PENTAGONIA BAUMANNII AND *P. CARNIFLORA* (RUBIACEAE: CONDAMINEEAE): TWO NEW SPECIES WITH ORNAMENTAL POTENTIAL FROM COLOMBIA AND ECUADOR

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Abstract. Two new species of Rubiaceae (Condamineeae) are here described and illustrated. *Pentagonia baumannii* is a shrub endemic to the lowlands of northwestern Ecuador. The second novelty is *P. carniflora*, an unbranched to few-branched pachycaule tree restricted to the eastern lowlands of the Departments of Antioquia and Caldas in northwestern Colombia. The relations of both species with their closest relatives are discussed.

Keywords: Colombia, Ecuador, endemics, *Pentagonia*, Rubiaceae

Resumen. Dos nuevas especies de Rubiaceae (Condamineeae) son descritas e ilustradas. *Pentagonia baumannii* es un arbusto endémico de las tierras bajas del noroccidente de Ecuador. La segunda novedad es *P. carniflora*, un árbol paquicaule no ramificado o con escasas ramas restringido a las tierras bajas del este de los departamentos de Antioquia y Caldas, en el noroccidente de Colombia. Se discute las relaciones de ambas especies con las más cercanas.

Palabras claves: Colombia, Ecuador, endémicas, *Pentagonia*, Rubiaceae

Pentagonia Bentham (Rubiaceae: Condamineeae) is a Neotropical genus that comprises about 50 species of understory low-to-medium-size trees and shrubs, inhabiting wet to pluvial forests from Guatemala to Peru and Brazil, from sea level to 1600 (–1800) m (Cornejo 2009, 2010). According to our data base of herbaria collections, the highest concentrations of species in the genus are found in Colombia (22 spp.) and Ecuador (18 spp.). Both countries encompass a preliminary total of 32 species of *Pentagonia* (Andersson and Rova, 2004; Delprete and Cortés-B., 2015; Rova et al., in prep.), and new species in the genus are still expected to be found in that region. Half of the generic diversity (about 25 spp.) occur in the Chocoan–Panamanian forests, and 16 local or regional endemics are found only in the Choco region. As compared with Mesoamerica, which harbors a total of 18 species, of which 12 are locally or regionally endemic (Taylor, 2012; Hammel, 2015), this high concentration of species together with the relative high endemism suggest that the Choco bioregion is the main center of diversity of *Pentagonia*. In South America, the Andean cordillera is an effective orographic barrier that makes a clear separation between Chocoan and Amazonian species in the genus. The distinctive allopatric pattern of distribution allows the recognition of one group of species that occur in the Pacific lowlands and the westernmost slopes of the Andes in Ecuador and Colombia, and another group of species that is restricted to the Amazonian rainforests from Colombia to Peru and Brazil. Recently, molecular studies (Rova et al., in prep.) have brought to light new insights into the genus and the discovery of two new species from the Equatorial Choco and the Magdalena Valley. These new species, both decorated with showy inflorescences and of ornamental potential, are formally described and presented here.

Taxonomy

Pentagonia baumannii Cornejo & Rova, *sp. nov.* TYPE**:** ECUADOR. Esmeraldas: Santa Teresa environs, finca Julio, sector Mono, 0°43'51"N, 79°49'27"W, 65 m, 15 October 2014 (fl), *X. Cornejo & B. Baumann 8635* (Holotype: GUAY; Isotype: GB). Fig. 1.

Pentagonia baumannii is closely related to *P. sprucei* Standl. but differs from the latter by having subsessile leaves, lobed leaf blades, well-developed reddish bracts, and reddish calyces and corollas. It is also similar to *P. subsessilis* L. Andersson & Rova, from which it differs by having lobed leaf blades and flowers with greenish stigma lobes.

Few-branched *shrub* to 3 m tall. *Stipules* light-green, 5–8 × 1.7–2.3 cm, lanceolate, acuminate, chartaceous, abaxially densely strigose, adaxially glabrous. *Leaves* simple; subsessile to shortly petiolate, to 2 cm long; blade 90–110 × 50–60 cm, oblanceolate to spatulate, basally attenuate, coriaceous, dull on both surfaces, densely and minutely strigose on main and secondary nerves abaxially, loosely

Thanks are due to Bruno Baumann for hosting the senior author and helping to collect the type of *Pentagonia baumannii* in northwestern Ecuador. Philip Silverstone-Sopkin,† former Director of CUVC, shared his field and herbarium images of the type of *P. carniflora* with the senior author; Andrés Bohórquez Osorio (FAUC) and Claes Persson (GB) made available herbarium and field images of the paratypes of *P. carniflora*. Boris Villanueva Tamayo is acknowledged for kindly providing field images of *P. magnifica*.

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FIGURE 1. *Pentagonia baumannii* Cornejo & Rova. **A**, terminal branches holding mature leaves; **B**, close-up of new lobed leaf blades; **C**, stipule; **D–E**, inflorescences; **F**, close-up of open calyx, note the centered nectary cup and colleters clustered around sinuses within. Photographs of the holotype, *X. Cornejo & B. Baumann 8635* (GUAY).

strigulose on main nerves adaxially, lobed to strongly dentate (1/3–1/4 the way to the midrib), and with 17–18 secondary veins per side, intersecondaries present, the lobes 4 to 6 per side, 3–8 × 3.5–6.5 cm, the sinus 10–20 cm from the midrib. *Inflorescences* congested cymose panicles; peduncle to 30 mm; bracts light green to reddish, 15–20 × 10–13 mm, ovate to shortly lanceolate, abaxially strigose; flowers up to 20, subsessile or with pedicel to 5 mm, densely strigose. *Calyx* tube pink or greenish, ca. 5 mm, ± funnelform, coriaceous, densely strigose; calyx lobes 5, the lobes pink, imbricate, ± obovate to oblong, 9–12 × 3–6 mm, with colleters clustered around sinuses within, apically obtuse to rounded; a fleshy nectary cup present at inner base. *Corolla* light coral to salmon, subcylindric, ca. 20–25 × 3–4 mm (dried), the tube densely strigose without, glabrous within, the lobes deltoid, 5–6 × ca. 3 mm (dried), 6–8 × 5–6 mm (in vivo), widely divergent at anthesis; stamens with the filament ca. 14 mm when dried, ca. 20 mm in vivo, inserted at ca. 6 mm above the base of the tube, basally swollen and densely hyaline-tomentose, the anthers ca. 4 mm; style ca. 17–20 mm when dry, ca. 25 mm in vivo, stigma lobes 3 mm, greenish. *Berries* not seen.

Etymology: the epithet of this taxonomic novelty honors Bruno Baumann, a Swiss collector of native species of ornamental potential for cultivation in Ecuador and co-collector of the type; he was aware of this interesting novelty and led the senior author to find the species in the field.

Habitat, distribution, conservation status, and phenology: *Pentagonia baumannii* is known only from the type locality, a disturbed remnant wet forest located in the lowlands of the Esmeraldas province, northwestern Ecuador; this is the southernmost area of Choco, one of the main centers of diversity for the genus in South America. Because deforestation, fragmentation, and extinction of small patches of native vegetation are steadily ongoing in northwestern Ecuador, and because *P. baumannii* has not been recorded in any protected area of the country, the conservation status Endangered (EN B1ab[iii]) (IUCN, 2012) is suggested for this new species. *Pentagonia baumannii* flowers in October.

Propagation: *Pentagonia baumannii* can be vegetatively propagated by cuttings, for example, to be planted as an ornamental shrub (X. Cornejo, pers. obs.).

On the basis of ITS and rps16 sequences, this new species is related to *Pentagonia sprucei* Standl. and *P. subsessilis* L. Andersson & Rova (Rova et al., in prep.). and *Pentagonia baumannii* differs from *P. sprucei*, which is endemic to western Ecuador, by having subsessile leaves with attenuate leaf bases and lobed leaf blades (vs. petiolate leaves with acute to subcordate leaf bases and entire margin), the presence (vs. absence) of numerous conspicuous bracts, pink (vs. green) calyx lobes, and salmon to light coral (vs. white to pale green, or sometimes distally pinkish) corollas. *Pentagonia baumannii* also resembles *P. subsessilis*, a species restricted to NW Ecuador and SW Colombia, but differs morphologically by lobed (vs. entire) leaf blades, pale greenish-pinkish (vs. pink to reddish) bracts, and flowers with stigmas greenish (vs. white). It should be noted that young individuals of *P. baumannii* present entire leaf blades, and during this stage it can easily be confused with *P. subsessilis* or some other species with subsessile to shortly petiolate leaves in the genus. This form of heteropylly has been observed also in young stages of several other species of *Pentagonia* that eventually bear lobed leaf blades [e.g., *P. gymnopoda* (Standley) Standley, *P. lanciloba,* and *P. tinajita*] (Rova et al., in prep, pers. obs.); therefore, mature individuals are needed for a reliable identification.

Pentagonia carniflora Cornejo & Rova, *sp. nov.* TYPE: COLOMBIA. Caldas: Mpio. Norcasia, reserva Río Manso, valle medio del Río Magdalena, a 40 km por carretera al norte de La Dorada, cerca de quebrada Tostada, bosque húmedo tropical, 5˚40'N, 74˚46'W, 192 m, 1 Nov 2014 (fl), *P. Silvertone-Sopkin, A. F. Bohórquez, M. E. Cardona et al. 11931* (Holotype: CUVC). Fig. 2.

Pentagonia carniflora mostly resembles the Amazonian *P. gigantifolia* Ducke, *P. subauriculata* Standl., and *P. williamsii* Standl., but the new species differs from the other three by having ebracteate to minutely linear-bracteate flowers, the bracts green (vs. red), the calyx, and corollas with crimsom red limb (vs. corollas yellow or white to pinkish). *Pentagonia carniflora* differs from *P. magnifica* K. Krause by having green and spathaceous (vs. red and 5-lobed) calyx and greenish-white (vs. red) corolla tube.

Unbranched to few-branched pachycaule *tree* to 12 m tall and to 42 cm dbh. *Stipules* light-green turning brown, ca. 5–7 × 2 cm, narrowly-lanceolate, acuminate, chartaceous, adaxially densely strigose. *Leaves* simple; subsessile; blade 90–122 × 50–70 cm, obovate to obovate-elliptic, basally broadly obtuse to subcordate, coriaceous, dull on both surfaces, densely strigose on main and secondary nerves abaxially, strigulose on main nerves and glabrescent adaxially**,** the margin entire, laterally somewhat undulate, and with ca. 18–21 secondary veins per side, intersecondaries sometimes present. *Inflorescences* congested cymose panicles; peduncle to 30 mm; ebracteate, otherwise bracts light green, 3–4 × 1 mm, linear, abaxially strigose (*Bohórquez et al. 1259*); *flowers* up to 30, the terminal subsessile, the lateral with pedicel to 7 mm, densely strigose. Hypanthium turbinate, ca. 5 × 3(–4) mm, densely strigose; *calyx limb* spathaceous, somewhat laterally compressed at apex in bud, laterally splitting for upper third to half of its length, greenish throughout (*Idarraga et al. 5319*), otherwise greenish at lower half, turning to cream or greenish-white with 5 weak longitudinally brownish-red stripes (the type) at distal half, ca. 17–23 mm, membranaceous, densely strigose; a fleshy nectary cup present at inner base. *Corolla* funnelform, ca. 35–38 × 15–20 mm (dried), ca. 60 × 35–50 mm (fresh, *fide* the type), the limb dark-red to bright-red, the tube subcylindric, greenish-white, glabrous on both sides, the lobes deltoid, ca. 12 × 7–10 mm (dried), patent to reflexed at anthesis; stamens with the filament ca. 20–26 mm (dried), inserted at ca. 6 mm above the base of the tube, basally swollen and densely hyaline-tomentose, the anthers ca. 4 mm; style 25–33 mm (dried), stigma lobes green. *Berries* not seen.

Additional specimens examined: COLOMBIA. Antioquia: municipio de Puerto Berrío, vía Puerto Berrrío-Yondó, finca San Juan de Bedout, 06˚36'06.2"N,

FIGURE 2. *Pentagonia carniflora* Cornejo & Rova. **A**, leaf blade, partial view of abaxial side; **B**, auriculate, sessile leaf base and part of detached stem; **C**, stipule; **D–E**, inflorescences; **F**, spathaceous calyces and a 5-costate flower bud. Photos A–C and E–F courtesy of Claes Persson; photo D, courtesy of Philip Silverstone-Sopkin.

74°26'40.2"W, 159–190 m, 20 April 2013 (fl), *A. Idarraga, C. Persson & C. Sánchez 5319* (HUA). Caldas: Mpio. Norcasia, vereda Quebrada de San Roque, reserva Río Manso, 5°39'54.1"N, 74°46'54.8"W, 204 m, 1 November 2014 (fl), *A. F. Bohórquez, P. A. Silvertone-Sopkin, J. A. Orozco, O. A. Bedoya & estudiantes de Botánica y Sistemática, Universidad del Valle 1259* (JAUM).

Etymology: the epithet of this taxonomic novelty refers to the bright red color of the corolla limb that resembles the color of flesh.

Habitat, distribution, conservation status, and phenology: *Pentagonia carniflora* is known only from the Magdalena Valley in the lowlands of the northeast of departments Antioquia and Caldas in northwestern Colombia. It occurs between 160 and 200 m in wet forests with 3500 mm average annual rainfall. As forests in eastern Antioquia and Caldas are disturbed by selective cutting, clearing, and fragmentation, the conservation status Endangered (EN B1ab[iii]) (IUCN, 2012) is suggested for this new species. *Pentagonia carniflora* flowers from April to October and November.

Pentagonia carniflora appears to be closely related to the Mesoamerican *P. donnell-smithii* (Standl.) Standl. and *P. tinajita* Seem. (Rova et al., in prep.), for example, but the new species mainly differs from the two latter (and all Mesoamerican species with subsessile, entire leaves) by the spathaceous (vs. 5-lobed) calyx and bright red (vs. cream to yellow) corolla limb. Furthermore, *P. carniflora* has leaf blades entire and sessile (vs. deeply lobed in *P. tinajita* and distinctively petiolate in *P. donnell-smithii*). Because of the large sessile leaves and spathaceous calyx, *P. carniflora* resembles the Amazonian *P. gigantifolia* Ducke, *P. subauriculata* Standl., and *P. williamsii* Standl., but differs from them mainly by having corollas with red limb (vs. white to cream or yellow), the calyx green (vs. red), and floral bracts that are absent or barely shortly linear (vs. well developed and laterally expanded). By its large, subsessile leaves and red corollas, *Pentagonia carniflora* also resembles *P. bonifaziana* Cornejo from NW Ecuador, but the new species sharply differs from the latter by the pubescence strigose (vs. conspicuously hirsute) throughout, the calyx spathaceous (vs. 5-lobed), and the stipules narrowly lanceolate (vs. elliptic). It is also similar to the Chocoan *P. magnifica* K. Krause, but it differs by having green and spathaceous (vs. red and regularly 5-lobed) calyx and a white (vs. red) corolla tube. *Pentagonia magnifica* also possesses well-developed bracts, in contrast to *P. carniflora*. It should be noted that the B holotype of *P. magnifica* only exists as a photo and small bud fragments at F, and calyx lobation is not easily interpreted on that material or the isotypes. However, the description clearly states that the calyx of *P. magnifica* is 5-lobed, and this is also obvious from photos of recently collected fresh material of *P. magnifica* (B. Villanueva Tamayo, pers. obs.).

It is interesting to note that, on the basis of molecular results (Rova et al., in prep.), *Pentagonia carniflora* has a Mesomerican origin and that the strong resemblance to the discussed South American conspecifics could be a case of evolutionary convergence.

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