

Baccharis funkiae (Compositae: Astereae), a New Narrow Endemic Species from Uruguay

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Abstract—*Baccharis funkiae*, a new species endemic to Uruguay, is described and illustrated here. We also provide field work pictures, etymology, distribution and habitat, and preliminary conservation status information. Comments on how to differentiate it from the morphologically similar *B. subopposita*, highlighting differences setting the new species apart are discussed. Additionally, a key to the identification of the Uruguayan species belonging to *Baccharis* subgen. *Baccharis* sect. *Cylindrica* is presented.

Keywords—Asteraceae, Baccharidinae, *Baccharis* subgen. *Baccharis* sect. *Cylindrica*, Pampean province.

Uruguay is right in the center of one of the most extensive areas of grasslands in South America (Andrade et al. 2019). The extensive grasslands and associated scrub harbor a reported total of ca. 3000 vascular plant species, of which the Compositae are the largest plant family with ca. 450 spp. (Bonifacino et al. 2019). Among the Uruguayan Compositae, the Astereae constitute the largest tribe with 76 species, and within it, *Baccharis* L. comprising ca. 50 species is the largest genus of vascular plants in the country (Bonifacino et al. 2019).

Baccharis worldwide comprises 440 species (Heiden et al. 2019), is the largest genus in the Astereae, and is endemic to the Americas, occupying a wide range of habitats from Canada to Tierra del Fuego (Fielding 2001; Giuliano 2001; Müller 2006; Giuliano and Freire 2011; Heiden 2013). The genus is characterized by a tuft of trichomes commonly present on stems and leaves, and the occurrence of gynodioecious (generally functionally dioecious) plants with mostly functionally diclinous florets, except for a few species with reversal characteristics (Müller 2006; Heiden et al. 2019).

According to Heiden et al. (2019) *Baccharis* infrageneric classification comprises seven subgenera and 47 sections. Among these sections, *Baccharis* subgen. *Baccharis* sect. *Cylindrica* Heering is one of the top five most diverse sections and in Uruguay it is ecologically dominant in the scrub that develops associated to the grasslands alongside the country's extensive system of hills. Plants in this section are shrubs or xylopodiferous subshrubs with capitula arranged in leafy glomerules usually disposed in racemes.

During the Flora of Uruguay project, currently underway, we came across some specimens that, after close morphological examination proved to belong to a hitherto undescribed species, and based on molecular data and phylogenetic analysis (Heiden et al. 2019), this undescribed species emerged in the clade corresponding to *Baccharis* subgen. *Baccharis* sect. *Cylindrica*.

Our objective is therefore to describe this unnamed taxon as a new species, for which we propose the name *Baccharis funkiae* and provide description, illustration, field work pictures, etymology, distribution and habitat, and preliminary conservation status information. Comments on how to differentiate it from the morphologically similar *B. subopposita* DC., highlighting differences setting the new species apart are discussed. Additionally, a key to the identification of the Uruguayan species belonging to *Baccharis* sect. *Cylindrica* is presented.

MATERIALS AND METHODS

We have studied herbarium material hosted at ECT, MVFA, SI, and SPF (acronyms according Thiers 2019). Terminology for trichome morphology follows Ramayya (1962). Type material and protologues of phylogenetically closely related species sensu Heiden et al. (2019) were analyzed. We used this information to both ascertain the status of the taxon as new and to construct the dichotomous key. We recorded field information such as habitat, plant architecture, involucre shape, and corolla color. Plants were photographed in habitat showing details of various morphological parts. The illustration was prepared based on herbarium material using a camera lucida attachment fixed to a Wild M5 stereoscope, and later digitally edited. The preliminary conservation status of the species was assessed under IUCN (2019) guidelines and criteria based on georeferenced data. The Criterion B: Geographic range size, and fragmentation, decline or fluctuations, was used to evaluate if the taxon belongs in a threatened category. We applied the criterion of Geographic range through the assessment of area of occupancy (AOO) (IUCN 2012) estimated using the software GeoCAT, Geospatial Conservation Assessment Tool (Bachman et al. 2011), with a cell width of 2 km. Given that *Baccharis funkiae* shows a restricted geographic distribution and restricted habitat, we consider the AOO a good predictor for its real geographic distribution.

TAXONOMIC TREATMENT

Baccharis funkiae Bonif., G.Heiden, Valtierra & Marchesi, sp. nov. TYPE: URUGUAY, Treinta y Tres, Quebrada de los Cuervos, Lat. 32°55'26.34", Long. 54°27'31.74", 16 March 2017, C.Pérez, J.M.Bonifacino, F.Gadea, E.Pedrero & V.Valtierra 75 (Holotype MVFA!, Isotype ECT!; pistillate individual).

Gynodioecious (functionally dioecious) shrubs 0.8–1.5 m tall, stems erect, terete and seemingly glabrous, but covered with a thick resin layer released by tufted indumentum (composed of biseriate vesicular glandular trichome type β). Leaves 18–37 \times 3–9 mm, obtriangular to narrowly obovate, green, concolorous, coriaceous, glutinose, 1-veined, base sessile, long attenuate, apex truncate to obtuse, margins entire or entire in basal 2/3 with 2(3) teeth on each side in upper 1/3 and terminal apical tooth. **Capitula** solitary, pedunculate, peduncles 1.5–2 mm long, glandular. Staminate **capitula** involucres ca. 5 \times 2.5 mm, cylindrical; phyllaries 4-seriate, outer phyllaries 1.5–3 \times 0.8–1.5 mm, ovate to elliptic, base rounded, apex acute, glandular abaxially, herbaceous, margins fimbriate, membranaceous, inner phyllaries 4–4.5 \times 1–1.2 mm, narrowly obovate, base attenuate, apex acute, glandular trichomes (short biseriate vesicular glandular trichome type β) towards apex, abaxially, herbaceous, margins fimbriate towards apex, membranaceous; **receptacles** convex, fimbriate

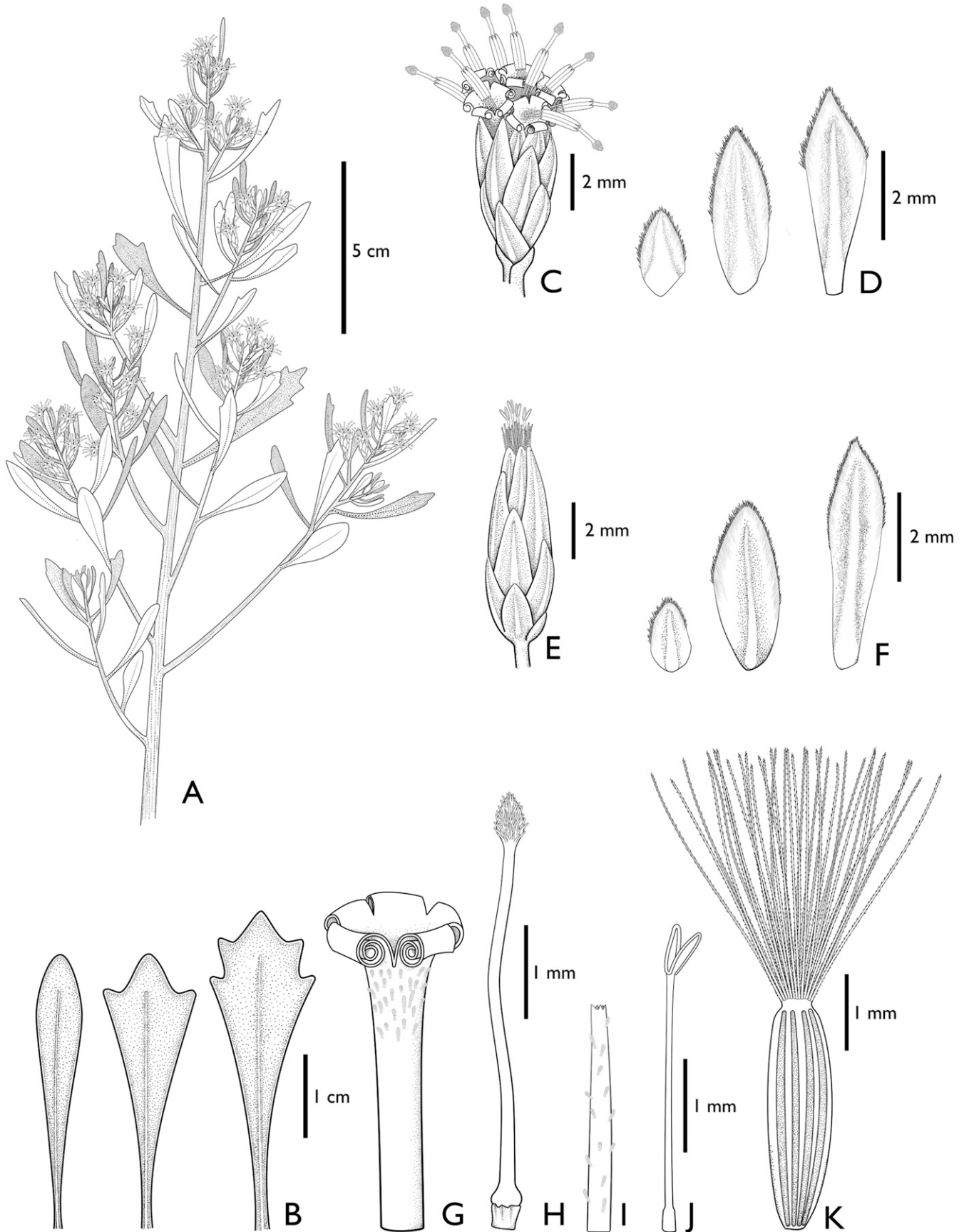


FIG. 1. *Baccharis funkiae*. A. Habit. B. Leaves, showing variation in number of teeth. C. Staminate capitulum. D. Phyllaries of staminate capitulum (outer to inner phyllaries, from left to right respectively). E. Pistillate capitulum. F. Phyllaries of pistillate capitulum (outer to inner phyllaries, from left to right respectively). G. Corolla of monoclinous floret (staminate capitulum). H. Style of monoclinous floret. I. Corolla of pistillate floret. J. Style of pistillate floret. K. Cypselas and pappus from pistillate floret.

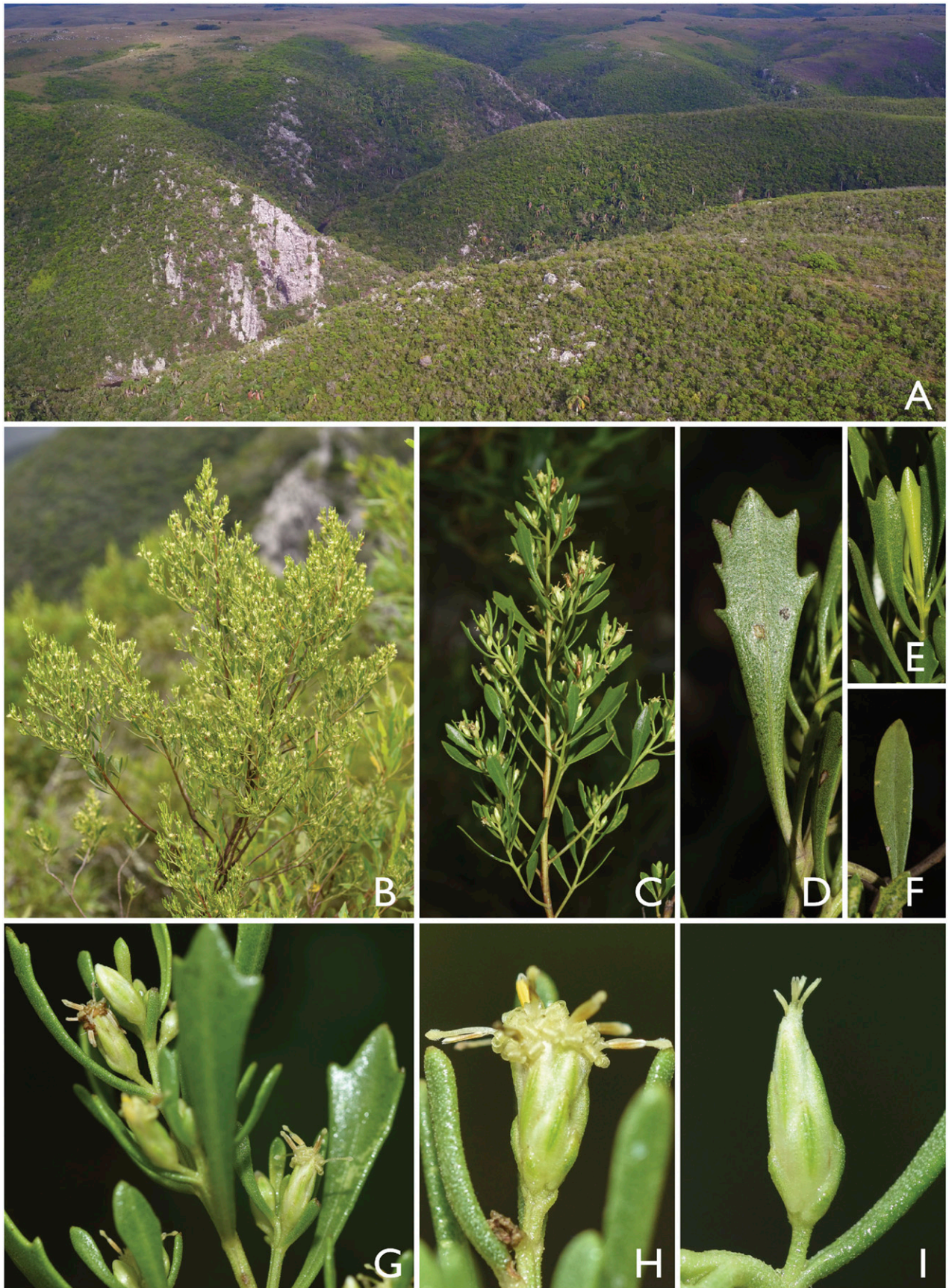


FIG. 2. *Baccharis funkiae*. A. Habitat in Quebrada de los Cuervos. B. Habit. C. Flowering branch. D-F. Leaf variation. G. Close-up of flowering branch, showing solitary axillary capitula. H. Staminate capitulum. I. Pistillate capitulum.

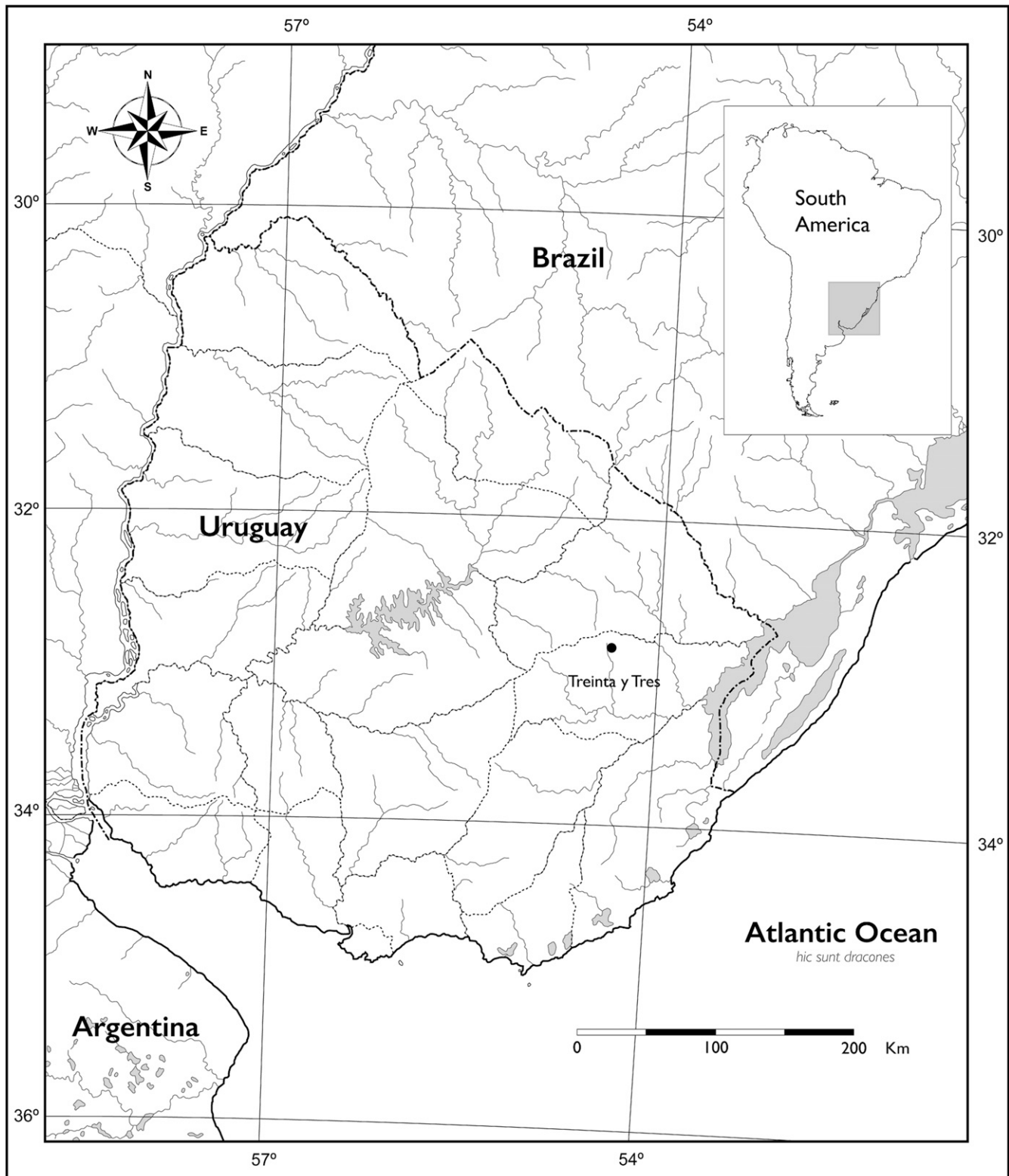


FIG. 3. Geographic distribution of *Baccharis funkiae* (Asteraceae: Astereae) at Quebrada de los Cuervos (•) in Treinta y Tres Department, Uruguay.

with walls of unequal height, inner taller and united to form a thin central palea-like prominence; **florets** 9 or 10, morphologically perfect, functionally staminate; corollas tubular, white-yellowish, 5-lobed, tube 4 mm long, cylindrical, abruptly broadened towards apex, lobes 1 mm long, triangular, tightly rolled, glandular trichomes (short biserial vesicular glandular trichome type β) arranged towards upper part of tube; anthers 1 mm long, oblong, yellow, base cordate, apical appendage triangular; style 5 mm long, style branches fused forming a thickened ovate-shaped upper part, collector trichomes covering all of thickened part; cypselae aborted, pappus 4 mm long, 1-seriate, composed of numerous persistent scabrous bristles, somewhat sinuous at base, slightly thickened and flattened towards apex, fused at base, stramineous. **Pistillate capitula** involucre 6–6.5 \times 2 mm, narrowly ovoid, phyllaries 4–5-seriate; outer phyllaries 1–3 \times 0.5–1 mm, ovate-elliptic to oblong, base rounded, apex acute, glandular trichomes (short biserial vesicular glandular trichome type β) towards apex, herbaceous, margins fimbriate towards apex, membranaceous; inner phyllaries 3.5–5.5 \times 0.7–1.3 mm, elliptic to narrowly elliptic, base attenuate, apex acute, glandular trichomes (short biserial vesicular glandular trichome type β) towards apex, margins fimbriate towards apex, membranaceous; **receptacles** convex, fimbriate with walls of unequal height, inner taller and united to form a thin central palea-like prominence; **florets** 3 to 5; corollas filiform, white-yellowish, 2.3–2.7 mm long, 5-lobed, lobes 0.05–0.07 mm long; style 3–3.5 mm long, stylopodium present, style branches 0.3–0.4 mm long, triangular, glabrous. **Cypselae** 1.5–2.4 mm long, cylindrical, provided with a short apical constriction, terete, 10-ribbed, glabrous; carpodium absent. Pappus 2.7–2.8 mm long, 2-seriate, composed of numerous persistent scabrous bristles, thinner towards apex, fused at base, stramineous. Figures 1, 2, 3.

Distribution and Habitat—The species is only known from the type locality at the Paisaje Protegido Quebrada de Los Cuervos, the oldest national-level protected landscape, in Treinta y Tres Department, Uruguay. *Baccharis funkiae* occurs in the Pampean Biogeographic Province where it inhabits the upper slopes of hills and crevices (150–200 m a. s. l.) occupied by dense scrub mostly composed of *Baccharis aliena* (Spreng.) Joch.Müll., *B. dracunculifolia* DC., *B. cultrata* Baker, *Hatchsbachiella tweediana* (Hook. & Arn.) R.M.King & H.Rob., and *Raldkoferotoma cistifolium* (Less.) Kuntze (Compositae), *Dodonaea viscosa* Jacq. (Sapindaceae), and *Mimosa bifurca* Benth. (Leguminosae). The new species occurs in soils developed over basement metamorphic rocks of impure-limestone composition. This sequence is characterized by muscovite \pm graphite limestones interbedded with muscovite \pm garnet \pm sillimanite \pm biotite schists. Thin to medium size layers of quartz-rich lithologies (quartzites, quartz-schists) are very common in the siliciclastic sequence (Blanco et al. 2009).

Etymology—We dedicate this species to our late friend Vicki Funk (Fig. 4), renowned synanthologist who was the driving force behind an international network of Compositae systematists. Vicki's cheerful and friendly spirit has inspired and empowered countless young systematists to pursue their passion for Compositae research, so we thought it fitting that the largest genus of Astereae had a species named after her.

Flowering Period—November to January.

Preliminary Conservation Status—*Baccharis funkiae* was categorized in the analysis of AOO as a Critically Endangered (CR) species. Only one population of *Baccharis funkiae* has been found so far, and it occurs as a part of the scrub vegetation that



FIG. 4. Vicki Funk examining *Baccharis trimera* (Less.) DC. in the foothills of Cerro Miriñaque in Rivera, Uruguay, during fieldwork with JMB in 2013. Vicki was a dauntless collector who intuitively knew where to look for botanical discoveries, and always cheerfully teamed up with local botanists in pursuit of Comps around the world. We deeply miss her and find solace knowing her spirit lingers on in every Comp along the mountains she loved.

dominates the upper slopes of the hills and crevices in the protected area "Paisaje protegido Quebrada de los Cuervos," in Treinta y Tres Department in northwestern Uruguay.

Note 1—*Baccharis funkiae* (paratype Heiden 1460) was included in a recent phylogeny of *Baccharis* (Heiden et al. 2019), where it was shown to belong to *Baccharis* subgen. *Baccharis* sect. *Cylindrica*, a position strongly supported (PP = 1) based on nuclear (ETS, ITS) and plastidial (trnH-psbA, trnL-F) data. *Baccharis* subgen. *Baccharis* sect. *Cylindrica* is morphologically characterized by a shrubby or xylopodiferous subshrubby habit with capitula usually arranged in leafy glomerules. The new species fits the gestalt of *Baccharis* subgen. *Baccharis* sect. *Cylindrica* but is rather distinctive in its capitula being solitary, a trait that could also be interpreted as an expanded leafy glomerule. According to Heiden et al. (2019), *Baccharis funkiae* is closely related to *Baccharis petraea* Heering and *B. subopposita* DC., differing from the former in its obovate to obtriangular leaves (vs. narrowly elliptic to linear) and from the latter in the solitary capitula (vs. paniculate caputulescence), and by fewer florets in the pistillate capitula 3–5 (vs. 22–40) and the cypselae 2–3 times as long as wide (vs. 1.5 times as long as wide).

Note 2—The glutinous nature of *Baccharis funkiae* is the result of the secretion of resins by the glandular trichomes (short biserial vesicular glandular trichome type β) arranged

in tufts that are somewhat sunken and spread throughout the whole surface of the plant (both leaves and stems).

Additional Specimens Examined—Uruguay. — TREINTA Y TRES: Quebrada de los Cuervos, [-32.924°, -54.459°], 16 March 2017, C. Pérez, J.M. Bonifacino,

F. Gadea, E. Pedrero & V. Valtierra 76 (staminate; ECT, MVFA); 1 November 1964, E. Marchesi 1277 (sterile; MVFA); trilha para o mirante do vale do rio Yermal Chico, [-32.924°, -54.466°], 197 m asl, 3 January 2011, G. Heiden & J.R.V. Iganci 1460 (sterile; ECT, MVFA, SPF).

KEY TO URUGUAYAN SPECIES OF *BACCHARIS* SUBGEN. *BACCHARIS* SECT. *CYLINDRICA*

1. Leaf margins sparsely and uniformly dentate throughout their length
 2. Teeth length ½ to 1/3 of distance from margins to midrib; pistillate capitula 23–35-flowered *B. pedersenii* Cabrera
 2. Teeth length ¼ or less of distance from margins to midrib; pistillate capitula 7–12-flowered *B. cognata* DC.
1. Leaf margins mostly entire, only sparsely dentate towards apex
 3. Capitula arranged in paniculiform capituloescences
 4. Leaves broadly elliptic or narrowly obovate; pistillate capitula 22–40-flowered; receptacle fimbriate *B. subopposita* DC.
 4. Leaves linear elliptic, narrowly ovate or narrowly obovate; pistillate capitula 10–14-flowered; receptacle alveolate
 5. Subshrubs up to 60 cm tall; xylopodium present; pappus strongly elongated at cypsel maturity, 8.5–11.5 mm long *B. linearifolia* (Lam.) Pers.
 5. Shrubs 100–200 cm tall; xylopodium absent; pappus not elongated at cypsel maturity, 2.5–3.5 mm long *B. microdonta* DC.
 3. Capitula solitary or arranged in glomerules
 6. Leaf bases rounded; receptacle alveolate; pistillate capitula 17–23-flowered; pappus 3–4-seriate *B. sessiliflora* Vahl
 6. Leaf bases attenuated; receptacle fimbriate; pistillate capitula 3–6-flowered; pappus 2-seriate
 7. Staminate capitula 5- or 6-flowered; cypselae 0.8–1 mm long, cylindrical with apical ring *B. vernicosa* Hook. & Arn.
 7. Staminate capitula 9- or 10-flowered; cypselae 1.5–2.4 mm long, cylindrical with short apical constriction *B. funkiae* sp.nov.

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AUTHOR CONTRIBUTIONS

MB, GH, MVV and EM collected data; MB prepared the description and illustrations; MB, GH, MVV and EM wrote the manuscript.

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