

Two new species of *Calea* (Asteraceae: Neurolaeneae) from Bahia, Brazil

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Abstract

In the previous studies of *Calea* in Bahia, some specimens were treated as *C. candolleana* but their morphology was called “particularly distinct”. Detailed studies on the currently accepted species and these specimens demonstrated that they represent two new species. *Calea flagelliformis* resembles *C. candolleana*, but differs from the latter by the villous (vs. pubescent to hispid) indumentum of stems, leaves and peduncles, and sessile (vs. petiolate, 1.5–4 mm) leaves. *Calea nakajimae* differs from *C. candolleana* by the lanceolate or ovate (vs. elliptic) leaf limb, and pappus scales 0.5–1.2 mm long (vs. 0.2–0.3 mm long). These new species are described, illustrated, mapped, and their conservation status and taxonomic affinities are discussed.

Key words: Caatinga, Campo Rupestre, Cerrado, Compositae, Neotropics

Introduction

Calea Linnaeus (1763: 1179) is the most species-rich genus within the Neurolaeneae Rydb., Asteraceae Bercht. & Presl, currently comprising 166 species (Bueno *et al.* 2025d). *Calea* has the natural Neotropical distribution, which extends from Mexico to Argentina, including occurrences in Jamaica and Trinidad and Tobago. The *Calea* species are typically recognized by their shrubby to herbaceous habit, striated phyllaries, yellow florets in both the ray and disc, pistillate ray florets (when present), and pappus scales 0.1–11.0 mm long (Bueno *et al.* 2021, 2025d).

Calea ser. *Candolleanae* Bueno *et al.* (2024b: 47) includes species endemic to eastern and central Brazil. Members of this series are characterized by narrow leaves, radiate capitula typically borne on long peduncles, a campanulate involucre, and a receptacle that ranges from epaleaceous to hemipaleaceous, and pappus scales 0.2–1.7 mm long (Bueno *et al.* 2024b). *Calea* ser. *Candolleanae* is mostly associated with open vegetation types such as coastal scrubs, grasslands, and savannas.

Most of the species of *C. ser. Candolleanae* occur in Bahia state in Brazil (Bueno *et al.* 2024b). Roque & Carvalho (2011) published an article reviewing *Calea* for Bahia state, describing 10 species. In this paper, some specimens of *C. candolleana* were considered “particularly characteristic” but kept within the circumscription of this species. In one of such individuals, handwritten notes of Harold Robinson were found at US, in which he suggested that some specimens (here studied) could be a species of *Geissopappus* Benth (1840: 44), a synonym of *Calea*, due to the epaleaceous receptacle of the individuals analyzed.

When examining these specimens, describing and comparing all their morphological characters, we concluded that they represent two new species of the genus. These two new species are hereby described, illustrated, and their conservation status and taxonomic affinities are discussed.

Material and methods

All the morphological structures were described from dried herbarium specimens, the reproductive structures were measured and described after rehydration in warm water (ca. 100°C) for one minute. We used a protractor, digital caliper, and a stereomicroscope to perform measurements and detailed description. The morphological terminology used in our taxonomic treatment follows Hickey (1973), Ellis *et al.* (2009), and Beentje (2016). The specialized Compositae terminology follows Funk *et al.* (2009), the specific terminology for the morphological attributes of *Calea* follows Bueno & Heiden (2022a), Bueno *et al.* (2022), and Bueno *et al.* (in press a). The map was prepared using QGIS v. 3.0 (QGIS Development Team 2025). The extent of occurrence (EOO) and area of occupancy (AOO) were generated through GeoCAT (Bachman *et al.* 2011) to assess the preliminary extinction risks of these two new species. To assess the threat status and propose the preliminary conservation status, the IUCN criteria were followed (IUCN 2024). The risk assessment will be done with CNCFLORA (National Center for Flora Conservation of the Rio de Janeiro Botanical Garden) staff in the future; the authors are already in contact to facilitate the full assessment.

Regarding the frequency of the morphological characteristics in the individuals analyzed, we have applied the following generalizations. We use “generally”, “usually” or “commonly” to indicate that the character is most frequent. “Rarely” is applied for the characters that occur in up to 10% of the specimens studied, “sometimes” is used for the characters that occur between >10% and 25% of the specimens studied, “often” is utilized for the characters that occur between >25% and 40% of the specimens analyzed. Glossary for the key (Bueno *et al.* 2022): Holopaleaceous—all the disc florets have paleae associated; Hemipaleaceous—among 50.01% and 99.99% of disc florets have paleae associated; Pauperpalaceous—up to 10% of disc florets have paleae associated; Epaleaceous—complete absence of paleae.

Several collections were studied from the herbaria: ALCB, CEN, ESA, HUEFS, HUFU, HRB, HURB, K, MBM, MO, NY, P, R, RB, SP, SPF, UB, UEC, and US (acronyms according to Thiers 2025). Furthermore, the online databases were consulted to study digitized specimens: C. V. Starr Virtual Herbarium (2025), REFLOA (2025), Smithsonian Virtual Herbarium (2025), SpeciesLink (Canhos *et al.* 2022, SpeciesLink 2025), and Tropicos® (2025).

The *Calea* literature available was consulted (Linnaeus 1763; Brown 1818; Candolle 1836; Gardner 1848; Baker 1884; Robinson & Greenman 1896; Malme 1933; Barroso 1975; Robinson 1975, 1979; Pruski & Urbatsch 1983, 1987, 1988; Pruski 1984, 1997, 1998, 2005, 2011, 2013; Wussow *et al.* 1985; Urbatsch *et al.* 1986; Pruski & Hind 1998; Panero 2007; Roque & Carvalho 2011; Diaz-Piedrahita & Rodríguez-Cabeza 2012; Pozo & Hind 2013; Silva 2016; Silva *et al.* 2016; Pruski & Robinson 2018; Silva & Teles 2018; Reis-Silva 2019; Reis-Silva & Nakajima 2020, 2021; Bueno & Heiden 2021, 2022a, 2022b; Bueno *et al.* 2021, 2022, 2023a, b, c, 2024a, b, 2025a, b, c, d, in press a, b; Bueno 2023; Remor *et al.* 2024, Melquíades *et al.* 2025, Reis-Silva *et al.* 2025, Silva *et al.* 2025). The interpretations and discussions presented here are derived from the knowledge generated by these works and by the descriptive activities of the materials analyzed here.

Taxonomic treatment

Calea flagelliformis V.R.Bueno & Roque, *sp. nov.* (Fig. 1, 2)

Type:—BRAZIL. Bahia, Morro do Chapéu 19,5 km SE of the town of Morro do Chapéu on the BA-052 road to Mundo Novo, by the Rio Ferro Doido, [−11.633333, −41.033333], 900 m, 02 Mar 1977, R.M.Harley *et al.* 19280 (holotype RB00855641!; isotypes CEPEC digital image!, K!, US!).

Calea flagelliformis resembles *C. candolleana* but differs from the latter by the villous (vs. pubescent to hispid) indumentum of stems, leaves and peduncle, sessile leaves (vs. petiolate, on petioles 1.5–4 mm long), and craspedodromous (vs. acrodromous basal) venation.

Herbaceous or shrubby, creeper or erect, 0.2–1 m tall. Stems cylindrical, striate, sparsely to densely villous, castaneous, internodes 0.5–7.8 (9.4) cm long. **Leaves** decussate, sessile, 0.75–4.9 × 0.25–2.05 cm, lanceolate or narrow lanceolate, base rounded, apex acute, margins serrate, 2–8 (–12) teeth, teeth 0.8–3 mm long, strongly revolute, abaxial surface sparsely to densely villous, nerves villous to densely villous, glandular-punctate to densely glandular-punctate, adaxial surface sparsely villous to villous, glands absent, coriaceous, green, discolorous, venation craspedodromous. **Capitula** generally solitary, rarely laxly cymose, usually 3–4 leaves under the peduncle, peduncle 1.5–21.7 cm long, sparsely

to densely villous; involucre commonly campanulate, rarely cylindric, 5.7–12.4 × 7.6–16.4 mm, 5-seriate. **Phyllaries** margin entire, glands absent; first series of phyllaries 6–9.3 × 3.2–4.7 mm, narrow ovate or oblong to elliptic, apex acute, sparsely to densely villous, glands absent, margins green apex with margins revolute, foliaceous with base scarious, green with base yellowish, 6–8-striate; remaining series scarious, greenish yellow to yellow, margin hyalin, flat, widely-striate: second series 5.5–7 × 4–5.25 mm, wide elliptic to oblong, apex obtuse or rounded, pubescent to glabrescent, rarely sparsely villous, 5–10-striate; third series 7–9.5 × 4.5–5.25 mm, elliptic to narrow oblong or obovate, apex rounded, glabrous, 9–10-striate; fourth series 8.5–11 × 4–5 mm, narrow obovate to oblanceolate, apex obtuse or rounded, glabrous, 10–13-striate; fifth series 10–11.5 × 3–4.1 mm, narrowly oblong or oblanceolate, apex obtuse, glabrous, 10–11-striate. **Receptacle** convex to conic, usually epaleaceous, rarely pauperpaleaceous (one paleae per capitula), ca. 7 × 0.2 mm, filiform, flat, apex acute, light yellow. **Ray florets** 8–12, pistillate, corolla liguliform, yellow, 10.5–12 mm long, tube 1.9–3.0 mm, limb 8–9.9 × 3.5–6.9 mm, commonly wide oblong, rarely wide elliptic or wide obovate, apex 5-lobulate or rounded, 5 nerves, surface abaxial glandular-punctate or densely glandular-punctate; style arms 1–1.5 mm long, yellow. **Disc florets** 25–45, bisexual, corolla tubular, yellow to golden, 3.5–5 mm long, tube 0.6–1 mm long, lobes 0.4–1 mm long, sparsely glandular-punctate or glabrous. Anthers 1.75–2 mm long, light yellow, appendages apex ovate; style arms 0.8–1.75 mm long, narrowly elliptic, yellow to golden. **Cypselae** 3.5–4 mm long, cylindrical, blackish, 4-angled, ribs strigose or pubescent to sparsely pubescent, face strigose or pubescent to sparsely pubescent. **Pappus** 12–15 scales, free, monotypic, equal in length, 0.7–1.1 (–1.5) mm long, elliptic to oblanceolate, apex obtuse or rounded, margins entire, apex erose.

Distribution and Habitat—*Calea flagelliformis* occurs in campo rupestre and transitions areas between Cerrado and Caatinga in the center to northwest of Bahia state, Brazil (Fig. 3). Some specimens were found in the Espinhaço Mountain Range (Fig. 3). This new species grows at elevations of 845–1200 m, on rock outcrops or sandy soils, in moist sites close to waterfalls and among riverine vegetation close to streams.

Preliminary Conservation Status—The Extent of Occurrence (EOO) of these species is 12,928.015 km² in transition areas between Cerrado and Caatinga and Area of Occurrence (AOO) of 48 km². EOO and AOO suggest different extinction risks, Vulnerable and Endangered (IUCN 2024), respectively. With the exception of two collections in the protected areas of Chapada Diamantina and the Boqueirão da Onça Environmental Protection Area, most collections of *C. flagelliformis* are from protected areas. Most records occur in Morro do Chapéu, outside the Morro do Chapéu State Park. In this area, the species faces the following threats: livestock (Schober 2002), agriculture and fires (Lobão 2006), and tourism (MMA/ICMBio 2007). These factors cause a continuous decline in habitat quality in the Morro do Chapéu area. The populations of the species found are severely fragmented (criteria B condition a), and it is estimated that the area extent and/or quality of habitat is in continuous decline (criteria B condition iii). Based on this, we consider that this species can be treated as Endangered (IUCN 2024).

Etymology—The epithet refers to the very long trichomes of the villous indumentum of stems, leaves, and peduncle. The trichomes of this new species are the longest found in *Calea* species, measuring up to 5 mm in length.

Phenology—The species was found with fertile individuals throughout the year, February being the unique month without records. The reproduction peak is probably in May and June, when most collections were made. Although fertile individuals were found year-round, individuals further north in the species' distribution (Fig. 3) were only recorded as fertile between March and April.

Notes—Most of the specimens of *Calea flagelliformis* were previously identified as *C. candolleana* (Gardner 1848: 414) Baker (1884: 256) and *C. pilosa* Baker (1884: 257). These three species are morphologically related and belong to *C. ser. Candolleanae* (Bueno *et al.* 2024b). In common with *C. candolleana* and *C. pilosa*, *C. flagelliformis* has herbaceous to shrubby habit, usually long peduncle, phyllaries with margin hyaline, first series of phyllaries ovate, corolla of ray florets 10–12 mm long, corolla of disc florets 3.5–4 mm long, anthers ca. 2 mm long, cypselae strigose, and pappus scales 12–15.

The new species can be distinguished from *C. candolleana* by the villous (vs. scabrid to pilose) indumentum of stems, leaves and peduncle, sessile leaves (vs. petiolate, petioles 1.5–4 mm long), craspedodromous (vs. acrodromous basal) venation, teeth 0.8–3 mm long (vs. up to 0.5 mm), first series of phyllaries longer (vs. shorter) than the second series, receptacle epaleaceous, rarely pauperpaleaceous (vs. holopaleaceous, sometimes hemipaleaceous), disc florets tube 0.6–1 mm long (vs. 1.4–2 mm long), and pappus scales 0.7–1.5 mm long (vs. 0.2–0.3 mm long).

Calea flagelliformis differs of *C. pilosa* by the sessile (vs. petiolate) leaves, lanceolate or ovate (vs. elliptic) leaf limb, teeth 0.8–3 mm long (vs. up to 0.5 mm long), craspedodromous (vs. eucamptodromous) venation, first series of phyllaries 8–9-striated (vs. 2–4-striated) and sparsely to densely villous (vs. pilose to sparsely pilose).

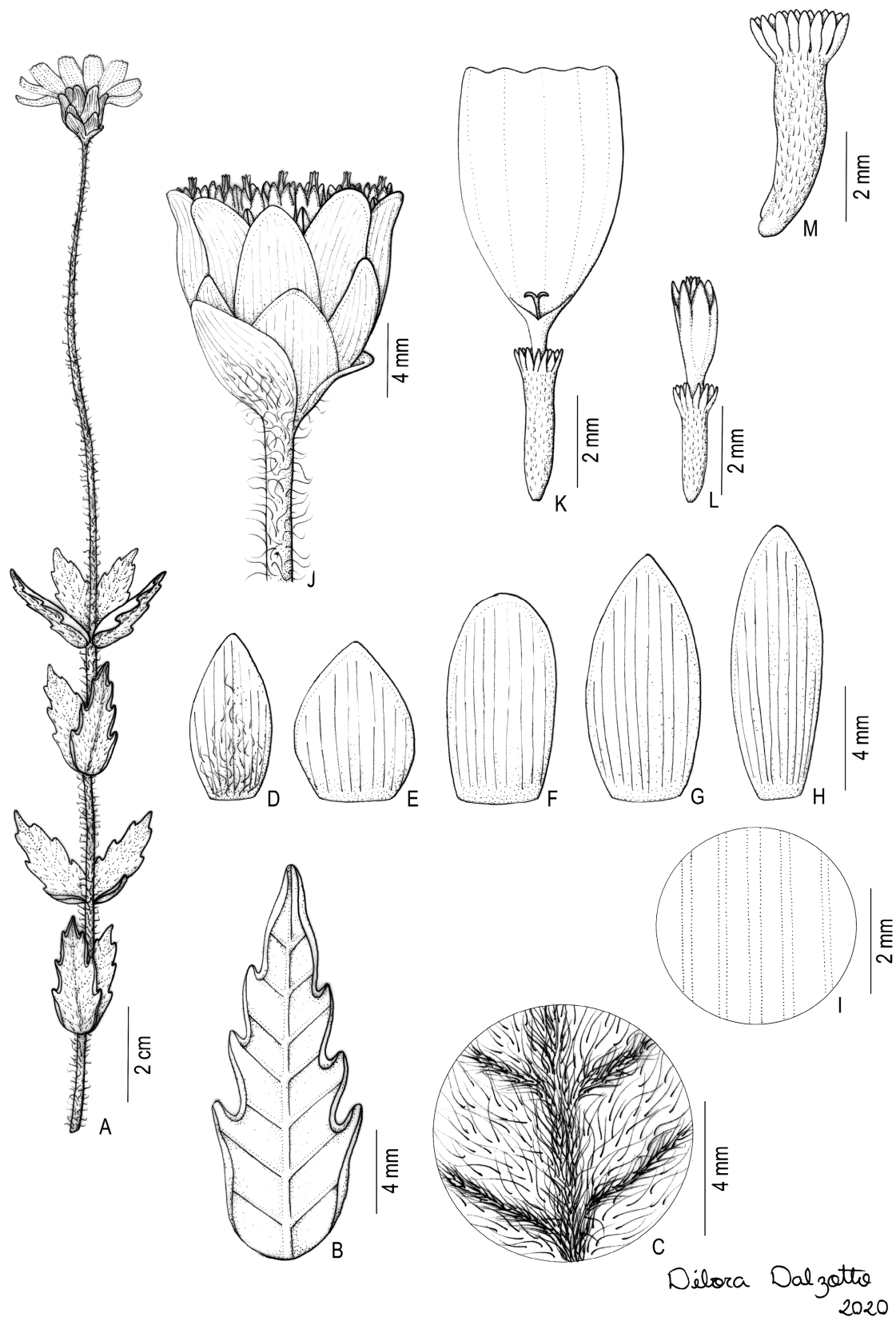


FIGURE 1. *Calea flagelliformis* sp. nov. (Neurolaeneae, Asteraceae). A. Flowering branch; B. Leaf, in detail abaxial surface; C. Indumentum villous in the abaxial surface leaf; D. Phyllary of the first series; E. Phyllary of the second series; F. Phyllary of the third series; G. Phyllary of the fourth series; H. Phyllary of the fifth series; I. Widely striate phyllaries; J. Capitulum with ray florets removed to show involucre and disc floret arrangements; K. Ray floret; L. Disc floret; M. Cypsel. A–M drawn from *R.M.Harley et al. 19280* (RB); A–M: millimeter scale. Illustration by Débora Dalzotto.

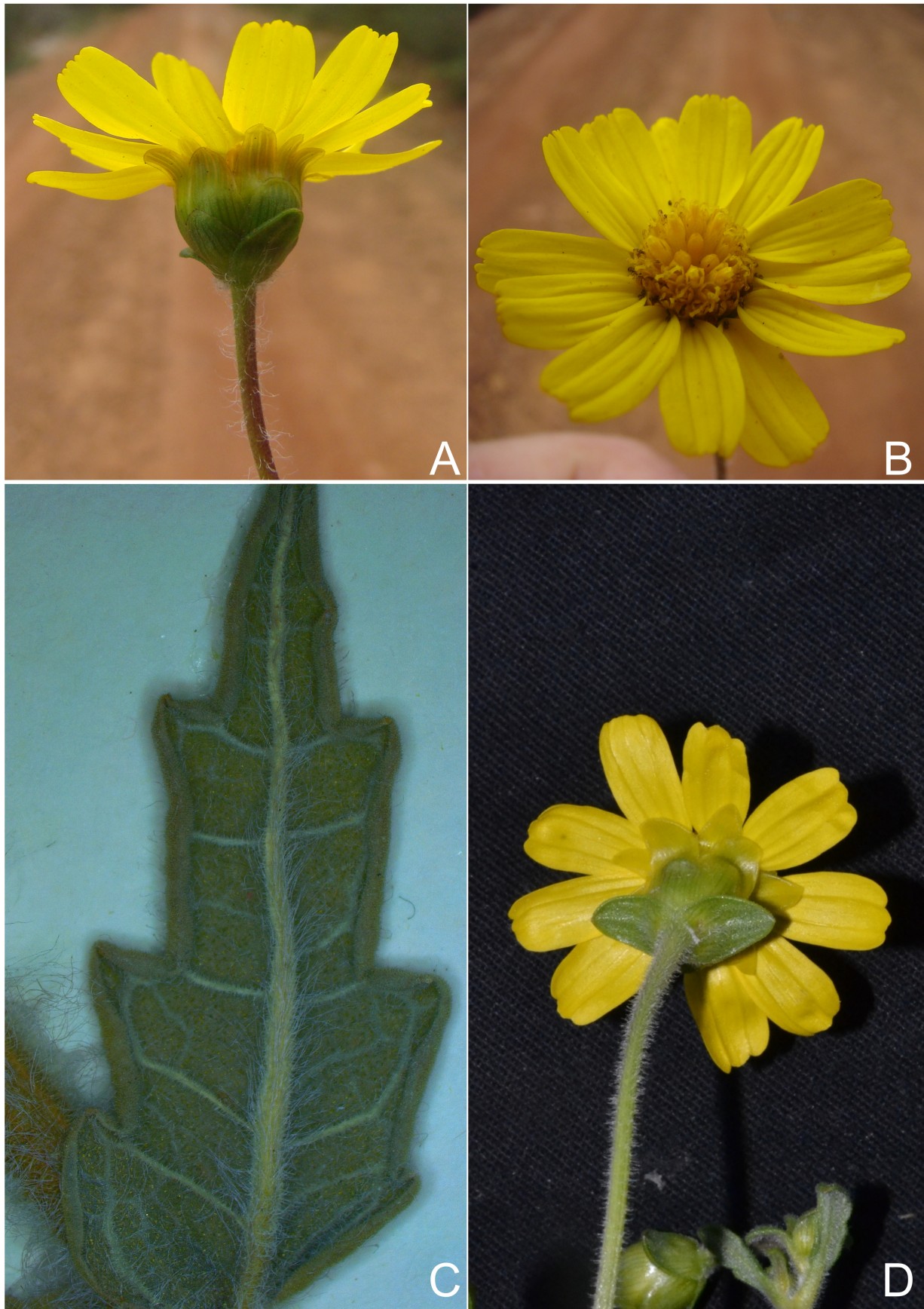


FIGURE 2. *Calea flagelliformis* sp. nov. (Neurolaeneae, Asteraceae). A. Peduncle and lateral view of the involucre; B. Capitulum in frontal view; C. Abaxial leaf surface; D. Capitulum in back view. A–B. By N. Roque; C. By V.R.Bueno (R.M.Harley *et al.* 19280); D. By V. Rebouças.

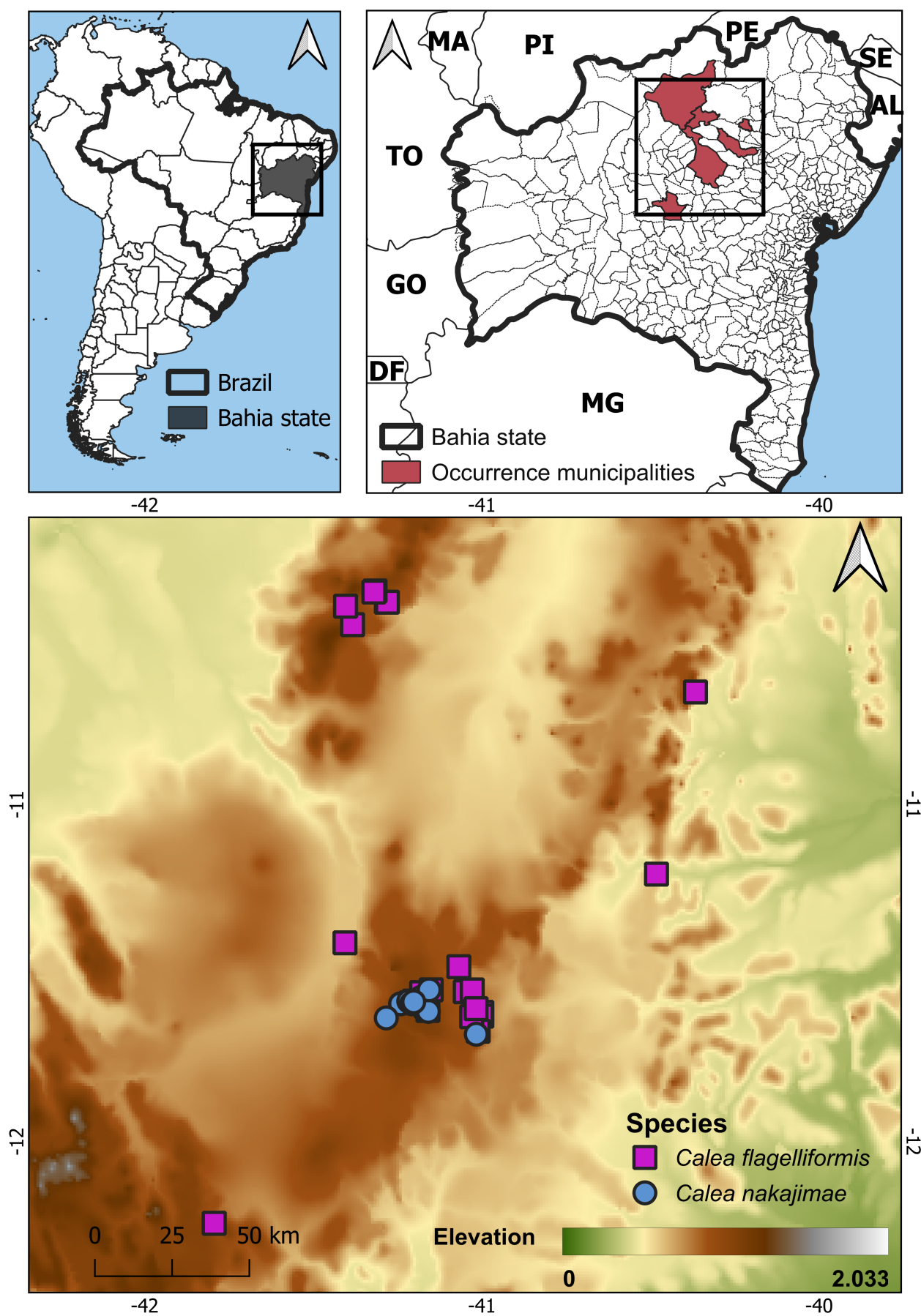


FIGURE 3. Occurrence map of the new species: *Calea flagelliformis* and *C. nakajimae*.

Paratypes—BRAZIL. Bahia: Santo Sé, Serra do Curral Feio—8 km NW de Lagoinha (5 km SW de Delfino) na estrada de Minas do Mimoso, [-10.400000, -41.283333], 850 m, 03 May 1974, *R.M. Harley et al.* 16791 (K, RB, US); Vegetação, savana arbórea aberta—Ponto 13, [-10.410556, -41.405833], 29 Apr 1981, *R.P. Orlandi* 400 (RB); Jacobina, Serra do Cruzeiro, [-11.206667, -40.481944], 1040 m, 07 Apr 2001, *N.G. Jesus* 1303 (CEPEC, HUEFS); Morro do Chapéu, estrada para o Barracão, [-11.422222, -41.209167], 1111 m, 28 Apr 2006, *J.L. Ferreira et al.* 13 (K); estrada para a veredinha, [-11.620556, -41.007778], 910 m, 16 Sep 2015, *M.G. Staudt & L. Barres* 96 (ALCB, HUEFS); Tabuleiro do Tigre, [-11.599444, -41.164167], 1095 m, 18 Apr 2016, *M.G. Staudt and N. Roque* 137 (ALCB); Cachoeira Ferro Doido, [-11.628056, -41.000000], 941 m, 04 Jan 2005, *J.G.A. Nascimento* 196 (HUEFS); estrada para Cachoeira do Agreste, com 12 km da BA 052, [-11.552778, -41.178333], 940 m, 04 Jan 2005, *L.V. Vasconcelos et al.* 577 (HUEFS); Cachoeira do Ferro Doido, 20 km SE., [-11.623889, -41.001111], 900 m, 19 Nov 1986, *L.P. Queiroz et al.* 1301 (HUEFS); próximo à ponte sobre o rio Ferro Doido, [-11.627778, -41.001389], 1000 m, 28 Jun 1996, *D.J.N. Hind et al.* 3160 (HUEFS, SPF); 11 km N do Morro do Chapéu, na estrada para Jacobina, em leito de rio seco, [-11.481389, -41.068056], 845 m, 22 Apr 2001, *E. Melo et al.* 3467 (HUEFS, MBM, UEC); Serra of Morro do Chapéu, 20 Apr 1944, *R.W. Schery* 591(US); Cachoeira do Ferro Doido, [-11.524444, -41.002222], 872 m, 23 Aug 2014, *F. Hurbath et al.* 653 (ALCB, US); Morro do Chapéu, [-11.555556, -41.049167], 970 m, 15 Jun 2006, *J.M. Gonçalves et al.* 60 (HUEFS); Santo Sé, depois de Campo Largo, estrada para Lagoinha, [-10.410556, -41.405833], 1087 m, 02 Apr 2002, *E.R. Souza et al.* 142 (HUEFS, K); Seabra, estrada Lagoa Boa Vista e Água de Rega, [-12.242500, -41.793611], 1117 m, 25 Jun 2010, *E. Melo et al.* 8361 (HUEFS); Umburanas, Serra da Empreitada, [-10.446722, -41.302528], 921 m, 21 Sep 2006, *J.A. Siqueira Filho et al.* 1786 (HVASF); Serra do Curral Feio ou Serra da Empreitada, entrando para W, cerca de 20 km S de Delfin, na estrada para Umburanas [-10.366667, -41.316667], 1000 m, 21 Apr 1999, *L.P. Queiroz et al.* 5220 (HUEFS, NYBG).

Calea nakajimae V.R.Bueno, *sp. nov.* (Fig. 4, 5)

Type—BRAZIL. Bahia, Morro do Chapéu, trilha para o Morrão, [-11.5914, -41.2408], 31 May 2016, *N. Roque et al.* 4664 (holotype ALCB022219!; isotypes RB!, SP!, US!).

Calea nakajimae resembles *C. candolleana*, from which it differs by the lanceolate or ovate (vs. elliptic) leaf limb, petiole (when present) 0.4–2.55 (vs. 3–4.2) mm long, first series of phyllaries longer (vs. shorter) than the second series, pappus scales 0.5–1.2 mm long (vs. 0.2–0.3 mm long).

Herbaceous or shrubby, creeper or erect, 0.3–1 m tall. Stems cylindrical, striate, scabrid to scabridulous, sometimes scabrid with sparsely long trichomes, rarely villous, castaneous, internodes 0.2–10.6 (–31.3) cm long. **Leaves** decussate, generally petiolate, 0.4–2.2 (–2.55), sometimes sessile; blade 0.4–4.25 × 0.14–1.3 cm, commonly lanceolate, rarely narrowly ovate, base usually truncate, often rounded, sometimes obtuse, apex acute, margins usually entire, often serrate, 2–6 teeth, 0.2–0.9 (–1.4) mm long, strongly revolute, abaxial usually glabrous, often scabridulous, nerves usually sparsely scabridulous, rarely associated with long trichomes or villous, sparsely glandular-punctate, adaxial surface glabrous to sparsely scabridulous, glands absent, coriaceous, green, concolorous, venation eucamptodromous, sometimes acrodromous basal. **Capitula** solitary, peduncle 2.4–14.8 cm long, usually sparsely scabridulous to scabrid, rarely sparsely villous; involucre generally campanulate, sometimes cylindrical, 6.1–9.8 (–11.9) × 6.6–12 (–17.5) mm, 5-seriate. **Phyllaries** margin entire, glands absent; first series of phyllaries 4.1–7.8 × 1.7–3.6 mm, narrowly ovate or lanceolate, apex generally obtuse and revolute, sometimes acute, usually glabrous to sparsely scabridulous, rarely sparsely villous, sparsely glandular-punctate or absent, margins not hyalin, revolute or just the apex margin revolute, foliaceous, green, 2–5-striate; remaining series scarious, greenish yellow to yellow, margin hyalinous; second series 3.6–5.7 × 1.9–3.5 mm, oblong to narrowly ovate or widely elliptic, apex rounded, margin flat, usually glabrous, sometimes sparsely scabridulous, 6–9-striate; third series 4.1–5.5 × 2.6–3.1 mm, oblong to narrowly ovate, apex rounded, margin apex slightly revolute or flat, commonly glabrous, sometimes sparsely scabridulous, 5–9-striate; fourth series 5.4–7.1 × 2.2–3.2 mm, narrowly oblong, apex rounded, margin apex slightly revolute, glabrous, 5–8-striate; fifth series 7.3–8.3 × 1.9–2.8 mm, narrowly oblong, apex usually obtuse, rarely rounded, margin apex slightly revolute, glabrous, 5–7-striate. **Receptacle** convex to conic, generally epaleaceous, rarely pauperpaleaceous (three paleae per capitula), ca. 7 × 0.1–0.2 mm, filiform, flat, apex acute, light yellow. **Ray florets** (4–) 6–12, pistillate, corolla liguliform, yellow, 9.7–11.5 mm long, tube 2–2.4 mm, limb 7.7–9.1 × 3.5–6.4 mm, narrow obovate, apex 3–4-lobulate, 5 nerves, surface abaxial glandular-punctate or densely glandular-punctate; style arms 0.6–1.3 mm long, yellow. **Disc florets** 18–30 (–50), bisexual, corolla tubular, yellow, 3.6–4.5 mm long, tube 0.9–1.5 mm long, lobes 0.6–1.1 mm long, glabrous or sparsely glandular-punctate. Anthers 1.8–2 mm long, light yellow, appendages apex ovate; style arms 0.6–1 mm long, linear, yellow. **Cypselae** 3.2–4 mm long, cylindrical, blackish, 4-angled, ribs densely

strigose to strigose, surface glabrous to densely strigose. **Pappus** 13–18 scales, free, generally bitypic, sometimes monotypic, usually monolength and bilength in the same capitula, sometimes monomorphic, shorter 0.5–1.1 mm long (longer 0.8–1.2 mm long, when present), oblong or oblanceolate, apex rounded, margins entire, sometimes erose.

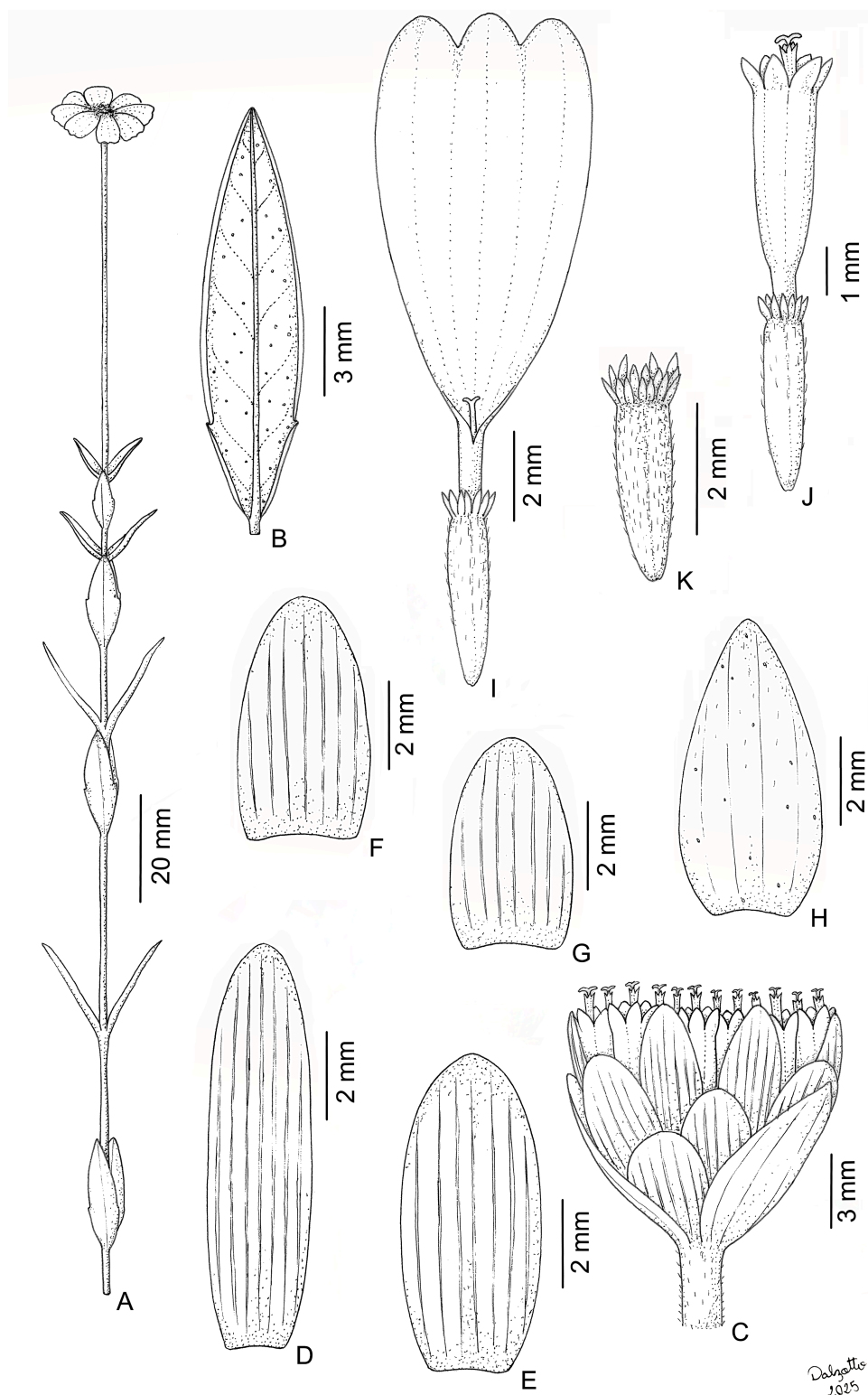


FIGURE 4. *Calea nakajimae* sp. nov. (Neurolaeneae, Asteraceae). A. Flowering branch; B. Leaf in detail abaxial surface; C. Capitulum with ray florets removed to show involucre and disc floret arrangements; D. Phyllary of the first series; E. Phyllary of the second series; F. Phyllary of the third series; G. Phyllary of the fourth series; H. Phyllary of the fifth series; I. Ray floret; J. Disc floret; K. Cypsel. A–K drawn from *N. Roque et al.* 4664 (ALCB); A–M: millimeter scale. Illustration by Débora Dalzotto.

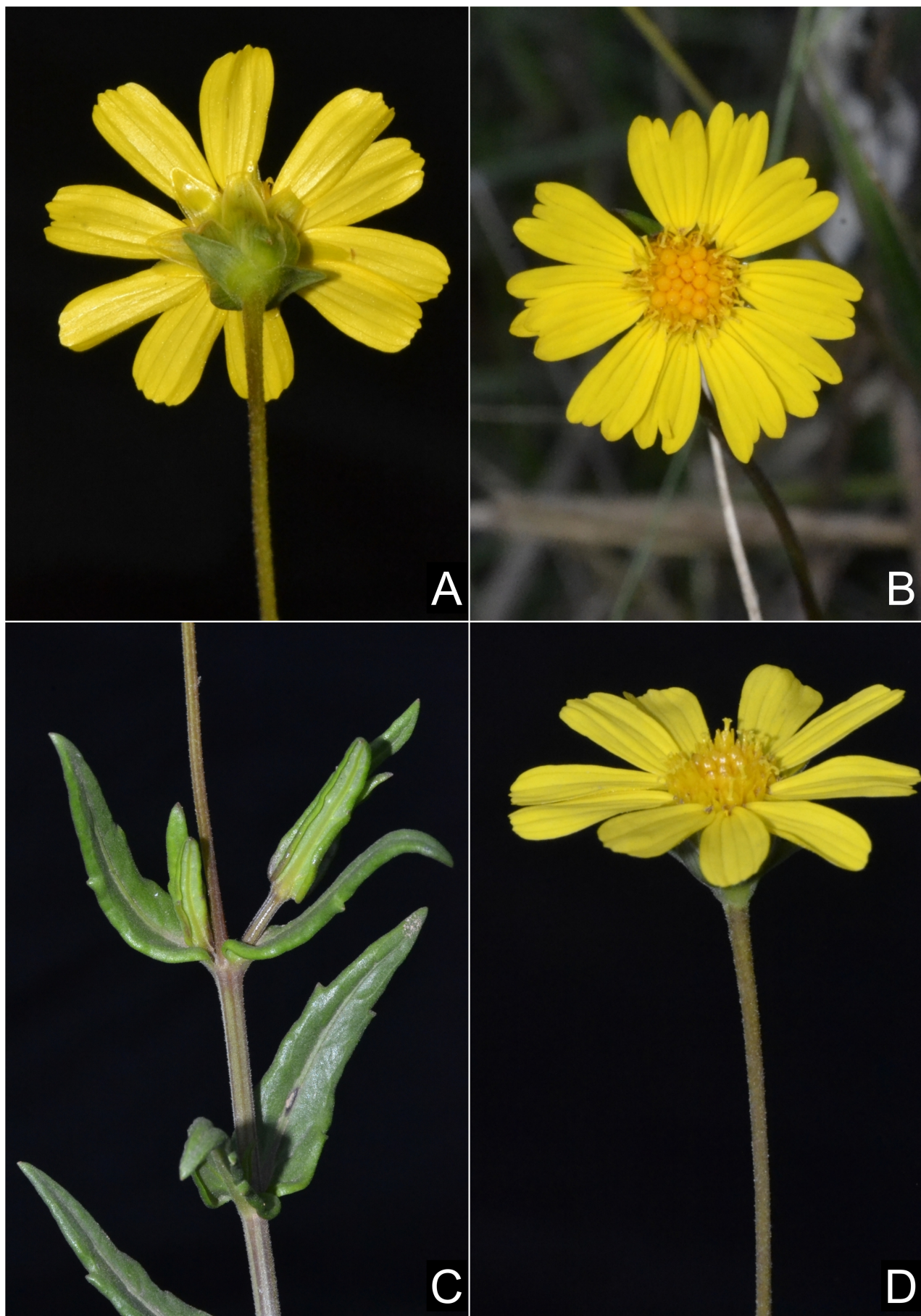


FIGURE 5. *Calea nakajimae* sp. nov. (Neurolaeneae, Asteraceae). A. Capitulum in back view; B. Capitulum in frontal view; C. Leaves and stems; D. Capitulum in lateral view. A–D. By V. Rebouças.

Distribution and Habitat—*Calea nakajimae* occurs in campo rupestre and transition areas between Cerrado and Caatinga in Bahia state, Brazil (Fig. 2). This new species grows at elevations of 1000–1300 m, on rock outcrops or sandy soils. Unlike *C. flagelliformis*, *C. nakajimae* is endemic to a single municipality, Morro do Chapéu, which is located in the Espinhaço Mountain Range in Bahia state.

Preliminary Conservation Status—*Calea nakajimae* has an AOO of 183.26 km² and an EOO of 36 km² (Bachman *et al.* 2011); both projections suggest that the species is Endangered. The populations of the species are severely fragmented (criteria B condition a), as for *C. flagelliformis*; the area extent and/or quality of habitat is in continuous decline (criteria B condition iii) due livestock farming (Schober 2002), agriculture and burning (Lobão 2006), and tourism (MMA/ICMBio 2007). Although there is a protected area called Morro do Chapéu State Park, none of the species collections occurred within this park. Due this information, we consider preliminarily that this species is Endangered (IUCN 2019).

Etymology—The species epithet is given in honor of Dr. Jimi Naoki Nakajima, one of the greatest researchers on Brazilian Asteraceae. Dr. Jimi N. Nakajima is a professor at the Universidade Federal de Uberlândia (UFU) since 1992, he was curator of HUFU for 10 years (1992–1995 and 1998–2005) and of the Cerrado Biodiversity Museum in Uberlândia (2001–2003). In addition, he supervised undergraduate students, master's, and Ph.D. candidates at the UFU, Universidade Federal de Viçosa, Universidade Federal do Rio Grande do Sul, and Universidade Federal de Minas Gerais. Jimi N. Nakajima published around 80 articles, ten book chapters, and described two new genera and 30 new species. As the main or secondary collector, he produced approximately 23,000 specimens.

Phenology—*Calea nakajimae* was found with fertile individuals from February to November; probably this new species can be found with florets and fruits throughout the year. The species reproduction peak is probably in May and June, when most collections were made.

Notes—Like the *Calea flagelliformis* specimens, the *C. nakajimae* specimens were identified as *C. candolleana* and *C. pilosa*. With the exception of the length of the disc corolla and the number of pappus scales, the same characters that are shared between *C. flagelliformis*, *C. candolleana* and *C. pilosa* are also shared among these three species and *C. nakajimae*.

Calea nakajimae resembles *C. flagelliformis*, it can be individualized by trichomes scabrid to scabridulous, sometimes scabrid with sparsely long trichomes (vs. sparsely villous to densely villous), leaf generally petiolate (vs. sessile), abaxial leaf surface sparsely indumented or usually glabrous, often scabridulous (vs. sparsely villous to densely villous), adaxial leaf surface glabrous to sparsely scabridulous (vs. sparsely villous to villous), venation usually eucamptodromous, sometimes acrodromous (vs. craspedodromous); phyllaries first series with base foliaceous (vs. scarious), third series 4.1–5.5 mm long (vs. 7–9.5 mm), fourth series 5.4–7.1 × 2.2–3.2 mm (vs. 8.5–11 × 4–5 mm), 5–8-striate (vs. 10–13-striate), fifth series 7.3–8.3 × 1.9–2.8 mm (vs. 10–11.5 × 3–4.1 mm), 5–7-striate (vs. 10–11-striate); corolla of ray florets with apex 3–4-lobulate (vs. 5-lobulate), disc corolla 3–4 times (vs. 5–5.8 times) longer than tube, pappus scales usually dimorphic (vs. monomorphic).

Calea nakajimae differs from *C. candolleana* by the leaf blade lanceolate or narrowly ovate (vs. elliptic), leaf base usually truncate, often rounded, sometimes obtuse (vs. attenuate or cuneate), petiole (when present) 0.4–2.55 (vs. 3–4.2) mm long, first series of phyllaries longer (vs. shorter) than the second series, receptacle epaleaceous, rarely pauperpaleaceous (vs. holopaleaceous, sometimes hemipaleaceous), pappus scales usually dimorphic (vs. monomorphic), scales 0.5–1.2 mm long (vs. 0.2–0.3 mm long).

The new species can be distinguished from *C. pilosa* by the leaf limb lanceolate or narrowly ovate (vs. elliptic), leaf base usually truncate, often rounded, sometimes obtuse (vs. attenuate), abaxial leaf surface usually glabrous, often scabridulous (vs. sparsely villous to densely villous), adaxial leaf surface glabrous to sparsely scabridulous (vs. villous to densely villous), first series of phyllaries usually glabrous to sparsely scabridulous, rarely sparsely villous (vs. pilose to sparsely pilose), and pappus scales usually dimorphic (vs. monomorphic).

Paratypes—BRAZIL. Bahia: Morro do Chapéu, Telebahia Tower, ca. 6 km S of Morro do Chapéu, 1000 m, 16 June 1981, *S.A.Mori & B.M.Boom 14449* (CEPEC, US); Piemonte da Diamantina, [-11.681667, -41.016389], 17 May 1975, *A.L.Costa et al. s.n.* (ALCB, CGMS, HUEFS); Reserva da Vila Açafrão, [-11.681667, -41.016389], 19 April 2001, *E.Melo et al. 3334* (HUEFS, UB, UEC); Estrada para Romão, [-9.93333, -38.98333], 05 May 2007, *S.C.Ferreira et al. 242* (HUEFS); em beira de estrada para a trilha do Morrão, 05 December 2024, *D. Remor & A.J.Santos 505* (ALCB, HUEFS); Morrão (Alto da Antena), [-11.58333, -41.2], 05 May 2007, *M.Freitas et al. 38* (HUEFS); Terço superior da estrada do Morrão, [-11.585833, -41.202778], 17 June 2006, *J.M.Gonçalves et al. 101* (HUEFS); Morro ao sul de Morro do Chapéu, [-11.5833, -41.216667], 28 November 1992, *M.M.Arbo et al. 5394* (HUEFS, K, SPF, UB); Fazenda Lagoa Preta dos Tropeiros, [-11.5833, -41.216667], 27 July 2024, *N.Roque et al. 5427* (ALCB); Morrão, [-11.590833, -41.208056], 28 July 2024, *N.Roque et al. 5528* (ALCB); Morro do Chapéu, Trilha do Tabuleiro do Tigre,

11 September 1956, *E. Pereira* 2146 (RB); morro da antena de televisão, 27 October 1978, *G. Martinelli* 5238 (RB); 26 September 1965, *E. Pereira* 10122 (RB); ca. 6 km do entroncamento com a BA-144 (Morro do Chapéu—Utinga) na estrada para o Morroão (entrando ca. 1 km Sul de Morro do Chapéu), [-11.585556, -41.201944], 07 May 2019, *L.P. Queiroz et al.* 16616 (HUEFS); summit of Morro do Chapéu, ca. 8 km SW of the town of Morro do Chapéu to the west of the road to Utinga, [-11.583333, -41.20], 30 May 1980, *R.M. Harley* 22824 (CEPEC, K, UEC, US); 16 km along the Morro do Chapéu to Utinga, [-11.583333, -41.20], 01 June 1980, *R.M. Harley* 22951 (SPF); summit of Morro do Chapéu, ca. 8 km SW of the town of Morro do Chapéu to the west of the road to Utinga, [-11.633333, -41.283333], 30 May 1980, *R.M. Harley* 22824 (SPF, UEC); ca. 7 km S of town of Morro do Chapéu, 17 February 1971, *H.S. Irwin et al.* 32420 (RB, UB).

Taxonomic key to the *Calea* species related to the new taxa

1. First series of phyllaries shorter than the second series, receptacle hemipaleaceous or holopaleaceous, pappus scales shorter than or equal to 0.3 mm long..... *Calea candolleana*.
- First series of phyllaries equal to or longer than the second series, receptacle epaleaceous or pauperpaleaceous, pappus scales longer than 0.3 mm long.....2.
2. Venation craspedodromous..... *Calea flagelliformis*
- Venation acrodromous basal or eucamptodromous.....3.
3. Adaxial leaf surface glabrous to sparsely scabridulous, first series of phyllaries with base foliaceous *Calea nakajimae*
- Adaxial leaf surface densely villous or hirsute or hispid or scabrid, first series of phyllaries with base scarious..... *Calea pilosa*

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