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# Three New Species of *Justicia* (Acanthaceae) from Costa Rica

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**ABSTRACT.** *Justicia arborescens*, *J. circulibracteata*, and *J. densibracteata* are described and illustrated. *Justicia arborescens*, of the Monteverde Cloud Forest area, is rare or unique in its arboreal habit. *Justicia circulibracteata* is recognized by its spikelike inflorescences with spreading, suborbicular bracts 3–4 mm long, each bract bearing a spikelet with 2–5 secund flowers. *Justicia densibracteata* is recognized by its spicate panicles, inflorescences with nodes with one fertile and one highly reduced sterile bract, and 4-colporate pollen.

The intensive collecting effort of the collaborative team from the Instituto de Biodiversidad (InBio), the Missouri Botanical Garden, and a number of other institutions is yielding a great deal of new information about the Costa Rican flora, including species new to science, new records, and vastly improved data on the ranges of species. Among the former are several new species of *Justicia* that we have studied as part of our work to prepare the treatment of the Acanthaceae for the *Manual to the Plants of Costa Rica*.

As surveyed by Graham (1988), *Justicia* is the largest genus of the family, with at least 600 species worldwide and many no doubt yet to be described. It is also the most species-rich genus of Acanthaceae in Costa Rica with 30 species reported to date, three recently described by Gómez-Laurito and Hammel (1994).

As will be clear from this paper alone, *Justicia* as presently circumscribed is an exceedingly heterogeneous group. Earlier generations of students of Acanthaceae have recognized a number of genera as distinct from *Justicia*, but these have not withstood additional study. We suspect that, as the genus becomes better known, monophyletic lineages will be recognized within it and the group will be revised taxonomically at least at the infrageneric level. Graham's (1988) work represents a significant step in this direction. That we still have

considerable work to do is apparent from the fact that none of the species described here is successfully accommodated in Graham's (1988) classification. To facilitate comparison among species, we urge all who describe new taxa in *Justicia* to provide complete information on the characters that Graham employed in her analysis of the group (i.e., inflorescence type, bracts and bracteoles, calyx, corolla, androecium, pollen, fruit, and seeds). In particular, as a result of working with these new species, we are struck by the rich diversity of inflorescence morphology in these plants. It seems likely that careful study of inflorescence development and morphology would yield a great deal of phylogenetically useful information.

Two of the species described herein are from lowland wet forest on the Caribbean slope of Costa Rica, areas that have not received a great deal of attention from collectors in the past. In particular, the foothill elevations, between the coastal plain and about 700 m elevation, have been very poorly collected and are likely to yield additional new taxa. It is more surprising that the third species is from one of the best known sites in Costa Rica, the Monteverde Cloud Forest Reserve. That a treelet with large and conspicuous, orange-red flowers would have escaped notice until recently is especially unexpected. These discoveries highlight the value of intensive collecting of the sort being undertaken for the *Manual* project.

## ***Justicia arborescens* Durkee & McDade, sp. nov.**

**TYPE:** Costa Rica. Puntarenas: Monteverde, Río San Luis Valley on Pacific slope, 1000 m, 11 Nov. 1984, *Haber 893* (holotype, MO). Figures 1, 4A.

Frutex ad 7 m altitudine. Folia elliptica ad ovato-elliptica, saepe anisophylla, 7–25 cm longa, 1.2–7.5 cm lata, apice acuminato, basi attenuata; sessiles ad subsessiles. Inflorescentiae spiciformes vel paniculatae spiciformes, terminales ad 17 cm longitudine; bracteae rubiginosae, oblongae ad oblongo-lanceolatas, 7–13 mm longitudine, 2–3 mm latae. Flores aurantiaci ad aurantiaco-rubros, cor-

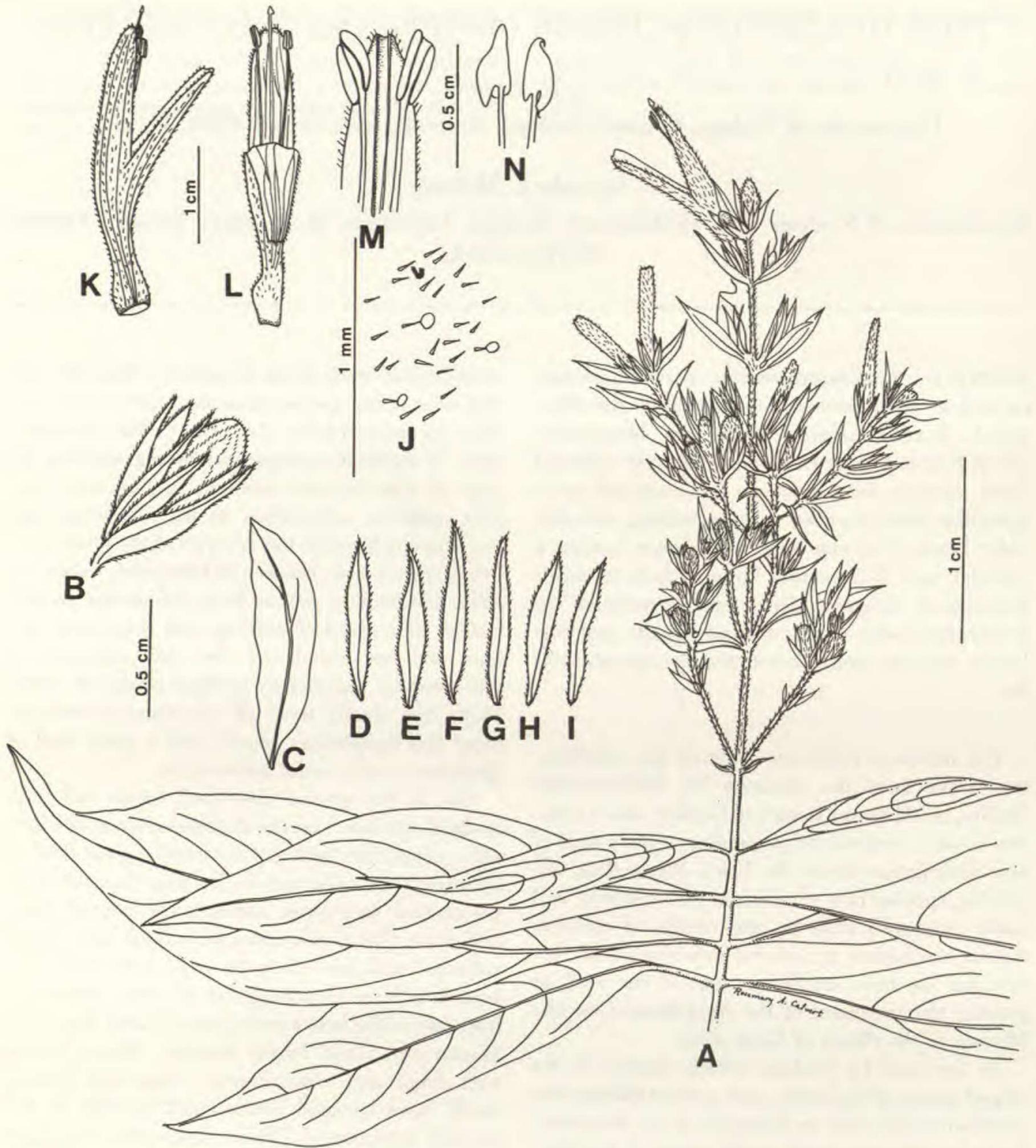


Figure 1. A–N, *Justicia arborescens* Durkee & McDade (Haber 893) —A. Habit. —B. Node showing bract, bractlet, calyx, and flower bud. —C. Bract. —D. Bractlet. —E–I. Calyx segments. —J. Glandular and eglandular trichomes of bracts. —K. Corolla, lateral view, with exerted style and stigma. —L. Corolla, ventral view. —M. Distal portion of corolla with style removed and anthers bent laterally to show rugula. —N. Anthers, dorsal view.

ollis 2.5–3 cm longis, staminibus exsertis. Fructus clavati, 18–21 mm longi, seminibus 4.

Understory shrub or tree to 7 m tall. Stem quadrangular, glabrous. Leaves elliptic to elliptic-ovate, often anisophyllous, 7–25 cm long, 1.2–7.5 cm broad, apically acuminate, basally long attenuate, margins entire to sparingly crenulate, glabrous, cystoliths abundant; petioles (unwinged por-

tion) 0–3 mm long. Inflorescences in terminal spicate panicles to 17 cm long, distal portions of inflorescences unbranched, with opposite bracts each bearing a single flower, proximal portions of inflorescences with opposite branches at each node, these 4-ranked, each subtended by a single bract (lateral branches sometimes additionally branched in larger inflorescences), ultimate branches of the

inflorescences spicate, with paired bracts at each node, one of these often sterile, nodes lax; floral bracts dull red, spreading, oblong to oblong-lanceolate, 7–13 mm long, 2–3 mm broad, sterile bracts similar but smaller, bracteoles similar but smaller; peduncles sparingly puberulous, rachises puberulous. Flowers one per bract; calyx 5-merous, lobes subulate, equal, 5.5–8 mm long, 0.65–0.75 mm broad, minutely puberulous; corolla bright orange to orange-red to red with yellow, 2.5–3 cm long, 2.6 mm broad at base, bilabiate, glandular-puberulous, lips 10–13 mm long, upper lip ca. 5.5 mm broad, apically minutely bilobed, lobes acute, ca. 0.3 mm long, lower lip ca. 4 mm broad, apically 3-lobed, lobes ca. 1 mm long, apically acute, lateral lobes ca. 0.8 mm broad, middle lobe ca. 1 mm broad; stamens exerted to about the tip of the upper lip, thecae attached one slightly above the other, 2.2–2.5 mm long, lower theca very slightly spurred, pollen prolate-perprolate,  $42\text{--}53 \times 24\text{--}27 \mu\text{m}$ , diporate with four longitudinal rows of ca. 9 insulae in each trema region, strongly flattened on porate surface, exine between the tremata reticulate; ovary 3.5–4.5 mm long, glabrous, style 17–18 mm long, glabrous, stigma linear, 0.5–0.7 mm long. Fruits a clavate capsule, 18–21 mm long, sterile stipe portion ca. 2.5–3 mm long, glabrous or essentially so, up to 4 ovules, mature seeds ca. 2.5–3 mm diam., tuberculate.

*Habitat, distribution, and phenology.* *Justicia arborescens* is a species of premontane moist forest slopes, thus far known from the Pacific slope of the Cordillera de Tilarán and the Cordillera Guanacaste, Costa Rica. It appears to occur in primary as well as secondary forest understory. Flowering collections have been made in June, August, November, December, and January, and it thus appears to flower during the wet to early dry seasons. Two fruiting collections have been made, both from Guanacaste, one in June and the other in December. Each of the fruiting collections also had flowers.

*Etymology.* The species epithet refers to the arboreal habit.

Using Graham's (1988) key to sections of *Justicia*, this new species keys to section *Plagiacanthus* and is consistent with most of this group's characteristics (i.e., compound inflorescences with spicate units, eglandular rachises, calyces of five equal parts, anther thecae slightly superposed). Inflorescence structure appears to conform to Graham's type H. *Justicia arborescens* has pollen type 7 (Graham, 1988), which is also common among members of section *Plagiacanthus*. The new species differs

from others in this section in having bracts that are longer rather than shorter than the calyx and corollas that are bright orange rather than red. Because the new species is not completely in line with the characteristics of Graham's section *Plagiacanthus*, we feel it is best not to formally place it in that section.

Among Costa Rican *Justicia*, *J. arborescens* is recognized by its arboreal habit, which is rare among neotropical species of the genus, its terminal spicate panicles with narrow spreading bracts that are dull red, its bright orange corollas, and its sessile to subsessile leaves that are often anisophyllous. The tallest *Justicia* species described for Costa Rica is *J. aurea* D. F. K. Schlechtendal, a shrub that attains a height of 6 m, has larger leaves (to 30 or more cm long), and thyrsoid inflorescences with long yellow corollas to 5.5 cm long. *Justicia trichotoma* (Kuntze) Leonard also has anisophyllous leaves, but it has numerous other differences and would not likely be confused with *J. arborescens*. In inflorescence, corolla shape, and color, *J. arborescens* is more similar to *J. tinctoria* (Oersted) D. N. Gibson, but differs in its arboreal habit (vs. shrubby), nearly sessile leaves (vs. with petioles to 1.2 cm long), terminal vs. axillary inflorescences, longer bracts (8–12 mm vs. 1–2 mm), longer calyx segments (6–7 mm vs. 2.25–3 mm), and its shorter corollas (2.5–3 cm vs. 3–4 cm). *Justicia spicigera* D. F. K. Schlechtendal, which is easily confused with *J. tinctoria*, also has orange corollas and can be distinguished from *J. arborescens* by a similar suite of characters.

None of the species of *Justicia* known from Nicaragua or Panama that do not also occur in Costa Rica is likely to be confused with *J. arborescens* (Durkee, 1978, and in prep.).

*Paratypes.* COSTA RICA. **Guanacaste:** along Río Las Flores between Quebrada Desprendimiento and Q. Sanguijuela, Hacienda Montezuma,  $10^{\circ}40'N$ ,  $85^{\circ}04.5'W$ , 450 m, 25 Jan. 1985, Grayum et al. 4917 (GRI, INB, MO); Parque Nacional Guanacaste, Estación Cacao, 1100 m, 2 Nov. 1990, Chavez 334 (CR, INB, MO, USJ); Parque Nacional Guanacaste, Estación Cacao, Quebrada Pedregal, streamside, 700–900 m, 6 June 1990, Hammel 17793 (ARIZ, INB, MO); Parque Nacional Guanacaste, Estación Maritza (on Volcan Orosí), 600 m, 29 Aug. 1990, Delgado 85 (ARIZ, CR, F, INB, MO). **Puntarenas:** Monteverde Cloud Forest Reserve, 1500 m, 10 Dec. 1985, Haber ex Bello 3619 (CR, MO); Monteverde, Río San Luis Valley on Pacific slope, 1100 m, secondary forest understory, 1100 m, 11 Nov. 1984, Haber 863 (ARIZ, CAS, GRI, INB, MO), Haber 891 (ARIZ, DUKE, GRI, INB, MO, US); Monteverde, Río San Luis valley below community, premontane moist forest on Pacific slope,  $10^{\circ}20'N$ ,  $84^{\circ}50'W$ , 1200 m, 30 Dec. 1985, Haber & Bello 4038 (MO); San Luis, on Río Guacimal, 700 m, 21 Dec. 1989, Haber &

Zuckowski 9668 (ARIZ, CAS, CR, DUKE, F, INB, MO, US).

**Justicia circulibracteata** Durkee & McDade, sp. nov. TYPE: Costa Rica. Limón: just SE of Puerto Viejo de Talamanca, along trail leading from cemetery, 9°39'N, 82°45'W, 100–150 m, 1 Aug. 1984, M. H. Grayum 3634 (holotype, MO). Figures 2, 4B.

Herbae ad 27.5 cm altitudine. Folia ovato-elliptica, 3–10 cm longa, 1.4–3.7 cm lata, apice acuminato, basi acuminata; petiolis 5–8 mm longis. Inflorescentiae terminales et axillares ad 8 cm longitudine; bracteae sub-orbiculares, 3–4 mm longae, 2.4–3 mm latae. Flores sub-rosei, corollis 6.5–7.5 mm longis, staminibus exsertis. Fructus clavati, 6–7.5 mm longi, seminibus 4.

Herb to 27.5 cm tall. Stem quadrangular, pubescence of younger stems bilineately retrorse. Leaves ovate-elliptic, 3–10 cm long, 1.4–3.7 cm broad, apically acuminate, basally acuminate, margins entire to slightly undulate, glabrous on both surfaces, cystoliths abundant on both surfaces of dried specimens; petioles 3–7 mm long, puberulous. Inflorescences in terminal and axillary compact cymose panicles (thyrses) appearing as spikes to 8 cm long, 1 cm broad, primary rachises with mainly bilineate retrorse hairs; peduncles 0.9–2.8 cm long, with bilineate retrorse hairs; bracts opposite, perpendicular to primary rachis at anthesis, suborbicular, 3–4 mm long, 2.4–3 mm broad, venation prominent, puberulous; each bract bearing what appears as a short spike with 2–5 secund flowers, the peduncle of the short spike nested in and nearly enclosed by the grooved petiole of the bract; bracteoles 2 per flower, oblanceolate, 2.5–3.5 mm long, 0.5–0.75 mm broad, puberulous-glandular. Flowers sessile, calyx 5-merous, lobes subulate, 3–4 mm long, puberulous, posterior segment smaller, 2–2.5 mm long; corolla pinkish, sparingly puberulous outside, bilabiate, 6.5–7.5 mm long, the upper lip erect, ca. 3 mm long, the lower lip ca. 2.5 mm long, obscurely 3-lobed; stamens exserted to ca. 0.5 mm from the tip of the upper lip, anther cells superposed, ca. 0.5 mm long, lower cell slightly smaller, pollen prolate,  $34\text{--}37 \times 23\text{--}25 \mu\text{m}$ , diporate with two rows of 5 insulae in each trema region, exine between tremata thickened, reticulate; ovary ca. 1 mm long, style ca. 11 mm long. Fruit a clavate capsule, 6–7.5 mm long, ca. 2 mm broad, ca. 1.5 mm thick, puberulous, ovules 4, seeds broadly obovate, asymmetrical at the hilar end, compressed, ca. 1.5 mm diam., muricate.

*Habitat, distribution, and phenology.* *Justicia circulibracteata* is known only from the type location on the Caribbean slope of southern Costa Rica

where it was collected in the understory of disturbed forest and cacao plantations. Plants collected in August (wet season) had both flowers and fruits.

*Etymology.* The specific epithet refers to the unusual circular shape of the floral bracts.

*Justicia circulibracteata* cannot be successfully keyed to any of Graham's (1988) sections, but plants in her section IV, *Tyloglossa*, have inflorescences resembling those of *J. circulibracteata*. These superficially resemble a simple spike, but with each node bearing two very reduced spicate units instead of single flowers. However, Graham described the flowers of the spicate units as "not secund." Pollen of *J. circulibracteata* is of Graham's (1988) type 5, which occurs in plants belonging to at least five of her sections, as well as in a number of species identified by her as of uncertain position.

Among other species of *Justicia* in Costa Rica, *J. parvibracteata* Leonard shares the unusual feature of having 2–4 flowers per bract (Durkee, 1986). *Justicia circulibracteata* may be distinguished from this species by bract size (3–4 mm vs. 3–6 mm long in *J. parvibracteata*), shape (suborbicular vs. elliptic to obovate), apical shape (rounded vs. obtuse, apiculate), and orientation (spreading and lax vs. erect and imbricate); leaf size ( $3\text{--}10 \times 1.4\text{--}3.7 \text{ cm}$  vs.  $3.5\text{--}7 \times 0.7\text{--}1.2 \text{ cm}$ ) and shape (ovate-elliptic vs. elliptic-oblong).

None of the Nicaraguan or Panamanian species of *Justicia* that do not also occur in Costa Rica is likely to be confused with *J. circulibracteata*. It is interesting, however, that three species of Panamanian *Justicia* recently described by Daniel and Wasshausen (1990) share pollen type 5 (Graham, 1988) with this new species. Plants of all three species also have spicate inflorescences with relatively broad bracts and small flowers; however, the bracts are closely imbricate and bear only a single flower in the Panamanian species.

**Justicia densibracteata** Durkee & McDade, sp. nov. TYPE: Costa Rica. Heredia: Cantón de Sarapiquí, Rara Avis Lodge, ca. 15 km SW of Horquetas, 10°15'–19'N, 84°0'–04'W, 400–600 m, 8 Nov. 1989, Vargas 297 (holotype, ARIZ; isotypes, DUKE, INB, MO). Figures 3, 4C.

Frutex ad 1.5 m altitudine. Folia ovata, 9–22 cm longa, 4.5–13.5 cm lata, apice acuminato, basi acuta ad attenuatam; petiolis 3–8 cm longis. Inflorescentiae paniculatae spiciformes, terminales ad 19 cm longitudine; bracteae virides, imbricatae, ellipticae ad spatulatas, 12–22 mm longae, 7–12 mm latae, apice apiculato. Flores albi, corollis 2.7 cm longis, staminibus exsertis. Fructus clavati, 14–16 mm longi, seminibus 4.

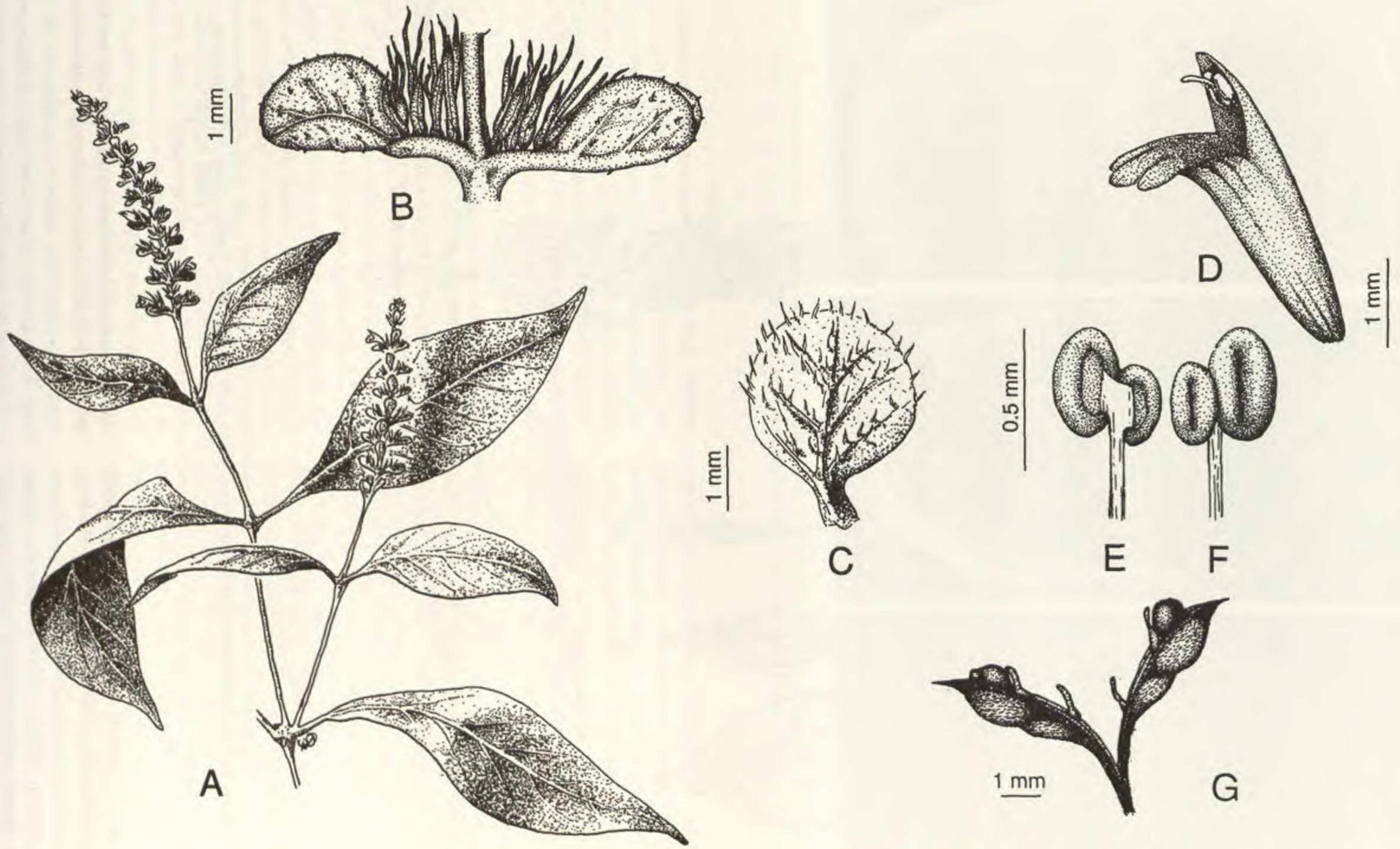


Figure 2. A-G, *Justicia circulibracteata* Durkee & McDade (*Grayum* 3634). —A. Habit. —B. Node of inflorescence showing opposite bracts each subtending short inflorescences with secund flowers. —C. Bract. —D. Corolla. —E, F. Dorsal and ventral views, respectively, of anther. —G. Dehiscent capsule.

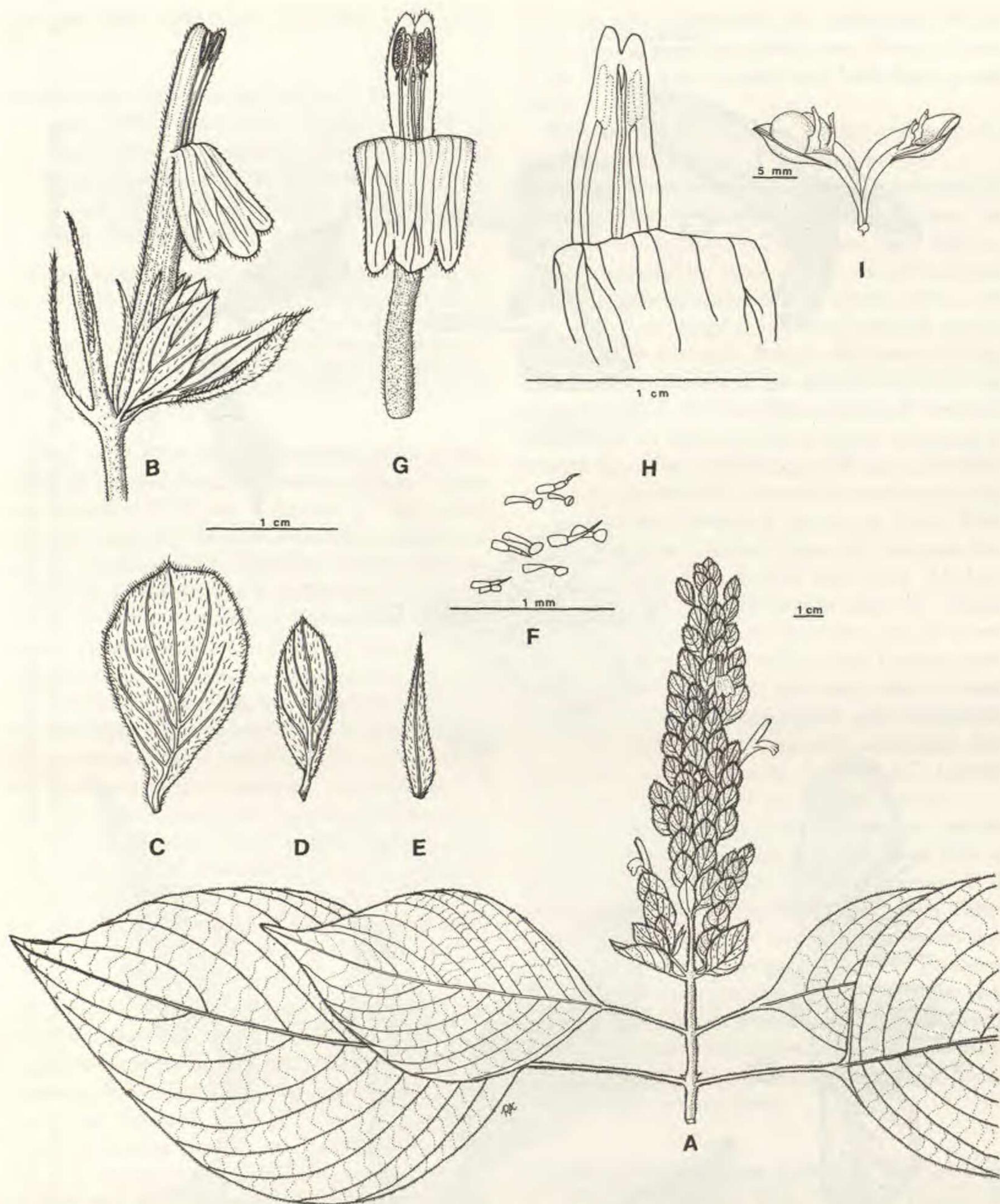


Figure 3. A–J, *Justicia densibracteata* Durkee & McDade (Vargas 297). —A. Habit. —B. Node of inflorescence with sterile and fertile bracts; fertile bract showing bractlets, calyx, and corolla. —C. Fertile bract. —D. Bracteole. —E. Calyx segment. —F. Glandular and multiseriate trichomes of bracts. —G. Corolla. —H. Distal portion of corolla with anthers and style removed to show rugula. —I. Dehiscent capsule. (Note that B–E and G are drawn to same scale.)

Shrub ca. 1.5 m tall. Young stem quadrangular, sparingly puberulous. Leaves ovate, 9–22 cm long, 4.5–13.5 cm broad, apically acuminate, basally obtuse to acute to slightly attenuate, margins entire, glabrous above, puberulous on costa and main veins beneath, cystoliths abundant and visible on

both surfaces of dried leaves; petioles 3–8 cm long, puberulous. Inflorescences in terminal, densely and oppositely branched, spicate panicles to 19 cm long, 5 cm broad; peduncle of entire inflorescence to 2.5 cm long, puberulous; rachises more densely puberulous than peduncle; spikes (i.e., branches of

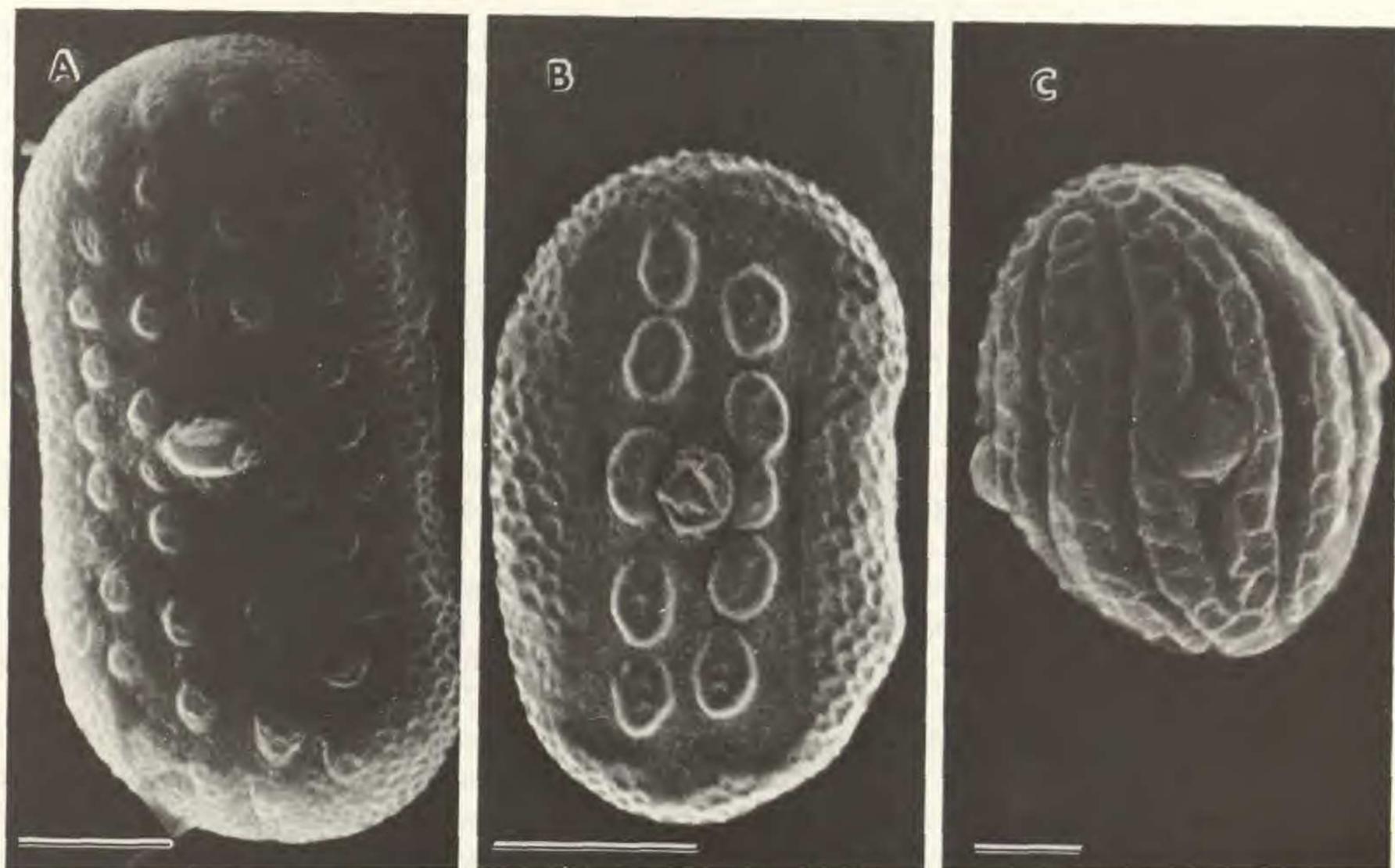


Figure 4. Scanning electron micrographs of *Justicia* pollen. —A. *J. arborescens* (Haber 893). —B. *J. circulibracteata* (Grayum 3634). —C. *J. densibracteata* (M. Grayum et al. 7937). Scale lines represent 10  $\mu\text{m}$ .

the compound inflorescence) to 6 cm long, shorter toward apex of inflorescence, nodes bearing one fertile, externally oriented bract and one sterile, internally oriented bract, fertile bracts green, midrib often reddish, imbricate, elliptic to broadly spatulate, 12–22 mm long, 7–12 mm broad, apically apiculate, glandular-puberulous, eglandular trichomes uniseriate and multicellular, ciliate, sterile bracts subulate, ca. 10 mm long, 1.9 mm broad; bracteoles oblanceolate, 11–17 mm long, 4–7 mm broad, pubescence like bracts. Flowers one per bract; calyx 5-merous, lobes subulate, ca. 10 mm long, 2 mm broad, glandular-puberulous, ciliolate; corolla white tinged with purple externally, 2.7–2.9 cm long (including lips), the tube cylindrical, 2.5 mm broad, expanding slightly at the throat to ca. 3 mm, puberulous, lips 10 mm long, upper lip 4 mm broad, minutely bilobed, lobes ca. 1 mm long, lower lip 5–6 mm broad at base of lobes, three-lobed, the lobes ca. 3 mm long, middle lobe ca. 3 mm broad, lateral lobes ca. 2 mm broad; stamens exerted to tip of upper lip, thecae attached one slightly above the other, ca. 4 mm long, both spurred but the upper theca less so; pollen prolate, 48–55  $\times$  39–45  $\mu\text{m}$ , 4-colporate, pores operculate, paired inaperturate colpi lying between each pair of aperturate colpi, aperturate colpi extending ca.  $\frac{2}{3}$  the distance from equator to poles, adjacent inaperturate colpi

joined near the poles, sculpting of intercolpate regions coarsely reticulate, sculpting of colpi essentially smooth; stigma minutely bilobed and infundibular reaching to ca. 2–3 mm from tip of upper lip, style in a dorsal rugula of corolla, filiform, hyaline, ca. 25 mm long, ovary ca. 1.5 mm long, sparsely puberulous, trichomes as on bracts, borne on a disk ca. 2 mm diam. Fruit clavate, 14–16 mm long, ca. 4 mm broad, ca. 3.5 mm thick, puberulous; seeds 4, suborbicular, compressed, surface minutely reticulate, ca. 3 mm diam.

*Habitat, distribution, and phenology.* *Justicia densibracteata* is found in wet primary forest between sea level and about 600 m on the Caribbean slope of Costa Rica. Collectors working at these elevations at other sites on the Caribbean slope of Costa Rica, adjacent Nicaragua, and Panama should watch for this distinctive plant. Plants collected in January had both flowers and fruits; however, many more collections will be needed before flowering and fruiting seasons can be determined with confidence.

*Etymology.* The specific epithet refers to the compact arrangement of the bracts in the inflorescences.

Using Graham's (1988) key to sections of *Justicia*, this new species keys to section *Plagiacanthus*,

a group characterized by compound inflorescences with spicate units, glandular rachises, and calyces of five equal parts. This species, however, differs from members of this section in having elliptic to obovate bracts that exceed the calyx (vs. subulate bracts that are shorter than the calyx) and in pollen type. The pollen of *J. densibracteata* does not correspond to any of the types described by Graham (1988), differing in number and type of apertures as well as in sculpturing. However, it bears considerable resemblance both in nature of apertures and sculpture pattern to the pollen of *J. montana* (Standley & Leonard) D. N. Gibson of Guatemala (Gibson, 1972), *J. orosiensis* Durkee (Durkee, 1986), and to that of two species of *Dicliptera* from the Guianas (Wasshausen, 1991), although pollen grains of the *Dicliptera* species are 3-colporate. Clearly much work remains to be done on pollen morphology and its taxonomic significance in these plants.

Among Costa Rican species of *Justicia*, *J. densibracteata* is distinctive and may be recognized by its spicate panicles with large, green, imbricate bracts, nodes bearing one fertile and one sterile bract, narrow, white corollas, 4-colporate pollen, and rather large ovate leaves. It bears considerable resemblance to *J. peninsularis* Gómez-Laurito & Hammel (of the Osa Peninsula), which has similar inflorescences with nodes bearing one fertile and one sterile bract. The two species can be distinguished by the breadth, shape, and vestiture of their fertile bracts (5–8 mm broad, narrowly spatulate, with multiseriate eglandular trichomes and minute sessile glands in *J. peninsularis* vs. 7–12 mm broad, elliptic to broadly spatulate, with multiseriate eglandular and glandular trichomes in *J. densibracteata*), size of bracteoles (10–15 mm long, 1–2.5 mm broad in *J. peninsularis* vs. 11–17 mm long, 4–7 mm broad in *J. densibracteata*), length of calyx (8–9 mm long in *J. peninsularis* vs. ca. 10 mm long in *J. densibracteata*), and size and vestiture of capsules (9–12 mm long, glabrous in *J. peninsularis* vs. 14–16 mm long, puberulous in *J. densibracteata*). Perhaps the strongest evidence for recognizing these two species as distinct is that pollen grains are quite different: those of *J. densibracteata* lack insulae, whereas pollen grains of *J. peninsularis* have the pores flanked by rows of six or seven insulae. Gómez-Laurito and Hammel (1994: 357) have noted the similarity of these two species and refer to several additional differences. A number of these alleged differences do not appear to be the case now that additional material of both species is available. From our studies, it appears that at least some specimens of *J. peninsularis* have

sparsely pubescent rather than glabrous leaves and pedicels (e.g., *Marin* 293, MO), and flowers that, like those of *J. densibracteata*, are white with purple markings rather than green. The leaves of *J. peninsularis* do appear to be larger than those of *J. densibracteata*, but there is considerable overlap. Still these two species can be distinguished readily by the differences presented above.

*Justicia densibracteata* also resembles *J. orosiensis* Durkee, which has similar inflorescences with nodes of branches bearing one fertile and one sterile bract, as well as 4-colporate pollen. *Justicia densibracteata* differs in its longer, glandular-puberulous bracts (12–22 mm long vs. 6–8 mm, mostly basally strigose), longer, glandular-puberulous calyx segments (ca. 10 mm long vs. 6–7 mm, glabrous), and longer, puberulous corollas (2.7 cm long vs. 1.6–1.7 cm, glabrous).

Among Panamanian species of *Justicia* that do not also occur in Costa Rica, three species recently described by Daniel and Wasshausen (1990), *J. fortunensis*, *J. veraguensis*, and *J. readii*, have spicate inflorescences and bracts that are similar in shape to those of *J. densibracteata*. However, these species have simple, unbranched spikes that are axillary as well as terminal, and corollas that are much shorter than those of *J. densibracteata* (to 19 mm in *J. readii* vs. 27 mm long).

No species of *Justicia* are known to occur in Nicaragua that are not also found in Costa Rica, thus none additional with which *J. densibracteata* might be confused (Durkee, in prep.).

Although similar to this new species palynologically (see above), the Guatemalan species *Justicia montana* (Standley & Leonard) D. N. Gibson is a decumbent plant with much smaller leaves, bracts and calyces.

*Justicia chol* T. F. Daniel of Mexico (Daniel, 1995) also has spikelike inflorescences with nodes bearing one fertile and one sterile bract, but its pollen is 3-aperturate. As noted in the introduction, inflorescence architecture warrants further study in these plants as a character of potential phylogenetic utility.

*Paratypes.* COSTA RICA. **Limón:** Zona Protectora Barbilla, 10°00.5'N, 83°28.5'W, SE of Siquirres in primary forest, 600–660 m, 11 Jan. 1987, *M. Grayum et al.* 7937 (INB, MO); Parque Nacional Tortuguero, Estación Agua Fría, 3 km sur siguiendo el Sendero Real, bosque primario, 10°27'N, 83°34'W, 40 m elev., 18 Jan. 1988, *R. Robles* 1524 (DUKE, INB, MO).

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