TAXONOMIC REVISION OF *KAUNIA* (EUPATORIEAE, ASTERACEAE), AN ANDEAN GENUS WITH PRESENCE IN EASTERN SOUTH AMERICA[1]

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ABSTRACT

Kaunia R. M. King & H. Rob. is a small genus of 11 species that play an important role in Andean ecosystems, either by dominating specific vegetation units or as subdominant species at boundaries of alder communities and pino del cerro forests. The species of *Kaunia* are shrubs or small trees with commonly pinkish or white, usually tubular-funnelform corollas of internally smooth lobes lacking papillae, uniformly wide styles, and 20 to 26 chromosomes. A complete and exhaustive treatment of *Kaunia* is lacking, and so its taxonomy is herein revised. As a result of this work, together with those of previous statistical studies, 10 species of *Kaunia* are recognized. *Kaunia ignorata* (Hieron.) R. M. King & H. Rob. is placed under synonymy of *K. camataquiensis* (Hieron.) R. M. King & H. Rob., and a lectotype for *Eupatorium hosanense* B. L. Rob. is designated. Our study provides the first morphological and anatomical study of *Kaunia*. A key to the species, detailed descriptions, illustrations, and distribution maps for each species are also provided.

Key words: Andes, Asteraceae, *Kaunia*, morphology, South America, taxonomy.

Kaunia R. M. King & H. Rob. is a genus with 11 species distributed in Argentina, Bolivia, Brazil, Ecuador, Paraguay, and Peru (Table 1), although the highest diversity occurs in the Andes. The species of *Kaunia* are shrubs or small trees with commonly pinkish or white, usually tubular-funnelform corollas of internally smooth, not papillate lobes, uniformly wide styles, and 20 to 26 chromosomes (Robinson et al., 1989). *Kaunia* was first described by King and Robinson (1980) to include 14 species that originally belonged to *Eupatorium* L. (Table 1). As a result of partial taxonomic (Robinson & Holmes, 2008; Jørgensen et al., 2010) and statistical, morphological, and ecological integrative studies (Viera Barreto et al., 2018), only 11 species of *Kaunia* are currently recognized. *Kaunia* belongs to the subtribe Oxylobinae R. M. King & H. Rob. (Eupatorieae), which includes 10 genera distributed from southern North America to South America, with the highest concentration of species in Mexico and the Andean highlands. However, recent molecular studies on Eupatorieae (Hattori, 2013; Fernandes, 2014; Tippery et al., 2014; Rivera et al., 2016) are challenging the circumscription of the subtribes proposed by King and Robinson (1987 and subsequent works) by showing them as non-monophyletic groups. For this reason, the placement of *Kaunia* in Oxylobinae should be confirmed by future studies involving comprehensive sampling throughout the tribe.

In *Kaunia*, as in many other Eupatorieae, the anatomical characters are important for genus and species identifications. For instance, recent anatomical studies have shown uncommon glandular trichomes on styles, which have proved to be useful in the identification of the species of *Kaunia* (Viera Barreto et al., 2016). In this work, a defensive role for the stylar glands was suggested by regarding these glands as the last defense barrier in the flower against predators (Viera Barreto et al., 2016).

Phylogenetic studies involving all or most of the species of *Kaunia* have not yet been carried out. Rivera et al. (2016) included three species of *Kaunia* (*K. lasiophthalma* (Griseb.) R. M. King & H. Rob., *K.*

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Table 1. Taxonomic history of *Kaunia* R. M. King & H. Rob. For reference of basionyms see the taxonomic treatment section.

Basionym and original description date	New combinations in *Kaunia* (King & Robinson, 1980)	Synonymy	Geographic distribution
Eupatorium rufescens P. W. Lund ex DC., 1836	*K. rufescens*		Argentina, Bolivia, Brazil, Paraguay
E. lasiophthalmum Griseb., 1874	*K. lasiophthalma*		Argentina, Bolivia
E. longipetiolatum Sch. Bip. ex Rusby, 1893	*K. longipetiolata*		Bolivia, Ecuador, Peru
E. saltense Hieron., 1897	*K. saltensis*		Argentina, Bolivia
E. gynoxymorphum Rusby ex B. L. Rob., 1920	*K. gynoxymorpha*		Bolivia
E. ignoratum Hieron., 1908	*K. ignorata*		Bolivia
E. camataquiense Hieron., 1908	*K. camataquiensis*		Bolivia
E. grossidentatum Hieron., 1908	*K. grossidentata*	Jørgensen et al., 2010 (= *K. camataquiensis*)	Bolivia
E. endytum B. L. Rob., 1919	*K. endyta*		Bolivia, Peru
E. uber B. L. Rob., 1919	*K. uber*	Robinson & Holmes, 2008; Viera Barreto et al., 2018 (= *K. longipetiolata*)	Peru
E. longipetiolatum var. *arbusculare* B. L. Rob., 1920	*K. arbuscularis*	Robinson & Holmes, 2008; Viera Barreto et al., 2018 (= *K. longipetiolata*)	Ecuador
E. pachanoi B. L. Rob., 1920	*K. pachanoi*		Ecuador
E. eucosmoides B. L. Rob.*, 1925	*K. eucosmoides*		Peru
E. hosanensis B. L. Rob., 1932	*K. hosanensis*		Bolivia

* Type.

rufescens (P. W. Lund ex DC.) R. M. King & H. Rob., and *K. saltensis* (Hieron.) R. M. King & H. Rob.) in their molecular studies, which resulted in monophyly.

The characters used to differentiate the species of *Kaunia* were, many times, confusingly defined, which obscured their identification. Specifically, there was a complex of six species with rather similar leaf characteristics: *K. arbuscularis* (B. L. Rob.) R. M. King & H. Rob. (today regarded as a synonym of *K. longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob.), *K. lasiophthalma*, *K. longipetiolata*, *K. rufescens*, *K. saltensis*, and *K. uber* (B. L. Rob.) R. M. King & H. Rob. (today regarded as a synonym of *K. longipetiolata*). This complex was statistically studied (Viera Barreto et al., 2018), and, as a result, vegetative characters (such as area of leaf surface covered by simple trichomes, among others) over floral characters were found to be significant for distinguishing species.

From a geographic point of view, *Kaunia* occurs mainly in the Andes, inhabiting especially the shrubby layer of subtropical montane forest and occasionally secondary forests (Liberman Cruz & Pedrotti, 2006). That mountains could have played the role of a corridor for migration of some species of *Kaunia* (e.g., *K. longipetiolata*) along a latitudinal gradient has been proposed by Viera Barreto et al. (2018), based on a species distribution modeling (SDM) approach. As well, these studies suggest that ecological isolation may have played a role at some point in the species differentiation of *Kaunia*.

Up to the present, *Kaunia* was not treated globally and a key including all of its species was lacking. Detailed descriptions, morphological character analyses, maps, and illustrations of all of the species have not been carried out as well. In this context, an evaluation of the diagnostic characters of *Kaunia* in order to reflect the morphological variation throughout the genus is pending.

The present study aims to carry out morphological and anatomical studies together with a taxonomic revision of *Kaunia* that join all of the available information of this little-known genus.

Materials and Methods

MORPHOLOGICAL AND ANATOMICAL STUDIES

All of the accepted species of *Kaunia* were included in the morphological and anatomical studies, except *K. hosanensis* (B. L. Rob.) R. M. King & H. Rob., which is known from only the type collection. Data were obtained from the study of 288 herbarium specimens (23 type and 265 non-type specimens) from CORD, CTES, F, GH, LP, LPB, MO, NY, and SI (acronyms according to Thiers, continuously updated) and from field observations. Additionally, 43 type specimen images were obtained from <https://plants.jstor.org/> and from herbarium web pages (B, BR, C, E, G, GOET, K, LD, M, MICH, MOL, P, PH, S, US, WIS, and Z). Collectors and collection numbers are listed in Appendix 1.

For light microscopy examination, floral and vegetative parts were rehydrated, treated with a clearing process, and stained in 2% safranin. For anatomical observations, transverse sections of leaves were cut by free hand. Whenever possible, data from live specimens were included (phyllaries, pappus, and corolla color) in the descriptions. Plant illustrations were made by Samanta Faiad, Alejandra Migoya, and Julieta Ponte. The floral structures were observed using a Nikon SMZ1000 stereomicroscope (Nikon, Tokyo, Japan) and a Nikon Eclipse E200 light microscope with a camera lucida. Photographs were taken with a Nikon Coolpix S10. Pubescence leaf cover was measured with 4× magnification with the same equipment.

For SEM, portions of flowers of formaldehyde/acetic acid/alcohol (FAA)–fixed samples were taken, critical-point dried in CO_2, sputter-coated with gold palladium, and examined in a JEOL/EO JSM-6360 microscope (JEOL Ltd., Tokyo, Japan) at Museo de La Plata, Argentina.

The terminology follows Hess (1938) for cypsela trichomes, Ramayya (1962) for general trichomes, Hickey (1974) for leaf terminology, Rua (1999) for secondary inflorescence architecture, and Small (1919), Metcalfe and Chalk (1979), King and Robinson (1987), and Harris and Harris (1994) for general terminology. In order to avoid confusion, glabrous surfaces are here regarded as lacking non-glandular trichomes, although they could bear glandular trichomes (glandular surface).

For each species, protologue data are included between quotes. Additional information to the descriptions is provided as follows: Phenology, Geographic distribution, Ecology and habitat, Etymology, Common names, Uses, Observations, and Nomenclatural notes. The lack of any of these items in the description indicates unknown information.

Results

From the studies provided herein, together with the information obtained in previous works (Viera Barreto et al., 2016, 2018) and field observations, we recognize 10 species of *Kaunia*, for which general morphology and anatomy, geographic distributions, and taxonomic treatments are provided as follows.

MORPHOLOGY AND ANATOMY

The species of *Kaunia* are shrubs 2–5 m tall, although in some species (*K. camataquiensis* (Hieron.) R. M. King & H. Rob., *K. gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob., *K. lasiophthalma*, and *K. longipetiolata*) small trees up to 6 m tall are found. In some individuals, secondary stems grow along with the main stem. In Eupatorieae, trees are uncommon and can be found in a few other genera such as *Badilloa* R. M. King & H. Rob, *Critonia* P. Browne, and *Koanophyllon* Arruda (King & Robinson, 1987). The young woody branches are pubescent but glabrous at maturity, except in *K. endyta* (B. L. Rob.) R. M. King & H. Rob. and *K. pachanoi* (B. L. Rob.) R. M. King & H. Rob., which have pubescent old branches; in *K. eucosmoides* (B. L. Rob.) R. M. King & H. Rob., *K. gynoxymorpha*, and *K. longipetiolata* the old branches are subglabrous.

The internodes are variable in length. The shortest internodes are found in *Kaunia pachanoi* (less than 2 mm) and the longest internodes in *K. camataquiensis*, *K. endyta*, and *K. longipetiolata* (up to 10 cm).

The leaves of *Kaunia* are persistent or exceptionally caducous in *K. longipetiolata* (Seibert, 1993 and personal observations), opposite, and decussate. Occasionally, short branches are borne between the main stem and leaves (e.g., *K. camataquiensis*). The leaves are petiolate except in *K. pachanoi*, which has sessile or subsessile leaves. The petiole length is variable and ranges from 0 to 2 mm in *K. pachanoi* and to 8 cm in *K. lasiophthalma*. Most leaf blades in *Kaunia* are relatively large (e.g., up to 17 × 10.5 cm in *K. lasiophthalma*, 20 × 11 cm in *K. longipetiolata*, and 20 × 15 cm in *K. rufescens*); *K. pachanoi*, however, has relatively small leaves (1–2.2 × 0.4–1 cm).

Leaf blades are simple and mostly ovate (e.g., *Kaunia eucosmoides*, *K. gynoxymorpha*, *K. hosanensis*, *K. longipetiolata*, and *K. saltensis*), or ovate-elliptic (e.g., *K. endyta*, *K. eucosmoides*, *K. gynoxymorpha*, and *K. pachanoi*), ovate-lanceolate (e.g., *K. camataquiensis*, *K. longipetiolata*, and *K. saltensis*), ovate-rhombic (e.g., *K. camataquiensis* and *K. rufescens*), ovate-deltoid (e.g., *K. lasiophthalma*), or elliptic (e.g., *K. endyta* and *K. longipetiolata*). The leaf bases are symmetric or subsymmetric, cuneate, rounded, subcordate, or truncate, for instance, in *K. gynoxymorpha*, although there are intermediate forms among these shapes. Leaf apices in most species are acute or acuminate; occasionally they are obtuse (e.g., *K. hosanensis*). Leaf margins are mostly serrate (e.g., *K. lasiophthalma* and *K. saltensis*), serrulate (e.g., *K. eucosmoides* and *K. pachanoi*), undulate (e.g., *K. endyta* and *K. eucosmoides*), or crenate (e.g., *K. rufescens*), less commonly entire (e.g., *K. camataquiensis* and *K. gynoxymorpha*), or intermediate among those types of margins. Leaf margins can vary in the same plant. For instance, entire, barely serrate, and coarsely serrate (with relatively large teeth) blade margins are found in *K. camataquiensis*, crenate or serrate margins in *K. rufescens*, or entire and serrate margins in *K. gynoxymorpha*.

In *K. longipetiolata* the leaves of the secondary inflorescences have entire margins, whereas those of the main stems have serrate margins. The teeth of serrate margins are mucronate and similar or different in size and shape. A third-order vein ends in the teeth mucro.

Leaf venation in most of the species of *Kaunia* is acrodromous, with one (e.g., *K. camataquiensis* and *K. pachanoi*) (Fig. 1A) or two pairs (e.g., *K. hosanensis*) (Fig. 1B) of strongly developed secondary veins, imperfect (secondary veins running less than two thirds of the distance to the leaf apex), and suprabasal (secondary veins originating some distance above the leaf base); only *K. saltensis* has acrodromous, basal leaf venation. Two species, *K. endyta* and *K. gynoxymorpha*, have pinnate eucamptodromous venation (Fig. 1C) (terminology according to Hickey, 1974). The tertiary veins are reticulate and delimit areoles; veinlets end within the areoles. The presence of one or two strongly developed pairs of secondary veins is usual in Eupatorieae (King & Robinson, 1987).

Regarding the indumentum, the leaf blades of *Kaunia eucosmoides* and *K. saltensis* are eglandular and glabrous on both surfaces, although in *K. eucosmoides* the abaxial surface is sometimes subglabrous with a few trichomes at the vein bifurcation point. In the other species, the adaxial leaf surface is more or less glandular and glabrous or subglabrous except in *K. endyta*, which has shortly hirsute adaxial surfaces. The abaxial surface of *K. camataquiensis* is glabrous or subglabrous and glandular. In *K. endyta*, *K. lasiophthalma*, *K. longipetiolata*, and *K. rufescens* the abaxial surface is glandular and variously pubescent. In *K. lasiophthalma* the non-glandular trichomes cover about 5%–50% of the abaxial surface. In the remaining species, the glandular and non-glandular trichomes cover about 60%–95% of the abaxial surface. The trichome cover has been used in species determination by previous authors, although this is a feature difficult to define accurately. The glandular trichomes of *Kaunia* are biseriate vesicular glandular, subtype β. The non-glandular trichomes are simple conical (in most of the species), oblique aseptate flagellate (e.g., *K. endyta*), and exceptionally T-shaped (e.g., *K. gynoxymorpha*). A detailed study of these last trichomes in *Kaunia* and other South American Eupatorieae, which is out of the scope of this revision, is presently being carried out (Viera Barreto, in prep.). The characteristics of the trichomes of *Kaunia* agree with those described by Ramayya (1962).

Leaf Anatomy

The species of *Kaunia* have amphistomatic blades. The stomata are anomocytic. The cuticle is usually thin and sometimes thickened (e.g., *K. eucosmoides* and *K. pachanoi*) with the surface smooth (e.g., *K. lasiophthalma* and *K. longipetiolata*) to striate (e.g., *K. gynoxymorpha*). The epidermis is a single layer (sometimes two layers in *K. gynoxymorpha*) of isodiametric or polygonal cells (Fig. 2A). In the mostly glandular leaf blades, the glandular trichomes are sunken into epidermal cavities (Fig. 2A). The mesophyll is dorsiventral with one or usually two layers of palisade tissue (Fig. 2A). This type of mesophyll is typical of mesomorphic leaves of plants found in relatively humid conditions such as those of temperate regions. The sheath of secondary vascular bundles can extend toward the abaxial and adaxial surfaces in, for instance, *K. saltensis* (Fig. 2B). In *K. lasiophthalma*, secretory reservoirs were found between the palisade and the spongy tissue. Median vascular bundles are usually associated with subepidermal collenchyma sheaths. We did not observe sclerenchyma elements associated with the vascular bundles. However, an incomplete bundle sheath of parenchyma with thickened cell walls was found in, for instance, *K. endyta* (Fig. 2C). As well, *K. gynoxymorpha* and *K. saltensis* have mesophylls with two to four secretory reservoirs by the median vein; the reservoirs are surrounded by epithelial cells (Fig. 2D). Secretory reservoirs are common in Eupatorieae (e.g., Plos et al., 2011) and other Asteraceae (e.g., Simon et al., 2002; Andreucci et al., 2008; Sancho et al., 2010). According to Plos et al. (2011), the secretory reservoirs of *Ophryosporus* Meyen (Eupatorieae), instead of the glandular trichomes, are likely to be the responsible structures for synthesizing secondary metabolites. In *Kaunia*, however, glandular trichomes are profusely distributed in vegetative and floral structures and may have an important role in secondary metabolite synthesis (Viera Barreto et al., 2016).

The capitulescences in *Kaunia* are always terminal and include many capitula (from 20 to 50 per capitulescence in *K. pachanoi* to more than 500 in *K. longipetiolata*). They are sub-aphyllous, with only a pair of reduced leaves at the nodes (e.g., *K. saltensis*), or leafy, with well-developed leaves, similar to those of the stems (e.g., *K. lasiophthalma*). The capitulescence unit in *Kaunia* is a cyme-like dichasium at the base of the axes and a cyme-like monochasium at the end of the axes (Fig. 1D). *Kaunia* has two types of capitulescences: (1) thyrsoid: thyrse-like, with a main axis ending in a cyme of capitula and several paraclades bearing pseudo-racemes of cyme-like units (e.g., *K. lasiophthalma*, *K. longipetiolata*, *K. rufescens*; Fig. 1E), and (2) cymoid: strongly acropetal thyrsoid, the main axis ending in a cyme of capitula and one or two first-order paraclades bearing cymes of capitula. This arrangement provides the cyme-like aspect to the capitulescence (e.g., *K. gynoxymorpha* and *K. saltensis*; Fig. 1F). The paraclades of the capitulescences are always opposite and decussate. They range from first order to fourth order. The pairs of paraclades vary from three to 10 in number. The distance between pairs of paraclades

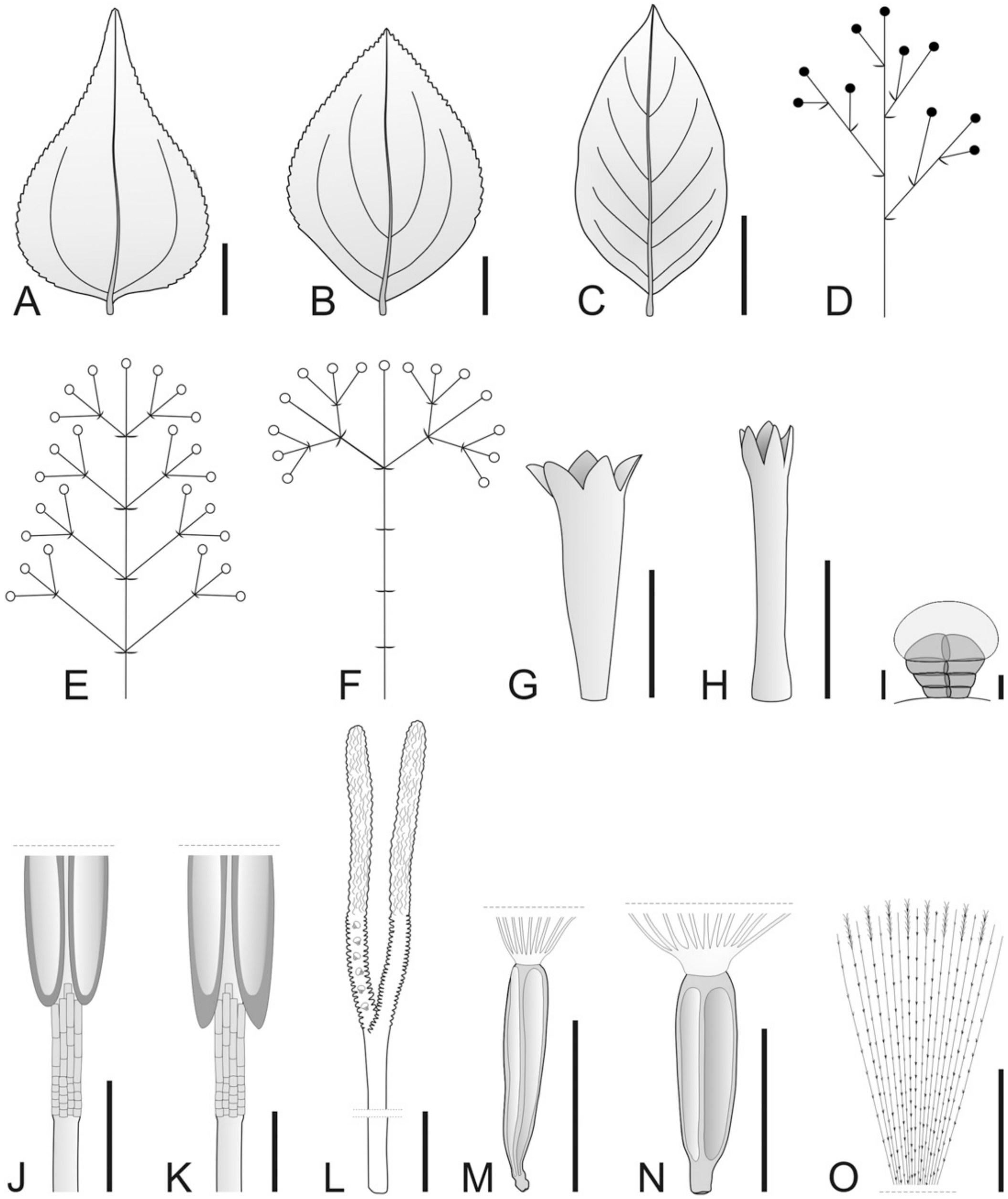

Figure 1. Morphology of *Kaunia* R. M. King & H. Rob. A–C. Leaf venation. —A. Basal acrodromous with one pair of strongly developed secondary veins (*K. saltensis* (Hieron.) R. M. King & H. Rob.). —B. Suprabasal acrodromous with two pairs of strongly developed secondary veins (*K. rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob.). —C. Pinnate eucamptodromous (*K. endyta* (B. L. Rob.) R. M. King & H. Rob.). D–F. Capitulescences. —D. Secondary inflorescence unit: a dichasium cyme at the base of the axes and a monochasium cyme at the end of the axes. —E. Thyrsoid capitulescence. —F. Cymoid capitulescence. G, H. Corollas. —G. Tubular-funnelform (*K. saltensis*). —H. Tubular (*K. endyta*). —I. Biseriate vesicular subtype β glandular trichome (*K. longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob.). J, K. Stamens. —J. Thecae obtuse at the base (*K. lasiophthalma* (Griseb.) R. M. King & H. Rob.). —K. Thecae auriculate at the base (*K. gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob.). —L. Style evenly wide throughout (base not swollen), style branches linear, with glandular trichomes on the inner surface (*K. lasiophthalma*). M, N. Cypselae. —M. Obovate-fusiform; carpopodium stopper-shaped (*K. camataquiensis* (Hieron.) R. M. King & H. Rob.). —N. Obovate-cylindrical, carpopodium cylindrical (*K. endyta*). —O. Pappus of unequal setae: setae uniformly wide throughout and setae slightly wider apically (*K. longipetiolata*). Scale bars: A–C = 2 cm; G, H = 2 mm; I = 12 μm; J, K = 0.4 mm; L–O = 1.5 mm. A, G from *J. C. Solomon 10312* (NY); B from *G. Hatschbach & A. C. Cervi 49550* (NY); C, H, N from *S. G. Beck 32690* (LP); I, O from *B. Peyton & S. T. Peyton 1144* (F); J, L from *R. F. Steinbach 114* (LP); K from *O. Buchtien 7550* (LP); M from *M. Nee 49436* (NY).

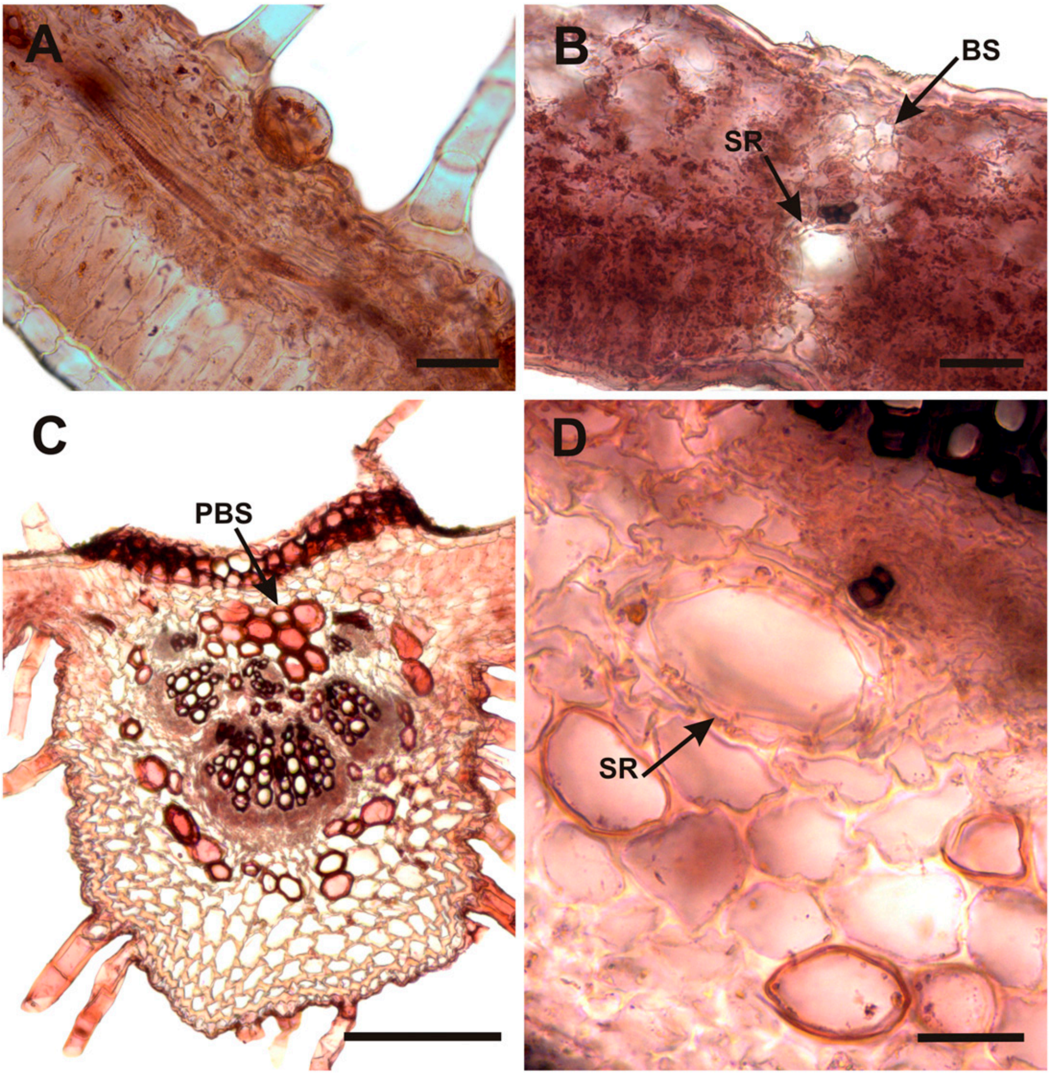

Figure 2. A–D. Leaf anatomy of *Kaunia* R. M. King & H. Rob. —A. Leaf transverse section showing sunken glandular hairs (*K. endyta* (B. L. Rob.) R. M. King & H. Rob.). —B. Secondary vascular bundle sheath extension (*K. saltensis* (Hieron.) R. M. King & H. Rob.). —C. Midvein showing vascular bundles and an incomplete bundle sheath of parenchyma (*K. endyta*). —D. Detail of secretory reservoir (*K. saltensis*). BS, bundle sheath; PBS, parenchyma bundle sheath; SR, secretory reservoir. Scale bars: A, B = 30 μm; C = 250 μm; D = 20 μm. A, C from *S. G. Beck et al. 29751* (LP); B, D from *H. A. Fabris et al. 6329* (LP).

provides the general aspect to the capitulescence (e.g., globose, as in cymoid capitulescences, or elongate, as in thyrsoid capitulescences). The presence of capitulescences on first- or second-order stems provides the general aspect of the capitulescence as well. The capitula are usually congested, and in *K. pachanoi* they are glomerate.

The capitula are pedunculate, discoid (with only actinomorphic florets), and homogamous (with hermaphroditic flowers). The peduncles are bracteolate and vary from 3 to 10 mm long (up to 12 mm in *Kaunia pachanoi*). The peduncle bracteoles are alternate or opposite and range from one to four (up to eight in *K. pachanoi*); they are linear, with a clasping base and an acute apex.

The involucre in *Kaunia* is campanulate in shape. The phyllaries are arranged in two or three series, slightly unequal in length. The involucres of Eupatorieae have been classified as imbricate, sub-imbricate, and eximbricate (e.g., King & Robinson, 1987). Based on these involucre characteristics, some authors defined sections in *Eupatorium*. Most species of *Kaunia*, which were previously treated in *Eupatorium*, have traditionally been placed in *Eupatorium* sect. *Eximbricata* Hoffm. (Robinson, 1919, 1920b; Cabrera & Vittet, 1954). Included in this section were those species of *Eupatorium* with barely imbricate, subequal in length phyllaries except for one to three external, shorter phyllaries. In those species of *Kaunia* that have up to three series of phyllaries (e.g., *K. endyta*, *K. lasiophthalma*, *K. rufescens*, and *K. saltensis*), the median and internal phyllaries are very similar in length. Characteristically, the species belonging to *Eupatorium* sect. *Eximbricata* had phyllaries persistent after fruit dispersion. *Kaunia camataquiensis*, *K. endyta*, *K. lasiophthalma*, and *K. rufescens* have some caducous internal phyllaries. Only *K. gynoxymorpha* and *K. hosanensis* were formerly placed in *Eupatorium* sect. *Subimbricata* Hoffm. (Robinson, 1920a), which was characterized by phyllaries unequal in length, with the external ones becoming gradually shorter and arranged in three or more series. However, the involucral features of these two species only partially agree with those of section *Subimbricata*. Because some species of *Kaunia* show states that are intermediate compared to those observed in sections *Eximbricata* and *Subimbricata*, in the present treatment we did not establish morphological groups within *Kaunia* based on involucre characteristics.

The number of phyllaries in *Kaunia* varies from 12 to 29. The external phyllaries are ovate, obovate, ovate-lanceolate, or oblong with acute or subacute apices; the middle phyllaries (if present) are ovate, ovate-oblong, or ovate-lanceolate with subacute or obtuse apices; the internal phyllaries are ovate-lanceolate, oblong, obovate, obovate-elliptic, lanceolate, elliptic, or obovate-oblong with acute, subacute, or obtuse apices. Phyllary margins are scarious and fimbriate. In live specimens (we studied live specimens of *K. camataquiensis*, *K. lasiophthalma*, *K. longipetiolata*, *K. rufescens*, and *K. saltensis*), the phyllaries are herbaceous in consistency and green, commonly with purple tips. The phyllaries are 3-veined, with usually ramified veins. The stereoma (which provides strength to the phyllary) is entire or divided and occurs more profusely in external and middle phyllaries (when present). All species of *Kaunia*, except *K. saltensis*, have glandular phyllaries (with biseriate vesiculate glandular trichomes subtype β). The phyllaries are also subglabrous to pubescent with long trichomes (oblique aseptate flagellate or simple conical, varying in cell number). Both glandular and eglandular trichomes cover the external surfaces of the phyllaries. The degree of trichome cover and presence of glandular trichomes on phyllaries have been pointed out as diagnostic for the identification of *Kaunia* species. However, these features were not always clearly delimited by previous authors (Hieronymus, 1908; Robinson, 1919). Statistical studies (Viera Barreto et al., 2018) were carried out to clarify the value of these features in species identifications of *Kaunia*. According to Viera Barreto et al. (2018) the phyllary pubescence, among other characters, allowed discrimination of certain species of *Kaunia* (e.g., *K. lasiophthalma*, *K. rufescens*, and *K. saltensis*).

The receptacles of *Kaunia* are flat to slightly convex, which are the usual shapes in Eupatorieae (King & Robinson, 1987). Exceptionally, some specimens of *K. rufescens* have convex receptacles. In addition, the receptacles of *Kaunia* are epaleaceous, areolate (with polygonal depressions surrounded by a low, narrow ridge (Small, 1919), and glabrous, except in *K. camataquiensis* and *K. longipetiolata*, which have subglabrous receptacles with a few long oblique aseptate flagellate trichomes. The scattered presence of pilose receptacles throughout the Eupatorieae (King & Robinson, 1987) may indicate that, at genus rank, this feature is only relatively valuable as a diagnostic.

The florets of *Kaunia* are hermaphroditic and fertile, as in other genera of Eupatorieae (King & Robinson, 1987). The number of florets usually varies from 20 to 30; however, *K. pachanoi* has 10 to 16 florets, *K. gynoxymorpha* and *K. rufescens* have up to 38 to 40 florets, and *K. endyta* has up to 45 florets. Even though a count of 50 florets was reported for *K. ignorata* (Hieron.) R. M. King & H. Rob. (Hieronymus, 1908), we were not able to find more than 27 in that species. The amount of florets in *Kaunia* is typical for tribe Oxylobinae.

The corollas of *Kaunia* are white, whitish lilac, white-pink, or pinkish, although the color varies with flower maturity. Corollas are tubular-funnelform (Fig. 1G), showing a gradual transition from tube to limb, or tubular in *K. endyta* (Fig. 1H). The corollas are 3.5–5 mm long, 5-lobed, with deltoid lobes 0.4–0.6 × 0.3–0.5 mm. These short lobes are typical of Eupatorieae. The corolla cells are narrowly prismatic with sinuate lateral walls; the cell walls are even more sinuate at the corolla throat. In *K. gynoxymorpha* there are some cells with thickened walls. The corollas of *Kaunia* are also glabrous and glandular or eglandular. The corolla tube is eglandular or exceptionally bears two or three simple biseriate glandular trichomes. Only in *K. gynoxymorpha* are the tube trichomes glandular biseriate vesicular, subtype β. The outer surfaces of the corolla lobes are glandular, with biseriate vesicular, subtype β glandular trichomes (Fig. 1I), and sometimes with relatively long papillae on the tips. The inner surfaces of the corolla lobes are smooth (Fig. 3A), which departs from most other genera of the subtribe Oxylobinae in which the presence of papillae on the inner surfaces of the lobes was regarded as a diagnostic character (King & Robinson, 1987).

The filaments of the stamens are inserted on the first third of the corolla, as is usual in Eupatorieae (King & Robinson, 1987). The anthers are 1–2 × ca. 0.4 mm.

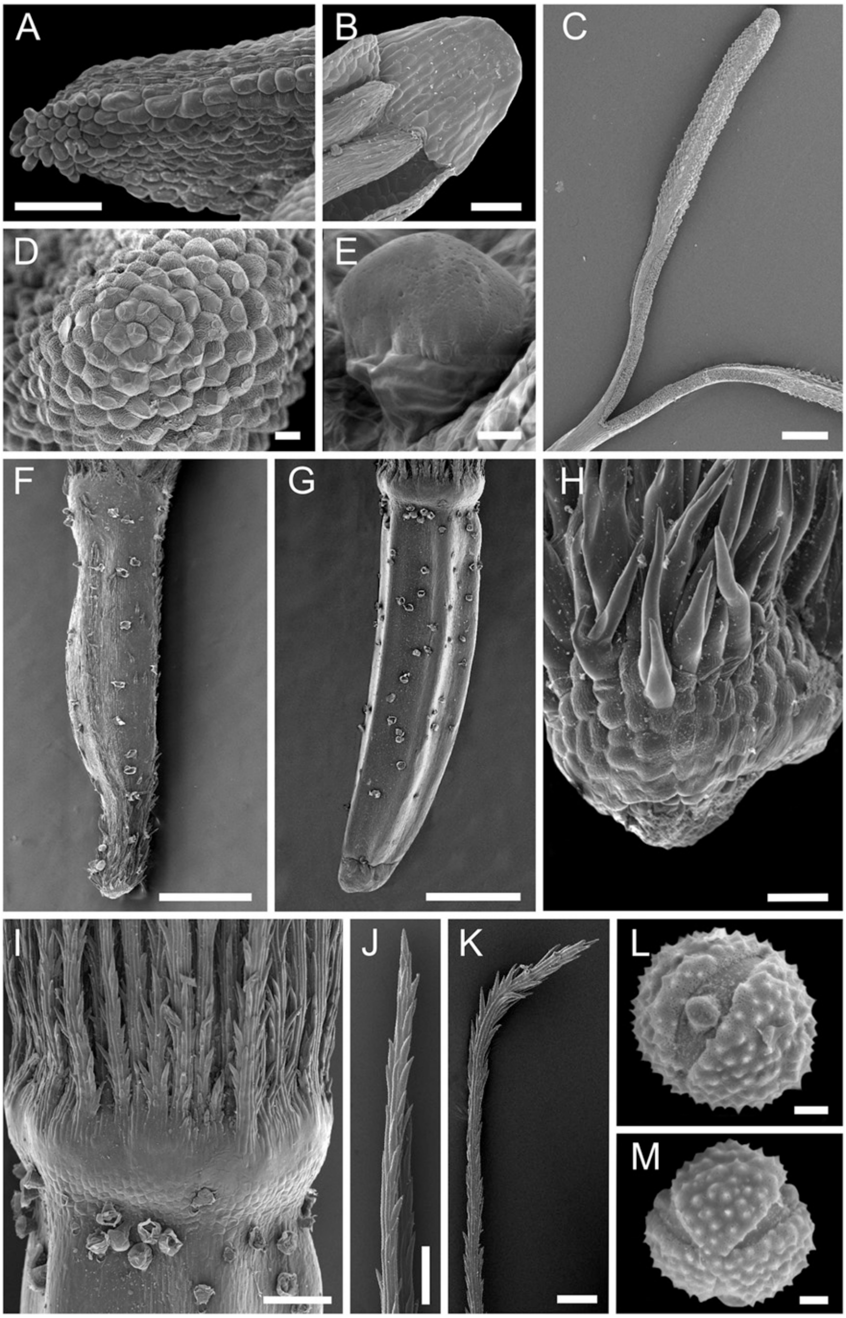

Figure 3. SEM images of *Kaunia* R. M. King & H. Rob. structures. —A. Smooth inner surface of corolla lobes (*K. lasiophthalma* (Griseb.) R. M. King & H. Rob.) —B. Apical appendage of anther (*K. saltensis* (Hieron.) R. M. King & H. Rob.). —C. Style branches showing the basal first third fertile portion and the upper two thirds sterile portion (*K. saltensis*). —D. Style appendage with longitudinally striate cells (*K. lasiophthalma*). —E. Biseriate vesiculate, subtype β glandular trichome of style branch (*K. longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob.). —F. Obovate-fusiform cypselae (*K. saltensis*). —G. Obovate-cylindrical cypselae (*K. endyta* (B. L. Rob.) R. M. King & H. Rob.). —H. Stopper-shaped carpopodium (*K. saltensis*). —I. Basal ring of connate setae of pappus (*K. endyta*). —J. Seta uniformly wide throughout (*K. lasiophthalma*). —K. Seta slightly wider apically (*K. saltensis*). —L. Pollen grain equatorial view (*K. camataquiensis* (Hieron.) R. M. King & H. Rob.). —M. Pollen grain polar view (*K. camataquiensis*). Scale bars: A, J, K = 100 μm; B, D, H = 50 μm; C, F, G = 500 μm; E = 10 μm; I = 20 μm; L, M = 2.5 μm. A, D, J from *J. N. Viera Barreto et al. 54* (LP); B, C, F, H, K from *J. N. Viera Barreto et al. 49* (LP); E from *B. Peyton & S. T. Peyton 1144* (F); G, I from *S. G. Beck et al. 29751* (LP); L, M from *J. N. Viera Barreto et al. 44* (LP).

The anther collars are 0.2–0.5 × ca. 0.1 mm, evenly wide throughout, cylindrical, with rectangular distal cells and quadrangular proximal cells, which matches the most common pattern of anther collar cells in the Eupatorieae (King & Robinson, 1987). Although according to King and Robinson (1987) the anther collar of Eupatorieae is very variable in shape, those of *Kaunia* are uncommonly homogeneous. The thecae are obtuse at the base (Fig. 1J), except in *K. gynoxymorpha*, which has auriculate theca bases (Fig. 1K). The apical appendages of the anthers are 0.2–0.3 × 0.3–0.4 mm and ovate, acute, subacute, or obtuse apically (Fig. 3B). The external cell walls of the appendages are thickened. This type of anther appendage is the most common in Eupatorieae, although within the tribe there are genera with differing degrees of appendage reduction. Indeed, some genera lack anther appendages (e.g., *Ophryosporus* Meyen).

The styles are, perhaps, the most distinctive feature of Eupatorieae. In *Kaunia*, as in the other Eupatorieae, the styles are exserted, widely overpassing the corolla. Within the tribe, the exserted style branches have been pointed out as pollinator attractants in the absence of a showy and radiating corolla (Cassini, 1819; King & Robinson, 1987). The style shaft of *Kaunia* is glabrous and evenly thick throughout (base not swollen) (Fig. 1L). However, pilose style bases are relatively usual in Eupatorieae (e.g., *Austroeupatorium* R. M. King & H. Rob., *Brickellia* Elliott, *Campuloclinium* DC., *Gyptis* Cass., and *Mikania* Willd.). The evenly wide styles are uncommon in Oxylobinae because most genera of the subtribe have styles that are widened basally. The style base is inserted into a lobulate and glabrous nectary, with stomata. According to King and Robinson (1987), these stomata may be regarded as secretory pores. The styles of *Kaunia* are 5.5–9.5 mm long and the style branches 2–6.5 mm long, linear in shape, and rounded to subobtuse apically. In all the species, the sterile appendage is one half to two thirds of the total style branch length (Figs. 1L, 3C). The style appendages are papillose on both sides with densely, longitudinally striate cells (Fig. 3D), similar to those commonly found in other genera of Eupatorieae (Erbar & Leins, 2015).

In Asteraceae, glandular trichomes are found on phyllaries and corollas, and less commonly on anthers and styles. Eight of 10 species of *Kaunia* (exceptions are *K. gynoxymorpha* and *K. saltensis*) have biseriate vesiculate subtype β glandular trichomes (Fig. 3E) on the inner surfaces of the style branches (Fig. 1L), which is uncommon in Eupatorieae and almost lacking in most tribes of Asteraceae (Viera Barreto et al., 2016). These trichomes found between stigmatic lines contain sesquiterpene lactones even in very immature stages of flower development (before anthesis), and they have been suggested to act as the innermost defensive barrier against flower-predator insects (Viera Barreto et al., 2016).

The cypselae of *Kaunia* are usually obovate-fusiform (Figs. 1M, 3F) or obovate-cylindrical (Figs. 1N, 3G) and 5-ribbed as in most genera of the tribe. Some genera of Eupatorieae, however, have up to 10-ribbed cypselae (King & Robinson, 1987). The cypselae are symmetric or subsymmetric and stipitate or substipitate (Figs. 1M, N, 3F, G). Due to the presence of carbonized, resin-like deposits in the cell walls, the cypselae of *Kaunia* are blackish. Carbonized walls are found in Eupatorieae and other members of the Heliantheae alliance (Robinson et al., 2009). The cypselae of *Kaunia* are mostly glandular with biseriate vesiculate, subtype β glandular trichomes. Twin hairs, if present, are restricted to the ribs and cypsela base. The twin hairs are septate with a variable number of cells (6-celled, 3-celled, 2-celled). Septate twin hairs have been described in other Asteraceae (e.g., Sancho & Katinas, 2002). The carpopodium is distinct in some species of *Kaunia* (e.g., *K. camataquiensis* and *K. lasiophthalma*) and slightly distinct in others (e.g., *K. longipetiolata* and *K. pachanoi*); it can be cylindrical or stopper-shaped (Fig. 3H) with two to five rows of basal subquadrangular or oblong, thin- or thick-walled cells. The carpopodium features are diagnostic for the identification of genera and species (King & Robinson, 1987).

The pappus of *Kaunia* is setose with 20 to 33 white or pinkish barbellate setae arranged in one series. The setae in live specimens are usually white (e.g., *K. camataquiensis*) or pinkish in a few species (e.g., *K. saltensis*). The setae are persistent, unequal in length, 1.8–5 mm long, and connate in a basal ring (Fig. 1M, N) of five to 25 cell rows (Fig. 3I). In *K. endyta* and *K. eucosmoides* the ring is more noticeable than in the other species. The setae are uniformly wide throughout their length (Figs. 1O, 3J) or slightly wider toward the apex (Figs. 1O, 3K); lateral cell projections are apically acute. A setose pappus with only one row of setae was regarded as a primitive variant within Eupatorieae (King & Robinson, 1987), a tribe that includes many other different types of pappi (e.g., pappus lacking or paleaceous, with free pappus elements, fused pappus elements, etc.).

In *Kaunia*, the morphology of pollen grains is uniform throughout the genus. They are subtriangular in shape and tricolporate (Fig. 3L, M). The grain diameter varies from 16 to 26 μm. The size of the pollen grains in Eupatorieae is perhaps smaller on average than that of any other tribe of Asteraceae (King & Robinson, 1987). The exine is echinate (with short spines) (Fig. 3L, M). The pollen grains of only *K. rufescens* were studied in detail (Cardoso Pacheco Evaldt et al., 2009) and described as follows: middle sized, subtriangular in polar view, oblate-spheroidal in equatorial view, tricolporate, colpi middle sized, endoapertures elongate, exine echinate, with a wide equatorial cavus; sexine thicker than nexine; polar diameter 25 (23–26) μm, equatorial diameter 30 (24–32) μm, exine 3.5 (3–4) μm, and spines ca. 1 μm high.

CHROMOSOME NUMBERS

The inclusion of *Kaunia* in Oxylobinae (King & Robinson, 1987) apparently was supported by its high chromosome numbers since other morphological characters (i.e., the equally wide styles and the smooth inner surfaces of the corolla lobes) conflict with those defined for the subtribe (i.e., the enlarged bases of the styles and the papillose inner surfaces of the corolla lobes). However, in light of recent molecular studies, the monophyly of this subtribe, like that of the other subtribes, needs to be revised.

Cytologically, the genus *Kaunia* has not been widely investigated. The studies have been limited to chromosome counts for only four species: *K. ignorata*: $2n$ = ca. 45 (King & Robinson, 1980) and n = ca. 20 (Robinson et al., 1989); *K. grossidentata* (Hieron.) R. M. King & H. Rob.: $n = 10$ II (Wulff et al., 1996); *K. lasiophthalma*: n = ca. 26 (Robinson et al., 1989) and $n = 10$ II (Turner et al., 1979; Wulff et al., 1996); *K. saltensis*: n = ca. 24 II (Hunziker et al., 1990), n = ca. 26 II and ca. 20 II + 1 XII (Wulff et al., 1996). The species of *Kaunia* are shrubby perennial plants or small trees, in agreement with the high chromosome numbers expected for this kind of habit (Watanabe et al., 1995). Further studies in *Kaunia* are required to establish whether all of its species follow the chromosome number patterns of those analyzed up to the present.

Several basic chromosome numbers have been reported for Eupatorieae, ranging between $x = 4$ and $x = 26$, although the most frequent are $x = 10$ and $x = 17$ (Watanabe et al., 1995). This character is apparently diagnostic, and, according to King et al. (1976), the Eupatorieae might be discussed in terms of cytological groups.

The phylogenetic tree based on chloroplast DNA (cpDNA) restriction fragment length polymorphism (RFLP) data obtained by Ito et al. (2000) shows that genera with high chromosome numbers diverged first, and then the chromosome base number in the tribe Eupatorieae was successively reduced from $x = 17$, to $x = 11$, to $x = 10$. As indicated by Semple and Watanabe (2009), the evolution of base numbers in Eupatorieae is striking because $x2 = 17$ is likely both ancestral and derived.

The chromosome counts of *Kaunia* ($x = 20$–26) are unusually high in the tribe, although another genus, *Neomirandea* R. M. King & H. Rob. (Neomirandeinae), has similar chromosome numbers ($x = 20$–25). The potential origin of the high counts of these two genera was not yet postulated, although, in some subtribes, secondarily derived base numbers occur (Semple & Watanabe, 2009). Apparently, only molecular studies involving a thorough sampling of genera from all of the subtribes could fully explain the redundant patterns of karyotype evolution in Eupatorieae.

HABITAT AND GEOGRAPHIC DISTRIBUTION

Kaunia ranges mainly in the Andes from Ecuador to northwestern Argentina and exceptionally extends to Brazil and Paraguay (one species, *K. rufescens*) (Fig. 4). Its species occur in different environments of subtropical montane forest, especially in its shrubby layer or often as elements of secondary forests (Liberman Cruz & Pedrotti, 2006). Usually, the species of *Kaunia* are associated with local humid areas either in forest margins or close to streams, rivers, or groundwater in drier areas (Weberbauer, 1945; Seibert, 1993; Liberman Cruz & Pedrotti, 2006). Elevation gradient and its changing environmental conditions are crucial in the definition of vegetation types and its constituents in the Andes. For instance, in Argentina and southern Bolivia, subtropical montane forest expands across a large altitudinal gradient from 400 to 2300 m in elevation. However, elevation gradient produces dramatic effects on vegetation types of the subtropical montane forest as, for instance, shifts in species richness, tree height, or tree top surface (Malizia et al., 2006, 2012). The species of *Kaunia*, although found throughout almost the entire elevational range of subtropical montane forest, apparently prefer environments between 1600 and 2100 m where they are important ecological elements of vegetation associations (Malizia et al., 2012). Latitudinal gradient is also important in vegetation type definition through the Andean montane forest. This becomes particularly true in some tribes of Compositae because Eupatorieae, which, although distributed throughout the montane forest from Venezuela to Argentina, has its highest diversity of species especially in northern Bolivia (Funk et al., 1995). As for the tribe, *Kaunia* has its main diversity in Bolivia decreasing northward and southward in a number of species. Regional environmental factors such as climate also vary along sites in the montane forest and may also be significant for its species composition (Blundo et al., 2012).

According to a recent SDM study (Viera Barreto et al., 2018), Andean forests from Bolivia to Ecuador provide suitable habitats for species such as *Kaunia longipetiolata* and *K. saltensis*. However, only *K. longipetiolata* occupies this whole range. Along this distribution, the Amotape–Huancabamba zone in northern Peru and

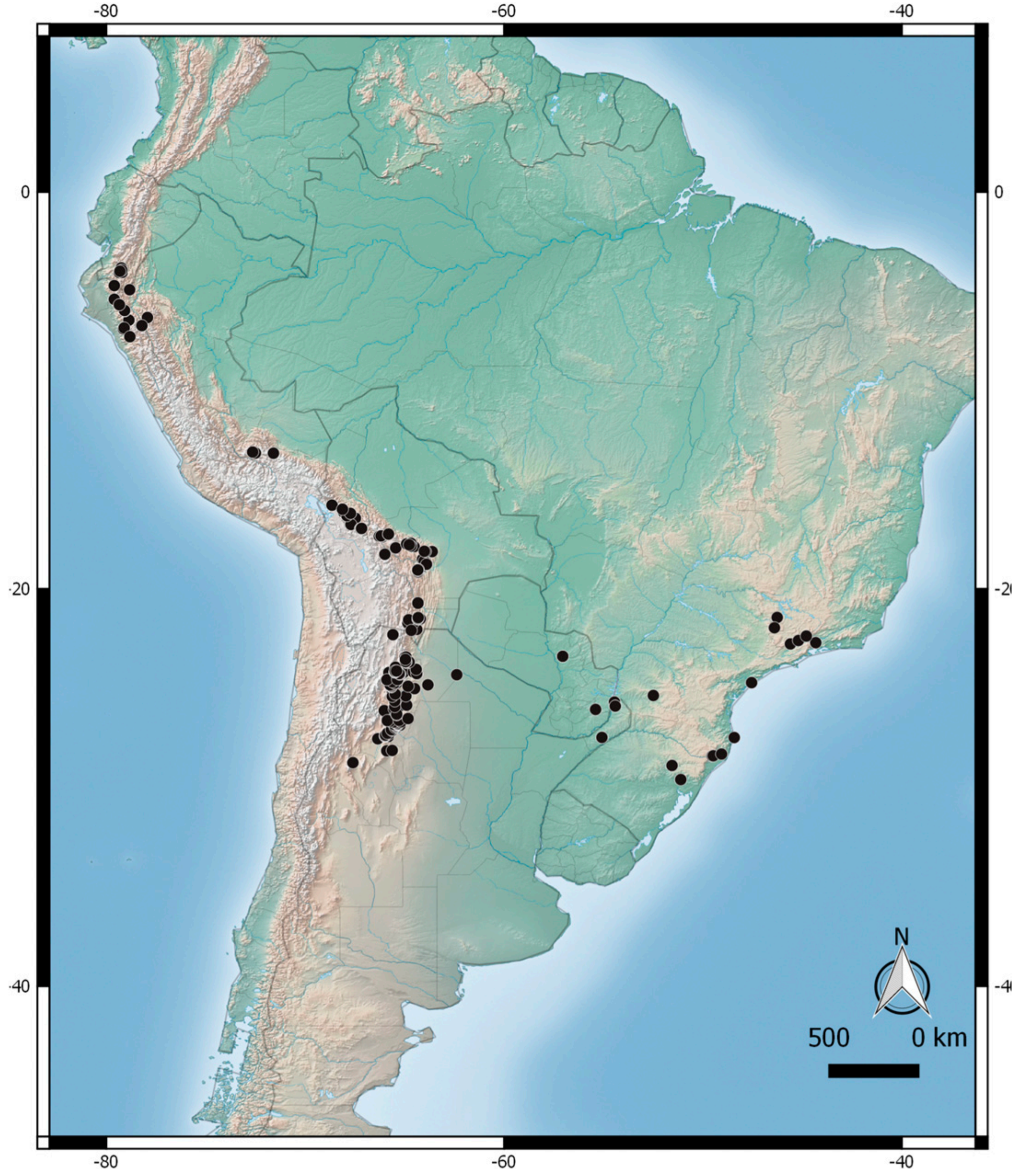

Figure 4. Geographic distribution of *Kaunia* R. M. King & H. Rob.

southern Ecuador, is an area where physical and environmental conditions of the Andes change dramatically (Weigend, 2002) and represents for many species a discontinuity in their distribution. However, *K. longipetiolata* is found in this area, occurring in secondary forest on the east side of the Andes at 1900 to 2200 m.

The species of *Kaunia* have an important role in Andean ecosystems. For instance, *K. longipetiolata* dominates specific vegetation units in the Bolivian Andes near the Peruvian border, called Kaunietum longipetiolatae (Seibert, 1993), by forming scrublands on the boundaries of alder forests. *Kaunia saltensis*, in addition, is a sub-dominant species in alder communities and pino del cerro forests (*Podocarpus parlatorei* Pilg.) (Liberman Cruz & Pedrotti, 2006; Malizia et al., 2012).

Kaunia rufescens, despite its presence in the Andes, is the only species with an extra-Andean distribution. It is a characteristic species of the Cerrado, Paranense, and Atlantic Forest biogeographic provinces (Cabrera & Willink, 1973).

Regarding the conservation status of *Kaunia* species, *K. lasiophtahalma*, *K. rufescens*, and *K. saltensis* were assessed as Least Concern (LC) (Viera Barreto & Sancho, 2018), according to IUCN Red List criteria (IUCN, 2012).

TAXONOMIC TREATMENT

Kaunia R. M. King & H. Rob., Phytologia 47: 258. 1980. TYPE: *Eupatorium eucosmoides* B. L. Rob. (current name *K. eucosmoides* (B. L. Rob.) R. M. King & H. Rob.).

Shrubs or small trees, usually profusely branched; stems cylindrical to subangled, striate, generally pubescent in young plants and glabrous or subglabrous when mature. Leaves persistent or exceptionally caducous, opposite, decussate, petiolate or rarely sessile or subsessile, leaf blades mostly ovate, less commonly ovate-elliptic, ovate-lanceolate, ovate-rhombic, ovate-deltoid, or elliptic, base symmetric or subsymmetric, cuneate, rounded, subcordate, or truncate with intermediate forms between shapes, apex acute, acuminate, or obtuse, glabrous, subglabrous, hirsute, or pubescent, glandular in most species, margins serrulate, undulate, crenate, entire, or mostly serrate, teeth similar or different in shape and size throughout the margin, mucronate; venation acrodromous, imperfect, basal or suprabasal with 1 or 2 pairs of secondary veins strongly developed or exceptionally pinnate eucamptodromous. Capitulescences terminal, thyrsoid or cymoid, congested or glomerate, usually leafy. Capitula homogamous, discoid, isomorphic, pedunculate, peduncles pubescent or subglabrous, bracteolate, bracteoles linear, base clasping, apex acute. Involucre campanulate, phyllaries 12 to 29 arranged in 2 or 3 series, slightly unequal in length, persistent or the innermost ones occasionally caducous, ovate, oblong, lanceolate, or elliptic, with intermediate forms between shapes, apex acute, subacute, or obtuse, usually pubescent and glandular or exceptionally eglandular, with stereoma associated with the vascular tissue, margins scarious and fimbriate. Receptacle flat, slightly convex, or exceptionally convex, epaleaceous, areolate, glabrous or subglabrous with a few trichomes. Florets 10 to 40 (to 50) per capitulum, hermaphroditic, fertile, corollas white, whitish lilac, white-pink, or pinkish, tubular-funnelform, tube and limb gradually differentiated, exceptionally tubular, glabrous, sometimes with a few glandular trichomes, limb 5-lobed, lobes deltoid, as long as wide to 1.5× longer than wide, glandular, internally smooth, externally glandular and papillate, especially at apex. Stamens with anther collar distinct, cylindrical (evenly wide throughout), thecae bases obtuse or exceptionally auriculate, apical appendage ovate, apex acute, subacute, or obtuse. Style evenly wide throughout, base not swollen, immersed in a lobulate, glabrous nectary; style branches nearly half as long as style, linear, apex rounded to subobtuse, sterile appendage papillate on both sides, most of the species with scarce glandular trichomes on inner surface of style branch. Cypselae blackish, obovate-fusiform or obovate-cylindrical, 5-ribbed, symmetric or subsymmetric, stipitate or substipitate, glandular, usually sericeous with twin hairs on ribs and at cypsela base, exceptionally glabrous; carpopodium commonly distinct, cylindrical or stopper-shaped, cells subquadrangulate or oblong, thin- or thick-walled. Pappus white or pinkish in live specimens, of 1 series of setae, setae persistent, unequal in length, barbellate, connate in a basal ring, with setae equally wide throughout or widened at apex. Pollen grains subtriangular, 16–26 μm in diam., exine echinate.

In this treatment 10 species of *Kaunia* are recognized (Appendix 1).

Distribution and habitat. *Kaunia* is found in Argentina, Bolivia, Brazil, Ecuador, Paraguay, and Peru, mostly in different environments of subtropical Andean forest, especially in shrubby layers or secondary forests.

Etymology. The name honors Edward Kaun, who greatly aided in proofreading the treatment of the tribe Eupatorieae by King and Robinson (1980). Edward Kaun was a retired government worker who had worked for years as a proofreader for the Government Printing Office.

KEY TO THE SPECIES OF *KAUNIA*

1a. Leaf blades with pinnate venation 2
  2a. Leaf indumentum of T-shaped trichomes; style branches eglandular (without glandular trichomes) . . . . 4. *K. gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob.
  2b. Leaf indumentum of other than T-shaped trichomes; style branches with glandular trichomes . . . . 2. *K. endyta* (B. L. Rob.) R. M. King & H. Rob.
1b. Leaf blades with acrodromous venation (with 1 or 2 pairs of strongly developed secondary veins) 3
  3a. Leaf blades pubescent abaxially on the whole surface 4
    4a. Leaves sessile or subsessile (petiole up to 0.2 cm long) . . . 8. *K. pachanoi* (B. L. Rob.) R. M. King & H. Rob.
    4b. Leaves petiolate (petiole more than 0.2 cm long) 5
      5a. Leaves caducous; capitulescences on first- and second-order stems; florets 14 to 28 . . . . 7. *K. longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob.

5b. Leaves persistent; capitulescences on first-order stems; florets 20 to 38 .... 9. *K. rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob.
3b. Leaf blades glabrous or subglabrous abaxially (pubescent only on veins or at vein bifurcation points) 6
6a. Leaf blades subglabrous abaxially, pubescent on veins or at vein bifurcation points, ovate-elliptic, ovate, or ovate-deltoid 7
7a. Leaf margins undulate and serrulate; cypselae sericeous on ribs and at cypsela base .... 3. *K. eucosmoides* (B. L. Rob.) R. M. King & H. Rob.
7b. Leaf margins serrate; cypselae glabrous .... 6. *K. lasiophthalma* (Griseb.) R. M. King & H. Rob.
6b. Leaf blades glabrous abaxially, when subglabrous with ovate-rhombic or ovate-lanceolate blades 8
8a. Leaf blades with 2 pairs of well-developed secondary veins ..... 5. *K. hosanensis* R. M. King & H. Rob.
8b. Leaf blades with 1 pair of well-developed secondary veins 9
9a. Leaf blades eglandular on both surfaces; phyllaries eglandular .... 10. *K. saltensis* (Hieron.) R. M. King & H. Rob.
9b. Leaf blades glandular on both surfaces; phyllaries glandular .... 1. *K. camataquiensis* (Hieron.) R. M. King & H. Rob.

1. **Kaunia camataquiensis** (Hieron.) R. M. King & H. Rob., Phytologia 47: 259. 1980, as "camataguiensis." *Eupatorium camataquiense* Hieron., Bot. Jahrb. Syst. 40: 377. 1908. TYPE: Bolivia. "Crescit prope Camataqui, alt. s. m. 2500 m loco aquoso (*K. Fiebrig 3069* pro parte; 10. m. Febr. 1904)" (lectotype, designated by Viera Barreto & Sancho [2014: 43], B-10 0366430 image!; isolectotypes, F-0050145!, GH-00007583 [fragm.] image!, K-000500260 image!, US-00147520 image!). Figures 5, 6A–C.

Eupatorium grossidentatum Hieron., Bot. Jahrb. Syst. 40: 377. 1908, nom illeg., non Mart. ex Colla, as "*grossedentatum*." *Kaunia grossidentata* (Hieron.) R. M. King & H. Rob., Phytologia 47: 259. 1980. TYPE: Bolivia. "Crescit prope Camataqui, alt. s. m. 2500 m loco aquoso (*K. Fiebrig 3069* pro parte; 10. m. Febr. 1904)" (lectotype, designated by Viera Barreto & Sancho [2014: 44], GH-00007693 image!; isolectotypes, G-00223766 image!, LD-1061796 image!, S-R-8999 image!, SI!).

Eupatorium ignoratum Hieron., Bot. Jahrb. Syst. 40: 379. 1908. *Kaunia ignorata* (Hieron.) R. M. King & H. Rob., Phytologia 47: 259. 1980. TYPE: Bolivia. "prope urbem Santa Cruz alt. s. m. 1600 m.," May 1892, *O. Kuntze s.n.* (lectotype, designated by Viera Barreto & Sancho [2014: 44], NY-00169056!).

Shrubs or small trees up to 2.5 m tall. Stems branched, cylindrical to subcylindrical, young stems pubescent to subglabrous, old stems glabrous, leafy up to capitulescence, internodes 2–10 cm. Leaves persistent, petiolate, petiole 0.5–2.5 cm, pubescent to subglabrous, blades ovate-rhombic or ovate-lanceolate, 1.5–9.5 × 1–5.4 cm, base symmetric, cuneate to cuneate-rounded, apex acuminate, glabrous or subglabrous and glandular on both surfaces, margins entire, barely serrate, teeth small and similar in size and shape, or coarsely serrate and different in size and shape, 0.5–4 × 1–6 mm, venation acrodromous, suprabasal, imperfect with 1 pair of secondary veins strongly developed, borne 1–10(–13) mm from blade base. Capitulescence cymoid (?) or thyrsoid, congested, leafy, on pubescent first-order stems. Capitula 100 to more than 500, pedunculate, peduncles 1–10 mm, pubescent, bracteoles 1 to 3, opposite or alternate, 1.5–2 × ca. 0.5 mm. Involucre 3–4 mm high, phyllaries 12 to 17, arranged in 2 series, pubescent and glandular; outer phyllaries obovate, 2–3.2 × 0.5–1 mm, apex subacute; inner phyllaries oblong-obovate, 2.5–4 × 0.6–1 mm, apex obtuse or acute. Receptacle flat to slightly convex, subglabrous or glabrous. Florets 21 to 30, corollas white, tubular-funnelform, 4–5.5 mm, tube glabrous, eglandular, lobes 0.5–0.9 × ca. 0.5 mm; stamens with anther collar 0.3–0.5 × ca. 0.1 mm, anthers 1.5–2 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.4 × 0.3–0.4 mm, subacute; style 7–9.8 mm, style branches 3–4.7 mm, internally with glandular trichomes between stigmatic lines and sterile appendage. Cypselae obovate-fusiform to obovate-cylindrical, 2–2.8 mm, subsymmetric, substipitate, glandular, sericeous on ribs and at cypsela base, carpopodium distinct, stopper-shaped. Pappus white in live specimens, of 22 to 31 setae, setae 2.5–4.5 mm, connate in a basal ring of 5 to 10 rows of cells.

Phenology. *Kaunia camataquiensis* flowers from March to July with fruiting synflorescences present concurrently with the flowers.

Distribution. *Kaunia camataquiensis* is endemic to southern Bolivia (Chuquisaca, Cochabamba, Potosí, western Santa Cruz, and Tarija) (Valenzuela Celis, 1993; Jørgensen et al., 2010) (Fig. 7A).

Ecology and habitat. *Kaunia camataquiensis* is found in the Chiquitano semideciduous forest, Yungas, and dry valleys, between 500 and 2500 m in elevation (Valenzuela Celis, 1993).

Etymology. The name "camataquiensis" refers to the type locality, Camataqui (Tarija, Bolivia).

Nomenclatural notes. Hieronymus's name is based on the locality Camataqui; however, the new combination was *Kaunia camataguiensis* by King and Robinson (1980).

The type specimens belonging to *Eupatorium grossidentatum* and *E. camataquiense* are easily differentiated by their leaf features, especially leaf blade margins (entire in *Kaunia camataquiensis* and coarsely serrate in *K. grossidentata*). Although when the genus *Kaunia* was created (1980), both species were regarded

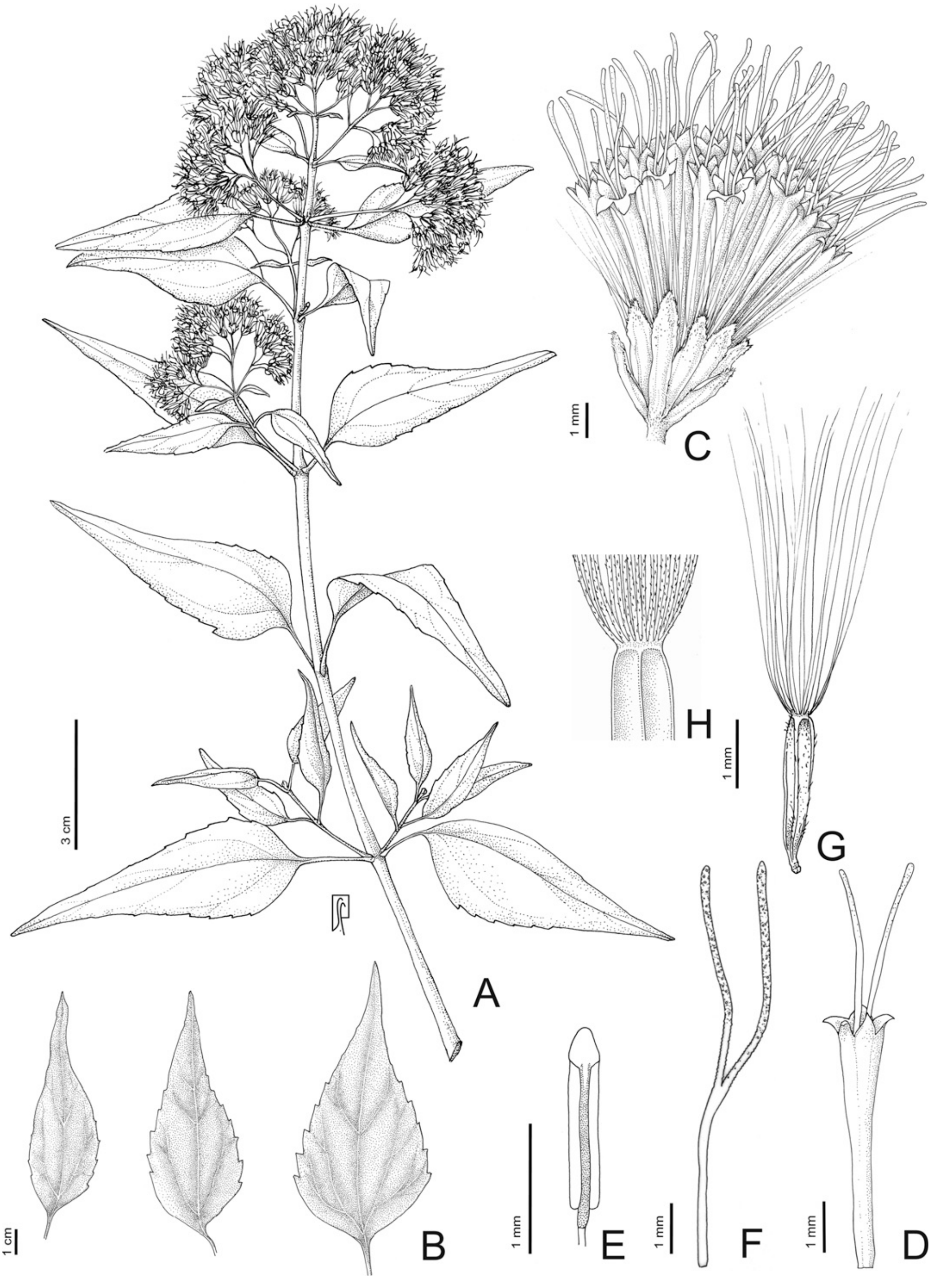

Figure 5. *Kaunia camataquiensis* (Hieron.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Leaves showing margin variation. —C. Capitulum. —D. Floret without cypsela. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *M. Nee 49436* (NY) and drawn by S. Faiad.

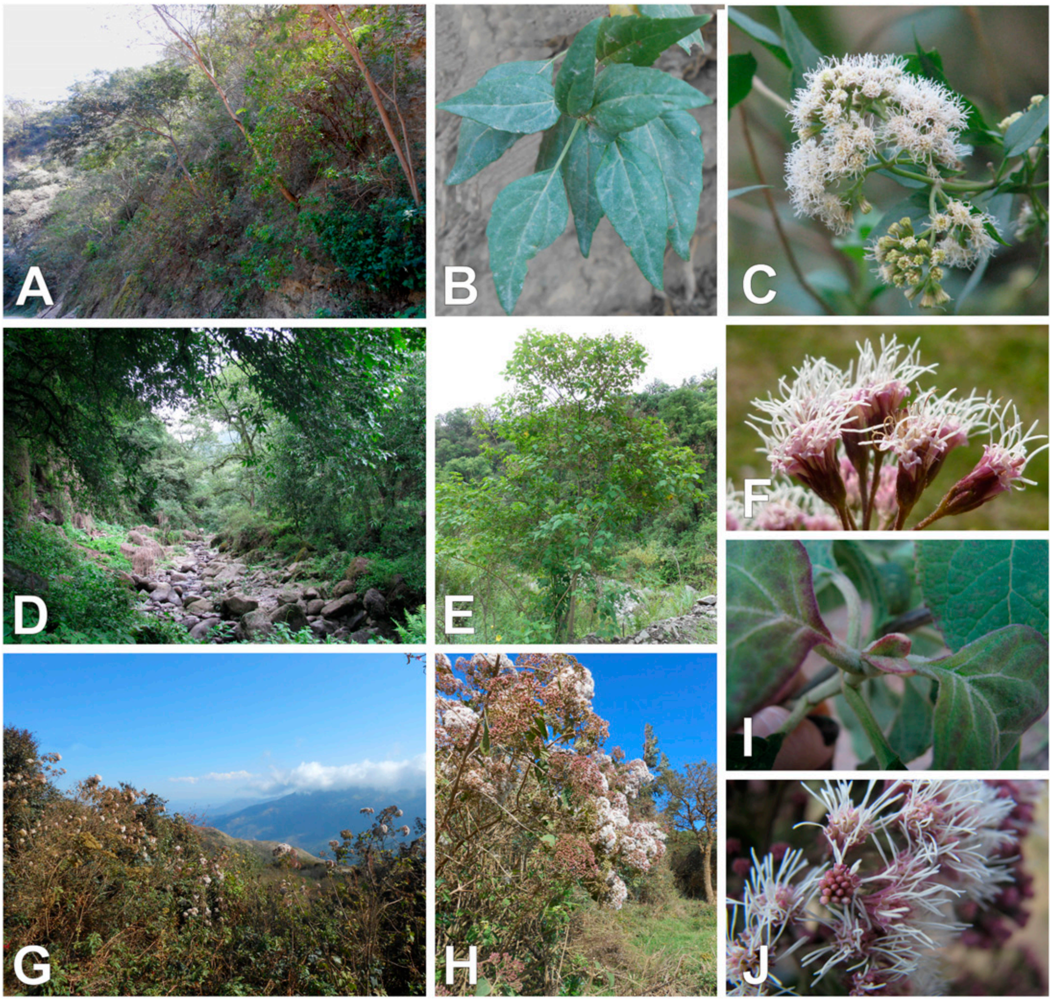

Figure 6. Photographs of live specimens. A–C. *Kaunia camataquiensis* (Hieron.) R. M. King & H. Rob. —A. Habit and habitat (Caballero, Santa Cruz, Bolivia). —B. Leaves. —C. Capitulescence. D–F. *Kaunia lasiophthalma* (Griseb.) R. M. King & H. Rob. —D. Habitat (Tafí del Valle, Tucumán, Argentina). —E. Habit. —F. Close-up of capitula. G–J. *Kaunia longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob. —G. Habitat (Carrasco, Cochabamba, Bolivia). —H. Close-up of branches. —I. Close-up of new leaves. —J. Close-up of capitula.

separately by their authors; more recently, Jørgensen et al. (2010) established the synonymy of these species. The study of the type specimens together with other additional material allowed us to identify intermediate states and a gradient of leaf features between those of *K. camataquiensis* Hieron. and *K. grossidentata.* Also, during field observations, we found leaf features of both species in the same specimen. All of this information supports the synonymy of *K. camataquiensis* and *K. grossidentata* as proposed by Jørgensen et al. (2010) and the difference of leaf features shown in the type specimens as the extremes of a continuous variability.

The specimens of *Eupatorium camataquiense* and *E. grossidentatum*, as well as those of *E. ignoratum* include, most of the time, only a small part of an otherwise much larger branch. Indeed, the only available leaves of many specimens are just those of the leafy capitulescences instead of those of the vegetative parts of the plants. On the other hand, we found the identity of *E. ignoratum* as doubtful, and the differences of this species with *E. camataquiense* and *E. grossidentatum* as obscure. The situation described above, i.e., most specimens including only small flowering branches that are part of a much larger branch and a compound capitulescence, is also similar for collections identified as *E. ignoratum*, including the type material. For instance, the specimen *Steinbach 8618* at GH, which was determined by B. L. Robinson and R. M. King and H. Robinson as *E. ignoratum*, does not have lower leaves. However, the duplicate at MO shows lower leaves

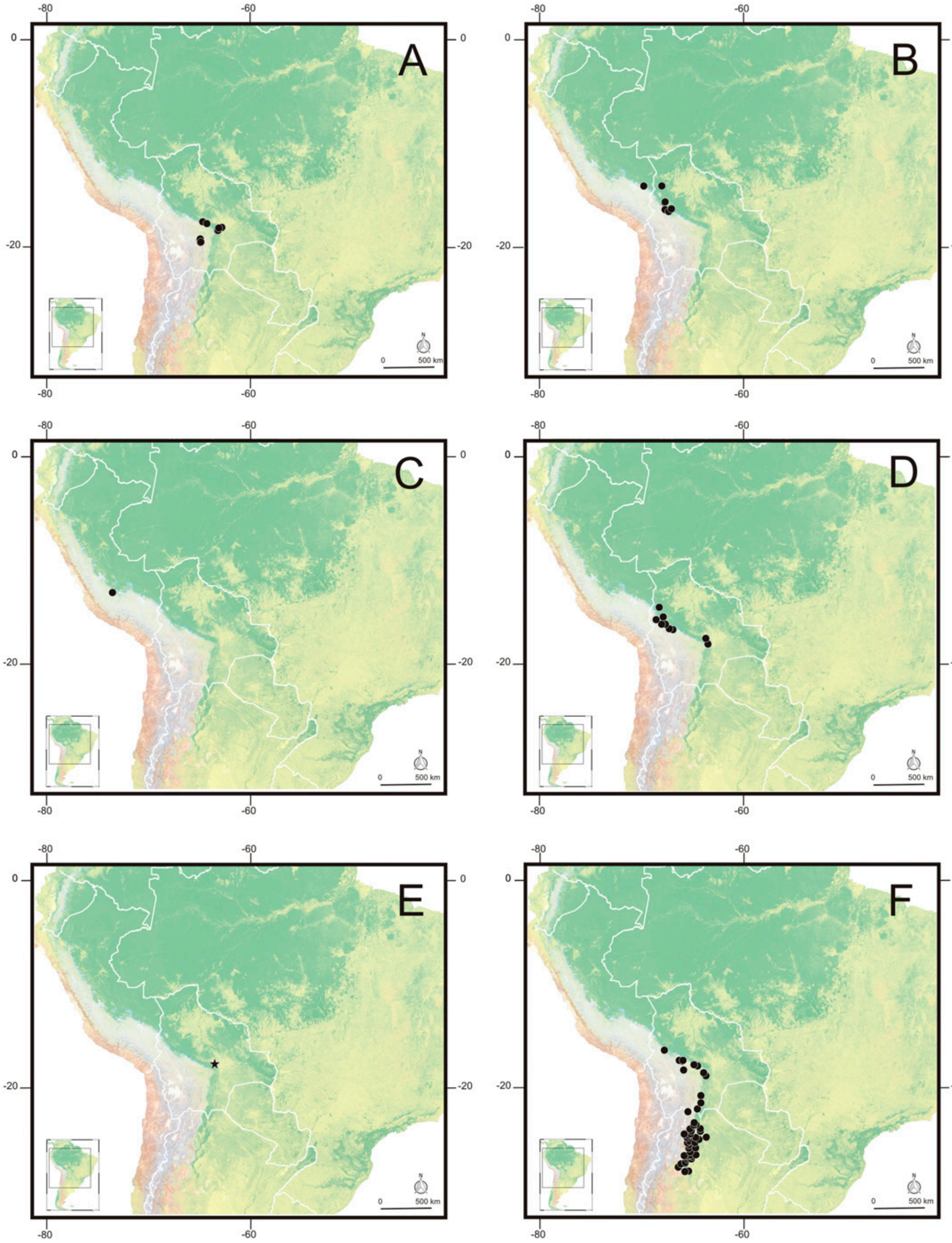

Figure 7. Distribution maps. —A. *Kaunia camataquiensis* (Hieron.) R. M. King & H. Rob. —B. *Kaunia endyta* (B. L. Rob.) R. M. King & H. Rob. —C. *Kaunia eucosmoides* (B. L. Rob.) R. M. King & H. Rob. —D. *Kaunia gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob. —E. *Kaunia hosanensis* (B. L. Rob.) R. M. King & H. Rob. Star indicates inspecific locality. —F. *Kaunia lasiophthalma* (Griseb.) R. M. King & H. Rob.

compatible with those of *E. grossidentatum*. In addition, by comparing the flowering branches of these three species, which is the only material available, we did not find clear differences among them. Hieronymus indicated in the protologue that *E. ignoratum* is different from *E. camataquiensis* by its higher number of florets per capitulum (40 to 50 in *E. ignoratum* and 22 to 28 in *E. camataquiense*). Indeed, he annotated the number of florets on the sheet of the type specimen at B (now destroyed). However, in the sheet at B there were two small branches and Hieronymus annotated different ranges of floret numbers for each branch (35 to 38 florets for one branch and 43 to 45 for the other branch). This demonstrates that even the branches mounted on the same sheet were variable in number of florets. With all of the above evidence, we place the three names under synonymy. These three names were proposed in the same work of Hieronymus (1908). Following our previous criterion (Viera Barreto & Sancho, 2014), *K. camataquiensis* is the correct name of the species.

Additional specimens examined. BOLIVIA. **Chuquisaca:** Samuel Oropeza, Yotala (Sucre), 2300 m, Apr. 1933, *H. M. Cárdenas 501* (GH); 1 km N of Puente Sucre (bridge over the Rio Pilcomayo), Km. 49 on the Sucre–Potosí rd., near dividing line betw. the depts. of Chuquisaca & Potosi, 2000 m, 29 Apr. 1963, *D. Ugent & V. Ugent 5140* (MO). **Cochabamba:** Carrasco, Pojo, 1800 m, 4 Nov. 1928, *J. Steinbach 8618* (MO). **Potosí:** Cornelio Saavedra, Betanzos, 86 km hacia Sucre dentro isla de rocas en el Río Tanana, 2650 m, 27 Mar. 1979, *S. G. Beck 856* (LPB). **Santa Cruz:** Caballero, 1.5 km on rd. to Puquina Arriba from Comarapa–Samaipata hwy., 1775 m, 11 July 1998, *M. Nee & D. Atha 50035* (MO, NY); ib. *M. Nee & D. Atha 50037* (F, MO, NY); Florida, along dirt rd. from Mairana to Alto Mairana, 2.2 km (by rd.) W of Todos los Santos, 5.8 km (by rd.) W of Mairana, 1475 m, 8 May 1998, *M. Nee 49253* (F, NY); along hwy. from Santa Cruz to Samaipata, 5 km (by rd.) SW of Angostura, 700 m, 17 May 1998, *M. Nee 49436* (F, NY); Andrés Ibañez, sobre ruta antigua Santa Cruz–Cochabamba, a 5 km de La Angostura, 800 m, 25 Aug. 2015, *J. N. Viera Barreto et al. 44* (LP).

2. Kaunia endyta (B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 259. 1980. *Eupatorium endytum* B. L. Rob., Proc. Amer. Acad. Arts 55: 13. 1919. TYPE: Peru. Puno: “between Sandia and the tambo Azalaya, on the way from Sandia to Chunchusmayo, among bushes at an altitude of 1500–2000 m, 5 June 1902,” *A. Weberbauer 1074* (lectotype, designated by Viera Barreto & Sancho [2014: 44], GH-00007650 image!). Figure 8.

Eupatorium sordescens DC. var. *bolivianum* Rusby, Mem. Torrey Bot. Club 6(1): 56. 1896. TYPE: Bolivia. “between Guanai and Tipuani, Apr.–June 1892,” *[M. Bang] 1464* (holotype, NY-00169199!; isotypes, GH-00007972!, MICH-1107389 image!, MO-1934326 image!, PH-00013371 image!).

Shrubs 1–2 m tall. Stems branched, cylindrical, young and old stems densely pubescent, leafy up to capitulescence, internodes 4–10 cm. Leaves persistent, petiolate, petiole 1–2 cm, pubescent, blades ovate-elliptic and elliptic, 4–12 × 2.6–6 cm, base symmetric, cuneate-rounded, apex acute or acuminate, shortly hirsute adaxially and densely pubescent and glandular abaxially, margins undulate or serrate, teeth 0.5–2 × 0.5–3 mm, similar in shape and general size, venation pinnate eucamptodromous, first pair of secondary veins borne 2–4 mm from blade base. Capitulescence cymoid, glomerate, with reduced leaves, sometimes somewhat thyrsoid and leafy, on pubescent first-order stems. Capitula more than 200, pedunculate, peduncles 2–10 mm, pubescent, bracteoles 1 to 3, opposite or alternate, 1–2 × ca. 0.5 mm. Involucre 3–5 mm high, phyllaries 16 to 24, arranged in 2 or 3 series, ovate-lanceolate, apex acute, pubescent and glandular; outer phyllaries 2–3 × 0.6–1 mm, middle phyllaries (if present) 3.5–4 × 0.8–0.9 cm, inner phyllaries 3.7–4.6 × 0.4–0.7 mm. Receptacle flat to slightly convex, glabrous. Florets 30 to 45, corollas white, tubular, 4–5 mm, tube glabrous and eglandular, lobes 0.7–0.8 × ca. 0.5 mm, sometimes pilose externally; stamens with anther collar ca. 0.25 × ca. 0.1 mm, anthers 1.2–1.3 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.3 × 0.2–0.3 mm, acute; style 7–8 mm, style branches 3.7–4 mm, internally with glandular trichomes between stigmatic lines. Cypselae obovate-cylindrical, ca. 2 mm, subsymmetric, stipitate, glandular, glabrous (without twin hairs), carpopodium distinct, cylindrical. Pappus of 22 to 30 setae, setae 2–3.7 mm, connate in basal ring of 15 to 25 rows of cells.

Phenology. It has been documented to flower from April to June, and some specimens were found flowering in December and January.

Distribution. *Kaunia endyta* is native to northern Bolivia (La Paz) and southern Peru (Brako & Zarucchi, 1993; Jørgensen et al., 2010) (Fig. 7B).

Etymology. Benjamin L. Robinson did not indicate why he chose this epithet for this taxon. The words *endytum* or *enchytum* have a Greek origin and refer to a kind of cake.

Ecology and habitat. This species is characteristic of the lowlands and Andes of Bolivia in humid forests, Yungas, and dry valleys, between 500 and 1500 m in elevation (Jørgensen et al., 2010). This species has also been found in the montane forest of the Madidi region, at the same elevational range (Jørgensen et al., 2005). In Peru, it is found in Puno between 1000 and 2000 m in elevation (Brako & Zarucchi, 1993). It has also been located in the Sandia Valley, between 1500 and 2000 m in elevation (Weberbauer, 1945).

Observations. In the preliminary list of vascular plants of Bolivia, Hind (2011) indicates that this species was found in Brazil and Peru by Koster (1945); however, we were not able to confirm this species in Brazil. King

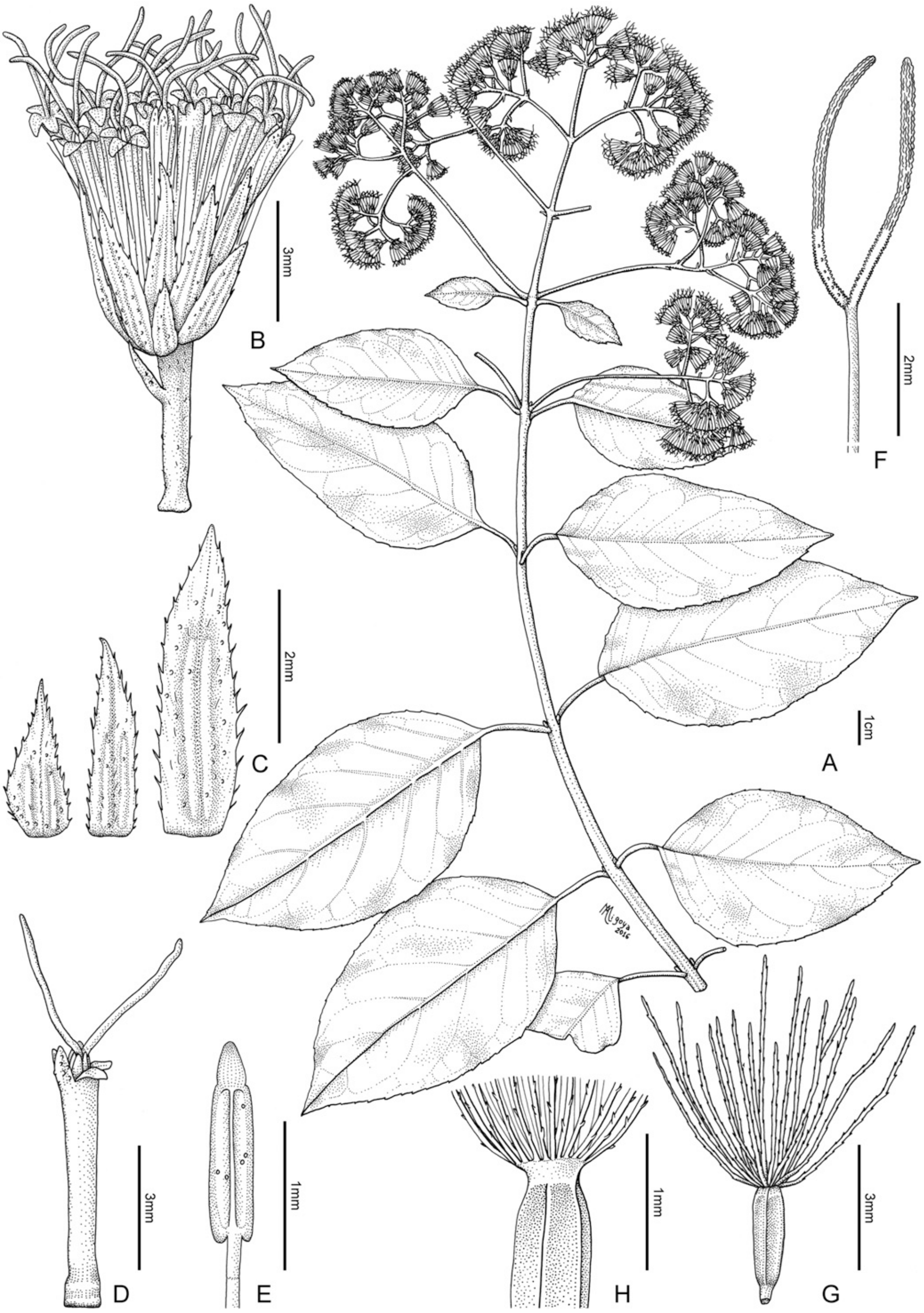

Figure 8. *Kaunia endyta* (B. L. Rob.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer, middle, and inner phyllary). —D. Floret without cypsela. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *S. G. Beck 32690* (LP) and drawn by A. Migoya.

and Robinson (1987) have seen this species only in Peru, but it was also found in Bolivia.

After studying the type material and additional specimens, we support the inclusion of *Eupatorium sordescens* var. *bolivianum* under the synonymy of *Kaunia endyta.*

Additional specimens examined. BOLIVIA. **La Paz:** Murillo, Valle de Zongo, 900–950 m, 7 July 2010, *S. G. Beck 32690* (LP). **Nor Yungas:** cerca de Chuspipata, 3050 m, 14 Jan. 1984, *E. Zardini 2013* (MO). **Sud Yungas:** Chulumani, 25 km hacia Asunta, pasando Tajma, 1440 m, 27 June 1985, *S. G. Beck 12046* (LPB); Chulumani, 6 km hacia Ocobaya, entrando por la quebrada del río Cala Cala, 1600 m, 30 Dec. 2006, *S. G. Beck et al. 29751* (LP, LPB). PERU. **Puno:** Sandia, near Pajonal, on trail, 1000–1300 m, 26 May 1942, *R. D. Metcalf 30623* (MO). [Observation: The specimen *R. D. Metcalf 30623* at GH does not belong to *Kaunia.*]

3. **Kaunia eucosmoides** (B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 259. 1980. *Eupatorium eucosmoides* B. L. Rob., Contr. Gray Herb. 75: 6. 1925. TYPE: Peru. "*Mathews*, no. *1123*" (holotype, P-00742392 image!; isotype, F-0043563F fragm.!, GH-00007658 fragm.!). Figure 9.

Shrubs up to 4 m tall. Stems branched, cylindrical, young and old stems subglabrous, leafy up to capitulescence, internodes 3–6.5 cm. Leaves persistent, petiolate, petiole 1.5–3 cm, glabrous, blades ovate-elliptic and ovate, 5–12 × 2.6–6 cm, base symmetric, cuneate-rounded, apex acuminate, glabrous adaxially and glabrous or subglabrous, with some trichomes at vein bifurcation point, abaxially, eglandular on both surfaces, margins undulate and serrulate, teeth 0.5–1.5 × 1–3 mm, similar in shape and size, venation acrodromous, suprabasal, imperfect with 1 or 2 pairs of secondary veins strongly developed, borne 5 mm from blade base. Capitulescence cymoid, congested, leafy, on subglabrous first-order stems. Capitula more than 200, pedunculate, peduncles 5–10 mm, subglabrous, bracteoles 1 to 4, opposite or alternate, ca. 1 × 0.5 mm. Involucre 3–4 mm high, phyllaries 13 to 17, arranged in 2 series, ovate-lanceolate, glandular; outer phyllaries ca. 2.5 × 0.6 mm, subacute, subglabrous or slightly pubescent on sides, inner phyllaries ca. 3 × 1 mm, acute, glabrous. Receptacle flat to slightly convex, glabrous. Florets 23 to 30, corollas white, tubular-funnelform, 4–5 mm, tube glabrous and eglandular, lobes 0.7–0.8 × ca. 0.5 mm, pinkish in live specimens; stamens with anther collar ca. 0.5 × 0.1 mm, anthers 1.5–1.8 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.3 × ca. 0.2 mm, obtuse to subacute; style 9–9.2 mm, style branches 4.5–5.2 mm, internally with glandular trichomes between stigmatic lines. Cypselae obovate-cylindrical, 2–2.3 mm, subsymmetric, stipitate, glandular, sericeous on ribs and at cypsela base, carpopodium distinct, stopper-shaped. Pappus of 20 to 21 setae, setae 2.4–3.9 mm, connate in basal ring of 15 to 25 rows of cells.

Phenology. *Kaunia eucosmoides* has been documented to flower in April.

Distribution. *Kaunia eucosmoides* is endemic to Peru (Ayacucho) (Brako & Zarucchi, 1993) (Fig. 7C).

Etymology. The name "eucosmoides" refers to its resemblance to the Bolivian species *Eupatorium eucosmum* B. L. Rob., which currently is regarded as a synonym of *Kaunia saltensis.* In the protologue the author indicates that *K. eucosmoides* (as *E. eucosmoides*) differs from *E. eucosmum* by its sharply toothed leaves, shorter and broader phyllaries, and fewer-flowered capitula.

Nomenclatural notes. The type specimen at GH herbarium (barcode GH-00007658) was mounted on the same sheet with the specimen *C. Gay 344* (barcode GH-00257045).

Observations. The original author indicates in the protologue that the type specimen at P belongs to Alexander Mathews's collections from Peru. These collections were given or sold, in part, to Gaudichaud during his visit to Peru in 1836–1837.

This species is included in the Red Book of Endemic Plants of Peru (Beltrán et al., 2006), and it has been assigned to the Data Deficient (DD) category due to the poor knowledge and few collections of this species.

Additional specimen examined. PERU. **Ayacucho:** La Mar, Anco, Río Mantaro Valley, 2500 m, 30 Apr. 1929, *E. P. Killip & A. C. Smith 22179* (GH, NY).

4. **Kaunia gynoxymorpha** (Rusby ex B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 259. 1980, as "*gynoximorpha.*" *Eupatorium gynoxymorphum* Rusby ex B. L. Rob., Contr. Gray Herb. 61: 7. 1920, new name based on *Eupatorium gynoxioides* Rusby, Bull. New York Bot. Gard. 4: 380. 1907, non *Eupatorium gynoxoides* Wedd. TYPE: Bolivia. "A scarce tree, 15 to 20 ft. high, with light-red flowers, in wet forest-mould. Coripata, Yungas, May 16, 1984," *M. Bang 2194* (holotype, NY-00169024! [NY-00169025]; isotypes, CORD-00005337 image!, E-00413720 image!, GH-00007695!, K-000500259 image!, M-0029595 image!, MICH-1107366 image!, MO-714312!, NY-00169023! [NY-00169026], PH-00008361 image!, US-00147616 image!, WIS-0255231 image!, Z-000053961 image!). Figure 10.

Shrubs or small trees up to 6 m tall. Stems branched, cylindrical, young and adult stems glabrous or subglabrous, leafy up to capitulescence, internodes 2–5 cm. Leaves persistent, petiolate, petiole 1.5–3 cm, subglabrous, blades ovate or ovate-elliptic, 7.5–14.5 × 3–8 cm, base symmetric, cuneate, rounded, or truncate, apex acute, glabrous adaxially, pubescent abaxially, with T-shaped trichomes, glandular on both surfaces, margins entire or slightly serrate, teeth 1–3 × 3–10 mm,

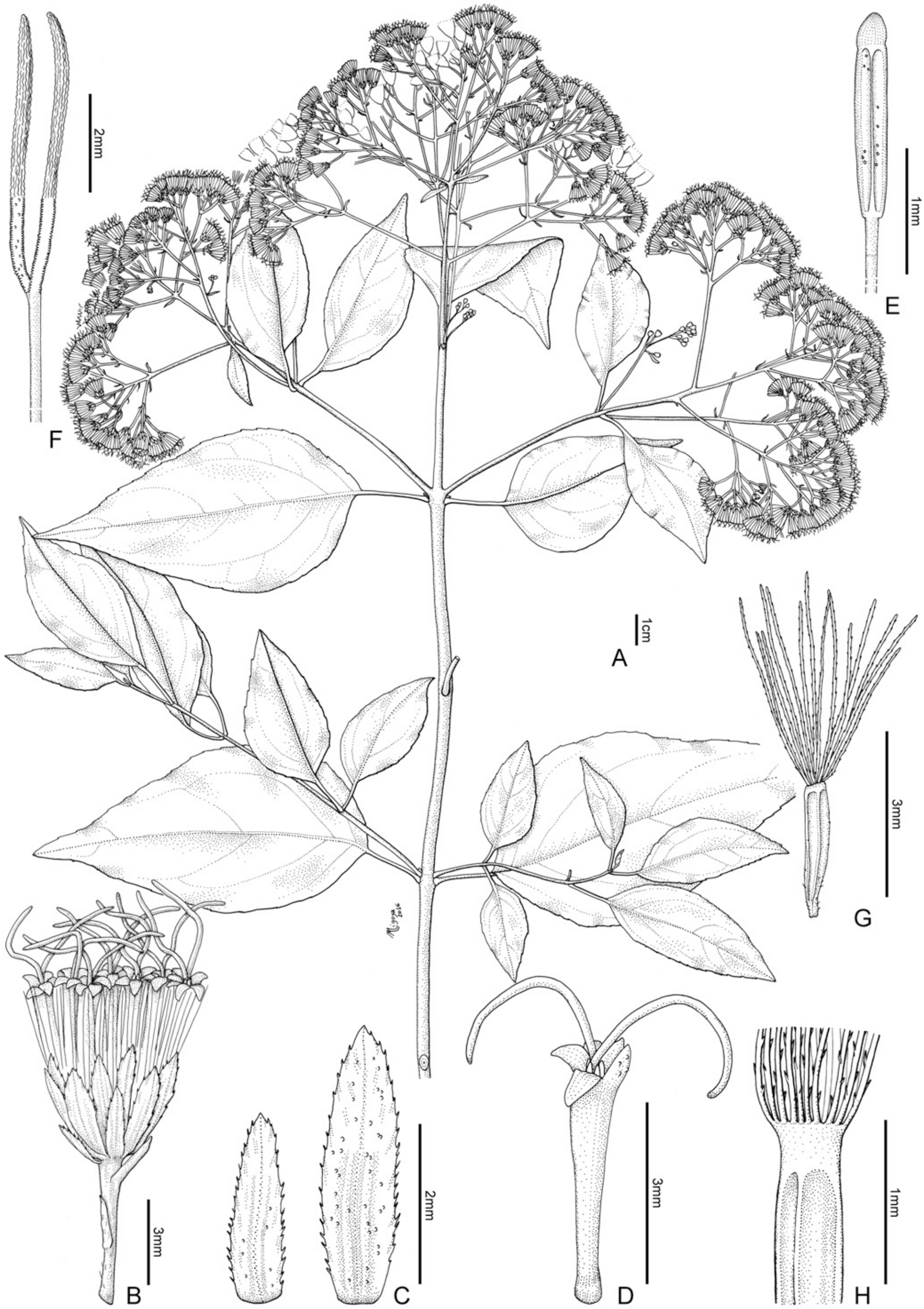

Figure 9. *Kaunia eucosmoides* (B. L. Rob.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer and inner phyllary). —D. Floret without cypsela. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *E. P. Killip & A. C. Smith 22179* (GH) and drawn by A. Migoya.

Figure 10. *Kaunia gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Leaf showing margin variation. —C. Capitulum. —D. Phyllaries (from left to right: outer and inner phyllary). —E. Floret without cypsela. —F. Stamen. —G. Style. —H. Cypsela with pappus. —I. Detail of pappus setae connate in a basal ring. A–I based on *M. Nee & L. Bohls 49760* (F) and drawn by A. Migoya.

different in shape and size, venation pinnate eucamptodromous, first pair of secondary veins borne 6–10 mm from blade base. Capitulescence cymoid, congested, with reduced leaves, on pubescent first-order stems. Capitula usually less than 100, pedunculate, peduncles 5–13 mm, pubescent or subglabrous, bracteoles 1 or 2, alternate, 1–2 × ca. 0.5 mm. Involucre ca. 4.5 mm high, phyllaries 15 to 24, arranged in 2 series, ovate-lanceolate, acute, pubescent and glandular; outer phyllaries 3–3.6 × 1–1.4 mm, inner phyllaries 3.5–4.2 × 0.6–0.9 mm. Receptacle flat to slightly convex, glabrous or subglabrous. Florets 30 to 40, corollas pinkish, tubular-funnelform, 4–4.5 mm, tube glabrous, eglandular or barely glandular (with 1 to 3 glandular trichomes on tube), lobes ca. 0.5 × 0.5 mm; stamens with anther collar ca. 0.5 × 0.1 mm, anthers 1.1–1.3 × ca. 0.4 mm, theca bases auriculate, apical appendage 0.2–0.3 × ca. 0.3 mm, obtuse or exceptionally subacute; style 6.5–8.5 mm, style branches 3–4.5 mm, internally without glandular trichomes. Cypselae 2.1–2.5 mm, obovate-cylindrical, subsymmetric, stipitate, glandular, glabrous, carpopodium distinct, stopper-shaped. Pappus of 20 to 26 setae, setae 1.8–3.8 mm, connate in a basal ring of 5 and 10 rows of cells.

Phenology. *Kaunia gynoxymorpha* flowers from May to September with fruiting synflorescences present concurrently with the flowers.

Distribution. *Kaunia gynoxymorpha* is endemic to central-northern Bolivia (La Paz, Santa Cruz) (Valenzuela Celis, 1993; Jørgensen et al., 2010) (Fig. 7D).

Ecology and habitat. *Kaunia gynoxymorpha* is a component of the high montane forest, Tucumano-Boliviano rainforest, Yungas, and dry valleys, between 1000 and 3000 m in elevation (Valenzuela Celis, 1993; Jørgensen et al., 2010).

Etymology. The epithet "gynoxymorpha" refers to Rusby's *Eupatorium gynoxioides*.

Common name. Paichané (Florida, Bolivia).

Nomenclatural notes. After consulting and obtaining permission from the original author, Benjamin L. Robinson (1920a) created a replacement name (*Eupatorium gynoxymorphum*) for Rusby's *E. gynoxioides*, on the basis of the name similarity with that of Weddell, *E. gynoxoides.* Both names differed by only one letter, which could lead to confusion. Robinson explicitly ascribed his new name to Rusby.

The type specimens (holotype and isotype) deposited in NY herbarium have two barcodes on each sheet. Both numbers are indicated in the synonymy list. The labels of the type collections indicate "Coripati" instead of "Coripata."

Observation. As indicated in the key to species, this is the only species of *Kaunia* having T-shaped trichomes on the leaves.

Additional specimens examined. BOLIVIA. **La Paz:** Franz Tamayo, Senda Apolo–San José de Uchupiamonas, a 1 hora del Naranjal hacia la izquierda del camino, 1780 m, 29 Nov. 2002, *T. Miranda et al. 221* (MO); Inquisivi, "Abra de Alto Polea," along the rd. betw. Alto Polea & Poqueloque where it crosses the pass, 2780 m, 5 June 1990, *M. Lewis 37357* (MO); "Cerro Choro," along the trail on the ridge leading to Cerro Choro, betw. Río Isi Taxaña (Río Khenwani on map), betw. Parrillada at 2150 m & 3000 m, 20 km NW of Choquetanga, 23 Sep. 1991, *M. Lewis 40446* (LPB, MO); Larecaja, Tipuani Valley, Hacienda Casana, 1400 m, 6 Aug. 1922, *O. Buchtien 7550* (F, LP, NY); Murillo, Valle de Zongo, vic. of Escuela Cambaya, 28.3 km N of (below) La Cumbre, 2560–2800 m, 10 May 1990, *J. L. Luteyn & L. J. Dorr 13598* (MO); trail from Estancia Islani Bajo to water intake for hydroelectric projects along Río Chuchulluni, 1 km W of Estancia Islani Bajo & Planta Hidroeléctrica Jarca, 1700–2050 m, 18 June 1998, *M. Nee & L. Bohs 49760* (F, MO, NY); Nor Yungas, arriba del final del camino a Chairo, 2350 m, 21 June 1997, *S. G. Beck 23059* (LPB); Coroico, subiendo el Cerro de Uchumachi, 2450 m, 8 May 2005, *S. G. Beck 30434* (LP); 16.2 km NE (below) Chuspipata (13.5 km S of Yolosa), 1900 m, 19 July 1982, *J. C. Solomon 8035* (MO); 16.5 km al NE (debajo) de Chuspipata por el camino a Coroico (Yolosa), 1900 m, 28 May 1988, *J. C. Solomon 18480* (MO, NY); Sud Yungas, Puerto Linares, 61 km hacia San Borja, Cerro Pelado, 1100 m, 14 July 1979, *S. G. Beck 1744* (SI); Chulumani, subiendo 6 km, arriba pasando la granja Mejillones, 2360 m, 29 Dec. 2006, *S. G. Beck et al. 29640* (LP, LPB). **Santa Cruz:** Santa Cruz, 1000 m, May 1892, *O. Kuntze s.n.* (NY); Florida, 10.5 km by rd., to antennas of Cerro Sillar, from turnoff at Bermejo of Santa Cruz–Samaipata hwy., 1450–1525 m, 17 May 1998, *M. Nee 49399* (F); Bermejo, 5 km al E subiendo hacia el sillar–Tres Cruces, camino del gasoducto y zona de la antena, 1500 m, 2 Aug. 1996, *I. G. Vargas C. 5048* (NY); Ichilo, "Cerro Amboró," Parque Nacional de Amboró, 60 km W of Santa Cruz, 1150–1300 m, 23 Sep. 1990, *M. Lewis & R. Clark 37739* (LPB, MO).

5. **Kaunia hosanensis** (B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 259. 1980. *Eupatorium hosanense* B. L. Rob., Contr. Gray Herb. 100: 14. 1932. TYPE: Bolivia. Santa Cruz: "Rio Blanco, Cerro Hosana, alt. 1200 m, Aug. 12, 1917," *J. Steinbach 3368* (lectotype, designated here, GH-00007706 [fragm.] image!). Figure 11.

Shrubs 2–3 m tall. Stems branched, subcylindrical, subglabrous, leafy up to capitulescence, internodes 3–4.5 cm. Leaves persistent, petiolate, petiole 2.5–5.5 cm, blades ovate, 5–9 × 3.5–6 cm, base sometimes slightly asymmetrical, subcordate or rounded, apex shortly acuminate or obtuse, glabrous on both surfaces, margins crenate-serrate or roughly serrate, teeth similar in size and shape, 2–3 × 5–7 mm, venation acrodromous, suprabasal, imperfect with 2 pairs of secondary veins strongly developed, borne ca. 2 mm from blade base. Capitulescence cymoid, congested, with reduced leaves, on first-order stems. Capitula more than 100, short-pedunculate. Involucre with ca. 17 phyllaries, arranged in ca. 3 series,

Figure 11. Image of the lectotype of *Eupatorium hosanensis* B. L. Rob. [≡ *Kaunia hosanensis* (B. L. Rob.) R. M. King & H. Rob.]. Photograph taken from GH web page (<https://huh.harvard.edu/pages/gray-herbarium-gh>).

ovate, obtuse, glabrous. Florets ca. 30, corollas white pink, tubular-funnelform, ca. 4 mm. Cypselae ca. 2.5 mm, glabrous. Pappus of ca. 20 setae, setae ca. 4 mm.

Phenology. *Kaunia hosanensis* has been documented to flower in August.

Distribution. *Kaunia hosanensis* is known from only Bolivia (western Santa Cruz) (Fig. 7E).

Ecology and habitat. *Kaunia hosanensis* is found in dry valleys between 1000 and 1500 m (Jørgensen et al., 2010).

Etymology. The name "hosanensis" refers to Mount Hosana, the place where the type specimen was collected.

Nomenclatural note. The holotype at B was not found (Dr. Robert Vogt, Curator of the Herbarium B, pers. comm.). The original isotype at GH includes a small fragment and an image of the specimen originally housed at B. This material at GH is chosen as the lectotype.

Observation. This species is known from only the type collection. Because no specimens other than the type material were collected, the above description is based on the image of the type at GH (small fragment) and the original description. This species is cited in updated floristic treatments, but it was never collected again after the original gathering. With the available information, it is difficult to accurately establish its status, so we prefer to continue treating it as an accepted species.

6. Kaunia lasiophthalma (Griseb.) R. M. King & H. Rob., Phytologia 47: 259. 1980. *Eupatorium lasiophthalmum* Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 167. 1874. TYPE: Argentina. Tucumán: "Cuesta de Siambon, inter Siambon et Juntas," Mar. 1872, *P. G. Lorentz 508* (holotype, GOET-001519 image!; isotypes, CORD-00006264 image!, CORD-00006265 image!). Figures 6D–F, 12.

Eupatorium hiemale Lillo, Prim. Reun. Nac. Soc. Argentina Ci. Nat. 218. 1919. TYPE: "Abundante en los bosquecillos de los alrededores de la ciudad de Tucumán," *M. Lillo s.n.* (holotype, LIL not seen).

Shrubs or small trees up to 5 m tall. Stems branched, cylindrical, sometimes profusely branched from base, young stems short-pubescent, old stems glabrous, leafy up to capitulescence, internodes 1.7–7.5 cm. Leaves persistent, petiolate, petiole 1–8 cm, glabrous or subglabrous, blades ovate-deltoid or ovate, 3.5–17 × 2–10.5 cm, base symmetric, cuneate or cuneate-rounded, apex acute or acuminate, glabrous and eglandular adaxially, pubescent on veins, subglabrous among veins and glandular abaxially, margins serrate, teeth 1–3 × 1.5–6 mm, similar in shape and size, venation acrodromous, suprabasal, imperfect with 1 or 2 pairs of secondary veins strongly developed, borne 2–11 mm from blade base. Capitulescence thyrsoid, congested, leafy, on tomentulose first- and second-order stems, giving together an apparently larger capitulescence. Capitula more than 500, pedunculate, peduncles 3–10 mm, pubescent, bracteoles 1 to 4, opposite or alternate, 1–2 × 0.1–0.3 mm. Involucre 3–5 mm high, phyllaries 12 to 29, arranged in 2 or 3 series, green, commonly with purple tips in live specimens, acute to subacute, pubescent and glandular; outer phyllaries ovate, 1.4–3.2 × 0.5–1.5 mm, middle phyllaries (if present) ovate-oblong, 2.2–3.5 × 0.7–1 mm, inner phyllaries obovate-oblong, 3.5–4.5 × 0.6–1 mm. Receptacle flat to slightly convex, glabrous. Florets 13 to 35, corollas white or pinkish, tubular-funnelform, 3.5–5.4 mm, tube glabrous, without or exceptionally with 2 or 3 glandular trichomes, lobes 0.4–0.8 × 0.4–0.6 mm; stamens with anther collar 0.3–0.4 × ca. 0.1 mm, anthers 1.4–2 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.3 × 0.3–0.4 mm, subacute; style 5.5–9.5 mm, style branches 3.2–6.5 mm, internally with glandular trichomes between stigmatic lines. Cypselae obovate-cylindrical, 1.6–3.6 mm, symmetric, stipitate, glandular, glabrous, carpopodium distinct, stopper-shaped. Pappus pinkish in live specimens, of 15 to 33 setae, setae 2.5–5 mm, connate in basal ring of 5 to 10 rows of cells.

Phenology. *Kaunia lasiophthalma* flowers from May to September with fruiting synflorescences present concurrently with flowers in Argentina, and flowers from December to February in Bolivia (Valenzuela Celis, 1993).

Distribution. *Kaunia lasiophthalma* is found in northwestern Argentina (Catamarca, Jujuy, La Rioja, Salta, Tucuman) and southern and central Bolivia (Cochabamba, La Paz, Santa Cruz, Tarija) (Fig. 7F).

Ecology and habitat. *Kaunia lasiophthalma* is a characteristic element of the Yungas biogeographic province (Cabrera, 1978), found mainly between 900 and 1600 m (Blundo et al., 2012; Malizia et al., 2012). In Catamarca it is found below the "laurel" (*Ocotea porphyria* (Griseb.) van der Werff) forest at ca. 1100 m in elevation (Cabrera & Freire, 1997). This species is also found in scrubs, gallery forests, and edges of montane prairies (Novara, 2009). In Argentina this species was assigned to the Least Concern (LC) category by Viera Barreto and Sancho (2018), according to IUCN Red List criteria (IUCN, 2012).

Figure 12. *Kaunia lasiophthalma* (Griseb.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer, middle, and inner phyllary). —D. Corolla. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *T. Meyer 4307* (LP). A–G drawn by J. Ponte; H drawn by S. Faiad.

Etymology. The epithet comes from the Greek *lasios* and *ophthalmos*, probably due to the woolly buds sometimes present on the stems.

Common names. Malvón, cutu cutu, tuwi tuwi (Bolivia) (Muñóz Rodriguez, 2001; Novara, 2009).

Uses. The wood has been used as combustible material, although it is of poor quality (Novara, 2009). This species has been used in agroforestry systems in the Bolivian altiplano (Muñóz Rodríguez, 2001). In Cochabamba, Bolivia, it is used as medicine for inflammation and headache (Modesto Zárate, pers. comm.).

Additional specimens examined. ARGENTINA. **Catamarca:** Ambato, Las Juntas, 8 Feb. 1974, *E. A. Ulibarri 608* (CORD); Andalgalá, Cuesta del Clavillo, a más o menos 3 km al N de Río Potrero, 18 Jan. 1983, *M. M. Cerana et al. 351* (CORD [sheets a and b]); La Playa, 2400 m, 20 Feb. 1916, *P. Jørgensen 1415* (GH); Río del Potrero, 1600 m, 28 Mar. 1927, *S. Venturi 4989* (GH [2 sheets]); Paclín, Cuesta de Totoral (ruta 38), alrededores de Agua de Mato, rumbo a La Merced, 1100 m, 8 Apr. 1971, *A. T. Hunziker & T. E. Di Fulvio 21127* (CORD). **Jujuy:** Dr. Manuel Belgrano, Termas de Reyes, July 1928, *A. Burkart 2985* (LP); cerros próximos a Jujuy, 11 Sep. 1938, *A. L. Cabrera 4541* (GH, LP); Termas de Reyes, 19 July 1963, *A. L. Cabrera 15724* (LP); Los Blancos, camino al Cucho, 24 July 1963, *A. L. Cabrera 15855* (LP); camino de Yala a Las Lagunas, 30 Jan. 1947, *C. A. O'Donell 4820* (GH); Palpalá, 5 July 1948, *A. Pereira s.n.* (NY); camino de Termas de Reyes a Lagunas de Yala, 1829 m, 4 Dec. 2013, *J. N. Viera Barreto & G. Sancho 20* (LP); Ledesma, La Quinta, 25 July 1994, *T. Pedersen 16117* (F); quebrada del Arroyo del Medio, 4 km al W de la Toma de Agua del arroyo, 15–20 km al NW de Calilegua, 700–1000 m, 11 July 1999, *J. Tolaba et al. 1885* (LP); Santa Bárbara, Vinalito, Yuto, 8 July 1937, *A. L. Cabrera 4092* (F, LP); Valle Grande, de Abra de Cañas a Valle Grande, 12 Sep. 1976, *A. L. Cabrera et al. 27865* (MO); de Abra de Cañas a Valle Grande, 14 Sep. 1976, *A. L. Cabrera et al. 27867* (F). **La Rioja:** Capital, El Cantadero, Quebrada La Aguadita, 24 Sep. 1987, *M. M. Cerana 975* (CORD [sheets a and b]). **Salta:** Anta, Parque Nacional El Rey, camino a Pozo Verde, entre tercer Nado y Pozo, 15 Aug. 1981, *A. Brown et al. 1454* (LP); Cresta de Gallo, July 1934, *A. E. Ragonese 247* (LP); Capital, Quebrada de San Lorenzo, 23 Aug. 1936, *A. L. Cabrera 3798* (F, LP); Quebrada de San Lorenzo, 7 Aug. 1959, *A. L. Cabrera 13582* (LP); San Lorenzo, 2 Aug. 1936, *Cobas s.n.* (LP); Quebrada de San Lorenzo, 1463 m, 18 July 1938, *A. P. Rodrigo 2048* (LP, NY); Guachipas, Pampa Grande, Quebrada del Río Grande, 1600 m, 2 May 1942, *A. T. Hunziker 1802* (LP, MO); Cuesta del Cebilar, Ruta 9, 22 km SE de La Viña, 27 Mar. 1977, *A. Krapovickas & A. Schinini 30617* (F); La Caldera, camino de Cornisa Salta–Jujuy, 27 Sep. 1980, *E. Zardini 1263* (LP, MO); La Viña, Coronel Moldes, Apr. 1934, *R. Lahitte s.n.* (LP); Rosario de La Frontera, Los Baños, 900 m, 3 Aug. 1929, *S. Venturi 9329* (LP); Rosario de Lerma, Quebrada del Toro, en caída de agua (cascada) 80 m al S de las vías, 1500–1600 m, 30 June 1995, *J. Tolaba 548* (CORD); Ruta 51, Km. 29, 1896 m, *J. N. Viera Barreto et al. 13* (LP); Ruta 51, Km. 37, 1938 m, *J. N. Viera Barreto et al. 15* (LP); Ruta 51, Km. 22–23, 1618 m, 29 Nov. 2013, *J. N. Viera Barreto et al. 16* (LP). **Tucumán:** Burruyacu, 1900 m, Mar. 1918, *E. Bailetti 186* (GH); Capital, 450 m, Aug. 1913, *M. Lillo 12912* (GH); alrededores de Tucumán, 450 m, *R. Schreiter 79* (GH); Barranca Colorada, 530 m, 6 Sep. 1925, *S. Venturi 3529a* (LP); ib. 19 Oct. 1925, *S. Venturi 3529a* (GH); Chicligasta, Nevados del Aconquija (faldeos orientales), Ruta Nacional 65, entre Andalgalá y Cochuna, Cuesta de El Clavillo, 24 Apr. 1994, *G. Barboza et al. 117* (CORD); Estancia Las Pavas, 1700–2000 m, 8 Mar. 1924, *S. Venturi 2958* (F, GH [2 sheets], MO); Estancia Las Pavas, 1800 m, 11 Mar. 1924, *S. Venturi 2958a* (LP); Famailla, Quebrada de San Rafael, 500 m, 4 Sep. 1932, *R. Schreiter 8883* (F, GH, NY); Lules, Quebrada de Lules, 500 m, 23 Sep. 1923, *R. Schreiter 4156* (GH); Tafí del Valle, Cerro San Javier, 11 Aug. 1959, *A. L. Cabrera 13586* (LP); 3.5 km antes de Anta Muerta, camino a Villa Nogués, 18 Sep. 1997, *M. Dematteis & G. Seijo 770* (GH); falda de San Javier, 16 Sep. 1946, *A. T. Hunziker 6787* (LP); Cuesta Malamala, 1500 m, 8 Mar. 1905, *M. Lillo 4368* (GH); Parque Aconquija, 500 m, 14 Aug. 1941, *T. Meyer 4307* (GH, LP); Parque Aconquija, 500 m, 28 Aug. 1941, *T. Meyer 4336* (GH, LP); Parque Aconquija, 18 Aug. 1951, *A. Ruiz Leal 14356* (LP); Nacimiento de Ojo de Agua, 10 Sep. 1949, *B. Sás 36* (GH, NY); Tafí del Valle, 2500 m, 20 Feb. 1924, *S. Venturi 2908* (GH); Los Cañitos, borde de precipicio, en mirador hacia el arroyo, RP 307, 816 m, 27 Nov. 2013, *J. N. Viera Barreto & G. Sancho 10* (LP); Tafí Viejo, Anta Muerta, Aconquija, 1200 m, 17 Aug. 1942, *A. P. Rodrigo 3157* (LP); La Hoyada, 1800 m, 28 Feb. 1924, *S. Venturi 2908b* (LP); El Duraznito, 600 m, Aug. 1925, *S. Venturi 3885* (GH); El Duraznito, 600 m, 25 Aug. 1925, *S. Venturi 3886* (GH); Trancas, Mal Paso, 2000 m, 1 Feb. 1927, *R. Schreiter 5691* (GH); Pie de la Cuesta, 1700 m, 20 Apr. 1926, *S. Venturi 4170* (F, GH, LP, NY); ib. 1800 m, 20 Apr. 1926, *S. Venturi 4170* (GH); Yerba Buena, 27 Aug. 1912, *M. Lillo 11967* (GH, LP); Yerba Buena, 750 m, 10 Sep. 1920, *S. Venturi 897* (LP); ib. 700 m, 10 Sep. 1920, *S. Venturi 897* (GH); unknown department, Quebrada Río Colorado, Sep. 1939, *T. Meyer 2972* (LP); La Criolla, 1200 m, 27 Feb. 1942, *R. Rodriguez 345* (F). BOLIVIA. **Chuquisaca:** Zudañez, N de Presto, 100 km NE de Sucre, 2750 m, 29 Aug. 1980, *ERTS (G.M.) 18h* (LPB). **Cochabamba:** Cercado, Cochabamba, 12 Mar. 1920, *E. W. D. Holway & M. M. Holway s.n.* (GH); Cochabamba, 12 Mar. 1920, *E. W. D. Holway & M. M. Holway 396* (MO); ib. 11 Mar. 1920, *E. W. D. Holway & M. M. Holway 396* (GH); Mayorazgo, 26 Apr. 1955, *A. Jiménez 42* (LP); Queru-Queru, 2500 m, May 1938, *P. Müsch 14* (NY); ciudad de Cochabamba, Cerro de San Pedro, 2600 m, 20 Apr. 1995, *N. Ritter 1879* (GH); valle del cercado de Cochabamba, 2570 m, 8 Apr. 1966, *R. F. Steinbach 37* (F, GH, MO, NY); N del Valle de Cochabamba, 2570 m, 23 Apr. 1966, *R. F. Steinbach 114* (F [2 sheets], GH, LP [2 sheets], MO); Feldraine Valle, 2700 m, 18 Apr. 1929, *J. Steinbach 9716* (GH, NY); Chapare, Nordosthänge der Sierra do Cochabamba, Umgebung von Incachaca, 2700 m, July 1926, *E. Werdermann 2005* (MO); Esteban Arze, Molle-Pucru, near Anzaldo, 2800 m, Mar. 1944, *H. M. Cárdenas 2429* (GH); Florida, sobre ruta que une Samaipata con Comarapa, 5 km antes de Los Negros, 26 Aug. 2015, *J. N. Viera Barreto et al. 54* (LP); Quillacollo, camino a Liriuni, 24 Sep. 1982, *A. L. Cabrera & M. M. Gutiérrez 33766* (MO); Tiquipaya, Chilimarca (a 10 km), 9 Apr. 1955, *A. Jiménez 47* (LP); Tunari, 3000 m, Apr.–May 1892, *O. Kuntze s.n.* (NY). **La Paz:** Nor Yungas, Unduavi, 3300 m, *O. Buchtien 3028* (NY); Pedro Domingo Murillo, Cotaña, am Ilimani, 2400 m, *O. Buchtien 3288* (NY). **Potosí:** Cornelio Saavedra, quebrada que conduce a Samblas de Puita, 2810 m, 29 Apr. 1993, *G. Torrico & C. Peca 482* (LPB). **Santa Cruz:** Vallegrande, Cruz Grande Bajo la Peña (25 km al S de la ciudad de Vallegrande, por el camino Vallegrande–Masicurí), 2300 m, 20 Oct. 1992, *I. G. Vargas C. et al. 1734* (NY). **Tarija:** Aniceto Arce, Reserva Nacional de Flora y Fauna Tariquia, 2260 m, 27 Apr. 2005, *H. Huaylla et al. 1897* (MO); O'Connor, 10.8 km W of Narvaez (Canaletas), 2200 m, 3 May 1983, *J. C. Solomon 10462* (MO).

7. **Kaunia longipetiolata** (Sch. Bip. ex Rusby) R. M. King & H. Rob., Phytologia 47: 259. 1980. *Eupatorium longipetiolatum* Sch. Bip. ex Rusby, Mem. Torrey Bot. Club 3: 52. 1893. *Ageratina*

longipetiolata (Sch. Bip. ex Rusby) R. M. King & H. Rob., Phytologia 24: 92. 1972. TYPE: Bolivia. "Songo, Nov. 1890 [*M. Bang*] (*867*) = *Mandon 257*" (lectotype, designated by Viera Barreto & Sancho [2014: 46], NY-00169096!; isolectotypes, BR-000000531285 image!, E-00433267 image!, GH-00007783 image!, GH-00273957!, MO-714311!, NY-00169095!, PH-00008376 image!, US-00610850 image!). Figures 6G–J, 13.

Eupatorium uber B. L. Rob., Proc. Amer. Acad. Arts 55: 37. 1919. *Kaunia uber* (B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 260. 1980. TYPE: Peru. "Woods near a brook, below Pampa Romas, between Samanco and Caraz, Dept. Ancash, alt. 2100 m., 29 May, 1903," *A. Weberbauer 3184* (lectotype, designated by Viera Barreto & Sancho [2014: 47], GH-00008039 [fragm.] image!; isolectotype, MOL-00006430 image!).

Eupatorium longipetiolatum var. *arbusculare* B. L. Rob., Contr. Gray Herb. 61: 9. 1920. *Kaunia arbuscularis* (B. L. Rob.) R. M. King & H. Rob., Phytologia 47: 259. 1980. TYPE: Ecuador. "Prov. Loja, in the vicinity of Zaragura," *J. N. Rose, A. Pachano & G. Rose 23144* (holotype, GH-00007785 image!; isotypes, NY-00169097!, US-00145699 image!).

Shrubs or small trees up to 6 m tall. Stems branched, cylindrical or subangled, young stems pubescent, old stems subglabrous, leafy up to capitulescence, internodes 2–10 cm. Leaves caducous, petiolate, petiole 2–7 cm, pubescent, blades ovate, ovate-lanceolate, or elliptic, 5–20 × 3–11 cm, base symmetric, cuneate or cuneate-rounded, apex acuminate or acute, subglabrous and slightly glandular adaxially, pubescent and glandular abaxially, margins entire, serrulate, or serrate, teeth 0.5–4 × 0.5–6 mm, similar in shape and size, venation acrodromous, suprabasal, imperfect with 1 or 2 pairs of secondary veins strongly developed, borne 3–10 mm from blade base. Capitulescence thyrsoid, congested, leafy, on pubescent first- and second-order stems, giving together an apparently larger capitulescence. Capitula more than 500, pedunculate, peduncles 2–9 mm, pubescent, bracteoles 1 to 4, opposite or alternate, 1.5–2 × ca. 0.5 mm. Involucre 3–7 mm high, phyllaries 14 to 20, arranged in 2 or 3 series, acute, pubescent and glandular; outer phyllaries oblong, 1.5–3 × 0.5–1 mm, middle phyllaries (if present) oblong or ovate, 2.5–5.4 × 0.7–1.4 mm, inner phyllaries lanceolate, 2.9–5.6 × 0.5–1 mm. Receptacle flat to slightly convex, subglabrous. Florets 14 to 28, corollas whitish lilac, tubular-funnelform, 3.9–5.5 mm, tube glabrous, eglandular, lobes 0.5–0.8 × 0.4–0.7 mm; stamens with anther collar 0.2–0.5 × ca. 0.1 mm, anthers 1.2–2 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.3 × 0.3–0.4 mm, acute to subobtuse; style 5.5–9.5 mm, style branches 3.5–5 mm, internally with glandular trichomes between stigmatic lines and sterile appendage. Cypselae 1.8–2.5 mm, obovate-cylindrical, symmetric to subsymmetric, substipitate, glandular, glabrous or subglabrous with a few (1 to 10) twin hairs on ribs and at cypsela base, carpopodium slightly distinct, cylindrical. Pappus pinkish in live specimens, of 23 to 31 setae, setae 1.8–4.5 mm, connate in a basal ring of 5 to 10 rows of cells.

Phenology. *Kaunia longipetiolata* flowers from July to December.

Distribution. *Kaunia longipetiolata* is found from central-northern Bolivia (Cochabamba, La Paz, Santa Cruz) (Valenzuela Celis, 1993, Jørgensen et al., 2010), Peru (Cajamarca, Cuzco, Piura) (Brako & Zarucchi, 1993), and southern Ecuador (Loja) (Jørgensen & León-Yáñez, 1999) (Fig. 14A).

Ecology and habitat. It is found in a wide variety of environments such as scrubs (Valenzuela Celis, 1993), Tucumano-Boliviano forest (Hurtado Ulloa & Moraes, 2010), deciduous forest of dry valleys, and Yungas, crop fields, roadsides, and riversides, between 1000 and 4000 m in elevation (Jørgensen et al., 2010). According to Antezana and Navarro (2002), *Kaunia longipetiolata* has a wide Andean distribution and occurs in different bioclimatic zones such as sub-humid, pluviseasonal, and mesotropical to dry and xeric. This species has caducous leaves, which is an exception in *Kaunia*.

Etymology. The epithet ("longipetiolata") probably refers to the relatively long petioles.

Common names. Lap'a lap'a (Vallegrande, Bolivia) (Hurtado Ulloa & Moraes, 2010).

Uses. In some communities, for instance in Loma Larga (Vallegrande, Bolivia), the woody stems are used as combustible materials (Hurtado Ulloa & Moraes, 2010).

Nomenclatural notes. Due to some confusing issues about the type material of *Eupatorium longipetiolatum*, Viera Barreto and Sancho (2014) designated as lectotype the specimen *Bang 867* (NY-00169096) because it is well preserved and complete, and probably it is the very one that the author indicated in the protologue. Together with the fragment of the lectotype of *E. uber* at GH there is a picture of a specimen once housed at B. The type specimen at GH herbarium (barcode GH-00007783) was mounted on the same sheet with the specimen *R. S. Williams 2408* (barcode GH-00257080).

Observation. While carrying out this revision, the inclusion of *Kaunia arbuscularis* and *K. uber* under the synonymy of *K. longipetiolata* was confirmed through different approaches. The morphological study allowed detecting the similarity of the three species, which, together with the other three species were included

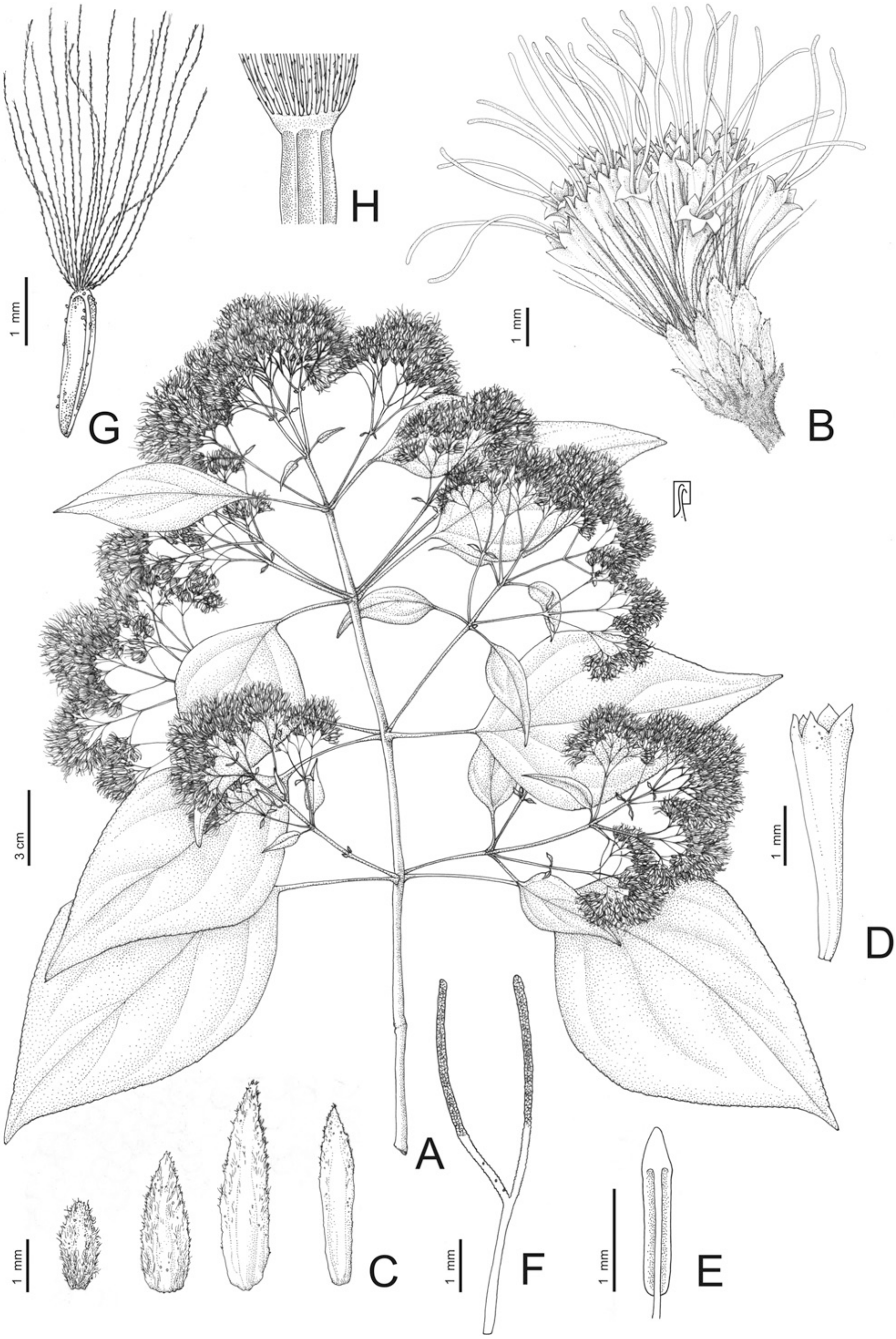

Figure 13. *Kaunia longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer, two different middle, and inner phyllaries). —D. Corolla. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *M. Nee & S. Churchill 52797* (SI) and drawn by S. Faiad.

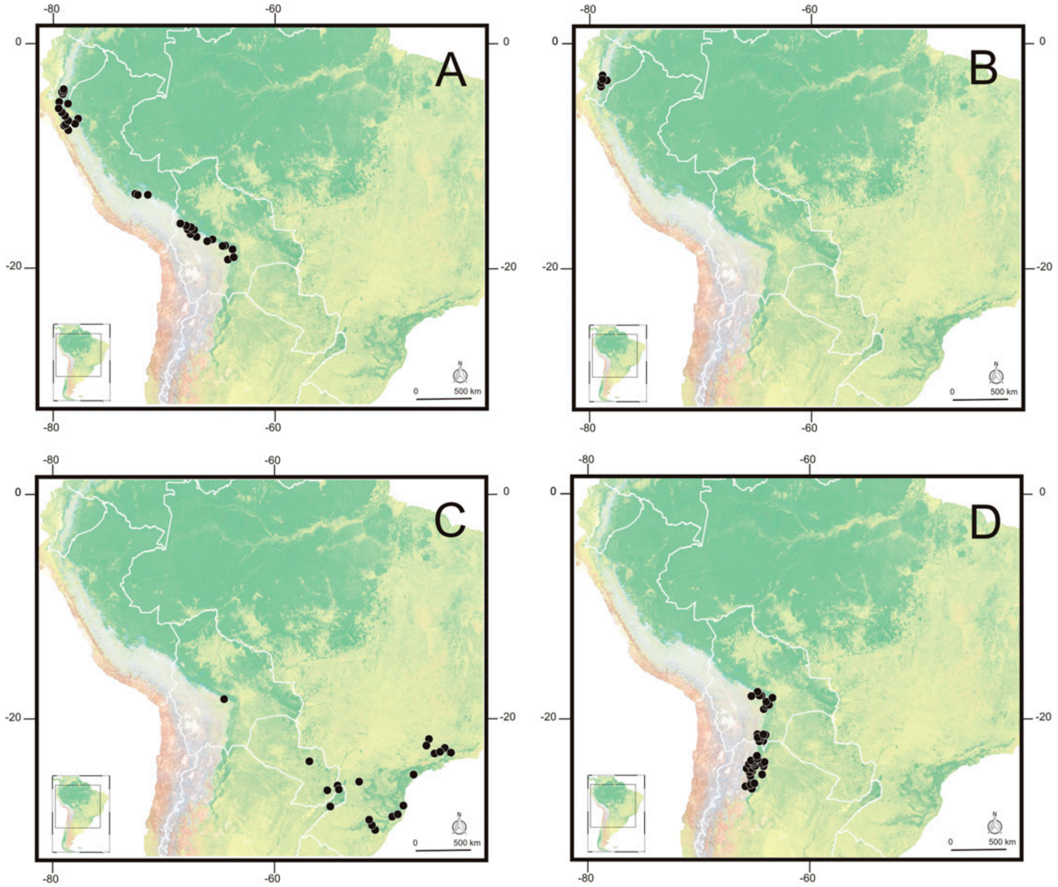

Figure 14. Distribution maps. —A. *Kaunia longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob. —B. *Kaunia pachanoi* (B. L. Rob) R. M. King & H. Rob. —C. *Kaunia rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob. —D. *Kaunia saltensis* (Hieron.) R. M. King & H. Rob.

in a species complex by Viera Barreto et al. (2018). The morphological study of type and additional specimens led us to the conclusion that these three species are part of a morphological continuum, without gaps between them, justifying keeping them as distinct entities. The statistical analysis showed overlapping of the specimens of these three species, supporting the same conclusion of the morphological study. All of this evidence together with that derived from SDM and climatic spaces (Viera Barreto et al., 2018) supports the inclusion of *K. arbuscularis* and *K. uber* under the synonymy of *K. longipetiolata* as suggested earlier (Robinson & Holmes, 2008).

Additional specimens examined. BOLIVIA. **Chuquisaca:** Belisario Boeto, 11.4 km N of Villa Serrano on rd. to Nuevo Mundo, 2360 m, 19 July 2004, *M. Nee 52778* (F, NY); 19 km (by rd.) NE of Villa Serrano on rd. to Nuevo Mundo, 5 km (by rd.) SW of Nuevo Mundo, 2440 m, 20 July 2004, *M. Nee & S. Churchill 52797* (F, NY, SI). **Cochabamba:** Ayopaya, 7 km al NW de la Capital de la Provincia, 3800 m, 6 Nov. 1987, *G. Mérida 16* (LP, LPB); Carrasco, 10 km W de La Siberia, 3480 m, 26 July 2003, *M. Dematteis et al. 1089* (CTES, SI); Chua Khocha, 2300 m, 6 July 1990, *R. Renjel 14* (NY); Cercado, near Taquina brewery, above Cochabamba, 2900 m, 8 Apr. 1939, *W. J. Eyerdam 25224* (F, GH); Chapare, Incachaca, small power station ca. 80 mi. NE of Cochabamba, 8000 ft., 14 Aug. 1950, *W. M. A. Brooke 6705* (NY); 3 km N del río Vinto, 27 July 2003, *M. Dematteis et al. 1108* (CTES); Incachaca, S. Antonio, 2300 m, July 1926, *E. Werdermann 2071* (MO). **Inquisivi:** along rd. 1–2 km W of Quime, 3200 m, 11 Aug. 1988, *M. Lewis 881065* (MO, NY); along Rio Khatu at mouth of Rio Irupaya ca. 3 km NE of Quime, 2800 m, 14 Aug. 1988, *M. Lewis 881085* (NY); W slope of Cerro Kharrata SSE Camillaya, 3550–3850 m, 30 Sep. 1997, *J. Müller & J. Heinrichs 6418* (MO); J. Bautista Saavedra M. Am Beginn des Weges zum Thermalbad bei Charazani, etwa 100 m vom Ortsrand, 3200 m, 26 May 1980, *T. Feuerer 4235* (LP, LPB); Larecaja, Sorata, 2666 m, 3 Oct. 2006, *K. Apaza et al. 6* (LP, LPB); Cotaña am Ilimani, 2400 m, Nov. 1911, *O. Buchtien 651* (GH, LP, MO); vicinus Sorata, in sepibus, nemoribus, undique, 2600–3000 m, Aug. 1858–Feb. 1859, *G. Mandon 257* (F [2 sheets], GH, NY); Sorata, 2800 m, 4 Dec. 1983, *S. G. Beck 8633* (LPB); Sorata, 7500 ft., 30 Aug. 1901, *R. S. Williams 2408* (NY); Loayza, Humapalca, confluencia de los ríos

Miquillas y Jalancha, 2050 m, 18 Aug. 1994, *N. Salinas et al. 3329* (LPB). **La Paz:** Camacho, Cantón Ambana, bajando por el sendero Ambana a Llojillata, 3000 m, 19 Dec. 1980, *S. G. Beck 4154* (LP, LPB). **Nor Yungas:** Coroico, Yungas, 14 Aug. 1894, *M. Bang 2381* (GH, NY [4 sheets]). **Santa Cruz:** Caballero, 0.5 km S of (down from) El Empalme (at Comarapa–Cochabamba hwy.), 2500 m, 7 Aug. 2003, *M. Nee & M. Mendoza 52543* (F, NY); sobre ruta que une Comarapa con Cochabamba, a 24 km de Comarapa, 26 Aug. 2015, *J. N. Viera Barreto et al. 58* (LP). **Sud Yungas:** Chulumani, 2–4 m hacia Irupana, 1600 m, 13 Sep. 1987, *S. G. Beck 14233* (SI); Chicaloma, 1600 m, 8 Aug. 1998, *S. G. Beck 24469* (LPB). ECUADOR. **Loja:** Cantón Loja, rd. La Toma–Loja, Km. 12, 2000 m, 2 Sep. 1988, *J. E. Madsen & L. Ellemann 75199* (NY); Argelia, 2300 m, 7 Oct. 1946, *R. Espinosa 691* (F, NY); betw. El Tambo & La Toma, 1000–2200 m, 3 Sep. 1923, *A. S. Hitchcock 21348* (NY); along the rd. to Loja, ca. 4 km N of Loja, 6400 ft., 25 Jan. 1976, *R. M. King & R. M. Garvey 6905* (NY); vic. of Las Juntas, 28–29 Sep. 1918, *J. N. Rose et al. 23229* (GH, NY); 13.6 km E of Sambi on rd. to Chinchicas (2 km W of Chinchicas), 2200 m, 5 Sep. 1979, *T. F. Stuessy & G. Nesom 5883* (LP). PERU. **Amazonas:** Contumazá, Rupe (Chilete-Contumazá), 1500 m, 24 May 1981, *A. A. Sagástegui 9799* (MO); Luya, valley of Rio Utcubamba Tingo & Ponaya, 1750–1850 m, 24 Aug. 1962, *J. J. Wurdack 1787* (F, GH, LP, NY); Mendoza, 1500 m, 9 Aug. 1963, *F. Woytkowski 8156* (GH). **Cajamarca:** Celendín, Llanguat, 2500 m, 28 July 1985, *J. Mostacero L. et al. 948* (F); Chota, Arriba de Cochabamba, 2300 m, 13 Nov. 1986, *J. Mostacero L. et al. 1580* (F, MO); Jaén, Sallique, de Catala a Piquijaca, 1940–2195 m, 29 July 1998, *J. Campos & C. Díaz 5408* (F, MO); Colasay, 5 Oct. 1961, *F. Woytkowski 6843* (F); Colasay, 2700 m, 14 Oct. 1961, *F. Woytkowski 6913* (F, MO); San Ignacio, Distr. San José de Lourdes, Santo Tomás, NE del Marañón, 1950 m, 1 Nov. 1995, *S. V. Quipuscoa 408* (F); San Miguel, alrededores del Naranjo, Niepos, 1500 m, 1 July 1985, *S. Llatas Quiroz 1239* (F); Santa Cruz, ca. 2.5 km (por aire) ENE Monteseco, 1700 m, 9 June 1987, *J. C. Santisteban & J. B. Guevara 159* (MO, NY). **Cusco:** Calca, Calca–Colca rd., Km. 80, 30 Aug. 1980, *J. D. Boeke & S. Boeke 3248* (NY); Quillabamba, Santa Teresa, on a hillside called Mandornilloc, 5 km W of La Playa, 2380 m, 5 Sep. 1982, *B. Peyton & S. T. Peyton 1144* (F); Urubamba, Distr. Machupicchu, Aguas Calientes, Quebrada Alcamayo, 2050–2200 m, 28 Aug. 2002, *I. Huamantupa & G. Calatayud 2191* (MO); Machupicchu, 2040 m, 16–17 Aug. 1949, *I. G. Vargas C. 6233* (F, LP, NY). **Lima:** Lima & environs, Jesús María, cultivada, Museo de Historia Natural, 100 m, 25 Nov. 1981, *T. Plowman 11001* (F); Jesús María, cultivada, Jardín Botánico de INMETRA, Ministerio de Salud, 100 m, 30 June 2000, *J. Schunke Vigo 14685* (F, NY). **Piura:** Huancabamba, 4200 ft., 7 Sep. 1911, *C. H. T. Townsend A174* (F), *A175* (F).

8. Kaunia pachanoi (B. L. Rob) R. M. King & H. Rob., Phytologia 47: 260. 1980. *Eupatorium pachanoi* B. L. Rob., Proc. Amer. Acad. Arts 55: 25. 1919. TYPE: Ecuador. "Vicinity of Nabón, Prov. of Azuay, Sept. 25, 26, 1918," *J. N. Rose, A. Pachano & G. Rose 22978* (holotype, GH-00007869!; isotypes, NY-00169141!, US-00130451 image!). Figure 15.

Shrubs 0.3–3 m tall. Stems branched, cylindrical, young and old stems pubescent, leafy up to capitulescence, internodes 0.3–1.5(–2) cm. Leaves persistent, sessile or subsessile, petiole (if present) up to 2 mm, pubescent, blades ovate-elliptic, 1–2.2 × 0.4–1 cm, base symmetric, cuneate or cuneate-rounded, apex acute, glabrous and eglandular adaxially, pubescent and glandular abaxially, margins serrulate, teeth 0.5–2 × 1.5–4 mm, similar in shape and size, venation acrodromous, suprabasal, imperfect with 1 pair of secondary veins strongly developed, borne 1–2 mm from blade base. Capitulescence cymoid, glomerate, subaphyllous, on pubescent first-order stems. Capitula 20 to 50, pedunculate, peduncles 4–12 mm, pubescent or subglabrous, bracteoles 2 to 8, opposite or alternate, 1–2 × ca. 0.5 mm. Involucre 5–6 mm high, phyllaries 13 to 17, arranged in 2 or 3 series, pubescent and glandular; outer phyllaries ovate, 2.4–3 × 1–1.3 mm, subacute, middle phyllaries (if present) obovate-oblong or widely obovate-oblong, 3.6–4.7 × 1.5–1.7 mm, subacute, inner phyllaries obovate-oblong, 3.7–4.4 × 1–1.6 mm, obtuse. Receptacle flat to slightly convex, glabrous. Florets 10 to 16, corollas white, pinkish toward throat and lobes, tubular-funnelform, 3.5–4.5 mm, tube glabrous, eglandular, lobes 0.3–0.6 × 0.3–0.7 mm; stamens with anther collar 0.25–0.3 × ca. 0.1 mm, anthers 1.5–1.7 × ca. 0.4 mm, apical appendage ca. 0.3 × 0.3 mm, subacute, theca bases obtuse; style 7–7.5 mm, style branches 3.5–3.8 mm, internally with glandular trichomes between stigmatic lines. Cypselae ca. 2.5 mm, obovate-cylindrical, subsymmetric, substipitate, glandular, glabrous, carpopodium distinct, stopper-shaped. Pappus of 27 to 29 setae, setae 2.2–5 mm, connate in a basal ring of 5 to 10 rows of cells.

Etymology. The name honors Abelardo Pachano, born in Ecuador, who collaborated with Joseph Nelson Rose (1862–1928) in his expedition to South America.

Phenology. *Kaunia pachanoi* flowers from July to September, and some specimens have been found flowering in January and February.

Distribution. *Kaunia pachanoi* is endemic to Ecuador (Azuay, Cañar) (Fig. 14B).

Ecology and habitat. *Kaunia pachanoi* is found from the high Andean forest to the dry páramo, between 2000 and 3500 m (Jørgensen & León-Yáñez, 1999).

Observation. This species is included in the IUCN Red List of Threatened Species (IUCN, 2012). It was assigned the category Endangered (EN) B1ab (iii) by Montúfar and Pitman (2003). These authors point out habitat loss as the main threat to this species.

Additional specimens examined. ECUADOR. **Azuay:** Cantón Cuenca, Parroquia Banos, Hacienda da Yanasacha, 3000–3200 m, 28 July 1978, *J. D. Boeke & J. Jaramillo 2541* (MO, NY); Rd. Baños–Nero, at the pass 9.1 km, 3390 m, 17 Jan. 2000, *P. Jørgensen et al. 1970* (MO); Cantón San Felipe de Oña, betw. Oña & Cuenca, 2700–3300 m, 9–10 Sep. 1923, *A. S. Hitchcock 21615* (GH, NY); "Oriente" Border, E Cordillera,

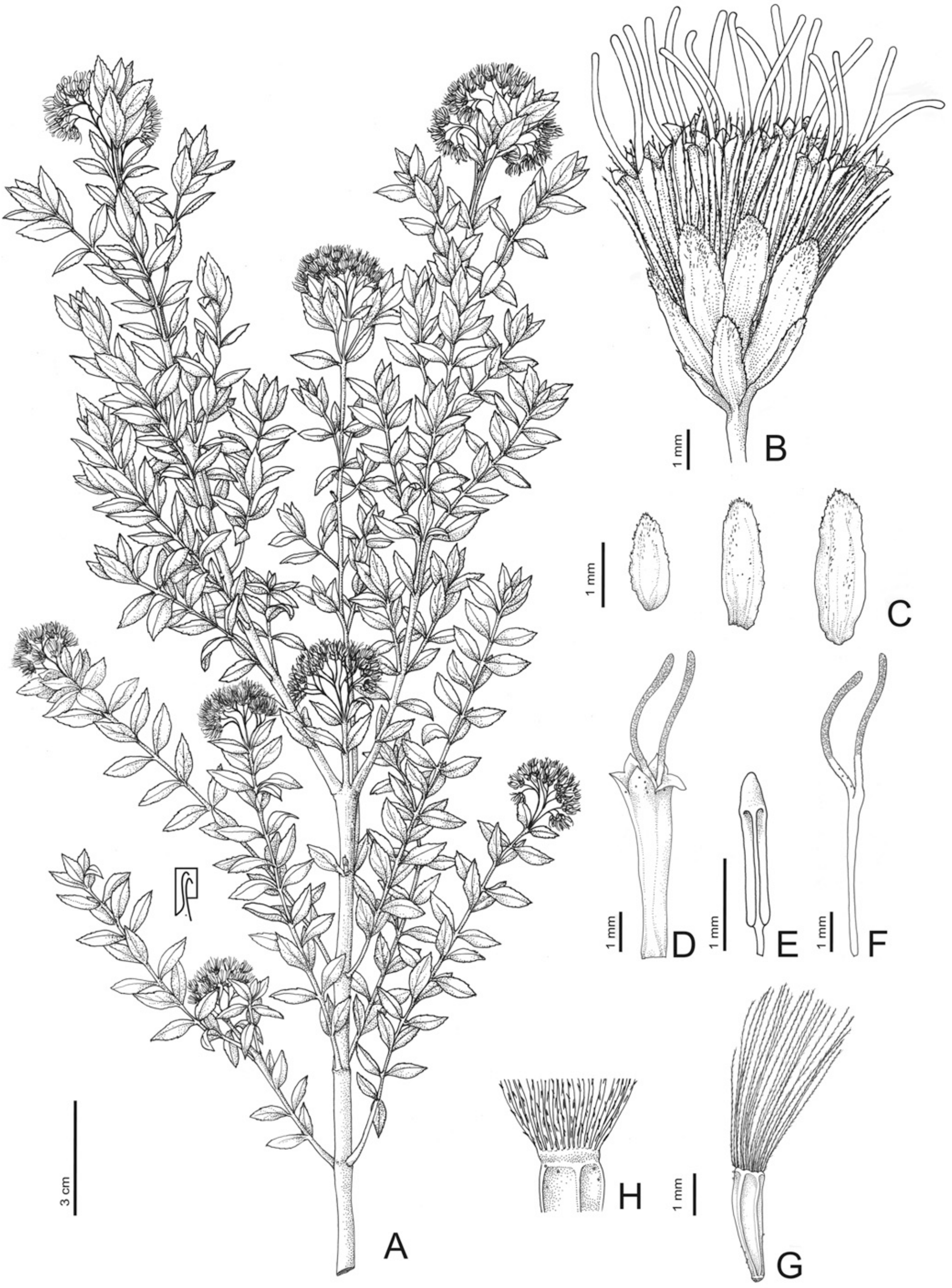

Figure 15. *Kaunia pachanoi* (B. L. Rob) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer, middle, and inner phyllary). —D. Floret without cypsela. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *F. Prieto 189* (NY) and drawn by S. Faiad.

betw. Oña & Río Yacuambí, 8000–9500 ft., 10–19 Sep. 1945, *F. Prieto P-189* (NY); Cantón Sevilla de Oro, E Cordillera, 4–6 km N of village of Sevilla de Oro, 9000–10,000 ft., 16 Aug. 1945, *W. H. Camp E-4732* (NY). **Cañar:** Cantón Cañar, Carretera Cañar–Azogues, desvío a Mololve–Ventanas, colecciones en Mololve Grande, 3200–3450 m, 14 Aug. 1987, *J. Jaramillo 9853* (NY); 10 km N of Zhud, 3200 m, 18 Jan. 1985, *J. L. Luteyn & E. Cotton 11095* (NY); Rd. Chunchi–Zhud, 3200 m, 18 Feb. 1985, *B. Ølgaard et al. 57750* (NY).

9. Kaunia rufescens (P. W. Lund ex DC.) R. M. King & H. Rob., Phytologia 47: 260. 1980. *Eupatorium rufescens* P. W. Lund ex DC., Prodr. 5: 168. 1836. TYPE: Brazil. "Rio-Janeiro," *P. W. Lund s.n.* (lectotype, designated by Freire & Ariza Espinar [2014: 364], C-10007346 image!; isolectotype, C-10007344 image!, C-10007345 image!, G-DC-00495076 image!). Figures 16, 17A–C.

Eupatorium rufescens P. W. Lund. ex DC. var. *glabratum* Hieron. ex B. L. Rob., Contr. Gray Herb. 61: 67. 1920. TYPE: Bolivia. "Cochabamba: Prov. Tapacari, on the Rio Tapacari, alt. 3000 m," 19 Mar. 1892, *O. Kuntze s.n.* (holotype, NY-00169189!).

Shrubs 1.5–4 m tall. Stems branched, cylindrical, young stems short-pubescent, old stems glabrous, leafy up to capitulescence, internodes 3–8 cm. Leaves persistent, petiolate, petiole 2–6 cm, pubescent, blades usually ovate, less commonly ovate-rhombic, 7–21 × 5–15 cm, base symmetric, rounded or cuneate-rounded, apex acuminate or acute, glabrous or subglabrous on veins adaxially, pubescent abaxially, glandular on both surfaces, margins crenate or serrate, teeth 1–3 × 1–7 mm, usually similar in shape and size, venation acrodromous, suprabasal, imperfect with 1 or 2 pairs of secondary veins strongly developed, borne 2–11 mm from blade base. Capitulescence thyrsoid, congested, leafy, on pubescent first-order stems. Capitula 200 to 400, pedunculate, peduncles 3–11 mm, pubescent, bracteoles 1 to 3, opposite or alternate, 1–2.5 × 0.1–0.3 mm. Involucre 3–4 mm high, phyllaries 17 to 26, arranged in 2 or 3 series, subacute, pubescent and glandular; outer phyllaries narrowly ovate, 1.8–3.7 × 0.8–1 mm, middle phyllaries (if present) narrowly ovate to oblong, 2.8–4.2 × 0.8–1 mm, inner phyllaries obovate-oblong, 3.6–4.5 × 0.6–1 mm. Receptacle usually slightly convex, less commonly convex, glabrous. Florets 20 to 38, corollas white or pinkish, tubular-funnelform, 3.9–5.2 mm, tube glabrous, subglandular with 2 or 3 glandular trichomes, lobes 0.4–0.8 × 0.5–0.7 mm; stamens with anther collar 0.3–0.4 × ca. 0.1 mm, anthers 1–1.6 × ca. 0.4 mm, theca bases obtuse, apical appendage 0.2–0.3 × 0.3–0.4 mm, acute or subacute; style 5.5–9.5 mm, style branches 3.2–5.5 mm, internally with glandular trichomes between stigmatic lines and sterile appendage. Cypselae obovate-cylindrical, 1.7–3.5 mm, subsymmetric, stipitate, glandular, slightly sericeous on ribs and at cypsela base, carpopodium slightly distinct, cylindrical. Pappus of 16 to 28 setae, setae 2.5–4 mm, connate in basal ring of 5 to 10 rows of cells.

Phenology. *Kaunia rufescens* flowers from August to September in Argentina (Vega & Dematteis, 2008) and Bolivia, from April to July in Brazil (Cabrera & Klein, 1989), and from June to July in Paraguay (Cabrera, 1996).

Distribution. *Kaunia rufescens* is found in northeastern Argentina (Misiones), southern Bolivia (Cochabamba), southern Brazil (Mato Grosso do Sul, Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, São Paulo) (Viera Barreto & Grossi, 2016), and central and eastern Paraguay (Concepción, Guairá) (Fig. 14C).

Ecology and habitat. This species is a characteristic element of the Cerrado and Atlantic Forest phytogeographic provinces (Viera Barreto & Grossi, 2016). It is heliophilous and not very specific as to soil requirements. In Santa Catarina it is rarely found, occurring in capoeiras and on forest margins between 350 and 700 m (Cabrera & Klein, 1989). In Argentina and Paraguay it occurs in the subtropical forest of the Paranense phytogeographic province (Cabrera, 1996; Vega & Dematteis, 2008). In Bolivia it is found in Cochabamba dry valleys (Jørgensen et al., 2010; Viera Barreto, pers. obs.) and other more humid areas (Paracti). Viera Barreto and Sancho (2018) assigned this species the Least Concern (LC) category according to IUCN Red List criteria (IUCN, 2012), and considered its general distribution in Argentina, Bolivia, Brazil, and Paraguay. However, in Argentina only a few populations of this species were noted and some of them were not found again (Viera Barreto, pers. obs.).

Etymology. The plants have reddish pubescent young stems, which become glabrous at maturity. The epithet *rufescens* derives from the Latin word *rufus*, which refers to the ferruginous (rusty, reddish colored) pubescence of young stems and leaves.

Common names. Mangerona (Cabrera & Vittet, 1961), eupatório, mangerona-brava (Cabrera & Klein, 1989; Flora Digital do Rio Grande do Sul e de Santa Catarina; <http://www.ufrgs.br/fitoecologia/florars/index.php?pag=apresenta.php>), mata-campo (Inventario Florestal Continuo do Rio Grande do Sul, <http://coralx.ufsm.br/ifcrs/frame.htm>).

Uses. *Kaunia rufescens* is used for medicinal purposes. In Rio Grande do Sul, Brazil, it is used for chronic cough, bronchitis, flu, expelling kidney stones, skin and uterine diseases, body aches, "amarelao," and blood clotting (Inventario Florestal Continuo de Rio Grande do Sul, <http://coralx.ufsm.br/ifcrs/frame.htm>).

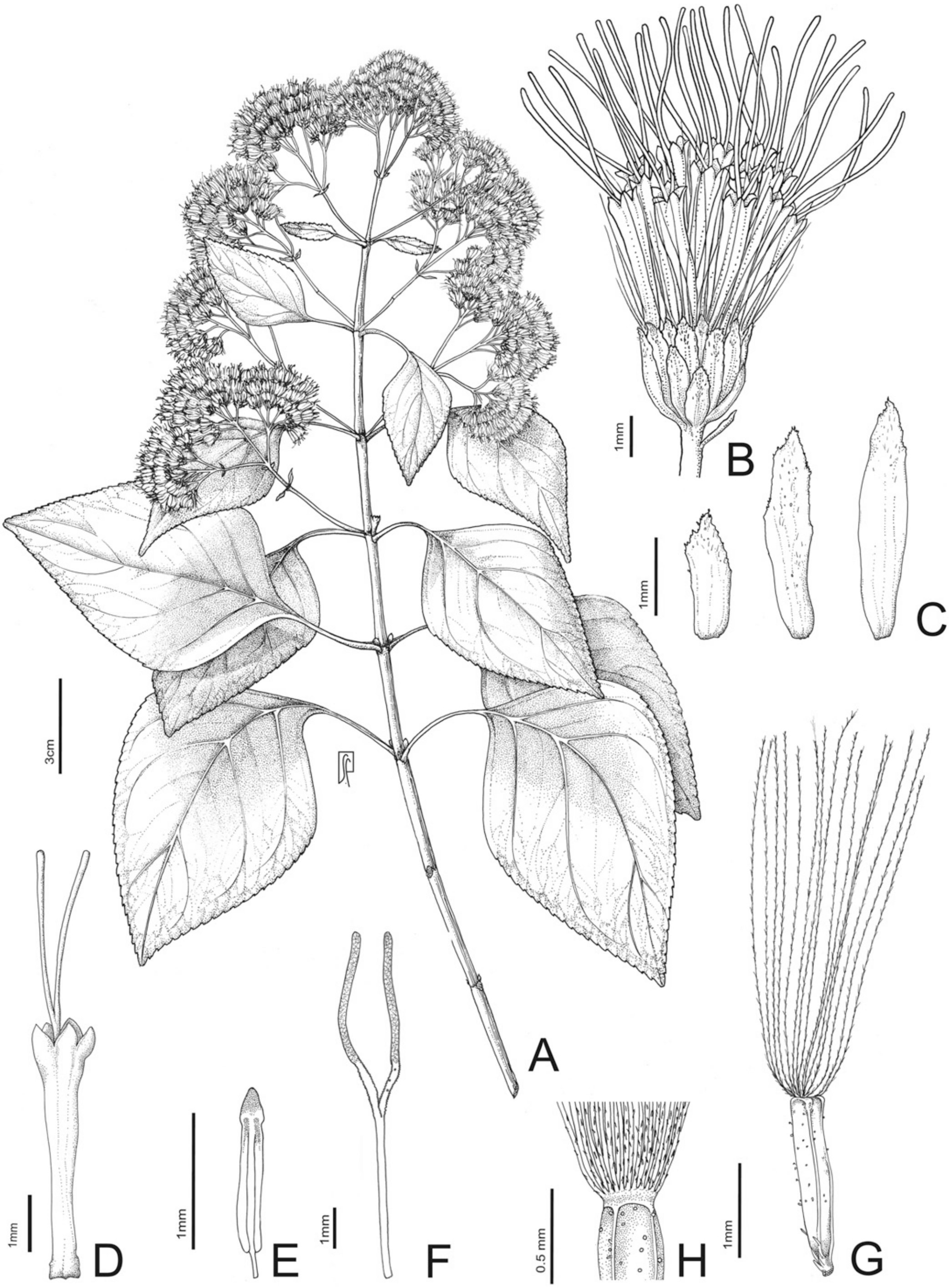

Figure 16. *Kaunia rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Phyllaries (from left to right: outer, middle, and inner phyllary). —D. Floret without cypsela. —E. Stamen. —F. Style. —G. Cypsela with pappus. —H. Detail of pappus setae connate in a basal ring. A–H based on *G. Hatschbach & A. C. Cervi 49550* (NY) and drawn by S. Faiad.

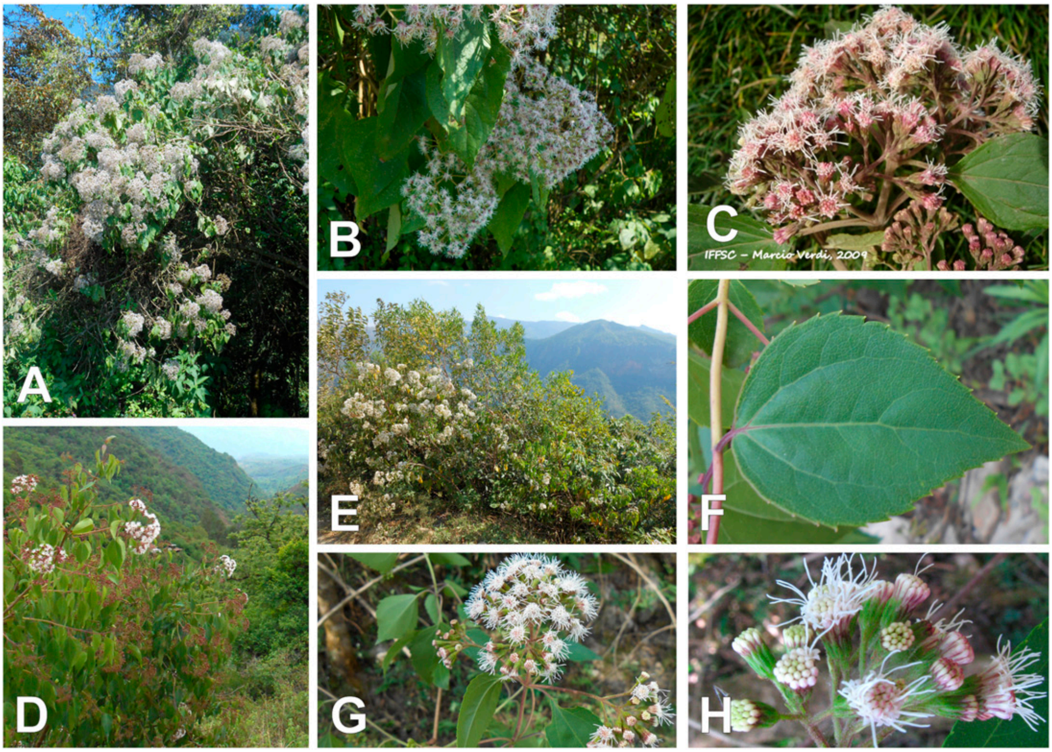

Figure 17. Photographs of live specimens. A–C. *Kaunia rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob. —A. Habit. —B. Close-up of branches. —C. Close-up of capitulescences. D–H. *Kaunia saltensis* (Hieron.) R. M. King & H. Rob. —D. Habitat (Termas de Reyes, Jujuy, Argentina). —E. Habit. —F. Close-up of leaf. —G. Close-up of capitulescence. —H. Close-up of capitula. Photograph of C by Marcio Verdi, taken from Flora Digital of Rio Grande do Sul and Santa Catarina web page (<http://www.ufrgs.br/fitoecologia/florars/index.php?pag=apresenta.php>).

Nomenclatural note. *Eupatorium subtriplinerve* Sch. Bip. (Linnaea 30: 182, 1859) is a nomen nudum referred by authors (e.g., Robinson, 1920b) to *E. rufescens* var. *glabratum*. *Eupatorium rufescens* var. *glabratum* was a nomen nudum assigned to Hieronymus by Kuntze (1898). This name was validly published by B. L. Robinson (1920b) on the basis of a specimen collected by Kuntze.

Additional specimens examined. ARGENTINA. **Misiones:** Iguazú, Ruta 6 entre Ruta Nac. 12 y Campo Veira, 31 July 1986, *illegible collector & Fontana 5615* (SI); Parque Nacional Iguazú, sendero de observación, 7 Aug. 1991, *R. Vanni et al. 2770* (CTES); Parque Nacional Iguazú, paredón frente a isla San Martín, 10 Aug. 1995, *R. Vanni et al. 3441* (CTES). BOLIVIA. **Cochabamba:** Chapare, Paracti, Incachaka, sobre carretera nueva (7) que une Sta Cruz–Cochabamba, Km. 84, 2021 m, 30 Aug. 2015, *J. N. Viera Barreto et al. 65* (LP). BRAZIL. **Minas Gerais:** Monte Belo, Fazenda Lagoa, 19 July 1987, *M. C. W. Vieira 1228* (NY); Caldas, Aug. 1903, *G. Edwall 16336* (GH). **Paraná:** Laranjeiras do Sul, Rod. BR-277, 3 km L do Rio Xagu, 19 Aug. 1985, *G. Hatschbach & A. C. Cervi 49550* (NY). **Rio Grande do Sul:** Vila Flores, 800 m, 17 Sep. 1992, *R. Wasum et al. 8637* (NY [2 sheets]); São Leopoldo, Dos Irmãos, 3 July 1935, *B. Rambo 1971* (LP); Farroupilha. 24 Sep. 1991, *R. Wasum et al. 7972* (NY). **Santa Catarina:** Ararangua, Taimberinho-Arararangua, 50 m, 23 June 1945, *R. Reitz C1148* (LP); Lauro Müller, Vargem Grande, 350 m, 11 July 1958, *R. Reitz & R. M. Klein 6729* (LP); Novo Horizonte, 400 m, 11 June 1959, *R. Reitz & R. M. Klein 8861* (LP, NY); Serra do Río Rastro, 700 m, 31 May 1968, *R. Reitz & R. M. Klein 18139* (LP); Grão Pará, Estrada SC-489, encontrada leste da Serra do Corvo Branco, 100 m, 16 June 1996, *D. B. Falkemberg 7923* (SI); Gravatal, 500 m, 17 June 1995, *N. I. Matzenbacher 28* (F). **São Paulo:** Campos do Jordao, Serra da Mantiqueira, entre Itajubá e Guaratinguetá, 14 July 1962, *A. Castellanos 23381* (F); Km. 146, Estrada São Jose, 16 Aug. 1974, *M. Sakane 149* (NY); Iguape, Bananal, Estrada Sertao do Rio Vermello, 20 July 1932, *A. Brade 15901* (LP). PARAGUAY. **Guairá:** Charará region, Guairá, July 1932, *T. Rojas 6104* (LP).

10. Kaunia saltensis (Hieron.) R. M. King & H. Rob., Phytologia 47: 260. 1980. *Eupatorium saltense* Hieron., Bot. Jahrb. Syst. 22: 786. 1897. TYPE: Argentina. Salta: "Cafayate, Río Colorado, 8 enero 1972, *A. Krapovickas & C. L. Cristóbal 20687*" (neotype, designated by Viera Barreto & Sancho [2014: 46], F-1783063!; isoneotypes, CTES-(herb. 00893) image!, GH-0273967!, LP-077660!). Figures 17D–H, 18.

Eupatorium eucosmum B. L. Rob., Contr. Gray Herb. 61: 6. 1920. TYPE: "BOLIVIA. in the southern part of the country at Padcaya, Dept. Tarija, alt. 2300 m.," 13 Dec. 1903, *K. Fiebrig 2576* (holotype, GH-00007661!; isotypes, GH[A]-00007660 image!), US-00147592 image!).

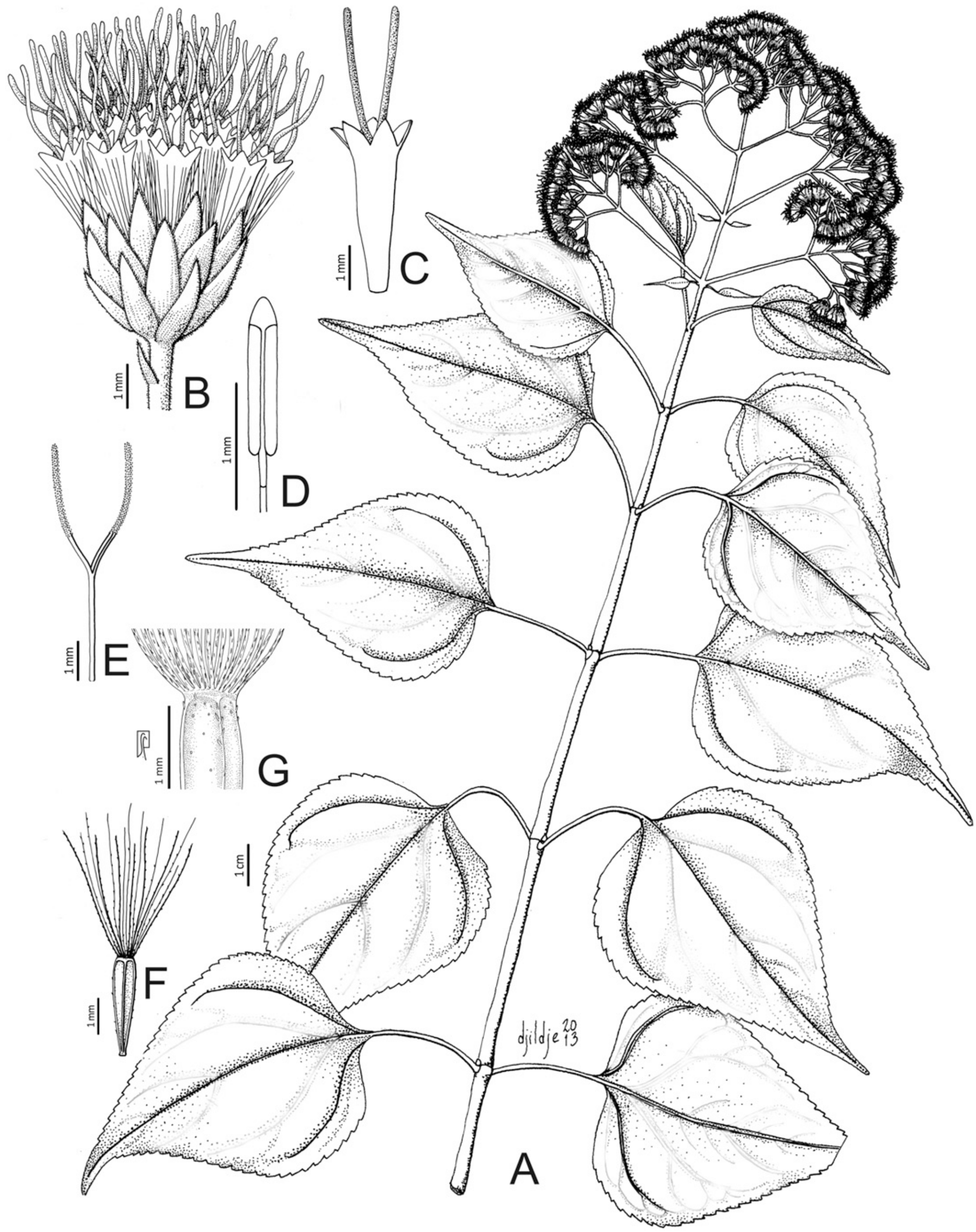

Figure 18. *Kaunia saltensis* (Hieron.) R. M. King & H. Rob. —A. Branch with capitulescence. —B. Capitulum. —C. Floret without cypsela. —D. Stamen. —E. Style. —F. Cypsela with pappus. —G. Detail of pappus setae connate in a basal ring. A–G based on *J. C. Solomon 10312* (NY). A–F drawn by J. Ponte; G drawn by S. Faiad.

Shrubs up 4 m tall. Stems branched, cylindrical, young stems short-pubescent, old stems glabrous, leafy up to capitulescence, internodes 2–5.5 cm. Leaves persistent, petiolate, petiole 1–4 cm, glabrous, blades ovate or ovate-lanceolate, 4–10 × 2.5–6.5 cm, base sometimes slightly asymmetrical, rounded, cuneate-rounded, or truncate-rounded, apex acuminate or acute, glabrous and eglandular on both surfaces, margins serrate, teeth 0.5–3 × 1.4–6 mm, similar in shape and size, venation acrodromous, basal, imperfect with

1 pair of secondary veins strongly developed, borne from blade base. Capitulescence cymoid, congested, subaphyllous, with reduced leaves, on tomentulose first-order stems. Capitula ca. 100, pedunculate, peduncles 3–10 mm, pubescent, bracteoles 1 to 4, opposite or alternate, 0.7–3 × 0.2–0.4 mm. Involucre 3–4 mm high, phyllaries 12 to 23, arranged in 2 or 3 series, obtuse or subacute, subglabrous, eglandular; outer phyllaries ovate, 1.7–2.5 × 0.4–1 mm, middle phyllaries (if present) ovate-lanceolate, 2.5–3 × 0.7–1 mm, inner phyllaries elliptic or obovate-elliptic, 2.8–4 × 0.4–0.7 mm. Receptacle flat to slightly convex, glabrous. Florets 15 to 30, corollas white, tubular-funnelform, 3.5–4.6 mm, tube glabrous, exceptionally glandular with 2 or 3 glandular trichomes, lobes 0.4–0.6 × 0.3–0.5 mm; stamens with anther collar 0.3–0.4 × ca. 0.1 mm, anthers 1.2–1.9 × ca. 0.4 mm, theca base obtuse, apical appendage 0.2–0.3 × 0.3–0.4 mm, subacute; style 6–9.5 mm, style branches 2–5 mm, internally without glandular trichomes. Cypselae obovate-fusiform, 1.5–3 mm, subsymmetric, stipitate, glandular, scarcely sericeous on ribs and at cypsela base, carpopodium distinct, stopper-shaped. Pappus pinkish in live specimens, of 20 to 33 setae, setae 2–4.1 mm, connate in a basal ring of 5 to 10 rows of cells.

Phenology. *Kaunia saltensis* has been documented to flower from September to May.

Distribution. The species is found in the Yungas of Argentina (Jujuy, Salta), southern and central Bolivia (Chuquisaca, southern Cochabamba, southern Santa Cruz, Tarija) (Fig. 14D).

Ecology and habitat. *Kaunia saltensis* is found in the northwestern forests of Argentina and southern Bolivia. From a phytogeographic point of view, it grows in the Yungas Province (Cabrera, 1978; Valenzuela Celis, 1993; Cabrera & Freire, 1997; Hind, 2011), mainly between 1500 and 2600 m (López, 2003; Aagesen et al., 2012; Blundo et al., 2012; Malizia et al., 2012). As large shrubs, *K. saltensis* subdominates in alder (*Alnus jorullensis* Kunth) and pino del cerro (*Podocarpus parlatorei* Pilg.) forests (Liberman Cruz & Pedrotti, 2006; Malizia et al., 2012). This species is commonly associated with *K. lasiophthalma* in roadsides, riversides, and disturbed sites, although it is usually found at higher altitudes. This species was assigned the Least Concern (LC) IUCN category (IUCN, 2012) by Viera Barreto and Sancho (2018).

Etymology. Its name refers to its geographic distribution in Salta (Argentina).

Common names. Jaya, towi (Bolivia, Tapacarí) (Brandt et al., 2013), jalancacho (Bolivia, Tarija) (Valenzuela Celis, 1993), laphilla, salancachi (Jørgensen et al., 2010).

Uses. Its wood is used as combustible material (Novara, 2009). A study of the cultural importance and potential exploitation in agroforestry of woody species in a rural community of the Bolivian Andes (Brandt et al., 2013) classified *Kaunia saltensis* as being of average utility and low usage.

Additional specimens examined. ARGENTINA. **Jujuy:** Dr. Manuel Belgrano, Termas de Reyes, 28 Feb. 1945, *D. Abbiatti & L. Claps 812* (LP, SI); Termas de Reyes, 17 Feb. 1940, *A. Burkart & N. S. Troncoso 11206* (LP); Termas de Reyes, 23 Jan. 1944, *A. L. Cabrera 8143* (LP, SI); Quebrada del Jaire, camino a Tiraxi, 20 May 1962, *A. L. Cabrera et al. 14681* (LP, SI); Quebrada de Guerrero, 8 Jan. 1968, *A. L. Cabrera et al. 18904* (LP, MO, SI); Villa Achaval, 2 Dec. 1969, *A. L. Cabrera & R. Kiesling 20072* (LP, SI); Quebrada de Lozano, 18 Apr. 1975, *A. L. Cabrera et al. 26072* (LP); Cerro Zapla, Mina 9 de Octubre, 14 Nov. 1980, *A. L. Cabrera et al. 31997* (MO, SI); camino a Laguna de Yala, a más o menos 7 km de la ruta, 25 Feb. 1998, *M. M. Cerana 1502* (CORD); Termas de Reyes, 3 Dec. 1996, *G. Delucchi 1468* (LP); El Cucho, 5 Nov. 1961, *H. A. Fabris et al. 2791* (GH, LP, SI); Termas de Reyes, 13 Jan. 1971, *H. A. Fabris 8037* (LP, MO, SI); Capital, 1250 m, 9 Dec. 1905, *M. Lillo 4631* (GH); de Yala a Lagunas de Yala, 8 Apr. 1945, *C. A. O'Donell 2842* (GH); Estrada para Lagunas de Yala, 21 Jan. 2007, *J. Paula-Souza et al. 7549* (CTES, SI); Yala, 1450 m, 29 Jan. 1940, *R. Schreiter s.n.* (ex Miguel Lillo Herbarium 33224, NY); Cerro Zapla, Mina 9 de Octubre, 1491 m, *J. N. Viera Barreto & G. Sancho 19* (LP); camino de Termas de Reyes a Lagunas de Yala, 1829 m, *J. N. Viera Barreto & G. Sancho 21* (LP); Ledesma, Abra de Cañas, 9 Apr. 1971, *P. R. Legname & A. R. Cuezzo 8067 C* (LP); Santa Bárbara, Sierra El Cerro Centinela, 6–7 Jan. 1966, *A. L. Cabrera et al. 17370* (LP, SI); Cerro Centinela, 11 Feb. 1964, *H. A. Fabris et al. 5154* (LP, SI); Tumbaya, Volcán, Cantera, 9 Jan. 1966, *H. A. Fabris et al. 6329* (LP, SI); Valle Grande, Valle Colorado, 23 Dec. 1962, *H. A. Fabris 3556* (LP, SI); Río Jordán, 1600 m, 20 Feb. 1964, *H. A. Fabris et al. 5334* (LP, SI); Valle Grande, 26 Jan. 1974, *R. Kiesling et al. 569* (LP); Abra de Cañas, 1707 m, 2 Dec. 1969, *P. R. Legname & A. R. Cuezzo 7259 C* (GH). **Salta:** Cafayate, Dec. 1896, *C. Spegazzini s.n.* (LP 059768); Dec. 1896, *C. Spegazzini s.n.* (LPS 13653); Capital, San Lorenzo, 28 May 1933, *A. L. Cabrera 2991* (GH, LP, SI); San Lorenzo, 17 Feb. 1946, *A. L. Cabrera 9113* (LP); San Lorenzo, 2 Dec. 1960, *E. D. Gautier 4472* (LP); Guachipas, Ruta 9, Cuesta del Lajar, 23 km al SE de Guachipas, 1900–2000 m, 16 Jan. 1990, *L. J. Novara & S. Bruno 9382* (CORD); La Candelaria, Ruta 9, quebrada Río Grande del Sauce, a 19 km de "El Jardin," 1200 m, 26 Feb. 1967, *K. Okada 2935* (LP); La Caldera, camino a Jujuy, 1 Feb. 1949, *A. L. Cabrera & H. Schwabe 218* (LP); Lesser, 1750 m, 16 Nov. 1980, *S. R. Lapata 37* (NY); entre Yacones y el Potrero del Castillo, 1900 m, 12 Mar. 1952, *H. Sleumer & F. Vervoorst 2797* (LP); Arroyo Castellanos, en el camino a Lesser, bajando el puente siguiendo el lecho del arroyo, 1415 m, 25 Nov. 2013, *J. N. Viera Barreto & G. Sancho 1* (LP); *J. N. Viera Barreto & G. Sancho 2* (LP); *J. N. Viera Barreto & G. Sancho 3* (LP); Ruta 68 camino a Jujuy, 1469 m, 30 Nov. 2013, *J. N. Viera Barreto et al. 17* (LP); La Viña, Coronel Moldes, La Hoyada, 14 Nov. 1942, *A. Burkart 13270* (LP); Rosario de Lerma, Campo Quijano, 18 Nov. 1942, *A. Burkart 13269* (LP, SI); Rosario de Lerma, Dec. 1960, *A. Burkart 22038* (SI); Potrero de Linares, 17 Mar. 1958, *A. L. Cabrera & J. M. Marchionni 13136* (LP, NY); Ruta de San

Antonio de Los Cobres, Km. 29, en cruce estación Virrey Toledo, 1620 m, 1 Dec. 1986, *A. Charpin & L. J. Novara 20735* (MO, SI); Quebrada del Toro, entre Virrey Toledo y El Alisal, 1680 m, 3 Apr. 1971, *M. N. Correa 4367* (LP); Rosario de Lerma, *A. T. Hunziker 12318*, *12603* (SI); Campo Quijano, Jan. 1937, *M. M. Job 1553* (LP); Campo Quijano, 27 Mar. 1977, *A. Krapovickas & A. Schinini 30606* (CTES, SI); Campo Quijano, 1200 m, 20 Jan. 1941, *T. Meyer 3509* (GH, NY); Potrero de Linares, 15 km al NNE de Campo Quijano, 1500 m, 4 Feb. 1990, *L. J. Novara & S. Bruno 9463* (SI); Quebrada del Toro, Ruta 51, Km. 32–32.5, 1 km antes de Viaducto Río Toro, 1750 m, 19 Jan. 2002, *L. J. Novara 11630* (CTES); Campo Quijano, 1600 m, 17 Jan. 1929, *S. Venturi 8063* (GH [2 sheets], SI); Quebrada de los Toros, Ruta 51, a partir del Km. 20 aproximadamente hacia El Alisal, 1594 m, 29 Nov. 2013, *J. N. Viera Barreto & G. Sancho 12* (LP); Vaqueros, Arroyo Chaile, 27 Aug. 1986, *V. Núñez & L. J. Novara 70* (SI). BOLIVIA. **Chuquisaca:** Belisario Boeto, Comunidad Ovejeros, 5 km al NE de la localidad de Villa Serrano, 2275 m, 27 Feb. 1994, *M. Serrano 683* (LP); Comunidad Huerta Mayu, 2.5 km al SW de la localidad de Villa Serrano, 2230 m, 28 Feb. 1994, *M. Serrano 709* (LP). **Santa Cruz:** Florida, 5 km (by rd.) & 3 km (by air) NE of Bermejo, Cerro Herradura, 1450 m, 25 Sep. 1990, *M. Nee 38919* (NY); camino al Sillar, subida a la antena, 25 Aug. 2015, *J. N. Viera Barreto et al. 49* (LP); Manuel María Caballero, 12 km from Comarapa on rd. to Cochabamba, 8400 ft., 5 Feb. 1978, *R. M. King & A. Bishop 7663 A* (F); 4.5 km (by air) N of Comarapa, 2200 m, 27 Nov. 1999, *M. Nee 50715* (F, NY); Vallegrande, loma larga a 60 km al S de Vallegrande, 1966 m, 6 Jan. 2006, *R. Hurtado 506* (LPB); quebrada del Zorro, San Antonio, 1.5 km S de Vallegrande, 2030 m, 30 Apr. 1989, *I. G. Vargas C. 164* (CORD, MO, NY); tramo entre El Zapallar–Pujio, 2000 m, 29 Dec. 1990, *I. G. Vargas C. 881* (CORD, NY). **Tarija:** Aniceto Arce, valle lateral del río Camacho, Valle Soledad a la altura de la Comunidad La Huerta, 2650 m, 16 Dec. 1987, *S. G. Beck & M. Liberman 16174* (LP, SI); Toldos bei Bermejo, Padcaya, 1800 m, 21 Dec. 1903, *K. Fiebrig 2428* (GH); 5 km S of comunidad Guayavillas, 28.3 km S of Padcaya on rd. to Bermejo, 1800–1900 m, 5 May 1983, *J. C. Solomon 10504* (MO); Burdet O'Connor, 19.7 km E of Narvaez on rd. to Entre Rios (8.7 km W of Entre Rios), 1450 m, 5 Oct. 1983, *J. C. Solomon 11070* (MO); ex camino carretero, Papachacra–río Tambo, 2050 m, 16 Feb. 2006, *F. Zenteno et al. 3773* (LPB); Cercado, Pampa Redonda, 2100 m, 6 Feb. 2006, *S. Gallegos et al. 169* (LPB); 54.9 km E of Tarija–Padcaya rd., on rd. to Entre Rios, 2050 m, 1 May 1983, *J. C. Solomon 10312* (MO, NY); Pampa Redonda, 2000 m, 7 Feb. 2006, *F. Zenteno et al. 3514* (LP); Eustaquio Méndez, 5 km antes de Padcaya, 1900 m, 1986, *R. Ehrich 45* (LP, LPB); Gran Chaco, Yacuiba 18–24 km hacia Palos Blancos, 800–1230 m, 24 Sep. 1985, *G. S. Beck et al. 11546* (LPB).

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Appendix 1. List of accepted species and examined material of *Kaunia* R. M. King & H. Rob. Collections are listed alphabetically by first collector's last name. Numbers in parentheses refer to the corresponding species in the text.

1. *Kaunia camataquiensis* (Hieron.) R. M. King & H. Rob.
2. *Kaunia endyta* (B. L. Rob.) R. M. King & H. Rob.
3. *Kaunia eucosmoides* (B. L. Rob.) R. M. King & H. Rob.
4. *Kaunia gynoxymorpha* (Rusby ex B. L. Rob.) R. M. King & H. Rob.
5. *Kaunia hosanensis* (B. L. Rob.) R. M. King & H. Rob.
6. *Kaunia lasiophthalma* (Griseb.) R. M. King & H. Rob.
7. *Kaunia longipetiolata* (Sch. Bip. ex Rusby) R. M. King & H. Rob.
8. *Kaunia pachanoi* (B. L. Rob) R. M. King & H. Rob.
9. *Kaunia rufescens* (P. W. Lund ex DC.) R. M. King & H. Rob.
10. *Kaunia saltensis* (Hieron.) R. M. King & H. Rob.

Abbiati, D. & Claps, L. 812 (10); Apaza et al. 6 (7).

Bailetti, E. 186 (6); Bang, M. 867 (7), 1464 (2), 2194 (4), 2381 (7); Barboza, G. et al. 117 (6); Beck, S. G. 856 (1), 1744 (4), 4154 (7), 8633 (7), 12046 (2), 14233 (7), 23059 (4), 24469 (7), 30434 (4), 32690 (2); Beck, S. G. & Liberman, M. 16174 (10); Beck, S. G. et al. 11546 (10), 29640 (4), 29751 (2); Boeke, J. D. & Boeke, S. 3248 (7); Boeke, J. D. & Jaramillo, J. 2541 (8); Brade, A. 15901 (9); Brooke, W. M. A. 6705 (7); Brown, A. et al. 1454 (6); Buchtien, O. 651 (7), 3028 (6), 3288 (6), 7550 (4); Burkart, A. 2985 (6), 13269 (10), 13270 (10), 22038 (10); Burkart, A. & Troncoso, N. S. 11206 (10).

Cárdenas, H. M. 501 (1), 2429 (6); Castellanos, A. 23381 (9); Cabrera, A. L. 2991 (10), 3798 (6), 4092 (6), 4541 (6), 8143 (10), 9113 (10), 13582 (6), 13586 (6), 15724 (6), 15855 (6); Cabrera, A. L. & Gutiérrez, M. M. 33766 (6); Cabrera, A. L. & Kiesling, R. 20072 (10); Cabrera, A. L. & Marchionni, J. M. 13136 (10); Cabrera, A. L. & Schwabe, H. 218 (10); Cabrera, A. L. et al. 14681 (10), 17370 (10), 18904 (10), 26072 (10), 27865 (6), 27867 (6), 31997 (10); Camp, W. H. E-4732 (8); Campos, J. & Díaz, C. 5408 (7); Cerana, M. M. 975 (6), 1502 (10); Cerana, M. M. et al. 351 (6); Charpin, A. & Novara, L. A. 20735 (10); Cobas s.n. (6); Correa, M. N. 4367 (10).

Delucchi, G. 1468 (10); Dematteis, M. & Seijo, G. 770 (6); Dematteis, M. et al. 1089 (7), 1108 (7).

Edwall, G. 16336 (9); Ehrich, R. 45 (10); Espinosa, R. 691 (7); Eyerdam, W. J. 25224 (7).

Fabris, H. A. 3556 (10), 8037 (10); Fabris, H. A. et al. 2791 (10), 5154 (10), 5334 (10), 6329 (10); Falkemberg, D. B. 7923 (9); Feuerer, T. 4235 (7); Fiebrig, K. 2428 (10), 2576 (10), 3069 (1).

Gallegos, S. et al. 169 (10); Gautier, E. D. 4472 (10).

Hatschbach, G. & Cervi, A. C. 49550 (9); Hitchcock, A. S. 21348 (7), 21615 (8); Holway, E. W. D. & Holway, M. M. s.n. (6), 396 (6); Huamantupa, I. & Calatayud, G. 2191 (7); Huaylla, H. et al. 1897 (6); Hunziker, A. T. 1802 (6), 6787 (6), 12318 (10), 12603 (10); Hunziker, A. T. & Di Fulvio, T. E. 21127 (6); Hurtado, R. 506 (10).

Jaramillo, J. 9853 (8); Jimenez, A. 42 (6), 47 (6); Job, M. M. 1553 (10); Jørgensen, P. 1415 (6); Jørgensen, P. et al. 1970 (8).

Kiesling, R. et al. 569 (10); Killip, E. P. & Smith, A. C. 22179 (3); King, R, M. & Bishop, A. 7663A (10); King, R. M. & Garvey, R. M. 6905 (7); Krapovickas, A. & Cristóbal, C. L. 20687 (10); Krapovickas, A. & Schinini, A. 30606 (10), 30617 (6); Kuntze, O. s.n. (4), s.n. (6), s.n. (9).

Lahitte, R. s.n. (8); Lapata, S. R. 37 (10); Legname, P. R. & Cuezzo, A. R. 7259 (10), 8067 C (10); Lewis, M. 37357 (4), 40446 (4), 881065 (7), 881085 (7); Lewis, M. & Clark, R. 37739 (4); Lillo, M. 4368 (6), 4631 (10), 11967 (6), 12912 (6); Llatas Quiroz, S. 1239 (7); Luteyn, J. L. & Cotton, E. 11095 (8); Luteyn, J. L. & Dorr, L. J. 13598 (4).

Madsen, J. E. & Ellemann, L. 75199 (7); Mandon, G. 257 (7); Mathews, A. 1123 (2); Matzenbacher, N. I. 28 (9); Mérida, G. 16 (7); Metcalf, R. D. 30623 (2); Meyer, T. 2972 (6), 3509 (10), 4307 (6), 4336 (6); Miranda, T. et al. 221 (4); Mostacero L.

J. et al. 948 (8), 1580 (7); Müller, J. & Heinrichs, J. 6418 (7); Müsch, P. 14 (6).

Nee, M. 38919 (10), 49253 (1), 49399 (4), 49436 (1), 50715 (10), 52778 (7); Nee, M. & Atha, D. 50035 (1), 50037 (1); Nee, M. & Bohs, L. 49760 (4); Nee, M. & Churchill, S. 52797 (7); Nee, M. & Mendoza, M. 52543 (7); Novara, L. J. 11630 (10); Novara, L. J. & Bruno, S. 9382 (10), 9463 (10); Núñez, V. & Novara, L. J. 70 (10).

O'Donell, C. A. 2842 (10), 4820 (6); Okada, K. 2935 (10); Ølgaard et al. 57750 (8).

Paula-Souza, J. et al. 7549 (10); Pedersen, T. M. 16117 (6), 16129 (6); Pereira, A. s.n. (6); Peyton, B. & Peyton, T. S. 1144 (7); Plowman, T. 11001 (7); Prieto, F. 189 (8).

Quipuscoa S. V. 408 (7).

Ragonese, A. E. 247 (6); Rambo, B. 1971 (9); Reitz, R. C1148 (9); Reitz, R. & Klein, R. M. 6729 (9), 8861 (9), 18139 (9); Renjel, R. 14 (7); Ritter, N. 1879 (6); Rodrigo, A. P. 2048 (6), 3157 (6); Rodriguez 345 (6); Rojas, T. 6104 (9); Rose, J. N. et al. 22978 (8), 23144 (7), 23229 (7); Ruiz Leal 14356 (6).

Sagastegui, A. A. 9799 (7); Sakane, M. 149 (9); Salinas, N. et al. 3329 (7); Santisteban C. J. & Guevara, J. B. 159 (7); Schreiter, R. s.n. (10), 79 (6), 4156 (6), 5691 (6), 8883 (6), Serrano, M. 683 (10), 709 (10); Shunke Vigo, J. 14685 (7); Sleumer, H. & Vervoorst, F. 2797 (10); Solomon, J. C. 8035 (4), 10312 (10), 10462 (6), 10504 (10), 11070 (10), 18480 (4); Spegazzini, C. s.n. (LPS 13738) (6), s.n. (LP 059768) (10), s.n. (LPS 13653) (10); Steinbach, J. 8618 (1), 9716 (6); Steinbach, R. F. 37 (6), 114 (6); Stuessy, T. F. & Nesom, G. 5883 (7).

Tolaba, J. 548 (6); Tolaba, J. et al. 1885 (6); Torrico, G. & Peca, C. 482 (6); Townsend, C. H. T. A174 (8), A175 (7).

Ugent, D. & Ugent, V. 5140 (1); Ulibarri, E. A. 608 (6).

Vanni, R. et al. 2770 (9), 3441 (9); Vargas C., I. G. 164 (10), 881 (10), 5048 (4); Vargas C., I. G. et al. 1734 (6); Venturi, S. 897 (6), 2908 (6), 2908a (6), 2908b (6), 2958 (6), 3529a (6), 3885 (6), 3886 (6), 4170 (6), 4989 (6), 8063 (10), 9329 (6); Vieira, M. C. W. 1228 (9); Viera Barreto, J. N. & Sancho, G. 1 (10), 2 (10), 3 (10), 10 (6), 12 (10), 19 (10), 20 (6), 21 (10); Viera Barreto, J. N. et al. 13 (6), 15 (6), 16 (6), 17 (10), 44 (1), 49 (10), 54 (6), 58 (7), 65 (9).

Wasum, R. et al. 7972 (9), 8637 (9); Werdermann, E. 2005 (6), 2071 (7); Williams, R. S. 2408 (7); Woytkowski, F. 6843 (7), 6913 (7), 8156 (7); Wurdack, J. J. 1787 (7).

Zardini, E. 1263 (6), 2013 (2); Zenteno, F. et al. 3514 (10), 3773 (10).

illegible collector & Fontana 5615 (9).