Rubiacearum Americanarum Magna Hama Pars IX. New Species and a New Combination in *Hippotis* and *Pentagonia* (Hippotideae) from Central and Western South America

Charlotte M. Taylor
Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, U.S.A.
Charlotte.Taylor@mobot.org

ABSTRACT. The following new species are described: *Hippotis stellata* C. M. Taylor & Rova, found from eastern Panama to northwestern Ecuador and distinguished by its closely grouped or possibly stellate trichomes; *Pentagonia angustifolia* C. M. Taylor, found in western Panama and formerly confused with *P. nuciformis* Dwyer; *P. dwyeriana* C. M. Taylor, found in western Panama and formerly confused with *P. macrophylla* Bentham; *Pentagonia monocaulis* C. M. Taylor, found in eastern Costa Rica and formerly confused with *P. donnell-smithii* (Standley) Standley; and *Pentagonia sanblasensis* C. M. Taylor, found in central Panama and also formerly confused with *P. macrophylla*. The new combination *H. panamensis* (Dwyer) C. M. Taylor is based on *Duroia panamensis* Dwyer, and a description is presented for this poorly known species, which is actually the most commonly collected species of *Hippotis* in Central America and adjacent northwestern Colombia.

Key words: Hippotideae, *Hippotis*, neotropics, *Pentagonia*, Rubiaceae.

The Neotropical genus *Hippotis* Ruiz & Pavón (Hippotideae; Robbrecht, 1993; Rova & Andersson, 1995) comprises about 11 species of shrubs and small trees found in wet lowland forests from Nicaragua to Bolivia. This genus is distinguished in the Rubiaceae by the combination of its lack of raphides; its interpetiolar stipules that are convolute or induplicate-valvate with the resulting structure often twisted again; its leaves with the higher order venation striolate or lineolate (i.e., very closely set and parallel within the areoles; Rova & Andersson, 1995); its axillary, usually solitary flowers; its well-developed calyx limbs that are spathaceous (i.e., completely fused in bud forming a closed structure that is split along one side or sometimes irregularly by the elongating corolla); its funnelform corollas with five valvate or reduplicate-valvate lobes; its baccate fleshy fruits with the large calyx limb usually persistent; and its seeds that are angled, generally smooth, and numerous on placentas that are axile at the base and parietal above (Rova & Andersson, 1995). The corollas are often rather zygomorphic with the tube broadly curved. *Hippotis* was last studied as a whole by Steyermark (1965); this work is now somewhat dated.

The Neotropical genus *Pentagonia* Bentham (Hippotideae; Robbrecht, 1993; Rova & Andersson, 1995) comprises about 25 to 30 species of shrubs and small trees found in wet lowland to premontane forests from Guatemala to Peru, in both primary and secondary vegetation. This genus is distinguished in the Rubiaceae by the combination of its fleshy, relatively large vegetative and reproductive structures; its lack of raphides; its interpetiolar convolute stipules; its leaves with the abaxial and often also the adaxial surfaces finely striate (described and illustrated in detail by Rova & Andersson, 1995); its axillary, cymose to subcapitate or glomerulate, sessile to usually shortly pedunculate inflorescences; its calyx limb that is usually five-lobed with the lobes often well developed and imbricated in bud, or alternatively this limb is sometimes spathaceous; its corollas with well-developed tubes and five valvate lobes; its five included stamens with the filaments pubescent on their bases; its baccate, coriaceous to rather woody, usually lenticellate, generally subglobose fruits; and its seeds that are angled, smooth on the sides, and numerous on fleshy placentas that are axile at the base and parietal above (Rova & Andersson, 1995). Plants of *Pentagonia* usually contain generous amounts of mucilaginous latex or sap, which is visible in dried specimens as elastic filaments that stretch between broken edges of most tissues. The flowers are often slightly zygomorphic in their broadly curved tubes and the arrangement of their lobes and anthers, with the anthers usually grouped on the lower side of the flower and imbricated end-to-end because of the twisting and thus relative shortening of the filaments from the upper side of the flower.

Several morphological structures found in some

species of *Pentagonia* are unusual in the Rubiaceae. The most striking of these is pinnatifid leaf shape (e.g., *P. tinajita* Seemann, *P. lobata* C. M. Taylor). Pinnatifid leaves may be lobed shallowly (e.g., some plants of *P. tinajita*) to essentially completely, with the blade tissue between the lobes sometimes reduced to a ridge of tissue along the costa (e.g., some plants of *P. alba* Dwyer and *P. pinnatifida* Seemann). Pinnatifid leaves are infrequent in the Rubiaceae, and are otherwise known in the neotropics only in occasional plants of some species of *Simira*. Pinnatifid *Pentagonia* species are most numerous in Panama and Costa Rica. Some species of *Pentagonia* have a "trash bucket" habit, with sessile or subsessile leaves that are rounded to auriculate at the base. These leaf bases form a cup or platform around the stem where leaf litter accumulates (e.g., *P. wendlandii* Hooker f.). Occasional herbarium specimens have small adventitious roots arising from the stems just above the nodes; these probably grew into the decaying accumulated litter. A number of species of *Pentagonia* are striking also in their unbranched or monocaulous habit (e.g., *P. macrophylla* Bentham). These plants may be as much as 3.5 m tall, and this monocaulous habit is loosely correlated with leaves that are relatively large. The leaves of these monocaulous species may be as much as 1.2 m long (e.g., *P. magnifica* K. Krause, *P. gigantifolia* Ducke). This aspect of the habit is here considered a generally consistent character for species of *Pentagonia*; some taxonomists have considered it variable within a species. Species of *Pentagonia* also show a notable variability in the development of their inflorescence bracts: in general, these are either relatively reduced to absent (to 1 mm long; e.g., *P. parvifolia* Steyermark), or quite well developed (5–30 mm long, e.g., *P. macrophylla*, *P. wendlandii*). Degree of development of the inflorescence bracts is also here considered a generally consistent character within species of *Pentagonia*.

Standley (1914b) presented a taxonomic history of this genus and noted that the name *Pentagonia* Bentham which was applied to these plants was illegitimate because it had been used twice previously, and that *Watsonamra* Kuntze was the first valid and legitimate name for them. At the same time Standley (1914a) published the genus name *Nothophlebia* Standley for a Costa Rican species that he distinguished from *Watsonamra* by its campanulate, only shallowly lobed calyx limb. Subsequently, the name *Pentagonia* Bentham was conserved for this group, and *Nothophlebia* was reduced to synonymy of *Pentagonia* (Burger & Taylor, 1993) as the relatively wide variation in this group's calyx morphology became evident. *Pentagonia* has not been studied as a whole since Standley's (1914b) article and is relatively poorly known. The large fleshy plants are difficult to prepare as good herbarium specimens. Most species of *Pentagonia* are locally uncommon in Central America and Colombia (pers. obs.; cf. Ernst, 1989). Little is known about population-level morphological variation, though study of this would be useful for the characters considered taxonomically informative (e.g., pubescence, corolla, and fruit sizes). Freeman and Stiles (1990), Stiles and Freeman (1993), and Janzen (1971) noted that *Pentagonia* flowers produce significant nectar, and in a lowland forest in Costa Rica are visited by hermit hummingbirds, large bees, and lepidopterans. The floral biology of *Pentagonia macrophylla* was studied by McDade (1986), who found the flowers to be protandrous, sequentially unisexual in function, and strongly synchronized among the plants of a single population.

The new species of *Hippotis* and *Pentagonia* described below were discovered during preparation of the Rubiaceae treatment for the *Flora Mesoamericana*.

New Species and a New Combination

Hippotis panamensis (Dwyer) C. M. Taylor, comb. nov. Basionym: *Duroia panamensis* Dwyer, Ann. Missouri Bot. Gard. 55: 138. 1968. TYPE: Panama. Bocas del Toro: Duwebdulup Peak, N of R. Terebé across from W. Huron (behind chief's house), 300–900 m, 13 Apr. 1968, *J. H. Kirkbride, Jr. & J. A. Duke 571* (holotype, MO-1968346; isotypes, MO-1968345, PMA).

Trees or treelets to 17 m tall; stems pilose to hirsute. *Leaves* elliptic to usually obovate, 12–35 × 5.5–18 cm, at apex acuminate, at base cuneate to subtruncate, drying papyraceous to chartaceous, on both surfaces pilose to hirsute; secondary veins 7 to 10 pairs, not looping to interconnect, without domatia; petioles 1–3.5 cm long; stipules elliptic to lanceolate, 1.5–3 cm long, obtuse to acute. *Flowers* solitary, ebracteate; peduncles 1–10 mm long; hypanthium ellipsoid, ca. 5 mm long, densely sericeous; calyx limb spathaceous, 2.5–4 cm long, hirsute, apex entire and acute to irregularly 2- or 3-lobed, lobes acute; *corolla* funnelform, white to cream, externally sericeous to hirsute, internally glabrous, tube 35–45 mm long, lobes 5, triangular, 5–8 mm long, acute to obtuse; anthers ca. 3 mm long, filaments hirsute at base; stigmas ca. 2 mm

long. *Fruits* ellipsoid, 3–4 × 1–3 cm, hirsute to pilose; seeds ca. 2 mm long.

This species is found in wet forests at 0–900 m elevation from Nicaragua to northeastern Colombia; it has been collected with flowers most frequently in February and also in March, April, August through October, and December, and in fruit in February and April through October.

Dwyer (1980) described this species in *Duroia* Aublet probably based mainly on its general aspect, the hirsute to pilose pubescence of all its vegetative organs, its externally sericeous corollas, and its usually solitary, rather large (i.e., several cm in diameter), baccate fruits. However, his species clearly belongs instead to *Hippotis* as shown by its interpetiolar, induplicate-valvate stipules (vs. fully fused into a circumscissile calyptrate structure in *Duroia*), its lineolate higher-order leaf venation (vs. irregularly reticulated in *Duroia*), its bisexual flowers (vs. unisexual on dioecious plants in *Duroia*), its spathaceous calyx limb (vs. tubular and truncate to regularly lobed in *Duroia*), and its five corolla lobes (vs. six to nine in *Duroia*).

Dwyer (1980) treated this species together with the following, *Hippotis stellata*, under the name *Hippotis albiflora* H. Karsten. However, *H. albiflora* is a species restricted to Colombia and Venezuela (Steyermark, 1965). Because of this confusion and also the limited usefulness of the original description of *Duroia panamensis*, a complete description and a list of representative specimens are presented here. *Hippotis panamensis* is distinguished from the other species in this genus by the combination of its spreading pubescence on the vegetative organs and fruits, its stipules 1.5–3 cm long, its petioles 1–3.5 cm long, its solitary flowers with peduncles 1–10 mm long, its relatively long calyx limbs, and its relatively long white corollas. *Hippotis albiflora* differs in its appressed pubescence, its flowers 1 to 3 per leaf axil on pedicels 7–11 mm long, its calyx limbs 16–23 mm long, and its corollas 35–42 mm long.

Representative specimens. COLOMBIA. **Chocó:** Parque Nacional de Utría, en la falta de la serranía que bordea el Río San Pichí, *F. García C. & Agualimpia 470* (MO). COSTA RICA. **Cartago:** 24 km NE of Turrialba on highway to Limón, then E at Tres Equis on jeep road 1.5 km, *Liesner et al. 15379* (MO). **Heredia:** Finca La Selva, the OTS field station on the Rio Puerto Viejo just E of its junction with the Rio Sarapiquí, along W Boundary Trail, 2900 m line, *Grayum 2352* (MO). **Limón:** Cerro Coronel, E of Laguna Danto, *Stevens & Montiel 24363* (MO, PTBG). NICARAGUA. **Río San Juan:** sobre el Río Sábalo, *P. P. Moreno & Robleto 26007* (MO). **Zelaya:** along road to Colonia Yolaina, Colonia La Esperanza, etc. [sic], ca. 1.3 km SE of intersection with road between Nueva Guinea and Colonia Verdun, immediately upriver from bridge over Caño Sardina, *Stevens 6306* (MO). PANAMA. **Bocas del Toro:** near highway to Chiriquí Grande, 10 road-mi. from continental divide and about 2 road-mi. along road E of highway, *McPherson 11822* (MO).

Hippotis stellata C. M. Taylor & J. H. E. Rova, sp. nov. TYPE: Panama. Darién: Parque Nacional del Darién, ridge between N and S branches of Río Pucuro, in forest N of old village of Tacarcuna, ca. 18 km N of Pucuro, 8°05′N, 77°16′W, 600–800 m, 24 Oct. 1987, *B. Hammel, G. de Nevers, H. Cuadros & H. Herrera 16473* (holotype, PMA; isotypes, MO-3607390, PTBG-7273). Figure 1.

Haec species a congeneris foliis calyce fructuque pubescentia plerumque adpressa vestitis, limbo foliari subtus secus venationem tertiariam trichomatibus ramosis ex ramulo centrali elongato etiam ramulis basalibus brevibus numerosis constantibus induto, limbo calycino 30–40 mm longo atque corollae albae tubo ca. 50 mm longo ac lobulis 10–12 mm longis distinguitur.

Shrubs or small trees to 15 m tall; stems densely strigillose to sericeous. *Leaves* elliptic to obovate, 13–35 × 6–18 cm, at apex acuminate, at base obtuse to rounded, drying papyraceous to chartaceous, adaxially strigillose and scabridulous, abaxially strigillose and hirtellous with trichomes mixed simple and sessile-stellate; secondary veins 8 to 10 pairs, not to weakly looping to interconnect, without domatia or rarely with crypt-type domatia; petioles 1–3 cm long; stipules lanceolate-oblong, 9–16 mm long, obtuse. *Flowers* solitary; peduncles 4–6 mm long, densely strigillose to sericeous; hypanthium turbinate, 6–7 mm long, densely velutinous; calyx limb 30–40 mm long, densely strigillose, spathaceous and acute, irregularly and shortly 1- to 4-lobed; *corolla* funnelform, white, externally moderately to densely sericeous, internally glabrous, tube ca. 50 mm long, lobes ligulate, 10–12 mm long, obtuse to rounded; anthers and stigmas not seen. *Fruits* ellipsoid, ca. 3 × 2 cm, densely strigillose, brown.

Distribution, habitat, and phenology. In wet forest at 350–1500 m, eastern Panama through western coastal Colombia to northwestern Ecuador; collected with flowers in February, April, June, October, and November, with fruits in February, April, May, July, and September.

This new species is distinguished from other *Hippotis* by the unusual trichomes found on its leaf undersides, which are unlike the trichomes known from other *Hippotis* species: these are apparently stellate or multiradiate with one large central arm and 3 to 20 shorter arms arranged generally in a

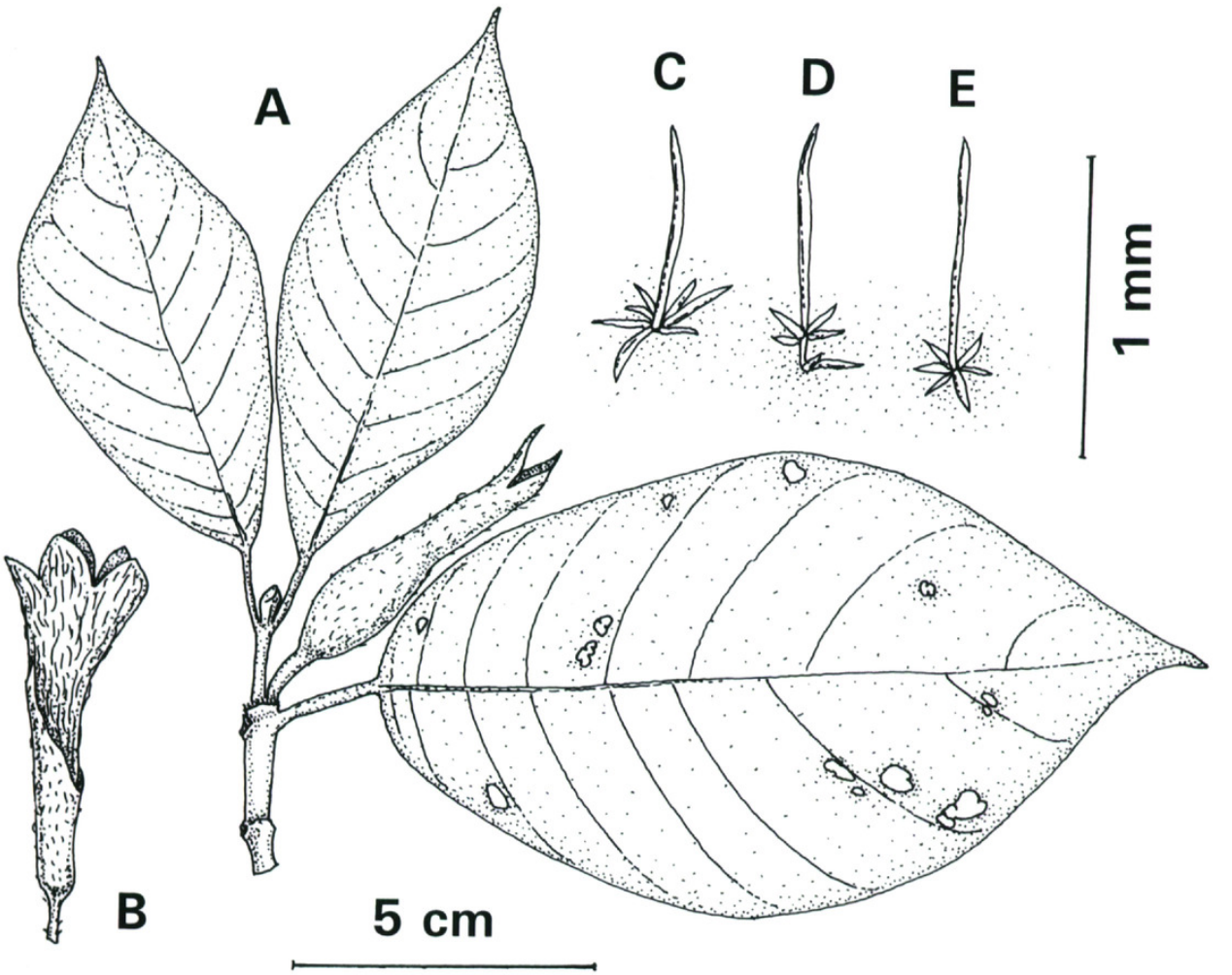

Figure 1. *Hippotis stellata* C. M. Taylor & Rova. —A. Fruiting branch. —B. Flower. —C, D, E. Branched trichomes from abaxial leaf surface. A, based on *Orozco et al. 2347*; B, C, D, E, based on *Hammel et al. 16473*. A, B to 5-cm scale; C, D, E to 1-mm scale.

basal rosette. Each of the arms is unicellular. The species epithet refers to these trichomes. Individual plants of some other species of *Hippotis* (e.g., *H. panamensis*) have a mixture of short and long trichomes on their leaf undersides, and these are occasionally grouped to almost fasciculate. It seems likely that the apparently stellate trichomes found in *H. stellata* are formed from the fusion among these grouped unequal trichomes rather than by branching of individual trichomes. Such stellate or closely grouped trichomes are otherwise unreported in Rubiaceae (Robbrecht, 1988).

This new species is also distinguished by its calyx limbs 30–40 mm long and its white corollas with tubes ca. 50 mm long and lobes 10–12 mm long. Dwyer (1980) included this species together with *Hippotis panamensis* in his circumscription of *H. albiflora*, as discussed above under *H. panamensis*. However, *H. albiflora* differs from this new species in its pedicels 7–11 mm long, its calyx limb 16–23 mm long, and its corollas 35–42 mm long. Also similar to *H. stellata* is *H. grandiflora* Steyermark from Pacific coastal Colombia; *H. grandiflora* differs from this new species in its stipules 30–35 mm long, its petioles 6–10 mm long, its bracteoles 30 × 10–15 mm long, its calyx limb with the tube 43–47 mm long and lobes 6–10 mm long, and its corolla ca. 80 mm long.

Paratypes. COLOMBIA. **Antioquia:** mpio. Frontino, correg. La Blanquita, region de Murrí, vía Nutibara–La Blanquita, 14.5 km O de Nutibara, 15–16 km del Alto de Cuevas–La Blanquita, *Callejas et al. 6762* (HUA, MO); Parque Nacional Natural "Las Orquídeas," Sector Venados, *Cogollo et al. 2865* (JAUM, MO); Murrí, La Blanquita, Río Murrí, hills above village, *Gentry et al. 75739* (MO); mpio. Cocorná, vereda La Piñuela, carretera a San Francisco, *Giraldo-Cañas 916* (HUA, MO); mpio. Frontino, vereda Venados, Parque Nacional Natural "Las Orquídeas," Quebrada Las Manzanares, *Pipoly et al. 18211* (JAUM, MO). **Chocó:** mpio. Nuquí, correg. Termales, Quebrada Piedra Piedra, *Acevedo-Rodríguez et al. 6783* (MO, US); NW of Alto Curiche, *Duke 11258* (MO). **Risaralda:** mpio. de Mistrató, correg. de Puerto de Oro, vereda Chirrinchá, Finca La Cilia, *C. I. Orozco et al. 2347* (COL, MO). ECUADOR. **Carchi:** cantón Tulcan, Reserva Etnica Awá, parroquia El Chical, Centro Gualpi Medio,

Rio Cabumi, *A. Grijalva et al. 591* (MO); cantón Tulcan, around encampment in Gualpi Chico area of Awá Reservation, NW and SE, *Hoover et al. 3695* (MO); cantón Tulcan, Reserva Etnica Awá, parroquia El Chical, Centro San Marcos, *P. Méndez et al. 373* (MO); cantón Tulcan, Reserva Indígena Awá, comunidad San Marcos, 25 km al NW de El Chical, parroquia Maldonado, *D. Rubio et al. 1051* (MO). PANAMA. **San Blas:** Pemasky, Sendero Ina Igar, *R. Peralta 608* (MO).

Pentagonia angustifolia C. M. Taylor, sp. nov. TYPE: Panama. Veraguas: on Caribbean slope above Río Primero Brazo 5 mi. NW of Santa Fe, 700–1200 m, 18–19 Mar. 1973, *R. L. Liesner 993* (holotype, MO-2257090). Figure 2C.

Haec species a *Pentagonia nuciformi* habitu monocauli breviore, a *Pentagonia monocauli* foliis angustis 10–16 cm latis atque limbo calycino glabrescente 17–18 mm longo distinguitur.

Slender trees to 4 m tall, unbranched; stems glabrescent. *Leaves* entire, narrowly oblanceolate to narrowly ligulate or elliptic-oblong, 35–50 × 10–16 cm, at apex acute to acuminate, at base acute to attenuate or obtuse to rounded, drying chartaceous, adaxially glabrous, abaxially glabrescent or sometimes strigillose on principal veins; secondary veins 11 to 13 pairs; petioles 5–8.5 cm; stipules lanceolate to ovate, 2.5–4.8 cm long, acute to acuminate, smooth, abaxially and adaxially glabrous. *Inflorescences* congested-cymose, puberulous to glabrescent; peduncles 5–7 cm long; bracts reduced or absent; pedicels 2–3 mm long; *flowers* ca. 7, pedicellate; hypanthium turbinate, ca. 5 mm long, glabrescent; calyx limb 17–18 mm long, glabrescent, color not noted (probably green), lobed for ⅓–½, lobes 5, elliptic, ciliolate, obtuse to rounded, somewhat cucullate; *corolla* in bud tubular, color not noted, externally glabrescent, internally not seen, tube to 22 mm long, lobes 5, deltate, to 5 mm long, acute; anthers and stigmas not seen. *Fruits* several, subglobose, 25–30 mm diam., densely lenticellate, yellow, glabrescent; seeds not seen.

Habitat, distribution, and phenology. In wet forest at 450–1200 m in western Panama; collected in flower in March and August, in fruit in May and October.

This new species differs from *Pentagonia nuciformis* Dwyer by its relatively short monocaulous habit, its pedicellate flowers, and its longer calyx limbs; plants of *P. nuciformis* branch and frequently are up to 15 m tall, with sessile or subsessile flowers and calyx limbs 5–8 mm long. *Pentagonia angustifolia* is similar in habit to *P. monocaulis* (described below), but *P. monocaulis* can be quickly distinguished by its broader leaves, 26–36 cm wide. The specific epithet of this new species refers to its relatively narrow leaves. The flowers of the type collection may be mature, but more likely these are well-developed buds that partially and prematurely opened after collection.

Paratypes. PANAMA. **Veraguas:** valley of Río Dos Bocas along road between Escuela Agrícola Alto Piedra and Calovébora, 15.6 km NW of Santa Fe, *Croat 27561* (MO); Cerro Tute, W of Santa Fe, beyond Alto de Piedra, *McPherson 7187* (MO); NW of Santa Fe, 8.8 km from Escuela Agrícola Alto de Piedra, Pacific slope, *Mori & Kallunki 6184* (MO).

Pentagonia dwyeriana C. M. Taylor, sp. nov. TYPE: Panama. Coclé: hills above road 18 km past Sardinilla on way to Nombre de Dios (road not finished), 150–300 m, 2 Aug. 1974, *T. B. Croat 26123* (holotype, MO-2205421). Figure 2A, B.

Haec species a *Pentagonia macrophylla* bracteis acutis anguste triangularibus usque lingulatis distinguitur.

Small trees to 5 m tall, branching pattern not noted; stems densely pilosulous or hirtellous sometimes becoming glabrescent. *Leaves* entire, oblanceolate to narrowly elliptic-oblong, 35–65 × 12–25 cm, at apex acute to somewhat acuminate, at base obtuse to rounded, drying chartaceous, adaxially and abaxially moderately to densely pilosulous or hirtellous; secondary veins 13 to 18 pairs; petioles 6.5–10.5 cm long; stipules narrowly triangular, 32–40 mm long, acute, smooth, adaxially sericeous to glabrescent, abaxially densely sericeous. *Inflorescences* glomerate to congested-cymose, densely strigillose; peduncles 0–10 mm long; bracts narrowly triangular to lanceolate, 1.5–3 × 0.3–0.8 cm, acute to long-acute; *flowers* sessile or subsessile; hypanthium turbinate, ca. 6 mm long, densely sericeous; calyx limb ca. 15 mm long, densely strigillose to sericeous, lobed for ca. ½, perhaps yellow, lobes 5, elliptic to ovate, obtuse to rounded; *corolla* tubular, pale yellow, externally densely velutinous except glabrous in basal ¼–⅓, internally not seen, tube ca. 30 mm long, lobes 5, narrowly triangular to ligulate, ca. 6 mm long, acute; anthers and stigmas not seen. *Fruits* several, subglobose to ellipsoid, 2–3 × 2–2.5 cm, yellow, sparsely lenticellate, glabrescent, with bracts persisting and pink; seeds ca. 4 mm long.

Habitat, distribution, and phenology. In wet forest at 150–700 m in western Panama; collected in flower in August, in fruit in January and August.

This new species is similar to *Pentagonia macrophylla* Bentham, but it is easily separated from that by its narrower, acute inflorescence bracts.

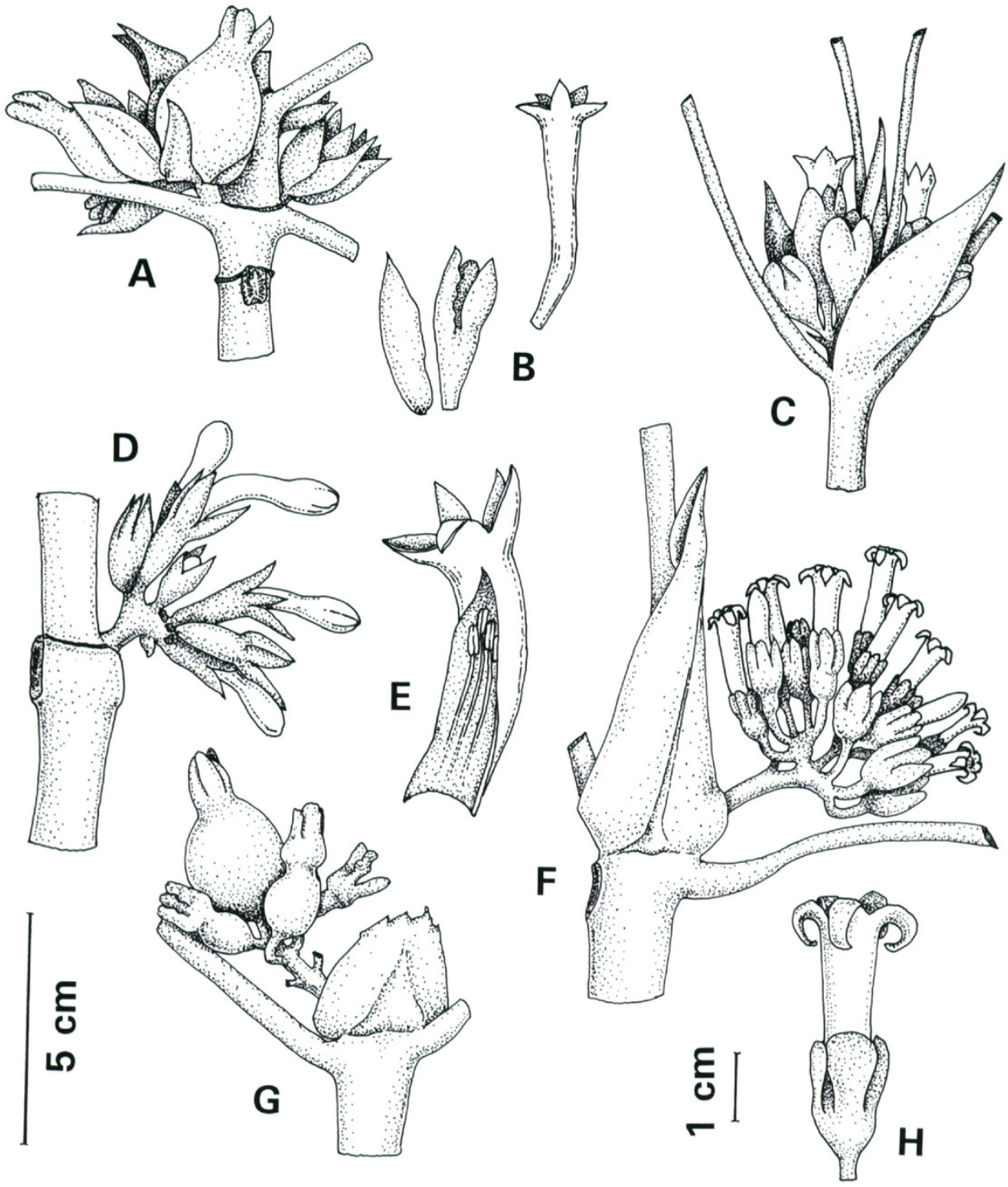

Figure 2. A, B. *Pentagonia dwyeriana* C. M. Taylor, based on *Croat 26123*. —A. Part of stem with infructescence. —B. Flower partly dissected with (left to right) bract, calyx, and corolla. —C. *Pentagonia angustifolia* C. M. Taylor, based on *Liesner 993*. D, E. *Pentagonia sanblasensis* C. M. Taylor, based on *Sytsma & Andersson 4500*. —D. Part of stem with inflorescence. —E. Corolla, partly dissected. F, G, H. *Pentagonia monocaulis* C. M. Taylor, based on *Croat 35720*. —F. Part of stem with infructescence and broken stipule. —G. Part of stem with inflorescence. —H. Flower. A, C, D, G to 5-cm scale; B, E, H to 1-cm scale.

Pentagonia macrophylla has obtuse to rounded bracts 6–15 mm wide, and also differs from this new species in its usually fewer secondary leaf veins (10 to 14 pairs) and its calyx limb lobed for ¾ or more of its length. The epithet of this new species commemorates John D. Dwyer, who prepared the Rubiaceae treatment for the *Flora of Panama* (Dwyer, 1980).

Paratypes. PANAMA. **Colón:** N of Diamante, ridge NW of abandoned mine on Quebrada de la Mina, *H. W. Churchill & de Nevers 4213* (MO), *4214* (MO, PMA).

Pentagonia monocaulis C. M. Taylor, sp. nov. TYPE: Costa Rica. Heredia: near Puerto Viejo along road near Río Sucio, 20 m, 27 May 1976, *T. B. Croat 35720* (holotype, MO-2381703). Figure 2F, G, H.

Haec species a *Pentagonia donnell-smithii* habitu simplici, limbo calycino dense strigilloso atque corolla cremosa luteave extus dense velutino-tomentulosa distinguitur.

Shrubs or small trees to 3.5 m tall, unbranched or perhaps sparsely branched; stems pilosulous or puberulous to glabrescent. *Leaves* entire, obovate to broadly elliptic, 30–63 × 26–36 cm, at apex acute to obtuse or somewhat acuminate, at base obtuse to rounded or truncate, drying chartaceous to subcoriaceous, adaxially glabrescent, abaxially strigillose to glabrescent on the lamina and moderately to densely strigillose on the principal veins; secondary veins 12 to 16 pairs; petioles 3–15 cm long; stipules ligulate to lanceolate, 3.5–7.5 cm long, acute, adaxially glabrous, abaxially moderately to densely strigillose to glabrescent. *Inflorescences* subcapitate to congested-cymose, strigillose to glabrescent; peduncles 0.5–2 cm long; axes conspicuously lenticellate; bracts none or reduced, up to 1 mm long, rounded; pedicels 0–3 mm long; *flowers* sessile to shortly pedicellate; hypanthium cylindrical to ellipsoid, 4–5 mm long, densely strigillose; calyx limb 10–15 mm long, densely strigillose, green, lobed for ⅓–½, lobes 5, elliptic to ligulate, obtuse to rounded, entire to sparsely ciliolate, frequently somewhat cucullate; *corolla* tubular, cream to usually yellow, externally densely velutinous-tomentulose except glabrous near base, internally glabrous except densely hirtellous just above stamen insertion, tube 28–34 mm long, lobes 5, narrowly triangular or lanceolate, 8–10 mm long, acute; anthers ca. 3.5 mm long, positioned variously ⅔ of length of corolla tube above base to just below corolla throat, filaments ca. 12 mm long, villous on bases; stigmas ca. 3.5 mm long, positioned near anthers. *Fruits* several, subglobose to ellipsoid, 20–25 mm diam., glabrescent, lenticellate, brown to orange; seeds ca. 23 mm long.

Habitat, distribution, and phenology. In wet forests at 0–900 m, Caribbean slopes of Costa Rica; collected in flower in January, March through July, and October, in fruit in January, July, September, and November.

This new species is similar to *Pentagonia donnell-smithii* (Standley) Standley (Burger & Taylor, 1993; Taylor, 2001); it differs from *P. donnell-smithii* in its low unbranched habit, its densely strigillose calyx limbs, and its externally densely velutinous-tomentulose, cream to yellow corollas. In contrast, *P. donnell-smithii* has a branched habit up to 15 m tall, glabrous calyx limbs, and externally glabrous, white to pink corollas. The specific epithet of *P. monocaulis* refers to its habit.

Paratypes. COSTA RICA. **Heredia:** Parque Nacional Braulio Carrillo, estación Magsasay, *G. Carballo 91* (INB, MO); cantón de Sarapiquí, Río Sarapiquí near Puerto Viejo, Estación Biológica La Selva, *A. Faivre 6* (INB, MO), *Gentry & Ortiz 78595* (MO), *L. J. Poveda 697* (MO), *D. Smith 538* (DUKE, MO); cantón de Sarapiquí, cuenca del Sarapiquí, La Virgen, margen del Río San Ramón, carreterea al Tirimbina, *A. Rodríguez & Fernández 1413* (INB, MO). **Limón:** cantón de Pococi, Refugio Nacional Barra del Colorado, Llanura de Tortuguero, Sardinas, *F. Araya et al. 236* (INB, MO); between Río Chirripocito and Río Sardina ("Sardinal"), *Grayum 9784* (CR, MO); Guapiles, on road from Guapiles to Río Chirripó, *Barringer & Gómez-Laurito 2369* (MO); hills 3.4 airline km S of Islas Buena Vista in the Río Colorado, 16 airline km SW of Barra del Colorado, *Davidse & Herrera 31280* (MO); path from Río Sucio to González farm, Braulio Carrillo, *L. D. Gómez et al. 22736* (MO); Cerro Coronel, E of Laguna Danto, *Stevens 23702* (MO); E of Río Zapote, *Stevens 23944* (MO), *24300* (MO), *Stevens et al. 24677* (MO); Barra del Colorado, N side, between town and ocean beach, *Stevens 24099* (MO). NICARAGUA. **Río San Juan:** entre el Pueblo de San Juan del Norte Nuevo y la casa de Ramón Castillo, viajando por el caño San Juanillo, *Rueda et al. 1862* (MO).

Pentagonia sanblasensis C. M. Taylor, sp. nov. TYPE: Panama. San Blas: El Llano–Cartí road, 12 mi. from PanAmerican Hwy., 350–400 m, 10 May 1981, *K. Sytsma & L. Andersson 4500* (holotype, MO-2929899). Figure 2D, E.

Haec species a congeneris pubescentia dense velutina, foliis satis amplis, inflorescentia subsessili glomerata, calycis limbo profunde lobato 12–20 mm longo ac lobulis acutis atque fructu luteo 22–25 mm in diametro distinguitur.

Small trees to 5 m tall, possibly monocaulous; stems glabrescent, a little to markedly quadrangular and sometimes strongly channeled on sides. *Leaves* narrowly elliptic-oblong to elliptic or oblanceolate, 30–82 × 12–32 cm, at apex obtuse to acute, at base obtuse to rounded or truncate, drying chartaceous to subcoriaceous, adaxially glabrescent, abaxially densely velutinous; secondary veins 12 to 21 pairs; petioles 3.5–9 cm long; stipules narrowly triangular to lanceolate, 1.5–5 cm long, acute, smooth or sometimes with midrib thickened, adaxially glabrous, abaxially densely strigillose. *Inflorescences* glomerate, velutinous or pilosulous to glabrescent; peduncles 0–8 mm long; bracts absent or minute; *flowers* sessile or subsessile; hypanthium

turbinate, 5–6 mm long, densely velutinous; calyx limb ca. 12 mm long, densely velutinous, lobed for ¾ to nearly completely, green, lobes 5, lanceolate to ovate, acute; *corolla* tubular-funnelform, white to yellow, externally densely velutinous except glabrous in basal ⅓, internally glabrous except puberulous in basal ⅓, tube ca. 43 mm long, lobes 5, narrowly triangular, ca. 10 mm long, acute; anthers ca. 4 mm long, positioned ca. ⅔ of length of corolla tube above its base, filaments 15–17 mm long, villous on bases; stigmas ca. 2 mm long, situated near anthers. *Fruits* several, subglobose to ovoid, 22–25 mm diam., velutinous to glabrescent, yellow; mature seeds not seen.

Habitat, distribution, and phenology. In wet forests at 0–400 m in central Panama; collected in flower in May and June, in fruit in March, April, and September.

This new species is distinguished by its combination of densely velutinous pubescence, relatively large leaves (even for *Pentagonia*, i.e., to 1 m or more long), glomerate subsessile inflorescences, deeply lobed calyx limbs 12–20 mm long, acute calyx lobes, and yellow fruits 22–25 mm in diameter. The specific epithet refers to the only region from which this new species is known. Similar species are *Pentagonia macrophylla* and *P. dwyeriana*, which both differ from *P. sanblasensis* in their well-developed red inflorescence bracts 5–20 mm long, and *P. sprucei* Standley, which differs in its subtruncate to shallowly lobed calyx limbs 10–12 mm long with the lobes obtuse to rounded.

Paratypes. PANAMA. **San Blas:** El Llano–Cartí road, 19 km from Interamerican Hwy., *de Nevers & Herman 3830* (MO, PMA); Km 27.6, Río Pingandi, *de Nevers et al. 5027* (MO); Km 26.5, along Río Cartí Chico, *de Nevers et al. 5344* (MO, PMA), *5831* (MO sterile, PMA), *7830* (MO); Cangandí, *de Nevers 5698* (MO sterile); Río Cangandí, camino entre el pueblo Cangandí y el aeropuerto de Mandinga, *H. Herrera 107* (MO, PMA); frente a la Isla Miria Ubigandup, camino Sangandi, *H. Herrera & Harris 321* (MO); 34–38 km from Pan-American Hwy. on El Llano–Cartí road, *Knapp & Schmalzel 5466* (MO, PMA).

Acknowledgments. I thank the curators of DUKE, F, and PMA for access to specimens and information, and in particular Mireya Correa; Johan H. E. Rova for generously providing much information and many helpful comments; Roy E. Gereau for preparation of the Latin diagnoses; L. Andersson for much helpful advice and providing additional data; O. M. Montiel and B. Magill for significant encouragement of this work; and Robin Foster, Tyana Wachter, and a grant from the Andrew Mellon Foundation to the Field Museum of Natural History for support for travel to consult that collection.

Literature Cited

Burger, W. C. & C. M. Taylor. 1993. Flora Costaricensis: Family #202. Rubiaceae. Fieldiana, Bot. n.s. 33: 1–333.

Dwyer, J. D. 1980. Flora of Panama Part IX. Family 179. Rubiaceae. Ann. Missouri Bot. Gard. 67: 1–522.

Ernst, K. A. 1989. Insect herbivory on a tropical understory tree: Effects of leaf age and habitat. Biotropica 21(3): 194–199.

Freeman, C. E. & F. G. Stiles. 1990. [Abstract 171] Floral nectar sugar compositions of Costa Rican hummingbird-visited taxa. Amer. J. Bot. 77(6): 67.

Janzen, D. H. 1971. Euglossine bees as long distance pollinators of tropical plants. Science 171: 203–205.

McDade, L. C. 1986. Protandry, synchronized flowering and sequential phenotypic unisexuality in Neotropical *Pentagonia macrophylla* (Rubiaceae). Oecologia 68(2): 218–223.

Robbrecht, E. 1988. Tropical woody Rubiaceae. Opera Bot. Belg. 1: 1–271.

———. 1993. Supplement to the 1988 outline of the classification of the Rubiaceae, Index to genera. Opera Bot. Belg. 6: 173–196.

Rova, J. H. E. & L. Andersson. 1995. A reevaluation of the tribes Hippotideae and Tammsieae (Rubiaceae). Nordic J. Bot. 15: 269–284.

Standley, P. C. 1914a. *Nothophlebia*, a new genus of Rubiaceae from Costa Rica. Contr. U.S. Natl. Herb. 17: 437–438.

———. 1914b. A revision of the genus *Watsonamra*. Contr. U.S. Natl. Herb. 17: 439–444.

Steyermark, J. A. 1965. Género *Hippotis*. Acta Bot. Venez. 1: 85–102.

Stiles, F. G. & C. E. Freeman. 1993. Patterns in floral nectar characteristics of some bird-visited plant species from Costa Rica. Biotropica 25: 191–205.

Taylor, C. M. 2001. Rubiaceae. *In:* W. D. Stevens et al., Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Gard. Vol. 85, Tomo 3: 2206–2284.