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A new species of *Tabernaemontana* (Apocynaceae; Rauvolfioideae: Tabernaemontaneae) from Mexico

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Abstract

A new species of *Tabernaemontana* from south-eastern Mexico is described and illustrated. *Tabernaemontana riverae* is separated from all known species of the genus by its long elliptic–lanceolate sepals and infundibuliform corolla. The new species is endemic to Mexico and only observed in the states of Oaxaca, Tabasco, and Veracruz. With this addition, *Tabernaemontana* is represented in Mexico by 15 species, six of them endemic. These numbers highlight Mexico as a diversity center for the genus. We propose a conservation status for the new species and provide a key to the Mesoamerican species of *Tabernaemontana* with leaf-like sepals.

Key words: Stemmadenia, Tabernaemontanineae

Introduction

The genus *Tabernaemontana* Linnaeus (1753: 210) is a member of the family Apocynaceae, and is included in the tribe Tabernaemontaneae G. Don (1837: 70), subtribe Tabernamontaninae together with seven genera (Simões *et al.* 2010, Endress *et al.* 2014). The genus is pantropical with more than 100 species of trees and shrubs (Leeuwenberg 1994, Simões *et al.* 2010). There are approximately 60 species of *Tabernaemontana* in the Americas, with 14 species in Mexico, growing mainly in tropical dry forest. The number of species in Mexico is greater than in other neotropical countries, for example Bolivia (10 spp.), Guatemala (7 spp.), Nicaragua (8 spp.), El Salvador (4 spp.), and Honduras (6 spp.) (Gentry 1998, Morales 2006, 2009a, b, Morales & Méndez 2005, Jørgensen *et al*. 2014); the high species richness suggests Mexico as the northern center of diversity for the genus.

During a revision of *Tabernaemontana* from Mexico, we encountered specimens from the Atlantic slope of the country that were identified as *T. eubracteata* (Woodson 1928: 368) A.O. Simões & M.E. Endress (2010: 787); however, upon closer examination we recognized that these specimens did not adhere to the species description of *T. eubracteata* or to any other taxa in the genus. The species of *Tabernaemontana* are identified by the size and morphology of the sepals, flowers, and fruits (Leeuwenberg 1994, Morales 1999, Morales & Méndez 2005, Alvarado-Cárdenas 2007, Morales 2009, Alvarado-Cárdenas & Juárez-Jaimes 2012). We compared the floristic attributes of the questionable specimens to putatively similar species of *Tabernaemontana* from Mexico and Central America and discovered that they did not match any of the currently recognized taxa. Based on these comparisons, we propose the recognition of a new species.

Materials and methods

Specimens of *Tabernaemontana* from ENCB, MEXU and XAL were observed for morphological comparison.

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Taxonomic treatment

Tabernaemontana riverae L.O. Alvarado & V. Saynes, ***sp. nov.*** (Fig. 1, 2)

The new species is similar to Tabernaemontana eubracteata but differs in its longer elliptic-lanceolate sepals and longer infundibular corollas.

Type:—MEXICO. Veracruz: Municipality Hidalgotitlán, Campamento Hermanos Cedillo a 4 km hacia Río Alegre, 150 m, 21 March 1975, *Juan & Avendano 15* (holotype: XAL; isotype: MEXU)

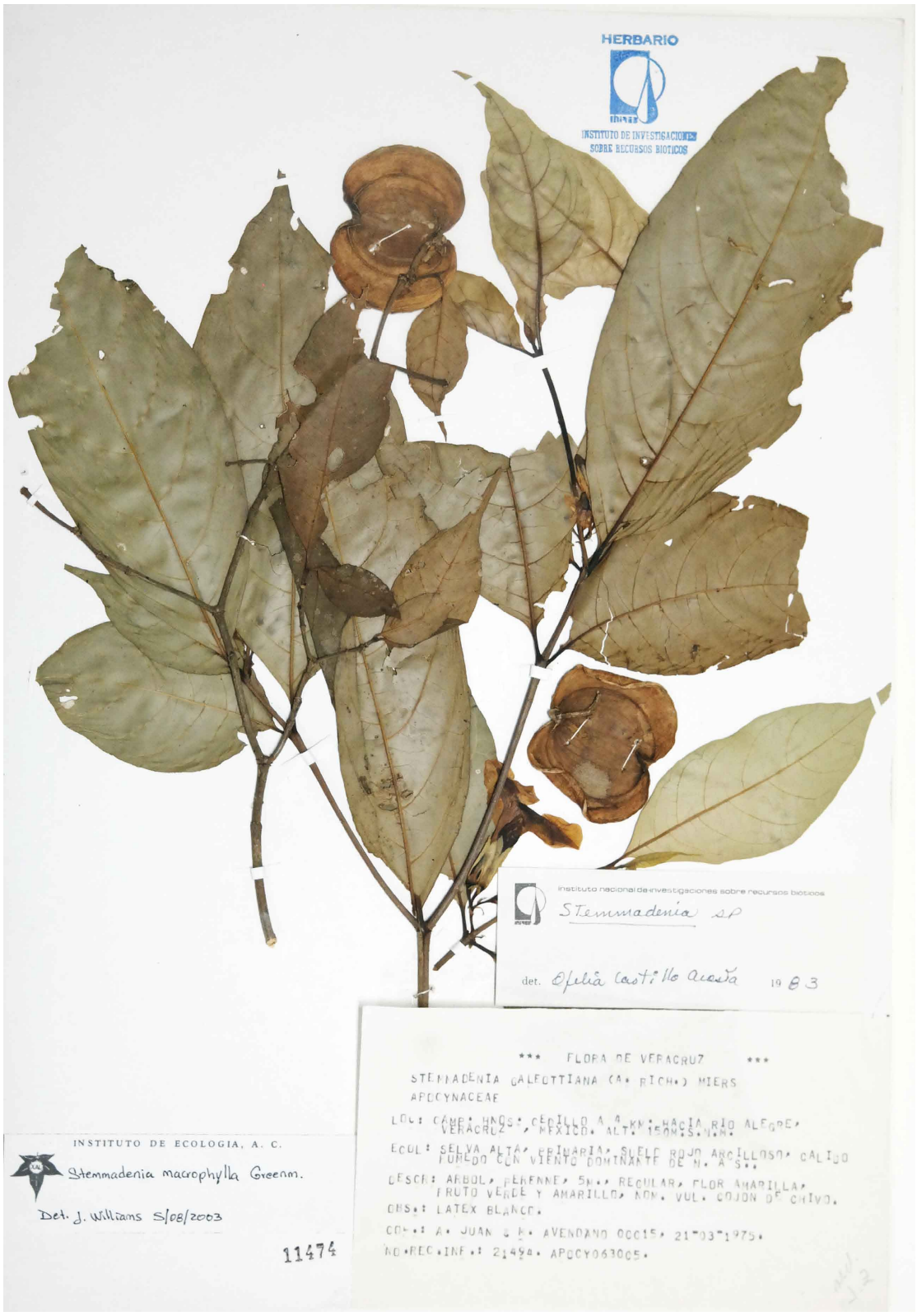

FIGURE 1. Holotype of *Tabernaemontana riverae* deposited in XAL.

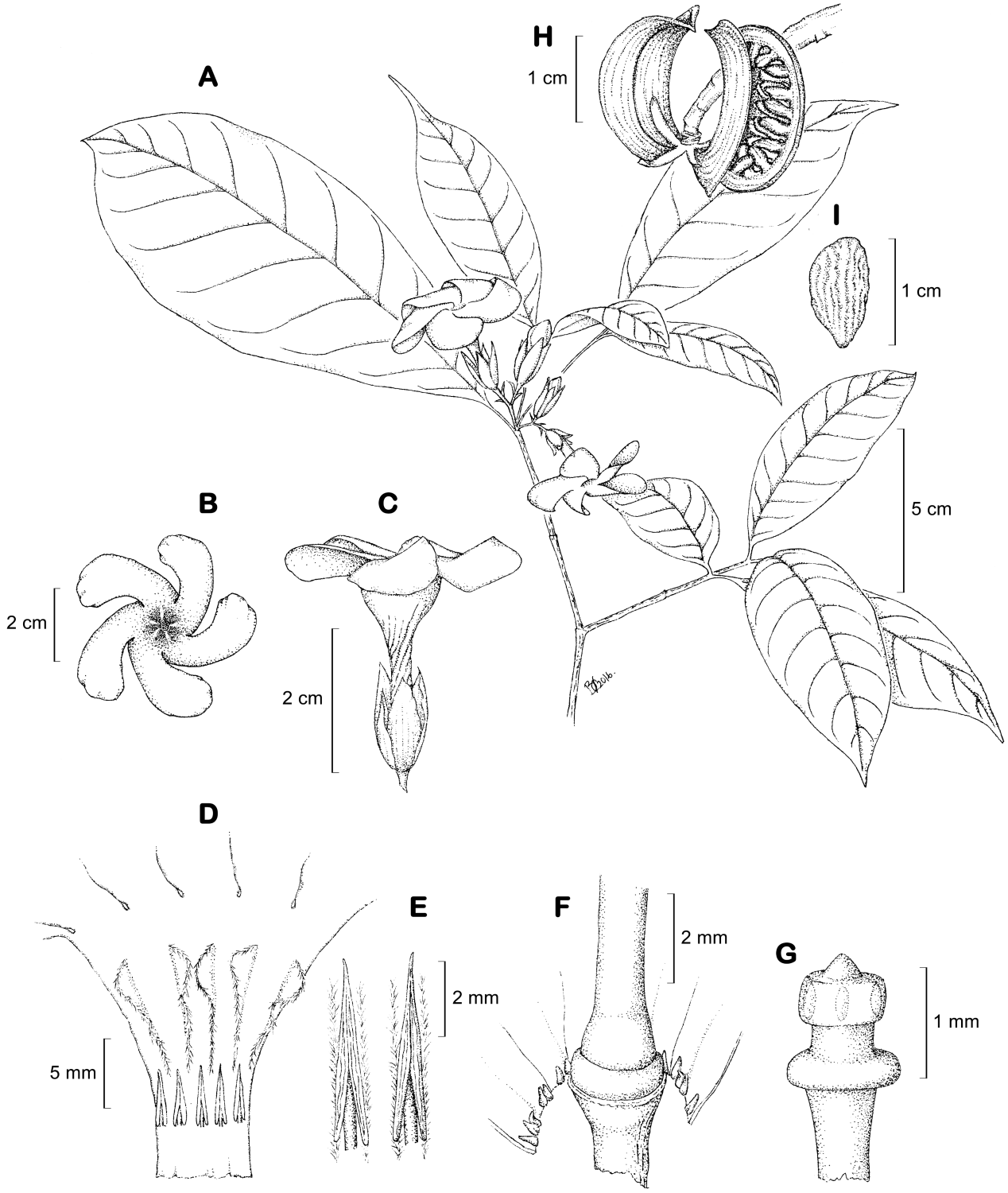

FIGURE 2. *Tabernaemontana riverae.* A. Branch with leaves and flowers. B–C. Flower. D. Flower detail. E. Anthers. F. Detail of base ovary and sepals. G. Stigma. H. Fruit. I. Seed. Illustration based on A–G. *T. Wendt y A. Villalobos 2554*, H–I *Juan & Avedaño 15*.

Trees or shrubs 1.5–6 m tall, stem terete to subterete, bark smooth or slightly verrucose, fissurate with age, with milky latex. Leaves opposite, pairs subequal, petiolate; petiole 0.5–1.2 cm; blade 5–19 × 1.8–4.5(–8) cm, elliptic, ovate to obovate, base obtuse to acute, apex acuminate, glabrous on both sides, to spreading pubescent beneath, membranaceous, venation brochidodromus, with 10 to 12 pair of secondary veins. Inflorescence 2–4 flowered cymes, terminal, peduncle 2–7 mm, glabrous; bracts 3.5–6.3 × 1 mm, linear to linear-lanceolate, greenish, papyraceous; pedicel 4–8 mm, glabrous; sepals subequal, internals 14.2–18.3 × 3.7–6.2 mm, externals (11.5–) 15–21 × 5.2–7.2 mm, elliptic–lanceolate, acute, glabrous, greenish, with 5–7 veins, persistent in fruit, papyraceous when dried; corolla

infundibuliform, yellow to yellowish, glabrous outside, lower tube (13.3–)15–18 × 3.4–5 mm, straight, twisted around the middle in the anther insertion, upper tube 10–14 × 10–15.5 mm, campanulate, suprastaminal appendices or wings present, 15–18 mm long, with a semicircular apical portion, 2–2.5 mm long, pubescent, the tube glabrous above the wings, without thickenings in the mouth of the tube, lobes 15–18 × 14–16 mm, obliquely obovate; stamens included, and inserted halfway up the lower tube, filaments 1.1 mm long, anthers 4.8–5.2 mm long, included, lanceolate, base saggitate, not fused or agglutinated at the top of the style head; Pistil 12–15 mm long, bicarpellary, apocarpous, ovary 1.5–2 × 1.5–2 mm, ovoid, glabrous, ovule numerous, nectary disc present; style 10–13 mm long; style head 1.5–2 mm, capitate. Follicles (2.7–)2.8–4.3 × 1.5–2 cm, obliquely ellipsoid, recurved, apex apiculate, finely striate with 2 evident ridges, non-lenticelated, brownish, glabrous, wall approximately 1.5–2 mm thick; seeds 8.5–9 mm long, oblongoid, striate, with an orange aril.

Additional specimens examined (paratypes): MEXICO. **Oaxaca**. Along road to Uxpanapa from Sarabia, 220 m, 20 February 1987, *Croat & Hannon 65421* (MEXU). Municipality Matías Romero, 22 km al S de Esmeralda, 9 km al S del Aserradero La Floresta, lomas al S del Río Verde, 290 m, 26 March 1981, *Wendt, Villalobos, Navarrete & Anguiano 3073* (MEXU).

Tabasco: Municipality Huimanguillo, entrada del ejido Villa de Guadalupe, viniendo de la Colonia Las Flores, 260 m, 5 April 1998, *Guadarrama, Ortiz, Gómez & Flores 6317* (MEXU).

Veracruz: Municipality Hidalgotitlán, Campamento Hermanos Cedillo a 4.5 km por la escuadra, 150 m, 2 April, 1975, *Ortíz & Martiniano 80* (MEXU). Km 8–12 del camino Plan de Arroyo-Álvaro Obregón, 140 m, 18 April 1974, *Dorantes & Castillo 2872* (XAL). Km 0–25 del Campamento Hermanos Cedillo, camino hacia Río Alegre, desviación al E., 22 April 1974, *Dorantes & Castillo 2951* (XAL). Municipality Minatitlán, 6.6 km al Norte de la terracería La Laguna-Río Grande, sobre el camino nuevo (no completo) a Ejido Belisario Domínguez, el cual sale de la terrracería 14.7 km al E de la Laguna, 130 m, 13 July 1980, *Wendt & Villalobos 2554* (MEXU). Zona Uxpanapa, a 13.7 km al E de La Laguna sobre terracería a Uxpanapa, luego 5–7 km al N, 130 m, 29 March 1982, *Lorence, Wendt, Riviere, Vázquez, Ton & Navarrete 3972* (MEXU, XAL). 13.7 km al E de la Laguna, sobre terracería a Uxpanapa, luego 8 km al N sobre camino nuevo (no completo) a Belisario Domínguez, 130 m, 21 March 1981, *Wendt & Villalobos 3018* (MEXU). Municipality Uxpanapa, Esfuerzo Nuevo, al E cerro Cordón Platanillo, 255 m, 3 May 1996, *Rivera & Escobedo 92* (MEXU).

Habitat:—*Tabernaemontana riverae* grows in evergreen tropical forest and is associated with *Brosimum alicastrum* Swartz (1788: 12) and members of *Bursera* Jacquine ex Linneaus (1762: 471), Anacardiaceae, Lauraceae and Clusiaceae. The species grows in drained soil on rocky hills between 130–290 m elevation in the Gulf of Mexico south of Veracruz and east of Oaxaca, receiving more than 2000 mm of annual rain with a median annual temperature between 26 and 30º Celsius (INEGI 2014, 2015, 2016).

Distribution:—The new species of *Tabernaemontana* is endemic to Mexico and is only known from the states of Oaxaca, Tabasco, and Veracruz, growing on the slopes of the Mexican Gulf and the Isthmus of Tehuantepec.

Etymology:—The specific epithet is dedicated to Diego María de la Concepción Juan Nepomuceno Estanislao de Rivera y Barrientos Acosta y Rodríguez, who is better known as Diego Rivera. He was a social activist and one of the most important muralists in Mexico. Diego's themes included the social conflicts of pre- and post-revolutionary Mexico, pre-Hispanic legacy, and science communication and popularization (Mandel 2007, Souter 2007). In his mural "*Man, Controller of the Universe*" (Figs. 3A–B), Rivera painted Charles Darwin and the idea that regardless of the repercussions of science and technology in our world, we are connected with all other organisms on the planet (Eldredge 2005). In the Sump of Dolores, he painted the mural "*Water, origin of life*" (Figs. 3C–D), which is inspired by the scientific works of biochemist Alexander Oparin and biologist Ernst Haeckel (Lazcano 2012).

Common names:—The local names of this species include "cojón de chivo", "cojón de burro" or "lechería". These names are often used to refer to many other species of Apocynaceae trees.

Conservation status:—*Tabernaemontana riverae* is only known from a few localities in three states. Given that the new species is only found in small areas of Oaxaca, Tabasco, and Veracruz, and that the intense grazing activity that occurs in Tabasco and Veracruz (*Pérez et al*., 2005) can significantly reduce the number of individuals in the future, we suggest adding the species to the Vulnerable (VU B2, C) category based on IUCN criteria (IUCN 2013).

Taxonomic remarks:—*Tabernaemontana* is well represented in Mexico with 15 species registered, of which six are endemic. These numbers highlight the diversity of the genus in the country. *Tabernaemontana riverae* is morphologically similar to *T. eubracteata*, *T. hannae* (M. Méndez & J.F. Morales 2005:354) A.O. Simões & M.E. Endress (2010:787), and *T. robinsonii* (Woodson 1928:369) A.O. Simões & M.E. Endress (2010:787). All these taxa share a similar sepal morphology, that is foliose, persistent in fruit, and typically with conspicuous venation. In addition, some of the species share the same infundibular corolla morphology (Fig. 4).

The new species was previously determined as *T. eubracteata* but can be separated from this species based on its infundibuliform corolla (vs. slightly infundibuliform), sub-equal and elliptic–lanceolate sepals (vs. clearly unequal and lanceolate) and distribution below 300 m asl (vs. above 500 m asl). *Tabernaemontana riverae* and *T. hannae* share long sepals that become papyraceous when dried, but the former is easily distinguished by its sepals elliptic-lanceolate (vs. lanceolate to ovate-lanceolate in *T. hannae*) and corollas infundibuliform (vs. salverform to slightly urceolate in *T. hannae*). Finally, the new species can be separated from *T. robinsonii,* based on its sepals with conspicuous veins (vs. inconspicuous in *T. robinsonii*), its corolla size of 2.3–3.2 cm length (vs. 3–5 cm length in *T. robinsonii*), its abrupt campanular upper tube (vs. slightly conical in *T. robinsonii*) and its distribution in Mexico (vs. Central America).

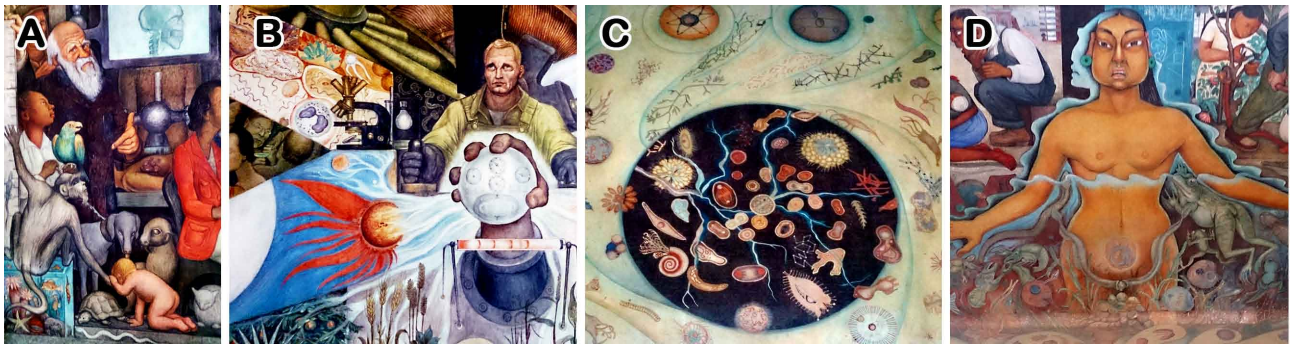

FIGURE 3. A–B. Mural "Man, Controller of the Universe". A. Inferior corner of the mural; B. Main section of the mural. C–D. Sump of Dolores, the mural "Water, origin of life".

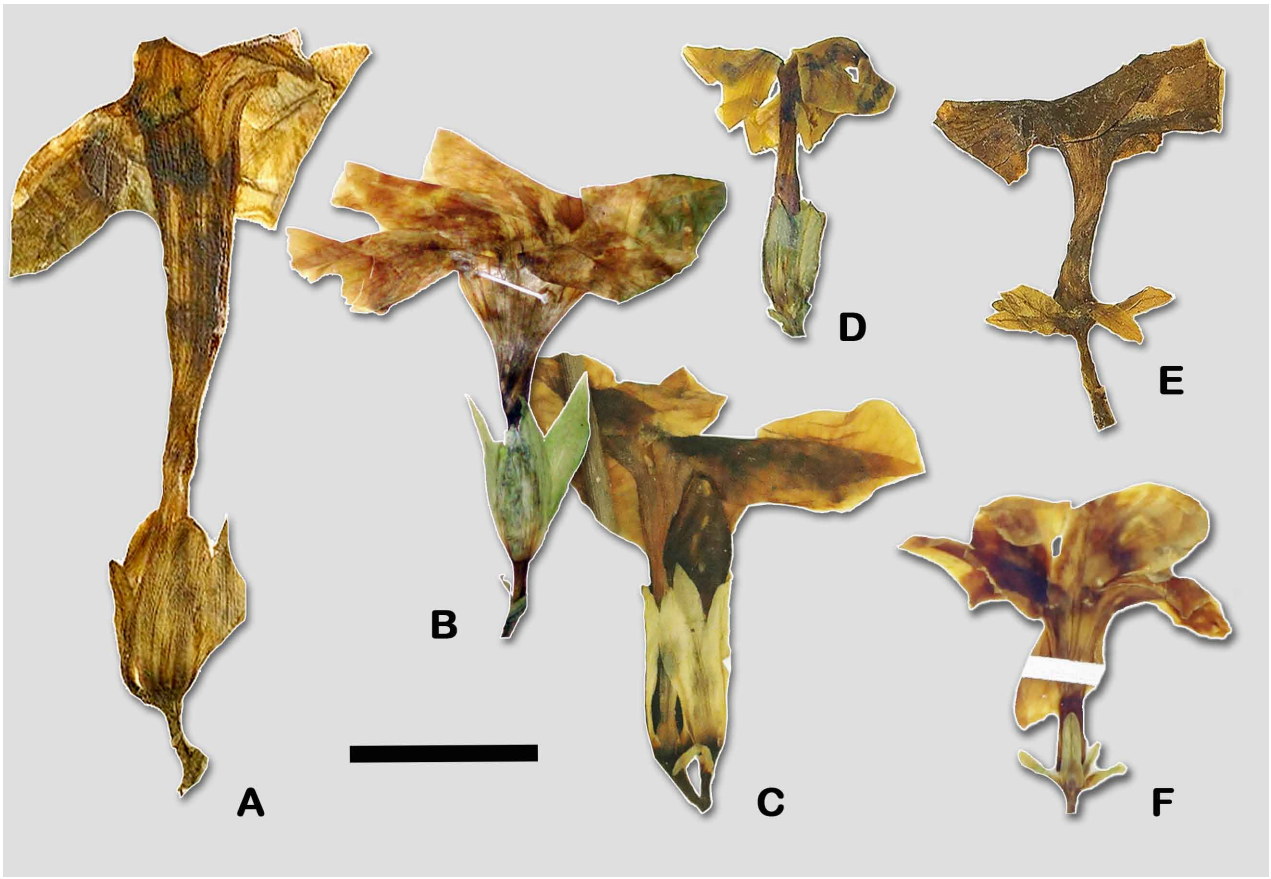

FIGURE 4. Comparison of flower sizes and morphology among *Tabernaemontana riverae* and species related morphologically. *T. robinsonii* holotype specimen (A), *T. riverae* specimen of *T. Wendt y A. Villalobos 2554* (B) and holotype specimen (C), *T. hannae* holotype specimen (D), *T. eubracteata* specimen of *J.C. Soto 8433* (E) and holotype specimen (F). Scale bar, 2 cm.

Key to the species of *Tabernaemontana* with leaf-like sepals and infundibuliform corollas in Mexico and Mesoamerica

1. Flowers white, corolla lower tube slightly geniculate, upper tube tubular ..... *T. litoralis*

-. Flowers yellow, corolla lower tube straight, upper tube campanulate to slightly campanulate 2
2. Sepals conspicuously unequal, obovate to oblong ..... *T. glabra*
-. Sepals subequal, lanceolate, elliptic–lanceolate to elliptic 3
3. Corolla with upper tube tubular. Endemic to Panama ..... *T. robinsonii*
-. Corolla with upper tube campanulate to slightly campanulate. From Mexico to Honduras 4
4. Sepals 0.6–1.2 cm long, lanceolate; corolla upper tube slightly campanulate ..... *T. eubracteata*
-. Sepals 1.83–2.1 cm long, elliptic–lanceolate; corolla upper tube distinctly campanulate ..... *T. riverae*

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