
New and Reconsidered Mexican Acanthaceae X. Flora del Bajío Region

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ABSTRACT. Three new species (*Carlowrightia venturatae*, *Justicia zamudioi*, and *Tetramerium carranzae*) and a new combination (*Mirandea hyssopus* based on *Rhytiglossa hyssopus* Nees) are proposed for the acanthaceous flora of the region in central Mexico covered by the *Flora del Bajío y de Regiones Adyacentes*. Morphological and palynological characters are used to distinguish these taxa from their Mexican congeners. Studies of Acanthaceae in this region reveal the presence of 59 species (5 endemic) in 18 genera there.

RESUMEN. Tres especies nuevas (*Carlowrightia venturatae*, *Justicia zamudioi*, y *Tetramerium carranzae*) y una combinación nueva (*Mirandea hyssopus* basada en *Rhytiglossa hyssopus* Nees) se proponen para la flora de acantáceas de la región de México central cubierta por la *Flora del Bajío y de Regiones Adyacentes*. Los caracteres morfológicos y palinológicos se utilizan para distinguir estos taxa de sus congéneres mexicanos. Los estudios de Acanthaceae en ésta región revelan la presencia de 59 especies (5 endémicas) en 18 géneros allí.

Key words: Acanthaceae, *Carlowrightia*, *Justicia*, Mexico, *Mirandea*, pollen, *Tetramerium*.

The relatively high and flat region located in the southern extremity of central Mexico's Altiplano, comprising portions of the states of Guanajuato, Michoacán, and Querétaro, is commonly referred to as "el Bajío" (Rzedowski & Calderón de Rzedowski, 1987). An amplification of this region, including all of Guanajuato and Querétaro as well as much of northern Michoacán, is the subject of the *Flora del Bajío y de Regiones Adyacentes*, a project of the Instituto de Ecología in Pátzcuaro, Michoacán (Calderón de Rzedowski & Rzedowski, 1991). This amplified region comprises about 50,000 square kilometers, contains considerable topographic relief, and is estimated to have more than 5500 species of plants (Calderón de Rzedowski & Rzedowski, 1991). Portions of the amplified region, especially in northern Guanajuato and adjacent Querétaro, remained botanically unexplored until the late 1980s

and 1990s. Extensive field activities associated with the ongoing floristic project have resulted in approximately 55,000 plant collections since 1985 when the project was initiated (J. Rzedowski, pers. comm.). Studies of these collections have revealed numerous undescribed species and distributional range extensions in various taxa (e.g., Calderón de Rzedowski, 1991; Calderón de Rzedowski & Rzedowski, 1997; Rzedowski & Calderón de Rzedowski, 1995, 1997, 1998a, 1998b; Daniel, 1999).

In this report three new species and a new combination are proposed for the acanthaceous flora of the amplified Bajío region. Studies of Acanthaceae in this region to date reveal the presence of 59 species in 18 genera (Daniel, unpublished). Sixteen of these genera are native to the region and five species (including those treated here) appear to be endemic there. An account of the family in the Bajío region is being prepared for the flora noted above.

Carlowrightia venturatae T. F. Daniel, sp. nov.

TYPE: Mexico. Guanajuato: Mpio. Victoria, Cerro de la Luz, camino a Xichú, 1800 m, 26 July 1991, E. Ventura V. & E. López P. 9336 (holotype, IEB; isotype, CAS). Figure 1.

Herbae perennes decumbentes usque ad 1.5 dm altae. Caules juniores bisulcati, pubescentes trichomatibus eglandulosis. Folia petiolata, petioli usque ad 3 mm longi, laminae lanceolato-ovatae vel ovatae, 10–22 × 2.8–8 mm, 2.1–3.8-plo longiores quam latiores. Dichasia redacta, 1-flora, sessilia in axillis bractearum. Calyces 3.7–6 mm longi, extus glandulosi. Corollae subactinomorphae, azur-ae, 7–9.5 mm longae. Capsulae 9–10 mm longae, extus pubescentes. Semina 3.5–3.8 × 3.3–3.5 mm, testae tuberculatae ad margines dentatae.

Decumbent perennial herbs to 1.5 dm tall from stout woody caudices. Young stems bisulcate, ± bifariously pubescent with retrorse eglandular trichomes 0.05–0.1 mm long, trichomes concentrated in (or restricted to) 2 lines. Leaves petiolate, petioles to 3 mm long, blades lance-ovate to ovate, 10–22 × 2.8–8 mm, 2.1–3.8 times longer than wide, truncate to rounded at base, acuminate at apex, surfaces with several orders of venation prominent,

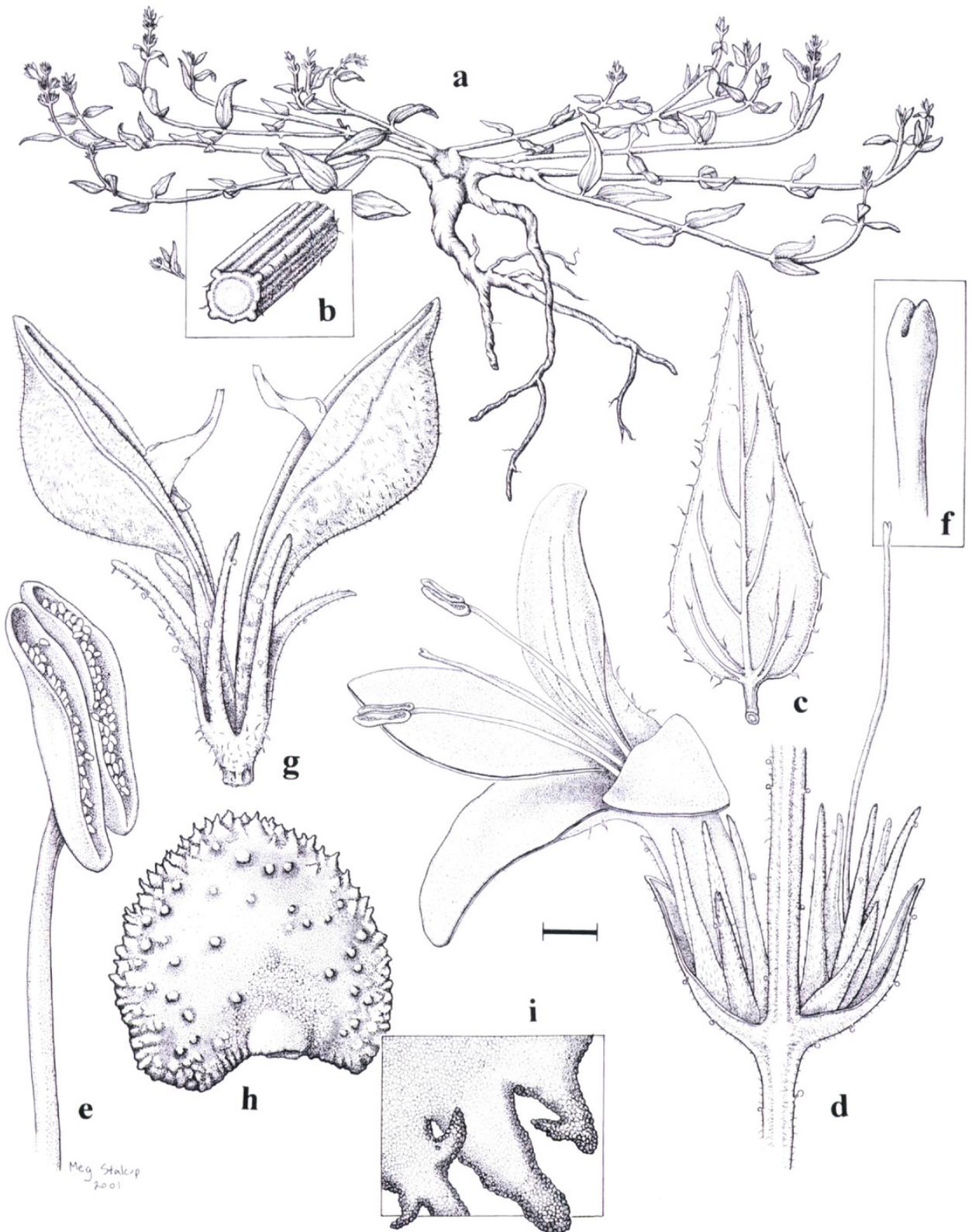


Figure 1. *Carlwrightia venturae* T. F. Daniel. —a. Habit. —b. Enlargement of section of young stem. —c. Leaf. —d. Inflorescence node with flower. —e. Distal portion of stamen. —f. Distal portion of style. —g. Capsule and calyx. —h. Seed. —i. Enlargement of seminal tubercles. a–c from Ventura & López 7399; d–i from Ventura & López 9336. Drawn by M. Stalcup. Scales: a = 15 mm; b = 2.6 mm; c = 1.5 mm; d = 1 mm; e = 0.2 mm; f = 0.3 mm; g = 1.1 mm; h = 0.6 mm; i = 0.04 mm.

pubescent with erect to flexuose to antrorse eglandular trichomes (these mostly restricted to major veins on abaxial surface) to nearly glabrate, margin flat, ciliate with understory of erect to flexuose to antrorse eglandular, subglandular, and glandular (sometimes sparse or absent) trichomes to 0.1 mm long and an overstory of flexuose to antrorse eglandular trichomes to 0.6 mm long. Inflorescence of terminal pedunculate dichasiate spikes to 5 cm long (including peduncles and excluding flowers), axillary spikes sometimes present in axils of distalmost leaves as well, peduncles to 29 mm long, pubescent like young stems or with trichomes becoming somewhat more evenly disposed, rachis ± evenly pubescent with erect eglandular and glandular (sometimes sparse) trichomes 0.05–0.2 mm long; dichasia opposite, sessile, 1-flowered. Bracts lance-subulate, 2.8–5.5 × 0.8–1.3 mm (proximalmost bracts sometimes subfoliose and larger, i.e., up to 9 mm long and 2 mm wide), abaxial surface pubescent like rachis. Bracteoles linear to lance-subulate, 2–3 × 0.5–0.6 mm, abaxial surface pubescent like bracts. Flowers sessile to subsessile (i.e., borne on pedicels to 0.5 mm long). Calyx 3.7–6 mm long, lobes subulate, 2.9–5 mm long, abaxially pubescent like rachis. Corolla subactinomorphic, blue, 7–9.5 mm long, externally pubescent with erect to flexuose to antrorse eglandular trichomes 0.1–0.2 mm long, tube 3–3.5 mm long, 1.3–1.7 mm diam., upper lip 4–5 mm long, 0.8–1 mm wide, lower lip 4–7 mm long, lobes homomorphic, 3.5–6 × 1–2.3 mm. Stamens 5–6 mm long, filaments bluish, glabrous distally, pubescent near base with retrorse eglandular trichomes, thecae yellowish, 0.9–1.1 mm long. Style 4–7 mm long, glabrous, stigma lobes 0.2 mm long. Capsule 9–10 mm long, pubescent with erect to retrorse eglandular trichomes 0.05–0.1 mm long, stipe 4 mm long, head subspheric, 6 mm long. Seeds 2 (to 3) per capsule, flat to planoconvex, 3.5–3.8 × 3.3–3.5 mm, surfaces tuberculate with conic projections, margin dentate, teeth often with retrorse barbs.

Phenology. Flowering and fruiting in July and October.

Distribution and habitat. Known only from north-eastern Guanajuato (Fig. 2); plants occur in grasslands at 1800 m.

Twenty-six species of *Carlwrightia* are now recognized, with 24 of them occurring in Mexico (Daniel, 1983, 1988; Daniel & Wasshausen, 1993; Ezcurra, 1994). Pollen of *C. venturæ* (Fig. 3) is 3-colporate and 6-pseudocolpate (with pairs of pseudocolpi sometimes fusing and forming pseudocolpal

ellipses in mesocolpia). It resembles that of other species of the genus (Daniel, 1998).

Carlwrightia venturæ is known only from the state of Guanajuato in central Mexico. Two other species of the genus, *C. parviflora* (Buckley) Wasshausen and *C. neesiana* (Schauer ex Nees) T. F. Daniel, are known from Guanajuato. They can be distinguished from *C. venturæ* by the following key.

KEY TO SPECIES OF *CARLWRIGHTIA* IN GUANAJUATO

- 1a. Young stems terete to quadrate, pubescent with glandular and eglandular trichomes; corolla pseudopapilionaceous, white within, (11–)15–19(–26) mm long, lower central lobe conduplicate-keeled; thecae maroon; capsule 10–16 mm long, head distinctly flattened laterally *C. neesiana*
- 1b. Young stems bisulcate with 4 prominent ridges, pubescent with eglandular trichomes only; corolla subactinomorphic, blue within, 6.5–11(–13) mm long, lower central lobe not conduplicate-keeled; thecae yellow; capsule 8–10.5 mm long, head spherical to partially flattened.
 - 2a. Capsule pubescent; plants prostrate-decumbent; leaf margin flat *C. venturæ*
 - 2b. Capsule glabrous; plants erect to spreading; leaf margin revolute *C. parviflora*

Using the key to sections provided by Daniel (1983), *Carlwrightia venturæ* belongs to section *Carlwrightia*. It appears to differ from other species in that section only by usually having two rather than four seeds per capsule. Within section *Carlwrightia*, *C. venturæ* differs from *C. linearifolia* (Torrey) A. Gray by its bisulcate (vs. multistriate) stems with bifariously (vs. evenly) disposed trichomes, lance-ovate to ovate (vs. linear) leaves, and dentate (vs. entire) seed margin, and it differs from *C. parviflora* and *C. ovata* A. Gray by its pubescent (vs. glabrous) capsules. *Carlwrightia venturæ* appears most similar to *C. hapalocarpa* B. L. Robinson & Greenman; both species have bisulcate stems with bifariously disposed trichomes and pubescent capsules. These two species can be distinguished by the following couplet:

- 1a. Plants prostrate-decumbent; young stems pubescent with trichomes 0.05–0.1 mm long; leaves 2.8–8 mm wide, 2.1–3.8 times longer than wide, truncate to rounded at base; bracts lance-subulate, 0.8–1.3 mm wide; bracteoles linear to lance-subulate, 2–3 × 0.5–0.6 mm; calyx 3.7–6 mm long; corolla 7–9.5 mm long, upper lip 4–5 mm long, 0.8–1 mm wide; thecae 0.9–1.1 mm long; style 4–7 mm long; capsule 9–10 mm long; seeds usually 2 per capsule, 3.5–3.8 mm long *C. venturæ*
- 1b. Plants erect to spreading; young stems pubescent with trichomes 0.2–1.5 mm long; leaves 5–30 mm wide, 1–2 times longer than wide, subcordate to cordate at base; bracts triangular, 1.5–2

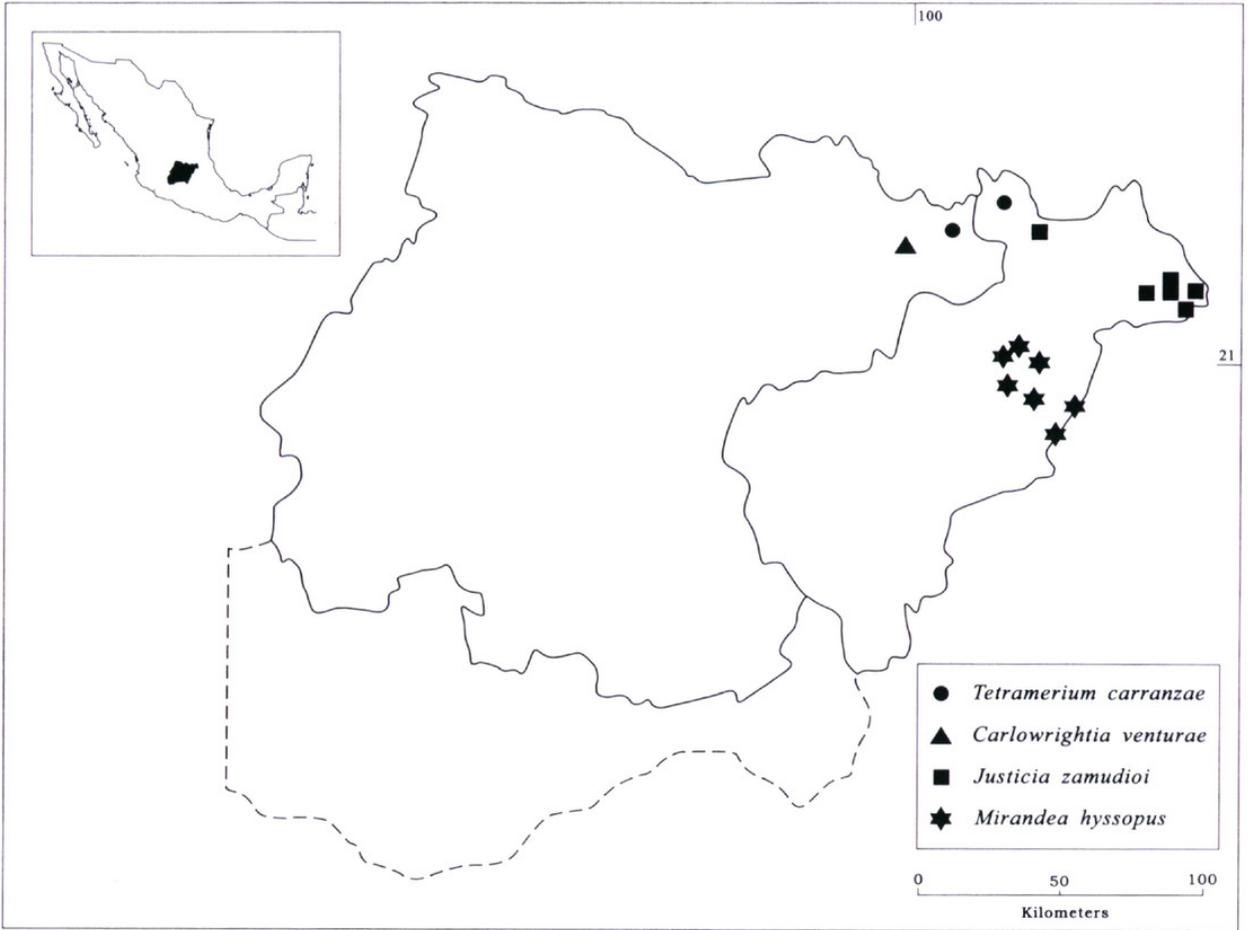


Figure 2. Map of the region covered by the *Flora del Bajío* (including Guanajuato, Querétaro, and northern Michoacán) showing the distributions of *Carlowrightia venturae*, *Justicia zamudioi*, *Mirandea hyssopus*, and *Tetramerium carranzae*.

mm wide; bracteoles triangular, $1-1.2 \times 0.7-1$ mm; calyx 2.5–3.5 mm long; corolla 9–12 mm long, upper lip 6.5–9 mm long, 2–3 mm wide; thecae 1.3–1.6 mm long; style 7.5–9 mm long; capsule 10.5–11.5 mm long; seeds usually 4 per capsule, 4–4.8 mm long *C. hapalocarpa*

Some of these putative distinctions may reflect a lack of sufficient data on character variation in *C. venturae*, which is known from only two collections. However, the number of differences between *C. venturae* and *C. hapalocarpa* suggests that the former species should be treated as distinct from the latter.

This species is named for one of its collectors, Emma Ventura V., who, with E. López P., has collected many fine specimens of Acanthaceae from Guanajuato (Rzedowski, 1997).

Paratype. MEXICO. **Guanajuato:** Mpio. Victoria, La Luz, 6 km S de Cañada de Moreno, 3 Oct. 1989, *E. Ventura V. & E. López P.* 7399 (CAS, IEB).

Justicia zamudioi T. F. Daniel, sp. nov. TYPE: Mexico. Querétaro: Mpio. Landa, 6 km E de La Vuelta, 1400 m, 21 Sep. 1988, *S. Zamudio 6814* (holotype, IEB; isotype, CAS). Figure 4.

Herbae perennes vel frutices usque ad 1 m alti. Folia petiolata, laminae ovato-ellipticae vel ellipticae, $10-62 \times 4-18$ mm, 2–4-plo longiores quam latiores. Spicae terminales (vel axillares), dense bracteatae; dichasia alterna, aliquando secunda, sessilia, uniflora. Bracteeae petiolatae, ovato-ellipticae vel late ovatae vel subcirculares, $7-10 \times 3.7-7.5$ mm, pagina abaxialis pubescens trichomatibus eglandulosus. Flores sessiles. Calyx 5-lobus, 3.5–4.5 mm longus, lobis homomorphis. Corolla alba vel cremea, labio infero marronino-notata, 10–14.5 mm longa, extus pubescens trichomatibus eglandulosus. Stamina 5 mm longa, thecis 1.2–1.5 mm longis, impariter insertis vel superpositis, inferiore calcare 0.4–0.5 mm longa instructa. Capsula 4.5–7.5 mm longa, glabra.

Perennial herbs or shrubs to 1 m tall. Young stems subterete, bifariously pubescent with retrorse eglandular trichomes or \pm evenly pubescent with erect to flexuose to antrorse to retrorse eglandular trichomes, the trichomes 0.3–0.7 mm long. Leaves petiolate, petioles to 20 mm long, blades ovate-elliptic to elliptic, $10-62 \times 4-18$ mm, 2–4 times longer than wide, acute at apex, acute to acuminate at base, surfaces pubescent with erect to flexuose to antrorse eglandular trichomes 0.1–0.4 mm long (trichomes sometimes restricted to major veins), margin entire to subsinuate. Inflorescence of ter-

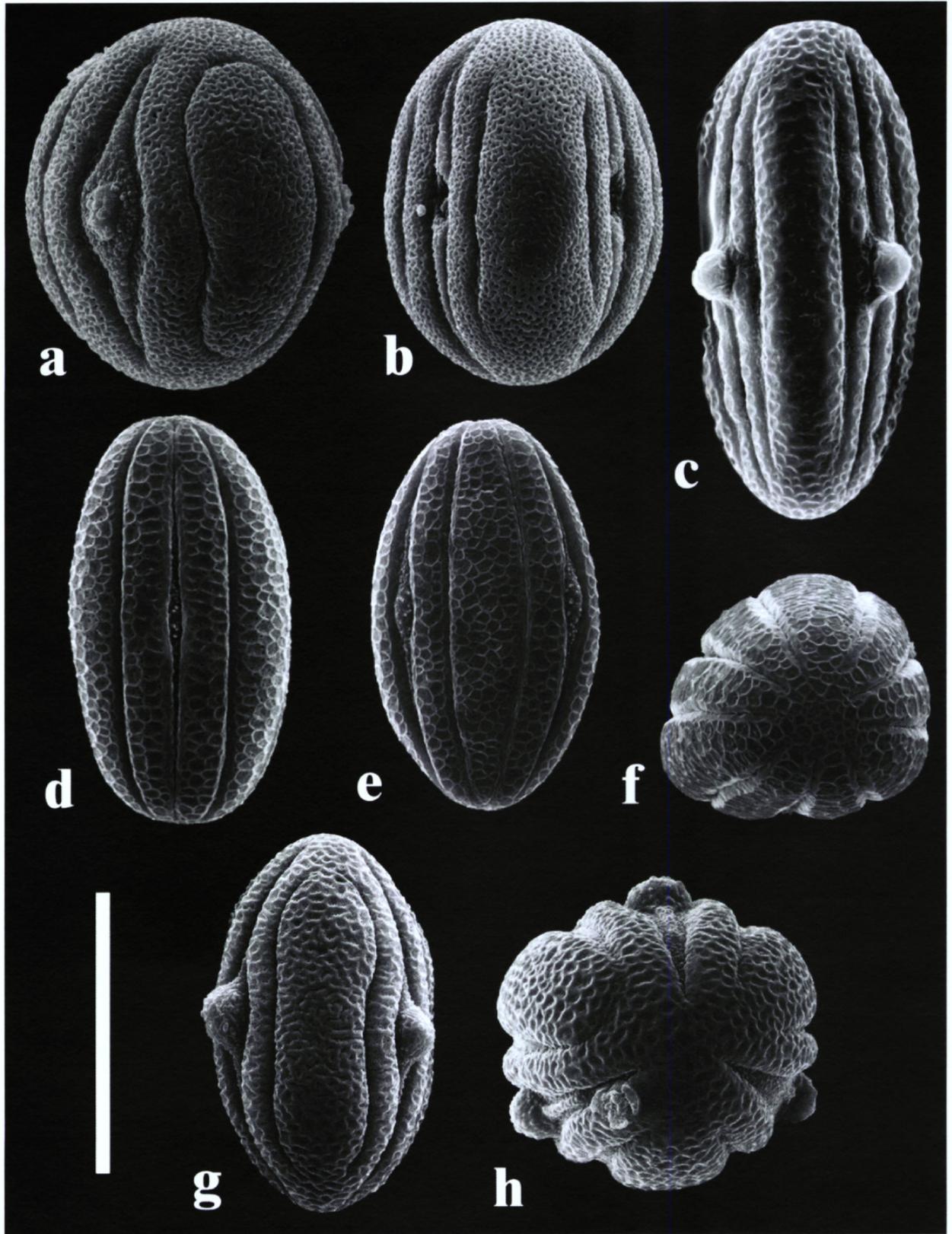


Figure 3. Pollen. —a. *Carlwrightia venturae*, subcolpal view (Ventura & López 9336). —b. *Carlwrightia venturae*, intercolpal view (Ventura & López 9336). —c. *Justicia zamudioi*, intercolpal view (Rubio 2119). —d. *Tetramerium carranzae*, colpal view (Carranza & Cervantes 5470). —e. *Tetramerium carranzae*, intercolpal view (Carranza & Cervantes 5470). —f. *Tetramerium carranzae*, polar view (Carranza & Cervantes 5470). —g. *Mirandea hyssopus*, intercolpal view (Zamudio R. 3199). —h. *Mirandea hyssopus*, polar view (Zamudio R. 3199). Scales: a–c, f, h = 27 μm ; g = 30 μm ; d = 35 μm ; e = 42 μm .

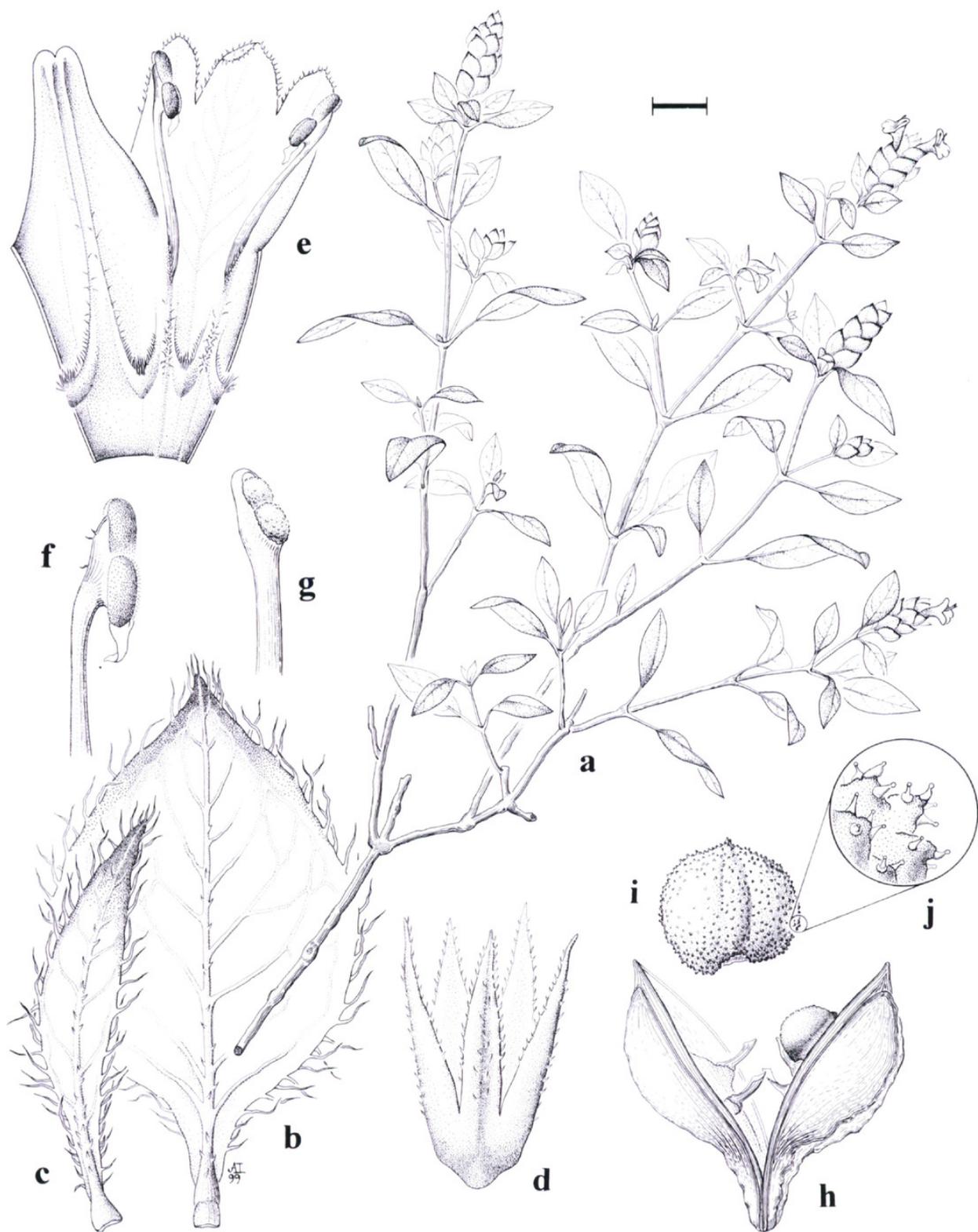


Figure 4. *Justicia zamudioi* T. F. Daniel. —a. Habit. —b. Bract. —c. Bracteole. —d. Calyx. —e. Corolla cut open with stamens. —f. Distal portion of stamen. —g. Distal portion of style with stigma. —h. Capsule. —i. Seed. —j. Seminal tubercles. a from Carranza 2826; b–g from Rubio 1358; h–j from Rzedowski 48148. Drawn by Anya Illes. Scales: a = 15 mm; b, c, h = 1 mm; d = 0.6 mm; e = 1.3 mm; f, i = 0.8 mm; g = 0.1 mm; j = 0.08 mm.

minimal (or axillary) pedunculate densely bracteate dichasiate spikes to 46 mm long (including peduncle and excluding flowers), 10–17 mm diam. near midspike, peduncles to 8 mm long, pubescent like

young stems, rachis pubescent with antrorse eglandular trichomes 0.1–0.8 mm long; dichasia alternate, sometimes borne along one side of spike, 1-flowered, 1 per axil, sessile. Bracts sometimes

yellowish green in dried plants (i.e., lighter than foliage), opposite, tinged with purple along margin near apex, borne on petioles 1.3–2 mm long, ovate-elliptic to broadly ovate to subcircular, 7–10 × 3.7–7.5 mm, apically acute, abaxial surface pubescent like rachis (trichomes sometimes sparse), margin ciliate with flexuose to antrorse eglandular trichomes to 1 mm long. Bracteoles petiolate, ovate to linear-elliptic to elliptic to oblanceolate, 6.5–9 × 1.2–2.5 mm, pubescent like bracts. Flowers sessile. Calyx 5-lobed, 3.5–4.5 mm long, lobes lance-subulate to lance-elliptic, homomorphic, 3–4 mm long, 0.6–1 mm wide, abaxially and marginally pubescent like bracts. Corolla white to cream with maroon markings on lower lip, 10–14.5 mm long, externally pubescent with erect to flexuose to retrorse eglandular trichomes 0.1–0.3 mm long, tube gradually expanded distally, 5.5–7 mm long, upper lip 4.5–7 mm long, apically 2-lobed, lobes 0.2–0.5 mm long, lower lip 4.5–7.5 mm long, lobes 2–3 × 2–3 mm. Stamens inserted near apex of corolla tube, 5 mm long, filaments pubescent with eglandular trichomes or glabrous, thecae maroon, 1.2–1.5 mm long (including basal appendage), subequal, parallel, unequally inserted (overlapping by 0.2 mm) to superposed (contiguous), dorsally pubescent (sometimes very sparsely so) with flexuose eglandular trichomes, lower theca with a basal appendage 0.4–0.5 mm long; pollen (Fig. 3) 3-aperturate, apertures flanked on each side by 1 row of insulae (these sometimes not very distinct), exine reticulate. Style 8.5–10 mm long, distally glabrous, proximally pubescent with eglandular trichomes, stigma 0.1–0.2 mm long, lobes unequal or indistinct. Capsule 4.5–7.5 mm long, glabrous, stipe 1.5–2.5 mm long, head subspheric, 3–5 mm long. Seeds 4, flat, subcircular to subcordate to suboblate, 2.1–2.3 × 2–2.3 mm, surfaces covered with subconic tubercles bearing stipelike appendages.

Phenology. Flowering: September–January; fruiting: October, January.

Distribution and habitat. Known only from Querétaro in central Mexico (Fig. 2); plants occur on slopes and along streams in thornscrub and tropical deciduous forest at elevations from 350 to 1480 m.

I am unable to associate these plants with any of Graham's (1988) infrageneric taxa or any previously described Mexican taxon. Superficially, they resemble plants from Chiapas treated by Daniel (1995) as *Justicia herpetacanthoides* Leonard. However, the Chiapan plants have opposite dichasia, sessile bracts and bracteoles, pubescent thecae, and pubescent capsules. Superficially similar plants from San Luis Potosí (e.g., *Purpus* 5227) and

Tamaulipas (e.g., *F. González M.* 9981) also have pubescent thecae and capsules. Their disposition remains to be determined. The identity of *Justicia nana* (Nees) Lindau, described from Hidalgo based on a collection of Ehrenberg, also remains a mystery. The holotype of *Justicia nana* at B was destroyed, and no isotypes or other collections of the species have been located. However, based on the protologue of *J. nana*, that species differs from ours by having flowers opposite in spikes, 4-lobed calyces, and linear bracts and bracteoles.

In most specimens of *Justicia zamudioi*, the cauline trichomes are retrorse and bifariously disposed. In *Carranza* 2826, they are more or less evenly disposed and vary from erect to flexuose to antrorse to retrorse. Trichomes in the inflorescence are also denser and more conspicuous on the latter specimen.

This species is named for the collector of the type, Sergio Zamudio R., an able Mexican botanist who, through his collections and publications, has greatly contributed to our knowledge of the botanical resources in the Bajío region (Rzedowski, 1997).

Paratypes. MEXICO. **Querétaro:** Mpio. Arroyo Seco, 4–5 km SE de Ayutla, *E. Carranza* 2826 (CAS, IEB); Mpio. Landa, Las Banquetas, ca. 4 km NW de Acatitlán de Zaragoza, *E. González P.* 1005 (CAS, IEB); Mpio. Landa, 11 km SW de Agua Zarca, *H. Rubio* 1358 (CAS, IEB); Mpio. Landa, 15 km SW de Agua Zarca, Río Moctezuma, *H. Rubio* 1450 (IEB), 2119 (CAS, IEB); 19 km NE de Landa, sobre la carretera a Xilitla, *J. Rzedowski* 48148 (CAS, IEB); Mpio. Landa, ca. 4 km E de La Vuelta, *S. Zamudio & E. Pérez C.* 9418 (CAS, IEB).

Tetramerium carranzae T. F. Daniel, sp. nov.

TYPE: Mexico. Guanajuato: Mpio. Xichú, 3 km NE de El Guamúchil, 1660 m, 22 Dec. 1997, *E. Carranza & P. Cervantes* 5470 (holotype, IEB; isotype, CAS). Figure 5.

Herbae perennes vel frutices usque ad 5 dm alti. Folia petiolata, laminae ovatae vel ellipticae, 8–20 × 2.5–11 mm. 1.6–3.3-plo longiores quam latiores, pagina abaxialis pubescens trichomatibus eglandulosis (aliquot geniculatis-uncinatis) et glandulosis. Bracteae anguste ellipticae vel lineari-oblanceolatae vel obovatae, 9–15 × 1.5–10 mm, extus pubescentes trichomatibus glandulosis et eglandulosis, apice mucronatae, mucrone 0.1–0.4 mm longo. Bracteolae lineares vel lanceolatae, 4–6.2 × 0.6–1 mm. Calyx quinquelobus, 3–5 mm longus. Corolla pseudopapilionacea, caeruleo-purpurea, 20.5–26 mm longa. Capsula 7–9.5 mm longa, trichomata nulla. Semina 2.5–3 × 2.2–2.5 mm.

Perennial herbs or shrubs to 5 dm tall. Young stems subterete to subquadrate, pubescent with flexuose to antrorse to antrorsely geniculate eglandular trichomes 0.1–0.6 mm long, trichomes ± concen-

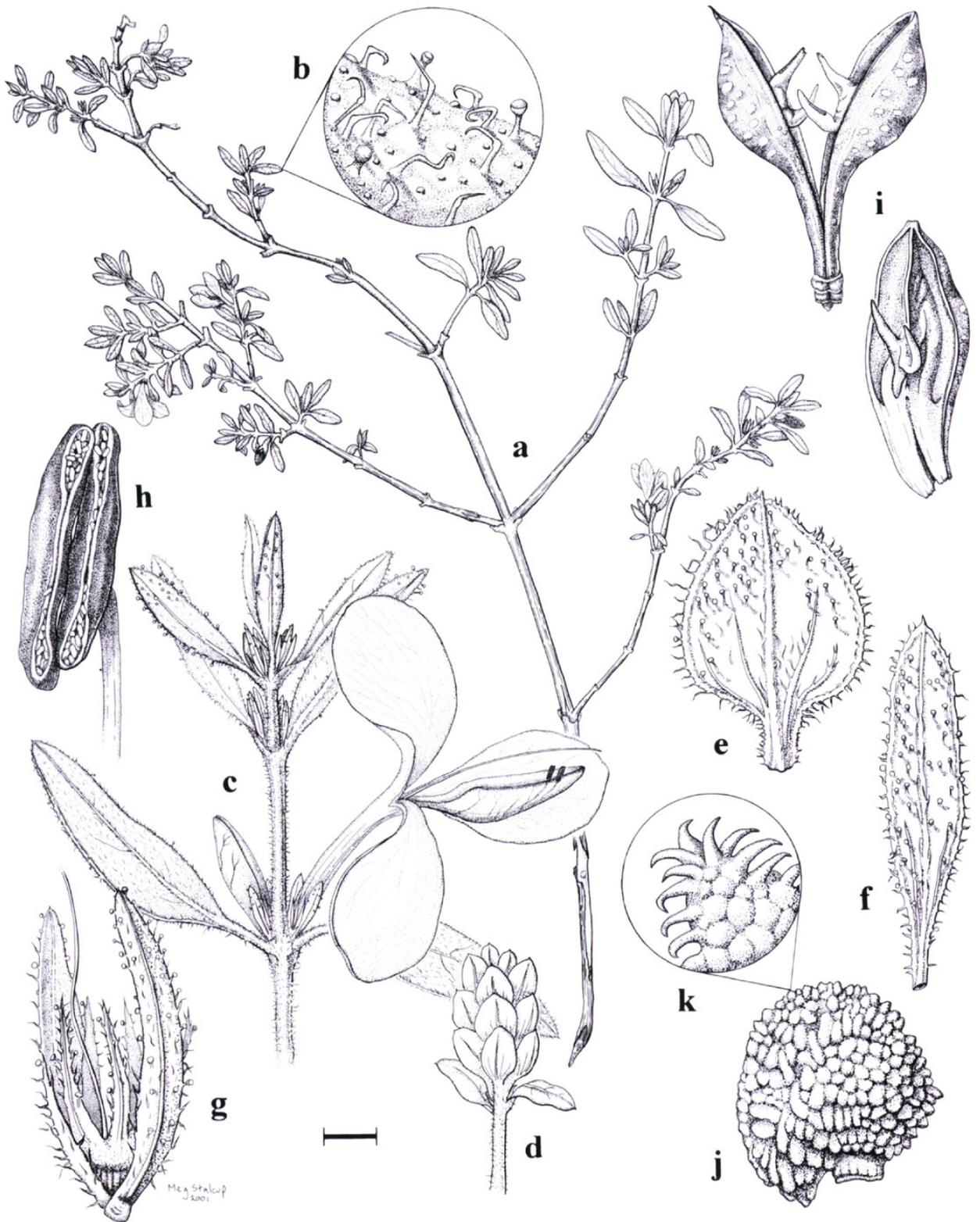


Figure 5. *Tetramerium carranzae* T. F. Daniel. —a. Habit. —b. Enlargement of abaxial surface of leaf showing trichomes. —c. Inflorescence with flower. —d. Inflorescence. —e. Bract. —f. Bract. —g. Bracteoles and calyx. —h. Distal portion of stamen. —i. Dehiscent capsule (top) and single capsule valve (bottom). —j. Seed. —k. Seminal tubercle. a–c, f–h from Carranza & Cervantes 5470; d, e, i–k from Carranza G. 3018. Drawn by M. Stalcup. Scales: a = 15 mm; b, h = 0.3 mm; c = 3.8 mm; d = 10 mm; e = 2 mm; f, i = 1.5 mm; g = 3.9 mm; j = 0.7 mm; k = 0.1 mm.

trated in 2 lines or evenly disposed on youngest growth and soon becoming concentrated in 2 lines. Leaves (plants sometimes leafless or nearly so during anthesis) petiolate, petioles to 6 mm long, blades ovate to elliptic, 8–20 × 2.5–11 mm, 1.6–3.3 times longer than wide, rounded- to acute-mucronate at apex, rounded to acute to subattenuate at base, adaxial surface ± pustulate and pubescent with erect to flexuose to antrorsely geniculate eglandular trichomes and sometimes with scattered erect glandular trichomes as well, abaxial surface pubescent with antrorsely geniculate to geniculate-uncinate eglandular trichomes to 0.4 mm long and erect glandular trichomes to 0.3 mm long, margin entire, ciliate with geniculate-uncinate eglandular trichomes to 0.4 mm long, flexuose eglandular trichomes to 1 mm long, and erect glandular trichomes to 0.3 mm long. Inflorescence of terminal sessile to pedunculate loosely to densely bracteate spikes to 32 mm long (excluding peduncles and flowers), 6–23 mm diam. near mid-spike (excluding flowers), dichasia sometimes in axils of distalmost leaves as well, rachis visible or not, pubescent with flexuose to antrorse to antrorsely appressed eglandular trichomes 0.1–0.4 mm long and sometimes with erect glandular trichomes to 0.3 mm long as well; dichasia sessile, 1-flowered. Bracts ± petiolate, broadly ovate to broadly elliptic to subcircular to narrowly elliptic to linear-oblongate to obovate, 9–15 × 1.5–10 mm (proximalmost bracts sometimes subfoliose and larger), apical portion of bract usually straight and erect, rounded- to acute-mucronate, mucro straight and erect to spreading, 0.1–0.4 mm long, major veins (1 to) 3 to 5, palmate, abaxial surface pubescent with antrorse and geniculate-uncinate eglandular trichomes 0.1–0.5 mm long and erect glandular trichomes to 0.4 mm long, margin ciliate with similar trichomes and with flexuose eglandular trichomes to 1.5 mm long as well. Bracteoles lanceolate to lance-linear to linear, 4–6.2 × 0.6–1 mm, abaxial surface pubescent with antrorse eglandular trichomes 0.1–0.2 mm long or pubescent like bracts. Flowers sessile. Calyx 5-lobed, 3–5 mm long, lobes subulate, 2–3.7 mm long, abaxially pubescent like bracteoles. Corolla blue-purple and white, 20.5–26 mm long, tube 8–13 mm long, upper lip 10.5–14 mm long, 6–7 mm wide, lower lip 10–16 mm long, lateral lobes 9–15 × 5–7.5 mm, lower-central lobe 8–12 × 4.8–6 mm. Stamens 7.5–9 mm long, thecae 1.5–2 mm long. Style 16–23 mm long, stigma lobes 0.1–0.2 mm long. Capsule 7–9.5 mm long, ± pustulate but lacking trichomes. Seeds 4, 2.5–3 × 2.2–2.5 mm, surfaces minutely granulate and tuberculate with subconic to rounded protuberances bearing minute barbs.

Phenology. Flowering: December–January; fruiting: December–January.

Distribution and habitat. Central Mexico (Guanajuato, Querétaro; Fig. 2); plants occur in tropical subdeciduous forest and submontane thornscrub at elevations from 700 to 1600 m.

Pollen of *Tetramerium carranzae* (Fig. 3) is 3-colporate and 6-pseudocolpate and resembles that of other species in the genus (Daniel, 1986, 1998). Based on the infrageneric classification of *Tetramerium* proposed by Daniel (1986), *T. carranzae* can be placed in section *Tetramerium*. It would appear to be morphologically most similar to two other Mexican species with glabrous capsules, 5-lobed calyces, blue or yellow corollas, and capsules 6–9.5 mm long: *T. glandulosum* Oersted and *T. glutinosum* Lindau. These three species can be distinguished by the following key.

KEY TO *TETRAMERIUM CARRANZAE*, *T. GLANDULOSUM*, AND *T. GLUTINOSUM*

- 1a. Corolla yellow, lower-central lobe with marginal region along each side folded outward 90° forming a horizontal platform; mature (i.e., brownish) seeds covered with low, short, irregular ridges or rounded protuberances lacking barbs *T. glandulosum*
- 1b. Corolla blue, lower-central lobe not as above (i.e., the sides remaining vertical); mature seeds covered with subconic to rounded protuberances bearing minute barbs.
 - 2a. Young stems pubescent with glandular and eglandular trichomes; abaxial surfaces of leaves and bracts lacking geniculate-uncinate trichomes (sometimes with some eglandular trichomes antrorsely curved or bent); apical portion of bract usually twisted and reflexed, mucronate with mucro usually curved, bent, geniculate or coiled, 0.5–2.5 mm long; bracteoles 1.2–2 mm wide; thecae 2.6–3.6 mm long; seeds 1.9–2.2 mm long, 1.5–1.7 mm wide; Guerrero, México, Morelos, and Puebla *T. glutinosum*
 - 2b. Young stems pubescent with eglandular trichomes only; abaxial surfaces of leaves and bracts with some trichomes geniculate-uncinate; apical portion of bract usually straight and erect, mucronate with mucro straight and erect to spreading, 0.1–0.4 mm long; bracteoles 0.6–1 mm wide; thecae 1.5–2 mm long; seeds 2.5–3 mm long, 2.2–2.5 mm wide; Guanajuato and Querétaro *T. carranzae*

The two known collections of *Tetramerium carranzae* share the diagnostic features as noted above, but differ conspicuously from one another in the shape and density of the inflorescence bracts. In *Carranza G. 3018*, the bracts are broadly ovate to broadly elliptic to subcircular, 5.5–10 mm wide, and usually have 5 major veins. They are arranged

in a dense, four-sided spike with the rachis not or only partly visible. In *Carranza & Cervantes 5470* the bracts are narrowly elliptic to elliptic to linear-oblongate to obovate, 1.5–3.3 mm wide, and usually have 3 major veins. They are more loosely arranged so that the rachis is clearly visible. Additionally, the rachis of *Carranza G. 3018* is eglandular whereas that of *Carranza & Cervantes 5470* is glandular. It is possible that these two collections represent different taxa, but until additional collections are available, and considering their overall similarity, they are treated as a single variable species.

Notes on the label of *Carranza G. 3018* indicate that living plants have a disagreeable odor. Several species of other acanthaceous genera with glandular trichomes also have an unpleasant (often mephitic) odor, e.g.: *Dyschoriste hirsutissima* (Nees) Kuntze, *Henrya insularis* Nees ex Benthham, and *Ruellia inundata* Kunth.

This species is named for Eleazar Carranza G., collector of both known specimens and of numerous other Acanthaceae from remote regions of north-eastern Querétaro (Rzedowski, 1997).

Paratype. MEXICO. **Querétaro:** Mpio. Arroyo Seco, Río Santa Marfa, S de El Refugio, 24 Jan. 1991, *E. Carranza G. 3018* (CAS, IEB).

Mirandea hyssopus (Nees) T. F. Daniel, comb. nov. Basionym: *Rhytiglossa hyssopus* Nees, in A. de Candolle, Prodr. 11: 345. 1847. *Justicia hyssopus* (Nees) Lindau, in Engler & Prantl, Naturl. Pflanzenfam. 4(3b): 350. 1895. TYPE: Mexico. Querétaro: "in ripâ fluvii Mosteguma prope las Ajuntas," Jan. (1840?), *C. Ehrenberg 1061* (holotype, B destroyed, photos at F, GH, MO).

Shrubs to 1.5 m tall. Young stems subterete, multistriate-sulcate, evenly pubescent with retrorse to flexuose (to antrorse) eglandular trichomes 0.05–0.4 mm long. Leaves sessile to petiolate, petioles to 2 mm long, blades narrowly ovate to lance-linear to narrowly elliptic, 9–35 × 2.4–7.5 mm, 3–7 times longer than wide, rounded to acute at apex, acute to subattenuate at base, surfaces pubescent with antrorse to flexuose eglandular trichomes 0.1–0.5 mm long, margin entire, flat. Inflorescence of terminal pedunculate dichasiate spikes to 55(–90) mm long (including peduncles and excluding flowers), 12–17 mm diam. (excluding flowers) near mid-spike, peduncles 2–6 mm long, pubescent like young stems, rachis not visible, evenly pubescent with flexuose to antrorse to retrorse eglandular trichomes 0.05–0.5 mm long and erect inconspicuous

eglandular to subglandular to glandular trichomes to 0.05 mm long; dichasia opposite, 1-flowered, 1 per axil, sessile. Bracts opposite, homomorphic, imbricate, broadly ovate to elliptic to subcircular, 8–16 × 6–9.5 mm, often constricted into a petiole-like stalk to 1 mm long, rounded-apiculate to ± acute at apex, abaxial surface pubescent with an understory of erect glandular trichomes to 0.05 mm long and an overstory (sometimes restricted to major veins or proximal portion of bract) of antrorse to antrorsely appressed eglandular trichomes 0.1–0.5 mm long, margin ciliate with trichomes like those of abaxial surface or with the eglandular trichomes becoming flexuose. Bracteoles lance-ovate to lanceolate to elliptic, 4.5–10 × 1.4–3.5 mm, pubescent like bracts. Flowers sessile. Calyx 5-lobed, 2.5–5 mm long, lobes lanceolate to lance-subulate, subequal, 1.5–3.5 mm long, 0.7–1 mm wide, abaxially pubescent with antrorse eglandular trichomes 0.1–0.4 mm long (occasionally with a few inconspicuous glands to 0.05 mm long as well; these more prominent on adaxial surface). Corolla bluish to purplish, 12–19 mm long, externally pubescent with flexuose to retrorse eglandular trichomes 0.1–0.5 mm long, tube 6–10 mm long, ± gradually or ± abruptly expanded distally, 1.5–1.8 mm diam. near midpoint, internal surface distally pubescent with sessile to subsessile glands less than 0.05 mm long and pubescent near midpoint with erect to flexuose eglandular trichomes to 0.5 mm long, upper lip 5.3–9 mm long, entire to emarginate at apex, lobes (if present) 0.1–0.2 mm long, lower lip 5.5–9 mm long, lobes 4–5.3 × 1.4–1.7 mm. Stamens inserted near apex of corolla tube, 5.5–7 mm long, filaments pubescent with sessile to subsessile glands less than 0.05 mm long, thecae 2–2.8 mm long, equal, parallel, equally to subequally inserted, glabrous, lacking basal appendages; pollen 3-colporate, 6-pseudocolpate. Style 9.5–15 mm long, recurved near apex, pubescent with flexuose to antrorse eglandular trichomes, stigma equally 2-lobed, lobes 0.2 mm long. Capsule 10–14 mm long, pubescent with retrorse to flexuose eglandular trichomes 0.05–0.2 mm long, stipe 4–5 mm long, head subcircular, 6–8 mm long. Seeds 4 (or fewer by abortion), sublenticular, 4.3–6 × 3.8–4.7 mm, surfaces mottled, smooth, shiny, and lacking trichomes, margin entire.

Phenology. Flowering: July–November; fruiting: July–August, November.

Distribution and habitat. Central Mexico (Querétaro; Fig. 2); plants occur in thornscrub and tropical deciduous forest at elevations from 900 to 1840 m.

According to Urban (1897), on one of several trips out of Zimapán, Hidalgo Ehrenberg traveled to Ajuntas and the Río Moctezuma via Caracol in January 1840. While there is an "Adjuntas" (or "Las Adjuntas") on modern maps in northwestern Hidalgo ca. 20 km east of the Río Moctezuma and to the north of Zimapán, there is also an "Ajuntas" on the west bank of the Río Moctezuma in Querétaro. The species has been collected recently in the vicinity of this latter locale, and it is assumed to represent the type locality.

Until 1990, this species was known only from a few collections and the brief and not very diagnostic description in the protologue. With the advent of a major collecting program in Querétaro in association with the *Flora del Bajío* project, numerous collections of the species have been made recently. These make a complete description of the species possible and allow for a reassessment of its generic position.

Although *Justicia* is an exceptionally large (ca. 700 species) and morphologically diverse genus, its species possess a corolla with a rugula on the upper lip, anther thecae that usually exhibit some modifications in position and/or ornamentation, and highly derived pollen (see Daniel, 1998). While some Mexican species have unmodified thecae and/or the 3-colporate, 6-pseudocolpate pollen typical of other *Justicieae* (see McDade et al., 2000), all have rugulate corollas. *Mirandea* is a genus of the "Tetramerium Lineage" of *Justicieae* (see McDade et al., 2000), characterized by relatively small (up to 20 mm long), infundibular corollas with a bilabiate limb that lacks a rugulate upper lip; stamens appressed to the upper lip of the corolla with thecae opening toward the lower lip; and the style recurved just proximal to the stigma (Daniel, 1982, 1995). In these, and other characters, the species described as *J. hyssopus* conforms to *Mirandea* rather than *Justicia* and is therefore transferred to the former genus. Pollen of *M. hyssopus* (Fig. 3) resembles that of other species in the genus (Daniel, 1998).

The five species of *Mirandea*, all endemic to Mexico, can be distinguished from one another by the following key.

KEY TO SPECIES OF *MIRANDEA*

- 1a. Corollas yellow; leaves petiolate, petioles 8–105 mm long, blades 50–200 × 18–105 mm, rounded to cordate at base; dichasia (1- to)3- to many-flowered, borne on peduncles to 13 mm long; plants of rain forests in southern Mexico *M. sylvatica* Acosta
- 1b. Corollas bluish or purplish; leaves sessile to short-petiolate, petioles 1–3 mm long, blades 3–40 × 1–7 mm, obtuse to acute to acute-attenuate

at base; dichasia 1-flowered, sessile or borne on peduncles to 4.5 mm long; plants of deserts and regions of thornscrub in central and northern Mexico.

- 2a. Leaves linear to linear-oblongate, 7–20 times longer than wide; calyx 5–7 mm long; style glabrous; capsules glabrous; plants of Tamaulipas *M. andradenia* T. F. Daniel
- 2b. Leaves lance-linear to lanceolate to ovate to elliptic to oblanceolate to obovate, 2–7 times longer than wide; calyx 3.5–5 mm long; style pubescent; capsules pubescent.
 - 3a. Bracts imbricate, broadly ovate to elliptic to subcircular, 8–16 × 6–9.5 mm; bracteoles 4.5–10 mm long; filaments pubescent with sessile to subsessile glands less than 0.05 mm long; seeds 4.3–6 mm long, testa smooth; plants of Querétaro and Hidalgo *M. hyssopus* (Nees) T. F. Daniel
 - 3b. Bracts not imbricate, subulate to lanceolate to narrowly ovate to narrowly elliptic, 2–6 × 0.8–2 mm; bracteoles 1–3 mm long; filaments eglandular; seeds 3.5–4 mm long, testa papillose.
 - 4a. Leaf margin flat, ciliate; dichasia pedunculate (peduncles 2–4.5 mm long), 1 per node, mostly secund; bracts narrowly ovate to narrowly elliptic, 2–4 mm long, eglandular; plants of Nuevo León *M. huastecensis* T. F. Daniel
 - 4b. Leaf margin revolute, eciliate; dichasia sessile, opposite at nodes, not secund; bracts lanceolate to subulate, 4.5–6 mm long, sometimes glandular; plants of San Luis Potosí and Tamaulipas *M. grisea* Rzedowski

Additional specimens examined. MEXICO. **Querétaro:** Mpio. Cadereyta, 1 km W de Las Moras, camino a San Joaquín, *J. Rzedowski* 51522 (IEB); 5 km de Las Moras a San Joaquín, *H. Díaz B. & E. Carranza* 7498 (CAS, IEB); Mpio. Cadereyta, 5.5 km NW de Vizarrón, *S. Zamudio* R. 3062 (IEB, MO); Mpio. San Joaquín, Cañada La Culebra, 1 km NE de La Tinaja, *S. Zamudio* R. 3199 (IEB, MO, TEX); Mpio. San Joaquín, Cañada La Culebra, 1 km NE de La Tinaja, *S. Zamudio* 3553 (IEB); Mpio. Peñamiller, 1 km SW de Higuerrillas, *S. Zamudio* 3705 (IEB); Mpio. Peñamiller, 6 km NE de Higuerrillas, *S. Zamudio & H. Díaz B.* 5308 (IEB); Mpio. Cadereyta, Cañada de La Culebra, NE de La Tinaja, *S. Zamudio & E. Pérez C.* 10000 (IEB); Mpio. Cadereyta, ca. 1 km N de La Florida, *S. Zamudio & E. Zamudio* 10263 (CAS, IEB, TEX).

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