *E. Dawson 6259* (RSA), *6272* (RSA); Las Cuevitas, below Comondú, *H. Gentry 4235* (DES, DS, MICH, MO); between San Ignacio and Los Martiles, *H. Gentry 7872* (DS, RSA, UC); San Nicholas Bay, *I. Johnston 3729* (CAS); Carmen Island, Puerto Balandra, *I. Johnston 3820* (CAS, GH, NY, UC, US); Carmen Island, Balandra Bay, 26°00'N, 111°10'W, *R. Moran 3928* (DS, SD, UC, US); NE side of San Marcos Island, Arroyo de los Chivos, 27°15'N, 112°06'W, *R. Moran 8999* (SD); Danzante Island, 25°48'N, 111°15'W, *R. Moran 9249* (SD); Sierra de la Giganta, summit of Cerro Mechudo, ca. 24°48'N, 110°43'W, *R. Moran 18945* (SD, UC); island in Conception Bay, *P. Rempel 197* (ARIZ, RSA), *208* (ARIZ, RSA); 14 mi S of Mulegé, *F. Shreve 7086* (ARIZ, F, GH, LA, MICH, MO); Isla del Carmen, Puerto Balandra, ca. 26°01'N, 111°11'W, *M. Sousa P. 142* (RSA); 13 mi S of Mulegé, *J. Whitehead 745* (DS); ca. 2 mi S of Punta Escondido along Hwy 1, *D. Zippin 49* (SD).

1b". *Holographis virgata* subsp. *glandulifera* var. *palmeri* (Rose) T. F. Daniel, J. Arnold Arbor. 64:144. 1983. *Berginia palmeri* Rose, Contr. U. S. Natl. Herb. 1:86. 1890. TYPE. — MEXICO. **Baja California Sur:** Santa Rosalía, 15 Mar 1890, *E. Palmer 272* (holotype: US!;

isotypes: A!, C!, DS!, F!, G!, GH!, MEXU!, NY!).

Trichomes of the younger stems erect to flexuose, 0.1–0.7 (–1) mm long. Leaves sessile to petiolate, petioles to 5 mm long, blades lance-ovate to obovate, (6–) 11–46 mm long, (4–) 7–26 mm wide, 1.1–3.3 times longer than wide. Inflorescence rachises pubescent with glandular trichomes 0.2–1 mm long and erect to subflexuose eglandular trichomes 0.2–0.5 mm long. Bracts pubescent like rachis. (Chromosome number unknown.) Fig. 17c.

DISTRIBUTION AND HABITAT. — Endemic to eastern Baja California Sur (Fig. 18); the species occurs in nondesert portions of the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast subdivision); plants occur on rocky slopes and along watercourses in desert-scrub and thornscrub primarily at elevations above 600 m (i.e., 550–1100 m except in the Cape Region where known from ca. 30 m, see Daniel 1983b).

LOCAL NAME. — “Rama blanca” (*Peters 206*).

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. **Baja California Sur:** Sierra de Laguna, *T. Brandegeae 443* (UC); Sierra de la Giganta, La Esperanza, ca. 25°48'N, 111°24'W, *A. Carter 4403* (UC); Sierra de la Giganta, vic. of Portezuelo W of summit of Cerro Gabilán, ca. 25°50'N, 111°25'W, *A. Carter 5106* (UC); Sierra de la Giganta, Mesa de San Gerónimo, N from Rancho Viejo, (on rd from Loreto to San Javier), ca. 25°58'–26°N, 111°32'–34'W, *A. Carter 5131* (CAS, GH, MICH, SD, UC, US); Aguaje de San Antonio, Arroyo el Coyote (SE of La Soledad, N of Cerro Mechudo), ca. 24°49'N, 110°46'W, *A. Carter 5420* (CAS, UC); Sierra de la Giganta, Arroyo Carrizal, E of Rancho El Horno (NE of San Xavier), ca. 25°53'N, 111°31'W, *A. Carter & R. Ferris 3819* (CAS, MEXU, UC, US); S side of Valle de los Encinos, S side of Cerro Giganta, ca. 26°03'N, 111°34'W, *A. Carter & R. Ferris 4001* (CAS, UC); Sierra de la Giganta, S of La Puerta, W end of Valle de los Encinos, S side of Cerro Giganta, ca. 26°04'N, 111°36'W, *A. Carter & J. Reese 4574* (CAS, MEXU, UC, US);

Sierra de la Giganta, N slope of Pilón de las Parras, W of Loreto, ca. 25°58'N, 111°30'W, *A. Carter & H. Sharsmith 4215* (CAS, F, MO, NY, UC, US); 5 mi S of San Bartolo, *M. Gallagher 139* (ASU); Sierra Giganta above Pto. Escondido, *H. Gentry 3762* (A, ARIZ, DES, MICH, MO, UC); 21.2 mi NE of summit of Volcán Tres Vírgenes, 27°30'N, 112°33'W, *J. Henrickson 9010* (SD); N base of Volcán las Tres Vírgenes, 27°29'N, 112°36'W, *R. Moran 20459* (POM, SD); La Ciénega Arroyo, Distr. Buena Vista, *R. Peters 206* (UC); 8 mi E of pass of Tres Vírgenes Peak, *F. Shreve 7051a* (ARIZ); El Purgatorio grade W of Santa Rosalía, along rd to San Ignacio, *I. Wiggins & D. Wiggins 18206* (CAS, DS, MEXU).

Daniel (1983b) further discussed the distribution of and morphological variation in this variety.

JUSTICIA

Justicia L., Sp. pl. 1:15. 1753, nom. cons. prop. LECTOTYPE (Hitchcock and Green, International Botanical Congress, Cambridge (England), 1930: Nomenclature Proposals by British Botanists. 116. 1929). — *Justicia hyssopifolia* L.

Dianthera L., Sp. pl. 1:27. 1753. TYPE. — *Dianthera americana* L. (≡ *Justicia americana* (L.) Vahl).

Beloperone Nees in Wall., Pl. asiat. rar. 3:76. 1832. LECTOTYPE (Kew Bull. 43:609. 1988). — *Beloperone amherstiae* Nees (≡ *Justicia brasiliana* Roth).

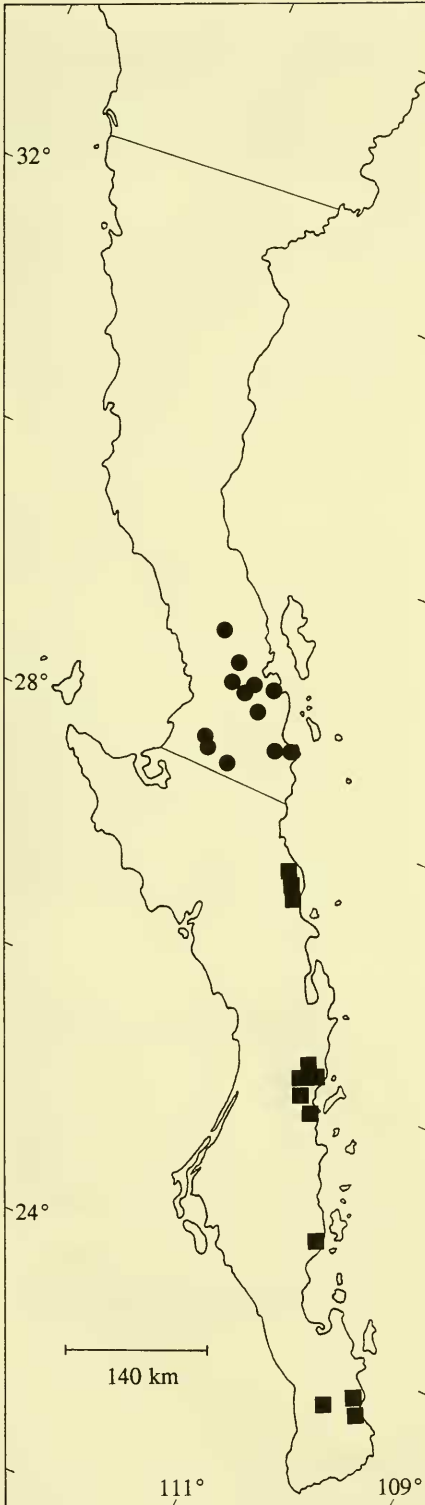
Sericographis Nees in Mart., Fl. bras. 9:107. 1847. LECTOTYPE (Contr. U. S. Natl. Herb. 31:650. 1958). — *Sericographis rigida* Nees (≡ *Justicia sericographis* V. A. W. Graham).

Jacobinia Nees in Moric., Pl. nouv. Amér. 156. 1847. TYPE. — *Jacobinia lepida* Nees (≡ *Justicia lepida* (Nees) Wassh.).

Siphonoglossa Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1854:159. 1855.

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FIGURE 18. Distribution of *Holographis virgata* subsp. *virgata* (circles) in the peninsula of Baja California and *H. virgata* subsp. *glandulifera* var. *palmeri* (squares).



TYPE. — *Siphonoglossa ramosa* Oerst. (\equiv *Justicia ramosa* (Oerst.) V. A. W. Graham).

Decumbent to erect perennial herbs, shrubs, or small trees with cystoliths. Leaves opposite, sessile to petiolate, margin entire to sinuate to crenate. Inflorescence of dichasia in leaf axils (or in axil of 2 partially fused bracts forming a cupulate involucre) or of axillary or terminal dichasiate spikes, racemes, thyrses, or panicles; dichasia alternate or opposite, 1 (–3)-flowered, subtended by a leaf or a bract, sessile or pedunculate. Bracts homomorphic (in ours) or heteromorphic, alternate or opposite, green or brightly colored, prominent or inconspicuous, margin entire (in ours). Flowers homostylous, subtended by 2 homomorphic bracteoles, sessile or pedicellate. Calyx deeply 4–5-lobed, lobes equal or unequal in size, posterior lobe sometimes greatly reduced in flowers with 5 calyx lobes. Corolla greenish, white, yellow, orange, pinkish, red, or purplish, usually with white or colored markings (often restricted to lower lip), tube cylindrical to expanded distally, usually lacking a distinct throat, limb strongly zygomorphic, bilabiate, upper lip internally rugulate (i.e., with a styler furrow), entire to 2-lobed, lower lip 3-lobed, corolla lobes imbricate in bud. Stamens 2, inserted at various positions within corolla tube, exserted from mouth of corolla, anthers 2-theous (1 theca rarely sterile), thecae equal or unequal in length, equally inserted, unequally inserted (but overlapping for some portion of their length), or superposed (i.e., not overlapping), parallel to perpendicular, 1 or both with a basal appendage or appendages absent, dehiscent toward lower lip (i.e., flower nototribal); pollen subprolate to perprolate, 2–4-aperturate (varying from porate to colporate with distinctness of colpi sometimes questionable), apertures flanked on each side by 1–several rows of \pm circular insulae and/or peninsulae (in ours) or by both a solid band of exine and a pseudocolpus, exine usually reticulate; staminodes 0 (although pubescent thickenings near attachment of filaments rarely present). Style exserted from mouth of corolla, stigma lobes indistinct to distinct, when distinct equal to unequal in length (1 lobe sometimes vestigial). Capsule stipitate, retinacula present, septa with attached retinacula remaining attached to inner wall of mature capsule. Seeds 2–4, homomorphic, lenticular to globose. ($x = 11, 14$).

Justicia is the largest genus of Acanthaceae with estimates of up to 600 species worldwide. It is also the largest genus of the family in Mexico with about 80 species there. About 14 species of *Justicia* are native to the United States. Morphological diversity in the genus is extensive and the above generic description is derived from North and Central American species only. The synonymy given above only includes genera in which species from our region have been previously treated. Daniel (1995) provided a more complete listing of generic synonyms in which American species have been treated. Graham (1988) presented a comprehensive generic account of *Justicia* that includes generic synonyms on a world-wide basis.

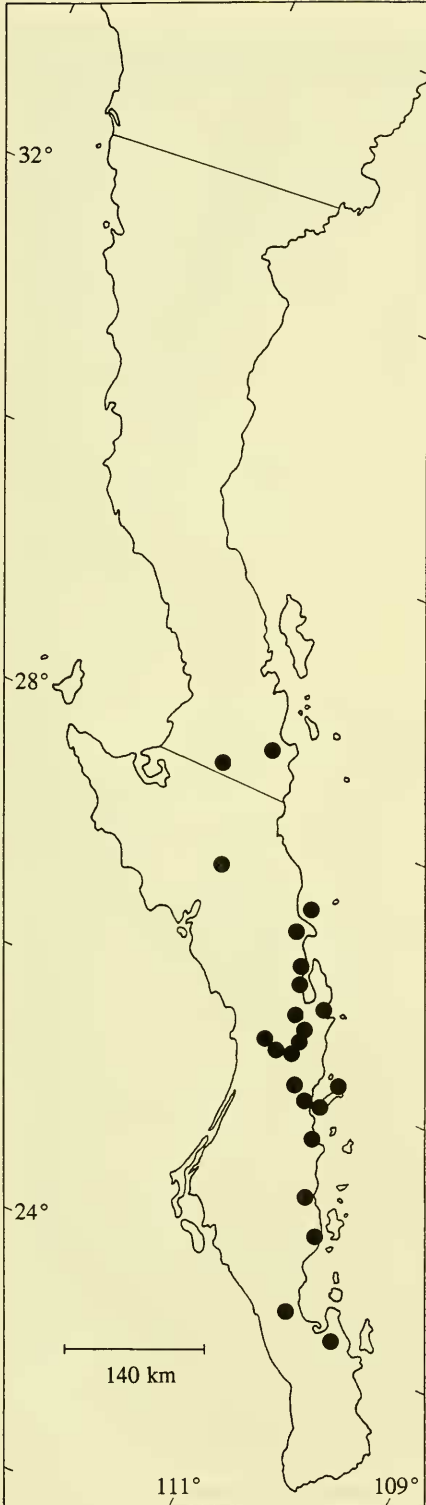
REFERENCE. — GRAHAM, V. A. W. 1988. Delimitation and infra-generic classification of *Justicia* (Acanthaceae). *Kew Bull.* 43:551–624.

Key to Species of *Justicia*

- 1. Calyx 4-lobed; corolla pinkish, 15–27 mm long, tube subsaccate or cylindric.
- 2. Inflorescence of 1-flowered dichasia in leaf axils; pubescence of bracteoles, calyx, and capsules comprising eglandular trichomes only; corolla 22–27 mm long, tube cylindric, 1.3–1.4 mm in diameter near midpoint; thecae lacking basal appendages; seeds lacking trichomes *J. austrocapensis*
- 2. Inflorescence of dichasiate spikes or panicles of spikes, dichasia 1-flowered and borne in axils of bracts; pubescence of bracteoles, calyx, and capsules including glandular trichomes; corolla 15–22 mm long, tube subsaccate on anterior side, 4.5–6 mm in diameter near midpoint; lower theca of a pair with a prominent basal appendage; seeds covered with retrorsely barbed trichomes . . . *J. insolita*
- 1. Calyx 5-lobed; corolla orange to red (rarely yellow), (21–) 27–55 mm long, tube expanded distally (i.e., funnellform).
- 3. Inflorescence of dichasiate thyrses; dichasia 1-flowered, usually opposite at inflorescence nodes, pedunculate, peduncles (1–) 1.5–21 mm long; thecae dorsally pubescent; capsules 15–24 mm long; seeds subglobose to subcompressed, 1.8–2.4 mm thick.
- 4. Bracts caducous, ovate to lance-elliptic to elliptic to obovate, 2.5–10 mm long, 1–4 mm wide; calyx 3–13 mm long; southwestern United States and northwestern Mexico *J. californica*
- 4. Bracts persistent, cordate to broadly ovate, 10–43 mm long, 8.5–33 mm wide; calyx 9–23 mm long; Cape Region of Baja California Sur only *J. purpusii*
- 3. Inflorescence of dichasiate spikes or panicles of spikes or of dichasia in leaf axils; dichasia 1-flowered, alternate at inflorescence nodes, sessile to subsessile (i.e., peduncles to 1.5 mm long); thecae dorsally glabrous; capsules 11–17 mm long; seeds compressed, 0.8–1.3 mm thick.
- 5. Stems multi-grooved (i.e., grooves > 8), pubescence of young stems resulting in a pallid aspect, the epidermis not (or only barely) visible; bracteoles petiolate, spatulate to oblanceolate to obovate to elliptic, 1–4.5 mm wide; lower theca of a pair with a conspicuous basal appendage to 0.3 mm long *J. palmeri*
- 5. Stems with 4–8 grooves (if grooves evident at all), pubescence of young stems not resulting in a pallid aspect, the epidermis usually clearly visible; bracteoles sessile, triangular to subulate to lanceolate to linear to ovate, 0.6–1 mm wide; thecae lacking basal appendages or with inconspicuous appendages to 0.1 mm long.
- 6. Bracteoles 8–10 mm long; pubescence of external surface of corolla comprising eglandular trichomes



FIGURE 19. Distribution of *Holographis virgata* subsp. *glandulifera* var. *glandulifera*.



- only; seeds reddish, surfaces smooth to irregularly bumpy . . . *J. candicans*
6. Bracteoles 2–3.6 mm long; external surface of corolla pubescent with eglandular and glandular trichomes or external surface glabrous distally and inconspicuously pubescent proximally with glandular trichomes only; seeds dark brown, surfaces bubbly tuberculate to papillate with subconic papillae.
7. Young stems suboctagonal, pubescent with trichomes 0.05–0.1 (–0.2) mm long; pubescence of inflorescence rachis including glandular trichomes; bracts 2.2–2.8 mm long, pubescence of the abaxial surface comprising glandular and eglandular trichomes; corolla 25–31 mm long, externally pubescent with glandular and eglandular trichomes, the lower lip spreading with lobes 5–7.5 mm long; capsule pubescent with glandular and eglandular trichomes; seeds bubbly tuberculate; native *J. hians*
7. Young stems subterete to quadrate, pubescent with trichomes 0.5–1.2 mm long; pubescence of inflorescence rachis comprising eglandular trichomes only; bracts 1–2 mm long, abaxial surface glabrous; corolla 33–55 mm long, externally glabrous distally and pubescent with inconspicuous glands only proximally, lower lip recoiled with lobes 0.8–2.5 mm long; capsule glabrous; seeds covered with subconic papillae; introduced
 *J. spicigera*

1. ***Justicia austrocapensis*** T. F. Daniel, nom. nov. *Dianthera incerta* Brandegee, Proc. Calif. Acad. Sci., ser. 2, 3:226. 1892, non *Justicia incerta* C.B. Clarke (1912). *Siphonoglossa incerta* (Brandegee) Hilsenb., Brittonia 31:378. 1979. TYPE. — MEXICO. Baja California Sur: San Bartolomé [San Bartolo], 24 Oct 1890, *T. Brandegee* 456 (lectotype, designated here: UC!; isolectotype: UC!).

Erect to ascending perennial herbs to 1 m tall. Young stems quadrate to quadrate-sulcate, pubescent with flexuose to retrorse eglandular trichomes 0.3–1 mm long, trichomes either \pm evenly disposed or concentrated in and soon restricted to 2 lines, epidermis visible. Leaves subsessile to petiolate, petioles to 6 mm long (petiolar stubs to 2 mm long remaining at nodes after leaves have fallen), blades lance-ovate to ovate to broadly ovate, (9–) 16–55 mm long, 3.5–44 mm wide, 1.1–2.3 (–4) times longer than wide, (rounded to) acute to acuminate at apex, acute to truncate to cordate at base, surfaces pubescent with flexuose to antrorse eglandular trichomes and sometimes \pm glandular punctate as well, margin entire to subsinuate. Inflorescence of dichasia in leaf axils (or distal leaves sometimes reduced and bractlike); dichasia alternate to opposite, 1-flowered, 1 (–3) per axil, sessile to subsessile (i.e., peduncles to 1 mm long). Bracteoles sessile, lance-subulate, 2.2–5.5 mm long, 0.6–0.9 mm wide, abaxial surface pubescent with cauline type trichomes. Flowers sessile. Calyx 4-lobed, 3–7 mm long, lobes lance-subulate, 2.5–5.5 mm long, subequal in length, 0.6–0.7 mm wide, abaxially pubescent like bracteoles. Corolla rose-pink with a white and darker rose-pink crow's-foot pattern on lower lip (just distal to mouth of corolla), (18–) 21–30 mm long, externally pubescent with erect to flexuose eglandular and glandular trichomes 0.1–0.4 mm long, tube cylindrical (i.e., not expanded distally), (11–) 14–17 mm long, (1–) 1.3–1.4 mm in diameter near midpoint, upper lip usually \pm recurved, 5–10.5 mm long, entire at apex, lower lip spreading, 5–14 mm long, lobes 4–9 mm long, 2.3–5.5 mm wide. Stamens inserted near apex of corolla tube, 4–5 mm long, filaments glabrous, thecae 1–1.7 mm long, subequal to \pm unequal, subparallel to subperpendicular, unequally inserted (overlapping by 0.7–1.3 mm), dorsally glabrous, lacking basal appendages; pollen (Fig. 20a, b) 2-aperturate, apertures flanked on each side by 2 rows of insulae (to peninsulae), exine reticulate. Style 14–18 mm long, proximally pubescent with eglandular trichomes, stigma lobes 0.3–0.6 mm long, unequal or indistinct from one another. Capsule 9–13.5 mm long, pubescent with flexuose to retrorse eglandular trichomes 0.2–0.3 mm long, stipe 2.5–4.5 mm long, head subellipsoid, 6–9 mm long. Seeds 4, white (immature) to brown (mature), compressed, 2–3 mm long,

1.8–2.6 mm wide, 0.8–1.1 mm thick, surfaces and margin bubbly tuberculate. ($n = 11$, Hilsenbeck 1983a).

PHENOLOGY. — Flowering and fruiting: September–December and April–May.

DISTRIBUTION AND HABITAT. — Endemic to nondesert portions of the southern Cape Region of Baja California Sur (Fig. 21); plants occur on slopes and along watercourses in tropical deciduous forest, oak woodland, and pine-oak woodland at 460–1230 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Saucito, *T. Brandegeae* s.n. (GH); San José del Cabo, *T. Brandegeae* s.n. (GH); Cape Region, *T. Brandegeae* s.n. (UC); El Taste, *T. Brandegeae* s.n. (POM, UC); Cape Region, Rancho San Bernardo, E side of Sierra de la Victoria, ca. 23°25'N, 109°57'W, *A. Carter 2681* (UC); Sierra El Taste, N of portezuelo between Rancho El Venado and El Encinal, 23°10'N, 109°56'W, *A. Carter & F. Chisaki 3585* (CAS, UC); E side of Sierra de la Victoria, near "Tapon" (jct with La Chuparosa trail), Arroyo de San Francisquito, 23°29–31'N, 109°47–55'W, *A. Carter & R. Ferris 3372* (DS, SD, UC); along rd from Hwy 1 across Cape Region mts to Hwy 19, 16–20 km W of Hwy 1, ca. 23°14'N, 109°55'W, *T. Daniel & M. Butterwick 6926* (BR, CAS, ENCB, MO, SBBG, US); 6929 (CAS, HCIB, MEXU, MICH); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, *T. Daniel et al. 6862* (CAS); Ojo de Agua, Cañón de La Burrera, 23°30'N, 110°02'W, *M. Domínguez L. 362* (HCIB); San Bartolo, *F. Gander 9676* (CAS); Sierra de la Laguna, Las Animas, ranch at river-fork near base of El Picacho Peak, *B. Hammerly 279* (CAS); El Jacinto, Cañón de La Burrera, 23°02'N, 109°57'W, *J. León de la Luz 4926* (HCIB); Cape Region, potrero de Almenta near head of S fork of Cañón San Pedro, ca. 23°19'N, 109°56'W, *R. Moran 7373* (CAS, DS, SD).

Brandegee (1892) did not designate a type or cite a particular specimen in his protologue of *Dianthera incerta*. He merely stated, "San Bartolomé and slopes of the mountains above Agua Caliente." According to information provided by Brandege (1891, 1892), material on which his species was based was collected in 1890 at "San Bartolomé." Indeed, the collection from San Bartolomé noted above is the only one of this species in the Brandege herbarium at UC that was collected in 1890. Other collections of *J. austrocapensis* in Brandege's herbarium (i.e., from "El Taste" and the "Cape Region") and Brandege

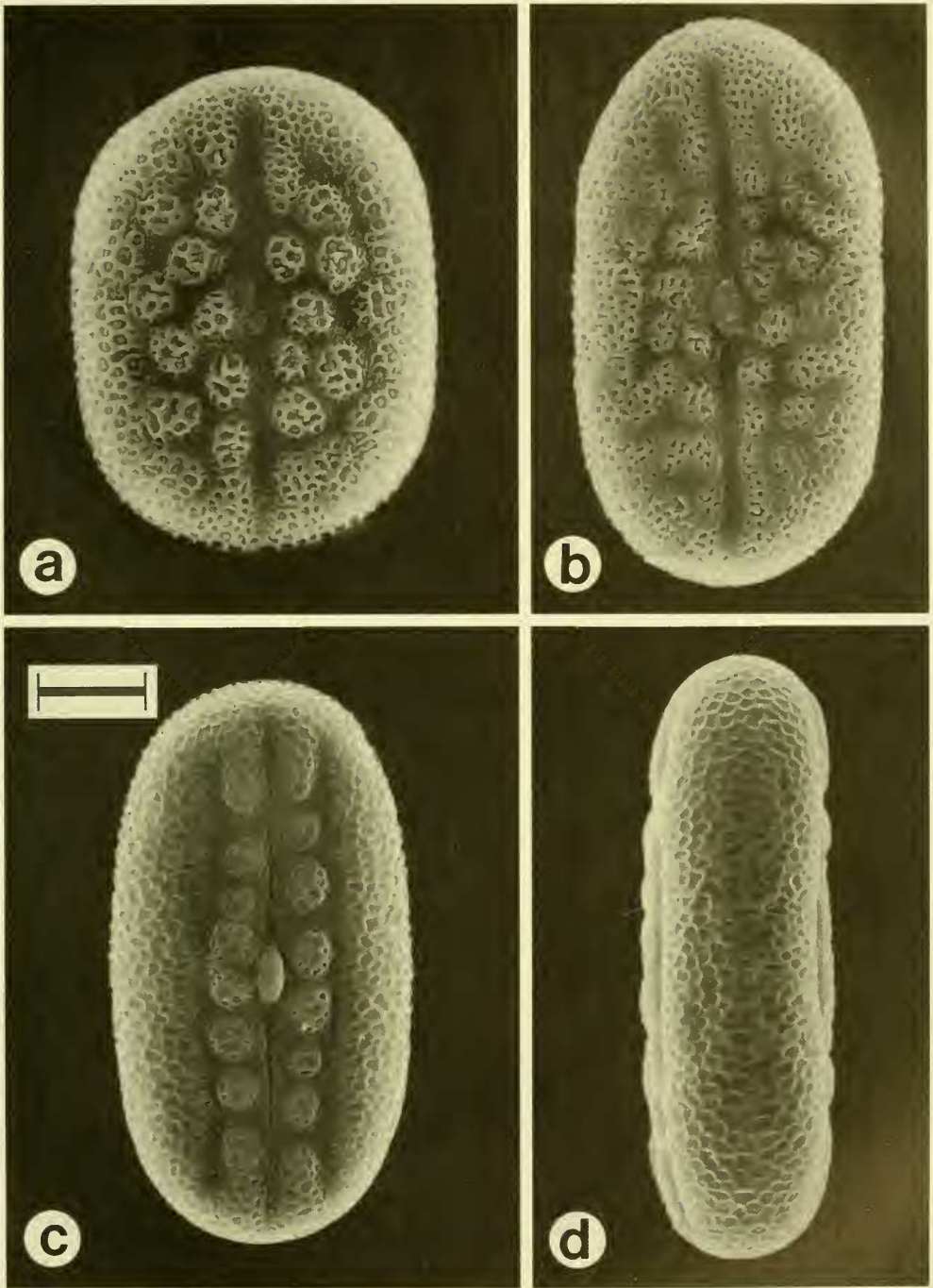


FIGURE 20. Pollen. a. *Justicia austrocapensis* (Moran 7373), apertural view; b. *J. austrocapensis* (Moran 7373), apertural view; c. *J. californica* (Daniel 1542), apertural view; d. *J. californica* (Daniel 1542), interapertural view. Scale for a-d = 10 μ m.

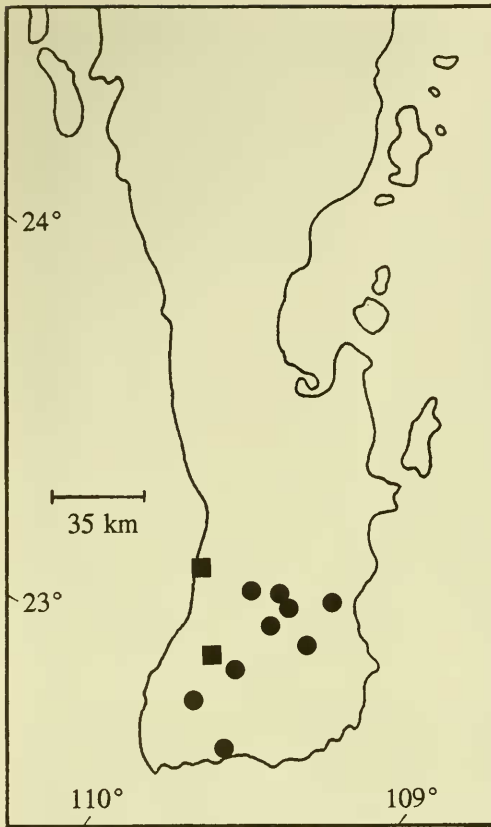


FIGURE 21. Distribution of *Justicia austrocapensis* (circles) and of *Ruellia inundata* (squares) in the peninsula of Baja California.

collections in other herbaria (e.g., from “Saucito” and “San José del Cabo,” both at GH) were collected in subsequent years. There are two specimens of *Brandege* 456 in the Brandege Herbarium. One of these was annotated by Hilsenbeck as the lectotype of *D. incerta* and the other as an isolectotype, but these designations were not published. The specimen designated as an isolectotype by Hilsenbeck contains the annotation “*Dianthera incerta*” in Brandege’s handwriting whereas the specimen designated by Hilsenbeck as the lectotype does not. Both specimens contain flowers and fruit and agree with the protologue. I chose to follow Recommendation 9A.3 of the International Code of Botanical Nomenclature (Greuter et al. 1994) and designate the specimen annotated by Brandege as the lectotype. This specimen is mounted on a sheet

with another of Brandege’s collections of *J. austrocapensis* (i.e., “El Taste” collected on 12 Sep 1893).

This species has been variously reported from the peninsula of Baja California as *Dianthera* sp. (Brandege 1891), *Dianthera incerta* (Brandege 1892), *Siphonoglossa ramosa* Oerst. (Johnson 1958), *S. longiflora* (Torr.) A. Gray (Wiggins 1980), and *S. incerta* (Brandege) Hilsenb. (Henrickson and Hilsenbeck 1979, Hilsenbeck 1990). *Siphonoglossa* was included in *Justicia* by Graham (1988). Daniel (1995) agreed with this inclusion and discussed the putative distinctions between the genera.

The closest relative of *J. austrocapensis* is undoubtedly to be found among those species of *Justicia* sometimes treated as comprising *Siphonoglossa*. Hilsenbeck (1983b) indicated that it was most similar to *J. sessilis* Jacq. (as *S. sessilis* (Jacq.) D. N. Gibson), a species occurring in the West Indies and northern South America.

2. *Justicia californica* (Benth.) D.N. Gibson, Fieldiana, Bot. 34:67. 1972. *Beloperone californica* Benth., Bot. voy. Sulphur, 38. 1844. *Jacobinia californica* (Benth.) Nees in A. DC., Prodr. 11:729. 1847. *Sericographis californica* (Benth.) A. Gray in Torr. in Emory, Rep. U. S. Mex. bound. 2(1):125. 1858. TYPE. — MEXICO. Baja California Sur: Cape St. Lucas, *R. Hinds* s.n., 1841 (holotype: K!).

Shrubs to 3 m tall, sometimes clambering through other growth. Young stems multi-grooved and terete to quadrate, densely and evenly pubescent with erect to antrorse to retrorse to appressed eglandular trichomes 0.05–0.2 mm long, these giving the stems a pallid aspect, sometimes with an overstorey of flexuose glandular trichomes (or rarely erect eglandular trichomes only) to 1 mm long as well, epidermis not visible. Leaves (plants often leafless at anthesis) petiolate, petioles to 20 mm long (petiolar stubs to 2 mm long remaining at nodes after leaves have fallen), blades (elliptic to) ovate to deltate to subcircular to cordate, 7–70 mm long, 4–48 mm wide, 1–2.9 times longer than wide, rounded to acute at apex, cordate to truncate to acute at base, surfaces pubescent with erect to flexuose eglandular trichomes to 0.6 mm long, margin entire to subsinuate. Inflorescence

of (axillary and) terminal dichasiate thyrses to 135 (–180) mm long, these often terminating axillary branches and collectively appearing as or forming an open terminal panicle of thyrses, rachises pubescent like young stems or with an understory of erect eglandular trichomes to 0.2 mm long and an overstory (sometimes absent) of flexuose mostly glandular trichomes to 1 (–2.5) mm long; dichasia (alternate to) opposite, 1-flowered, 1 (–2) per axil, pedunculate in axils of distal leaves or bracts, peduncles (1–) 1.5–14 mm long, pubescent like rachis. Bracts caducous, (alternate to) opposite, sessile to subsessile, ovate to lance-elliptic to elliptic to obovate, 2.5–10 mm long, 1–4 mm wide, abaxial surface pubescent like rachis, bracts at proximalmost 1–2 nodes often petiolate and larger. Bracteoles sessile, subulate to linear, 1.5–6 mm long, 0.5–1 mm wide, abaxial surface pubescent like rachis. Flowers sessile to pedicellate, pedicels to 3 mm long. Calyx 5-lobed, 3–13 mm long, lobes linear-elliptic to lanceolate to lance-subulate, 2.5–11.5 mm long, equal to subequal in length, 0.8–1.8 mm wide, abaxially pubescent like rachis. Corolla dark red or orange-red with yellowish coloration proximally on internal surface of lips (rarely corolla entirely yellow), 21–41 mm long, externally pubescent with erect to flexuose eglandular (and occasionally a few glandular) trichomes 0.1–0.5 mm long, tube expanded distally, 11–20 mm long, 2.5–4 mm in diameter near midpoint, upper lip 9–21 mm long, 2-lobed at apex, lobes 0.1–0.4 mm long, lower lip spreading, 9–20 mm long, lobes 1–5.5 mm long, 1–3 mm wide. Stamens inserted near apex of corolla tube, 15–19 mm long, filaments pubescent with eglandular trichomes, thecae 2–3.3 mm long (including basal appendage), equal to subequal, subparallel to subsagittate to subperpendicular, unequally inserted (overlapping by 0.9–2 mm), dorsally pubescent with eglandular trichomes (upper theca densely so, lower theca sparsely so to nearly glabrous), lower (and sometimes upper) theca with a ± bulbous basal appendage to 0.6 mm long; pollen (Fig. 20c, d) 2-aperturate, apertures flanked on each side by 1 row of insulae, exine reticulate. Style 24–37 mm long, proximally pubescent with eglandular trichomes, stigma 2-lobed, lobes 0.1–0.2 mm long, equal to unequal. Capsule (13–) 15–24 mm long, pubescent with an understory of erect to flexuose eglandular (and sometimes glandular) trichomes

0.2–0.4 mm long and an overstory (sometimes absent) of flexuose glandular trichomes to 2.5 mm long, stipe (6–) 8–12 mm long, head broadly subellipsoid to obovoid with a medial constriction and a vertical constriction outlining seeds, 6–12 mm long. Seeds 4, brown (often mottled with darker brown), subglobose to subcompressed, 2.5–3.5 mm long, 3–4.5 mm wide, 1.8–2.3 mm thick, smooth and lacking trichomes. ($n = 14$, Grant 1955, Daniel et al. 1984).

PHENOLOGY. — Flowering and fruiting: throughout the year.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona and California) and northwestern Mexico (Baja California, Baja California Sur, Sinaloa, and Sonora); the species is known from virtually all portions of our region (Fig. 22), but is very rare in the California Floristic Province (see above); plants occur mostly in or along rocky or sandy watercourses and on slopes in desertscrub and thornscrub from near sea level to 920 m elevation. The species is often cultivated for ornament in gardens of southern California. Collections of cultivated plants are not listed among the specimens cited below.

LOCAL NAME. — “Chuparosa” (numerous herbarium labels); “candalilla” (*Wiggins 4397*); “rama blanca” (*Peters 117*).

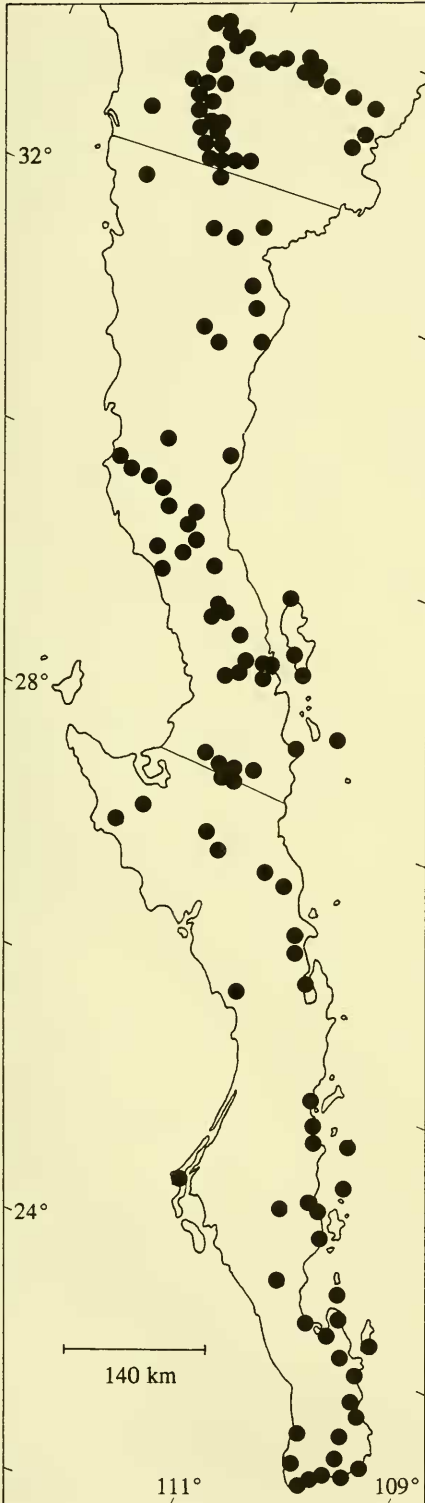
ADDITIONAL SPECIMENS EXAMINED. — UNITED STATES: California: Imperial Co: 17–20 mi S of Palo Verde, *R. Alava et al. 1822* (JEPS, UC); Coyote Wells, *N. Cooper 3078* (RSA); 4.6 mi NE jct. U. S. 80 on county rd S2, *T. Crovello 275* (UC); 2.5 mi E of Mt Springs on the El Centro Rd, *R. Ferris 7087* (DS, POM); In-Ko-Pah Gorge, *F. Gander 4657* (SD); Myers Creek bridge, foot of Mt Springs grade, *W. Jepson 11783* (JEPS); base of Mt Springs Grade, 3 mi E of San Diego Co. line, *D. Keck 3908* (DS); Coyote Wells, *E. McGregor 827* (DS); Shiphands Bridge W of Coyote Wells, *E. McGregor 1053* (DS); foot of Mt Springs Grade, *P. Munz 7815a* (POM); SE end of Chocolate Mts, Paymaster Mine, *A. Sanders 9519* (RSA), *9519.1* (UCR); 17 mi S of Palo Verde, *Sears 1171* (UCR); jct of State Hwys. 80 and 98, *I. Wiggins 14073* (DS); Pinto Wash, 32°38'N, 116°00'W, *H. Witham 686* (SD); 5 mi W of Coyote Wells on rd to Mt Springs, *C. Wolf 1889* (DS, RSA), *2279* (CAS, DS, RSA). Riverside Co: Palm Springs to Palm Canyon, *L. Abrams 11063* (DS); ca. 1 mi from JT Mon Rd and pipeline jct, *N. Aitkenhead 2105* (CAS); Indio, *J. Augsburg s.n.* (CAS); Box Canyon, Mecca, Coachella Valley, *M. Beal 862* (JEPS); San Jacinto Mts, beginning of Hemet

Rd, *L. Benson* 4183 (RSA); 2 mi W of Shaver Summit E of Indio on Hwy 66, *L. Benson* & *R. Benson* 14857 (POM); Tahquitz Canyon, *E. Blondin s.n.* (CAS); Cat Creek, 3 mi SW of Palm Desert, *D. Breedlove* 1879 (DS); 2.2 mi N of entrance from Hwy 10 to Joshua Tree Natl. Monument, *S. Carlquist* 15672 (RSA); Deep Canyon, *M. Clary 9a* (JEPS); 2 mi W of Coral Reef Ranch, Coachella Valley, *M. Clary* 1732 (JEPS); Carrizo Canyon, 18 mi W of Indio, *M. Clary s.n.* (JEPS); Mecca, *J. Clemens s.n.* (CAS); Cottonwood Spring Wash, *J. Cole* 455 (UC); near Palm Springs, *H. DeForest s.n.* (SD); Orocopia Mts, Box Canyon, *R. Dressler* 413 (RSA); S of Palm Desert, *D. Dreyer s.n.* (CAS); Tahquitz Canyon, *W.R. Dudley s.n.* (DS); Palm Springs, *A. Eastwood* 3025 (CAS), 3025a (CAS); Cottonwood Springs, *B. Evermann s.n.* (CAS); 5 mi E of Desert Center, *J. Ewan* 4145 (UC); 1 mi below Cottonwood Springs, *R. Ferris* & *R. Rossbach* 9557 (DS); Palm Springs, *G. Grant* 101 (UC); Joshua Tree Natl. Monument, ca. 4 mi from jct of rd leading through park and Hwy 70, *R. Gustafson* 839 (RSA); 7 mi W of Coachella, *H. Hall* 5776 (DS); Mecca Canyon, *G. Hanna* & *M. Hanna s.n.* (CAS); 3 mi below Cottonwood Springs, *C. Hitchcock* 5965 (DS, RSA, UC); Dead Indian Canyon, *R.F. Hoover* 10163 (CAS, UC); 2 mi E of Shaver's Well, *J. Howell* 3306 (CAS, JEPS); Mecca, Box Canyon, *J. Janish* 1026 (DS); Painted Canyon, Mecca Hills, *W. Jepson* 11674 (JEPS); near Palm Springs, *I. Johnston* 1079 (DS, UC); Shaver's Well, *M. Jones s.n.* (DS); W of Blythe, *M. Jones s.n.* (CAS); Indio, *M. Jones s.n.* (POM); Palm Springs, *H. Mason* 4251 (UC); Palm Canyon, *H. Mason* 14212 (SD, UC); 6 mi up Painted Canyon, *E. McGregor* 731 (DS, POM); Santa Rosa Mts, Deep Canyon along Coyote Wash, *D. Michener* 3451b (RSA); Eagle Mts, Cottonwood Pass, *R. Moran* 855 (CAS, DS, RSA); Deep Canyon, Coachella Valley, *P. Munz* 11971 (POM, UC); Eagle Mts, 3 mi S of Cottonwood Springs, *P. Munz* 15692 (CAS, DS, POM, UC); vicinity of Corn Springs, Chuckwalla Mts, *P. Munz* & *D. Keck* 4902 (POM, UC); Palm Canyon, *P. Munz et al.* 2383 (DS); Palm Springs, *A. Nelson* & *R. Nelson* 3219 (DS, UC); Palm Springs, *S. Parish* 4136 (JEPS), 19193 (UC); Cottonwood Springs, *S. Parish* 10840 (DS); Palms to Pines Hwy, mouth of Santa Rosa Canyon, *H. Parks* & *S. Parks* 24166 (UC); 20 mi E of Desert Center, *R. Perkins* & *H. de Forest s.n.* (RSA); W side of Chuckwalla Mts ca. 2 mi S of I-10, ca. 33°40'N, 115°31'W, *B. Pitzer* 640 (RSA, SD, UCR); Coachella Valley, *E. Rixford s.n.* (CAS); Chuckwalla

Mts, above Corn Spring, *J. Roos* 4233 (UCR); Tahquitz Canyon Wash, Palm Springs, *L. Rose* 46304 (CAS, DS, POM, UC); base of Orocopia Mts, Box Canyon, *J. Shevock* 5811 (CAS); Eagle Mts, E end of Box Canyon, *B. Stark* 3753 (DS, RSA, UC); S part of Palm Springs, *J. Thomas* 59 (DS); Lower Cottonwood Springs Wash, N of I-10, *B. Trowbridge* 6099 (CAS); 5 mi W of Shaver's Well, *I. Wiggins* 8757 (DS, UC); 9 mi W of Desert Center, *I. Wiggins* 9689 (DS, RSA, UC); 15 mi NE of Mecca, T4S, R9E, Thermal Quad, *H. Yates* 6445 (UC); N slope of Santa Rosa Mts, jeep rd to Coyote Canyon from Deep Canyon Research Center, *W. Zabriskie* 103 (CAS, UCR). San Diego Co: Borrego Park on Rte. 78, 35 mi W of jct U. S. Hwy 99 and Rte 78, *L. Abrams* 13898 (DS), 13899 (DS); S of Borrego Valley, *R. Bacigalupi* 3571 (JEPS); San Diego River, Lakeside, 32°52'N, 116°53'W, *R. Beauchamp* & *B. Mackintosh* 2986 (SD); *Tubbs Canyon*, W edge of Borrego Valley, *D. Breedlove* 58570 (CAS); Vallecitos Station, *C. Brown s.n.* (SD); Mine Wash, T12S, R6E, Whale Peak Quad, near old mine site, *D. Clemons* & *E. Jonsson* 1974 (SD); Borrego Desert below Julian, *N. Cooper* 2320 (RSA), 2321 (RSA); between Jacumba and Mt Springs, *A. Eastwood* 10 (CAS); Yaqui Wells, *A. Eastwood* 2724 (CAS); Hell Hole Canyon, near Borrego, *C. Epling* & *W. Robison s.n.* (DS, CAS, RSA, UC); along Coyote Creek ca. 3 mi SE of Lone Palm, N end of Borrego Valley, *F. Gander* 13451 (SD); Vallecitos Station, *F. Gander* 176.27 (SD); Round Granite Hill near The Narrows, *F. Gander* 295.6 (SD); S end of Pinyon Mountain, *F. Gander* 357 (SD); Borrego Palm Cañón, *F. Gander* 1253 (SD); Fish Creek, across from gypsum mine, *F. Gander* 4696 (SD); Mt Palm Springs, *F. Gander* 4856 (SD); Crane Break Cañón, *F. Gander* 4874 (SD); Lakeside, near Van der Veer Ranch, *F. Gander* 7018 (SD); near Palm Canyon, Borrego Valley, *H. Gentry s.n.* (DS); Borrego, *S. Harter s.n.* (SD); between Ocotillo Well and Agua Caliente Hot Springs, 1 mi E of Anza-Borrego State Park, *C. Hitchcock* 24266 (UC); N Borrego Valley, *J. Howell* 3220 (CAS, UC); Lakeside, *F. Hubby* 14 (DS); Vallecito, *W. Jepson* 8567 (JEPS, SD); Wagon Wash near Sentenac Canyon, *W. Jepson* 8773 (JEPS); Yaqui Well, *M. Jones s.n.* (DS); San Felipe Hill, *M. Jones s.n.* (DS); Jacumba, *M. Jones s.n.* (POM); along Hwy S-2, Carrizo Valley, T15S, R7E, Sweeney Pass Quad, *E. Jonsson* & *D. Clemons* 1227 (SD); ca. 2 mi N of summit of Yaqui Pass, *D. Kyhos* 62-8 (DS); Carrizo Gorge, *M. Leeper s.n.* (SD); Borrego Desert State Park, Palm

→

FIGURE 22. Distribution of *Justicia californica* in California, Baja California, and Baja California Sur.



Canyon, 1.8 mi W of headquarters, *R. Malloory* 403 (RSA); 1 mi N Tamarisk Grove, *J. Massey & J. Henrikson* 1057 (RSA); 15 km W of Borrego Springs, *A. Mayers s.n.* (UCR); Mt Spring, *E. Mearns* 3104 (DS); San Felipe Wash near Borrego Valley, *C. Meyer* 41 (JEPS, UC); near head of Borrego Valley, *P. Munz* 12885 (RSA); NW end of Borrego Valley, *P. Munz* 15589 (CAS, POM); below Cranebrake Canyon, near Vallecitos, *P. Munz* 15842 (POM); Borrego Springs, *G. Muth* 548 (DS); mts back of Agua Caliente, *S. Parish & W. Parish* 12 (DS, UC); San Felipe Creek near base of Sentenac Canyon, *F. Peirson* 7736 (DS, RSA); Lakeside, *N. Pettibone & F. Hubby s.n.* (CAS); Borrego Valley, *E. Purer* 4912 (SD); Vallecito Stage Station, *E. Purer* 6412 (SD); Mt Palm Springs, *P. Raven* 11542 (CAS, JEPS); 3 mi E of Sentenac Canyon on Hwy 79, *E. Rush* 137 (POM); foot of Palm Canyon, Borrego Valley, *P. Silva* 15 (RSA); Borrego Desert, *S. Stone* 30 (SD); Yaqui Springs in Anza Desert State Park, near Hwy 78, *J. Thomas* 365 (DS); Mason Valley, *F. Tose s.n.* (CAS); Vallecito Stage Station, Vallecito Creek, *G. True* 8129 (CAS); San Felipe Canyon, T12S, R6E, Seventeen Palms Quad, *H. Yates* 5463 (UC).

MEXICO: Baja California: sierra E of La Ramona on rd from Guayaquil to Puerto Santa Catarina, NW of Cataviña, *S. Boyd & T. Ross* 5395 (RSA); Sierra La Asamblea, 13.5 mi N of jct with rd to Bahía de Los Angeles, ca. 29°16'N, 114°06'W, *S. Boyd & T. Ross* 5560 (RSA); 34 km S of El Rosario, *D. Breedlove* 60744 (CAS); 20-30 mi S of Punta Canoas along tract to Punta Cono, *D. Breedlove* 62503 (CAS); 38 km N of jct to Bahía de Los Angeles along rd to Cataviña, *D. Breedlove & C. Burns* 72796 (CAS); 15 km inland from Punta Canoas on rd to Cataviña, *D. Breedlove & C. Burns* 72842 (CAS); Cataviña, *F. Cronemiller* 3060 (DS, POM); Cañón Carrizo, E side of Sierra Juarez, *T. Dallman & M. Guzy* 27 (UCR); along Hwy 3 in San Matias Pass, 6.2 mi SE of San Matias, *T. Daniel* 1336 (ASU, CAS); along Hwy 5, 5.9 mi S of La Ventana, *T. Daniel* 1542 (ASU, CAS); Puerto Refugio, *E. Dawson* 1029 (RSA); 3.1 km WSW of Rancho El Arenoso, ca. 3.4 km WSW of Hwy 1 and ca. 75 km NW of Cataviña, 30°02'N, 115°20'W, *J. Dice* 697 (SD, RSA); ca. 12 mi WNW of Bahía de Los Angeles, *M. Dillon et al.* 1887 (RSA, UCR); 2 mi S of Calmallí, *C. Epling & W. Robison s.n.* (DS, UC); KM 40 de San Felipe a Puertecitos, *E. Ezcurra et al. s.n.* (RSA); 12 mi E of Rosario on San Augustine rd, *R. Ferris* 8534 (DS); 3.5 mi S of Laguna Seca Chapala on rd to Punta Prieta, *R. Ferris* 8579 (DS, RSA); Bahía de Los Angeles, S shore, W of La Mona, *P. Fritsch et al.* 1298 (RSA, UCR); E slope of Sierra Juarez, N of Gaskill's Tanks, *F. Gander* 2964 (SD); 5 mi W of Calmallí, *A. Haines & W. Stewart s.n.* (DS); Calmallí, *C. Harbison* 41682 (RSA), *s.n.* (SD); Miraflores Rancho (El Arco), *C. Harbison s.n.* (SD); Yubay Mesa area, ca. 29°10'N,

- 113°55'W, *D. Harder & W. Appleby 1012* (RSA); Rosario Arroyo, *D. Harvey s.n.* (UC); San Francisquito wash, 18.7 mi SW of Bahía San Luis Gonzaga, *J. Hastings & R. Turner 63-160* (DS, SD); 5 mi S of Rancho Arenoso, ca. 36 mi E of El Rosario, *J. Henrickson 2305* (DUKE); 6.5 mi E of El Rosario, *J. Howell 30994* (CAS, SD); Rancho Ramona, 29°53'N, 115°06'W, *E. Huey s.n.* (SD); San Fernando, 29°58'N, 115°15'W, *E. Huey s.n.* (SD); Hwy 1, 51 km N of parador near Punta Prieta, S of San Martín, *D. Johansen 128* (CAS); San Esteban Island, *I. Johnston 3188* (CAS); Valley of the Palms, *M. Jones 3724* (CAS, DS, POM, UC); Sierra de San Pedro Mártir, ca. 50 mi NW of San Felipe, from SW fork of Valle Trinidad Rd, Borrego Wash, San Felipe Desert, *S. Kaune 693* (CAS); 30 mi S of El Rosario, *K. Kirtland et al. 13183-20* (UCR); 6.6 km NW of Bahía de Los Angeles at Arroyo Columbia, ca. 28°59'N, 113°36'W, *G. Levin 2146* (UCR); San Esteban Island, SE side, *G. Lindsay s.n.* (DS); ca. 64 mi S of Rancho de Mesquital, ca. 5.3 mi N of site of Manuela, ca. 28°11'N, 113°48'W, *D. Michener et al. 4254* (RSA); Sierra San Pedro Martir, E side of San Matias Pass along Mex. 3, ca. 31°17'N, 115°26'W, *D. Michener et al. 4284* (RSA); San Borja, 28°47'N, 113°57'W, *R. Moran 1990* (DS, UC); Isla Angel de la Guarda, second large canyon W of Punta Diablo, 29°14'N, 113°19'W, *R. Moran 7206* (SD); 10 mi N of San Borja, 28°53'N, 113°50'W, *R. Moran 7967* (SD); Arroyo Cataviña at Rancho San Luis, 29°43'N, 114°43'W, *R. Moran 11466* (SD); E base of Sierra Juarez, ca. 1 mi S of U. S. border, 32°37'N, 115°59'W, *R. Moran 14807* (SD, RSA); Arroyo Matomé, ca. 18 mi above (W of) mouth, ca. 31°29'N, 114°57'W, *R. Moran 21505* (SD, UC); Arroyo las Palmas, 1 km SE of Rancho los Gavilanes, ca. 32°20'N, 116°36'W, *R. Moran 25161* (RSA); 4.8 mi N of Cataviña, *E. Naranjo-Garcia s.n.* (UCR); Sierra Pinta, 60-65 mi S of Mexicali toward San Felipe, *J. Olmsted 1123* (RSA); Palm Valley, *C. Orcutt s.n.* (SD); Rosario, *C. Orcutt s.n.* (UC); 2.2 mi N of Cataviña on Hwy 1, Arroyo El Palmarito, ca. 29°45'N, 114°45'W, *B. Pitzer 737* (RSA); Sierra Las Pintas, 0.2 mi W of Hwy 5 and 3.1 mi S of rd to Ejido J. Soldana, ca. 31°49'N, 115°09'W, *B. Prigge & D. Verity 7904* (UC, UCR); between Tijuana and Ensenada, *C. Pringle s.n.* (CAS); Arroyo Calmallí, *C. Purpus 87* (DS, UC); near KM 112 S of Mexicali on rd to San Felipe, *P. Raven 14804* (UC, RSA); 16 km SE of El Rosario, 30°00'N, 115°37'W, *P. Raven et al. 12483* (UC); Isla Angel de la Guarda, Puerto Refugio, *P. Rempel 275* (RSA); La Virgen, 7 mi N of Santa Ines, *R. Schmid 1976-32* (DAV); 13 mi E of El Arco, *L. Smith 19* (UCR); S end of Laguna Salada, *S. Smith 347* (UC); Isla Ventana, *L. Spear 49* (DAV); 15 mi S of Mexicali, *S. Stephenson 67-75* (DUKE, SD); Isla Angel de la Guarda, Puerto Refugio, *P. Tenorio L. 10838* (RSA); Bahía de los Angeles, *P. Tenorio L. 10985* (RSA); Mpio Ensenada, Isla Angel de la Guarda, Puerto Refugio, 29°33'N, 113°34'W, *P. Tenorio L. & C. Romero de T. 10838* (RSA); Mpio. Ensenada, Isla Angel de la Guarda SE, 29°04'N, 113°10'W, *P. Tenorio L. & C. Romero de T. 10956* (RSA); Mpio. Ensenada, La Junta, 35 km NE de El Arco, brecha a San Francisquito, 28°12'N, 113°11'W, *P. Tenorio L. & C. Romero de T. 13030* (CAS); Mpio. Ensenada, San Borja, 28°46'N, 113°55'W, *P. Tenorio L. & C. Romero de T. 13099* (CAS); Mpio. Ensenada, 23 km al NW de Guayaquil, carr. a Rosario, 30°03'N, 115°17'W, *P. Tenorio L. & C. Romero de T. 13135* (CAS); pass ca. 11 mi W of El Rosarito, W of S end of Sierra San Pedro Mártir, ca. 30°28'N, 115°25'W, *R. Thorne 32089* (DUKE, RSA); San Matias Pass, ca. 31°18'N, 115°25'W, *R. Thorne & D. Charlton 60186* (RSA); near Aguajito Ranch, ca. 18 mi from El Rosario, *R. Thorne & J. Henrickson 32549* (RSA); 2 mi up Arroyo Cataviña from Santa Inés, *R. Thorne & J. Henrickson 32619* (RSA); San Matias Pass, ca. 31°18'N, 115°30'W, *R. Thorne & W. Wisura 57610* (RSA); Cañón de Guadalupe, E face of Sierra Juarez, ca. 32°09'N, 115°47'W, *R. Thorne et al. 57764* (CAS, RSA, UCR); S of Valle de las Palmas, just E of Hwy 3, *R. Thorne et al. 62158* (POM); ca. 15.5 mi NW of Bahía de los Angeles, 29°00'N, 113°45'W, *G. Webster 21573* (DAV); ca. 4 mi NW of Cataviña, ca. 29°53'N, 114°50'W, *G. Webster 21724* (DAV); 8 mi from Rosario on rd to El M rmoI, *I. Wiggins 4336* (CAS, DS, POM, UC); vicinity of El M rmoI, *I. Wiggins 4367* (DS), 4378 (POM); 5-10 mi N of Cataviña, *I. Wiggins 4397* (CAS, DS, POM, UC); 8 mi SE of Rosario, *I. Wiggins 5264* (CAS, DS, POM, UC); 9 mi E of Pozo Alemán, *I. Wiggins 7788* (DS, UC); near S end of Isla San Esteban, *I. Wiggins 17199* (DS); ca. 18 mi toward Cerro Blanco from main rd between San Agustín and Laguna Chapala, 29°35'N, 114°47'W, *I. Wiggins & J. Thomas 149* (DS, SD); 3 mi S of Agua Higuera, along rd to Misión San Borjas, *I. Wiggins & D. Wiggins 14829* (CAS, DS); near KM 107 S of Mexicali along hwy to San Felipe, *I. Wiggins & D. Wiggins 15758* (DS); 10 mi W of Bahía de los Angeles, *I. Wiggins & D. Wiggins 16008* (DS); San Matias Pass, 31 mi W of San Felipe hwy, *I. Wiggins & D. Wiggins 16047* (DS); 15 mi NNE of Punta Catarina, *D. Zippin 42* (SD). Baja California Sur: NE base of Sierra El Placer, 18.5 mi E of Rancho San José del Castro on rd to Bahía Tortugas, *S. Boyd et al. 3339* (RSA); Arroyo San Bruno, SE of Santa Rosalía, 4.8 mi W of Hwy 1 toward San José de Magdalena, ca. 27°04'N, 112°12'W, *S. Boyd & T. Ross 5843* (RSA); San José del Cabo, *T. Brandegeee 444* (DS, UC); Magdalena Island, *T. Brandegeee s.n.* (DS, UC); Las Palmas, *T. Brandegeee s.n.* (UC); E base of Sierra de Placeros, 40 km SE of San

José de Castro, *D. Breedlove* 60892 (CAS, RSA); 24 km N of San Ignacio, *D. Breedlove & C. Burns* 72733 (CAS); Sierra de la Giganta, Cañón de Matancita, near foot of Cuesta de Alta Gracia, ca. 25°41'N, 111°19'W, *A. Carter* 4899 (CAS, UC); Sierra de la Giganta, Aguaje de San Antonio, Arroyo el Coyote, SE of La Soledad & N of Cerro Mechudo, ca. 24°49'N, 110°46'W, *A. Carter* 5425 (CAS, UC); Sierra de la Giganta, Arroyo del Cajón de Tecomajá, SW of Puerto Escondido, 25°43'N, 111°20'W, *A. Carter & L. Kellogg* 2893 (DS, SD, UC); 19.2 km SW of San José del Cabo, *A. Carter et al.* 2236 (CAS, DS, POM, SD, UC); Carizal, between San Juanico Bay and Cadejé, 63 km NW of La Purísima, *A. Carter et al.* 2495 (DS, UC); upstream (E) from Rancho Agua Escondido, ca. 25°06'N, 111°00'W, *A. Carter et al.* 5727 (CAS, UC); Sierra de la Giganta, Ojo de Agua, Arroyo Bachomo, NW base of Mesa de Humí, ca. 25°03'N, 110°58'W, *A. Carter et al.* 5792 (CAS, UC); 35 mi S of Todos Santos, *K. Chambers* 874 (DS, UC); Bahía de las Palmas, 1 mi SE of Buena Vista, *L. Constance* 3169 (DS, SD, UC); Muertos Bay, *T. Craig* 711 (POM); between Santiago and Agua Caliente, 2.7-5 km SW of Santiago, ca. 23°27'N, 109°45'W, *T. Daniel & M. Butterwick* 6877 (CAS, ENCB, HCIB, MEXU, MO, SBBG, US); along Hwy 19, ca. 16 km NW of Cabo San Lucas, ca. 23°00'N, 110°02'W, *T. Daniel & M. Butterwick* 6961 (CAS, HCIB); near Hwy 1, SE of San Bartolo, 28.2 mi SE of El Triunfo, *T. Daniel et al.* 2493 (ASU, BR, CAS, ENCB, MEXU, MICH, MO); Punta Frailes, *E. Dawson* 1141 (RSA), 6192 (RSA); San José del Cabo, *E. Dawson* 1217 (RSA); 1-2 mi inland from Agua Verde Bay, *E. Dawson* 6228 (RSA); Bargo Island, Concepción Bay, *E. Dawson* 6382 (RSA); El Tule, near Cape San Lucas, *F. Gander* 9710 (SD); La Paz, *F. Gander* 9784 (CAS); Sierra Giganta, Arroyo Hondo, *H. Gentry* 4154 (DS); Sierra de la Giganta, Los Encinos, *H. Gentry* 4261 (DS, UC); Cerro Tordillo and vicinity, sistema de la Sierra Viscaíno, *H. Gentry* 7440 (DS, RSA, UC); El Tule, *C. Harbison s.n.* (SD); Isla Espiritu Santo, 24°30'N, 110°24'W, *J. Hastings* 71-177 (SD); Rancho Mezquital, S of Volcán Las Tres Vírgenes, 27°26'N, 112°39'W, *D. Howe* 3733 (SD); San José del Cabo, *D. Johansen* 519 (DS); Cabo San Lucas, *D. Johansen* 531 (DS); Espiritu Santo Island, Cadeleros Bay, *I. Johnston* 4079 (CAS); San José del Cabo, *M. Jones* 24425 (POM); San Luis Gonzaga, *R. Kniffen s.n.* (UCR); 20 km N de San José del Cabo, carr. a Los Frailes, *J. León de la Luz* 1079 (SD); Cape San Lucas, *H. Mason* 1871 (CAS); middle of S coast, Cerralvo Island, 24°09'N, 109°54'W, *R. Moran* 3577 (DS); W side of Santa Cruz Island, 25°17'N, 110°44'W, *R. Moran* 3842 (DS); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, *R. Moran* 6927 (CAS, DS, RSA, SD); near middle of W side of Catalina Island, ca. 25°39'N, 110°48'W, *R. Moran*

9332 (CAS, SD); Cerralvo Island, Ruffo Ranch Canyon, 24°11'N, 109°51'W, *R. Moran* 9522 (SD); Arroyo Calvario, NE of San Andrés, 27°21'N, 114°20'W, *R. Moran* 20019 (SD); NE base of lower N slope of Volcán las Tres Vírgenes, ca. 27°29'N, 112°36'W, *R. Moran & J. Reveal* 20213 (CAS, SD); Mulegé, *E. Palmer* 16 (UC); Santa Agueda, *E. Palmer* 255 (UC); La Paz, Coyote Bay, *R. Peters* 12 (UC); arroyo into Muertos Bay, Los Planes, *R. Peters* 117 (UC); 15.5 mi S of Todos Santos, *D. Porter* 358 (CAS, DS); 25 mi N of Santa Rosalía, *F. Reed* 6234 (POM); Cabeza Ballena, *P. Rempel* 65 (RSA); Puerto Escondido, *P. Rempel* 165 (RSA); Isla Cerralvo, 24°11'N, 109°52'W, *M. Sousa P.* 200 (RSA); lado SW de Isla Santa Catalina, 25°37'N, 110°47'W, *M. Sousa P.* 226 (CAS, RSA); 1.5 mi N of El Represo (near La Paz), *W. Taylor* 6243 (RSA); Cape Region, between San Lucas and San José del Cabo, *J. Thomas* 8501 (CAS, DS); Cabo San Lucas, 22°52'N, 109°53'W, *G. Webster* 19555 (SD); 7.3 mi W of Los Planes, *I. Wiggins* 14464 (CAS, DS, UC); 0.5 mi inland from El Coyote, E of La Paz, *I. Wiggins* 14586 (CAS, DS); 1.5 mi W of El Coyote, E of La Paz, *I. Wiggins* 14588 (DS); 2.5 mi from paved hwy along rd to San Hilario, ca. 24°21'N, 110°59'W, *I. Wiggins* 15418 (DS, UC); 4 mi N of Rancho El Tablón, *I. Wiggins* 16279 (DS); E side of Isla Catalina, 25°40'N, 110°45'W, *I. Wiggins* 17636 (DS).

Most plants have overstory glands in the inflorescence and usually on the capsules as well (e.g., Imperial Co., Riverside Co., San Diego Co., B.C., and B.C.S.). Other plants lack the overstory glands altogether (e.g., Imperial Co., Riverside Co., San Diego Co., and B.C.). There is a greater tendency for plants from Baja California and Baja California Sur to have the overstory glandular pubescence. Indeed, the type from the southern Cape Region has an overstory of glandular trichomes in the inflorescence. There are many fewer collections of strictly eglandular plants from the peninsula and apparently none in the southern state. The southernmost known locales for eglandular plants in Baja California are at about lat. 29°30'N (i.e., *Hastings & Turner* 63-160 and *Tenorio L.* 10838). Plants of *J. californica* from outside of our region comprise both glandular and eglandular plants (Sonora) or glandular plants only (Arizona, Sinaloa). The distinctions between the glandular and eglandular forms is not complete. Varying densities (i.e., very sparse to dense) of glands in the overstory are evident. For example, in *Moran* 6927 and *Ganders* 9784 the overstory pubescence in the inflo-

rescence appears to consist mostly of erect to flexuose eglandular trichomes to 2 mm long and only a few scattered glands. In *Moran & Reveal 20213* and *Johansen 531* from Baja California Sur, and in *Breedlove 1879* and *Thomas 59* from California, the glandular pubescence is particularly dense. *Wiggins & Wiggins 15758* lacks overstory glands in the inflorescence but has sparse overstory glands on the capsules.

Yellow-flowered individuals represent a rare form of the species that is known from southern California (e.g., *Blondin s.n.*, *Clemons & Jonsen 1974*, *Cooper 2321*, *Massey & Henrickson 1057*, *Zabriskie 103*) and Baja California Sur (e.g., *Moran & Reveal 20213*, *Sousa P. 226*). The yellow-flowered individuals occur intermixed among red-flowered individuals and are sometimes cultivated in gardens of southern California.

Grant and Grant (1966) noted visitation to (and, in some instances, pollination of) flowers of *J. californica* (as *Beloperone californica*) by black-chinned (*Archilochus alexandri*), Costa's (*Calypte costae*), and rufous (*Selasphorus rufus*) hummingbirds. The pollination biology of this species in southern California and Arizona was subsequently studied by Michener (1979). He found that *J. californica* exhibits floral features typically associated with pollination by hummingbirds but that pollinators apparently include an array of insect and avian visitors. Hummingbird visitors at his study sites in these states comprised the three species previously noted by Grant and Grant.

Hummingbird visitation to flowers of *J. californica* is noted on several collections (e.g., *Olmsted 1123*, *Gentry 4261*, *Harder & Appleby 1012*). During my studies, flowers of *Daniel & Butterwick 6877* from Baja California Sur were observed being visited by Xantus' hummingbird (*Hylocharis xantusii*). Also, the sugar composition of floral nectar from *Daniel 3976*, which was collected in Sonora, was analyzed by C.E. Freeman at the University of Texas at El Paso. The nectar shows a sucrose/hexose ratio of 1.8 (16.6% fructose, 19.5% glucose, 63.9% sucrose). Dr. Freeman indicated (in litt.) that this result is almost identical with those obtained from other samples of *J. californica* that he had analyzed. This ratio, which indicates a sucrose-dominant nectar, is typical of flowers in various plant families, including Acanthaceae, that are commonly

visited (and sometimes known to be pollinated) by hummingbirds (Baker and Baker 1983).

The closest relative of *J. californica* appears to be *J. purpusii*. Graham (1988) noted this close relationship and indicated that their various adaptations for growing in arid environments (i.e., dense indumentum, caducous leaves and bracts, and smooth seeds with large food reserves) and for pollination by hummingbirds (i.e., large red flowers borne on well-developed pedicels) obscured their relationships to other species of the genus.

3. *Justicia candicans* (Nees) L. D. Benson in L. D. Benson and R. A. Darrow, Tr. & sh. southw. des., ed. 3, 218. 1981. *Adhatoda candicans* Nees in A. DC., Prodr. 11:396. 1847. *Dianthera candicans* (Nees) Hemsl., Biol. cent.-amer., Bot. 2:517. 1882. *Jacobinia candicans* (Nees) B. D. Jacks., Index kew. 1:1246. 1893. TYPE. — MEXICO. Oaxaca: Cordillerae Mexicanae, 5000 ft., Nov–Apr, *Galeotti 911* (K ex hb. Hooker, photo at CAS!; isotype G, photo at US!).

Jacobinia ovata A. Gray, Proc. Amer. Acad. Arts 21:405. 1886. TYPE. — MEXICO. Chihuahua: near Batopilas, Aug–Nov 1885, *E. Palmer 220* (holotype: GH, photo at DS!; isotypes: NY, US!).

Jacobinia ovata var. *subglabra* S. Watson, Proc. Amer. Acad. Arts 24:67. 1889. *Jacobinia candicans* var. *subglabra* (S. Watson) L. D. Benson in L. D. Benson and R. A. Darrow, Tr. & sh. southw. des., ed. 2, 413. 1954. *Justicia candicans* var. *subglabra* (S. Watson) L. D. Benson in L. D. Benson and R. A. Darrow, Tr. & sh. southw. des., ed. 3, 218. 1981. TYPE. — MEXICO. Sonora: near Guaymas, Oct 1887, *E. Palmer 264* (GH, photo at DS!; isotypes: DS!, US).

Justicia mexicana Rose, Contr. U. S. Natl. Herb. 1:348. 1895. TYPE. — MEXICO. Sonora: Agiabampo, 3–15 Oct 1890, *E. Palmer 788* (holotype: US!; isotype: US!).

Shrubs to 1.8 m tall. Young stems quadrate to quadrate-sulcate, ± evenly pubescent with an understory of erect to flexuose eglandular trichomes 0.05–0.1 mm long (sometimes inconspicuous) and an overstory of flexuose to antrorse eglandular trichomes 0.3–1.2 mm long, the latter trichomes sometimes concentrated in 2 lines, epidermis clearly visible. Leaves petiolate,

petioles to 13 mm long (petiolar stubs to 2 mm long remaining at nodes after leaves have fallen), blades ovate, 15–71 mm long, 7–37 mm wide, 1.9–2.5 times longer than wide, acuminate at apex, acute to rounded to truncate at base, surfaces pubescent with flexuose to antrorse eglandular trichomes, margin entire to subsinuate. Inflorescence of dichasia in leaf axils or in axils of subfoliose bracts along axillary sessile to short-pedunculate dichasiate spikes to 18 mm long (these sometimes appearing as a dense cluster of dichasia at nodes), spikes (if present) opposite, rachis (if present) pubescent like young stems; dichasia opposite to subopposite, 1-flowered, 1 per axil, sessile to subsessile (i.e., borne on peduncles to 1 mm long). Bracts (if present) subfoliose, opposite, sessile to petiolate, elliptic to narrowly elliptic to oblanceolate, 9–15 mm long, 1.5–3 mm wide, abaxial surface pubescent like leaves. Bracteoles sessile, linear to lance-subulate, 8–12 mm long, 0.6–1 mm wide, abaxial surface pubescent like leaves. Flowers sessile to subsessile (i.e., borne on pedicels to 0.5 mm long). Calyx 5-lobed, 6–8 mm long, lobes lance-subulate, 5–7 mm long, equal in length, 0.8–1 mm wide, abaxially pubescent with flexuose to antrorse eglandular trichomes 0.05–0.4 mm long. Corolla red with white markings on lower lip, 32–35 mm long, externally pubescent with flexuose eglandular trichomes 0.2–0.5 mm long, tube gradually expanded distally, 18–20 mm long, 4.5–5 mm in diameter near midpoint, upper lip 11–15 mm long, minutely 2-lobed at apex, lobes 0.2–0.5 mm long, lower lip spreading, 13–15 mm long, lobes 7–9.5 mm long, 3–4.8 mm wide. Stamens inserted near apex of corolla tube, 12–15 mm long, filaments proximally pubescent with eglandular trichomes, thecae 1.9–2.3 mm long, equal, parallel, unequally inserted (overlapping by 1.2–1.6 mm), dorsally glabrous, lower theca with an inconspicuous basal appendage to 0.1 mm long; pollen (Fig. 23a) 2-aperturate, apertures flanked on each side by 2 rows of insulae, exine reticulate. Style 31–35 mm long, proximally pubescent with eglandular trichomes, stigma lobes 0.2–0.3 mm long, equal. Capsule 11–15 mm long, glabrous, stipe 5–8 mm long, head subellipsoid with a slight medial constriction, 6–8 mm long. Seeds 4, reddish, compressed, 3–3.7 mm long, 2–3 mm wide, 1–1.3 mm thick, surfaces and margin smooth to

somewhat irregularly bumpy. ($n = 14$, Daniel and Chuang 1993, Daniel et al. 1984).

PHENOLOGY.— Flowering: April, October; fruiting: April.

DISTRIBUTION AND HABITAT.— United States (Arizona) and Mexico (Baja California Sur, Colima, Durango, Jalisco, Michoacán, Oaxaca, Sinaloa, Sonora); in our region the species is known only from two collections from the Central Gulf Coast subdivision of the Sonoran Desert in northeastern Baja California Sur (Fig. 7); plants occur on moist slopes and along arroyos at 575–1060 m elevation. Gentry's collection was made in a region of oak-*Nolina* grassland. According to Moran's field notes, species growing in the vicinity of his collection included: *Tetramerium nervosum*, *Elytraria imbricata*, *Sapium biloculare*, *Esenbeckia flava*, *Ambrosia carduacea*, *Cassia goldmanii*, *Salvia peninsularis*, *Janusia californica*, and *Acalypha comoduana*.

ADDITIONAL SPECIMENS EXAMINED.— MEXICO. Baja California Sur: Sierra de las Palmas, La Champaña, S of Santa Rosalia, H. Gentry & W. Fox 11804 (MICH); Sierra de Guadalupe, San Sebastián, 27°01'N, 112°24'W, R. Moran 18787 (RSA, SD, UC).

In recent years the name *Justicia candicans* has been applied to plants resembling ours. The protologue and photographs of *Galeotti 911* (from Oaxaca) suggest that the name may apply to another, though similar, species with bracteoles shorter than the calyx. Collections with bracteoles shorter than the calyx, but otherwise similar to our plants, are also known from Sinaloa and Jalisco and have been treated with the name *Jacobinia mexicana* Seem. Additional studies will be necessary in order to determine whether our plants represent a taxon other than that represented by the type of *Justicia candicans*.

This is the first report of *J. candicans* in the peninsula of Baja California from where it is known only from the two collections noted above. The precise locality of Gentry & Fox 11804 has not been located. Phil Jenkins examined Gentry's field notes at ARIZ and indicated (in litt.) that the collection was made on 29 April 1952 in a rocky arroyo at "La Champaña." Immediately prior to collecting at this locale, Gentry and Fox collected at Rancho San Sebastián (also in the "Sierra de las Palmas"), the locality

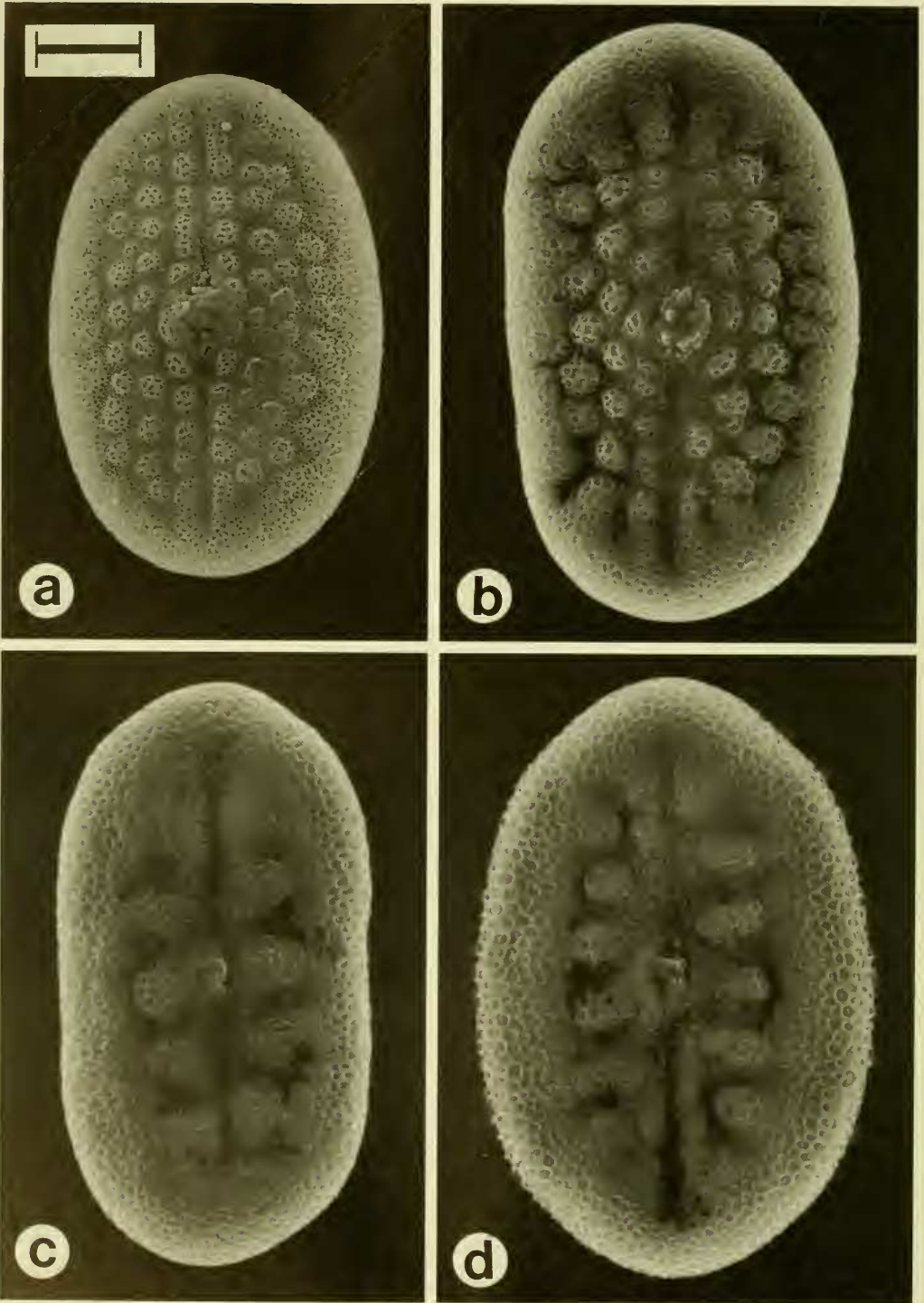


FIGURE 23. Pollen. a. *Justicia candicans* (Moran 18787), apertural view; b. *J. hians* (Carter et al. 4164), apertural view; c. *J. insolita* subsp. *insolita* (Carter 5711), apertural view; d. *J. insolita* subsp. *tastensis* (León de la Luz 2334), apertural view. Scale for a-d = 10 μ m.

where Moran collected this species nearly 20 years later. No elevation is cited in Gentry's notes (vs. "4500 to 5000 feet" on the printed specimen label); however, Gentry's numbers 11803 and 11805 were collected at an elevation of about 3500 feet. This latter elevation is utilized here.

The species shows considerable variation throughout its broad range in pubescence and bracteole length. For example, young stems vary from having a dense pubescence to being nearly glabrous. Nearly glabrous plants have been treated as *J. candicans* var. *subglabra*. Plants on the Mexican mainland with exceptionally long and curved bracts and bracteoles, but otherwise greatly resembling ours, have been treated as *Jacobinia roseana* Leonard.

Graham (1988) treated *J. candicans* as a species peripheral to *Justicia* section *Plagiacanthus* (Nees) V. A. W. Graham. Morphologically similar species in Mexico include *Jacobinia roseana*, which occurs in southwestern Mexico (e.g., Jalisco, Colima, and Michoacán), and *J. palmeri* of Baja California Sur.

Because of these taxonomic uncertainties, the above description is based solely on the two collections from Baja California Sur.

4. *Justicia hians* (Brandegee) Brandegee, Univ. Calif. Publ. Bot. 6:194. 1915. *Beloperone hians* Brandegee, Proc. Calif. Acad. Sci., ser. 2, 2:194. 1889. TYPE. — MEXICO. Baja California Sur: cliffs of Comondú, 21 Mar 1889, T. Brandegee s.n. (holotype: UC!; isotype: US)

Justicia wigginsii Leonard, J. Wash. Acad. Sci. 32:342. 1942. TYPE. — MEXICO. Baja California Sur: 27.7 mi S of Pozo Alemán, 4 Mar 1935, I. Wiggins 7874 (holotype: DS!; isotypes: UC!, US).

Erect perennial herbs (to shrubs) to 4 (–10) dm tall. Young stems suboctagonal, evenly and ± densely pubescent with retrorse to retrorsely appressed eglandular trichomes 0.05–0.1 (–0.2) mm long, epidermis occasionally not or barely visible. Leaves sessile to petiolate, petioles to 4 mm long (petiolar stubs to 1.5 mm long persisting at nodes after leaves have fallen), blades lance-ovate to ovate to elliptic, 8–29 mm long, 3.7–15 mm wide, 1.4–2.6 times longer than wide, rounded to acute at apex, rounded to acute at base, surfaces pubescent (often sparsely so)

with cauline type trichomes and sometimes glandular punctate as well, margin entire. Inflorescence of axillary (and terminal) pedunculate dichasiate spikes (or sometimes branched at base and becoming a panicle) to 85 mm long (including peduncle and excluding flowers), rachis pubescent with erect glandular trichomes 0.05–0.2 mm long and erect to retrorse eglandular trichomes 0.05–0.2 mm long; dichasia alternate, 1-flowered, 1 per axil, sessile in axils of bracts. Bracts opposite, sessile, linear-lanceolate to triangular-lanceolate, 2–2.8 mm long, 0.7–0.9 mm wide, abaxial surface pubescent like rachis. Bracteoles sessile, lanceolate to lance-subulate, 2–3.6 mm long, 0.6–0.8 mm wide, abaxial surface pubescent like rachis. Flowers sessile to subsessile (i.e., pedicels to 0.5 mm long). Calyx 5-lobed, 4–5.5 (–7) mm long, lobes lanceolate to lance-subulate, 2.4–4.5 (–5.5) mm long, subequal to unequal in length (i.e., posterior lobe ± shorter than others), 0.4–1.2 mm wide, abaxially pubescent like rachis. Corolla orange-red, 25–31.5 mm long, externally pubescent with erect eglandular and glandular trichomes 0.05–0.1 mm long, tube expanded distally, 12–16 mm long, 3–3.5 mm in diameter near midpoint, upper lip 12.5–16.5 mm long, 2-lobed at apex, lobes 0.2–0.7 mm long, lower lip spreading, 13–16 mm long, lobes 4–8 mm long, 1.8–3.5 mm wide. Stamens inserted near apex of corolla tube, 16–19 mm long, filaments glabrous, thecae 1.6–2.5 mm long, equal to subequal, subparallel to subperpendicular, equally to subequally inserted, glabrous, lacking basal appendages; pollen (Fig. 23b) 2-aperturate, apertures flanked on each side by 2–3 rows of insulae (third row sometimes of peninsulae), exine reticulate. Style 25–33.5 mm long, proximally pubescent with eglandular trichomes, stigma 0.3 mm long, lobes indistinct. Capsule 12–14.5 mm long, pubescent with erect to retrorse glandular and eglandular trichomes 0.05–0.1 mm long, stipe 4.5–5 mm long, head subellipsoid with a medial constriction, 7–9.5 mm long. Seeds 4, dark brown, compressed, 2.8–3.3 mm long, 2.3–2.7 mm wide, 0.9–1 mm thick, surfaces and margin bubbly tuberculate. (chromosome number unknown).

PHENOLOGY. — Flowering: October–March; fruiting: February–March.

DISTRIBUTION AND HABITAT. — Endemic to Baja California Sur (Fig. 7) where the species is

known from the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Vizcaíno subdivisions); plants occur along watercourses and on slopes in thornscrub and deserts scrub from 150–625 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: without locality [vic. of San José del Cabo], *T. Brandegeee s.n.* (UC); Sierra de la Giganta, Tanque de la Vuelta del Diablo, Mesa de San Alejo, W of San Javier, ca. 25°50'N, 111°34'W, *A. Carter & H. Sharsmith 4164* (CAS, SD, UC); SE edge of Viscaíno Desert, 27 km NW of San Ignacio, *A. Carter et al. 1964* (DS, CAS, UC); 19.2 km SW of San José del Cabo, *A. Carter et al. 2236* (CAS pro parte); Sierra de San Francisco, 50 km ENE of San Ignacio, W of Tres Vírgenes, Cañón Salsipuedes, *D. Charlton s.n.* (UCR); Cape Region, *C. Grabendorffer s.n.* (UC); 3 mi N of San José Comodú, ca. 26°05'N, 111°48'W, *R. Moran & J. Reveal 20054* (SD); ca. 18 mi NW from San Ignacio on rd to El Arco, *J. Thomas 8323* (CAS, DS, UC).

Brandegee (1915) included *Justicia palmeri* Rose within his *J. hians*. Leonard (1942) noted that *Brandegee s.n.* 21 Mar 1889 from cliffs at Comodú (i.e., the type of *J. hians*) represents the same taxon as his *J. wigginsii*. Leonard further noted that *J. wigginsii* is unusual in having the inflorescence of *J. hians* and the corolla of *J. mexicana* Rose, but that it differed from both by its irregular calyx. Subsequently, Leonard (1964) treated *J. wigginsii* as a synonym of *J. hians*.

As currently known, this species occurs over a broad area of Baja California Sur. Label information on Brandegeee's collection from the Cape Region does not specify a locality but provides a date, 4 Sep 1893. According to Moran (1952), on this date, Brandegeee was in the vicinity of San José del Cabo. *Carter 2236* at CAS from the southern Cape Region contains both *J. californica* and a shoot of *J. hians*. Because *J. hians* is known from a nearby locality her collection is assumed to represent a mixed gathering rather than subsequent confusion in arranging specimens.

Graham (1988) treated *J. hians* as a species peripheral to *Justicia* section *Sarotheca* (Nees) Benth. Gentry (1949) concluded that this species was a postinsular endemic of the Cape District. A likely sister species or close relatives remain to be determined.

5. *Justicia insolita* Brandegeee, Proc. Calif. Acad. Sci., ser. 2, 2:195. 1889. TYPE. — MEXICO. Baja California Sur: San Gregorio, 6 Feb 1889, *T. Brandegeee s.n.* (holotype: UC!; isotype: US).

Ascending to erect perennial herbs to shrubs to 1 m tall. Young stems subterete to subquadrate, evenly (and variously) pubescent (see below). Leaves subsessile to petiolate, petioles to 7 mm long (petiolar stubs to 0.5 mm long remaining at nodes after leaves fall), blades ovate to lance-elliptic to elliptic, 7–45 mm long, 5–22 mm wide, 0.9–4.7 times longer than wide, rounded to acute to acuminate at apex, rounded to acute to attenuate at base, surfaces pustulate and pubescent with erect to flexuose to antrorse to antrorsely appressed eglandular trichomes to 1.2 mm long and sometimes with inconspicuous stipitate glandular trichomes 0.05–0.1 mm long as well on distal leaves, margin entire to subsinuate. Inflorescence of (axillary and) terminal dichasiate spikes to 120 mm long, these sometimes branched at base and becoming a panicle of spikes to 160 mm long, rachis evenly pubescent with glandular trichomes 0.05–0.3 mm long (and sometimes with some eglandular trichomes like those of young stems intermixed with glands near base of spike); dichasia alternate, 1-flowered, 1 per axil, sessile in axils of bracts. Bracts opposite, sessile to subsessile, ovate-elliptic to elliptic to linear to obovate, 1.8–4 mm long, 0.7–1.7 mm wide, abaxial surface pubescent like rachis (and sometimes with some antrorsely appressed eglandular trichomes to 0.2 mm long as well). Bracteoles sessile to subsessile, lance-ovate to lanceolate to linear-elliptic to elliptic to obovate-elliptic, 2.7–4.7 mm long, 0.6–1.2 mm wide, abaxial surface pubescent like rachis. Flowers sessile to subsessile (i.e., pedicels to 1 mm long). Calyx 4-lobed, 4.5–9.4 mm long, lobes linear to lanceolate, 3.5–8 mm long, subequal in length, 1–1.5 mm wide, abaxially pubescent like rachis. Corolla white to pinkish and reddish pink (i.e., upper lip white to light pink and lower lip dark reddish pink with white markings on lower-central lobe), 15–22 mm long, externally pubescent with erect to flexuose glandular and eglandular trichomes 0.05–0.5 (–1) mm long, tube subsaccate on anterior side, not expanded distally, 4–8.5 mm long, 4.5–6 mm in diameter near midpoint, upper lip 10–16 mm long, 2-lobed at apex, lobes

0.5–2 mm long, lower lip spreading, 11–16 mm long, lobes 4–9 mm long, 3.5–9 mm wide. Stamens inserted near apex of corolla tube, 10–16 mm long, filaments glabrous or glandular proximally, thecae 1.5–3 mm long (including basal appendage), equal to unequal, subparallel to subperpendicular, unequally inserted (overlapping by 0.5–1.3 mm), dorsally pubescent with glandular and eglandular trichomes, lower theca with a ± bulbous basal appendage to 0.6 mm long, connective sometimes extended beyond upper theca as a broad deltate projection; pollen (Fig. 23c, d) 2-aperturate, apertures flanked on each side by 1 row of insulae (to peninsulae), exine reticulate. Style 13–18 mm long, pubescent with eglandular (and sometimes glandular proximally) trichomes, stigma lobes 0.1–0.2 mm long, unequal, or lobes indistinct. Capsule 13–21 mm long, pubescent with erect to retrorse glandular and eglandular trichomes 0.05–0.6 mm long, stipe 4.5–9.5 mm long, head subellipsoid with medial constriction, 8–13 mm long. Seeds 4, light brown, compressed, 2.5–3.5 mm long, 2–3.7 mm wide, 0.8–1.2 mm thick, surfaces and margin covered with retrorsely barbed (especially near apex) trichomes 0.2–0.3 mm long. ($n = 12$, Daniel et al. 1984). Fig. 24.

PHENOLOGY. — Flowering and fruiting: October–May.

DISTRIBUTION. — Endemic to Baja California Sur (Fig. 25) where the species is known from the Cape Region (mostly in nondesert portions), the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Magdalena subdivisions).

Graham (1988) did not include this species in her classification of *Justicia*. In many features of the inflorescence, flower, pollen, and fruit *J. insolita* resembles *J. salviiflora* Kunth, a widespread Mexican species that might be expected to occur in the Cape Region of Baja California Sur.

Two varieties of *J. insolita* have been recognized based on features of the branches and pubescence. The distinctions between these taxa, noted in the key below, were found to be consistent among all specimens examined. I choose to elevate the varieties to the rank of subspecies based on these minor differences which are correlated with their allopatric distributions. Such treatment is consistent with that utilized here for

the subspecies of *Holographis virgata* and *Ruellia californica*.

Key to the Subspecies of *Justicia insolita*

1. Branches ± divaricate and becoming spinescent at tips; epidermis of young stems not visible, covered by kinky-appressed trichomes 0.1–0.5 mm long giving the stems a conspicuously pallid aspect; corolla externally pubescent with trichomes 0.05–0.2 mm long; plants occurring from La Paz northward (i.e., north of lat. 24°05'N) subsp. *insolita*.
1. Branches neither divaricate nor spinescent; epidermis of young stems clearly visible, cauline trichomes erect to flexuose, (0.2–) 0.4–1.2 mm long, stems not appearing pallid; corolla externally pubescent with trichomes 0.1–0.5 (–1) mm long; plants occurring to the south of La Paz (i.e., south of lat. 24°05'N) subsp. *tastensis*.

5a. *Justicia insolita* subsp. *insolita*

Branches ± divaricate, becoming spinescent at tips; young stems densely pubescent with kinky-appressed eglandular (to glandular) trichomes 0.1–0.5 mm long giving the stems a conspicuously pallid aspect, epidermis not visible. Corolla externally pubescent with trichomes 0.05–0.2 mm long. ($n = 12$, Daniel et al. 1984). Fig. 24a, b, e, and f.

DISTRIBUTION AND HABITAT. — The subspecies is known from regions of the Sierra de la Giganta and the Sonoran Desert (Central Gulf Coast and Magdalena subdivisions) to the north of lat. 24°05'N (Fig. 25); plants occur along rocky and sandy watercourses in desertscrub and thornscrub from 25–600 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: N Sierra de la Giganta, 11.2 mi W of Hwy 1 on rd from Rosarito to San Isidro, ca. 26°21'N, 111°45'W, *S. Boyd & T. Ross 5949* (RSA); Cape Region, *T. Brandegee s.n.* (UC); ridge W of summit of Cuesta de Las Parras, 20 km W of Loreto on rd to San Javier, ca. 25°57'N, 111°30'W, *A. Carter 5711* (CAS, UC); Arroyo Carrizal, E of Rancho El Homo, NE of San Xavier, ca. 25°53'N, 111°31'W, *A. Carter & R. Ferris 3827* (CAS, SD, UC); Sierra de la Giganta, between La Victoria and portezuelo to the E, ca. 25°52'N, 111°25'W, *A. Carter & R. Ferris 3916*

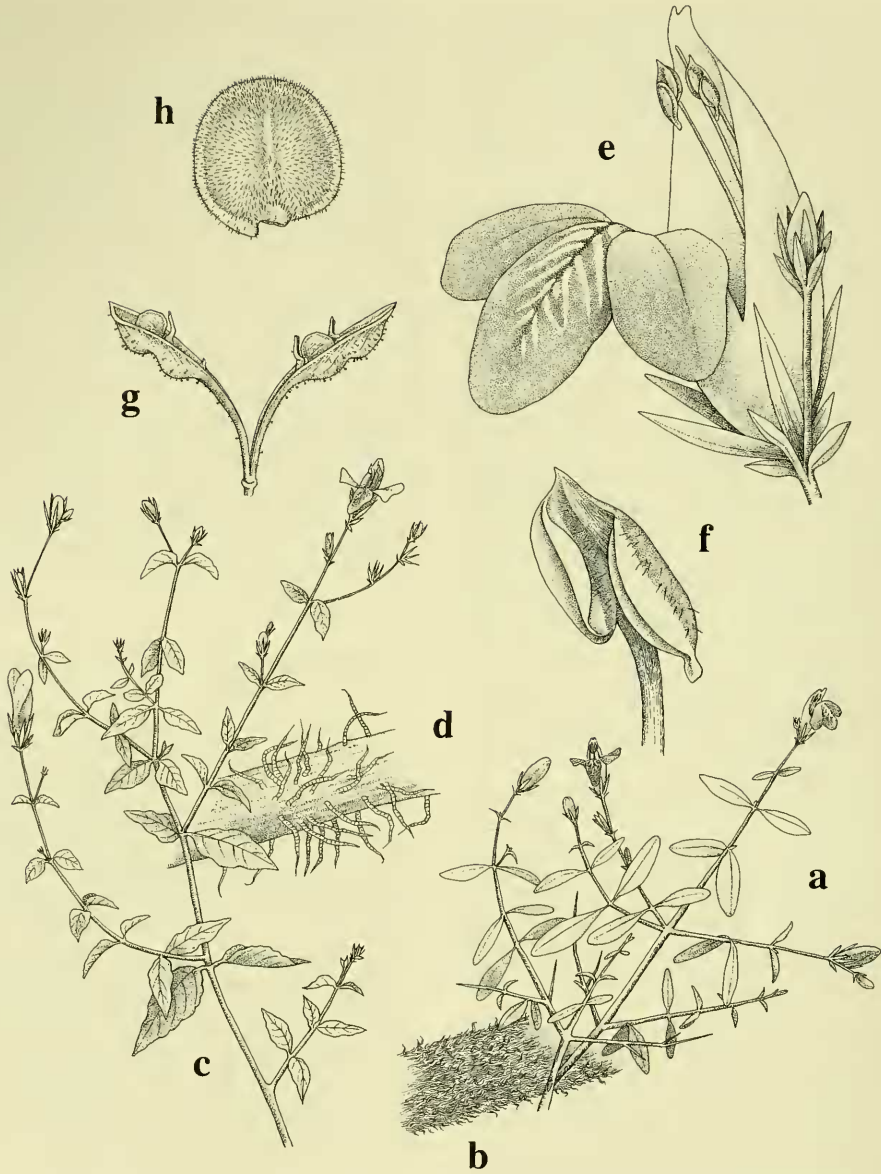


FIGURE 24. *Justicia insolita*. (a, b, e, f from subsp. *insolita*, c, d, g, h from subsp. *tastensis*). a. habit (Johnston 3702, Wiggins 15207, and Wiggins 17444), $\times 0.5$; b. young stem (Wiggins 17444), $\times 10$; c. habit (Moran 7132), $\times 0.5$; d. young stem (Moran 7107), $\times 10$; e. inflorescence node with flower (Daniel et al. 2451), $\times 3$; f. anther (Daniel et al. 2451), $\times 9$; g. capsule (Thomas 7871), $\times 1.5$; h. seed (Thomas 7871), $\times 5$. Drawn by Jenny Speckels.

(UC); 11.9-14.5 mi W of Hwy 1 in Rosarito, T. Daniel 1929.5 (CAS); along Hwy 1 in S end of Sierra de la Giganta, 38.3 mi NW of jct Hwy 11 in La Paz, T. Daniel et al. 2451 (ASU, BR, CAS, MEXU); "Puente Viejo," 15 km S de La Purísima, 26°09'N, 112°06'W, R. Domínguez C. 1082 (HCIB); 10 mi W of Comondú,

H. Gentry 4081 (DS, UC); Santa Margarita Island, D. Johansen 619 (DS); San Nicholas Bay, I. Johnston 3702 (CAS); La Paz, M. Jones 24418 (GH, POM); Pulpito Bay, ca. 26°30'N, 111°28'W, R. Moran 9082 (RSA, SD); near KM 40 on hwy between La Paz and Santo Domingo, J. Thomas 8460 (CAS, DS); 8 mi S

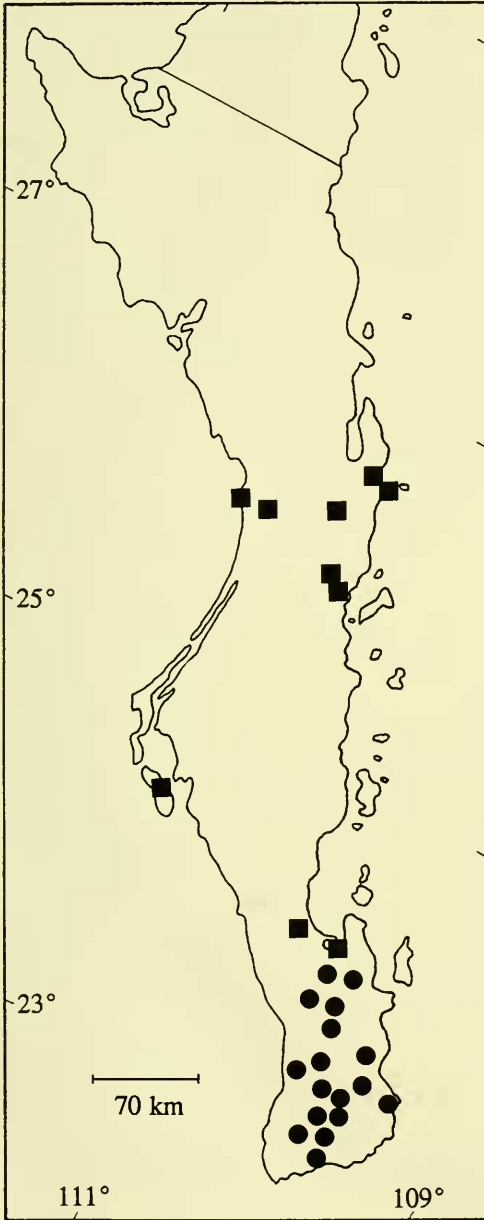


FIGURE 25. Distribution of *Justicia insolita* subsp. *insolita* (squares) and subsp. *tastensis* (circles).

of Río de la Purísima, 26°03'N, 112°08'W, *I. Wiggins* 15207 (CAS, DS, UC); S side of Punta El Pulpito, 26°30'N, 111°28'W, *I. Wiggins* 17444 (DS).

5b. *Justicia insolita* subsp. *tastensis* (Brandege) T. F. Daniel, stat. nov. *Justicia insolita* var.

tastensis Brandege, Zoe 5:173. 1903. TYPE. — MEXICO. Baja California Sur: Sierra de la Laguna, El Taste region, Jan–Mar 1901, *C. Purpus* 511 (holotype: UC!).

Branches ascending, not becoming spinescent at tips; young stems pubescent with erect to flexuose eglandular trichomes (0.2–) 0.4–1.2 mm long and sometimes (especially distally) with an understory of subsessile to stipitate glandular trichomes to 0.05 mm long, the stems not appearing pallid, epidermis clearly visible. Corolla externally pubescent with trichomes 0.1–0.5 (–) mm long. ($n = 12$, from Daniel & Butterwick 6938). Fig. 24c, d, g, h.

DISTRIBUTION AND HABITAT. — Endemic to the Cape Region (south of lat. 24°05'N; Fig. 25) where the subspecies is known primarily from nondesert areas (at least one collection may have been made in a portion of the Cape Region occupied by the Central Gulf Coast subdivision of the Sonoran Desert); plants occur along watercourses and on rocky slopes mostly in thornscrub and tropical deciduous forest from 40–900 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Sierra de la Laguna, *T. Brandege* s.n. (UC); 20 km S of Miraflores, *A. Carter et al.* 2189 (DS, UC); Arroyo La Huerta, near Hwy 286 between La Paz and San Juan de los Planes, 2.7 km SE of La Huerta, ca. 24°03'N, 110°09'W, *T. Daniel & M. Butterwick* 6836 (CAS); along rd from Hwy 1 across Cape Region mts to Hwy 19, 16–20 km W of Hwy 1, ca. 23°14'N, 109°55'W, *T. Daniel & M. Butterwick* 6938 (BR, CAS, MEXU, MICH, SBBG, US); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, *T. Daniel et al.* 6864 (CAS, HCIB); San José del Cabo, *E. Dawson* 1200 (RSA); subida a La Sierra de La Laguna, Agua el Palmillar, 23°29'N, 109°58'W, *M. Domínguez* L. 367 (HCIB); near San Bartolo, *F. Gander* 9774 (CAS, SD); Cape District, El Triunfo, *H. Gentry* 4334 (DS); Sierra Laguna, La Burrera, *H. Gentry* 4439 (DS, UC); Rancho La Huerta area, ca. 12 km SE of La Paz toward San Juan de los Planes, ca. 24°02'N, 110°09'W, *D. Harder & W. Appleby* 1098 (RSA); Todos Santos, *M. Jones* 24417 (POM); Laguna Mts, Cota Ranch, 14 mi E of Todos Santos, *M. Jones* 24419 (POM), 24649 (GH, POM); Cañón de La Burrera cerca de Todos Santos, “El Palmillar,” 23°33'N, 110°02'W, *J. León de la Luz* 2334 (CAS, HCIB); Cape Region, 9.5 km N of Santiago, ca. 23°33'N, 109°42'W, *R. Moran* 7107 (DS, RSA, SD);

Cape Region, 12 km SE of San Pedro, ca. 23°50'N, 110°11'W, *R. Moran 7132* (CAS, DS, SD); La Paz, *E. Palmer 40* (GH); Santiago, 3 mi S of Caduano, *R. Peters 20* (UC); 3.5 mi E of San Bartolo, *D. Porter 289* (DS), *294* (CAS, DS); Rincón, 8.7 km SE of La Ribera between Punta Arena and Cabo Pulmo, ca. 23°30'N, 109°25'W, *A. Sanders et al. 3316* (UCR); 24 mi S of La Paz, *F. Shreve 7208* (DS, UC); Cape Region, vicinity of Rancho La Burrera, ca. 11 mi E of Todos Santos, *J. Thomas 7871* (CAS, DS, SD); 16 mi S of San Pedro, *J. Whitehead 854* (DS); between La Paz and San Pedro, *I. Wiggins 5584* (CAS, DS, POM, UC); just N of San José del Viejo, *I. Wiggins 14715* (DS); 7.1 mi S of Caduano, between Santa Anita and La Palma, *I. Wiggins 14729-A* (CAS, DS).

6. *Justicia palmeri* Rose in Vasey & Rose, *Contr. U. S. Natl. Herb.* 1:75. 1890. TYPE. — MEXICO. Baja California Sur: vicinity of La Paz, 20 Jan–5 Feb 1890, *E. Palmer 97* (holotype: US; isotype: UC!).

Beloperone californica var. *conferta* Brandegee, *Proc. Calif. Acad. Sci.*, ser. 2, 2:194. 1889. *Justicia californica* var. *conferta* (Brandegee) D.N. Gibson, *Fieldiana, Bot.* 34:67. 1972. TYPE. — MEXICO. Baja California Sur: San Julio Cañón, 20 Apr 1889, *T. Brandegee s.n.* (holotype: UC!; isotype: US!).

Beloperone intermedia M. E. Jones, *Contr. W. Bot.* 18:66. 1933. TYPE. — MEXICO. Baja California Sur: Sierra Giganta, Cayuca Ranch, Loreto, 23 Oct 1930, *M. Jones 27436* (holotype: POM!).

Shrubs to 3 m tall. Young stems multi-grooved (especially evident on older stems) and subterete to subquadrate, densely and evenly pubescent with retrorse to retrorsely appressed eglandular trichomes 0.2–0.3 mm long giving the stem a conspicuously pallid aspect, epidermis not (or barely) visible. Leaves petiolate, petioles to 15 mm long (petiolar stubs to 2 mm long remaining at node after leaves have fallen), blades lanceolate to ovate to elliptic, 5.5–80 mm long, 3–36 mm wide, 1.4–4.8 times longer than wide, rounded to acute to acuminate at apex, acute to subattenuate at base, surfaces sparsely pubescent with erect to antrorse eglandular trichomes, margin entire. Inflorescence of dichasia in leaf axils or in axils of subfoliose bracts along axillary sessile to pedunculate dichasiate spikes to 25 (–65) mm long, spikes (if present) opposite or alternate, rachis (if present) pubescent like young

stems; dichasia alternate along spikes, 1-flowered, 1 per axil, sessile to pedunculate, peduncles to 2 mm long. Bracts (if present) subfoliose, opposite, petiolate, obovate to elliptic, (5–) 7–17 mm long, 2–8 mm wide, abaxial surface pubescent like leaves. Bracteoles subfoliose, petiolate, spatulate to oblanceolate to obovate to elliptic, 4–13 mm long, 1–4.5 (–5.5) mm wide, abaxial surface pubescent like leaves. Flowers sessile. Calyx 5-lobed, 2.2–6 mm long, lobes triangular to lance-subulate to subulate, 1.5–5 mm long, equal to subequal in length, 0.7–1.2 mm wide, abaxially pubescent with antrorse to antrorsely appressed eglandular trichomes 0.05–0.2 mm long. Corolla red to orange-red, sometimes with faint white markings on lower central lobe, (22–) 27–37 mm long, externally pubescent with erect to retrorse eglandular trichomes less than 0.05–0.2 mm long, tube gradually expanded distally, (11.5–) 15–21 mm long, 2.2–3.6 mm in diameter near midpoint, upper lip 9–19 mm long, 2-lobed at apex, lobes 0.1–1 mm long, lower lip spreading, 8–20 mm long, lobes 2.5–10 mm long, 1.5–5 mm wide. Stamens inserted near apex of corolla tube, 13–17 mm long, filaments proximally pubescent with glandular and/or eglandular trichomes, thecae 1.4–2.5 mm long (including basal appendage), subequal, parallel to subperpendicular, unequally inserted (overlapping by 0.9–2 mm), dorsally glabrous, lower theca with a ± bulbous basal appendage to 0.3 mm long; pollen (Fig. 26a) 2-aperturate, apertures flanked by 2 rows of insulae, exine reticulate. Style 20–32.5 mm long, glabrous, stigma lobes 0.2–0.3 mm long, equal. Capsule 10–16 mm long, glabrous, stipe 3.5–8 mm long, head subellipsoid, 6–9 mm long. Seeds 4, brownish or sometimes ± orangish, compressed, 3–3.8 mm long, 2.5–3.6 mm wide, 0.8–1.3 mm thick, surfaces and margin covered with rounded ± bubbly tubercles. ($n = 14$, from *Daniel & Butterwick 6843*).

PHENOLOGY. — Flowering: August–April; fruiting: September–April.

DISTRIBUTION AND HABITAT. — Endemic to Baja California Sur (Fig. 27) where the species is known from the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast and Vizcaino subdivisions); plants occur in and along watercourses, on slopes, on sandy plains, and on barren lava in desertscrub, thorn-

scrub, and tropical deciduous forest from near sea level to 1125 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. **Baja California Sur:** Todos Santos, *T. Brandegeee* 445 (UC); San José del Cabo, *T. Brandegeee* 446 (GH, UC); San José del Cabo, *T. Brandegeee* 447 (GH); San José del Cabo, *T. Brandegeee* s.n. (UC); Cape Region, *T. Brandegeee* s.n. (UC); 6–10 mi SE of Todos Santos-Cabo San Lucas Hwy on small rd to Rancho La Burrera, *D. Breedlove* & *D. Axelrod* 43189 (CAS); Sierra de la Giganta, La Esperanza, ca. 25°48'N, 111°24'W, *A. Carter* 4400 (UC); Sierra de la Giganta, vicinity of Rancho Agua Escondido (ca. 90 km E of Villa Constitución), ca. 25°06'N, 111°W, *A. Carter* 4744 (UC); Sierra de la Giganta, NW slopes of Mesa de Alta Gracia, SW of La Cumbre de Alta Gracia, ca. 25°41'N, 111°21'W, *A. Carter* 4889 (CAS, UC); Sierra de la Giganta, vicinity of Ojo de Agua del Carrizal, N from Rancho Viejo (on rd from Loreto to San Javier), ca. 25°59'N, 111°31'W, *A. Carter* 5006 (UC); Sierra de la Giganta, N side Cerro Gabilán, S of Portezuelo de Gabilán, ca. 25°51'N, 111°25'W, *A. Carter* 5091 (CAS, UC); Sierra de la Giganta, Cerro del Pinto, N of Portezuelo de San Antonio, headwaters of Arroyo el Coyote, ca. 24°50'N, 110°44'W, *A. Carter* 5442 (CAS, UC); Cape Region, La Hiedra, near headwaters of arroyo NW of El Encinal, 23°10'N, 109°57'W, *A. Carter* & *F. Chisaki* 3471 (DS, UC); Sierra de la Giganta, side arroyo heading into Mesa San Alejo, SW of Rancho El Horno (NE of San Xavier), ca. 25°53'N, 111°33'W, *A. Carter* & *R. Ferris* 3768 (UC); Sierra de la Giganta, Arroyo Carrizal, E of Rancho El Horno (NE of San Xavier), ca. 25°53'N, 111°31'W, *A. Carter* & *R. Ferris* 3818 (UC); near portezuelo E of La Victoria, ca. 25°52'N, 111°25'W, *A. Carter* & *R. Ferris* 3912 (CAS, UC); Sierra de la Giganta, Cañón de Tiojo, S of La Victoria, ca. 25°51'N, 111°25'W, *A. Carter* & *R. Ferris* 3953 (CAS, UC); Sierra de la Giganta, head of S branch of Cañada de Teojo in vicinity of Portezuelo de Peloteado (SW of Notrí), ca. 25°49'N, 111°23'W, *A. Carter* & *F. Leal* 4650 (UC); Sierra de la Giganta, ridge of Cerro de la Palma, W of Puerto Escondido, ca. 25°49'N, 111°23'W, *A. Carter* & *R. Moran* 5498 (CAS, UC); Sierra de la Giganta, vicinity of Cajón de la Mesa de San Alejo (W of San Javier), ca. 25°52'N, 111°34'W, *A. Carter* & *H. Sharsmith* 4182 (UC); Arroyo Tabor, W of Puerto Escondido, ca. 25°48'N, 111°20–21'W, *A. Carter* & *H. Sharsmith* 4249 (CAS, SD, UC); Sierra de la Giganta, El Aguaje, between Arroyo Hondo and Arroyo de Las Palmas, NW slopes of Cerro Giganta, ca. 26°08'N, 111°35'W, *A. Carter* & *M. Sousa* S. 5189 (UC); 10.4 km SW of San José del Cabo, *A. Carter* et al. 2208 (UC); Sierra de la Giganta, Picacho Humí,

Mesa de Humí, crest of Sierra Giganta E from Villa Constitución, ca. 25°03'N, 110°57'W, *A. Carter* et al. 5770 (CAS, UC); near base of S-most of Tres Vírgenes volcanoes, 25 mi W of Santa Rosalía, W side of pass, *K. Chambers* 766 (DS, SD, UC); Central Gulf Desert Highlands, Sierra San Francisco, 6.9 mi W of Rancho San Francisco, *D. Charlton* 84 (UCR); Cape San Lucas, 1 mi from beach, *T. Craig* 623 (POM); Arroyo La Huerta, near Hwy 286 between La Paz and San Juan de los Planes, 2.7 km SE of La Huerta, ca. 24°03'N, 110°09'W, *T. Daniel* & *M. Butterwick* 6843 (BR, CAS, ENCB, HCIB, K, MEXU, MICH, MO, SBBG, US); between Santiago and Agua Caliente, 2.7–5 km SW of Santiago, ca. 23°27'N, 109°45'W, *T. Daniel* & *M. Butterwick* 6871 (CAS), 6876 (ASU, CAS, MEXU, MO); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 3.5 km NE of San Pedro de la Soledad, ca. 23°15'N, 109°57'W, *T. Daniel* & *M. Butterwick* 6946 (CAS); along Hwy 19, ca. 16 km NW of Cabo San Lucas, ca. 23°00'N, 110°02'W, *T. Daniel* & *M. Butterwick* 6960 (CAS, ENCB); along Hwy 13 in the Sierra de la Laguna, ca. 0.5 mi NW of La Huerta, *T. Daniel* et al. 2478 (ASU); along rd to Microondas San Bartolo, ca. 1–3 mi W of Hwy 1 in San Bartolo, *T. Daniel* et al. 2531 (ASU); along Hwy 19 just S of Microondas El Carrizal, ca. 5.6 km S of jct Hwy 1 S of San Pedro, ca. 23°50'N, 110°14'W, *T. Daniel* et al. 6847 (CAS, HCIB, SBBG, MEXU); San José del Cabo, *E. Dawson* 1175 (RSA); 1–2 mi inland from Agua Verde Bay, *E. Dawson* 6245 (RSA); “La Parrita,” Rancho La Burrera, NE de Todos Santos, 23°35'N, 110°00'W, *M. Domínguez* L. 259 (HCIB); Rancho Matancitas, 23°04'N, 110°01'W, *R. Domínguez* C. 769 (RSA); Comondú, *F. Gander* 9640 (CAS, RSA, SD); near Tres Vírgenes volcanoes, ca. 20 mi W of Santa Rosalía, *B. Hammerly* 118 (CAS, DS); 2 mi W (below) Comondú, *B. Hammerly* 183 (CAS, DS); between San José del Cabo and Cape San Lucas, *C. Harbison* s.n. (SD); 23.4 mi W of La Paz, along paved rd to Santo Domingo, *J. Hastings* & *R. Turner* 64-177 (DS, SD); 2.5 mi NE of summit of Volcán Tres Vírgenes, 27°30'N, 112°33'W, *J. Henrickson* 9009b (SD); Todos Santos, *M. Jones* 24420 (POM); San José del Cabo, *M. Jones* 24421 (POM); Cayuca Ranch near Loreto, *M. Jones* 27391 (A, DS, POM); Cayuca Ranch, Loreto, *M. Jones* 87436 (UC); Cayuca Ranch, Loreto, *M. Jones* 97391 (UC); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, *R. Moran* 6928 (CAS, DS, SD); N base of Volcán las Tres Vírgenes, ca. 27°29'N, 112°36'W, *R. Moran* 20465 (POM, SD); N base of Volcán las Tres Vírgenes, ca. 27°29'N, 112°36'W, *R. Moran* 21371 (CAS, POM, RSA, SD); 10.1 mi N of Todos Santos on rd to La Paz, *D. Porter* 80 (CAS, DS); main hwy, 21 mi W of La Paz, *D. Porter* 392 (CAS, DS); Cape Region, San Felipe, *C. Purpus* 470 (UC); San José del Cabo, *C.*

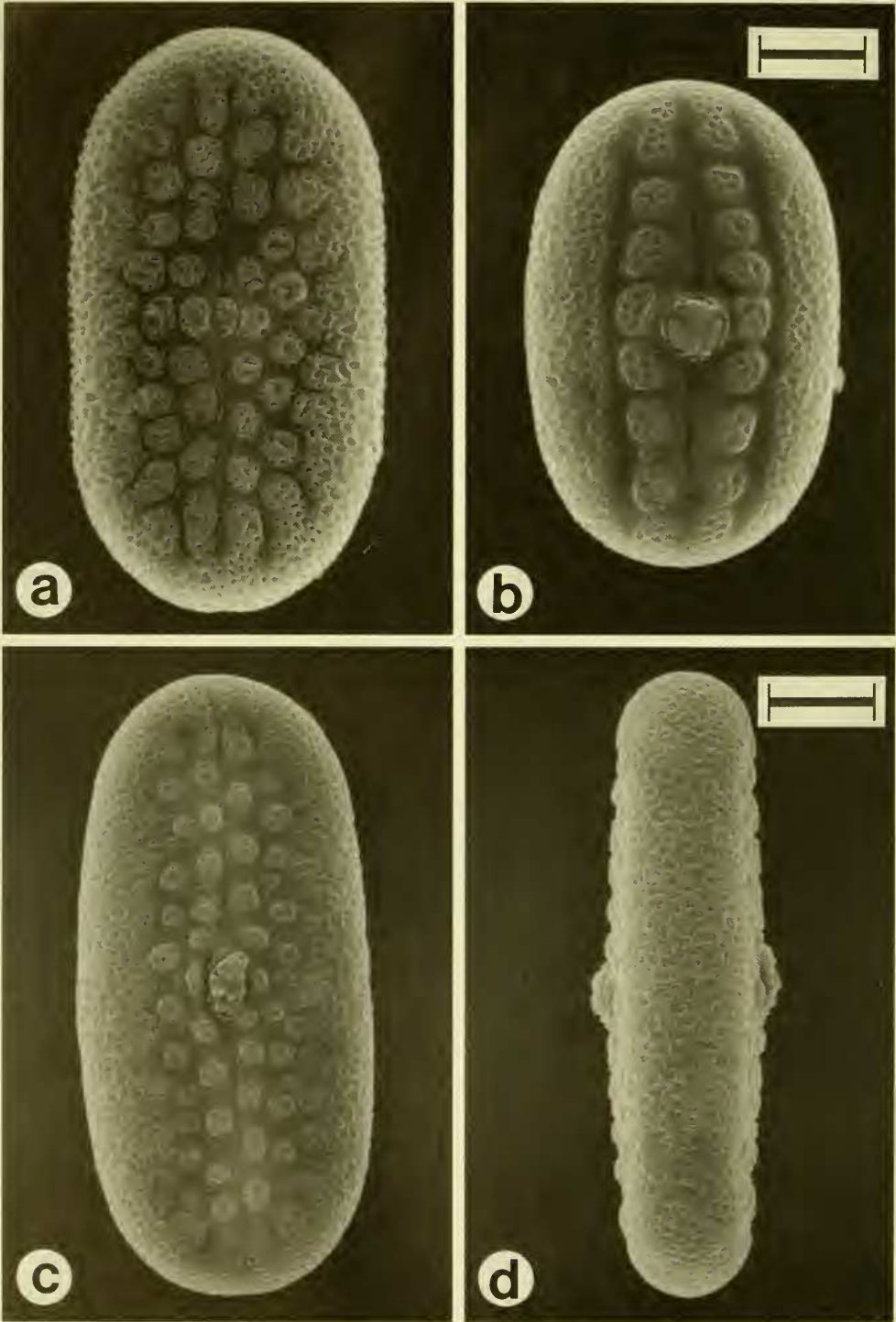


FIGURE 26. Pollen. a. *Justicia palmeri* (Carter 5442), apertural view; b. *J. purpusii* (Moran 6941), apertural view; c. *J. spicigera* from Veracruz (Avila B. 28), apertural view; d. *J. spicigera* (Avila B. 28), interapertural view. Scale for a and b = 10 μm ; scale for c and d = 12.5 μm .

Purpus s.n. (UC); Juncalito Bay area, 14 mi S of Loreto, *J. Reeder & C. Reeder 7063* (SD, UC); 31 km S of La Paz near San Pedro, ca. 1 km N jct Hwys 1 and 19, ca. 23°50'N, 110°11'W, *A. Sanders et al. 3300* (UCR); Rincón, 8.7 km SE of La Ribera, between Punta Arena & Cabo Pulmo, ca. 23°30'N, 109°25'W, *A. Sanders et al. 3322* (CAS, UCR); just off Hwy 1 along rd to Juncalito, ca. 15 mi S of Loreto, *R. Spjut 5414* (CAS); 12 mi N of Todos Santos, *J. Whitehead 858* (DS); 3.8 mi E of Los Planes, *I. Wiggins 14455* (CAS, DS, UC); 0.5 mi N of fork in rd to Rancho San Pedro, near Rancho La Presa, ca. 24°51'N, 111°04'W, *I. Wiggins 15482* (CAS, DS); 10 mi S of Mission Dolores, ca. 25°00'N, 110°47'W, *I. Wiggins et al. 318* (DS, UC); .

Justicia californica var. *conferta* is included in the synonymy of *J. palmeri* for the first time. Study of the holotype of the former taxon reveals that it resembles the latter species in all of the diagnostic characteristics (especially the petiolate and spatulate to oblanceolate bracteoles) noted above in the key to species.

Justicia palmeri and similar species (e.g., *J. candicans* (Nees) L. D. Benson, *Jacobinia roseana* Leonard, and *Jacobinia mexicana* Seem.) form a widely-distributed complex that is deserving of considerable further study. *Justicia palmeri* appears to be distinct within this complex by its cauline pubescence (vs. glabrous or variously pubescent but not resembling that of *J. palmeri*) and petiolate (vs. sessile) bracteoles that vary in shape from spatulate to obovate to elliptic (vs. triangular to subulate to linear to lanceolate). It remains to be seen whether these distinctions sufficiently circumscribe a taxon deserving specific status or if subspecific status would more appropriately reflect the geographic and morphological attributes noted herein. Graham (1988) did not include *J. palmeri* in her classification of *Justicia*.

7. *Justicia purpusii* (Brandegee) D. N. Gibson, Fieldiana, Bot. 34:73. 1972. *Beloperone purpusii* Brandegee, Zoe 5:172. 1903. TYPE. — MEXICO. Baja California Sur: Cape Region, San Felipe [23°06'N, 109°50'W], Feb 1901, *C. Purpus 552* (holotype: UC!; isotypes: UC!, US).

Erect perennial herbs to shrubs to 2 m tall. Young stems multi-grooved and subterete to subquadrate, evenly pubescent with a dense understorey of mostly erect eglandular (to subglandular)

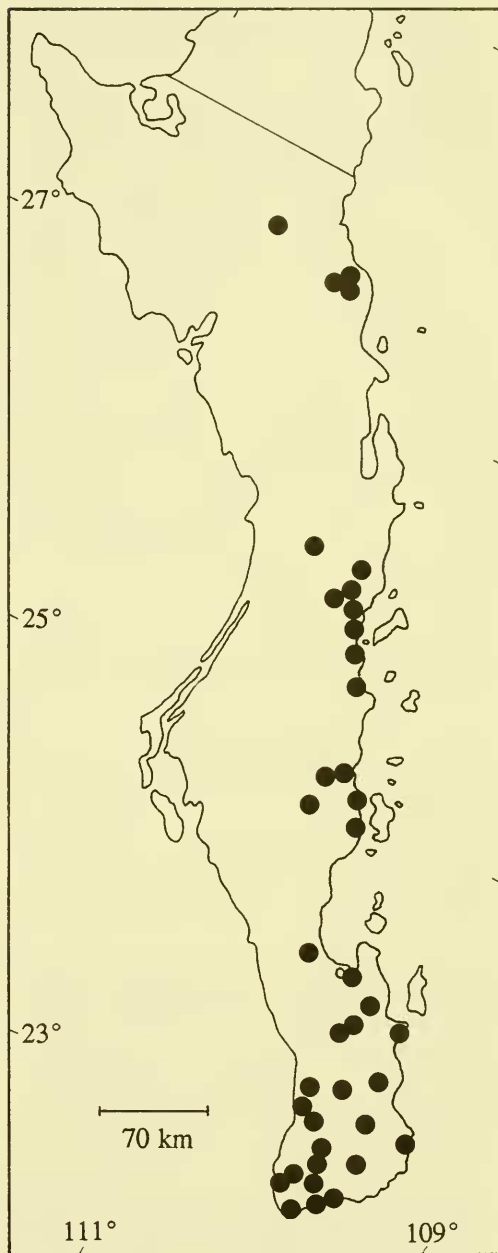


FIGURE 27. Distribution of *Justicia palmeri*.

dular) trichomes 0.05–0.2 mm long (often giving stems a pallid aspect) and an overstorey of erect to flexuose eglandular (to subglandular) trichomes 0.3–2 mm long, epidermis not visible. Leaves petiolate, petioles to 35 mm long (petio-

lar stubs to 1.5 mm long remaining at nodes after leaves have fallen), blades cordate to ovate, 19–135 mm long, 12–70 mm wide, 1.4–2.2 times longer than wide, rounded to acute to acuminate at apex, cordate to truncate at base, surfaces pubescent with erect to flexuose eglandular trichomes to 1.2 mm long, margin entire to subsinuate. Inflorescence of terminal pedunculate subfoliose dichasiate thyrses to 250 mm long, rachises pubescent with an understory of mostly erect eglandular to subglandular to glandular trichomes 0.05–0.3 mm long and an overstory of coarse erect to flexuose eglandular to subglandular to glandular trichomes 0.3–4 mm long; dichasia (alternate to) opposite, 1-flowered, 1 per axil, pedunculate in axils of leaves or subfoliose bracts, peduncles to 21 mm long, pubescent like rachis. Bracts intergrading with leaves, persistent, opposite, subsessile to sessile, cordate to broadly ovate, 10–43 mm long, 8.5–36 mm wide, abaxial surface pubescent like rachis (or with both understory and overstory trichomes fewer). Bracteoles sessile, subulate to lanceolate to narrowly elliptic, 2–9 (–11) mm long, 0.3–0.7 (–1.6) mm wide, abaxial surface pubescent like bracts (except overstory trichomes often not as long). Flowers (sessile to) pedicellate, pedicels 0.5–3 mm long. Calyx 5-lobed, 9–23 mm long, lobes lanceolate, 8–22 mm long, subequal in length, 1–2.8 mm wide, abaxially and marginally pubescent like rachis. Corolla orange-red, 30–40 mm long, externally pubescent with erect to flexuose eglandular and glandular trichomes 0.05–0.7 mm long, tube expanded distally, 15–24 mm long, 3.5–5 mm in diameter near midpoint, upper lip 14–20 mm long, entire or 2-lobed at apex, lobes 0.1–1.5 mm long, lower lip spreading, 15–19 mm long, lobes 1.5–3.5 (–6) mm long, 1.5–3.5 mm wide. Stamens inserted near apex of corolla tube, 19–24 mm long, filaments proximally pubescent with eglandular trichomes, thecae 2.7–3.2 mm long (including basal appendage), equal, subparallel to subperpendicular, unequally inserted (overlapping by 1.6–2 mm), dorsally pubescent with eglandular trichomes, lower (and sometimes upper) theca with a \pm bulbous basal appendage to 0.4 mm long; pollen (Fig. 26b) 2-aperturate, apertures flanked on each side by 1 row of insulae, exine reticulate. Style 28–36 mm long, glabrous or sparsely pubescent with eglandular trichomes proximally, stigma lobes 0.2 mm long, equal.

Capsule 17–23 mm long, pubescent with an overstory of erect to retrorse eglandular trichomes 0.2–0.3 mm long and an overstory of erect to flexuose to retrorse eglandular and glandular trichomes 0.4–2 mm long, stipe 8–12 mm long, head broadly subellipsoid to subglobose with a medial constriction, 9–11 mm long. Seeds 4, brown (often with darker brown mottling), subglobose to subcompressed, 2.6–3.6 mm long, 3–3.6 mm wide, 1.9–2.4 mm thick, surface smooth and lacking trichomes. ($n = 14$, Daniel et al. 1984).

PHENOLOGY. — Flowering: November–April; fruiting: January–April.

DISTRIBUTION AND HABITAT. — Endemic to the Cape Region of Baja California Sur (Fig. 28) where the species is known primarily (or exclusively ?) from nondesert areas; plants occur mostly in and along watercourses and on slopes in tropical deciduous forest and thornscrub from 270–1000 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Cañón de la Burrera, NE de Todos Santos, 23°32'N, 110°04'W, R.D. C. 122 (CAS); ca. 1/3 way from Rancho San Bernardo to mouth of Arroyo de San Bernardo, E side Sierra de la Victoria, 23°24'N, 109°55'W, A. Carter 2700 (DS, UC); Cape Region, between Rancho Palmilla and headwaters of arroyo NW of El Encinal, ca. 23°10'N, 109°58'W, A. Carter & F. Chisaki 3594 (DS, SD, UC); Arroyo Santa Rita, from San Jorge to San Francisquito and La Chuparosa, E side Sierra de la Victoria, 23°29–31'N, 109°47–55'W, A. Carter & R. Ferris 3317 (DS, SD, UC); SE from Rancho Poza Larga & Rancho La Ciruela, Arroyo de San Francisquito, E side Sierra de la Victoria, 23°29–31'N, 109°47–55'W, A. Carter & R. Ferris 3396 (DS, SD, UC); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 3.5 km NE of San Pedro de la Soledad, ca. 23°15'N, 109°57'W, T. Daniel & M. Butterwick 6945 (CAS); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 0.6 km W of San Pedro de la Soledad, ca. 23°14'N, 109°58'W, T. Daniel & M. Butterwick 6950 (CAS); along rd to Microondas San Bartolo, ca. 1–3 mi W of Hwy 1 in San Bartolo, T. Daniel et al. 2530 (ASU, CAS, K); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, T. Daniel et al. 6849 (BR, CAS, HCIB, MEXU, MICH, SBBG); Sierra Laguna, La Burrera, H. Genry 4436 (DS, UC); Miraflores, M. Jones 24171 (A, GH, LA, SD, POM, UC); La Paz, M. Jones 24424 (POM); Laguna Mts, Cota Ranch, 14 mi E of Todos Santos, M. Jones 24426 (POM); SW of San

Bartolo toward microwave towers, *D. Keil et al.* 16831 (UCR); "Pozas Cuatas," Cañón de La Zorra, NW de Santiago, 23°30'N, 109°52'W, *J. León de la Luz* 2179 (CAS, HCIB); Sierra de la Laguna, Cañón de la Burerera, "El Palmillar," 23°29'N, 110°00'W, *J. León de la Luz* 2553 (HCIB); Cape Region, 2 km below San Bartolo, ca. 23°44'N, 109°50' W, *R. Moran* 6941 (DS, RSA, SD); Cape Region, La Pastora, 9 km NE of Todos Santos, ca. 23°30'N, 110°17'W, *R. Moran* 6982 (CAS, DS, SD); ca. 22 mi N of Todos Santos on coastal rd, 23°41'N, 110°33'W, *P. Mudie* 903 (SD); La Paz, *E. Palmer* 98 (GH); San Bartolo, base of La Ballena, near rd from San Antonio to San Bartolo, *R. Peters* 147 (UC); Cape Region, ca. 6 mi SW from Santiago, Arroyo San Marteo from Agua Caliente Springs and dam to ca. 0.25 mi upstream, *J. Thomas* 7729 (DS, SD).

Graham (1988) treated *J. purpusii* as a species of uncertain position in the genus. Its closest relative appears to be *J. californica*. Both species have flowers in dichasiate thyrses, dorsally pubescent thecae, relatively large capsules, and subglobose to subcompressed seeds with a smooth surface. See additional discussion under *J. californica*.

8. *Justicia spicigera* Schltld., *Linnaea* 7:395. 1832. *Jacobinia spicigera* (Schltdt.) L. H. Bailey, *Stand. cycl. hort.* 1715. 1915. TYPE. — MEXICO. Veracruz: Jalapa, May 1829, A. Schiede s.n. (syntype: B, destroyed; isosyntype: GH); cultivated at Hacienda de la Laguna, Jul 1829, A. Schiede s.n. (syntypes: B, destroyed, P!; isosyntype: BM!).

Justicia atramentaria Benth., *Pl. hartw.* 69. 1840. *Jacobinia atramentaria* (Benth.) S. F. Blake, *Contr. Gray Herb.* 52:103. 1917. TYPE. — MEXICO. Oaxaca: "Zonaguia" [Tonaguia], 1839, *T. Hartweg* s.n. (holotype: K!).

Sericographis mohintli Nees in A. DC., *Prodr.* 11:361. 1847, nom. illegit. (*Justicia spicigera* and *J. atramentaria* cited in synonymy). *Jacobinia mohintli* (Nees) Hemsl., *Biol. cent.-amer., Bot.* 2:521. 1882.

Sericographis moctli Nees in Nees & S. Schauer, *Linnaea* 20:715. Dec 1847. TYPE. — MEXICO. State undetermined: "in ditone Toluccana," A. Aschenborn 101 (holotype: ?).

Sericographis neglecta Oerst., *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 1854:151. 1855. *Jacobinia neglecta* (Oerst.) A. Gray, *Syn. fl.*

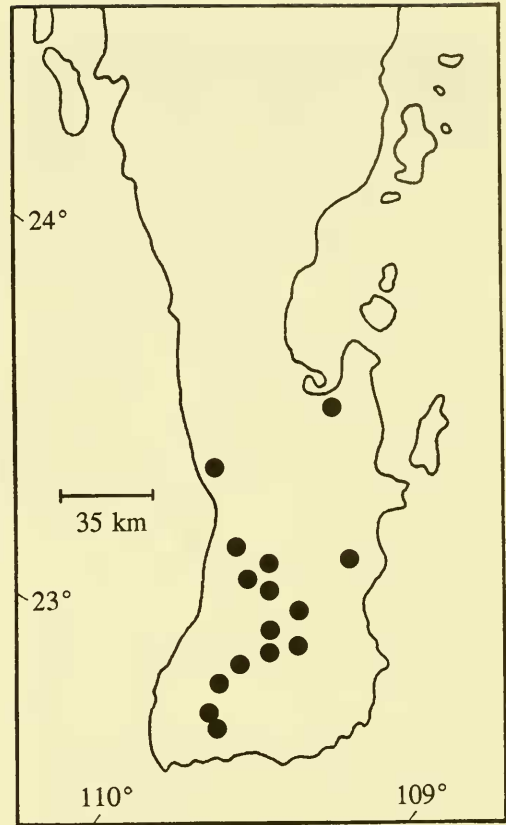


FIGURE 28. Distribution of *Justicia purpusii*.

N. Amer. 2(1):395. 1878. *Justicia liebmanii* V.A.W. Graham, *Kew Bull.* 43:612. 1988, non *Justicia neglecta* T. Anders. (1863). TYPE. — MEXICO. Veracruz: Pital ved Río Nautla, Apr 1841, *F. Liebmann* 10671 (syntype: C; isosyntype: K!); Colipa, Mar 1841, *F. Liebmann* 10670 (syntype: C); Paso del Correo ved Río Tecoluta, Jun 1841, *F. Liebmann* 10672 (syntype: C).

Jacobinia scarlatina S.F. Blake, *Contr. Gray Herb.* 52:102. 1917. *Justicia scarlatina* (S. F. Blake) V.A.W. Graham, *Kew Bull.* 43:612. 1988. TYPE. — BELIZE. Belize: near Manatee Lagoon, 12 May 1906, *M. Peck* 430 (holotype: GH; isotype: K!).

Shrubs to 1 (–5) m tall. Young stems subterete to quadrate, sparsely to ± densely pubescent with antrorse to retrorse eglandular trichomes 0.5–1.2 mm long, trichomes ± evenly disposed (in ours) to concentrated in 2 lines. Leaves petiolate, petioles to 20 mm long (petiolar stubs to 0.5 mm

long sometimes remaining at nodes after leaves have fallen), blades often blackening when dried, ovate-elliptic to elliptic to narrowly elliptic, 32–225 mm long, 7–67 mm wide, 2.2–4.6 times longer than wide, acute to acuminate at apex, acute to attenuate at base, surfaces pubescent (primarily along major veins) with cauline type trichomes or glabrous, margin entire to sinuate. Inflorescence of axillary pedunculate panicles of dichasiate spikes to 105 mm long (including peduncle and excluding flowers), inflorescence bracts triangular to subulate to lanceolate to obovate, 1–5 mm long, 0.5–1.3 mm wide, pubescent with cauline type trichomes (in ours) or glabrous, panicles opposite or alternate, 1 per axil, rachis glabrous or, in ours, pubescent with flexuose to antrorse to retrorse eglandular trichomes 0.1–0.5 mm long and sometimes inconspicuously glandular punctate as well, the eglandular trichomes becoming very sparse or concentrated in 2 lines distally; dichasia alternate, 1-flowered, \pm secund, 1 per axil, sessile. Bracts opposite, sessile, triangular, 1–2 mm long, 0.8–1.2 mm wide, abaxial surface glabrous, inconspicuously glandular punctate, or pubescent like rachis. Bracteoles sessile, triangular to ovate to subulate, 0.9–2.2 mm long, 0.6–1 mm wide, abaxial surface glabrous or inconspicuously glandular punctate. Flowers sessile to subsessile (i.e., borne on pedicels to 1 mm long). Calyx 5-lobed, 2.8–4.5 mm long, lobes lanceolate to lance-subulate, 1.7–3.2 mm long, equal in length, 0.5–0.9 mm wide, abaxially glabrous or pubescent with subsessile to stipitate glandular trichomes to 0.1 mm long. Corolla orange, fusiform in bud, 33–55 mm long, externally pubescent with inconspicuous subsessile to stipitate glandular trichomes to 0.1 mm long proximally (i.e., near base of tube) and glabrous distally, tube gradually expanded distally, 19–32 mm long, 2.5–4 mm in diameter near midpoint, upper lip 11–21 mm long, entire at apex, lower lip recoiled, 11–21 mm long, lobes 0.8–2.5 mm long, 1–1.7 mm wide. Stamens inserted near apex of corolla tube, 14–20 mm long, filaments glabrous, thecae 1.5–3.2 mm long, equal to subequal, subparallel to subsagittate, subequally inserted, glabrous, lacking basal appendages (or with inconspicuous appendages to 0.1 mm long); pollen (Fig. 26c, d; from extralimital material) 2-aperturate, apertures flanked on each side by 2 (–3) rows of insulae, exine reticulate. Style

28–48 mm long, glabrous or with a few glands near base, stigma 0.4–0.7 mm long, lobes indistinct. Capsule 17 mm long, glabrous, stipe 8 mm long, head hourglass-shaped, 9 mm long. Seeds 4, dark brown, compressed, 2.7–3 mm long, 2.5 mm wide, 0.7 mm thick, surfaces and margin covered with subconic papillae. (chromosome number unknown).

PHENOLOGY. — Flowering: April; elsewhere flowering December–August and fruiting in March (fruiting collections rare).

DISTRIBUTION AND HABITAT. — Throughout much of Mexico, Belize, Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica; plants are commonly cultivated and are found in a variety of habitats and vegetation types. In California cultivated for ornament and in Baja California cultivated as a medicinal plant where it appears to naturalize; in our region, the species is known from a nondesert portion of the Cape Region and from the Sierra de la Giganta (Fig. 4); Wiggins (1980) noted its occurrence in arroyos and on slopes and *Carter & Moran 5644* was noted to have been collected in an arroyo.

LOCAL NAME. — “Nicle” (*Carter 2710*); “nicle” (*Carter & Moran 5644*).

USES. — Used to cure fever (*Carter 2710*); elsewhere a common medicinal and dye plant and often used in Latin America as a bluing agent for whitening clothes.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: E side of Sierra de la Victoria, Boca de la Sierra, ca. 6 km NW of Miraflores, mouth of Arroyo de San Bernardo, 23°23'N, 109°48'W, A. *Carter 2710* (DS, UC); Sierra de la Giganta, arroyo E of La Soledad, ca. 24°49'N, 110°52'W, A. *Carter & R. Moran 5644* (UC).

The above description has been augmented with data from other Mexican collections of *J. spicigera*. Daniel (1995) discussed the distribution of and morphological variation in this species.

The closest relatives of *J. spicigera* appear to be *Justicia leonardii* Washh. (apparently differing only by its denser pubescence) and *Justicia colorifera* V. A. W. Graham (differing by its glabrous corollas with a spreading lower lip, and dorsally pubescent thecae). The former occurs in northeastern Mexico; the latter occurs in southern Mexico, Central America, and northern

South America. Graham (1988) treated all of these species as being peripheral to *Justicia* section *Plagiacanthus*.

RUELLIA

Ruellia L., Sp. pl. 634. 1753. LECTOTYPE (Britton and Brown, Ill. fl. n. U.S., ed. 2, 3:241. 1913). — *Ruellia tuberosa* L.

Dipteracanthus Nees in Wall., Pl. asiat. rar. 3:75, 81. 1832. LECTOTYPE (Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 45(1):15. 1948). — *Dipteracanthus prostratus* (Poiret) Nees (≡ *Ruellia prostrata* Poiret).

Aphragmia Nees in Lindl., Intr. nat. syst. bot. ed. 2, 444. 1836. TYPE. — *Aphragmia haenkei* Nees (≡ *Ruellia inundata* Kunth).

Cryphiacanthus Nees, Index Sem. Horti Vrat. 1841; Linnaea 16:298. 1842. LECTOTYPE (designated fide Index Nom. Gen. Pl.). — *Cryphiacanthus barbadensis* Nees (nom. illegit.; = *Ruellia tuberosa* L.).

Decumbent to erect, subcaulescent to caulescent perennial herbs, shrubs, or (rarely) trees with cystoliths, vegetative and floral surfaces sometimes glandular punctate. Leaves opposite, sometimes anisophyllous, sessile to petiolate, margin entire to sinuate to crenate to dentate. Inflorescence of reduced or expanded dichasia in axils of leaves or bracts, sometimes forming dichasiate spikes, thyrses, or panicles; dichasia alternate or opposite, 1–many-flowered, 1 or more per axil, sessile or pedunculate. Bracts opposite, green (in ours), margin entire (in ours). Flowers usually subtended by 2 isomorphic bracteoles (sometimes absent or vestigial), chasmogamous flowers generally large and showy, cleistogamous flowers often present as well, commonly preceding or succeeding chasmogamous flowers. Calyx deeply 5-lobed, lobes homomorphic or heteromorphic, equal to unequal in length. Corolla of chasmogamous flowers blue, blue-purple, pink, red, white, yellow, or blackish, generally concolorous, sometimes with whitish or greenish markings, tube usually funnelform, often curved, gradually or abruptly expanded distally into a ± distinct throat (rarely saccate), limb bilabiate (sometimes appearing subactinomorphic), upper lip 2-lobed, lower lip

3-lobed, corolla lobes contorted in bud, corolla of cleistogamous flowers, if present, small, whitish, budlike or tubular, lobes remaining closed. Stamens 4, (homodynamous to) didynamous, usually inserted near base of corolla throat, included in corolla tube or exerted from mouth of corolla, filaments sometimes united in pairs at base, anthers 2-theous, thecae equal in length, parallel to subsagittate, equally inserted, lacking basal appendages, dehiscing toward lower lip (i.e., flower nototribal); pollen (Figs. 29, 30) spheroidal, 3-porate, exine coarsely reticulate; staminodes 0 or 1. Style included in corolla tube or exerted from mouth of corolla, stigma 2-lobed, lobes equal or unequal, often with 1 lobe greatly reduced, rudimentary, or not evident. Capsule substipitate or stipitate, head terete or compressed, narrowly ellipsoid to broadly ellipsoid to subglobose to obovoid, retinacula present, septae with attached retinacula remaining attached to inner wall of mature capsule. Seeds 4–20 per capsule, lenticular, pubescent with hygroscopic trichomes (sometimes restricted to margin). ($x = 17$).

The generic boundaries of *Ruellia* have been debated for many years. In one broad sense it comprises approximately 250 species worldwide with species occurring primarily in the tropics and subtropics. It is the second largest genus of Acanthaceae in Mexico with about 65 species there. Thirteen or more species are native to the United States. The generic synonymy given above only includes genera in which our species have been treated previously. Daniel (1995) provided a more comprehensive generic synonymy pertaining to New World taxa.

Key to Species of *Ruellia*

1. Corolla white; young stems and leaves and external surfaces of calyx, corolla, and capsule beset with sessile patelliform glands (glandular punctate) *Ruellia leucantha*
1. Corolla bluish, blue-purple, or pinkish; young stems and leaves and external surfaces of calyx, corolla, and capsule lacking sessile patelliform glands (although sometimes with stipitate glands).
 2. Limb of corolla 10–13.5 mm in diameter; calyx lobes unequal with one conspicuously longer and wider than others; thecae 1.7–2.4 mm long; capsule often blotched

- with red, 7.5–10 mm long, glabrous
..... *Ruellia inundata*
- 2. Limb of corolla 17–42 mm in diameter; calyx lobes equal to subequal; thecae 2.8–5 mm long; capsule never blotched with red, 11–23 mm long, pubescent (or glabrous in *R. cordata*).
- 3. Perennial herbs; young stems pubescent with eglandular trichomes only; dichasia 3–many-flowered; leaves commonly constricted-attenuate at base; stipe of capsule 2–3.5 mm long; seeds 8–12 per capsule.
- 4. Those dichasia in axils of distal leaves or leaflike bracts collectively forming a terminal glandular pubescent paniculiform thyrse; external surfaces of calyx and corolla pubescent with stipitate glandular trichomes; style pubescent *R. nudiflora*
- 4. Dichasia never forming a terminal glandular paniculiform thyrse; external surfaces of calyx and corolla pubescent with eglandular trichomes only; style glabrous . . . *R. intermedia*
- 3. Shrubs; young stems pubescent with eglandular and stipitate glandular trichomes or glabrous-glutinous; dichasia 1–3-flowered; leaves never constricted-attenuate at base; stipe of capsule 3.5–7 mm long; seeds 4 per capsule.
- 5. Calyx lobes (linear to) oblanceolate to spatulate (i.e., widest at or above middle); bracteoles subcordate to broadly ovate to subcircular, 7–10 mm wide; leaf blades (ovate to) broadly ovate to cordate to reniform; capsule glabrous *R. cordata*
- 5. Calyx lobes lance-subulate (i.e., widest at base); bracteoles linear to lanceolate to lunate to ovate to elliptic to obovate, 0.3–2.5 (–4) mm wide; leaf blades elliptic to ovate (to broadly ovate); capsule pubescent *R. californica*

1889, *E. Palmer 190* (holotype: US; isotypes: GH!, NY, UC!).

Shrubs to 1.5 m tall, herbage mephitic and often glutinous (i.e. with a sticky and shiny surface). Young stems subterete to quadrate, glabrous or densely and evenly pubescent with erect to flexuose glandular (and often with a few inconspicuous eglandular) trichomes 0.1–1.5 mm long (glandular pubescent). Leaves petiole, petioles to 10 (–15) mm long, blades ovate to broadly ovate to elliptic (to cordate), 6–55 mm long, 3–32 mm wide, (1.1–) 1.3–2.6 times longer than wide, acute to acuminate at apex, acute to rounded to truncate to subcordate at base, surfaces either lacking eglandular and stipitate glandular trichomes or glandular pubescent, glandular punctate, punctae often inconspicuous and usually exuding a clear, shiny, and sticky substance (i.e., glutinous) and giving the appearance of either glistening dots or a general shiny coating, margin entire to angulate-sinuate. Inflorescence of axillary dichasia; dichasia alternate or opposite, 1–3-flowered, 1 per axil, pedunculate in leaf axils, peduncles 1–17 mm long, subterete, glabrous or glandular pubescent. Bracteoles often subfoliose, sometimes petiole, linear to lanceolate to lunate to elliptic to oblanceolate to obovate (to ovate), 1–14 mm long, 0.3–2.5 (–4) mm wide, abaxial surface glabrous or glandular pubescent, secondary bracteoles (if present) similar to bracteoles except smaller. Flowers sessile to pedicellate, pedicels (if present) to 2.5 mm long. Calyx (4–) 6–22 mm long, tube 1.5–4.7 mm long, lobes lance-subulate, (1.5–) 3.3–20 mm long, often subequal to unequal in length, 1.1–10 times longer than tube, 1–1.9 mm wide, abaxially glabrous, sparsely pubescent with antrorse eglandular trichomes to 0.1 mm long, or glandular pubescent, margin glandular pubescent. Corolla blue-purple (rarely pinkish), sometimes with yellowish markings in throat or the throat lighter purple than the limb and streaked with darker purple, (26–) 33–51 mm long, externally pubescent with erect to flexuose glandular trichomes 0.05–0.2 mm long, tube (18–) 24–42 mm long, narrow proximal portion 6–20 mm long, abruptly expanded distally into throat, throat 12–23 mm long, longer than (or rarely equal to) the narrow proximal portion of the tube, 6–15 mm in diameter near midpoint, limb (17–) 23–42 mm in diameter,

1. *Ruellia californica* (Rose) I. M. Johnst., Proc. Calif. Acad. Sci., ser. 4, 12:1171. 1924. *Calophanes californica* Rose, Contr. U. S. Natl. Herb. 1:85. 1890. TYPE. — MEXICO. Baja California Sur: Santa Rosalía, 24 Feb–3 Mar

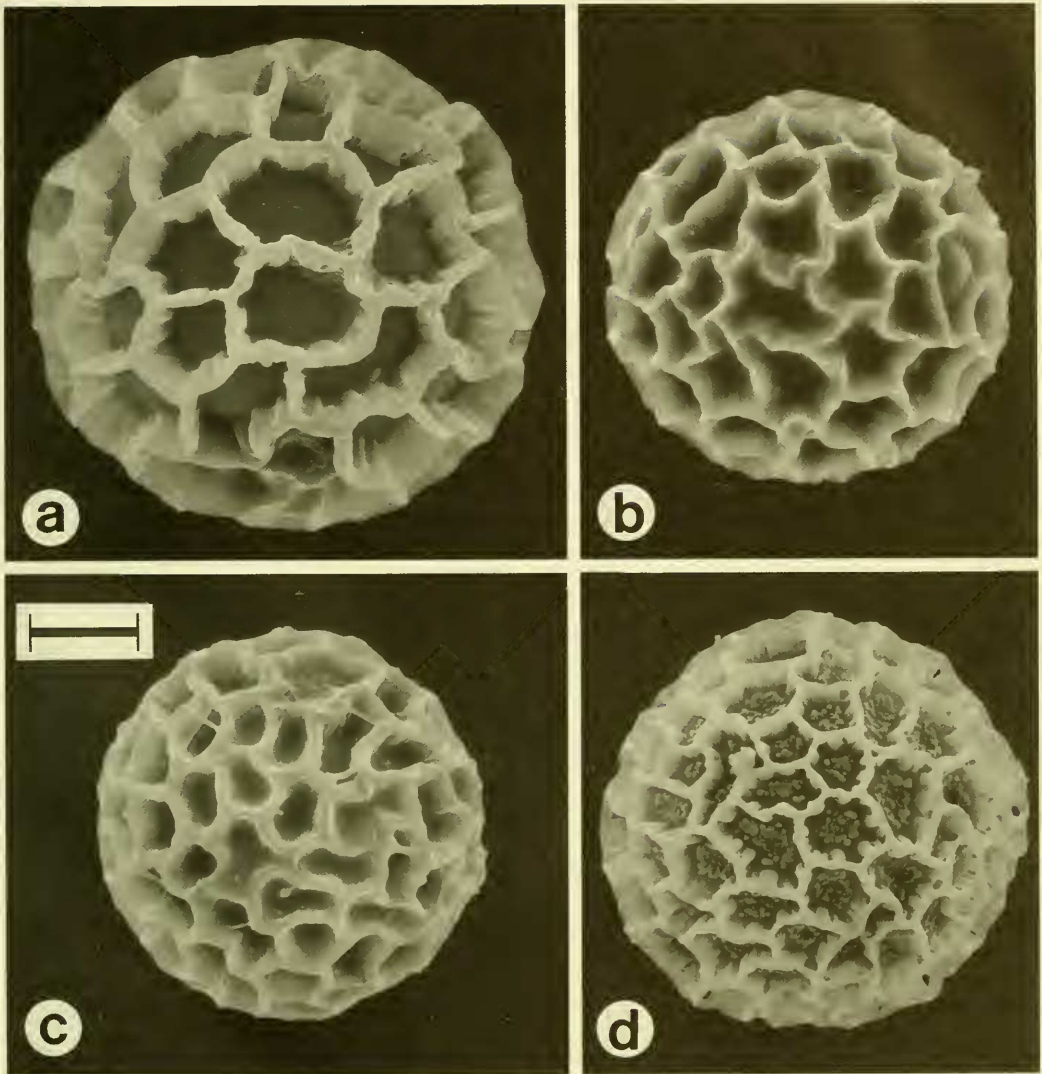


FIGURE 29. Pollen. a. *Ruellia californica* subsp. *californica* (Wiggins 11411); b. *R. californica* subsp. *peninsularis* (Daniel & Butterwick 6844); c. *R. cordata* (Boyd & Ross 5934); d. *R. intermedia* (Jenkins et al. s.n.). Scale for a–d = 15 μ m.

lobes 6–14 mm long, 6.5–18 mm wide. Stamens included, longer pair 8–18 mm long, shorter pair 5.5–13 mm long, thecae 3–5 mm long. Style 15–37 mm long, pubescent with eglandular and usually glandular (at least proximally, sometimes inconspicuous) trichomes, stigma unequally 2-lobed, 1 lobe 1.5–5 mm long, other lobe 0.3–0.7 mm long. Capsule stipitate, 14–19 mm long, pubescent with erect glandular trichomes 0.05–0.2 mm long, stipe 4.5–7.5 mm

long, head subovoid to ellipsoid to obovoid. Seeds 4, 2.5–4.5 mm long, 2.5–3.5 mm wide, surfaces covered with appressed hygroscopic trichomes. ($n = 17$, Daniel et al. 1984). Fig. 31.

PHENOLOGY.— Flowering and fruiting throughout the year.

DISTRIBUTION.— Northwestern Mexico (Baja California, Baja California Sur, and Sonora); in our region the species is known from southern Baja California and from throughout Baja Cali-

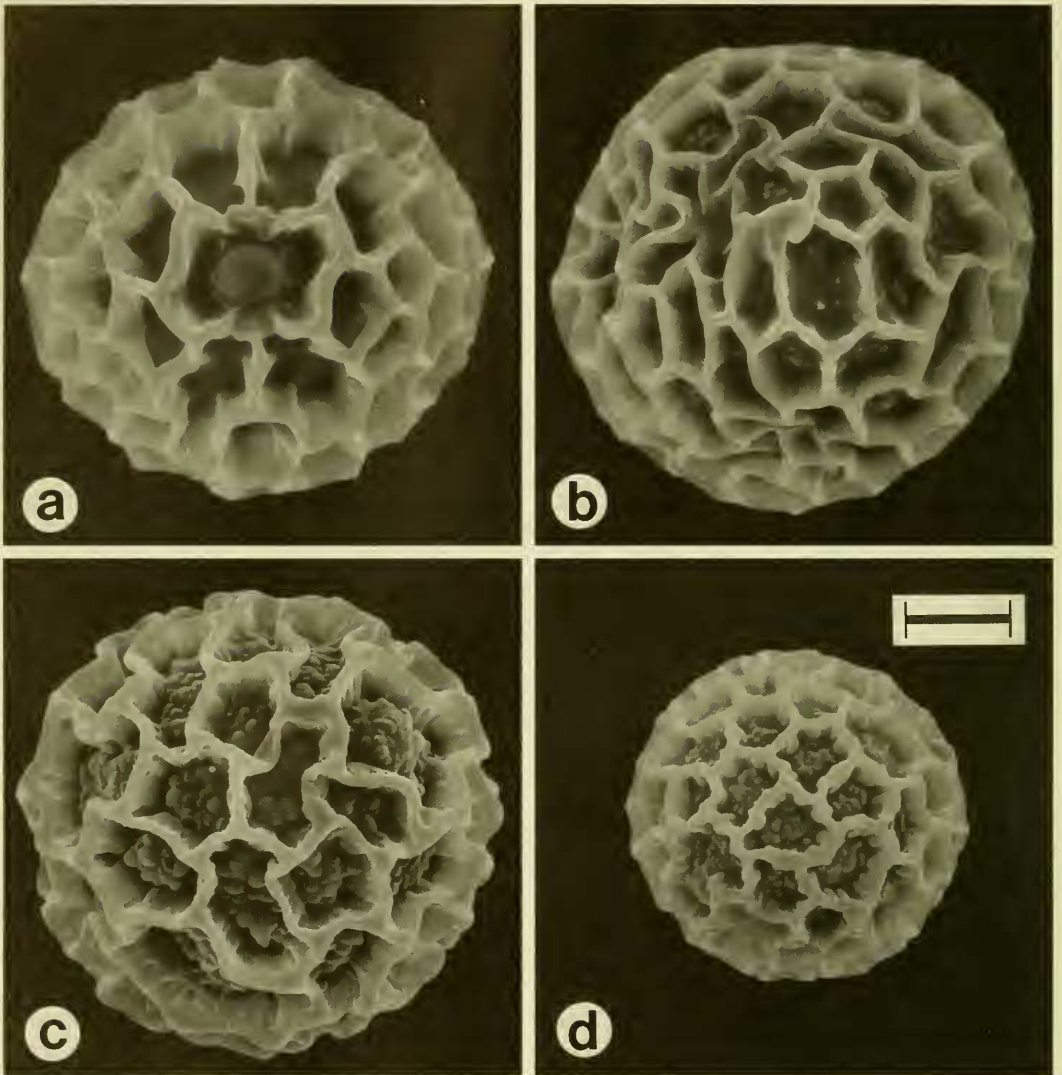


FIGURE 30. Pollen. a. *Ruellia inundata* (Daniel & Butterwick 6952); b. *R. leucantha* subsp. *leucantha* (Daniel & Butterwick 6940); c. *R. leucantha* subsp. *postinsularis* from Sinaloa (Brandegee s.n.); d. *R. nudiflora* from Sonora (Wiggins & Rollins 136). Scale for a-d = 15 μ m.

fornia Sur (Figs. 32, 33) where it occurs in the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast, Vizcaño, and Magdalena subdivisions).

There is no recent taxonomic treatment of Mexican *Ruellia*. Among species with which I am familiar, *R. cordata* is most similar to *R. californica* on the basis of morphological characteristics.

Felger and Moser (1985) considered *R. peninsularis* to be conspecific with *R. californica*. Johnston (1924) discussed the differences between these taxa and other peninsular species of *Ruellia*. Gentry (1949) noted that *R. californica* is closely related to *R. peninsularis*, the primary difference being the presence of clavate glands on the calyx of the former and the absence of them on the latter. He also noted that *R. peninsularis* appeared to be limited in distribution to the

peninsula. The two taxa are indeed very similar to one another and herbarium specimens of them have often been misidentified. They differ primarily in the presence of conspicuous, stipitate glandular pubescence on vegetative organs of *R. californica*. As noted by previous investigators (Johnston 1924, Gentry 1949, Turner et al. 1995) this difference in pubescence has a geographic basis. Specimens treated as *R. californica* and *R. peninsularis* were sorted based on the distinction noted above and their distributions were plotted on maps. The maps reveal that in Baja California (Figs. 32, 33) plants treated as *R. californica* occur only to the north of lat. 25°30'N (see discussion of *Craig 757*, presumably from Cape Region, below) and that plants formerly treated as *R. peninsularis* occur only to the south of lat. 26°13'N. Furthermore, only plants with stipitate glandular trichomes (see additional discussion below) are known from Sonora. The only known region where the ranges of these taxa overlap occurs between about lat. 25°30'N and lat. 26°13'N in the Central Gulf Coast subdivision of the Sonoran Desert and the Sierra de la Giganta.

In addition to the difference in pubescence, several morphological tendencies can be useful for further distinguishing these taxa. Lengths of the calyces, corollas, and styles are usually relatively shorter in plants treated as *R. peninsularis* than in those treated as *R. californica*: calyces (4–) 6–12.3 vs. 7–22 mm long, corollas 27–40 vs. (26–) 33–51 mm long, and styles 15–20 vs. 20–37 mm long.

My studies show that the differences between *R. californica* and *R. peninsularis* are slight and that their distributions are predominately allopatric. The minor difference in pubescence between these taxa, which has a geographic basis, is more suggestive of the differences between subspecies of *Justicia insolita* and *Holographis virgata* than between other species of *Ruellia*. For this reason, *R. peninsularis* is here treated as a subspecies of *R. californica*.

Several specimens from at least two regions are somewhat intermediate between these subspecies. Some collections from the vicinity of Guaymas in Sonora (e.g., *Blakley B-1640*, *Daniel 3987*, *Dawson 1002*, and *Phillips et al. 76-183*) and the northern Sierra de la Giganta in Baja California Sur (e.g., *Boyd & Ross 5944* and

Carter 4399) exhibit varying amounts of stipitate glandular and eglandular trichomes on the herbage. These trichomes, which are absent in subspecies *peninsularis* and usually dense in subspecies *californica*, vary from very sparse to somewhat dense (usually only on the newest growth) on various internodes of each of these collections. For example, *Dawson 1002* contains individuals with typical densely glandular shoots as well as less glandular individuals. Because stipitate glandular and eglandular trichomes are evident on all of these collections, they are treated as subspecies *californica*. The lengths of floral organs in all of these collections except *Carter 4399* also suggest that they are better treated as subspecies *californica*. *Carter 4399* has some shoots very sparsely glandular and others rather densely glandular. Lengths of the calyx (10.5–12 mm), corolla (26–30 mm), and style (18–20 mm) of plants represented by this collection are more suggestive of subspecies *peninsularis*. It is not known whether any or all of these collections represent hybrids (which might be expected in the northern Sierra de la Giganta based on present day distributions of the two taxa) or merely morphological variation in one or both subspecies. *Zippin 20* from the vicinity of San Isidro (i.e., near where there is overlap in the ranges of the subspecies) contains numerous separate shoots, some of which are referable to subsp. *californica* and others of which are referable to subsp. *peninsularis*.

Key to the Subspecies of *Ruellia californica*

1. Stems and leaves covered with stipitate glandular and eglandular trichomes (youngest growth lacking stellate trichomes); calyx 8–22 mm long, lobes abaxially pubescent with stipitate glandular and eglandular trichomes subsp. *californica*
1. Stems and leaves lacking stipitate glandular and eglandular trichomes (youngest growth sometimes with scattered stellate eglandular trichomes); calyx 5–12.3 mm long, lobes abaxially glabrous. subsp. *peninsularis*

1a. *Ruellia californica* subsp. *californica*

Young stems evenly pubescent with erect to flexuose glandular (and often with a few inconspicuous eglandular) trichomes 0.1–1.5 mm long (glandular pubescent). Leaf blades ovate to ellip-



FIGURE 31. *Ruellia californica*. (a, b, d–i from subspp. *californica*, c from subspp. *peninsularis*). a. habit (Hammerly 134 and Daniel 1884), $\times 0.5$; b. vegetative node (Wiggins 17944), $\times 1$; c. vegetative node (Daniel et al. 6844), $\times 1.5$; d. flower (Hammerly 134 and Wiggins 11411), $\times 1.2$; e. distal portion of flower cut open (Hammerly 134), $\times 1.5$; f. front view of flower (Hammerly 134), $\times 1.1$; g. capsule (Daniel 1884), $\times 2.7$; h. dry seed (Thomas 8318A), $\times 5$; i. moistened seed (Thomas 8318A), $\times 5$. Drawn by Jenny Speckels.

tic, surfaces glandular pubescent. Peduncles of inflorescence glandular pubescent. Bracteoles linear to narrowly elliptic to lanceolate to lunate, abaxial surface glandular pubescent. Calyx 7–22 mm long, tube 1.5–3 mm long, lobes 4–20 mm

long, 3–10 times longer than tube, abaxially and marginally glandular pubescent. Corolla (26–) 33–51 mm long, tube (18–) 24–42 mm long, narrow proximal portion (6–) 10–20 mm long. Longer pair of stamens 11.5–18 mm long,

shorter pair of stamens 9–13 mm long. Style 20–37 mm long, stigma with 1 lobe 3.5–5 mm long, other lobe 0.4–0.7 mm long. ($n = 17$, Daniel et al. 1984). Fig. 31a, b, d–i.

PHENOLOGY. — Flowering and fruiting throughout the year.

DISTRIBUTION AND HABITAT. — Northwestern Mexico (Baja California, Baja California Sur, and Sonora); in our region the subspecies occurs in southern Baja California and extends southward in Baja California Sur to about latitude 25°30'N (Fig. 32) and is known from the Sonoran Desert (Central Gulf Coast, Vizcaíno, and Magdalena subdivisions) and the Sierra de la Giganta; plants occur along sandy and rocky watercourses, on slopes, on rocky flats, and on sand dunes in desertscrub and thornscrub from near sea level to 800 (–1300) m elevation.

LOCAL NAME. — “Rama parda” (numerous herbarium labels).

ADDITIONAL SPECIMENS EXAMINED. — MEXICO.

Baja California: 11 km N of junction of El Barril and San Francisquito rds, ca. 28°27'N, 113°15'W, *A. Carter 5821* (CAS, UC); ca. 30 mi E of Pozo Alemán on Calmallí-San Ignacio Rd, *R. Ferris 8620* (DS); Rancho Miraflores, (El Arco), *C. Harbison s.n.* (SD); ca. 27 mi S of Bahía de los Angeles, *J. Henrickson 1129* (RSA); 9 mi SE of Las Flores, ca. 28°44'N, 113°29'W, *R. Moran 10258* (DS, SD, UC); ca. 8 mi ESE of La Bocana, 28°28'N, 113°18'W, *R. Moran 11558* (SD); Calmallí, *C. Purpus 85* (DS, UC); 14 mi N of Los Angeles, *I. Wiggins 5425* (DS, POM, UC). **Baja California Sur:** Concepción Bay, *E. Berry 102* (CAS, DS); Arroyo San Bruno, SE of Santa Rosalía, 4.8 mi W of Hwy 1 on rd to San José de Magdalena, ca. 27°04'N, 112°12'W, *S. Boyd & T. Ross 5836* (RSA, UCR); N Sierra La Giganta, S of Mulegé, 11.2 mi W of Hwy 1 on rd from Rosarito to San Isidro, ca. 26°21'N, 111°45'W, *S. Boyd & T. Ross 5944* (CAS, RSA); without locality, *T. Brandegees s.n.* (UC); 24 km N of San Ignacio, *D. Breedlove & C. Burns 72723* (CAS, MEXU); 43 km N de Loreto, carr. a Mulegé, 26°19'N, 111°33'W, *A. Campos V. 4486* (CAS); Sierra de la Giganta, Valle de Los Encinos (S side of Cerro Giganta), ca. 26°04'N, 111°34'W, *A. Carter 4136* (CAS, UC); Pilón de las Parras, 25°58'N, 111°30'W, *A. Carter 4212* (SD, UC); Sierra de la Giganta, La Esperanza, ca. 25°48'N, 111°24'W, *A. Carter 4399* (CAS, UC); W of cemetery, “Las Lomas de Anita,” Loreto, ca. 26°00'N, 111°21'W, *A. Carter 4421* (UC); Sierra de la Giganta, saddle between N and S peaks of Cerro Gabilán, ca. 25°55'N, 111°25'W, *A. Carter 4461a* (UC); ridge S of Tinaja de Naucajoa,

Cerro de Naucajoa (W of Llanos de San Juan), ca. 26°15'N, 111°38'W, *A. Carter 4479a* (UC), *4479b* (UC); Sierra de la Giganta, Cañón de la Cumbre, a branch of Arroyo de Agua Verde on trail to San José de Agua Verde, ca. 25°30'N, 111°07'W, *A. Carter 4846* (UC), *4846a* (UC); Isla Carmen, Puerto Balandra, ca. 26°00'N, 111°10'W, *A. Carter & R. Ferris 3724* (CAS, UC), *3724A* (CAS, UC); Sierra de la Giganta, ridge S of La Victoria, ca. 25°52'N, 111°25'W, *A. Carter & R. Ferris 3897* (CAS, UC); Cuesta de Chuenque, ca. 22 km S of Loreto, 25°53'N, 111°20'W, *A. Carter & L. Kellogg 2926* (DS, SD, UC); Isla Carmen, Puerto Balandra, ca. 26°05'N, 111°10'W, *A. Carter & J. Reese 4550* (CAS, UC); Sierra de la Giganta, Arroyo Tabor, W of Puerto Escondido, ca. 25°48'N, 111°20–21'W, *A. Carter & H. Sharsmith 4245* (CAS, UC); Sierra de la Giganta, mouth of Arroyo Tabor, W of Puerto Escondido, ca. 25°48'N, 111°20'W, *A. Carter & H. Sharsmith 4259* (UC); W of Bahía de la Concepción, 40.6 km S of Mulegé, *A. Carter et al. 1985* (DS, UC); near base of S-most of Tres Vírgenes, 25 mi W of Santa Rosalía on W side of pass, *K. Chambers 768* (DS, SD, UC); Arroyo de la Purísima, 16 mi above La Purísima, *L. Constance 3152* (DS, UC); S end of Bahía Coyote, across from Rancho El Coyote, 16.7 mi S of Puente Mulegé, ca. 26°42'N, 111°55'W, *T. Daniel 204* (ASU, CAS); along Mex. Hwy 1, 4.1 mi E of San Ignacio, *T. Daniel 1884* (ASU, CAS); above Playa El Coyote on W side of Bahía Concepción, 18.5 mi S of Mulegé, *T. Daniel 1891* (ASU, CAS); along Hwy 1 by Bahía Concepción, 14.1 mi N of Microondas Rosarito, *T. Daniel et al. 2396* (ASU, MICH, CAS); 1–2 mi inland from Agua Verde Bay, *E. Dawson 6279* (RSA); Bargo Island, Concepción Bay, *E. Dawson 6360* (RSA); Puerto Escondido, SW side of lagoon, *E. Dawson 6408* (RSA); Mpio. Comondú, Ejido Los Naranjos, 26°20'N, 111°53'W, *M. Domínguez L. 192* (HCIB); Sierra de la Giganta, San Javier Rd, 8.8 mi SW of Hwy 1, *J. Donahue 73095* (RSA); Isla del Carmen, 3–4 km al lado SE, *G. Flores F. 492* (RSA); Sierra Giganta, Arroyo Hondo, *H. Gentry 4133* (DS, UC); Desierto Vizcaíno Region, between San Ignacio and Los Martiles, *H. Gentry 7874* (DS, RSA, UC); Coyote, Bahía Concepción, *H. Gentry & B. Gentry 23180* (CAS); S end of Vizcaíno Desert, ca. 15 mi N of San Ignacio, *B. Hammerly 97* (CAS); overlooking Coyote Cove on Concepción Bay, *B. Hammerly 134* (CAS, DS); Loreto, *C. Harbison s.n.* (CAS, SD); between Santa Agueda and Santa Rosalía, *C. Harbison s.n.* (SD); Isla Carmen, Puerto Balandra, 26°00'N, 111°12'W, *J. Hastings 71-124* (SD); 27 mi SE of El Arco, *J. Hastings & R. Turner 63-275* (DS, SD); 16.1 mi W of San Ignacio, *J. Hastings & R. Turner 63-291* (DS, SD); Rancho Mezquital, S of Volcán Las Tres Vírgenes, 27°26'N, 112°39'W, *D. Howe 3731* (SD); Mulegé, I.

Johnston 3681 (CAS, DS, UC); San Nicholas Bay, *I. Johnston 3725* (CAS); Loreto, *I. Johnston 3781* (CAS); Arroyo de Arce, 15 mi N of Loreto, *I. Johnston 3793* (CAS); Carmen Island, Puerto Balandra, *I. Johnston 3808* (CAS, UC); Carmen Island, Puerto Balandra, *I. Johnston 3830* (CAS); Arroyo Undo Ranch, Loreto, *M. Jones 27393* (POM); Bahía del Coyote, *D. Keil et al. 16637* (UCR); Sierra de Santa Marta, 27°30'N, 112°58'W, *J. León de la Luz 3238* (HCIB); Carmen Island, Balandra Bay, 26°00'N, 111°10'W, *R. Moran 3922* (DS, SD, UC); San Bruno, ca. 27°09'N, 112°11'W, *R. Moran 7473* (CAS, DS, SD, UC); W side of Conception Bay, SE of Santispaquis, ca. 26°44'N, 111°57'W, *R. Moran 9044* (DS, SD); Danzante Island, ca. 25°48'N, 111°15'W, *R. Moran 9237* (DS, SD); 4 mi SW of Canipole, 26°23'N, 111°43'W, *R. Moran 20043* (SD); Sierra de la Giganta, Arroyo de la Zorra, *C. Mullinex s.n.* (CAS); 10 mi N of Santa Rosalía, *F. Reed 6223* (POM); Juncalito Bay, 14 mi S of Loreto, *J. Reeder 7066* (SD); Agua Verde Bay, *P. Rempel 133* (RSA), *138* (RSA); island in Conception Bay, *P. Rempel 193* (RSA); Arroyo El Infierno, 4 mi NW of Gulf of California, near Santa Rosalía, ca. 27°23'N, 112°22'W, *A. Sanders 6340* (UCR); 2.3 mi ENE of Ejido Alfredo V. Bonfil, 30 mi NW of Santa Rosalía, ca. 27°22'N, 112°28'W, *A. Sanders 6395* (UCR); Bahía Concepción, SE corner of bay at base of peninsula, 26°35'N, 111°41'W, *A. Sanders 7499* (RSA, SD, UCR); Isla del Carmen (26°01'N, 111°11'W), lado W de la isla, Puerto Balandra, *M. Sousa P. 240* (CAS, RSA); Bahía Concepción, along Mexico 1, *D. Taylor 6303* (UC); ca. 3 mi N of El Coyote, just inland from Bahía de la Concepción, *J. Thomas 7968* (CAS, DS); ca. 1.5 mi SW of Los Martires on rd to San Ignacio, *J. Thomas 8318A* (CAS, DS); 27.7 mi S of Pozo Alemán, *I. Wiggins 7875* (DS); foot of Coyote Grade (Cuesta de Coyote), 20 mi S of Mulegé, *I. Wiggins 11411* (DS, RSA, UC); 9 mi N of San Ignacio, 27°20'N, 112°54'W, *I. Wiggins 16229* (DS); Marques Bay, Isla Carmen, 26°01' N, 111°11' W, *I. Wiggins 17509* (DS); Isla Danzante, near N end of island, 25°45'N, 111°15'W, *I. Wiggins 17565* (DS); Bahía de la Concepción, E end of Club Aereo landing strip, Mulegé, *I. Wiggins & D. Wiggins 17944* (DS); Bahía de la Concepción, near Punta San Ignacio, *I. Wiggins & D. Wiggins 18034* (DS); Santispaquis Cove, Bahía de la Concepción, *I. Wiggins & D. Wiggins 18243* (CAS,

DS); ca. 2 mi N of Santispaquis Cove, Bahía de la Concepción, *I. Wiggins & D. Wiggins 18282* (CAS, DS); N of Loreto, *W. Wisura 3737* (RSA); along La Purísima River at San Isidro, *D. Zippin 20* (SD).

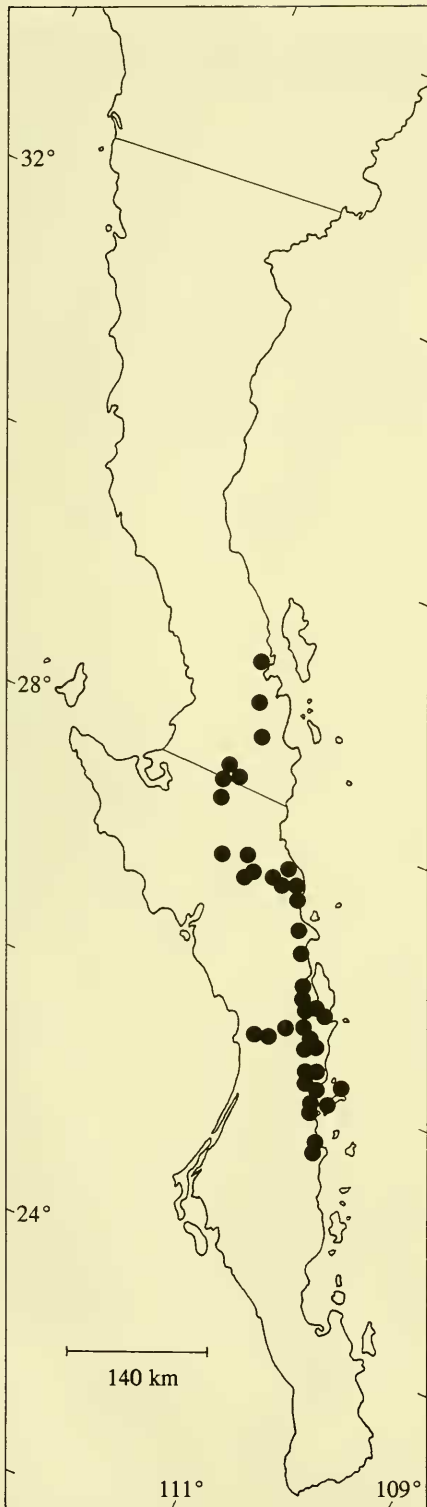
Plants of *Ruellia californica* subsp. *californica* have stipitate glandular trichomes varying from long (i.e., 1.5 mm) and dense (e.g., *Daniel 1891*) to short (i.e., 0.1–0.2 mm) and somewhat sparser (e.g., *Boyd & Ross 5944*); however, stipitate glands are always evident and more or less conspicuous. The subspecies sometimes becomes a dominant or codominant shrub in portions of its range. Pink-flowered individuals are known only from Isla Carmen. Occasional plants with pink corollas were noted to grow there among typical plants with “violet” corollas (fide *Johnston 3830*).

A specimen from the Cape Region [Cape San Lucas, 1 mi from beach, *T. Craig 757* (POM)] is referable to this subspecies on the basis of its shoots with dense stipitate glandular pubescence. In the same month of 1928, Craig also collected material of subspecies *peninsularis* at this same locality and material of subspecies *californica* in Sonora. Subspecies *californica* is not otherwise known from the Cape Region. It remains to be determined whether this collection represents a natural occurrence of subspecies *californica* in the Cape Region, a cultivated individual, or a mislabeled specimen. Until additional evidence is available concerning the presence of subspecies *californica* near Cabo San Lucas, this specimen is excluded from consideration.

1b. *Ruellia californica* subsp. *peninsularis* (Rose) T. F. Daniel, stat. nov. *Ruellia peninsularis* (Rose) I. M. Johnst., Proc. Calif. Acad. Sci., ser. 4, 12:1172. 1924. *Calophanes peninsularis* Rose, Contr. U. S. Natl. Herb. 1:75. 1890. TYPE. — MEXICO. Baja California Sur: mesas about La Paz, 20 Jan–5 Feb 1890, *E. Palmer 20* (holotype: US; isotypes: GH!, NY).

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FIGURE 32. Distribution of *Ruellia californica* subsp. *californica* in the peninsula of Baja California.



Young stems glabrous but usually \pm glutinous (i.e., sticky and shiny), youngest growth sometimes with scattered stellate eglandular trichomes to 0.2 mm long or with inconspicuous sessile patelliform glands (i.e., glandular punctate). Leaf blades ovate to broadly ovate (to cordate), surfaces lacking eglandular or stipitate glandular trichomes. Peduncles of inflorescence glabrous. Bracteoles (ovate to) linear to elliptic to oblanceolate to obovate, abaxial surface glabrous but glutinous. Calyx (4-) 6–12.3 mm long, tube (1.5-) 2.5–4.7 mm long, lobes (1.5-) 3.3–9 mm long, 1.1–3.2 times longer than tube, abaxially glabrous (or sparsely pubescent with antrorse eglandular trichomes to 0.1 mm long) and glutinous, margin pubescent with eglandular and glandular trichomes 0.05–0.1 mm long. Corolla 27–40 mm long, tube 19–27 mm long, narrow proximal portion 6–10 mm long. Longer pair of stamens 8–13.5 mm long, shorter pair of stamens 5.5–10 mm long. Style 15–20 mm long, stigma with 1 lobe 1.5–3 mm long, other lobe 0.3–0.5 mm long. ($n = 17$, Daniel et al. 1984). Fig. 31c.

PHENOLOGY. — Flowering and fruiting: October–May.

DISTRIBUTION AND HABITAT. — Endemic to Baja California Sur (Fig. 33); the subspecies is common in the Cape Region (both desert and nondesert portions) and extends northward to about latitude 26°13'N where it is found in the Sierra de la Giganta and the Sonoran Desert (Central Gulf Coast and Magdalena subdivisions); plants occur on slopes, along watercourses, and on sandy flats in desertscrub and thornscrub from near sea level to 750 m elevation.

LOCAL NAMES. — “Rama parda” (numerous herbarium labels); “rama prieta” (*León de la Luz* 2603, *Peters* 120); “viuda del monte” (*Peters* 1).

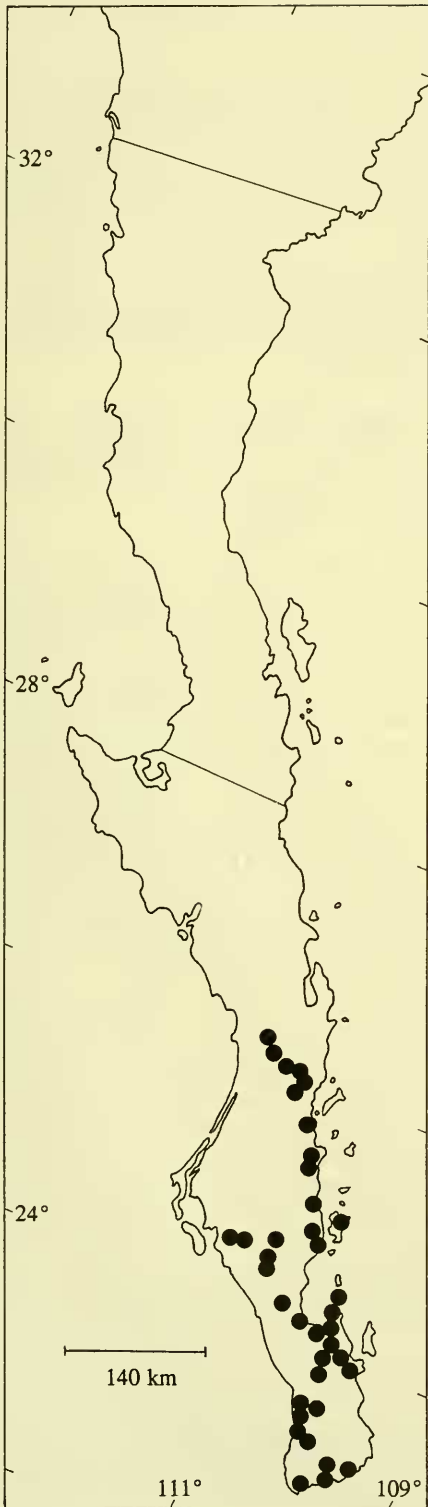
ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: San José del Cabo, *T. Brandegee* 441 (UC), s.n. (UC); 2.6 mi S of Todos Santos on hwy to Cabo San Lucas, *D. Breedlove* 43136 (CAS); Sierra de la Giganta, Llano de San Julio, E of Comondú, ca. 26°03'N, 111°45'W, *A. Carter* 4316 (CAS, UC); Sierra de la Giganta, NW of Portezuelo de la Cuesta de los Dolores (W from N end of Isla de San José), ca. 25°07'N, 110°57'–58'W, *A. Carter* 4784 (UC); Sierra de la Giganta, vicinity of Rancho Tasa-jera, ca. 3.5 km NE of San José de Agua Verde, ca.

25°30'N, 111°10'W, *A. Carter* 4828 (UC); Sierra de la Giganta, NW slopes of Mesa de Alta Gracia, SW of La Cumbre de Alta Gracia, ca. 25°41'N, 111°21'W, *A. Carter* 4888 (UC); Sierra de la Giganta, Aguaje de San Antonio, Arroyo el Coyote (SE of La Soledad and N of Cerro Mechudo), ca. 24°49' N, 110°46' W, *A. Carter* 5421 (CAS, UC); Sierra de la Giganta, KM 69, E of Villa Insurgentes on hwy to Loreto (2 km W of Estación Microondas Liguí), ca. 25°26'N, 111°12'W, *A. Carter* 5810 (CAS, UC); vicinity of Rancho Los Burros, E of Llanos de San Pedro, NE of Comondú, 26°05'N, 111°40'W, *A. Carter & R. Ferris* 3429 (DS, SD, UC); Sierra de la Giganta, Mesa San Alejo, SW of Rancho El Homo (NE of San Xavier), ca. 25°53'N, 111°33'W, *A. Carter & R. Ferris* 3766 (CAS, SD, UC); Sierra de la Giganta, vicinity of La Tinaja, Mesa de San Alejo (W of San Javier), ca. 25°51'N, 111°34'W, *A. Carter & H. Sharsmith* 4169 (UC); Sierra de la Giganta, between Tinaja del Cajón and summit of Mesa de San Alejo (W of San Javier), ca. 25°53'N, 111°33'W, *A. Carter & H. Sharsmith* 4193 (CAS, UC), 4193A (CAS, UC); Sierra de la Giganta, Mesa de San Alejo (N of Rancho el Horno), ca. 25°53'N, 111°33'W, *A. Carter & H. Sharsmith* 4202 (CAS, UC), 4202A (CAS, UC); Sierra de la Giganta, trail from San José de Agua Verde to Bahía Agua Verde, W of crest of ridge, ca. 25°30'N, 111°09'W, *A. Carter & H. Sharsmith* 4938 (UC); 8.3 km N of San José del Cabo, *A. Carter et al.* 2195 (DS, UC); San Lucas Bay, 1 mi from beach, *T. Craig* 625 (POM); along Hwy 286 between La Paz and San Juan de los Planes, near Paraje Los Chinos (8.3 km NW of La Huerta), ca. 24°06'N, 110°15'W, *T. Daniel & M. Butterwick* 6814 (CAS, MEXU, MICH, SBBG); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 9.7 km E of Hwy 19, ca. 23°16'N, 110°04'W, *T. Daniel & M. Butterwick* 6957 (CAS, HCIB); Hwy 1, 83.7 mi SE jct Hwy 22 in *Cd. Constitución*, *T. Daniel et al.* 2441 (ASU, MICH, CAS); along Hwy 19 just S of Microondas El Carrizal, ca. 5.6 km S of jct Hwy 1 S of San Pedro, ca. 23°50'N, 110°14'W, *T. Daniel et al.* 6844 (CAS); San José del Cabo, *E. Dawson* 1163 (RSA); Hwy 19, ca. 1 km ESE of Santa Inés, ca. 9 km ENE of Todos Santos, 23°31'N, 110°11'W, *J. Dice* 557 (RSA, SD); El Centenario, La Paz, 24°11'N, 110°20'W, *M. Domínguez* L. 388 (CAS); Isla Espiritu Santo, 1 km O de la Bahía, enfrente del Isrote del Gallo, 24°30'N, 110°22'W, *G. Flores* F. 402 (RSA);

San José del Cabo, *F. Gander* 9733 (CAS, SD); Sauce, Magdalena Plain, *H. Gentry* 4186 (DS, UC); SE La Paz, *C. Harbison s.n.* (CAS); Comondú, between San Miguel and San José, *C. Harbison & Higgins s.n.* (SD); ca. 5 km E of San José Comondú along rd to Loreto, ca. 26°03'N, 111°46'W, *D. Harder & W. Appleby* 1081 (RSA); 23.4 mi W of La Paz, along rd to Santo Domingo, *J. Hastings & R. Turner* 64-170 (DS, SD); 16 km N of La Paz, 2 km S of Pichilingue, *J. Henrickson* 2188 (RSA); 6.6 mi N of Todos Santos, ca. 23°31'N, 110°12'W, *D. Howe* 4438 (SD); Cape Region, Boca de Tinaja, *D. Johansen s.n.* (DS); La Paz, *I. Johnston* 3037 (CAS); San José del Cabo, *D. Johansen* 517 (DS); La Paz, *M. Jones* 22582 (POM); Todos Santos, *M. Jones* 24089 (CAS, DS, POM); San José del Cabo, *M. Jones* 24350 (POM); "El Comitán," 24°07'N, 110°12'W, *J. León de la Luz* 2122 (HCIB); "El Comitán," NW de La Paz, 24°13'N, 110°20'W, *J. León de la Luz* 2603 (HCIB); "El Comitán," 17 km NW de La Paz, 24°10'N, 110°26'W, *J. León de la Luz* 3432 (HCIB); Cape Region, San Pedro, ca. 23°23'N, 110°12'W, *R. Moran* 6996 (CAS, DS, SD); Arroyo de Aguada, NE side of San José Island, ca. 25°03'N, 110°39'W, *R. Moran* 9400 (CAS, RSA, SD); La Sabanilla, 24°49'N, 110°44'W, *R. Moran* 18871 (SD, UC); La Paz, 8 mi from Las Cruces Ranch, *R. Peters* 1 (UC); Los Planes, E side of Los Planes Valley, *R. Peters* 120 (UC); San José del Cabo, *C. Purpus* 401 (UC); 55 km NW de La Paz, sobre la carretera a Santo Domingo, *J. Rzedowski* 26565 (DS); 33 mi S of El Refugio, *F. Shreve* 7185 (DS); ca. 12 mi W of La Paz near El Centenario, *R. Spjut & C. Edson* 5310 (CAS); ca. 15–20 mi E of San José del Cabo, *R. Spjut & C. Edson* 5327 (CAS); Mpio. San Antonio, 4 km SE de San Pedro, carr. a Cabo San Lucas, 23°55'N, 110°15'W, *P. Tenorio L. & C. Romero de T.* 12821 (CAS); near KM 40 on hwy between La Paz and Santo Domingo, *J. Thomas* 8461 (CAS, DS); near KM 24 on hwy between La Paz and Santo Domingo, *J. Thomas* 8471 (CAS, DS); ca. 23 mi NW of La Paz, 24°10'N, 110°30'W, *G. Webster* 19563 (SD); 1 mi N of Flor de Malva Arroya, *J. Whitehead* 827 (DS); 9 mi W of La Paz, *I. Wiggins* 11500 (DS, RSA, UC); SE of La Paz, 18.5 mi SE of airport along rd to Los Planes, *I. Wiggins* 14410 (DS); 0.6 mi NW of Aripes, 10.3 mi W of La Paz, *I. Wiggins* 14613 (CAS, DS); 3.6 mi N of Punta del Cerro, ca. 24°40'N, 111°07'W, *I. Wiggins* 15465 (CAS, DS); near KM 123 NW of La Paz, ca. 24°28'N,

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FIGURE 33. Distribution of *Ruellia californica* subsp. *peninsularis*.



111°12'W, *I. Wiggins 15585* (CAS, DS); along La Purísima River at San Isidro, *D. Zippin 20* (SD).

Harbison & Higgins s.n. 18 Nov. 1956 from Comondú, *Hastings & Turner 64-170* from west of La Paz, and *Howe 4438* from the vicinity of Todos Santos have herbage that generally lacks stipitate glands, has relatively short (i.e., 26–34 mm long) corollas, and relatively short (i.e., 6.5–9 mm long) calyces suggestive of subsp. *peninsularis*. They differ from most other collections of this subspecies by having a few scattered stipitate glands on some leaves and internodes. These collections are treated as subsp. *peninsularis* based on the general absence of glandular pubescence and the relatively short floral organs.

The identity of *Johnston 3037* (CAS), a collection from the vicinity of La Paz, remains in doubt. It is a poorly preserved specimen that resembles subspecies *peninsularis* in the length of its floral organs (i.e., calyx 6–8 mm long, corolla 35–37 mm long) but resembles subspecies *californica* by having some herbage with scattered glandular trichomes and irregular patches of trichomes elsewhere. This collection is treated as aberrant and is not included herein.

Most specimens have typical dark purple (violet) corollas; however, *Carter & Sharsmith 4202* is noted to have white flowers with blue veins. They considered this form, which grew among purple-flowered individuals, to be albinic.

Flowers of *Daniel & Butterwick 6814* were visited by honey bees, a non-native hymenopteran. The form of flowers in this species is certainly suggestive of pollination by large bees. Freeman (1986) found that nectar sugar from flowers of an individual of *R. californica* var. *peninsularis* (as *R. peninsularis*) changed from sucrose-dominant to sucrose-rich over a 24 hour period.

This subspecies sometimes becomes a dominant or codominant shrub in portions of its range.

2. *Ruellia cordata* Brandegee, Zoe 5:173. 1903. TYPE. — MEXICO. Baja California Sur: Comondú, 26 Mar 1889, *T. Brandegee s.n.* (holotype: UC!; isotype: US).

Shrubs to 3 dm (or more?) tall. Young stems subterete to subquadrate, densely and evenly pubescent with erect (to flexuose) glandular and glandular trichomes 0.1–0.7 (–1.5) mm long

(glandular pubescent). Leaves petiolate, petioles to 6 mm long, blades (ovate to) broadly ovate to cordate to reniform, 4.5–20 mm long, 4–20 mm wide, 0.8–1.6 (–1.8) times longer than wide, (emarginate to) rounded to acute at apex, (acute to) truncate to cordate at base, surfaces glandular pubescent, margin entire. Inflorescence of axillary dichasia; dichasia alternate or opposite, 1-flowered, 1 per axil, pedunculate in leaf axils, peduncles 11–27 mm long, subterete, glandular pubescent. Bracteoles foliose, subpetiolate to petiolate, subcordate to broadly ovate to subcircular, 8–10 mm long, 7–10 mm wide, abaxial surface glandular pubescent. Flowers sessile to subsessile (i.e., borne on pedicels to 1 mm long). Calyx 13–17 mm long, tube 2–2.5 mm long, lobes (linear to) oblanceolate to spatulate (i.e., widest at or above middle), 11–14.5 mm long, subequal to equal in length, 4.4–5.8 times longer than tube, (0.8–) 1.7–4 mm wide, abaxially and marginally glandular pubescent. Corolla dark purple, 29–45 mm long, externally glandular pubescent (the trichomes sometimes sparse and mostly flexuose), tube 21–32 mm long, narrow proximal portion 8–12 mm long, abruptly expanded distally into throat, throat 14–21 mm long, longer than narrow proximal portion of tube, 7–8.5 mm in diameter near midpoint, limb 17–29 mm in diameter, lobes 6–14 mm long, 7.5–14 mm wide. Stamens included, longer pair 9–15 mm long, shorter pair 5–10 mm long, thecae 3–3.2 mm long. Style 19–25 mm long, pubescent with glandular and eglandular trichomes, stigma unequally 2-lobed, 1 lobe 2.5 mm long, other lobe 0.7 mm long. Capsule stipitate, 12 mm long, glabrous, stipe 3.5 mm long. Seeds apparently 4, surfaces covered with appressed hygroscopic trichomes. (Chromosome number unknown.)

PHENOLOGY. — Flowering: February–April; fruiting: April.

DISTRIBUTION AND HABITAT. — Endemic to central Baja California Sur (Fig. 34) where the species is known from the Sierra de la Giganta; plants occur on rocky slopes from 200–400 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: NW Sierra de la Giganta, 1.4 mi NE of San Isidro on rd to Rosarito, ca. 26°15'N, 112°00'W, *S. Boyd & T. Ross 5934* (CAS, RSA, UCR); 20 mi W of jet Hwy 1 on rd between La

Purísima and Rosarito near La Laguna, *D. Zippin 14* (SD).

Zippin 14 differs from the other collections of *R. cordata* by its calyx lobes which are more linear (i.e., widest at middle) than oblanceolate (i.e., widest distal to the middle). In other respects, this collection resembles others of *R. cordata*.

This species is most similar to *R. californica*, particularly *R. californica* subsp. *californica*, with which it shares the feature of conspicuously glandular herbage.

3. *Ruellia intermedia* Leonard, *J. Wash. Acad. Sci.* 17:512. 1927. TYPE. — MEXICO. Jalisco: Bolaños, 10–19 Sep 1897, *J. Rose 2915* (holotype: US!; isotype: NY).

Erect to ascending perennial herbs to 5 dm tall. Young stems quadrate to quadrate-sulcate, ± evenly pubescent with retrorse eglandular trichomes 0.05–0.4 mm long (and rarely with a sparse overstory of coarse flexuose eglandular trichomes 0.5 mm long as well). Leaves petiolate, petioles (naked portion) to 15 mm long, blades ovate to elliptic to obovate, 17–60 mm long, 11–40 mm wide, 1.1–1.9 times longer than wide, rounded to subacute at apex, acute and ± abruptly attenuate at base, surfaces pubescent with eglandular trichomes, margin entire to subsinuate to subcrenate. Inflorescence of ± expanded axillary dichasia; dichasia opposite or alternate, (1–) 3–many-flowered, 1 per axil, pedunculate in axils of leaves ± throughout plant or confined to distal leaves, peduncles 6–43 mm long, quadrate to quadrate-sulcate, pubescent like young stems. Bracteoles usually subfoliose, lance-ovate to ovate to elliptic to linear to obovate, 3.5–9.5 mm long, 0.9–5.5 mm wide, abaxial surface pubescent like leaves, secondary bracteoles (if present) linear to narrowly elliptic, 1.5–4 mm long, 0.8–1 mm wide. Flowers pedicellate, pedicels 3–9 mm long. Calyx 12.5–20 mm long, tube 1.5–3 mm long, lobes linear to subulate, 9–23 mm long, subequal in length, 5–11.5 times longer than tube, 0.7–1.6 mm wide, abaxially and marginally pubescent with erect to flexuose eglandular (extralimitally sometimes glandular as well) trichomes 0.1–0.3 mm long. Corolla bluish, 41–65 mm long, externally pubescent with flexuose to retrorse eglan-

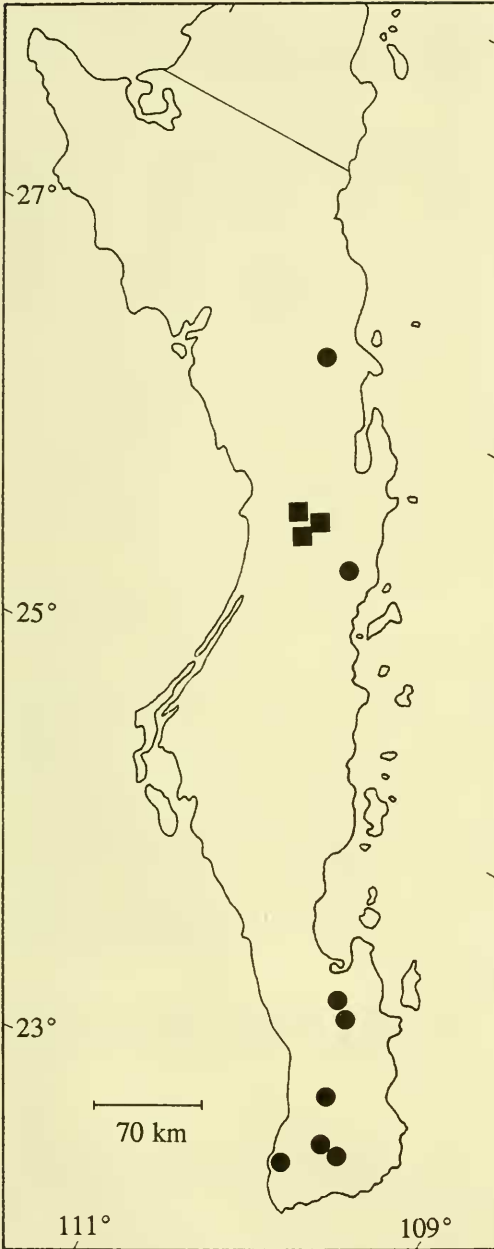


FIGURE 34. Distribution of *Ruellia cordata* (squares) and of *Tetramerium nervosum* (circles) in the peninsula of Baja California.

dular trichomes to 0.3 mm long, tube (25–) 30–52 mm long, narrow proximal portion (9–) 19–34 mm long, abruptly expanded distally into throat, throat 17–21 mm long, shorter than (or

extralimitally sometimes longer than) narrow proximal portion of tube, 8–12 mm in diameter near midpoint, limb 30–42 mm in diameter, lobes (11–) 14–18 mm long, 11–16 mm wide. Stamens included, longer pair 13–15 mm long, shorter pair 9–10 mm long, thecae 3 mm long. Style 22–41 mm long, glabrous, stigma 2 mm long, only 1 lobe evident. Capsule substipitate, 12–23 mm long, glabrous proximally, pubescent at apex with erect to antrorse eglandular (and sometimes glandular) trichomes 0.1–0.4 mm long, stipe 2–2.5 mm long, head narrowly ellipsoid. Seeds 12 (extralimitally to 20), 3.2–3.4 mm long, 2–3 mm wide, surfaces and margin covered with appressed hygroscopic trichomes. ($n = 17$, Grant 1955).

PHENOLOGY. — Flowering: August–October; fruiting: October.

DISTRIBUTION AND HABITAT. — Mexico (Baja California Sur, Chiapas, Chihuahua, Colima, Guerrero, Jalisco, México, Michoacán, Morelos, Nayarit, Sinaloa, Sonora); in our region the species is known only from nondesert portions of the Cape Region (Fig. 16); plants occur on rocky slopes and in watercourses in tropical deciduous forest and thornscrub from 450–600 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: La Parrita, Rancho La Burrera, 23°29'N, 110°03'W, *M. Domínguez L. 405* (HCIB); San Bartolo, *F. Gander 9677* (SD); Arroyo El Zacaón, 12 km NE de Todos Santos, cerca del Rancho Sta. Gertrudis, 23°38'N, 110°04'W, *J. León de la Luz 3022* (HCIB, MEXU, SD); 5 mi S of San Antonio, *C. Mullinex s.n.* (CAS).

The above description has been augmented with data from other Mexican collections. Exceptions are noted where extralimital collections differ from those in our region. This is the first report of the species from the peninsula of Baja California.

Ruellia intermedia is superficially similar to *R. nudiflora*, with which it is sometimes confused (see discussion under *R. nudiflora*). In addition to the distinctions noted in the key, plants of *R. intermedia* tend to have smaller leaf blades and shorter petioles than those of *R. nudiflora* from northwestern Mexico. Also, pubescence on the capsules of *R. intermedia* is restricted to the apex and sometimes lacks glands whereas that of *R.*

nudiflora is distributed over the entire surface of the capsule and always includes some glands (at least near apex).

4. *Ruellia inundata* Kunth, Nov. gen. sp. 2:239. 1817. *Aphragmia inundata* (Kunth) Bremek., Verh. Kon. Ned. Akad. Wetensch. Afd. Natuurk., Tweede Sect. 45:10. 1948. TYPE. — COLOMBIA. "In ripa fluminis Magdalenae prope Mompox et Badillas," May, (fide protologue), A. von Humboldt & A. Bonpland mss. n. 3711 (holotype: P-Bonpl!).

Ruellia albicaulis Bertero in Spreng., Syst. veg. 2:822. 1825. TYPE. — COLOMBIA. "Ad fl. Magdalen.," no specimens have been seen.

Aphragmia haenkei Nees in Lindl., Intr. nat. syst. bot., ed. 2, 444. 1836. *Dipteracanthus haenkei* (Nees) Nees in A. DC., Prodr. 11:141. 1847. TYPE. — MEXICO. Guerrero: Acapulco, 1791, T. Haenke s.n. (no type designated nor place of deposition noted; probable type material: K, PR!, PRC!).

Ruellia galeottii Leonard, Kew Bull. 1938:59. 1938. TYPE. — MEXICO. Oaxaca: Sola, Oct 1844, H. Galeotti 510J (holotype: US!; isotype: NY).

Erect to ascending perennial herbs or shrubs to 0.5 (–1) m tall, herbage mephitic. Young stems subterete to quadrate, at first evenly pubescent with erect to flexuose eglandular and glandular trichomes 0.2–2 mm long, pubescence soon consisting of flexuose-retrorse eglandular trichomes only. Leaves petiolate, petioles to 85 mm long, blades ovate to elliptic, 33–190 mm long, 13–105 mm wide, 1.5–2.5 times longer than wide, acuminate at apex, acute to attenuate at base, surfaces pubescent with glandular (absent on mature leaves) and eglandular trichomes, margin entire to crenate. Inflorescence of sessile to pedunculate expanded dichasia (or inflorescence seemingly derived from a compound dichasium where the central flower is displaced to a lateral position and one dichasial branch appears central or terminal) to 40 mm long from leaf axils, collectively sometimes forming a terminal leafy panicle; dichasia alternate or opposite, (1–) 3–many-flowered, 1 (–3) per axil, peduncles (if present) 1–8 (–30) mm long, terete to subquadrate, pubescent with erect to flexuose glandular and eglandular trichomes 0.1–1.5 (–2) mm long (glandular pubescent), secondary

peduncles to 22 mm long, glandular pubescent. Bracteoles and secondary bracteoles sessile to petiolate, lanceolate to lance-ovate to narrowly elliptic to oblanceolate, 4–14 mm long, 0.8–2.8 (–4) mm wide, abaxial surface glandular pubescent. Flowers sessile to subsessile (i.e., borne on pedicels to 0.5 mm long). Calyx 9–17 mm long, tube 1–2 mm long, lobes linear to oblanceolate, (5–) 7–15 mm long, unequal in length (longest lobe 1.2–1.7 times longer than shortest lobe), 6.5–24 times longer than tube, 0.2–2 mm wide, abaxially and marginally glandular pubescent. Corolla blue-purple (extralimitally sometimes pink), 20–35 mm long, externally glandular pubescent, tube 14.5–27 mm long, narrow proximal portion 8–16 mm long, gradually to ± abruptly expanded into throat, throat 6.5–17 mm long, longer or shorter than narrow proximal portion of tube, 3.5–6 mm in diameter near midpoint, limb 10–13.5 mm in diameter, lobes 4–7 mm long, 4–7.5 mm wide. Stamens included or slightly emergent, longer pair 6–12 mm long, shorter pair 4–10.5 mm long, thecae 1.7–2.4 mm long. Style 13–22 mm long, pubescent throughout with eglandular trichomes, stigma unequally 2-lobed, 1 lobe 0.2–0.5 mm long (or sometimes not evident), other lobe 0.9–1.8 mm long. Capsule stipitate, often blotched with red, 7.5–10 mm long, glabrous, stipe 2.2–3.3 mm long, head broadly ellipsoid to subcircular to obovoid. Seeds 4, 2.7–3.5 mm long, 2–3 mm wide, surfaces and margin pubescent with appressed hygroscopic trichomes. ($n = 17$, Daniel and Chuang 1993).

PHENOLOGY. — Flowering and fruiting: May, December (elsewhere flowering and fruiting: October–March).

DISTRIBUTION AND HABITAT. — Mexico (Baja California Sur, Campeche, Chiapas, Colima, Guerrero, Jalisco, México, Michoacán, Morelos, Oaxaca, Puebla, Quintana Roo, Sinaloa, Sonora, Veracruz, Yucatán), Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, and Brazil; in our region the species is known only from nondesert portions of the Cape Region (Fig. 21); plants occur on rocky slopes and in sandy watercourses in thornscrub from near sea level to 310 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: along rd from Hwy 1 across

Cape Region mts to Hwy 19, ca. 4.5 km W of San Pedro de la Soledad, ca. 23°15'N, 110°01'W, *T. Daniel* & *M. Butterwick* 6952 (CAS, HCIB, MEXU); vicinity of Punta Lobo, *F. Hrusa* 8421 (DAV).

Ruellia inundata is a widely distributed and sometimes weedy species that occurs in many habitats throughout its range. This is the first report of the species from the peninsula of Baja California where it appears to be rare. In other portions of its range, *R. inundata* sometimes has pink corollas. The above description has been augmented with data from other Mexican collections. Daniel (1995) discussed the use of this name for these plants relative to the type. *Hrusa* 8421 was collected in a wash along a beach ("apparently washed downstream from adjacent mountains") and consists entirely of greatly expanded dichasia (i.e., comprising 20 or more flowers with elongate secondary peduncles). *Daniel* & *Butterwick* 6952 comprises plants with considerably less floriferous dichasia.

Ruellia inundata is often confused with *R. paniculata* L., a similar species that occurs in similar habitats, that could also occur in the tropical deciduous forests of the Cape Region. *Ruellia paniculata* differs from *R. inundata* by its longer (11–16 mm) capsule with a narrowly ellipsoid head, its seeds which are more numerous (8–12 per capsule) and which have the trichomes restricted to the periphery, longer (2.5–3.5 mm) thecae, and subulate to linear-subulate calyx lobes which are subequal.

5. *Ruellia leucantha* Brandegee, Zoe 5:109. 1901. TYPE. — MEXICO. Baja California Sur: Todos Santos, 21 Jan 1890, *T. Brandegee s.n.* (lectotype, designated here: UC!).

Shrubs to 1.5 m tall, herbage often mephitic. Young stems subquadrate to quadrate, evenly and densely pubescent with erect to flexuose eglandular trichomes 0.3–1.5 mm long and glandular punctate as well, the youngest growth sometimes floccose and including stellate trichomes. Leaves sessile to petiolate, petioles to 16 mm long, blades ovate to elliptic to subcircular, 11–110 mm long, 6–62 mm wide, 1.2–2.6 times longer than wide, acute to subacuminate at apex, acute to subattenuate at base, surfaces pubescent with eglandular trichomes (youngest growth sometimes floccose and in-

cluding stellate trichomes) and glandular punctate, margin entire to subsinuate. Inflorescence of axillary dichasia; dichasia alternate or opposite, 1-flowered, 1 per axil, sessile to subsessile (i.e., peduncles to 1 mm long) in axils of distal leaves. Bracteoles petiolate, linear to elliptic to oblanceolate, 7.5–37 mm long, 0.9–7 mm wide, abaxial surface pubescent with \pm flexuose eglandular (sometimes stellate) trichomes 0.1–0.5 mm long and glandular punctate, margin ciliate with flexuose eglandular trichomes to 1.5 mm long. Flowers sessile to subsessile (i.e., pedicels to 1 mm long). Calyx 10.3–17 mm long, tube 1.5–2.5 mm long, lobes subulate, 8–15 mm long, equal to subequal in length, 3.5–7.3 times longer than tube, 1–1.5 mm wide, abaxially and marginally pubescent with flexuose eglandular trichomes 0.3–1.1 mm long and glandular punctate. Corolla white, (45–) 55–75 (–90) mm long, externally pubescent with flexuose eglandular trichomes 0.2–0.4 mm long and glandular punctate, tube (36–) 40–54 (–65) mm long, narrow proximal portion (20–) 22–35 (–40) mm long, abruptly expanded distally into throat, throat 16–25 mm long, nearly equaling or shorter than narrow proximal portion of tube, 8–12.5 mm in diameter near midpoint, limb 28–50 mm in diameter, lobes 9–28 mm long, 7.5–21 mm wide. Stamens included, longer pair 13–18 (–25) mm long, shorter pair 11–15 (–23) mm long, thecae 4.5–5 mm long. Style 42–45 (–65) mm long, pubescent with eglandular trichomes, stigma unequally 2-lobed, 1 lobe 2–2.6 mm long, other lobe 0.2–0.3 mm long. Capsule stipitate, 12–15 mm long, pubescent with erect to flexuose eglandular trichomes 0.2–0.3 mm long and glandular punctate, stipe 3–3.5 mm long, head subellipsoid to obovoid. Seeds (4–) 6–8, 4–5 mm long, 3.7–5 mm wide, surfaces and margin covered with appressed hygroscopic trichomes. ($n = 17$, from *Daniel* & *Butterwick* 6913cv).

PHENOLOGY. — Flowering: August–January, April–May; fruiting: September–January, May.

DISTRIBUTION AND HABITAT. — Northwestern Mexico (Baja California Sur, Sinaloa); in our region the species is restricted to the Cape Region (Fig. 35), primarily outside of the desert (only one or two collections appear to have been made in regions of desertscrub); plants occur in and along watercourses and on rocky slopes mostly in thornscrub and tropical deciduous forest from near sea level to 900 m elevation.

LOCAL NAMES. — “Conpinturia” (Carter *et al.* 2697); “petunia del monte” (Peters 230).

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: near La Palmilla, W of San José del Cabo, *K. Bechtel s.n.* (DS); San José del Cabo, *T. Brandegeee 442* (UC), *s.n.* (UC); Sierra de la Laguna, *T. Brandegeee s.n.* (UC); Cape Region, San Felipe, *T. Brandegeee s.n.* (UC); San Pedro, *T. Brandegeee s.n.* (GH); between Rancho Palmilla and headwaters of arroyo NW of El Encinal, ca. 23°10'N, 109°58'W, *A. Carter & F. Chisaki 3595* (DS, UC); Rancho Poza Larga, Arroyo de San Francisquito, E side of Sierra de la Victoria, 23°29–31'N, 109°47–55'W, *A. Carter & R. Ferris 3384* (DS, SD, UC); Cabo San Lucas, *A. Carter & D. Noack 4441a* (UC); ca. 1/3 of way from Rancho San Bernardo to mouth of Arroyo de San Bernardo, E side of Sierra de la Victoria, 23°24'N, 109°55'W, *A. Carter et al. 2697* (UC); Cape Region, 24 km NW of Cabo San Lucas, ca. 23°02'N, 110°01'W, *A. Carter et al. 5896* (CAS, UC); 47.5 mi S of Todos Santos on rd to Cabo San Lucas, *K. Chambers 871* (DS); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 9–10 km W of Hwy 1, ca. 23°13'N, 109°50'W, *T. Daniel & M. Butterwick 6913* (CAS, MEXU, MICH, SBBG); along rd from Hwy 1 across Cape Region mts to Hwy 19, 16–20 km W of Hwy 1, ca. 23°14'N, 109°55'W, *T. Daniel & M. Butterwick 6940* (CAS, HCIB); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, *T. Daniel et al. 6863* (CAS); Punta Frailes, *E. Dawson 1135* (RSA); Cape San Lucas, *E. Dawson 6430* (RSA); cima de la cuesta de San Antonio, 23°45'N, 110°02'W, *R. Domínguez C. 613* (HCIB); Sierra de La Laguna, Rancho San Antonio de La Sierra, 11.6 mi SE of KP 147.6 on Hwy 1, *J. Donahue 97.169* (RSA); San José del Cabo, *F. Gander 9729* (CAS, SD); Sierra de la Laguna, Las Animas, ranch at river-fork near base of El Picacho Peak, *B. Hammerly 266* (CAS, DS); half way between Cape San Lucas and Todos Santos, *C. Harbison s.n.* (CAS, SD); San Pedro, 17 mi S of La Paz, 23°55'N, 110°16'W, *C. Harbison s.n.* (SD); 5 mi W of San Bartolo, *J. Hastings & R. Turner 64-250* (DS, SD); 15 mi N of Cabo San Lucas, *J. Hastings & R. Turner 64-350* (DS, SD); 4 mi W of San Bartolo, 23°45'N, 109°52'W, *D. Howe 4397* (SD); Todos Santos, *M. Jones 24428* (POM); W side of the Lagunas, *M. Jones 27434* (POM); Triunfo, *M. Jones 27435* (DS, POM, UC); Sol de Mayo, NW de Santiago, 23°28'N, 109°50'W, *J. León de la Luz 2770* (CAS, HCIB); Mpio. Los Cabos (Las Bahías), camino a Matancitas, 23°08'N, 110°04'W, *J. León de la Luz 3027* (HCIB); mesa “San Martín,” Rancho La Burrera, 16 km NE de Todos Santos, 23°28'N, 110°07'W, *J. León de la Luz*

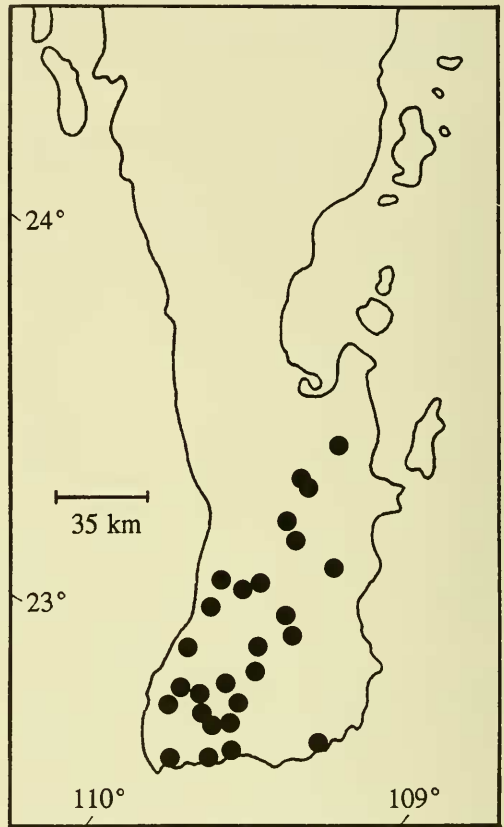


FIGURE 35. Distribution of *Ruellia leucantha*.

4758 (HCIB); Cape Region, Arroyo San Bartolo, 2.5 km above San Bartolo, 23°43'N, 109°53'W, *R. Moran 6952* (SD); Cape Region, San Pedro, ca. 23°23'N, 110°12'W, *R. Moran 7000* (DS); Cape Region, S of Cabo San Lucas, *R. Moran 7051* (DS); San Pedrito, S of Todos Santos, 23°24'N, 110°13'W, *R. Moran 21340* (SD); Santiago, above Arroyo San Ignacio, *R. Peters 230* (UC); Cape Region, Arroyo San Lázaro, from its mouth (ca. 10 mi NW of San José del Cabo) to ca. 3 mi upstream, *J. Thomas 7775a* (DS); between Triunfo and San Bartolo, *I. Wiggins 5619* (CAS, DS, POM, UC); 13.5 mi E of La Paz airport along rd to Los Planes, ca. 24°02'N, 110°07'W, *I. Wiggins 15307-A* (DS); higher slopes of Calaveras, *A. Zwinger 477* (RSA).

No collections or specific localities were cited in Brandegeee's (1901) protologue. He stated that the species was, “common along the slopes of the Cape Region Mountains” and that “flowers can be found at any time of the year.” Four collec-

tions from the Cape Region that were collected prior to 1901 are present in the Brandegee herbarium at UC: *Brandegee 442*, *Brandegee s.n.* (21 Jan 1890, Todos Santos), *Brandegee s.n.* (9 Sep 1893), and *Brandegee s.n.* (21 Jan 1890, Sierra de la Laguna). Brandegee labeled the former three of these specimens with his name, *Ruellia leucantha*; the latter specimen was labeled by him as simply "*Ruellia*." At least the three specimens that he labeled are syntypes of *R. leucantha*. One of these specimens (*Brandegee s.n.* 21 Jan 1890, Todos Santos) has been annotated as the type in handwriting other than that of Brandegee, but such designation of a lectotype has apparently never been published. This specimen is herewith so designated. It is a flowering and fruiting specimen that Brandegee annotated with his name and that agrees well with the protologue.

Ruellia leucantha is unusual among species of the genus occurring in northwestern Mexico by its white corollas. Although white corollas are commonly encountered among species of *Ruellia* section *Chiropterophila* Ramamoorthy from central and southern Mexico, these possess a gibbous throat and tend to open at night. The southern Mexican species *Ruellia pringlei* Fernald has white corollas that are similar in form to those of *R. leucantha* but that lack the punctate glands. It remains to be determined whether *R. pringlei* is closely related to *R. leucantha* or merely has similar corollas in response to a similar pollinator.

A mainland variety of this species was described by Gentry (1948) as *R. leucantha* var. *postinsularis* Gentry. Daniel (1996) elevated this taxon to subspecific rank. Pollen of both subspecies is shown in Fig. 30. The two subspecies can be distinguished by the following couplet:

Cauline trichomes erect to flexuose, 0.3–1.5 mm long; capsules 12–15 mm long; Baja California Sur subsp. *leucantha*.

Cauline trichomes erect to retrorse, 0.05–0.2 mm long; capsules 9–12 mm long; Sinaloa subsp. *postinsularis*.

Our subspecies is endemic to the Cape Region of Baja California Sur and becomes a dominant shrub in some parts of its range.

6. *Ruellia nudiflora* (Engelm. & A. Gray) Urb., *Symb. antill.* 7:382. 1912. *Dipteracanthus nudiflorus* Engelm. & A. Gray, *Boston J. Nat. Hist.* 5:229. 1845. TYPE. — UNITED STATES. Texas: Sim's Bayou near Houston, May–Jul 1843, *F. Lindheimer 157* (syntypes: GH!, UC!; isosyntype: K!); without locality, 1835, *T. Drummond coll. 2, no. 221* (syntype: GH!; isosyntype: K!), *coll. 3, no. 257* (syntype: GH!; isosyntype: K!). Leonard (J. Wash. Acad. Sci. 27:514. 1927) indicated that Lindheimer's collection from Sim's Bayou was the type. Because he did not cite a specimen, his choice would not appear to constitute a lectotypification.

Ruellia tuberosa L. var. *occidentalis* A. Gray, *Syn. fl. N. Amer.* 2(1):325. 1878. *Ruellia nudiflora* var. *occidentalis* (A. Gray) Leonard, J. Wash. Acad. Sci. 17:516. 1927. *Ruellia occidentalis* (A. Gray) Tharp & F. A. Barkley, *Amer. Midl. Naturalist* 42:25. 1949. TYPE. — Collections of Berlandier, Wright, Rothrock, and Coulter from the southwestern United States were cited by Gray. Leonard (J. Wash. Acad. Sci. 17:516. 1927) indicated that the type was collected in Texas by Berlandier. Because he did not cite a specimen, his choice would not appear to constitute a lectotypification.

Ruellia nudiflora var. *glabrata* Leonard, J. Wash. Acad. Sci. 17:518. 1927. *Ruellia glabrata* (Leonard) Tharp & F. A. Barkley, *Amer. Midl. Naturalist* 42:13. 1949. TYPE. — MEXICO. Sonora: Ciénega, Aug 1874, *J. Rothrock 560* (holotype: US; isotypes: GH!, NY).

Ruellia gooddingiana A. Nelson, *Amer. J. Bot.* 18:437. 1931. TYPE. — MEXICO. Sonora: La Ciénega, 18 Jul 1911, *L. Goodding 959* (holotype: RM!).

See Daniel (1995) for a complete listing of synonyms for this species.

Erect to ascending perennial herbs to 4.5 dm tall. Young stems quadrate to quadrate-sulcate, pubescent with an understory (sometimes sparse or absent) of retrorse eglandular trichomes 0.1–0.4 mm long and an overstory of flexuose eglandular trichomes 0.5–1 mm long. Leaves petiolate, petioles to 64 mm long, blades elliptic to ovate to broadly ovate, 70–200 mm long, 50–87 mm wide, 1.3–3.2 times longer than wide, rounded to subacute at apex, constricted-attenuate at base, surfaces pubescent with eglandular trichomes or becoming glabrate, margin undu-

late-crenate to sinuate. Inflorescence of pedunculate ascending or laterally spreading expanded dichasia from axils of proximal leaves and sessile to pedunculate \pm congested to \pm expanded dichasia from axils of distal, usually reduced, leaves and bracts, the latter dichasia collectively forming a terminal leafy paniculiform thyrses, thyrses rachis pubescent with erect to flexuose glandular and eglandular trichomes 0.05–0.5 (–1.5) mm long (glandular pubescent); dichasia alternate or opposite, 3–many-flowered, 1 (–2) per axil, peduncles of proximal dichasia up to 85 mm long, subquadrate to quadrate, pubescent like stems (or sometimes glandular pubescent), peduncles of distal dichasia 1–45 mm long, glandular pubescent. Bracts sessile to petiolate, obovate to elliptic to narrowly elliptic to linear to subulate, 3–20 mm long, 0.7–8 mm wide, glandular pubescent, proximal (larger and more leaflike) bracts sometimes eglandular. Bracteoles sessile, lanceolate to lance-ovate to elliptic to oblanceolate, 2–10 mm, 0.5–5 mm wide, glandular pubescent (or those of proximal dichasia sometimes eglandular), secondary bracteoles similar to bracteoles except smaller. Flowers pedicellate, pedicels 1–18 mm long, glandular pubescent. Calyx 7.5–21 mm long, tube 1–3 mm long, lobes lance-subulate to subulate, 6.5–18 mm long, subequal to unequal in length, 4.3–9 times longer than tube, 0.4–1 mm wide, abaxially and marginally glandular pubescent. Corolla blue-purple, (25–) 31–60 mm long, externally glandular pubescent, tube 21–47 mm long, narrow proximal portion 8–27 mm long, \pm abruptly expanded into throat, throat (9–) 11–25 mm long, longer than or \pm equal to narrow proximal portion of tube, 4–12 mm in diameter near midpoint, limb 18–31 mm in diameter, lobes 7–17 mm long, 7–18 mm wide. Stamens included, longer pair 8–19 mm long, shorter pair 6–16 mm long, thecae 2.8–4 mm long. Style 15–47 mm long, pubescent with eglandular trichomes and sometimes glandular near base as well, stigma unequally 2-lobed, 1 lobe 1–2 mm long, other lobe 0.1–0.7 mm long. Capsule 11–21 mm long, externally glandular pubescent (glandular trichomes becoming retrorse toward base of capsule and glandular trichomes sometimes sparse or restricted to apex), stipe 2–3.5 mm long, head linear-ellipsoid to obovoid. Seeds 8–12, 2.2–3.5 mm long, 2–3 mm wide, surfaces

and margin covered with appressed hygroscopic trichomes. ($n = 17$, Daniel et al. 1990).

PHENOLOGY. — Fruiting: November–January. Elsewhere flowering and fruiting: February–October.

DISTRIBUTION AND HABITAT. — United States (Arizona, Louisiana, Texas), Mexico (Baja California Sur, Campeche, Chiapas, Chihuahua, Coahuila, Colima, Durango, Morelos, Nuevo León, Oaxaca, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz, Yucatán), Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and West Indies; in our region the species is known only by two collections from the Sonoran Desert (Central Gulf Coast and Magdalena subdivisions) of Baja California Sur (Fig. 36); plants occur on flats and along watercourses in desertscrub from 100–130 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Pradera, Ejido de Los Naranjos, 26°20'N, 111°53'W, *M. Domínguez L. 176* (HCIB); 4–5 mi SW of Rancho El Obispo, ca. 24°39'N, 111°10'W, *I. Wiggins 15576* (CAS, DS).

This species is reported from the peninsula of Baja California on the basis of two fruiting collections. Wiggins had identified his collection as *Ruellia nudiflora* var. *glabrata* but did not include the species in his *Flora of Baja California* (1980). The above description has been augmented with data from other Mexican collections. The dichasia which are usually evident in the axils of proximal leaves (and which presumably bear cleistogamous flowers) are not evident on *Wiggins 15576* but are present on *Domínguez L. 176*.

Ruellia nudiflora is an extremely variable and widely distributed species. This species along with *R. tuberosa* L., *R. intermedia*, *R. puberula* (Leonard) Tharp & F. A. Barkley, and several others that are sometimes recognized, comprise a complex that has not been fully resolved taxonomically. Additional notes on this species were provided by Daniel (1984, 1995).

TETRAMERIUM

Tetramerium Nees in Benth., Bot. voy. *Sulphur*, 147. 1846, nom. cons., non *Tetramerium* C.F. Gaertn. (1806). TYPE. — *Tetramerium*

polystachyum Nees (= *Tetramerium nervosum* Nees).

Averia Leonard, J. Wash. Acad. Sci. 30:501. 1940.

TYPE. — *Averia longipes* (Standl.) Leonard (\equiv *Drejerella longipes* Standl.; = *Tetramerium nemorum* Brandegee).

Erect, ascending, or decumbent perennial herbs or shrubs with cystoliths. Older stems with epidermis exfoliating. Leaves opposite (elsewhere, rarely ternate), subsessile to petiolate (the distal leaves rarely sessile), margin entire to crenate, petioles detaching a short distance from their base leaving petiolar stubs at nodes. Inflorescence of terminal conspicuously and usually densely bracteate 4-sided unbranched dichasiate spikes; dichasia opposite, 1–3-flowered, sessile, subtended by a bract. Bracts opposite, green, margin entire to dentate. Bracteoles smaller than bracts. Flowers homostylous, subtended by 2 homomorphic bracteoles, sessile. Calyx deeply 4- or 5-lobed, lobes homomorphic or, if 5, one usually reduced in size. Corolla white, cream, yellow, blue, or red, often with maroon and purplish markings on upper lip, externally glabrous (in ours), tube subcylindric or gradually expanded distally, throat indistinct or distinct only near mouth, limb pseudopapilionaceous, upper lip entire to shallowly 2-lobed, lower lip 3-lobed, lower-central lobe (in ours) conduplicate and enclosing stamens and often style during anthesis, corolla lobes imbricate in bud. Stamens 2, inserted near base of lower-central lobe of limb, exserted from mouth of corolla, anthers 2-the-cous, thecae equal to subequal in size, parallel to subsagittate, equally inserted, lacking basal appendages, dehiscing toward upper lip (i.e., flower stenotribal); pollen (Fig. 37) prolate, 3-colporate, 6-pseudocolpate, pseudocolpi 2 per mesocolpium, exine reticulate; staminodes 0. Style exserted from mouth of corolla, stigma 2-lobed, lobes triangular, equal. Capsule stipitate, head ellipsoid to obovoid, retinacula present, septae with attached retinacula separating from inner wall of mature capsule. Seeds 4 (or fewer by abortion), homomorphic, plano-convex (in ours, elsewhere also concavo-convex), lacking trichomes. ($x = 18$).

A genus of 28 species occurring from the southwestern United States southward throughout most of Mexico, Central America, and north-

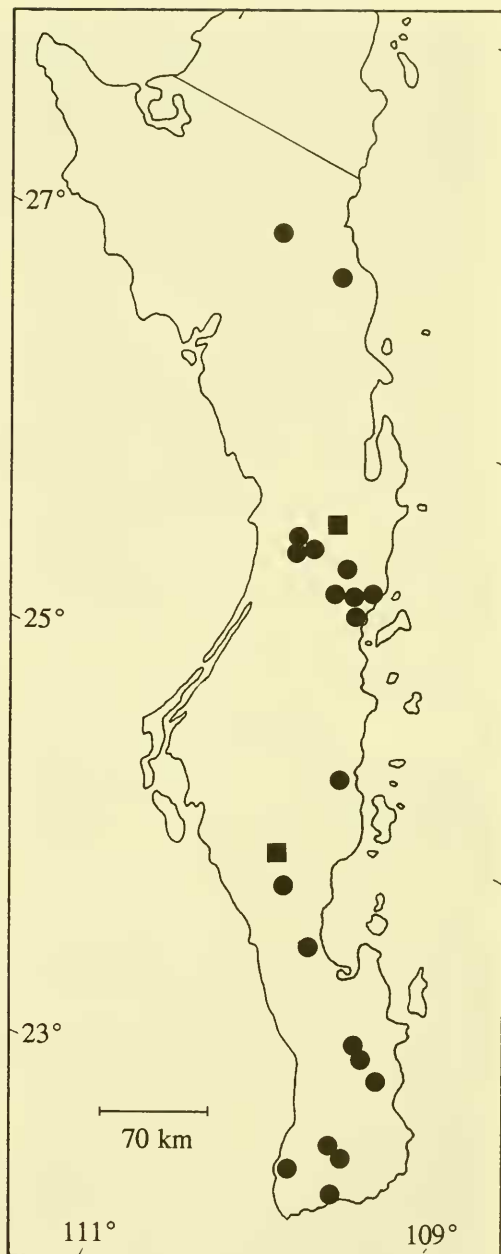


FIGURE 36. Distribution of *Ruellia nudiflora* (squares) and *Tetramerium fruticosum* (circles) in the peninsula of Baja California.

western South America to southeastern Bolivia. With 21 species, Mexico is the center of diversity of *Tetramerium*. A single species is known from the United States. Species occur primarily in regions of dry forest at relatively low elevations.

REFERENCES. — HAPP, G. B. 1937. Monograph of *Tetramerium* and *Henrya*. Ann. Missouri Bot. Gard. 24:501–583; DANIEL, T. F. 1986. Systematics of *Tetramerium* (Acanthaceae). Syst. Bot. Monogr. 12:1–134.

Key to Species of *Tetramerium*

1. Calyx 5-lobed; bracts with apical portion straight and erect, margin ciliate with trichomes up to 0.7 mm long; bracteoles linear to linear-lanceolate to linear-oblongate, 5–10 mm long; capsule glabrous *T. fruticosum*
1. Calyx 4-lobed; bracts with apical portion twisted and spreading, margin ciliate with at least some (usually most) trichomes longer than 0.7 mm; bracteoles subulate to lance-subulate, 2–5 mm long; capsule pubescent *T. nervosum*

1. *Tetramerium fruticosum* Brandegee, Zoe 5:171. 1903. TYPE. — MEXICO. Baja California Sur: San José del Cabo, Jan–Mar 1901, C. Purpus 489 (holotype: UC!; isotypes: CAS!, GH!, MO!, NY!, US!).

Ascending to erect perennial herbs to 5 dm tall. Young stems subquadrate to terete, pubescent with an overstory (sometimes sparse or nearly absent) of flexuose to retrorse eglandular trichomes (0.05–) 0.1–0.5 (–0.8) mm long and often with an understory of inconspicuous glandular trichomes 0.05 mm (or less) long, trichomes concentrated in 2 lines, older stems becoming glabrate as epidermis exfoliates. Leaves petiolate; petioles to 20 (–35) mm long; blades ovate to broadly ovate, 16–62 mm long, 5–42 mm wide, 1.4–3.8 times longer than wide, acute to acuminate to subfalcate at apex, acute to truncate to subcordate at base, surfaces and margin pubescent (often sparsely so) like young stems or the trichomes mostly antrorse and eglandular, margin entire to subcrenate. Inflorescence of ± densely bracteate spikes to 60 mm long, 10–20 mm wide near midspike, rachis not or only partly visible, pubescent with an understory of inconspicuous glandular trichomes 0.05

mm long and usually with an overstory of longer scattered flexuose eglandular trichomes as well. Bracts erect, ovate to elliptic, 7–13 (–25) mm long, (4–) 5–9 (–15) mm wide, proximalmost bracts often petiolate and longer than the more distal sessile bracts, acute to rounded to truncate and mucronate at apex, mucro 0.2–0.7 mm long, apical portion of bract straight and erect, major veins 3–5 (sometimes somewhat obscure), palmate to subpalmate, abaxial surface pubescent with cauline type trichomes, margin ciliate with antrorse or cauline type trichomes 0.05–0.7 mm long. Bractlets linear to linear-lanceolate to linear-oblongate, 5–10 mm long, 0.5–1.4 mm wide, abaxial surface pubescent like bracts. Calyx 5-lobed, 3–5.5 mm long, the tube 0.5–1 mm long, lobes subulate, 2.5–5 mm long, abaxially pubescent with an understory of glandular trichomes 0.05–0.1 mm long and an overstory of flexuose eglandular trichomes 0.2–0.5 mm long. Corolla cream with a maroon and purplish chevron (rarely absent) on the upper lip, 10–14 (–17.5) mm long, tube 4.5–6 (–7) mm long, upper lip obovate, 5.2–7.5 (–9) mm long, 3–4.5 mm wide, entire or emarginate at apex, lower lip 5.5–8.5 (–10.5) mm long, lateral lobes 5–7.5 (–9.5) mm long, 2–4.2 (–4.6) mm wide, lower-central lobe 4.2–6.3 (–7) mm long, 2.3–4 mm wide. Stamens 5.5–6.8 mm long, thecae 1–1.5 mm long. Style 6–13 mm long. Capsule 5–6.5 mm long, glabrous, stipe 1.5–2 mm long, head 3.5–4.5 mm long. Seeds 1.4–1.9 mm long, 1.2–1.7 mm wide, surfaces covered with conical papillae when young, these mostly becoming low and rounded on mature seeds. ($n = 18$, Daniel 1986, Daniel et al. 1984, 1990). Fig. 38.

PHENOLOGY. — Flowering and fruiting: October–April.

DISTRIBUTION AND HABITAT. — Northwestern Mexico (Baja California Sur and Sonora); in our region the species is known from nondesert portions of the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast, Vizcaíno, and Magdalena subdivisions) in Baja California Sur (Fig. 36); plants occur on slopes and along watercourses in desertscrub, thornscrub, and tropical deciduous forest from 100–950 m elevation.

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Cape Region, Cajoncito, *T. Brandegee* s.n. (UC); Purísima-Comondú, *T. Brande-*

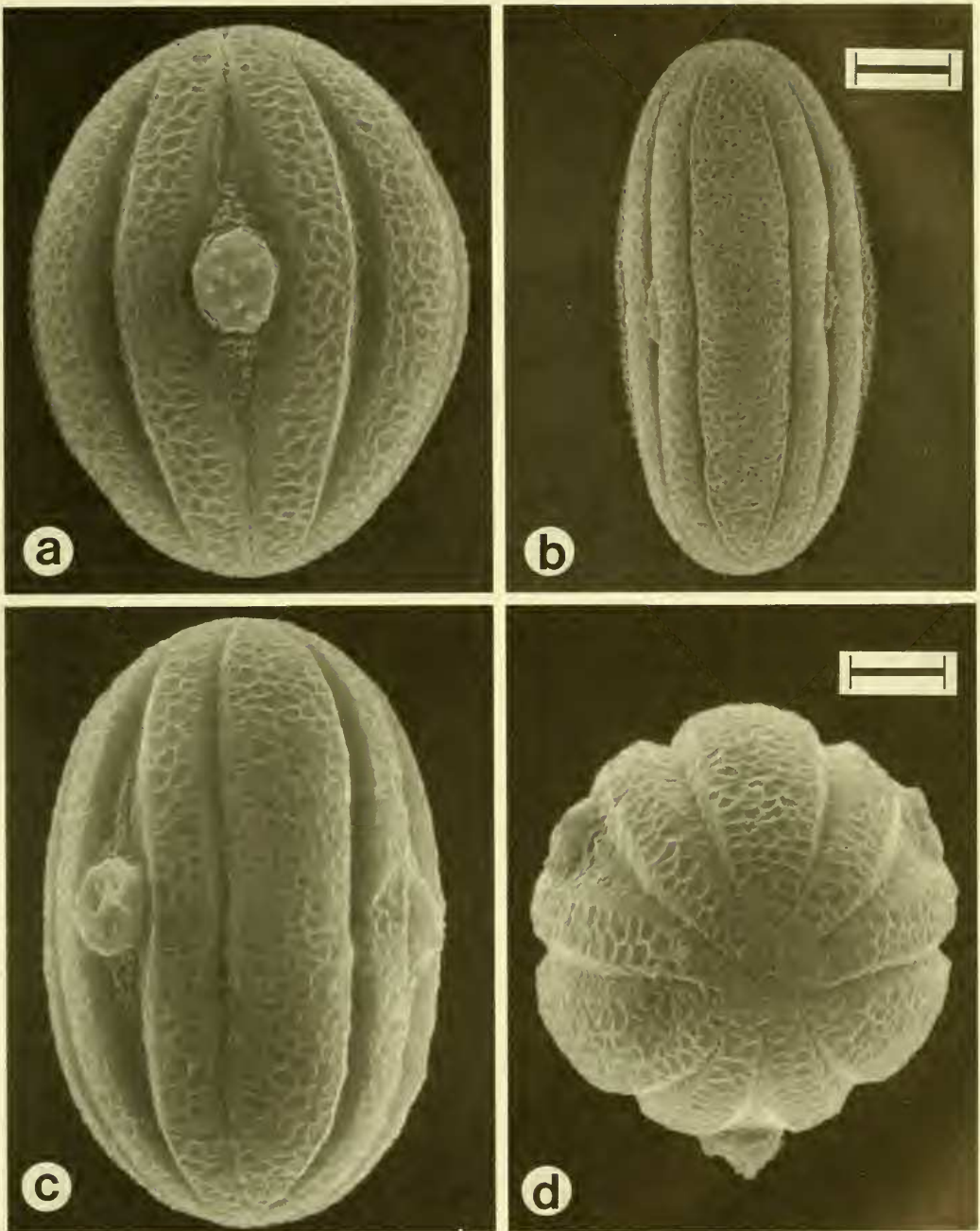


FIGURE 37. Pollen. a. *Tetramerium fruticosum* (Daniel & Butterwick 6869), colpal view; b. *T. fruticosum* (Daniel & Butterwick 6869), intercolpal view; c. *T. nervosum* (Carter & Moran 5324), intercolpal view; d. *T. nervosum* (Carter & Moran 5324), polar view. Scale for a, c, and d = 5 μ m; scale for b = 7.5 μ m.

gee 450 (NY, UC); Sierra de la Giganta, vic. Rancho Agua Escondido, ca. 90 km E of Villa Constitución, ca. 25°06'N, 111°W, *A. Carter 4748* (NY, TEX, UC); Sierra de la Giganta, Cañón de Teojo, W of Notrí, ca. 25°52'N, 111°22'W, *A. Carter 4913* (CAS, UC, US), 4914 (UC, US); Sierra de la Giganta, Arroyo Carrizal, E of Rancho El Horno (NE of San Xavier), ca. 25°53'N, 111°31'W, *A. Carter & R. Ferris 3832* (CAS, UC, US); Sierra de la Giganta, ridge S of La Victoria, ca. 25°52'N, 111°25'W, *A. Carter & R. Ferris 3899* (CAS, UC, US); Sierra de la Giganta, between La Victoria and portezuelo to the E, ca. 25°52'N, 111°25'W, *A. Carter & R. Ferris 3919* (MICH, UC); Sierra de la Giganta, Arroyo Gabilán, ca. 25°55'N, 111°23'W, *A. Carter & R. Ferris 4073* (MO, NY, SD, TEX, UC); Sierra de la Giganta, "El Pulpito" del Arroyo de las Parras, W of Loreto, 25°58'N, 111°27'W, *A. Carter & L. Kellogg 3157* (F, UC); Sierra de la Giganta, Arroyo Hondo, N side of Cerro Giganta, 26°08'N, 111°34'W, *A. Carter & M. Sousa S. 5168* (GH, MICH, SD, UC); along Hwy 1 between San Antonio and San Bartolo, ca. 4 km SE of San Antonio, ca. 23°48'N, 110°01'W, *T. Daniel & M. Butterwick 6869* (BR, CAS, HCIB, MEXU, MICH, MO, SBBG, US); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 9–10 km W of Hwy 1, ca. 23°13'N, 109°50'W, *T. Daniel & M. Butterwick 6912* (CAS, HCIB, MEXU); along rd from Hwy 1 across Cape Region mts to Hwy 19, ca. 0.6 km W of San Pedro de la Soledad, ca. 23°14'N, 109°58'W, *T. Daniel & M. Butterwick 6949* (CAS); Hwy 1, 83.7 mi SE jct Hwy 22 in Cd. Constitución, *T. Daniel et al. 2438* (ASU, CAS, ENCB, MEXU); along Hwy 1, 4.4 mi NW of El Triunfo, *T. Daniel et al. 2490* (CAS, MICH, NY, SBBG); Hwy 1, SE of San Bartolo, 28.2 mi SE of El Triunfo, *T. Daniel et al. 2521* (ASU); 10 mi W of Comondú, *H. Gentry 4074* (ARIZ, DES, DS, RSA, UC); Comondú, *H. Gentry 4106* (ARIZ, DES, DS, GH, UC, US); San Antonio, *M. Jones 22505* (POM); above Primera Agua near Loreto, *M. Jones 27390* (DS, MO, POM, UC); N base of Volcán las Tres Vírgenes, 27°29'N, 112°36'W, *R. Moran 20466* (ENCB, SD); Sierra San Francisco, Los Datiles, Arroyo Batequi, 27°35'N, 113°01'W, *R. Moran 23900* (SD); San Pablo, *C. Purpus 83* (DS, F, UC, US); central Baja California, *C. Purpus s.n.* (UC); 28.7 km N of Cabo San Lucas toward Todos Santos, ca. 23°05'N, 110°05'W, *A. Sanders et al. 3444* (UCR); near km 40 on hwy. between La Paz and Santo Domingo, *J. Thomas 8443* (CAS, DS, ENCB, GH, UC, US); N of Comondú, *I. Wiggins 5480* (DS).

Daniel (1986) discussed the unusual distribution pattern of this species, which is known from Baja California Sur and a single occurrence on the Mexican mainland. *Tetramerium fruticosum*

was treated by Daniel (1986) in section *Tetramerium*. It superficially resembles *T. nervosum* which is undoubtedly a close relative.

2. *Tetramerium nervosum* Nees in Benth., Bot. voy. Sulphur, 148. 1846. TYPE. — ECUADOR. Guayas: Puna, 1836–1839, *A. Sinclair s.n.* (holotype: K!).

Tetramerium hispidum Nees in A. DC., Prodr. 11:468. 1847. TYPE. — MEXICO. State unknown: prope las Ajustas ad flumen Montezuma, Jan, *C. Ehrenberg 1072* (lectotype, Ann. Missouri Bot. Gard. 24:529. 1937: B, destroyed; isolectotype: GH!).

Tetramerium nervosum var. *hispidum* Torr. in Emory, Rep. U. S. Mex. bound. 2(1):125. 1859. TYPE. — MEXICO. Sonora: Santa Cruz, Sep 1851, *G. Thurber 918* (lectotype, Syst. Bot. Monogr. 12:48. 1986: NY!; isolectotypes: F!, GH!, NY!).

Dianthera sonorae S. Watson, Proc. Amer. Acad. Arts 24:67. 1889. TYPE. — MEXICO. Sonora: vicinity of Guaymas, Sep 1887, *E. Palmer 240* (holotype: GH!; isotypes: K!, NY, US!).

Tetramerium scabrum Happ, Ann. Missouri Bot. Gard. 24:532. 1937. TYPE. — MEXICO. Sonora: Fronteras, Jun 1851, *G. Thurber 432* (holotype: NY!; isotypes: CAS!, GH!).

See Daniel (1995) for a complete listing of synonyms for this species.

Ascending to erect perennial herbs to 4 dm tall. Young stems subterete to subquadrate, bifariously pubescent with an understory of flexuose to retrorse eglandular trichomes 0.3–0.6 mm long and sometimes also ± evenly pubescent with an overstory of flexuose eglandular trichomes 0.7–1 mm long, older stems becoming glabrate as epidermis exfoliates. Leaves petiolate, petioles to 16 (–27) mm long, blades ovate to narrowly elliptic, 14–75 mm long, 4–38 mm wide, 2–4.6 times longer than wide, acute to acuminate at apex, rounded to acute to subattenuate at base, surfaces and margin pubescent with mostly antrorse eglandular trichomes, margin entire. Inflorescence of densely bracteate spikes to 50 mm long, 10–19 mm wide near midspike, rachis not visible, pubescent with antrorse eglandular trichomes 0.2–0.4 (–1) mm long and sometimes with inconspicuous sessile to stalked glandular trichomes 0.05–0.2 mm long (i.e., glandular pubescent) as well. Bracts erect to spreading, ovate

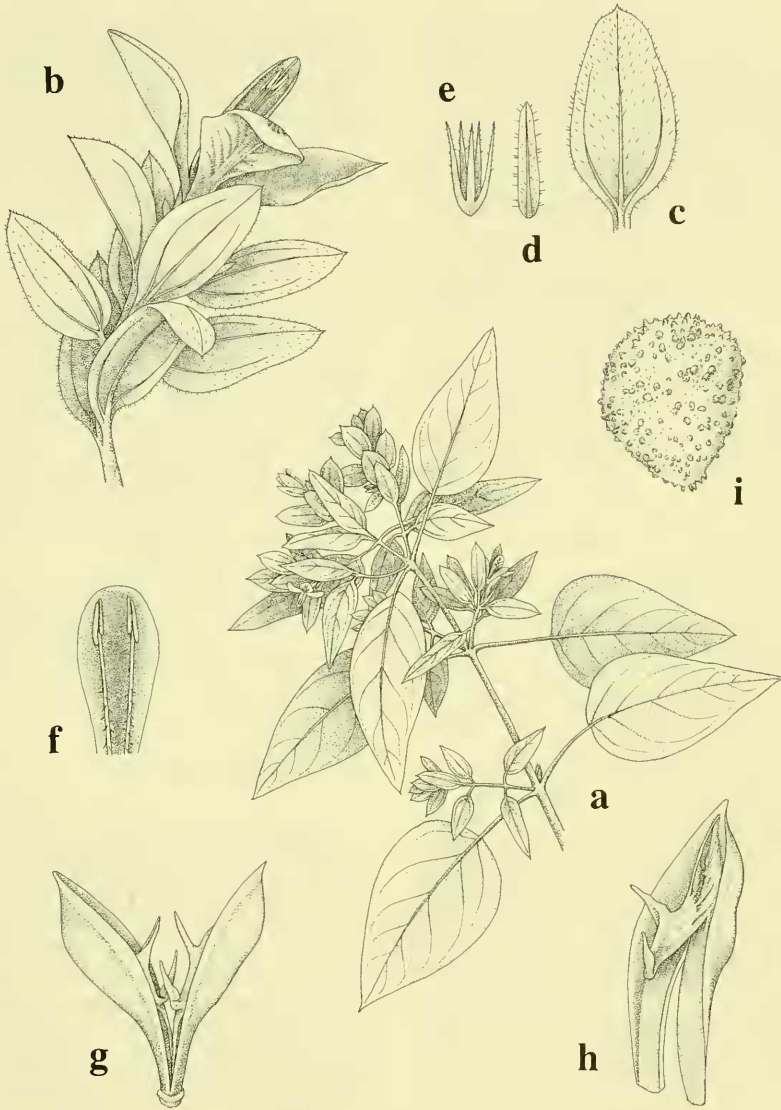


FIGURE 38. *Tetramerium fruticosum*. a. habit (Carter 4913), $\times 0.5$; b. spike with flower (Daniel et al. 2438), $\times 2.7$; c. bract (Gentry 4074), $\times 2.5$; d. bracteole (Thomas 8443), $\times 2.5$; e. calyx (Thomas 8443), $\times 2.5$; f. lower lip of corolla with stamens (Daniel & Butterwick 6869), $\times 4$; g. capsule (Carter 4913), $\times 5.5$; h. capsule valve (Gentry 4074), $\times 7.5$; i. seed (Daniel et al. 2438), $\times 15$. Drawn by Jenny Speckels.

to elliptic to obovate, 9–14 mm long, (3–) 4.8–6 mm wide (proximalmost bracts sometimes larger and remote), rounded- to acute-mucronate at apex, mucro 0.4–0.8 mm long, apical portion of bract twisted and somewhat recurved-spreading, major veins 3–5, palmate, abaxial surface glandular pubescent and sparsely to densely pubescent with antrorse eglandular trichomes 0.2–1

mm long, the latter trichomes sometimes \pm restricted to major veins, margin ciliate with antrorse eglandular trichomes 0.2–2.2 mm long (at least some trichomes > 1 mm long) and usually glandular pubescent as well. Bracteoles subulate to lance-subulate, (2.5–) 3–5 mm long, 0.5–0.6 mm wide, abaxial surface glandular pubescent and pubescent with eglandular trichomes to 0.6

mm long. Calyx 4-lobed, 3–5 mm long, tube 0.5–1 mm long, lobes subulate, 2.5–4 mm long, abaxially glandular pubescent. Corolla white to yellowish with purplish markings on upper lip, 12–16 mm long, tube 6–8 mm long, upper lip obovate, 5–7 mm long, 2 mm wide, entire at apex, lower lip 6–8 mm long, lateral lobes 4.5–7 mm long, 2.5 mm wide, lower-central lobe 4.5–7 mm long, 3–4.4 mm wide. Stamens 4.5–6 mm long, thecae 1–1.2 mm long. Style 6–9.5 mm long. Capsule 4.5–5.5 mm long, pubescent with erect to flexuose to retrorse eglandular trichomes 0.1–0.2 mm long, stipe 1–1.5 mm long, head 3.5–4 mm long. Seeds 1.3–1.6 mm long, 1–1.4 mm wide, surfaces covered with conical papillae bearing retrorse barbs. ($n = 18$, Daniel 1986, Daniel et al. 1984).

PHENOLOGY. — Flowering and fruiting: September–January, May.

DISTRIBUTION AND HABITAT. — Southwestern United States (Arizona, New Mexico, Texas), Mexico (Baja California Sur, Campeche, Chiapas, Chihuahua, Colima, Coahuila, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sinaloa, Sonora, Tamaulipas, Veracruz, Yucatán, Zacatecas), Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Ecuador, and Peru; in our region the species is known from nondesert portions of the Cape Region, the Sierra de la Giganta, and the Sonoran Desert (Central Gulf Coast subdivision) of Baja California Sur (Fig. 34); plants occur along watercourses in thornscrub and tropical deciduous forest from 40–675 m elevation.

LOCAL NAME. — “Panalito” (Domínguez C. 624).

ADDITIONAL SPECIMENS EXAMINED. — MEXICO. Baja California Sur: Sierra de Laguna, *T. Brandegeae* s.n. (NY, UC); Sierra de la Giganta, Valle de Los Encinos (S side of Cerro Giganta), ca. 26°04'N, 111°35'W, A. Carter & R. Moran 5324 (BM, CAS, GH, MICH, SD, TEX, UC, US); along rd from Hwy 1 across Cape Region mts to Hwy 19, 16–20 km W of Hwy 1, ca. 23°14'N, 109°55'W, T. Daniel & M. Butterwick 6939 (CAS, HCIB); Rancho La Burrera, W slope of Sierra de la Laguna, ca. 22 km NE of Todos Santos, ca. 23°31'N, 110°02'W, T. Daniel et al. 6856 (CAS, MEXU); Cañón La Burrera, 25 km NE de Todos Santos, 23°32'N, 110°04'W, R. Domínguez C.

624 (HCIB); desviación carretera al S a Todos Santos, 23°55'N, 110°15'W, J. León de la Luz 3018 (HCIB); Cape Region, 11 km N of Santa Anita, ca. 23°15'N, 109°42'W, R. Moran 6925 (CAS, DS, RSA, SD, TEX); Sierra de Guadalupe, San Sebastián, ca. 27°01'N, 112°24'W, R. Moran 18773 (UC); 28.7 km N of Cabo San Lucas toward Todos Santos, ca. 23°05'N, 110°05'W, A. Sanders et al. 3444 (CAS); between La Paz and San Pedro, J. Wiggins 5595 (CAS, DS, GH, MICH, NY, POM, UC, US).

The distribution of and variation in *T. nervosum* was discussed at length by Daniel (1986). The above description is derived solely from plants from the peninsula of Baja California. Plants from our region all have four calyx lobes and are relatively homogeneous in other respects as well. Information on the reproductive biology and pollination ecology of this species was provided by Daniel (1986).

Tetramerium nervosum was included in section *Tetramerium* by Daniel (1986). Because of its phenotypic plasticity it greatly resembles, and is undoubtedly closely related to, many species of that section.

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