

**COMPOSITAE OF CENTRAL AMERICA–V.
THE GENUS *BRICKELLIA* (EUPATORIEAE) IN COSTA RICA**

JOHN F. PRUSKI

Missouri Botanical Garden
P.O. Box 299
St. Louis, Missouri 63166

J. ESTEBAN JIMÉNEZ

Programa Regional de Posgrado en Biología
Universidad de Costa Rica
San José, Costa Rica

DAGOBERTO RODRÍGUEZ

Asociación Jardín Botánico La Laguna
Herbario LAGU
La Libertad, El Salvador

ABSTRACT

A synopsis of *Brickellia* (Compositae: Eupatorieae) in Costa Rica is provided and includes the report of *Brickellia kellermanii* as a new record both for Costa Rica and El Salvador. Images of each Costa Rican species (*B. argyrolepis*, *B. diffusa*, and *B. kellermanii*) are given, and generically important features of *Brickellia* are illustrated. As in previous classifications, *B. argyrolepis* and *B. kellermanii* are placed into *Brickellia* sect. *Bulbostylis* A. Gray (a nom. nov. at the sectional rank for *Bulbostylis* DC. non Steven), which by lectotypification includes the homotypic synonym *Brickellia* sect. *Coleosanthus*; and *B. diffusa* is placed in *Brickellia* sect. *Leptanthodium* B.L. Rob.

The American genus *Brickellia* Elliott is a species-rich, traditionally recognized genus of Compositae tribe Eupatorieae (Bentham & Hooker 1873; Gray 1884; Robinson 1913). *Brickellia* may be recognized most readily by its (4–)8–10-costate fruits (Fig. 5) and setose nodal stylopodium (Figs. 1C, 5). Other features useful in distinguishing *Brickellia* from other Costa Rican Eupatorieae (Standley 1938; King and Robinson 1987) are its involucre with all phyllaries persistent (Fig. 6D), shortly lobed funnellform corollas (Fig. 5), anthers with collar about as wide as the filaments and with appendage longer than wide with an obtuse to rounded apex (Fig. 1A), anther collar cells slightly annular-thickened, anther endothelial tissue transitional with irregular thickenings on both transverse and vertical cell walls (Fig. 1B), and a pappus of many capillary bristles (Fig. 5).

Brickellia was revised a century ago by Robinson (1917), who recognized 91 species, these mostly centered in Mexico. King and Robinson (1987) in their generic monograph of tribe Eupatorieae recognized 98 species in the genus. More recently, Pruski (1997) estimated as 98–110 the number of species in *Brickellia*, Turner (1997) gave as 90 the number, with "about 78 of these native to Mexico," and Scott (2006) recognized about 100 species, with 32 found in the United States. Schilling et al. (2015) sectionally placed 97 species, synonymized *Barroetia* A. Gray and *Phanerostylis* (A. Gray) R.M. King & H. Rob., and pointed out that 31 of B.L. Robinson's 91 recognized species have since been synonymized or removed.

The number of species of *Brickellia* diminishes southeastward throughout Central America, with Dillon et al. (2001) treating five species in Nicaragua, Standley (1938) recording only *B. argyrolepis* B.L. Rob. and *B. diffusa* (Vahl) A. Gray in Costa Rica, and King and Robinson (1975) citing only *B. diffusa* in Panama, although *B. argyrolepis* was subsequently reported in Panama by

D'Arcy (1987a, 1987b). We recognize here three species of *Brickellia* in Costa Rica: the two treated by Standley (1938) as well as *B. kellermanii* Greenm., which is reported as new for Costa Rica and also as new for El Salvador.

Two of our Costa Rican species, *Brickellia argyrolepis* and *B. kellermanii*, were placed by Robinson (1917) in *Brickellia* sect. *Bulbostylis* A. Gray (1852), a sectional name that by ICN Art. 58.1 is a nom. nov. (avowed substitute) for the generic name *Bulbostylis* DC., non Steven. Schilling et al. (2015) also treated *B. argyrolepis* and *B. kellermanii* (albeit there implicitly in synonymy with *B. oliganthes* (Less.) A. Gray) as consectional. Our third Costa Rican species, *B. diffusa*, was placed in *Brickellia* sect. *Leptanthodium* B.L. Rob. by each Robinson (1917) and Schilling et al. (2015). In the abbreviated generic synonymy below, nomenclatural status (when either a homonym, conserved name, or rejected name) of genera is indicated, and in the sectional nomenclator and species key that follow the genus description, the sectional dispositions (following Robinson 1917 and Schilling et al. 2015) of the three Costa Rican species are indicated.

BRICKELLIA Elliott (1823, nom. cons., non *Brickellia* Raf. 1808, hom. rej.). **TYPE:** *Brickellia cordifolia* Elliott.

Barroetia A. Gray, *Bulbostylis* DC. (1836, hom. illeg. et rej., non Steven 1817, nom. rej., nec Kunth 1837, nom. cons.), *Clavigera* DC., *Coleosanthus* Cass. (1817, nom. rej.), *Ismaria* Raf., *Kuhnia* L. (1763, nom. rej.), *Phanerostylis* (A. Gray) R.M. King & H. Rob., *Rosalesia* La Llave.

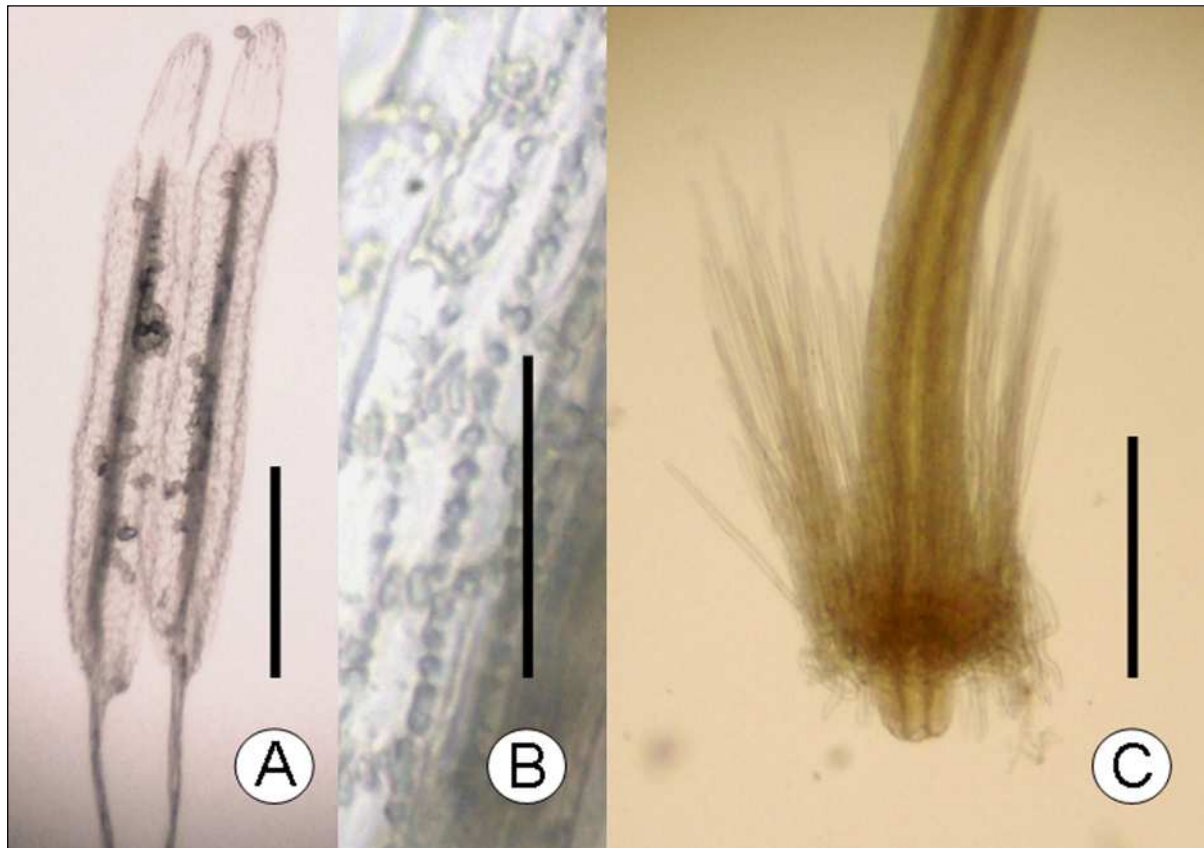


Figure 1. Floral microcharacters of *Brickellia diffusa*, characteristic of the genus. A. Anthers showing slender collar and long apical appendage with an obtuse apex. B. Endothelial tissue transitional showing irregular thickenings on both transverse and vertical cell walls. C. Long-setose nodular stylopodium. All from Pruski, Ortiz & Martínez 4196, MO. [scale bars: A 0.2 mm, B 30 μ m, C 0.2 mm].

Annual or perennial herbs to shrubs. **Leaves** opposite or alternate, petiolate or sessile; blade commonly puberulent or glandular, 3-veined from near base, margins usually dentate. **Capitulescence** usually terminal and thyrsoid-paniculate. **Capitula** discoid, sessile to long-pedunculate; involucre narrowly cylindrical to campanulate; phyllaries subimbricate, graduate, 3–5-seriate, narrow, mostly relatively thin-textured, pale-costate, persistent; clinanthium epaleate. **Ray florets** 0. **Disk florets** bisexual; corolla funnelform, shortly 5-lobed, usually white to ochroleucous, corolla lobe surfaces smooth; anther collar slender, about as wide as filaments, collar cells typically with indistinct transverse bead-like annular thickenings, endothelial tissue transitional with irregular thickenings on both transverse and vertical cell walls, apical appendage longer than wide, apex obtuse to rounded, never truncate; style trunk with two vascular traces, stylopodium enlarged (nodular), long-setose, setae unicellular, style branches narrowly clavate, appendage about as long as or longer than proximal stigmatic portions of branch. **Cypselae** (4–)8–10-costate, setulose, black with rimmed tan carpodium; pappus of many elongate isomorphic persistent barbellate(–plumose) capillary bristles. $x = 9$.

The two sections of *Brickellia* in Costa Rica

1. BRICKELLIA SECT. BULBOSTYLIS A. Gray, Smithsonian Contr. Knowl. 3(5): 84. 1852, as "§ *Bulbostylis*." Replaced name: *Bulbostylis* DC., Prodr. 5: 138. 1836, non Steven 1817, nec Kunth 1837. [The sole infrageneric rank used by Gray (1852) is section, and in *Laphamia* A. Gray (1852: 99) both the word 'section' and symbol '§' are used and equated. The Asa Gray avowed substitute name is thus not an unranked infragenus.]. **LECTOTYPE** (King and Robinson, Sida 3: 332. 1969): *Coleosanthus cavanillesii* Cass. (= *Brickellia cavanillesii* (Cass.) A. Gray).

Brickellia sect. *Coleosanthus* (Cass.) E.E. Schill. & R. Scott, Phytotaxa 234: 154. 2015, nom. superfl. Basionym: *Coleosanthus* Cass., Bull. Sci. Soc. Philom. Paris 1817: 67. 1817. [This name is nomenclaturally superfluous and homotypic with the earlier *Brickellia* sect. *Bulbostylis*, a name which should have been adopted (ICN Art. 52.1).]. **LECTOTYPE** (King and Robinson, Sida 3: 333. 1969): *Coleosanthus cavanillesii* Cass. (= *Brickellia cavanillesii* (Cass.) A. Gray).

Species in Costa Rica: *Brickellia argyrolepis* B.L. Rob., *Brickellia kellermanii* Greenm.

2. BRICKELLIA SECT. LEPTANTHODIUM B.L. Rob., Mem. Gray Herb. 1: 24. 1917. **LECTOTYPE** (Schilling et al., Phytotaxa 234: 155. 2015): *Eupatorium diffusum* Vahl (= *Brickellia diffusa* (Vahl) A. Gray).

Species in Costa Rica: *Brickellia diffusa* (Vahl) A. Gray.

The most common species in Costa Rica is the annual herb *Brickellia diffusa* (Figs. 1, 3). It also is the most widespread species of *Brickellia* in the neotropics. Less common are two perennial species, of which the relatively rare *B. kellermanii* (Figs. 4–6) is known in Costa Rica from a single collection made in Guanacaste. The relatively well-collected *B. argyrolepis* (Figs. 2, 4) is typified by seven syntype collections from Costa Rica, known in four provinces, and represented in Costa Rica by more than two dozen collections. Robinson (1917) placed both *B. argyrolepis* and *B. kellermanii* in *Brickellia* sect. *Bulbostylis*, but in different subsections, which he distinguished by relative petiole lengths.

Of the six species of *Brickellia* known in Central America (viz Williams 1976; King and Robinson 1987), only *B. scoparia* (DC.) A. Gray, diagnosed by its narrowly lanceolate leaves, is not expected in Costa Rica. Both *B. glandulosa* (La Llave) McVaugh and *B. paniculata* (Mill.) B.L. Rob. should be looked for in Costa Rica; they are known to occur from Mexico southeastwards into

Nicaragua (King and Robinson 1987; Dillon et al. 2001), and by moderately chartaceous ovate leaves both would key below to or near *B. argyrolepis*. As an aside we should mention that it seems likely that the citation by Turner (1997) of *B. cavanillesii* in Chiapas is in reference to material we would determine as *B. paniculata*. *Brickellia glandulosa* and *B. paniculata* are distinguished from *B. argyrolepis* by their stipitate-glandular peduncles, and *B. glandulosa* further distinguished by its outer more herbaceous phyllaries about half as long as the inner.

Key to species of *Brickellia* in Costa Rica

1. Annual herbs; stems usually glabrous; capitula 6–8 mm long; phyllaries 2-costate; (*Brickellia* sect. *Leptanthodium* B.L. Rob.) 2. ***Brickellia diffusa*** (Vahl) A. Gray

1. Subshrubs or shrubs; stems pubescent; capitula 12–16 mm long; phyllaries mostly 5–8-costate; (*Brickellia* sect. *Bulbostylis* A. Gray).

2. Leaf blades ovate to cordiform, moderately chartaceous, not prominently reticulate, margins crenate-dentate; petioles mostly 1–5 cm long; disk florets 20–25; involucre 12–14 mm long 1. ***Brickellia argyrolepis*** B.L. Rob.

2. Leaf blades lanceolate or elliptic-ovate to oblong, rigidly chartaceous or subcoriaceous, strongly reticulate, margins subentire to crenulate; petioles 0.1–0.5 cm long; disk florets 10–14; involucre 10–12 mm long 3. ***Brickellia kellermanii*** Greenm.

1. BRICKELLIA ARGYROLEPIS B.L. Rob., Mem. Gray Herb. 1: 90. 1917. **SYNTYPES: COSTA RICA. Cartago.** Agua Caliente, 1190 m, Apr 1894, *J.D. Smith 4859* (GH, K, US). **Heredia.** San Rafael, sin. elev., 13 Feb 1890, *Pittier (Tonduz) 1980* (CR, GH, US). **San José.** Forêts de San Marcos, 1355 m, Mar 1893, *Tonduz 7719* (as "7710" in protologue) (MO); Environs de San Marcos, 1355 m, Mar 1893, *Tonduz 7762* (CR, GH, US); Ad Copey, 1800 m, Mar 1898, *Tonduz 11847* (CR, GH); Ad San José, 1160 m, 3 Apr 1909, *Tonduz 17465* (GH). **Without specific locality.** Sin. elev., Apr 1910, *Worthen s.n.* (MO-47689). The collector given on a few sheets as 'Pittier' has been changed en sched. to 'Tonduz.' The identity of the species is not in doubt, none of the seven cited syntype collections are mixed with other species, and although *Tonduz 17465* (GH) is annotated (but perhaps not published) as the lectotype, lectotypification is not needed taxonomically. Figures 2, 4.

Brickellia adenocarpa B.L. Rob., *Brickellia guatemalensis* B.L. Rob., *Coleosanthus adenocarpus* (B.L. Rob.) Arthur

Shrubs 1–3 m tall; stems puberulent or hirtellous distally. **Leaves** opposite, petiolate; petiole mostly 1–5 cm long; blade mostly 3–12 × 2–7 cm, ovate to cordiform, moderately chartaceous, base broadly obtuse or rounded to subcordate, apex acute, not prominently reticulate, surfaces hirtellous to densely villous-pilose, abaxial surface punctate-glandular, margins crenate-dentate. **Capitulescence** of several few-capitulate convex to rounded corymbiform clusters; peduncles somewhat stiff but capitula sometimes nutant, short, pilose, not stipitate-glandular. **Capitula** 14–16 mm long; involucre cylindrical in young flower but quickly becoming broadly turbinate to campanulate, 12–14 mm long; phyllaries 6–7-seriate, strongly and evenly graduate with inner phyllaries twice as long as the outer ones, ovate to lanceolate, chartaceous, mostly 5–7-costate, hirsute, apex acute. **Disk florets** 20–25; corolla 7–9 mm long. **Cypselae** 4.5–6 mm long, spreading setose-pilose, also glandular; pappus bristles 7–9 mm long. $2n = 18$.

Representative specimens examined. COSTA RICA. Alajuela. Cinco Esquinas de Carrizal, 2000 m, 3 Feb 1966, *Jiménez 3656* (CR, F, MO); 2 km southwest of Zarcero, 1890 m, 30 Jan 1972, *King 6431* (CR, MO, NY, US). **Cartago.** Volcán Irazú, camino a Prusia, 3300–3400 m, 1 May 2003, *Alfaro & Quirós 4257* (CR, MO); Entre Cot y Tierra Blanca, 2060 m, 19 Feb 1997, *Rodríguez et al.*

2011 (CR, MO). **Heredia.** Santa Barbara, Río Los Ahogados, 1500 m, 13 Jun 1950, *León 2538* (CR). **San José.** Along Quebrada Cima, 1.5 km NE of Copey, 1960 m, 27 Feb 1990, *Grayum et al. 9693* (CR, MO); Villa Rancho Redondo, 1800 m, 14 Feb 1967, *Weston 4304A* (MO, UC).

Distribution and ecology. *Brickellia argyrolepis* ranges from Mexico southeastwards into Panama. In Costa Rica *B. argyrolepis* occurs mostly in disturbed vegetation and in montane forest (infrequently in premontane forest and páramo) between 1100–2800(–3400) meters elevation in the central portion of the country, especially in Cordillera Volcánica Central and Cordillera de Talamanca. The species usually flowers from January to May.

Williams (1976) treated *Brickellia argyrolepis* and *B. guatemalensis* B.L. Rob. as synonyms of stipitate-glandular *B. paniculata*, and noted that the type of *B. argyrolepis* was “not specified.” Clewell (1975), King and Robinson (1987), and Turner (1997) recognized pilose-peduncled *B. argyrolepis* as distinct, with *B. guatemalensis* treated in synonymy of it. By its stipitate-glandular peduncles and non-leafy involucre, *B. adenocarpa* var. *glandulipes* B.L. Rob. is excluded from synonymy with *B. argyrolepis* and here placed in synonymy with *B. paniculata*. Klatt (1892: 196; 1896: 283) cited *B. hartwegii* A. Gray in Costa Rica based on *Pittier 1980, Tonduz 7719*, and *Tonduz 7762*, but Robinson (1917) cited each as *B. argyrolepis*, and King and Robinson (1987) gave *B. hartwegii* as a synonym of extra-Costa Rican *B. paniculata*.



Figure 2. Syntype of *Brickellia argyrolepis* (Worthen s.n., MO-47689).

2. **BRICKELLIA DIFFUSA** (Vahl) A. Gray, Smithsonian Contr. Knowl. (Pl. Wright. I) 3(5): 86. 1852. *Eupatorium diffusum* Vahl, Symb. Bot. 3: 94. 1794. *Bulbostylis diffusa* (Vahl) DC., Prodr. 7: 268. 1838. *Coleosanthus diffusus* (Vahl) Kuntze, Revis. Gen. Pl. 1: 328. 1891. **TYPE:** AMERICA MERIDIONALIS. Sin. loc., Anon. (holotype: C, IDC microfiche set 2201). Although the subtitle of Vahl's *Symbolae Botanicae* mentions the plants as collected by Forsskal, for *B. diffusa* this appears not to be the case, as the plant is American but Forsskal never collected in the Americas. The type instead may be a gathering of von Rohr. Figures 1, 3.

Chondrilla rhombifolia (Humb. ex Willd.) Poir., *Eupatorium leptopodum* Gardner, *Eupatorium trichosantherum* A. Rich., *Prenanthes rhombifolia* Humb. ex Willd.

Much-branched annual herbs 0.3–1(–2) m tall; stems usually glabrous. **Leaves** opposite becoming alternate in capitulescence, long-petiolate; petiole 1–7 cm long; blade mostly 4–10 × 3–6.5 cm, broadly ovate, thin-chartaceous, surfaces glabrous or glabrous but with abaxial surface also sometimes punctate-glandular, base broadly obtuse to subcordate with basal acumen, margins crenate-dentate. **Capitulescence** a much-branched diffuse pluricapitulate panicle; peduncles filiform, glabrous. **Capitula** 6–8 mm long; involucre 6–7.5 mm long, cylindrical to narrowly turbinate; phyllaries 2–3-seriate, evenly graduated, all ≤ 1 mm diam., linear-lanceolate to lanceolate, scarious-chartaceous, 2-costate, glabrous, outer 1–2 mm long, inner 6–7.5 mm long. **Disk florets** 5–14; corolla 4–5.5 mm long. **Cypselae** 1–2 mm long, appressed-setulose; pappus bristles 4–5 mm long. $2n = 18$.

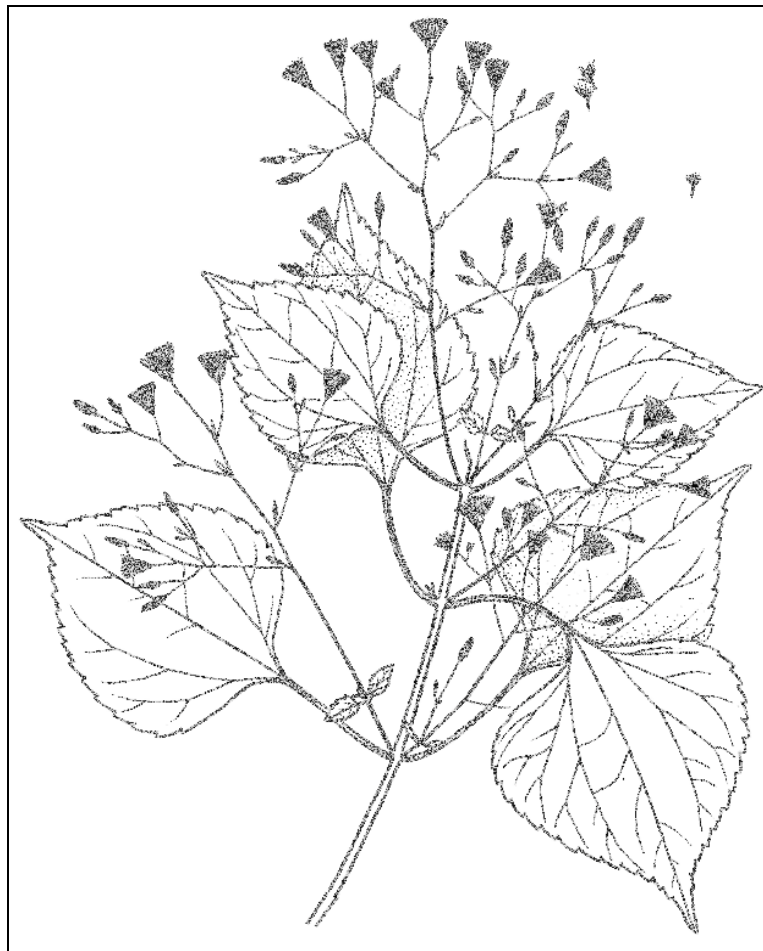


Figure 3. *Brickellia diffusa* line drawing. Reproduced from Pruski 1997, Fig. 175.

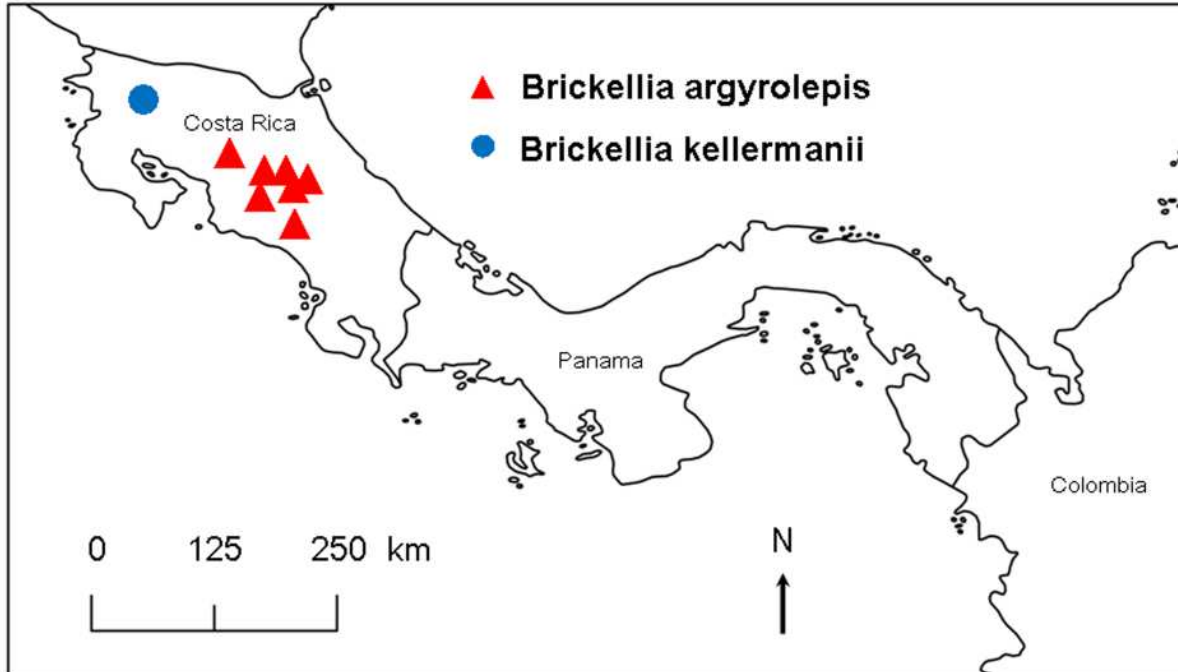


Figure 4. Distributions of *Brickellia argyrolepis* and *Brickellia kellermanii* in Costa Rica. *Brickellia diffusa* is not plotted, but is common throughout much of Costa Rica, especially on the Pacific watershed.

Representative specimens examined. COSTA RICA. Guanacaste. 30 km NW of Liberia, 0–320 m, 24 Dec 1981, *Janzen 12128* (MO); Parque Nacional Santa Rosa, entre la Casona y entrada, 300 m, 27 Feb 1996, *Morales 5312* (CR, MO); Nicoya, 1 Feb 1900, *Tonduz 13604* (CR). **Heredia.** Alrededores de Heredia, 1140 m, 25 Dec 1930, *Brenes 13269* (CR, NY); Belén, 972 m, 27 Jan 2010, *Solano 6129* (CR, MO). **Puntarenas.** Península de Nicoya, Playa Organos y alrededores, 10–100 m, 6 Feb 1993, *Hammel 18790* (CR, MO, TEX); Buenos Aires, Río Ceibo, 200 m, 1 Jan 1892, *Tonduz 4928* (CR). **San José.** Santa Eduvigis de Escazú, 1150 m, 17 Feb 1990, *Grayum 9680* (CR, MO, TEX); Vicinity of El General, 640 m, Jan 1939, *Skutch 3988* (MO, NY, US).

Distribution and ecology. *Brickellia diffusa* is common in Costa Rica in disturbed vegetation and in dry, humid, and premontane forests mostly on the Pacific watershed from sea level to about 1200 meters elevation. The species flowers in Costa Rica mostly from December to February. *Brickellia diffusa* is widespread in the Americas and is found from Mexico and the West Indies southwards to Argentina and Paraguay.

3. BRICKELLIA KELLERMANII Greenm., Publ. Field Columbian Mus., Bot. Ser. 2: 265. 1907. **TYPE: GUATEMALA. Baja Verapaz.** Sierra de Las Minas, 1160 m, 3 Mar 1907, *Kellerman 6127* (holotype: F; isotype: OS). Figures 4–6.

Brickellia kellermanii fo. *podocephala* B.L. Rob.

Stiffly erect subvirgate subshrubs 0.6–1 m tall; stems densely hirsutulous-hirtellous, the few lateral branchlets strongly ascending. **Leaves** opposite basally but mostly alternate distally, stoutly short-petiolate; petiole 0.1–0.5 cm long; blade lanceolate or elliptic-ovate to oblong, 1–5.5 × 0.4–2.3 cm, rigidly chartaceous or subcoriaceous, strongly reticulate, surfaces slightly discolorous, pilosulose or tomentulose, sparsely punctate-glandular, base and apex more or less obtuse, margins subentire to crenulate. **Capitulescence** of several leafy branches with paucicapitulate corymbiform-cymes or axillary clusters; peduncles stiff with capitula erect, much shorter than to much longer than

capitula, hirtellous. **Capitula** 12–14 mm long; involucre broadly turbinate to campanulate, 10–12 mm long; phyllaries 5–6 series, strongly graduated, ca. 1.5 mm diam., stiff-chartaceous, oblong to lanceolate, apex apiculate or cuspidate, the outer ones broadly ovate, ca. 2 mm long, 6–8-costate, puberulent and glandular, mid-series ones sometimes slightly herbaceous in the mid zone but with margins obviously hyaline, evenly grading to the inner ones linear-lanceolate, to ca. 12 mm long. **Disk florets** 10–14; corolla 5.5–6 mm long. **Cypselae** 3–3.5 mm long, densely spreading setose; pappus bristles 6–7 mm long.

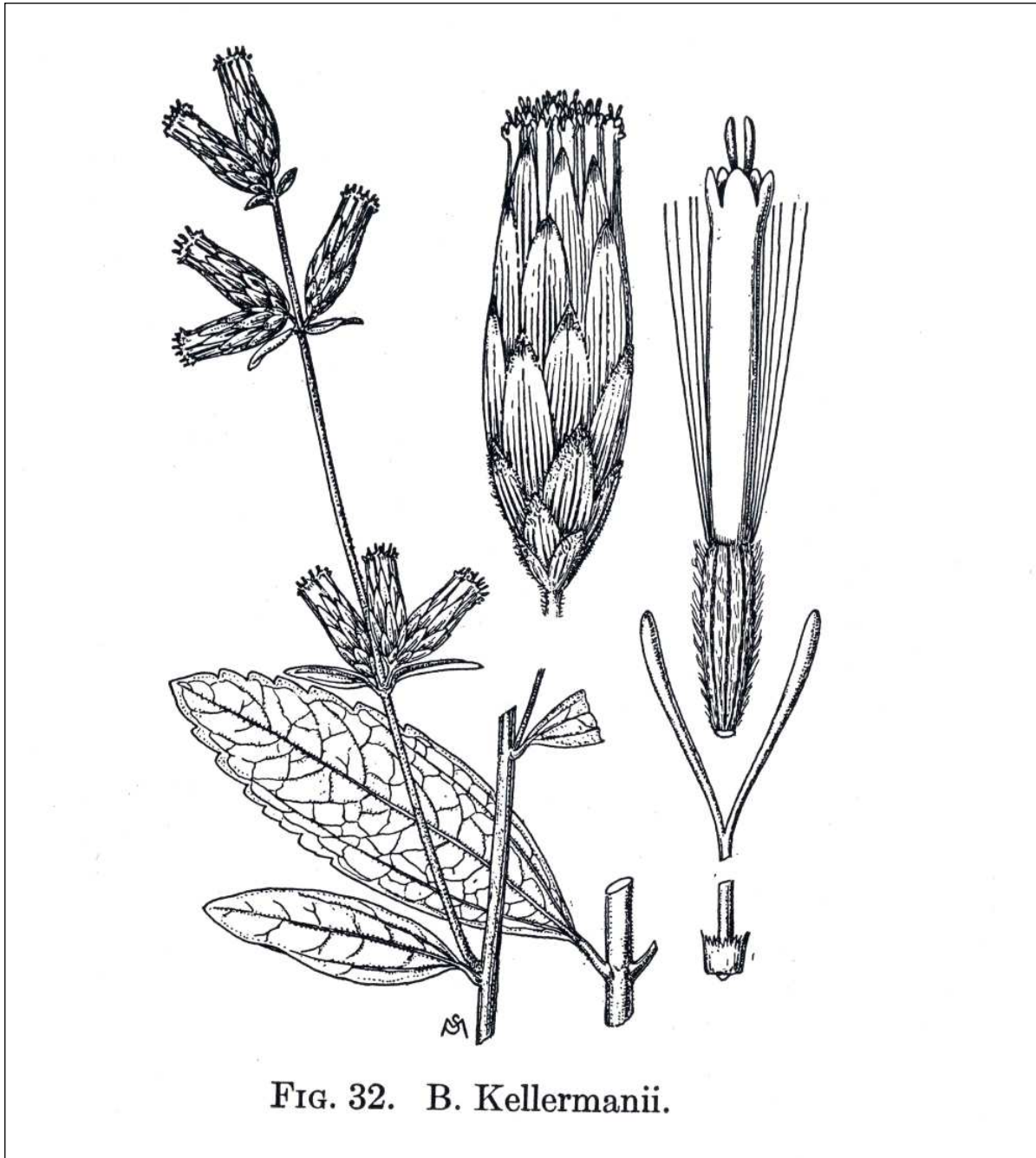


Figure 5. *Brickellia kellermanii* line drawing. Reproduced from Robinson 1917, Fig. 32.

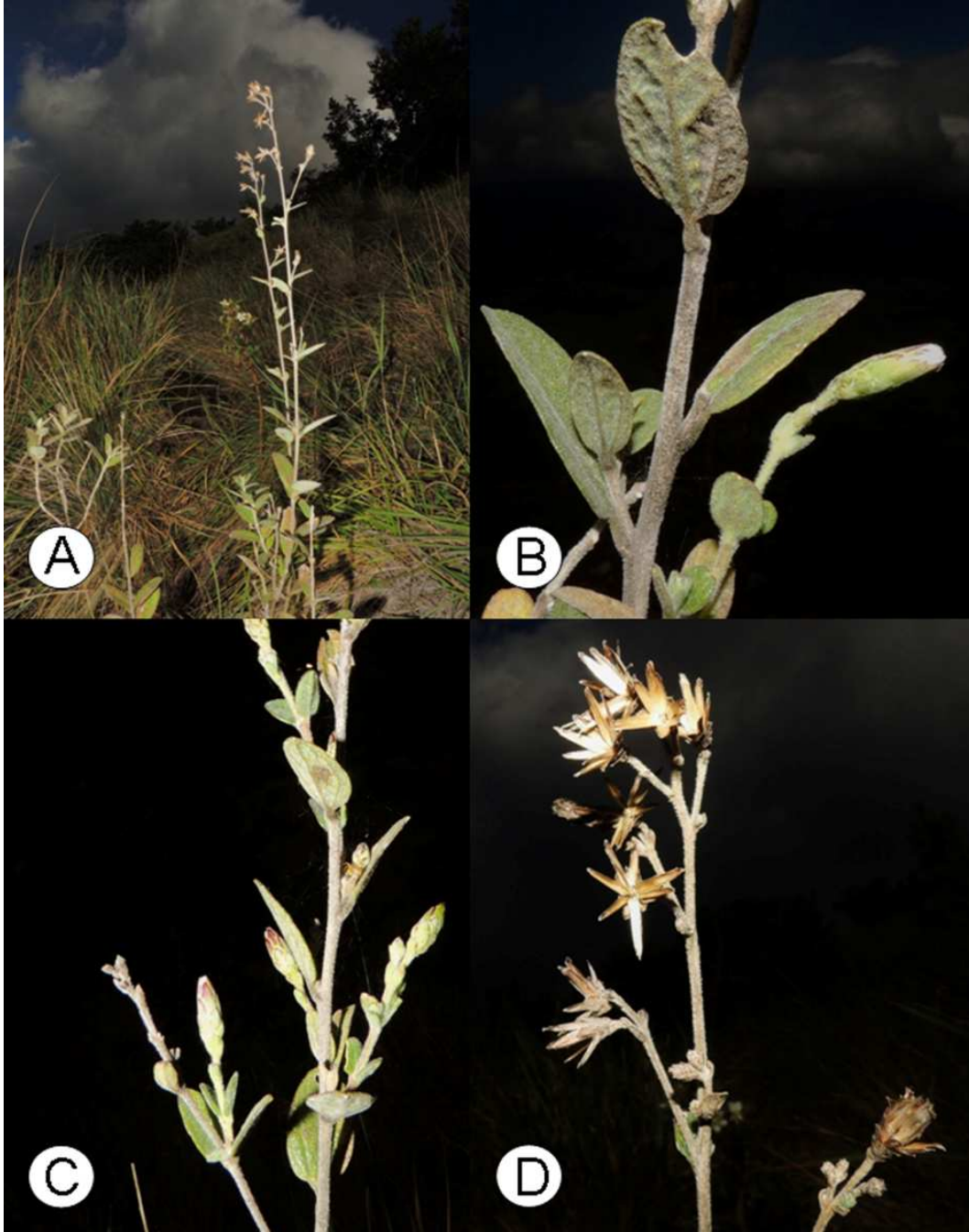


Figure 6. *Brickellia kellermanii*, field photographs in Costa Rica. A Habit and habitat. B–C. Proximal portions of capitulescence. D. Late-fruited infructescence showing spreading persistent phyllaries. All from Jiménez *et al.* 2107, photographs by J.E. Jiménez.

Voucher collections. **COSTA RICA.** Guanacaste. Cantón Bagaces, distrito La Fortuna, Zona Protectora Volcán Miravalles, Sabanas Miravalles (Sitio Miravalles), 988 m, 15 Apr 2013, Jiménez *et al.* 2107 (CR, MO, USJ). **EL SALVADOR.** La Unión. Reserva Natural de Conchagua, 1027–1150 m, 1 Dec 2006, Morales *et al.* 14470 (LAGU). **Santa Ana.** Entre Cerro Peña del Cuervo y el Cerro El Yupe, 6 km NE Candelaria de la Frontera, 1300 m, 9 Dec 1994, Linares y Martínez 2150 (MO); Cumbre de Cerro Peña del Cuervo, 1298 m, 7 Feb 2016, Rodríguez & Corrales 5587 (LAGU), 5588 (LAGU).

Distribution and ecology. *Brickellia kellermanii* is newly documented in Costa Rica and is known to us from only a single collection made by the second author in the northwestern part of the country. The occurrence of *B. kellermanii* in El Salvador, originally based on a 1995 determination by José Linares (en sched. MO), also represents a new record for that country (viz Berendsohn and Araniva de González 1989). Its occurrence in Costa Rica and El Salvador was not fully unexpected, however, as the species was known previously in nearby Nicaragua, Honduras, Guatemala, Belize, and Chiapas (Carlson 1954: 397; Clewell 1975; Dillon et al. 2001; King and Robinson 1987; Robinson 1917; Williams 1976). For example, in El Salvador where collected by José Linares and also by the third author, *B. kellermanii* occurs within 15 kms of the frontiers of each Guatemala and Nicaragua. In Costa Rica, *B. kellermanii* was found flowering in April on grassy slopes near Volcán Miravalles. Volcán Miravalles is northwest of Laguna Arenal and is the highest peak (2028 meters) on the Cordillera de Guanacaste, the watershed of which basically forms the line between Alajuela and Guanacaste, but Jiménez *et al.* 2107 was made at 988 meters elevation on the volcano's lower drier western slope.

We recognize *Brickellia kellermanii* in the strict sense as in Robinson (1917), Clewell (1975), Williams (1976), and King and Robinson (1987). The peduncle length may vary greatly within a single collection, and the extreme in peduncle length used to define *B. kellermanii* fo. *podocephala* is apparently not useful taxonomically. Although *B. kellermanii* fo. *podocephala* is typified by Nicaraguan material (*Friedrichsthal 1195* collected in the 1840s near Tinotepe and labeled as from Guatemala) it seems not to have been treated in Dillon et al. (2001). We note that Turner (1997) and Dillon et al. (2001) treated *B. kellermanii* in synonymy of the admittedly very similar *B. oliganthes*, a species that in the strict sense is endemic to Mexico and appears to differ by its longer-petiolate leaves and much larger capitula with outer phyllaries herbaceous to the very narrowly hyaline margins. Turner (1997) also treated *B. verbenacea* (Greene) B.L. Rob. in synonymy of *B. oliganthes*, whereas McVaugh (1984) and King and Robinson (1987) recognized *B. verbenacea* as distinct. McVaugh (1984) noted, however, that all species of *Brickellia* sect. *Bulbostylis* subsect. *Reticulatae* B.L. Rob. are "much alike."

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LITERATURE CITED

- Bentham, G. and J.D. Hooker. 1873. Compositae. Pp. 163–533, in *Genera Plantarum*, vol. 2. Reeve, London.
- Berendsohn, W.G. and A.E. Araniva de González. 1989. Listado básico de la Flora Salvadorensis: Dicotyledonae, Sympetalae (pro parte): Labiatae, Bignoniaceae, Acanthaceae, Pedaliaceae, Martyniaceae, Gesneriaceae, Compositae. *Cuscatlania* 1(3): without page numbers, cf. i + 260:1–290:13 + final page of "Referencias."
- Carlson, M.C. 1954. Floral elements of the Pine-Oak-Liquidambar forest of Montebello, Chiapas, Mexico. *Bull. Torrey Bot. Club* 81: 387–399.
- Clewell, A.F. 1975. Las Compuestas de Honduras. *Ceiba* 19: 197–244.
- D'Arcy, W.G. 1987a. Flora of Panama. Checklist and Index. Part I: The introduction and checklist. *Monogr. Syst. Bot. Missouri Bot. Gard.* 17: [xxx] + 1–325[–328]. Final three pages unnumbered.

- D'Arcy, W.G. 1987b. Flora of Panama. Checklist and Index. Part II: Index. Monogr. Syst. Bot. Missouri Bot. Gard. 18: ix + 1–670[–672]. Final two pages unnumbered.
- Dillon, M.O., N.A. Harriman, B.L. Turner, S.C. Keeley, D.J. Keil, T.F. Stuessy, S. Sundberg, R.K. Jansen, and D.M. Spooner. 2001. Asteraceae Dumort. Pp. 271–393, in W.D. Stevens et al. (eds.), Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Gard. 85(1).
- Gray, A. 1852. Plantae Wrightianae texano-neo-mexicanae: An account of a collection of plants made by Charles Wright. Smithsonian Contr. Knowl. 3(5): 1–146 + pl. 1–10.
- Gray, A. 1884. Caprifoliaceae–Compositae. Syn. Fl. N. Amer. 1(2): 1–474.
- King, R.M. and H. Robinson. 1969. Studies in the Compositae-Eupatorieae, XI. Typification of genera. Sida 3: 329–342.
- King, R.M. and H. Robinson. 1975 [1976]. Eupatorieae. Pp. 888–1004, in W.G. D'Arcy, Flora of Panama, Part IX. Family 184. Compositae. Ann. Missouri Bot. Gard. 62: 835–1321.
- King, R.M. and H. Robinson. 1987. The genera of Eupatorieae (Asteraceae). Monogr. Syst. Bot. Missouri Bot. Gard. 22: ix + 1–581.
- Klatt, F.W. 1892 [1893]. Compositae. Pp. 183–215, in T. Durand and H. Pittier (eds.), Primitiae Florae Costaricensis, Deuxième Fascicule. Bull. Soc. Roy. Bot. Belgique 31(1): 119–215.
- Klatt, F.W. 1896. Compositae II. Pp. 277–296, in T. Durand and H. Pittier (eds.), Primitiae Florae Costaricensis, Troisième Fascicule. Bull. Soc. Roy. Bot. Belgique 35(1): 131–296.
- McVaugh, R. 1984. Compositae. Flora Novo-Galiciana 12: 1–1157.
- Pruski, J.F. 1997. Asteraceae. Pp. 177–393, in J.A. Steyermark et al. (eds.), Flora of the Venezuelan Guayana, Vol. 3, Araliaceae–Cactaceae. Missouri Botanical Garden, St. Louis.
- Robinson, B.L. 1913. A generic key to the Compositae-Eupatorieae. Proc. Amer. Acad. Arts 49: 429–437.
- Robinson, B.L. 1917. A monograph of the genus *Brickellia*. Mem. Gray Herb. 1: 1–151.
- Schilling, E.E., R.W. Scott, and J.L. Panero. 2015. A revised infrageneric classification for *Brickellia* (Asteraceae, Eupatorieae). Phytotaxa 234: 151–158.
- Scott, R.W. 2006. *Brickellia*. Pp. 496–507, in Flora North America Editorial Committee (eds.). Fl. N. Amer., Vol. 21.
- Standley, P.C. 1938. Flora of Costa Rica. Compositae. Composite Family. Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1418–1538.
- Turner, B.L. 1997. The Comps of Mexico, A systematic account of the family Asteraceae, Vol. 1, Eupatorieae. Phytologia Mem. 11: iv + 1–272.
- Williams, L.O. 1976. Tribe II. Eupatorieae. Pp. 32–128, 466–482, in D.L. Nash and L.O. Williams, Flora of Guatemala. Part XII. Compositae. Sunflower Family. Fieldiana, Bot. 24(12): x + 1–603.