
Two New Species of *Pentagonia* (Rubiaceae, Hippotideae) from Colombia and Ecuador

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ABSTRACT. Two new species of *Pentagonia* Benth (Rubiaceae, Hippotideae) are described and illustrated. *Pentagonia tapacula* Cornejo is from the pluvial forests of Bajo Calima, Valle del Cauca Department, southwestern Colombia. This new species belongs to a species group of plants with entire leaves that have a tapering, sessile base, and with a 5-lobed calyx, but differs mainly by its thicker coriaceous leaf blades, obovate stipules, and inflorescences with remarkably elongated and thick peduncles. The second new species is *P. clementinensis* Cornejo from the wet forests of western Ecuador. This is segregated from *P. involucrata* C. M. Taylor, which differs sharply by its leaf blades, floral bracts, fruits, and calyces.

RESUMEN. Se describen e ilustran dos nuevas especies de *Pentagonia* Benth (Rubiaceae, Hippotideae). *Pentagonia tapacula* Cornejo es de los bosques pluviales del Bajo Calima, Departamento del Valle de Cauca, en el suroccidente Colombiano. Esta nueva especie pertenece al grupo de las *Pentagonia* de hojas enteras, de base gradualmente angosta, subsésil, con cáliz 5-lobado, de las que principalmente se diferencia por presentar hojas con gruesas láminas coriáceas, estípulas obovadas, e inflorescencias con pedúnculos distintivamente más gruesos y largos. La segunda nueva especie es *P. clementinensis* Cornejo de los bosques muy húmedos de la región occidental de Ecuador. Esta es segregada de *P. involucrata* C. M. Taylor, de la que difiere notoriamente en cuanto a sus hojas, brácteas florales, cálices y frutos.

Key words: Chocó, Colombia, Ecuador, Hippotideae, IUCN Red List, *Pentagonia*, Rubiaceae.

Pentagonia Benth (Rubiaceae, Hippotideae) is a Neotropical genus of usually understory shrubs to treelets, often monocaule or sparsely branched, with interpetiolar stipules that are triangular in bud and usually caducous, and with usually large, entire or pinnate leaf blades. The lateral inflorescences are in subsessile to pedunculate cymes or cymose, bearing flowers with a spatheous or 3- to 5-lobed calyx; the corollas are regular to zygomorphic with the tube

somewhat curved, hypocrateriform to infundibuliform, greenish or white to cream, yellow, or red, with (4 to) 5 lobes. The corollas are fibrous with the staminal filaments tomentose at and around their base and are mostly hummingbird pollinated. The fruits are berries, 2-locular, many seeded, \pm thick walled, and often crowned by a \pm persistent calyx. *Pentagonia* comprises ca. 34 species, all found from moist to pluvial, tropical to premontane and rarely to lower montane forests, ranging from 0 to 1600 (to 1800) meters above sea level, from Guatemala to Peru and Brazil (Dwyer, 1980; Burger & Taylor, 1993; Taylor, 1995, 2001, 2002). In South America, this genus is represented by ca. 21 species (Andersson & Rova, 2004; Cornejo, 2006). During the revision of the South American species of *Pentagonia*, the following novelties were discovered.

1. *Pentagonia tapacula* Cornejo, sp. nov. TYPE: Colombia. Dept. Valle del Cauca: Bajo Calima, ca. 15 km N of Buenaventura, Cartón de Colombia concession, 3°56'N, 77°08'W, ca. 50 m, transition betw. tropical wet & pluvial forest, 18 Feb. 1983, A. Gentry & A. Juncosa 40480 (holotype, MO 3210799 [fl.]; isotypes, MO 3104184, MO 3104185 [fl., fr.], COL 259809 not seen). Figure 1.

Species nova affinis *Pentagoniae subsessili* L. Andersson & Rova, a qua stipulis obovatis 3.5–5.5 cm latis, lamina foliari 48–80 cm lata, inflorescentia pedunculo robusto 3.5–7 cm \times 5–15 mm insidente, bracteis basalibus conduplicatis 2–3.5 cm longis, corolla glabra, viridi vel albida atque fructu 2–2.8 \times 2–2.7 cm differt.

Shrub or unbranched pachycaul tree, to 10 m tall; terminal stems subtetragonal, young shoots densely strigose. Stipules obovate, 5–9 \times 3.5–5.5 cm, stiffly coriaceous, strongly keeled, finely veined longitudinally, densely short-sericeous to strigose outside, at apex acuminate, ca. 8 mm (due to the elongated costa); petioles 0.5–2.5 \times 1–2 cm, densely strigose; leaf blades entire, drying thickly coriaceous, obovate to oblanceolate, 75–140 \times 48–80 cm, at apex somewhat obtuse, tapering at base; midveins densely to sparsely strigose, short-pilose or glabrous, and the

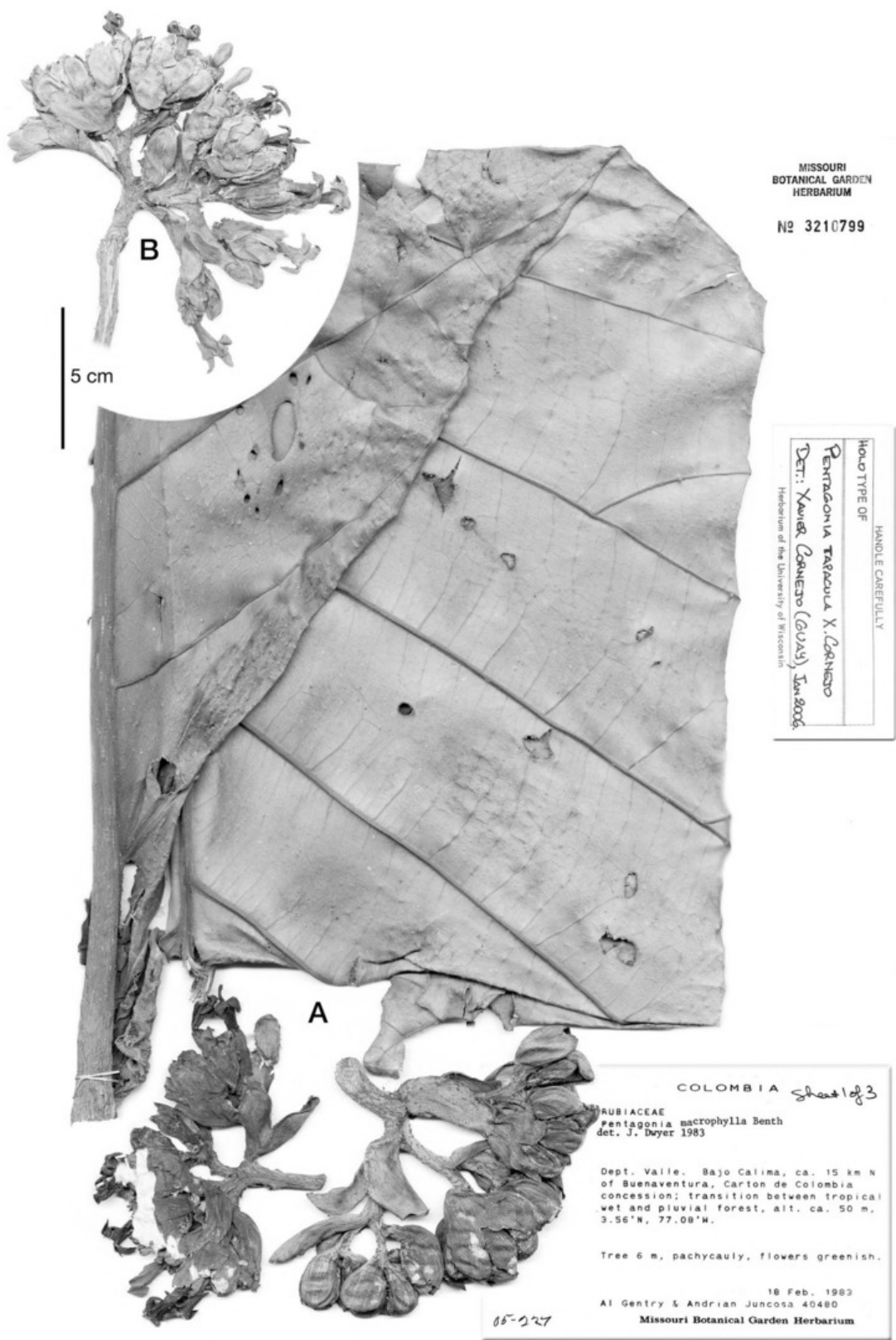


Figure 1. *Pentagonia tapacula* Cornejo. —A. Folded leaf blade and two separate inflorescences. —B. Inflorescence. A, from the holotype, Gentry & Juncosa 40480 (MO 3210799); B, from the isotype, MO 3104185.

blades glabrescent or glabrous adaxially, veins tomentose to densely strigose, and the blades tomentose to sparsely strigose abaxially, margin usually strigose and glabrescent toward the apex,

with 10 to 15 pairs of lateral veins. Inflorescences axillary, cymose, ca. 20- to 30-flowered, densely to sparsely strigose; peduncle stout, 3.5–7 cm × 5–15 mm, densely short-sericeous to strigose; basal

Table 1. Morphological comparison of *Pentagonia tapacula* and similar species.

	<i>P. tapacula</i>	<i>P. subsessilis</i>	<i>P. microcarpa</i>	<i>P. magnifica</i>	<i>P. wendlandii</i>
Leaf blade texture	coriaceous	papyraceous to thinly chartaceous	papyraceous to thinly chartaceous	papyraceous	chartaceous or subcoriaceous
Stipules	obovate, 5–9 × 3.5–5.5 cm	narrowly lanceolate, 3.5–8 × 1–2.5 cm	narrowly lanceolate, 2–3.5 × 0.7–1.2 cm	narrowly lanceolate, ca. 3–5 × 0.7–1.5 cm	lanceolate to ovate-oblong, 2.5–8.5 × 1–3 cm
Peduncle of the inflorescences	3.5–7 × 0.5–1.5 cm	0.5–2 × ca. 0.3–0.5 cm	0.5–1 × 0.3–0.5 cm	ca. 1 × 0.3 cm	0.5–2.5 × ca. 0.3–0.4 cm
Bracts	slightly obovate to oblong, 2–3.5 × 1–3 cm, yellow-green	oblong, 1–1.8 × 0.5–1.1 cm, reddish or green	oblong to lanceolate, 1–2 × 0.3–0.7 cm, pink-red or reddish green	narrowly lanceolate, ca. 0.5–1 × 0.1–0.3 cm, red	oblong, 0.6–2 × 0.3–0.7 cm, red
Calyx	green	red	pink-red	red	red to purplish red or brown-red
Corolla	greenish to white or cream, glabrous	pink to red, tomentose to tomentulose	pink-red to red, glabrous	red, hirtellous	yellow, glabrous to puberulent
Fruits	2–2.8 × 2–2.7 cm	ca. 3.5 × 3.5 cm	1–1.5 × 1–1.4 cm	ca. 1.2–1.5 × 1.2–1.5 cm	to 4.5 cm
Seeds	yellow	unknown	unknown	unknown	red

bracts conduplicate, obovate, 2–3.5 × 1–3 cm, coriaceous, yellow-green, densely short-sericeous to densely strigose and lenticellate outside; floral bracts slightly obovate to oblong, ca. 2–2.3 × 1–1.3 cm, yellow-green, ± chartaceous to foliaceous, with colleters in the basal 1/3 within, densely to sparsely strigose, glabrescent or glabrous without, margin ciliate, often with tufted fibers (from the vascular nerves reaching the outside of the margin); pedicels 2–6 mm, thick, somewhat complanate, densely strigose. Calyx regularly 5-lobed in the distal 1/3, ± chartaceous, green; hypanthium turbinate to cylindric, ca. 4 mm, tube 10–16 × 4–7 mm, both densely short-sericeous or strigose to glabrous without, with colleters arranged in longitudinal fields below the sinuses within, lobes ± equal, oblong, 5–9 × 5–7 mm, apex obtuse to rounded, glabrous without. Corolla hypocrateriform, greenish to white or cream, tube 20–25 × ca. 5 mm, glabrous without, lobes 5, lanceolate, ca. 8 × 3.5–5 mm, reflexed at anthesis, with abundant, tiny, flat to squamulose, light brown, subhyaline indumentum (apparently papillose when hydrated). Stamens 5, all filaments of similar length, 18–20 mm, attached 6–7 mm from the tube base, densely tomentose with flat yellowish hyaline hairs in the lower 1/3; anthers ca. 3 × 1 mm; style 18–20 mm, glabrous; stigma bilobate, ca. 3 mm. Infructescences with persistent bracts; fruits globose to globose-turbinate, 2–2.8 × 2–2.7 cm, ± truncate at the apex, fruit wall ca. 3 mm thick, brown to reddish brown, lenticellate, glabrescent or often densely strigose

toward apex, crowned by a persistent calyx, with tube 1–8 mm; mature seeds ca. 5 mm, yellow.

Discussion. In its subsessile leaves with blades tapering at the base and its 5-lobed calyx, *Pentagonia tapacula* is similar to *P. subsessilis*, *P. microcarpa* L. Andersson & Rova, *P. magnifica* K. Krause, and *P. wendlandii* Hooker (Table 1). It differs from these species by the thicker coriaceous leaf blades; the wider, obovate, stiffly coriaceous stipules; and the inflorescences with remarkably longer and thicker peduncles. The new species also differs from *P. subsessilis* by its larger bracts, which are conduplicate at the base of the inflorescence, and its glabrous corolla greenish to white or cream outside, longer stamens, and smaller fruits. *Pentagonia tapacula* additionally differs from the Amazonian *P. microcarpa* by the yellow-green larger bracts and larger fruits (vs. fruits only to 1.5 cm). It resembles *P. wendlandii*, restricted to the lowland Caribbean rainforests of Costa Rica and Panama (Burger & Taylor, 1993), and apparently disjunct to the lowlands of Chocó Province in western Colombia (*Tuberquia et al.* 490, GB). However, *P. tapacula* differs from the latter by the tendency to have thicker petioles, yellow-green bracts, green calyx, greenish to white or cream corolla, and fruits globose to globose-turbinate with the apex ± truncate, containing yellow seeds. Finally, the new species also differs from *P. magnifica* by the green calyx; glabrous corolla, greenish to white or cream, with larger lobes; and distinctively larger bracts.

Habitat and distribution. *Pentagonia tapacula* is an endemic species of primary tropical lowland rainforests in western Colombia, collected from elevations 50–230 m. Physical parameters of its habitat include annual rainfall 7400 mm, an average relative humidity of 86%, and temperatures from 22°C–30°C (J. van Rooden *et al.* 568, MO). It grows in poor soils, noted as low in the nutrients P, Ca, K, Mg, Cu, B, Mn, Zn, and with a high percentage of saturation of Al (Monsalve 384, 1327, MO).

IUCN Red List category. *Pentagonia tapacula* is only known from five close localities within an area of less than 5000 km², which is under pressure of deforestation. The species is assigned a provisional IUCN conservation status of Endangered (EN B12c) (IUCN, 2001).

Vernacular name and uses. Tapacula (Colombian [slang] Spanish, in sched. Monsalve 1327, MO). This may refer to the fruit's use to treat diarrhea or cause constipation after consumption (Stella Sylva, Juan Granados-Tochay, pers. comm.). The fruits at maturity are sweet and edible (Monsalve 1327).

Etymology. The specific epithet refers to its vernacular name. The epithet is considered as a noun in apposition, cf. Art. 23.1 and is supported by Art. 23.2 of the *International Code of Botanical Nomenclature* (McNeill *et al.*, 2006).

Phenology. *Pentagonia tapacula* has been collected with flowers and fruits from September to February.

Paratypes. COLOMBIA. **Valle del Cauca:** Mun. Buenaventura, Cartón de Colombia, 3°56'N, 77°10'W, J. van Rooden, B. J. H. ter Welle & S. M. C. Topper 568 (MO); Bajo Calima, Pulpapel/Buenaventura, 3°55'N, 77°00'W, M. Monsalve 384 (MO [2], NY); carr. La Gasolina, 25 Nov. 1986, M. Monsalve 1327 (MO [2]); carr. Nacional, M. Monsalve 3136 (MO [2]); carr. al mar, near Río Dagua, E. L. Core 1510 (US).

2. *Pentagonia clementinensis* Cornejo, sp. nov.

TYPE: Ecuador. Los Ríos: Hacienda Clementina, Cerro Samama, trail betw. Destacamento Pita & La Torre, betw. Ito [hito] 12 & 13, 1°39'S, 79°20'W, 600–700 m, 21 Sep. 1999 (fl., fr.), C. Gustafsson & X. Cornejo 500 (holotype, GUAY; isotypes, GB [also photo, preserved material], S). Figure 2.

Species nova affinis *Pentagoniae involucratae* C. M. Taylor, a qua lamina foliari elliptica usque late elliptica majore (30–60 × 15–28 cm), bracteis floralibus minoribus et angustioribus (5–15 × 3–7 mm), lobulis calycinis minoribus et angustioribus (4–12 × 2–6 mm) atque fructibus in sicco globosis usque late ellipticis calyce persistente ad tubum

sicut lobulos minores subaequales lenticellato coronatis differt.

Shrubs or trees, to 20 m tall and 30 cm DBH, branched, with open crown; terminal branches subtetragonal, strigulose, glabrescent or glabrous. Stipules narrowly lanceolate, 2.8–6 × 0.5–1.3 cm, chartaceous, rather smooth or finely veined longitudinally and ± densely strigulose to often strigose at the apex, glabrescent without, yellow or green, the tip usually minutely curved; petioles 3–6 cm × 2.4–5 mm, strigillose or glabrous; leaf blades entire, drying papyraceous to thinly chartaceous, elliptic to broadly elliptic or slightly obovate-elliptic, 30–60 × 15–28 cm, apex acute to obtuse, base cuneate, strigose to strigillose or glabrous (glabrescent with age) adaxially, densely strigose when very young, strigose to strigillose mainly on veins and glabrescent or glabrous at maturity abaxially, with 18 to 25 pairs of lateral veins. Inflorescences axillary, a pedunculate cyme, branched to 2nd order, ca. 4- to 12-flowered, glabrous; basal bracts unknown; peduncle 1.6–7 cm × 3–5 mm, flat to concave adaxially, green, glabrous; with 2 secondary axes (1 per side), 1–3.5 cm, both subtended by a pair of light green bracts, each bearing 1 to 3 flowers; lateral flowers with pedicels 5–18 × ca. 3 mm, somewhat complanate, central flowers subsessile; floral bracts 2 to 4, decussate, suborbicular to oblong or sub lanceolate, 5–15 × 3–7 mm, light green, thinly chartaceous, apex rounded to obtuse or emarginate, with colleters at the inner base, glabrous on both sides. Calyx regularly 5-lobed in the distal 1/3, chartaceous to thinly chartaceous, greenish cream or red; hypanthium turbinate to obconic, 3–4 mm, occasionally with a single bract attached; tube 5–9 × 5–7 mm, both glabrous without, lobes slightly unequal, obovate to oblong, shorter to slightly longer than the tube, 4–12 × 2–6 mm, at apex obtuse to rounded, with colleters arranged in small groups around or at both sides of the sinuses, glabrous without and within, but margin sometimes ciliate. Corolla obconic to subcylindric, white with lobes pale pink at tip outside, tube 25–35 × 6–15 mm, shortly tomentose or golden-velutinous at the upper 1/2 and glabrous toward the base without, lobes 5, ovate to triangular, 6–14 × 3–8 mm, erect at anthesis (in La Clementina), glabrous or with scattered, whitish squamulose indumentum within. Stamens 5, filaments of unequal length, 12–18 mm long, all inserted ca. 4–5 mm from the tube base, densely golden-hirtellous or tomentose at the lower 1/3 to 1/2 and around their attachment to the corolla tube, anthers 3–4 × 0.6–1.1 mm; style ca. 15 mm, glabrous; stigma bilobate, ca. 1.5–2.7 mm. Infructescences with persistent bracts; fruits globose to broadly elliptic, 3–5(–7 cm,

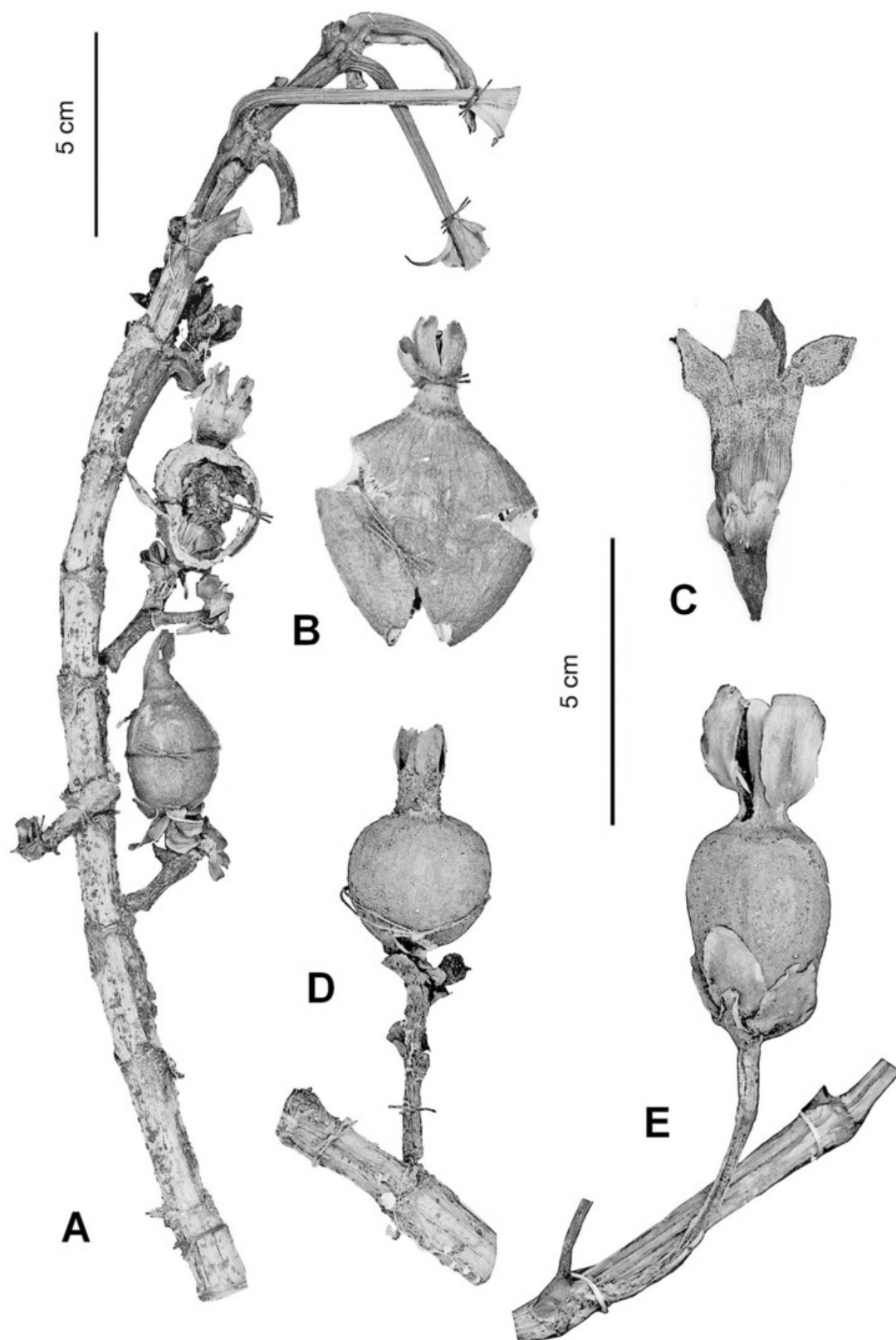


Figure 2. A–D. *Pentagonia clementinensis* Cornejo. —A. Terminal branch with infructescences. —B. Nearly mature fruit. —C. Flower at anthesis. —D. Infructescence. —E. *Pentagonia involocrata* C. M. Taylor. Infructescence. A, B, taken from the isotype, Gustafsson & Cornejo 500 (S); C, taken from Ståhl & Cornejo 5949 (S); D, from Ståhl & Knudsen 1247 (S); E, from the isotype, Aulestia & Aulestia 908 (GB).

Table 2. Morphological comparison of *Pentagonia clementinensis* and *P. involucrata*.

	<i>P. clementinensis</i>	<i>P. involucrata</i>
Leaf blades	elliptic to broadly elliptic or slightly obovate-elliptic, 30–60 × 15–28 cm	oblong-elliptic, 19–32 × 6–10 cm
Calyx lobes	4–12 × 2–6 mm	20–24 × 8–11 mm
Floral bracts	5–15 × 3–7 mm	13–22 × 9–12 mm
Fruits	globose to broadly elliptic, with persistent calyx tube ± as long as the calyx lobes	barrel-shaped, with persistent calyx tube 1/4 to 1/7 smaller than the calyx lobes

fide *Ortíz et al.* 529) × ca. 3–3.5 cm, rounded to obtuse at apex, fruit wall 1.5–7 mm thick, brown, richly lenticellate, glabrous, crowned by a persistent calyx, with tube ± as long as the lobes, both prominently lenticellate; mature seeds 5–7 × ca. 3 mm.

Discussion. In its petiolate leaf blades, the relatively long pedunculate inflorescences that become flexuous in fruit, the flowers surrounded by two to four persistent floral bracts, and the 5-lobed calyx with colleters in groups around the sinuses, *Pentagonia clementinensis* is related to *P. involucrata*, a lowland allopatric taxon endemic to northwestern Ecuador. This new species was previously included in the latter by Andersson and Rova (2004). However, *P. clementinensis* differs from *P. involucrata* by having larger and broader elliptic mature leaf blades, distinctively shorter and narrower calyx lobes, smaller and narrower floral bracts (Fig. 2D, E), and globose to broadly elliptic (dry) fruits with calyx tube approximately as long as the calyx lobes (Fig. 2B, D, E; Table 2).

Habitat and distribution. *Pentagonia clementinensis* is known from premontane to montane, wet to pluvial forests in western Ecuador between 600 and 1600 m. According to the literature, this is the highest altitudinal record for a species of this genus in South America (Burger & Taylor, 1993; Taylor, 1995, 2001, 2002; Andersson & Rova, 2004). Some populations of this new species are located at the upper part of the Reserva Indígena Awá, which belongs to the National System of Protected Areas of Ecuador (SNAP), and at Rancho Buitrón, in Pichincha Province. They are apparently disjunct to the lower wet forests in Cerro Samama (600–750 mm) at La Clementina, in Los Ríos Province.

According to herbaria records, *Pentagonia clementinensis* and *P. involucrata* appear to be allopatric. Even when both occur in the Reserva Indígena Awá, *P. clementinensis* is located higher on the western slopes of the Andes between 990 and 1600 m. *Pentagonia involucrata* occurs in lowlands between 250 and 500 m, ranging toward the west to the tropical evergreen and often hilly forests of the Cotacachi-Cayapas Reserve, which houses the largest (more than 200,000 ha.) and one of the best-conserved moist and wet forests of western Ecuador (Cornejo, pers. obs.).

Both reserves contain the remaining forests of the province of Esmeraldas and therefore deserve higher efforts for conservation. *Pentagonia clementinensis* may also be expected in the pluvial forests of Chocó Department in southwestern Colombia.

Some morphological differences are noted among the disjunct populations of *Pentagonia clementinensis*. Those from Reserva Indígena Awá have a red calyx and the tendency to produce larger fruits (to 7 cm long) with a thicker fruit wall (3–7 mm). One of its vernacular names, “huevo de gallo,” refers to the similarity of these larger fruits to a chicken’s egg. In contrast, the disjunct population from La Clementina has a greenish cream calyx and somewhat smaller fruits (to ca. 4 cm) with a thinner fruit wall (1.5–3 mm).

IUCN Red List category. During the past four decades, the native populations of *Pentagonia clementinensis* have been fragmented due to extensive deforestation of the wet forests in western Ecuador (Dodson & Gentry, 1991; Cornejo, pers. obs.). The species is assigned an IUCN conservation status of Endangered (EN A1c) (IUCN, 2001).

Vernacular name and uses. Huevo de gallo (Spanish; in sched. *Ortíz et al.* 529, NY), Palo aguanoso (Spanish; in sched. *Beck et al.* 3041, NY). The fruits are edible.

Etymology. The specific epithet refers to the type locality La Clementina, which is the largest banana farm of Ecuador and which encompasses the best and perhaps the last forests of Los Ríos Province, sheltering many local and regional endemic plant taxa from western Ecuador (Cornejo, pers. obs.).

Phenology. *Pentagonia clementinensis* has been collected with flowers in April to June and September and with fruits in May, June, and September.

Paratypes. ECUADOR. **Prov. Los Ríos:** Hacienda Clementina, Cerro Samama, trail betw. Destacamento Pita & La Torre, 1°39’S, 79°20’W, *B. Ståhl* & *X. Cornejo* 5898 (S); 25 May 1994, *B. Ståhl* & *J. Knudsen* 1247 (GB, S), *B. Ståhl* & *X. Cornejo* 5949 (S). **Prov. Pichincha:** Parr. Nanegalito, cuenca Río Pachijal, rancho Buitrón, 0°02’S, 78°43’W, *C. Cerón* 38264 (QAP). **Prov. Carchi:** Awá Indigenous Territory, comm. Baboso, 0°55’N, 78°25’W, *A. Ortíz*, *E. Loachamín* & *W. Mayer* 529 (NY); ca. 1 km W of house of Patrocinio Ortíz,

0°56'N, 78°25'W, *H. Beck*, *A. Ortíz*, *E. Loachamín* & *W. Mayer* 3041 (NY); Tulcán Cantón, around encampment in Gualpi Chico area of Awá Reservation, NW & SE, 0°58'N, 78°16'W, *W. Hoover*, *A. Arguello*, *P. Gelpi* & *R. Lorentzen* 3661 (GB, MO, QCA not seen); Río Blanco drainage above Chical, trib. of Río San Juan, ca. 12 km W of Maldonado, *A. Gentry* & *G. Schupp* 26531 (MO, SEL).

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