

**STUDIES IN NEOTROPICAL COMPOSITAE—XII.
PIPTOCARPHA CARDENASII (VERNONIEAE), A NEW SPECIES OF SUBGENUS
PIPTOCARPHA SERIES ASTEROTRICHIAE FROM CAQUETA, COLOMBIA**

JOHN F. PRUSKI and ROSA del C. ORTIZ

Missouri Botanical Garden

P.O. Box 299

St. Louis, Missouri 63166

ABSTRACT

***Piptocarpha cardenasii* Pruski, sp. nov.** (Compositae: Vernonieae: Piptocarphinae), a new species from Caquetá, Colombia is described, and its distinguishing features depicted. By its pointed, sclerified anther tails the new species is referred to subgenus *Piptocarpha*, and by its concolorous, loosely stellate-pubescent leaf blades we place *P. cardenasii* in the formerly monotypic, pluriflorous, paleate-capitulate series *Asterotrichiae*. The obovate leaves, non-costate phyllaries, and open capitulescences with mostly pedunculate capitula distinguish *P. cardenasii* from Peruvian-centered *P. asterotrichia*, the type of the series.

Piptocarpha R. Br. (Compositae: Vernonieae: Piptocarphinae) is a traditionally recognized genus (e.g., Candolle 1836; Schultz Bipontinus 1863, as synonymous *Carphobolus* Schott ex Sch. Bip.; Baker 1873; Bentham & Hooker 1873; Hoffmann 1890–1894) characterized by apically rounded stylar papillae (Fig. 1A) and deciduous mid-series and inner phyllaries. Smith and Coile (2007) revised *Piptocarpha* and recognized 46 species (44 of these are endemic to South America — including Trinidad —, one ranges from South America to southern Mexico, and one is a Puerto Rican endemic) distributed in two more or less equally speciose subgenera. They characterized Brazilian-centered *Piptocarpha* subg. *Hypericoides* (Sch. Bip.) G. Lom. Sm. as having blunt, broad-based anther tails (Fig. 1B–C), and widespread *Piptocarpha* subg. *Piptocarpha* as having pointed, sclerified anther tails (Figs. 2B, 3A).

Piptocarpha was placed in subtribe Piptocarphinae by Robinson et al. (1980), and the component genera of the subtribe are more or less those recognized by Robinson et al. (1980), Pruski (1992, 1996, 1997, 2016), and Robinson (1989, 1999, 2006). The few Vernonian genera similar to *Piptocarpha* in gestalt and by their deciduous inner phyllaries include *Critoniopsis* Sch. Bip. (Robinson 1993), *Cuatrecasanthus* H. Rob. (Robinson 1989), *Eremosis* (DC.) Gleason (Pruski 2016), and *Piptocoma* Cass. (Pruski 1996). Each of these four genera, however, have narrow-tipped stylar papillae unlike *Piptocarpha*, and none have the pointed, sclerified anther tails that characterize *Piptocarpha* subg. *Piptocarpha*. This subgenus is the only Compositae group with such anther tails and is recognizable at a glance.

Explorations in Amazonian Colombia, coordinated by Dairon Cárdenas of the Instituto Amazónico de Investigaciones Científicas (SINCHI), have resulted in discovery of a new species of Compositae with pointed, sclerified anther tails (Figs. 2B, 3A) and concolorous, loosely stellate-pubescent leaves (Figs. 4, 5A, 6). This new species was determined as *Piptocarpha* sp. by Dr. Santiago Diaz-P. (1944–2014) and is described here as *P. cardenasii* Pruski, which we place in *Piptocarpha* subg. *Piptocarpha*. Forty-eight species of *Piptocarpha* are now recognized, the 46 by Smith and Coile (2007), Brazilian *P. longipedunculata* Volet (of subgenus *Hypericoides*; Volet et al. 2017; as the excluded *P. obovata* in Smith & Coile 2007: 80), and Colombian *P. cardenasii*.

A majority of the 48 species have conspicuously discoloured leaves with relatively small, axillary capitula (Smith 1982), but a few species have easily observed, distinctly different morphologies, being concolorous-leaved, terminal-flowered, relatively large-capitulate, pedunculate, and/or paleate-capitulate. *Piptocarpha cardenasii* by its concolorous leaves somewhat resembles several Brazilian, Peruvian, and Venezuelan species but matches none (viz Baker 1873; Gleason 1932; Cabrera 1944, 1974; Cuatrecasas 1955; Aristeguieta 1964; Cabrera & Klein 1980; Jones 1980; Smith 1981, 1982; Badillo 1989; Pruski 1997, 2010, 2013; Nakajima et al. 2001; Robinson 2002; Smith & Coile 2007; Grokoviski et al. 2009; Pruski & Funston 2011). *Piptocarpha cardenasii* is especially distinctive by its concolorous, loosely stellate-pubescent abaxial leaf blade surfaces and relatively large, pluriflorous, paleate, mostly conspicuously pedunculate capitula (Figs. 4, 5A, 6).

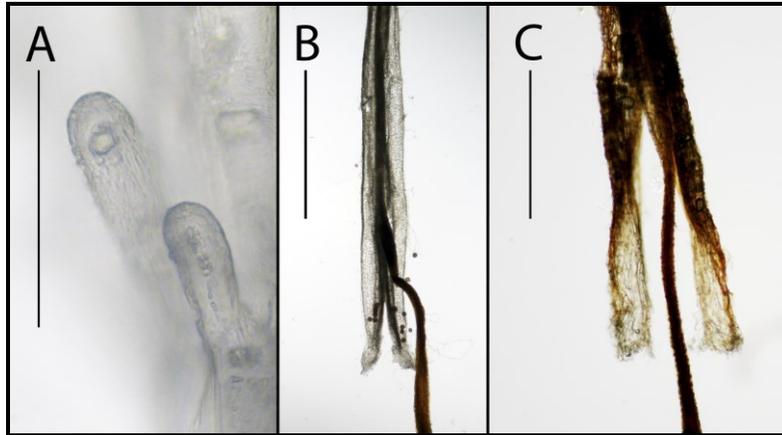


Figure 1. Select microfeatures of *Piptocarpha*. A. Apically rounded styler papillae characteristic of *Piptocarpha*; cross walls are not at all evident. B–C. Broad non-sclerified anther tails of subg. *Hypericoides*. The dark-staining filament is in the bottom-center of each image. (A–B *P. sellowii* (Sch. Bip.) Baker, Zardini & Velázquez 13002, MO; C *P. geraldsmithii*, Jaramillo et al. 498, MO). [Scale bars A 75 μ m, B 0.6 mm, C 0.3 mm].



Figure 2. *Piptocarpha cardenasii*, florets showing dark-drying corollas and stramineous anthers (cypselae and pappus bristles removed). The corolla tubes are bulbous proximally where surrounding styler nodes. A. Corollas showing elongate tube, throat, and lobes. B. Corolla, style trunk, and downturned anthers with tails directed upwards. (Correa 7052, COAH). [A metric ruler is on the left of each image].

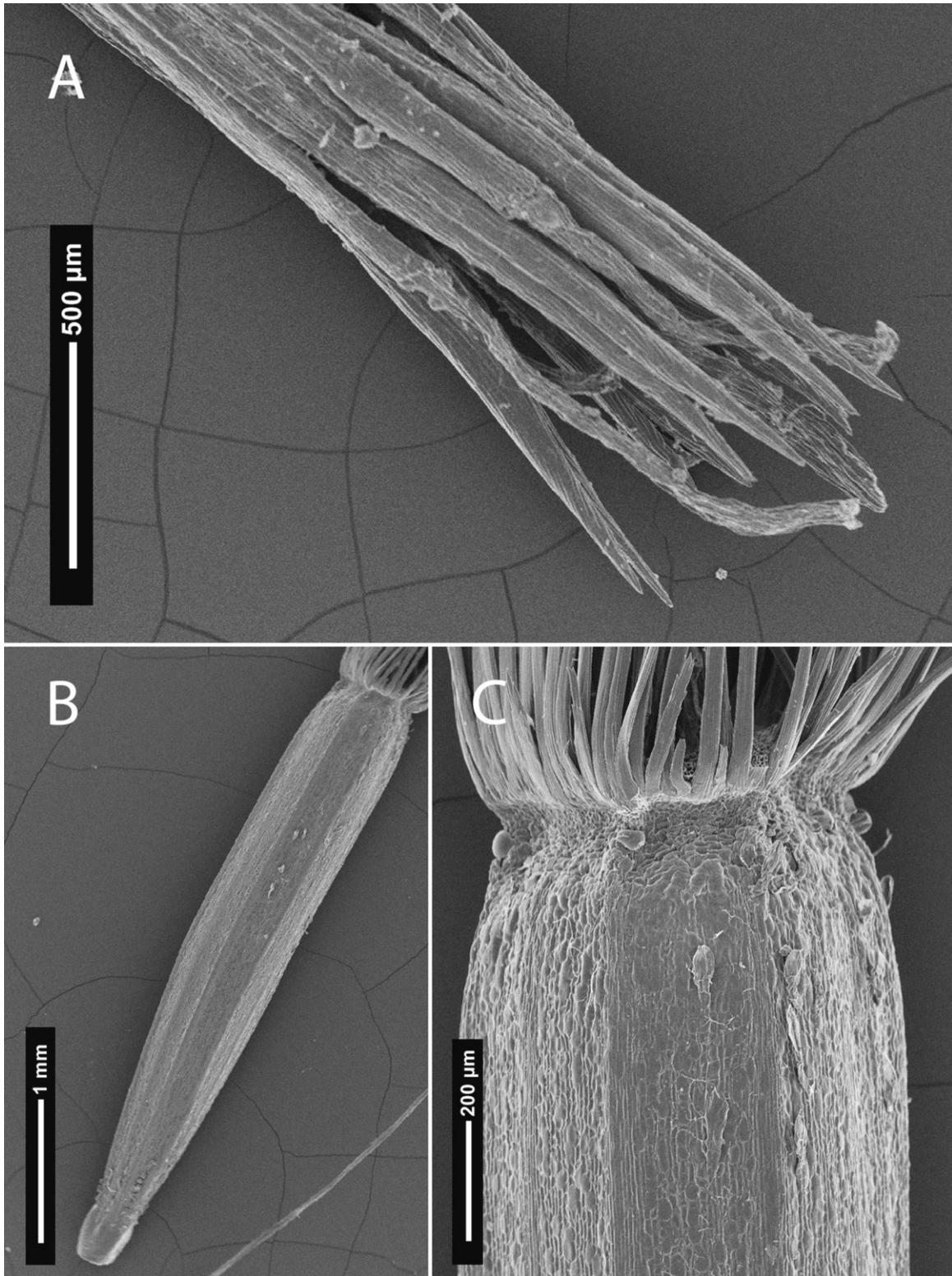


Figure 3. SEM micrographs of *Piptocarpha cardenasii*. A. Anther base showing pointed, sclerified tails. The tails of adjacent thecae are appressed and the filaments are curved at tips where dissected. B. Cypsel showing symmetric carpodium. C. Cypsel showing distal glands and pappus bristle bases; the cypselae are 4–5-angled and 10-striate. (*Cardenas et al.* 44409, COAH).

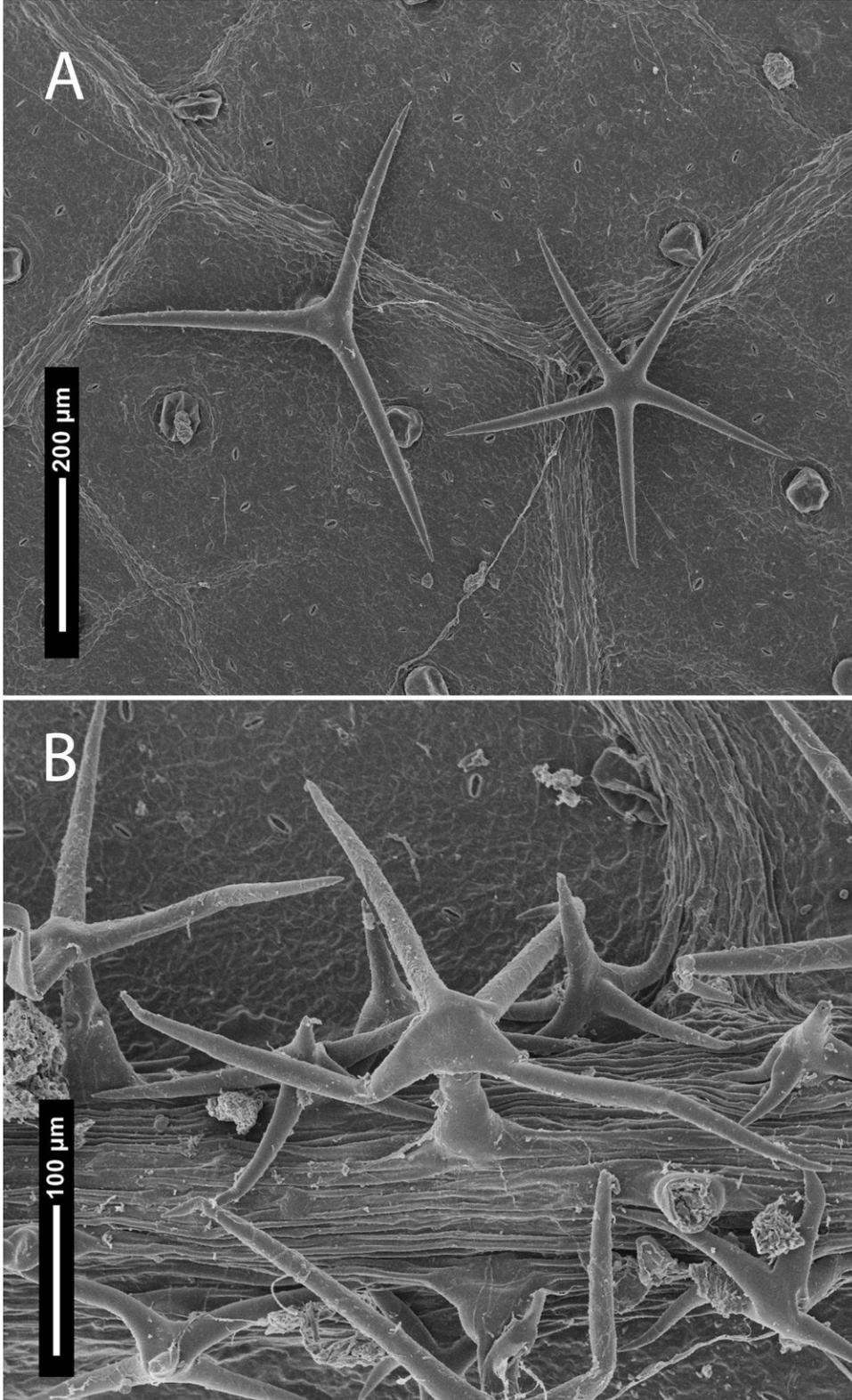


Figure 4. SEM micrographs of stellate trichomes on abaxial leaf blade surfaces of *Piptocarpha cardenasii*. A. Trichomes (3-armed towards the left and 5-armed towards the right) as seen from above. B. Side view of 4-armed trichome on leaf vein showing the short, but distinct stipe. (*Cardenas et al. 44409, COAH*).



Figure 5. Flowering branches of *Piptocarpha* subg. *Piptocarpha* ser. *Asterotrichiae*. A. *Piptocarpha cardenasii* showing mostly pedunculate capitula in open cymose distal capitulescences; on occasion a few subsessile capitula are found. B. *Piptocarpha asterotrichia* showing leafy stem and sessile (larger than usual) capitula in glomerulate capitulescences in two distal nodes. (A Cardenas *et al.* 44409, type collection; B Croat *et al.* 84362, unmounted duplicate). [A metric ruler is positioned at the bottom of the plate].

PIPTOCARPHA CARDENASII Pruski, *sp. nov.* **TYPE: COLOMBIA. Caquetá.** Mun. San Vicente del Caguán, Inspeccion Guacamaya, vereda La Música, río Caguán, 2° 20' 46" N, 74° 54' 12" W, 600 m, 12 July 2015, D. Cárdenas, Castaño, Rodríguez, Marin, Restrepo, Paky, Perdomo & Paky 44409 (holotype: COAH; isotype: MO). Figs. 2–4, 5A, 6–8.

Frutex scandens circiter 2+ m alta; folia alterna petiolata, lamina oblonda 12–22 × 6–12 cm concolorata pubescentia pilis stellatis et breviter stipitata pinnatim venosa base cuneata apice obtusa vel rountundata, petiolo 1–2 cm longo; capitulescentia laxa cymosa terminalis et axillares 2–13-capitulata, pedunculi ca. 1 cm longi; capitula discoidea paleacea; involucrum turbinato-pyriformis 12–14 × 5–7 mm; phyllaria imbricata 6–8-seriata; flosculis 17–20; corollae infundibularis 9.5–11.5 mm longae quinquelobatae parce glandulosae; cypselae obconicae circiter 4.5 mm longae; squammae pappo circiter 50–60, 7.5–8 mm longae.

Vining shrubs ca. 2+ m tall; stems subterete and only slightly angled-sulcate distally, closely stellate-pubescent, trichomes moderately dense, loosely-leaved with leaves much longer than distal internodes. **Leaves** alternate, petiolate; petiole 1–2 cm long; blade broadly(-narrowly) obovate, mostly 12–22 × 6–12 cm, stiffly chartaceous or subcoriaceous, pinnately veined with 7–10 larger secondary veins per side, midrib distinctly thicker than the thin secondaries, third order reticulations not very prominent, surfaces basically concolorous, adaxial surface sparsely stellate-pubescent,

abaxial surface moderately stellate-pubescent, trichomes with 3–5 subequal arms 150–250 μm long, arms much longer than the ca. 50 μm long ca. 3-celled stipe, trichome arms not interwoven, also minutely glandular, blade base cuneate, oblique, margins entire, apex obtuse to rounded, with small mucro. **Capitulescences** of loose, open cymes mostly terminating branches, sometimes in leaf axils from the distal-most few nodes, nodes 2–13-capitulate, capitula free, pedunculate from stem or sometimes on common anthophore to ca. 1 cm long, individual peduncles to ca. 1 cm long, usually nearly as long as capitula, on occasion a few sessile capitula are found. **Capitula** large, discoid, to 20 \times 6 mm, moderately long-pedunculate; involucre turbinate-pyriform, 12–14 \times 5–7 mm, constricted apically at maturity; phyllaries imbricate, markedly graduate, 6–8-seriate, moderately stiff-indurate, apex acute to acuminate, never strongly costate-apiculate; outer phyllaries triangular-lanceolate, 1–1.5 \times 0.7–1.4 mm, moderately spreading especially when pressed, decurrent on proximal portions of elongate-clavate clinanthium, closely matted, cinereous, stellate-pubescent throughout or nearly so, quickly grading to the inner ones; inner phyllaries ovate to lanceolate, 9–11 \times 3–5 mm, inserted ca. 2 mm distal to outer phyllary bases, appressed, deciduous post-anthesis, sometimes drying cymbiform, tan proximally where overlapping, dark-purplish in distal half (at least in herbarium specimens), margins broad, glabrous, apex closely matted stellate-pubescent in elongate distal mid-zone, trichomes cinereous, not obviously stipitate; clinanthium flat on top, ca. 2 mm diam., paleate, clinanthial stipe ca. 2 mm long, paleae 10–12.5 \times 0.9–1.3 mm, lanceolate, readily deciduous, somewhat conduplicate proximally, becoming narrower and flat distally, hyaline, apex sometimes cinereous-pubescent, sometimes also with a linear-filiform enation ca. 11 mm long. **Florets** 17–20; corolla 9.5–11.5 mm long, funnellform, moderately 5-lobed, tube elongate, lobes about as long as throat, pale lavender, sparsely glandular especially on throat, otherwise subglabrous, tube narrowly cylindrical, 6–6.5 mm long, bulbous proximally where surrounding stylar node, broadening into throat 1.5–2 mm long, lobes 2–3 mm long, ascending or spreading at anthesis, recurved when dried; anthers ca. 4.5 mm long, tan, caudate, apical appendage eglandular, anther collar cylindrical 0.4–0.5 mm long, about the same diameter as the filaments, tails ca. 0.8 mm long, pointed, sclerified, narrowly acuminate, tails of adjacent thecae appressed but free at the ends; pollen tricolporate, non-lophate, colpae broad; style base nodular, free, held above nectary on narrow stipe, trunk distally long-papillose, branches slender, ca. 2.3 mm long, long-papillose, papillae rounded at apex, stigmatic surface continuous. **Cypselae** 4–5-angled-obconical, ca. 4.5 mm long, 10-striate, brown, sparsely glandular proximally and distally, sparsely setulose distally on faces between striations, also with many embedded resinous idioblasts, pericarp cells with raphide crystals, carpodium annual, ca. 0.2 mm long, stramineous; pappus 1–2-seriate but outer bristles never squammose and the pappus not markedly double, of 50–60 pale white narrow slightly unequal bristles, mostly 7.5–8 mm long, the longest bristles nearly twice as long as cypselae and somewhat broad-tipped, contiguous basally. **Chromosome number** unknown.

Paratype: COLOMBIA. Caquetá. Mun. Florencia, Corregimiento Caraño, R.N. Comunitaria El Manantial Coordenadas, [ca. 1° 38' 06" N, 75° 34' 58" W], s. elev., 2 May 2010, *M. Correa* 7052 (COAH).

Distribution and ecology. *Piptocarpha cardenasii* is known from only the two cited collections (the type and an earlier collected, less complete paratype) from western Caquetá, Colombia (Fig. 8). This vining shrub flowers in May and July and has been collected at about 600 meters elevation. The species grows in foothills of the eastern cordillera of the Andes and should be looked for in adjacent Ecuador and Peru.

Eponymy. *Piptocarpha cardenasii* is dedicated to Dairon Cárdenas of the Instituto Amazónico de Investigaciones Científicas (SINCHI), director del herbario COAH, collector of the type material, and long-time student of the flora of Amazonian Colombia.



Figure 6. Type collection of *Piptocarpha cardenasii* showing the obovate leaf blades with surfaces basically concolorous and loosely stellate-pubescent (i.e., not cinereous-tomentose abaxially). (Cardenas et al. 44409). [A metric ruler is on the right].

The few regional concolorous-leaved species of *Piptocarpha* subg. *Hypericoides* each differ from the new species in anther tail structure as well as by their closely lepidote abaxial leaf blade surfaces. Regional concolorous-leaved species of *Piptocarpha* subg. *Piptocarpha* include axillary-flowered Peruvian *P. canescens* Gleason, axillary-flowered Peruvian and Ecuadorian *P. klugii* G. Lom. Sm. ex H. Rob., axillary-flowered Colombian *richteri* Cuatr., and terminal-flowered Peruvian and Ecuadorian *P. vasquezii* H. Rob. Each of these latter four species was placed by Smith and Coile (2007) in *Piptocarpha* subg. *Piptocarpha* sect. *Oocephalus* and is characterized by 6-flowered capitula, thus differing from pluriflorous *P. cardenasii*.



Figure 7. Dissected capitulum of *Piptocarpha cardenasii*, showing (counterclockwise from lower right) involucre with persistent outer phyllaries, detached inner phyllaries with included florets, and three mid-series phyllaries. Deciduous inner phyllaries are characteristic of the genus. (*Cardenas et al.* 44409). [A metric ruler is in the lower left].

The second of two sections of subg. *Piptocarpha* recognized by Smith and Coile (2007) is sect. *Piptocarpha*, within which they recognize four series. Two of these four series are either trees or very thin-leaved, and thereby neither can accommodate *P. cardenasii*. The most common species of either of these two series is *P. rotundifolia*, which has densely stellate-pubescent (not matted-pubescent) leaves with erect, long-stipitate stellate trichomes. *Piptocarpha rotundifolia* further differs from *P. cardenasii* by being a tree with cordiform leaves. By its shrubby vining habit and many-flowered capitula, *P. cardenasii* is somewhat similar to the five species of the third series, *Piptocarpha* subg. *Piptocarpha* sect. *Piptocarpha* ser. *Opacae* G. Lom. Sm., but each differs from *P. cardenasii* by their matted-lepidote or matted-pubescent abaxial leaf blade surfaces.

By its pointed, sclerified anther tails (Figs. 2B, 3A), shrubby habit with vining branches, concolorous leaves with loose, non-interwoven stellate abaxial blade indument (Fig. 4), and large, paleate, pluriflorous capitula in 2–13-capitulate groups per node (Figs. 5A, 6–7), *Piptocarpha cardenasii* matches formerly monotypic *Piptocarpha* subg. *Piptocarpha* sect. *Piptocarpha* ser. *Asterotrichiae* G. Lom. Sm. (the fourth of four series that Smith & Coile 2007 recognized in sect. *Piptocarpha*), where without hesitation we place the new species. Gleason (1932: 371) described *P. insignis* Gleason, a synonym of *P. asterotrichia*, as having "flowers subtended by linear-acuminate scales" (i.e., paleate), and Pruski (2013) in *Flora Mesoamericana* noted that the paleate condition is on

occasion found in *Piptocarpha*. *Piptocarpha* ser. *Asterotrichiae*, however, appears to be the only consistently paleate-capitulate group of *Piptocarpha*. *Piptocarpha cardenasii* thus becomes only the second recognized species of *Piptocarpha* ser. *Asterotrichiae* and its sole Colombian member. *Piptocarpha cardenasii* (Figs. 5A, 6) is distinguished from *P. asterotrichia* (Figs. 5B, 9; the protologue figure as drawn is too discolorous-leaved) by its obovate leaf blades with obtuse to rounded apices, open capitulescences with mostly pedunculate capitula, and ecostate phyllaries pubescent in a distal patch (Fig. 7). A key distinguishing *Piptocarpha cardenasii* and Peruvian-centered *P. asterotrichia* is given below.

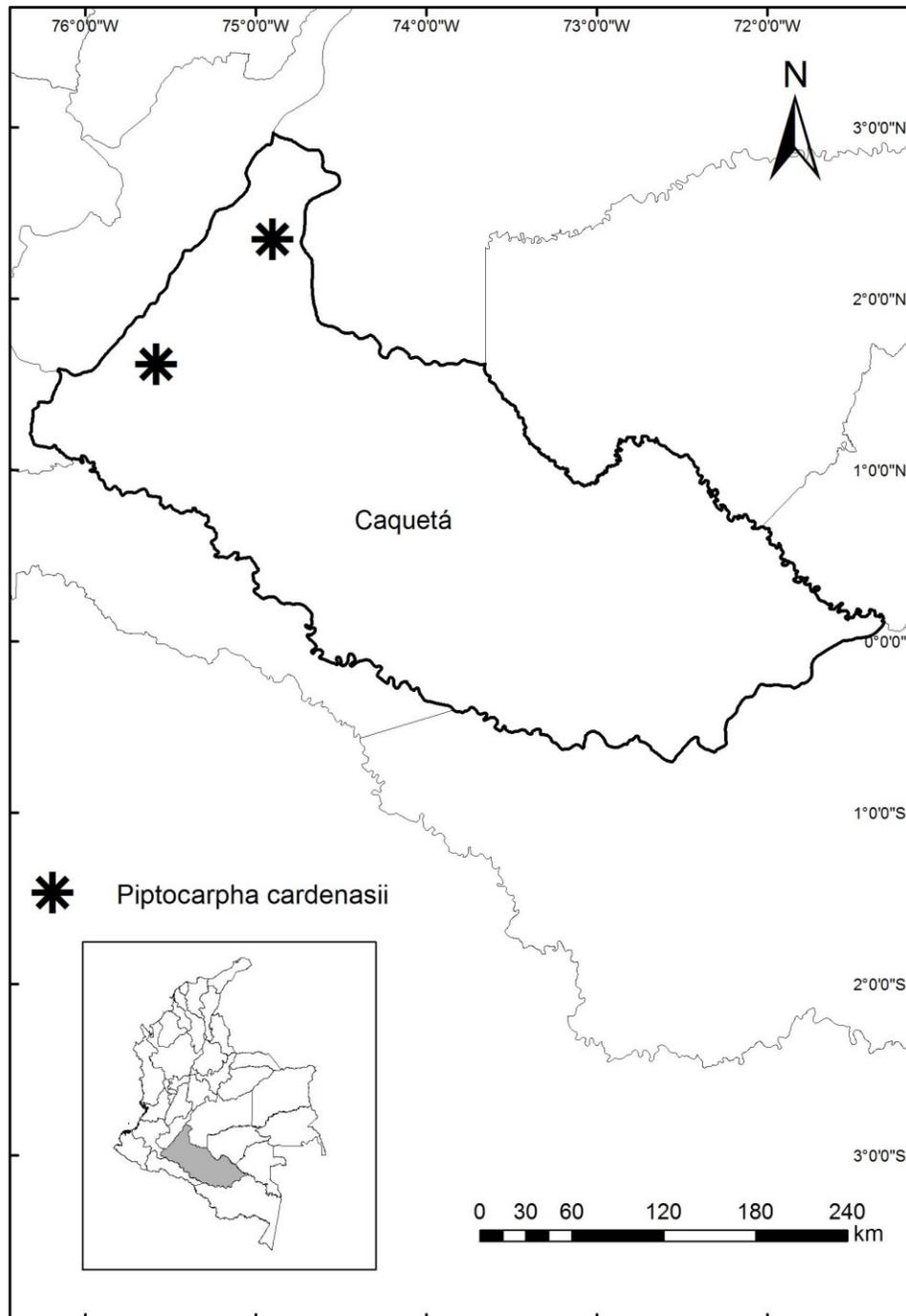


Figure 8. Distribution of *Piptocarpha cardenasii*; the coordinates of *Correa* 7052 are estimated.



Figure 9. Fruiting collection of *Piptocarpha asterotrichia* showing axillary glomerules of sessile capitula with involucres constricted apically. (Topotype: Peru. Tocache, Rios, Mori, Ortiz, Pruski & Torres 4099).

The following key modifies couplet 5B of the subgeneric key in Smith and Coile (2007: 31). We place *Piptocarpha cardenasii* following *P. asterotrichia* in the Smith and Coile monograph, treating it as species 10.1, and in doing so we expand the limits of paleate *Piptocarpha* subg. *Piptocarpha* sect. *Piptocarpha* ser. *Asterotrichiae* to house this second species.

- 5B'. Capitulescences of sessile capitula in few-capitulate glomerules along main stem or along short, leafy lateral branchlets; leaf blades lanceolate, elliptic, or ovate, apices (obtuse-)acute to acuminate; phyllaries often strongly costate-apiculate ("pungently acuminate" fide Gleason 1932: 371), commonly loosely and evenly pubescent, rarely pubescent only in distal patch; (Peru, Bolivia, Ecuador, and western Brazil). ***Piptocarpha asterotrichia*** (Poepp.) Baker
- 5B". Capitulescences of usually pedunculate capitula in loose, open cymes mostly terminating branches, sometimes in leaf axils from the distal-most few nodes; leaf blades obovate, apices obtuse to rounded; phyllaries never strongly costate-apiculate, densely pubescent only in an elongate distal patch; (western Amazonian Colombia). ***Piptocarpha cardenasii*** Pruski

The broad-tipped pappus bristles further distinguish *Piptocarpha cardenasii*. The moderately short stellate-trichome stipes and the tendency towards terminal capitulescences in the three specimens of *P. cardenasii* in front of us may prove to be distinguishing characters once more material of the new species becomes available for study. *Piptocarpha cardenasii* does not particularly resemble any of the nine previously described Colombian species of *Piptocarpha* (5 of them described by Cuatrecasas 1955) (see Appendix 1).

ACKNOWLEDGEMENTS

We would like to thank Dairon Cárdenas, Michael Nee, and Guy Nesom for helpful comments on the manuscript, Dairon Cárdenas for specimen loans and help during our July, 2017, visit to the COAH herbarium in Bogotá, Colombia, and Jorge L. Contreras (COAH) for his photographs of the type specimen used in figures 5A and 6.

LITERATURE CITED

- Aristeguieta, L. 1964. Compositae. In T. Lasser (ed.). Flora de Venezuela 10: 1–941. Instituto Botánico, Ministerio de Agricultura y Cria, Caracas.
- Badillo, V.M. 1989. Enumeración de las Vernoneae (Compositae) de Venezuela. *Ernestia* 54: 1–54.
- Baker, J.G. 1873. Compositae. I. Vernoniaceae. Pp. 1–180 + pl. 1–50, in C.F.P. von Martius (ed.). Flora Brasiliensis, Vol. 6, Pars II. Munich.
- Bentham, G. and J.D. Hooker. 1873. Compositae. Pp. 163–533, in Genera Plantarum, vol. 2. Reeve, London.
- Bernal, R., S.R. Gradstein, and M. Celis. 2015. Catálogo de plantas y líquenes de Colombia. Universidad Nacional de Colombia, Bogotá.
- Cabrera, A.L. 1944. Vernoneas Argentinas (Compositae). *Darwiniana* 6: 265–379.
- Cabrera, A.L. 1974. Compositae. Pp. 106–538, in A. Burkart (ed.). Flora ilustrada de Entre Rios, vol. 6. Instituto Nacional de Tecnología Agropecuaria, Buenos Aires.
- Cabrera, A.L. and R.M. Klein. 1980. Tribo: Vernoneae. Flora Ilustrada Catarinense, Compositas 3: 227–408.
- Cuatrecasas, J. 1955. A new genus and other novelties in Compositae. *Brittonia* 8: 151–163.
- Gleason, H.A. 1932. Studies on the flora of northern South America–XVII. *Bull. Torrey Bot. Club* 59: 361–376.
- Grokoviski, L., A.C. Cervi, and R.C. Tardivo. 2009. O gênero *Piptocarpha* R.Br. (Asteraceae: Vernoneae) no Estado do Paraná, Brasil. *Acta Botanica Brasílica* 23: 486–498.
- Hoffmann, O. 1890–1894. Compositae. Pp. 87–391, in A. Engler and K. Prantl (eds.). Die Natürlichen Pflanzenfamilien, vol. 4(5). Engelmann, Leipzig.
- Jones, S.B. [Jr.]. 1980. Flora of Peru. Family Compositae: Part I. Tribe Vernoneae. *Fieldiana, Bot.*, n.s. 5: 22–73.
- Nakajima, J.N., R.L. Esteves, V. Gonçalves-Esteves, M.A.G. Magenta, R.S. Bianchini, J.F. Pruski, and D.J.N. Hind. 2001. Familia 159-Asteraceae. Flora Fanerogâmica da Reserva do Parque Estadual das Fontes do Ipiranga (São Paulo, Brasil). *Hoehnea* 28: 111–181.
- Pruski, J.F. 1992. Compositae of the Guayana Highlands–VI. *Huberopappus maigualidae* (Vernoneae), a new genus and species from Venezuela. *Novon* 2: 19–25.
- Pruski, J.F. 1996. Compositae of the Guayana Highland–X. Reduction of *Pollalesta* to *Piptocoma* (Vernoneae: Piptocarphinae) and consequent nomenclatural adjustments. *Novon* 6: 96–102.
- Pruski, J.F. 1997. Asteraceae. Pp. 177–393, in J.A. Steyermark, P. Berry, and B.K. Holst (eds.). Flora of the Venezuelan Guayana, vol. 3, Araliaceae–Cactaceae. Missouri Botanical Garden, St. Louis.
- Pruski, J.F. 2010. Flora del Río Cenepa, Amazonas, Perú: Asteraceae Bercht. & J. Presl (Compositae Giseke, nom. alt. et cons.). *Monogr. Syst. Bot. Missouri Bot. Gard.* 114: 339–420.

- Pruski, J.F. 2013. Asteraceae. Pp. 1–1298, in G. Davidse, M. Sousa S., S. Knapp, and F. Chiang (eds.). *Flora Mesoamericana* 5(2). [<http://www.tropicos.org> accessed 19 December 2013].
- Pruski, J.F. 2016. Compositae of Central America–IV. The genus *Eremosia* (Vernonieae), nonglandular trichomes and pericarp crystals. *Phytoneuron* 2016-50: 1–41.
- Pruski, J.F. and M. Funston. 2011. Asteraceae. Pp. 308–340, in A. Idárraga P., R. del C. Ortiz, R. Callejas P., and M. Merello (eds.). *Flora de Antioquia. Catálogo de las Plantas Vasculares*, vol. 2. *Listado de las Plantas Vasculares del Departamento de Antioquia*. Univ. de Antioquia, Medellín.
- Robinson, H. 1989. Two new genera of Vernonieae (Asteraceae) from the northern Andes with dissected corolla limbs, *Cuatrecasanthus* and *Joseanthus*. *Revista Acad. Colomb. Ci. Exact.* 17: 207–213.
- Robinson, H. 1993. A review of the genus *Critoniopsis* in Central and South America (Vernonieae: Asteraceae). *Proc. Biol. Soc. Wash.* 106: 606–627.
- Robinson, H. 1999. Generic and subtribal classification of American Vernonieae. *Smithsonian Contr. Bot.* 89: 1–116.
- Robinson, H. 2002. Three new species of *Piptocarpha* (Asteraceae: Vernonieae) from Ecuador and Peru. *Novon* 12: 393–398.
- Robinson, H. 2007 [2006]. Tribe Vernonieae Cass. (1819). Pp. 149–175, in K. Kubitzki (ed.). *The Families and Genera of Vascular Plants*, vol. 8. Springer, Berlin.
- Robinson, H., F. Bohlmann, and R.M. King. 1980. Chemosystematic notes on the Asteraceae. III. Natural subdivisions of the Vernonieae. *Phytologia* 46: 421–436.
- Schultz Bipontinus, C.H. 1863. *Lychnophora* Martius! und einige benachbarte gattungen. *Jahresber. Pollichia* 20/21: 321–439.
- Smith, G.L. 1981. New taxa in *Piptocarpha* R. Br. (Vernonieae, Compositae). *Ann. Missouri Bot. Gard.* 68: 661–667.
- Smith, G.L. 1982. Taxonomic considerations of *Piptocarpha* (Compositae: Vernonieae) and new taxa in Brazil. *Brittonia* 34: 201–218.
- Smith, G.L. and N.C. Coile. 2007. *Piptocarpha* (Compositae: Vernonieae). *Fl. Neotrop.* 99: 1–94.
- Volet, D.V., J.N. Nakajima, M. Monge, and J. Semir. 2017. *Piptocarpha longipedunculata* (Asteraceae, Vernonieae) a new species of Serra do Mar, São Paulo, Brazil. *Phytotaxa* 306: 159–163.

APPENDIX 1: Infrageneric placements (adapted from Smith & Coile 2007) and distributions of the ten Colombian species of *Piptocarpha*.

Piptocarpha subg. Hypericoides (Sch. Bip.) G. Lom. Sm. (no species reported in Colombia).
Piptocarpha subg. Piptocarpha (2 sections, 2 series, and 10 species in Colombia).
Piptocarpha subg. Piptocarpha sect. Piptocarpha (capitula mostly 7–22-flowered; 2 series and 2 species in Colombia).
Piptocarpha subg. Piptocarpha sect. Piptocarpha ser. Asterotrichiae G. Lom. Sm. (1 species; abaxial leaf surface trichomes loose, not interwoven).
1. <i>Piptocarpha cardenasii</i> Pruski (endemic to Amazonian Colombia). [provisionally excluded from Colombia: <i>P. asterotrichia</i> , the citation by Robinson (1999: 77) of this species in Colombia is not vouchered; Smith and Coile (2007) cited <i>P. asterotrichia</i> in Peru and Bolivia; also Brazil (<i>Daly et al. 10957</i> , MO, NY, US) and Ecuador (<i>Freire & Santi 3235</i> , MO, US)].
Piptocarpha subg. Piptocarpha sect. Piptocarpha ser. Opacae G. Lom. Sm. (1 species; abaxial leaf surface trichomes matted and interwoven).
2. <i>Piptocarpha opaca</i> (Benth.) Baker (widespread in northern South America; represented in Colombia by <i>P. opaca</i> subsp. <i>piraparanaensis</i> G. Lom. Sm.). [excluded from Colombia: <i>P. polycephala</i> Baker, the erroneous report of this eastern Guayana Highland species by Bernal et al. (2015: 888) was based on <i>Croat 54238</i> from Bolívar, Venezuela].
Piptocarpha subg. Piptocarpha sect. Oocephalus (Sch. Bip.) G. Lom. Sm. (capitula 1–6-flowered; 8 species in Colombia).
3. <i>Piptocarpha atratoensis</i> Cuatr. (endemic to Choco, Colombia).
4. <i>Piptocarpha boyacensis</i> Cuatr. (endemic to Boyacá, Colombia).
5. <i>Piptocarpha foliosa</i> Cuatr. (Amazonian Brazil, Colombia, and Peru).
6. <i>Piptocarpha gutierrezii</i> Cuatr. (Colombia, Venezuela, Ecuador, Peru).
7. <i>Piptocarpha jonesiana</i> G. Lom. Sm. (endemic to Amazonian Colombia).
8. <i>Piptocarpha poeppigiana</i> (DC.) Baker (widespread, South America to Mexico).
9. <i>Piptocarpha richteri</i> Cuatr. (endemic to Putumayo, Colombia).
10. <i>Piptocarpha triflora</i> (Aubl.) Benn. ex Baker (widespread in northern South America).