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Euphorbia marciae: A New Species from the Balsas Depression of Mexico

Victor W. Steinmann

Facultad de Ciencias Naturales, Universidad Autónoma de Querétaro, Av. de las Ciencias s/n, Del. Sta. Rosa Jáuregui, Querétaro 76230, Mexico; steinmav@gmail.com

Abstract: *Euphorbia marciae*, a new species from the lowlands of the Balsas Depression in southwestern Mexico, is described and illustrated. The species was first collected by the renowned botanist George B. Hinton during his explorations of the area in the 1930s. It is known from only five collections made in northwestern Guerrero and the extreme southwestern portion of the state of México, at elevations from 250 to 610 m. Vegetation of the area is tropical deciduous forest. *Euphorbia marciae* belongs to *Euphorbia* subg. *Chamaesyce* sect. *Anisophyllum* and resembles *E. apatzingana*, *E. hyssopifolia*, and *E. nutans*. However, it differs from these species in having smooth seeds. The seeds are nearly identical to those of *E. pionosperma*, an endemic species occurring in the Sierra Madre Occidental of eastern Sonora and western Chihuahua. However, the leaves of *E. pionosperma* are more conspicuously serrate and have larger stipules. In addition, *Euphorbia pionosperma* has smaller involucres and involucral appendages. Following IUCN Redlist criteria, *E. marciae* should be treated as Data Deficient (DD) until the species can be relocated and its populations field evaluated.

Keywords: IUCN Redlist; sect. *Anisophyllum*; subg. *Chamaesyce*; tropical deciduous forest

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1. Introduction

George B. Hinton (1882–1943) was a pioneer plant collector and the first botanist to extensively explore the Balsas Depression of southwestern Mexico. His son James Hinton (1915–2006) often accompanied him on expeditions, and during the 1930s and early 1940s, they made more than 16,300 collections, primarily in the states of Guerrero, México, and Michoacán [1]. Their specimens are widely distributed in numerous herbaria, and at least 621 new species have been proposed on the basis of this material, including five species of *Euphorbia* L.: *E. coalcomanensis* (Croizat) V.W. Steinm., *E. dressleri* V.W. Steinm., *E. hintonii* L.C. Wheeler, *E. linguiformis* McVaugh, and *E. succedeana* L.C. Wheeler [2]. In the case of *E. dressleri*, it is known only from Hinton's material, and subsequent relocation attempts have been futile [3]. Hinton's collections continue to be invaluable for studies on Mexican plants, and the purpose of this article is to describe an additional new species of *Euphorbia* that was first collected by George B. Hinton in 1933, but whose specimens have remained unidentified or misidentified since its initial gathering.

2. Materials and Methods

During the study of Mexican *Euphorbia*, the herbarium collections of ARIZ, ENCB, F, K, MICH, NY, RSA, and USF (abbreviations according to Thiers [4]) were consulted, and a new *Euphorbia* species was encountered. Measurements and illustrations were made from herbarium specimens. The distribution map was generated using QGIS version 3.16.1 [5]. Latitude and longitude were estimated with Google Earth [6]. The conservation status was evaluated using IUCN Redlist criteria [7], and the extent of occurrence (EOO) and area of occupancy (AOO) were determined by the methods described by Bachman et al. [8]. The proposal of the new species follows the rules provided in the current International Code of Nomenclature for Algae, Fungi, and Plants [9].

3. Results

3.1. Taxonomic Treatment

Euphorbia marciae V.W. Steinm., sp. nov. TYPE: Mexico. Guerrero: distrito de Mina [municipio de Coyuca de Catalán], Placeres, [18.239° N, 100.903° W], 400 m, 4 September 1936, *G.B. Hinton et al. 9357* (holotype: ENCB!; isotypes: A-00246271!, NY!, USF-205412!). Figures 1 and 2.

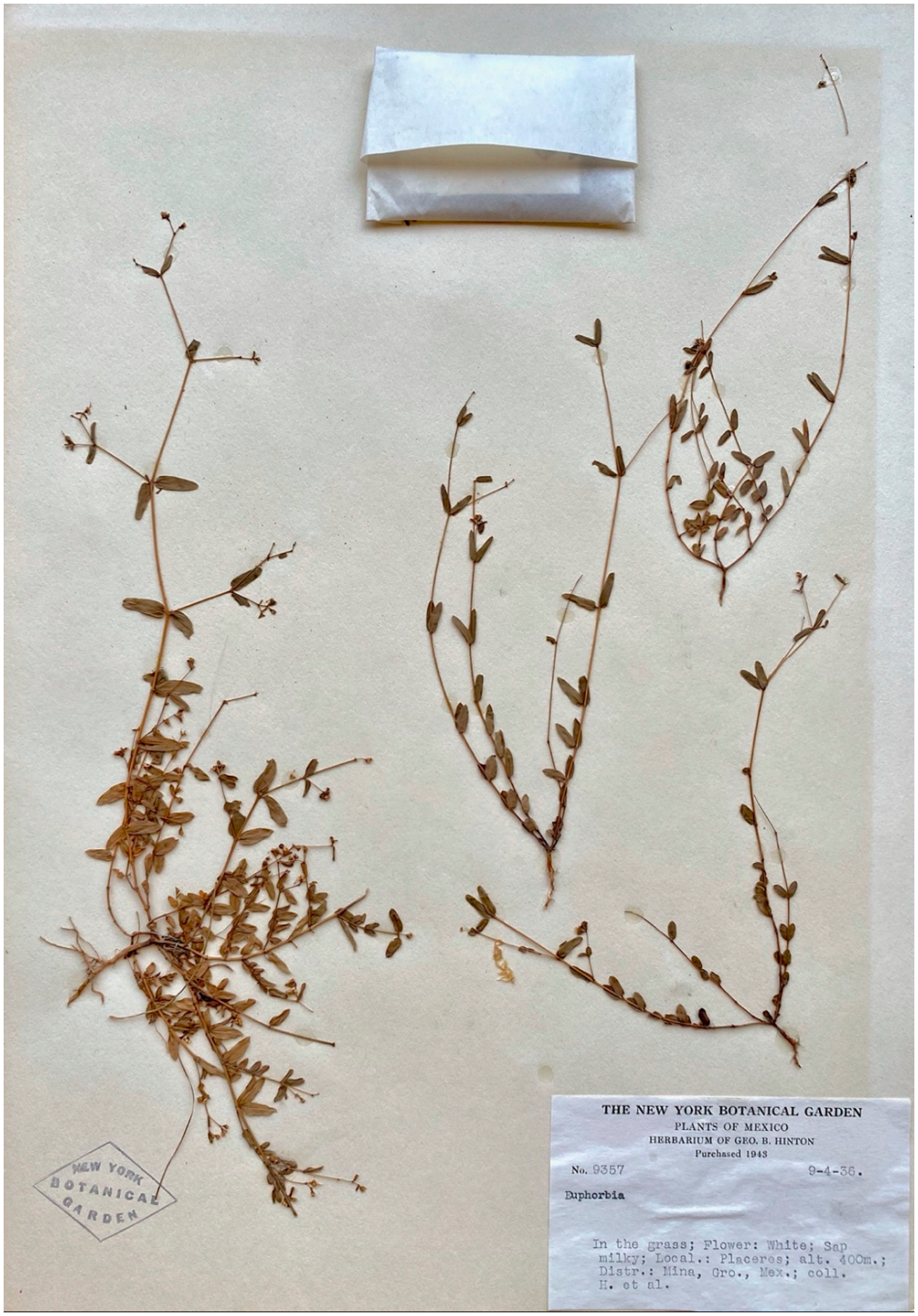


Figure 1. *Euphorbia marciae. Hinton et al. 9357*, isotype (NY).

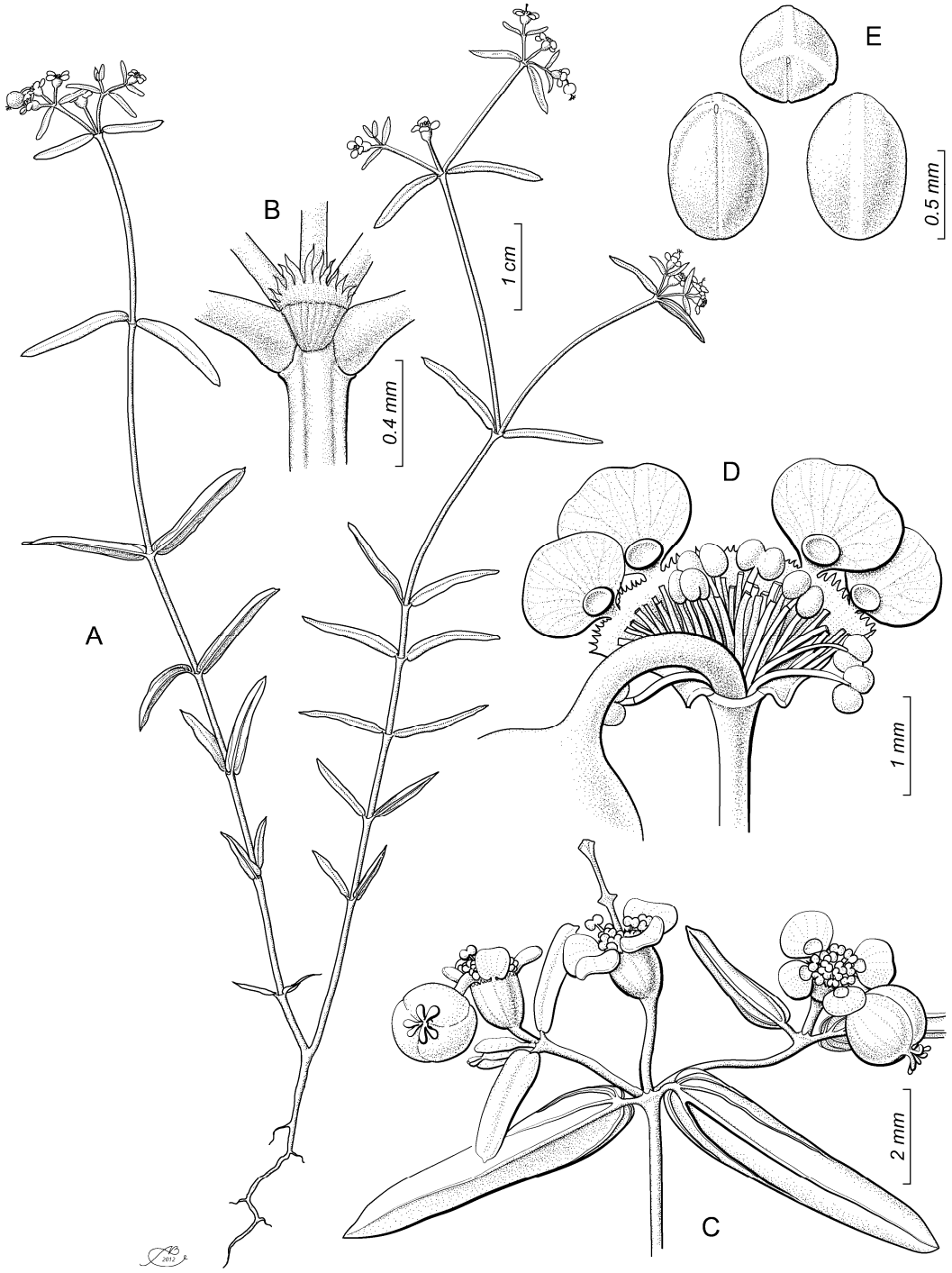


Figure 2. *Euphorbia marciae*. (**A**) Habit. (**B**) Node with stipules. (**C**) Dichasium. (**D**) Cyathium with the involucre opened. (**E**) Seeds, apical, dorsal, and ventral views. Illustrated by Alfonso Barbosa; based on *Hinton et al. 9411* (MICH).

Similar to *Euphorbia apatzingana*, *E. hyssopifolia*, and *E. nutans* in being an erect to ascending herb with relatively large leaves, glabrous ovaries, and cyathia in weakly defined dichasia and subtended by bracts similar to the stem leaves but smaller; differing from these by having smooth, unsculptured seeds.

Similar to *Euphorbia pionosperma* in having smooth, unsculptured seeds; differing from this by having less conspicuously serrate leaves, smaller stipules, and larger involucres and involucral appendages.

Annual, erect to ascending, 11–22 cm tall, from a slender taproot; stems dichotomously branching, glabrous, terete, internodes of main stems 0.8–5.9 cm long; leaves opposite, stipules interpetiolar, 0.3–0.6 mm long, separate or united, deltoid or divided to nearly the base into 3–5 (9) subulate segments, glabrous, lacking punctiform reddish glands, petiole 0.3–0.8 mm long, glabrous, blade linear, lanceolate, or ovate, 0.6–1.8 cm long, 0.15–0.45 wide, apex acute to obtuse, base slightly asymmetrical, both sides cordate or 1 side cordate and the other side rounded to truncate, margin entire to serrulate especially towards the apex, glabrous, faintly 3-nerved from the base with the two lateral nerves often indistinct; cyathia in weakly defined dichasia at the tips of the branches, bracts like the stem leaves but smaller, peduncle 0.3–1.6 mm long (to 6.5 mm at the first flowering node), involucre cylindrical to broadly obconical, glabrous, 1.2–1.4 mm long, 0.9–1.2 mm in diameter, lobes deltoid or laciniate into 4–6 subulate segments, 0.2 mm long, ciliate-pilose, sinus not evident, glands 4, concave, circular to transversely oblong, 0.1–0.2 mm long, 0.15–3 mm wide, appendages present, oblong, transversely reniform, to flabellate, to almost orbicular, 0.5–1 mm long, 1.1–1.4 mm wide, white, glabrous, unlobed but sometimes shallowly undulate, entire; staminate flowers approx. 40–50, bracteoles few, densely pilose distally; pistillate flower on a glabrous gynophore exserted from the involucre 0.6–1.7 mm, ovary ovoid to depressed globose, 3-lobed, glabrous, styles 3, 0.6–0.8 mm long, bifid 1/2–2/3 their length, narrowly cylindrical, not swollen at the apex; capsule oblate-ovoid, 1.6–1.8 mm long, 2–2.4 mm wide, glabrous, columella 1.6–1.9 mm long; seeds obloid, 1.2–1.4 mm long, 0.7–0.9 mm wide, faintly 3-angled in cross section with a low indistinct dorsal keel, apex and base rounded, brown to blackish at maturity, smooth, with a conspicuous mucilaginous coat, without a caruncle.

3.2. Additional Specimens Examined (Paratypes)

MEXICO. **Estado de México:** distrito de Temascaltepec [municipio de Tejupilco], Bejucos, [18.779° N, 100.426° W], 610 m, 19 September 1933, *G.B. Hinton 4775* (ARIZ, F, GH, K, NY); municipio de Tlatlaya, San Antonio, [18.398° N, 100.308° W, 390 m], 19–20 July 1954, *E. Matuda et al. 31210* (MEXU). **Guerrero:** distrito de Mina [municipio de Coyuca de Catalán], Manchón/Parotas, Filo, [18.278° N, 100.728° W, 284 m], 31 August 1936, *G.B. Hinton et al. 9411* (F, K, MICH, NY-2 sheets, USF); carretera Zitácuaro-Huetamo, límites entre Gro. y Mich., [18.365° N, 100.668° W, 250 m], 7 September 1981, *A. Díaz O. & A.A. Vargas 336* (MEXU).

3.3. Distribution, Habitat and Phenology

Euphorbia marciae is endemic to the lowlands of the Balsas Depression of southern Mexico (Figure 3). It is known from northwestern Guerrero and the extreme southwestern portion of the state of México, at elevations from 250 to 610 m. It likely also occurs in southeastern Michoacán, because one collection was made just across the border in Guerrero, and the extrapolated extent of occurrence (EOO) includes a portion of Michoacán. The vegetation of this region is dominated by tropical deciduous forest, following Rzedowski [10], and there is a pronounced dry season with little rain from November to May. The Hinton collections describe the habitat as "llano" or "in the grass," almost certainly referring to the grassy openings that often occur naturally on rocky substrates within the tropical deciduous forest. The Diaz & Vargas specimen states that plants were found in pastures, and the Matuda et al. sheet says a humid hillside with low scrub. Flowering and fruiting overlap, and reproductive plants have been gathered from July to September, but certainly extend into at least November.

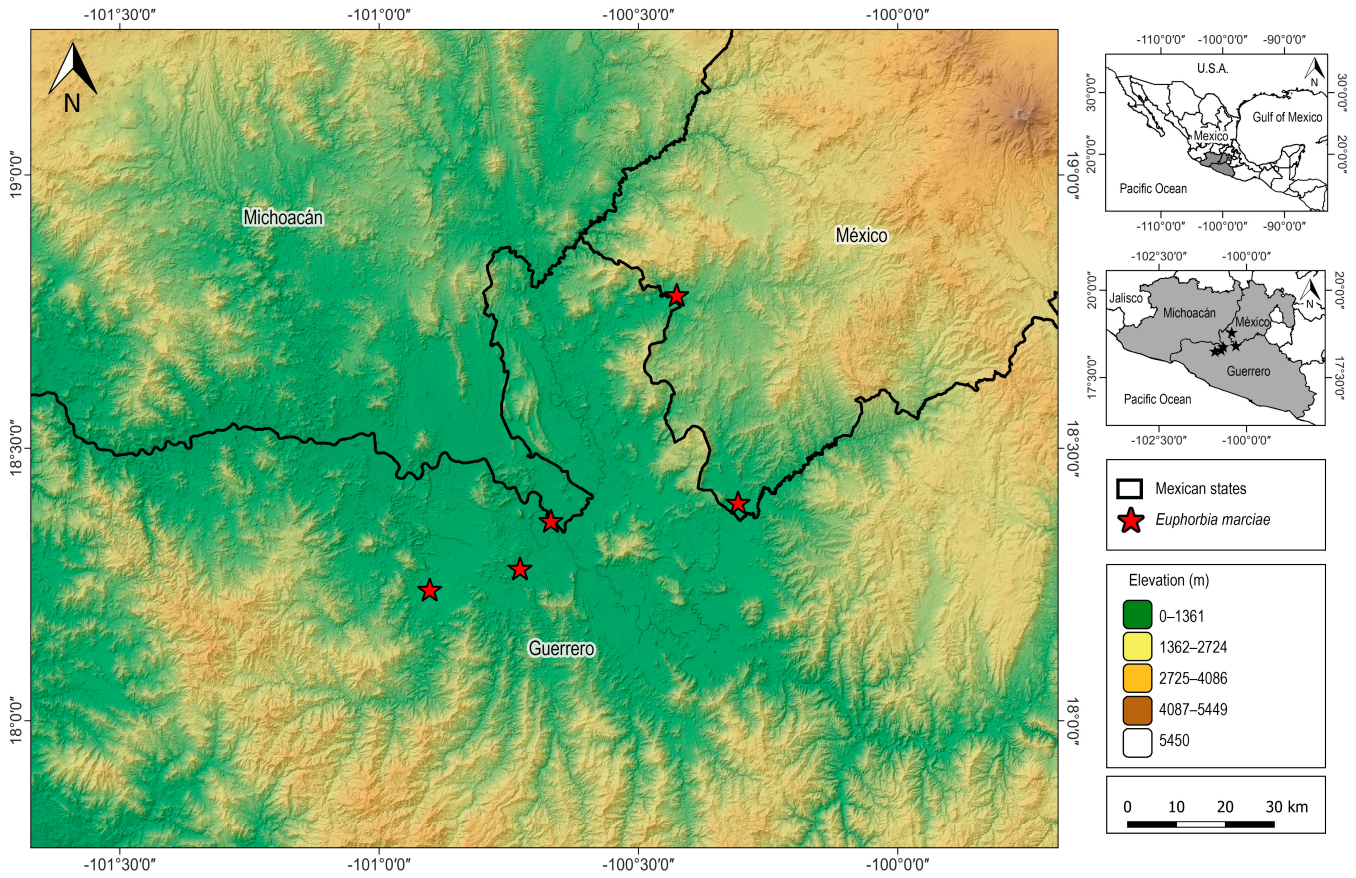


Figure 3. Distribution of *Euphorbia marciae*.

3.4. Conservation Status

I am aware of only five collections of *Euphorbia marciae*, the most recent of which was made more than 40 years ago. None of these are from protected areas. The extent of occurrence (EOO) is 1470 km^2, and the area of occupancy (AOO) is 20 km^2. There are no available data about population size or potential reductions. The only specimen that provides information about abundance describes the species as scarce (*Díaz & Vargas 336*). The tropical deciduous forest of the Balsas region is generally considered endangered [11], and as a result, we can infer that overall habitat loss has occurred and is likely to continue. However, many related species of *Euphorbia* subg. *Chamaesyce* sect. *Anisophyllum* are favored by disturbance, and at least one collection of *E. marciae* was made in a pasture (*Díaz & Vargas 336*). At present, it should be treated as Data Deficient (DD) until the species can be rediscovered and its populations field evaluated. If the plants are indeed as rare as the few collections suggest, and not favored by disturbance, its reduced distribution would warrant assessment as Endangered under criteria B1 and B2 (following [7]).

3.5. Etymology

Euphorbia marciae is named after my mother, Marcia Marie Steinmann, née Bradley (1938–2018), who not only gave me my life, but always offered unconditional support and encouragement, especially with regard to my interest in biology.

4. Discussion

Euphorbia is characterized by a pseudanthial inflorescence, termed a cyathium, in which the flowers lack a perianth and are reduced to a single anther or ovary. It contains more than 2000 species and has a near-cosmopolitan distribution [12]. *Euphorbia* is the second most diverse genus in Mexico, and Villaseñor [13] reports 245 species from the country. The genus occurs in nearly all vegetation types from sea level to approximately

3500 m. Although there is no account of the number of species in the Balsas Depression, I estimate that at least 85 species are present. Several of these are endemic to the region, such as *Euphorbia arteagae* W.R. Buck & Huft, *E. calcicola* Fernald, *E. grammata* McVaugh, *E. hintonii*, *E. infernidialis* V.W. Steinm., *E. linguiformis*, *E. lottiae* V.W. Steinm., *E. muscicola* Fernald, *E. rzedowskii* McVaugh, and *E. vestita* Boiss., in addition to the herein described species.

Based on the dichotomous branching and opposite leaves with interpetiolar stipules and blades asymmetrical at the base, *Euphorbia marciae* belongs to *Euphorbia* subg. *Chamaesyce* Raf. section *Anisophyllum* Roeper, as defined by Yang et al. [14]. Seeds are often necessary to distinguish taxa within the section, and those of *E. marciae* serve to separate it from similar species. Vegetatively, *E. marciae* resembles *E. apatzingana* McVaugh, *E. hyssopifolia* L., and *E. nutans* Lag. It shares with these species an erect to ascending habit, relatively large leaves, glabrous ovaries, and cyathia in weakly defined dichasia, subtended by bracts that are like the stem leaves but smaller. These species also occur in the Balsas Depression of Guerrero (*E. apatzingana*, *E. hyssopifolia*, *E. nutans*) and the state of México (*E. hyssopifolia*, *E. nutans*). In fact, one specimen of *E. marciae* was initially determined as *E. hyssopifolia* (*Díaz & Vargas 336*). In contrast to the smooth, unsculptured seeds of *E. marciae*, those of *E. nutans* are conspicuously wrinkled, and those of *E. hyssopifolia* have two or three conspicuous transverse ridges. *Euphorbia apatzingana* has seeds with one or two ill-defined longitudinal rows of three or four shallow concave depressions that are separated by longitudinal and transverse ridges.

Whereas the smooth seeds of *Euphorbia marciae* distinguish the species from the above taxa, they are nearly identical to those of *E. pionosperma* V.W. Steinm. & Felger. The latter is endemic to pine-oak forests in the Sierra Madre Occidental of eastern Sonora and western Chihuahua. Although habit is also similar, and both species are glabrous annuals, the leaves of *E. pionosperma* are more conspicuously serrate and have larger stipules (0.4–1.7 mm long vs. 0.3–0.6 mm long). In addition, *Euphorbia pionosperma* has smaller involucres (0.8–1.2 × 0.5–0.8 mm vs. 1.2–1.4 × 0.9–1.2 mm) and smaller involucral appendages (nearly absent to 0.4 × 0.6 mm vs. 0.5–1 × 1.1–1.4 mm).

Specimens of *Hinton et al. 9411* are labelled either as "Manchón" or "Parotas, Filo." These names refer to the same locality, a small town now known as Las Parotas and located approximately 5 km south-southwest of Coyuca de Catalán, Guerrero.

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