

***Amphoria*, a new monotypic genus of Amaranthaceae from the Pacific Coast of Mexico**

TINA KIEDAISCH^{1,3,*} & ROSS A. MCCAULEY^{2,4}

¹Prinzessin Therese von Bayern Chair for Systematics, Biodiversity and Evolution of Plants, Faculty of Biology, Ludwig-Maximilians-Universität München, Menzinger Str. 67, 80638 Munich, Germany

²Department of Biology, Fort Lewis College, 1000 Rim Dr., Durango, CO 81301, USA

³ t.kiedaisch@lmu.de;  <https://orcid.org/0009-0006-7442-502X>

⁴ mccauley_r@fortlewis.edu;  <https://orcid.org/0000-0002-1734-7014>

*Author for correspondence

Abstract

Lagrezia monosperma has long posed a taxonomic challenge due to its strikingly disjunct distribution along the Mexican Pacific coast, far from the center of diversity of *Lagrezia* in the Western Indian Ocean. Through morphological study of herbarium material, evaluation of pollen characters, and integration of recent molecular phylogenetic evidence, we demonstrate that *Lagrezia monosperma* is neither closely related to *Lagrezia* nor assignable to *Celosia*. Instead, it represents a distinct lineage within the tribe Celosieae. We therefore describe *Amphoria*, a new monotypic genus, to accommodate this species, and make the new combination *Amphoria monosperma*. *Amphoria* is distinguished by its tapered ovary base, uniovulate ovary, smooth shiny seeds, narrow lanceolate tepals, and a short androecial cup, as well as by its microechinate, pantoporate pollen. The genus is endemic to the Pacific lowlands of Mexico, occurring from Jalisco to Oaxaca.

Key words: Celosieae, *Lagrezia*, Recircumscription

Resúmen

Lagrezia monosperma siempre ha sido un taxón problemático debido a su distribución en la costa del Pacífico Mexicano muy aislada del centro de diversificación del género en la costa del Océano Índico Occidental. Un estudio detallado de material de herbario, incluyendo características de polen así como datos moleculares filogenéticos muestran que *Lagrezia monosperma* es un taxón único y no es parte del género *Lagrezia* ni tampoco está relacionado con el género *Celosia*. En lugar de esto, representa un linaje único dentro de la tribu Celosieae. Por esta razón describimos el género *Amphoria* como un género monotípico y proponemos el nombre *Amphoria monosperma* como el nuevo nombre de esta especie. El género *Amphoria* puede ser diferenciado por la presencia de un ovario angosto en la base con un solo óvulo, semillas pequeñas con superficie homogénea, tépalos lanceolados y angostos, una copa de androceo corta, así como un polen con microexina y pentaporado. El género es endémico a la costa del Pacífico Mexicano desde el estado de Jalisco hasta Oaxaca.

Palabras claves: Celosieae, *Lagrezia*, recircunscripción

Introduction

Lagrezia Moquin-Tandon (1849: 252) (Amaranthaceae Juss.) is a genus of shrubs to small trees comprising 14 accepted species primarily distributed on islands of the Western Indian Ocean with most being endemic to Madagascar. One species, *L. monosperma* (Rose 1895: 352) Standley (1915: 393), however, is geographically isolated from this center of diversity, occurring along the Pacific coast of Mexico. This disjunct distribution, as well as morphological characters of *L. monosperma*, have long been puzzling to botanists. Although *L. monosperma* resembles many species of *Celosia* Linnaeus (1753: 205) morphologically, it possesses only a single ovule in the ovary, contrasting with the multi-ovulate condition typical of *Celosia* (Odintsova 2025). In fact, Rose (1895: 352) originally described the species as *Celosia monosperma*, referencing a comment by Hans Schinz who affirmed its placement in *Celosia* based

on the presence of 2-celled anthers. In the same comment, Schinz already associated *C. monosperma* with *Lagrezia*, a group that was already described at the genus rank by Moquin-Tandon (1849: 252). Standley (1915) subsequently transferred *C. monosperma* to *Lagrezia*, arguing that its uniovulate ovary clearly distinguished it from the multiovulate *Celosia*. Schinz (1934) accepted Standley's classification but expressed reservations regarding the placement of *C. monosperma* in *Lagrezia*. The disjunct distribution of *L. monosperma* was later interpreted by Cavaco (1962) as a relictual occurrence of a formerly widespread *Lagrezia*.

In the most recent comprehensive morphological revision of *Amaranthaceae sensu stricto*, Townsend (1993) stated that *Lagrezia monosperma* is clearly distinct from the other species of *Lagrezia* and shares more morphological similarities with *Celosia*. He also noted that *Celosia* includes *C. stuhlmanniana* Schinz (1896: 419) which frequently displays a uniovulate ovary. While both *Celosia* and *Lagrezia* share the traits of narrow elongate stigmas, the absence of pseudostaminodes, and fruit form (circumscissile capsule), they differ in tepal venation (1-nerved in *Lagrezia* and multi-nerved in *Celosia*), the number of ovules in the ovary (uniovulate in *Lagrezia* vs. multiovulate in *Celosia*), and the structure of the androecium (stamens fused into a short cup in *Lagrezia* vs. stamens fused into a long tube in *Celosia*) (Schinz 1934, Townsend 1990). Both *Celosia* and *Lagrezia* have *Deeringia*-type pollen with a slightly anulopunctate to punctate tectum (Borsch 1998, Al-Qahtani 2023). Historically, *Lagrezia* was placed in tribe Amarantheae due to its uniovulate ovary, whereas *Celosia* with its multiovulate ovary has consistently been classified in tribe Celosieae (Standley 1915, Schinz 1934, Townsend 1993).

Recent phylogenomic work in *Amaranthaceae s.s.* (Kiedaisch *et al.* 2026) has provided strong evidence regarding the relationship of *Lagrezia monosperma*. Kiedaisch *et al.* have shown that all *Lagrezia* occur within the tribe Celosieae Fenzl in Endlicher (1837: 304) but that *L. monosperma* is not closely related to the other species, which form a monophyletic group (Fig. 1). This taxon instead forms a clade sister to a polyphyletic *Celosia*, specifically the shrubby *Celosia virgata* Jacquin (1789: 279) of Central and South America. Due to this pattern of relationship, continued recognition of *L. monosperma* leads to a polyphyletic *Lagrezia* and thus we recircumscribe this taxon in the new monotypic genus *Amphoria* Kied. & R.A. McCauley, recognizing it as a morphologically, geographically, and genetically distinct group with an evolutionary origin likely from American *Celosia*.

Materials and Methods

Specimens (including type material) of *Lagrezia monosperma* and putative closely related species [*Lagrezia oligomeroides* (C.H.Wright) Fosberg (1974: 262), *Celosia moquinii* Guillemain ex Candolle (1849: 239), and *Celosia virgata*] were examined using herbarium specimens at M, MSB, and NY (acronyms follow Thiers 2026 [continuously updated]). Floral material was rehydrated in water and dissected under a stereomicroscope to document reproductive structures, including perianth morphology as well as androecium and gynoecium characters. Vegetative and reproductive characters were measured using a ruler and a calibrated ocular micrometer. Whenever possible, multiple specimens were examined to capture intraspecific morphological variation.

Additionally, digitized specimens, including type material, from BM, C, COLO, GH, K, MEXU, MICH, MO, P, RSA, UC, and US were consulted. This digitized data was examined to further evaluate morphological variation, ecological associations, and to determine distribution. All specimen-derived location data was verified against maps prepared by the Instituto Nacional de Estadística y Geografía (INEGI) – Mexico. We plotted all verified occurrences in R (v.4.5.2) using the packages *dplyr*, *ggplot2* and *rnatualearth*, incorporating both country-level polygons and state-level boundaries for Mexico (South and South, 2017; Wickham *et al.* 2016, 2025; Yarberry, 2021).

Images of floral material were captured using a Keyence VHX-S770E digital microscope (Frankfurt, Germany) at 50–100× magnification under reflected and transmitted light. To improve resolution, images were stacked every 20–5 µm, depending on the magnification.

For pollen imaging, flowers were rehydrated in warm water, mounted on a specimen tray, and subsequently dehydrated in a desiccator with silica gel. Pollen grains were then sputter-coated with platinum in argon gas using a BAL-TEC SCD 050 sputter coater (Schalksmühle, Germany). Scanning electron micrographs were obtained with a LEO 438VP SEM (LEO Electron Microscopy, Cambridge, UK).

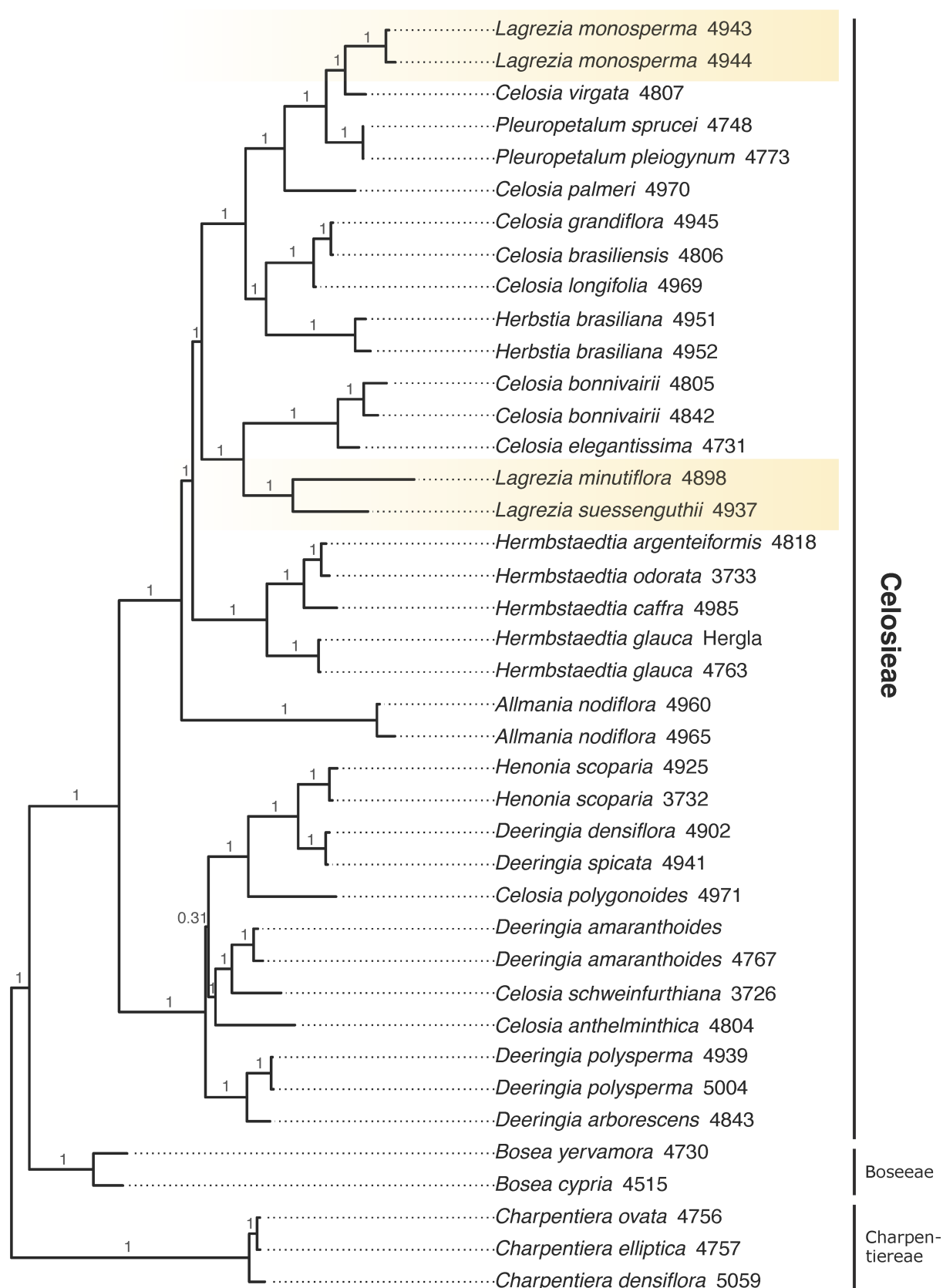


FIGURE 1. The phylogenetic placement of *Lagrezia* within the tribe Celosieae, as inferred from the coalescent species tree by Kiedaisch *et al.* (2026). *Lagrezia* clades are highlighted in yellow and branch support values represent local posterior probabilities.



FIGURE 2. Lectotype of *Celosia monosperma* (US106216).

Taxonomic treatment

Amphoria Kied. & R.A.McCauley, **gen. nov.**

Type:—*Amphoria monosperma* (Rose) Kied. & R.A. McCauley.

Amphoria monosperma (Rose) Kied. & R.A. McCauley **comb. nov.** (Fig. 2) $\equiv$ *Celosia monosperma* Rose (1895: 352) $\equiv$ *Lagrezia monosperma* (Rose) Standley (1915: 393).

Lectotype (designated by Sandoval-Ortega *et al.* 2023: 1):—MEXICO. Colima, Manzanillo, 01–31 December 1890, *Palmer 887* (US106216[photo!]); **Isolectotypes** (BM000993089[photo!], C10005437[photo!], GH00037042[photo!], K000582924[photo!], MO216357[photo!], NY00324468!, RSA0000618[photo!], UC116302, US106217[photo!], US893655[photo!])

Diagnosis:—*Amphoria* is differentiated from *Lagrezia* by its unique tapered base of the gynoeceum (vs. round to basally angled), smooth, shiny seeds (vs. rugulose), narrow lanceolate tepals > 2.2 cm (vs. < 1.8 cm, broader and suborbicular), and a minute style < 0.1 (vs. a distinct, elongate style > 0.2 cm). Lastly, its geographic distribution along the Pacific coast of Mexico sets it apart from the Western Indian Ocean islands where *Lagrezia* is distributed. *Amphoria* can further be distinguished from *Celosia* by its uniovulate ovary (vs. multiovulate), smooth shiny seeds (vs. rugulose, albeit variable), stamens only shortly connate into a low androecial cup (vs. fused into a well-developed staminal cup) and longer, lanceolate bracts and bracteoles, exceeding one-half of the flower (vs. short, truncate, and ca. one-fifth as long as the tepals).

Description:—Shrub to small tree, 2–7 m tall. Leaves alternate, the blades lanceolate, broadest below the middle, 3–15 cm long $\times$ 1.5–6 cm wide; base decurrent to a distinct petiole; apex acuminate; glabrous adaxially and glabrous to slightly pubescent abaxially; margin entire; petiole glabrous, 0.5–2.0 cm. Inflorescence in terminal drooping panicles, 14–40 cm long $\times$ 11–30 cm wide; slightly pubescent. Bracts acute, glabrous to pubescent at base or on abaxial side, prominent midrib (on surface) ending in a small mucro, 0.80–1.25 mm long $\times$ 0.5–0.6 mm wide. Bracteoles overlapping, enclosing the lower half of the flower, midrib prominent, slightly pubescent at base 1.1–1.8 mm long $\times$ 0.5–0.7 mm wide. Flowers white, tepals 5 with very thin 3–5 parallel veins, narrowly lanceolate, glabrous, 2.2–3.1 mm long $\times$ 0.6–0.9 mm wide (Fig. 3a). Stamens 5, united at the base into a short androecium cup, 1.1–1.8 mm long; pseudostaminodes absent (Fig. 3b). Anthers dorsifixed, biloculate, 0.5–0.9 mm long $\times$ 0.3–0.5 mm wide (Fig. 3c). Pollen pantoporate, 11–14 μ m, isopolar, spheroidal, c. 16 apertures, operculate, microechinate ornamentation, spikes 150–250 nm (Fig. 4). Ovary ovoid, tapering to the base, 0.6–1.0 mm long $\times$ 0.4–0.6 mm wide; style minute; stigma bifid, reflexed, 0.3–0.5 mm long (Fig. 3d). Ovule 1, connected at upper end via an arched funiculus to the ovary. Fruit a circumscissile capsule. Seed lenticular, smooth and shiny 0.8 mm $\times$ 0.8 mm (Fig. 3e–f).

Etymology:—The name *Amphoria* is derived from the Greek ἀμφορεύς (in Latin amphoreús), the name for vessels used in antiquity for the transport of wine in recognition of the unique tapered ovary base characteristic of the taxon.

Distribution and ecology:—Endemic to Mexico. Distributed along the Pacific Coast from Puerto Vallarta in Jalisco south to the Isthmus of Tehuantepec in Oaxaca with a limited extension inland toward the Central Valleys of Oaxaca (Fig. 5). It is a member of the low to medium deciduous dry subtropical forest (Rzedowski 1978) occurring in a range of elevation from 0–925 m. Within this general forest type, it occurs in forested floodplains, moist ravines, open hillsides, and disturbed areas. It commonly occurs with species of *Attalea* Kunth (1815: 309), *Brosimum* Swartz (1788: 12), *Cordia* Linnaeus (1753: 190), *Enterolobium* Martius (1837: 2, Beibl:117), *Guazuma* Miller (1754: 68), *Hura* Linnaeus (1753: 1008), *Licania* Aublet (1775: 119), *Platymiscium* Vogel (1837: 198), and *Orbignya* Martius ex Endlicher (1837: 257). Flowering occurs from October to February and it has been recorded that the flowers are visited and potentially pollinated by the hoverfly, *Palpada minutalis* (Sarmiento-Cordero *et al.* 2010).

Notes:—*Celosia* species occurring sympatrically with *Amphoria monosperma* include *C. chiapensis* Brandege (1917: 363), *C. moquinii*, *C. orcuttii* Greenman (1912: 330) and *Celosia virgata*. *Celosia moquinii* is the only *Celosia* species in Mexico that shares the tapered ovary with *Amphoria monosperma* although it is not as pronounced as in this species. However, it is easily distinguishable by its multiovulate ovary and an elongated staminal cup.

Both *Amphoria monosperma* and *Celosia virgata* produce pantoporate, operculate pollen grains (Fig. 4). They differ, however, in their ornamentation and aperture number: *A. monosperma* is microechinate with approximately 16 apertures, consistent with the observations of Quiroz-García *et al.* (1994), whereas *C. virgata* is nanoechinate and has about 22 apertures. We show that the pore types of *Amphoria* and *Celosia* differ (Type VII vs. Type VI *sensu* Borsch, 1998). *Celosia* and *Lagrezia* were described as having *Deeringia*-type pollen (Borsch, 1998). In contrast, we believe that *Amphoria* is better assigned to *Iresine*-type pollen, based on the presence of numerous, evenly distributed microspines and Type VII pores.

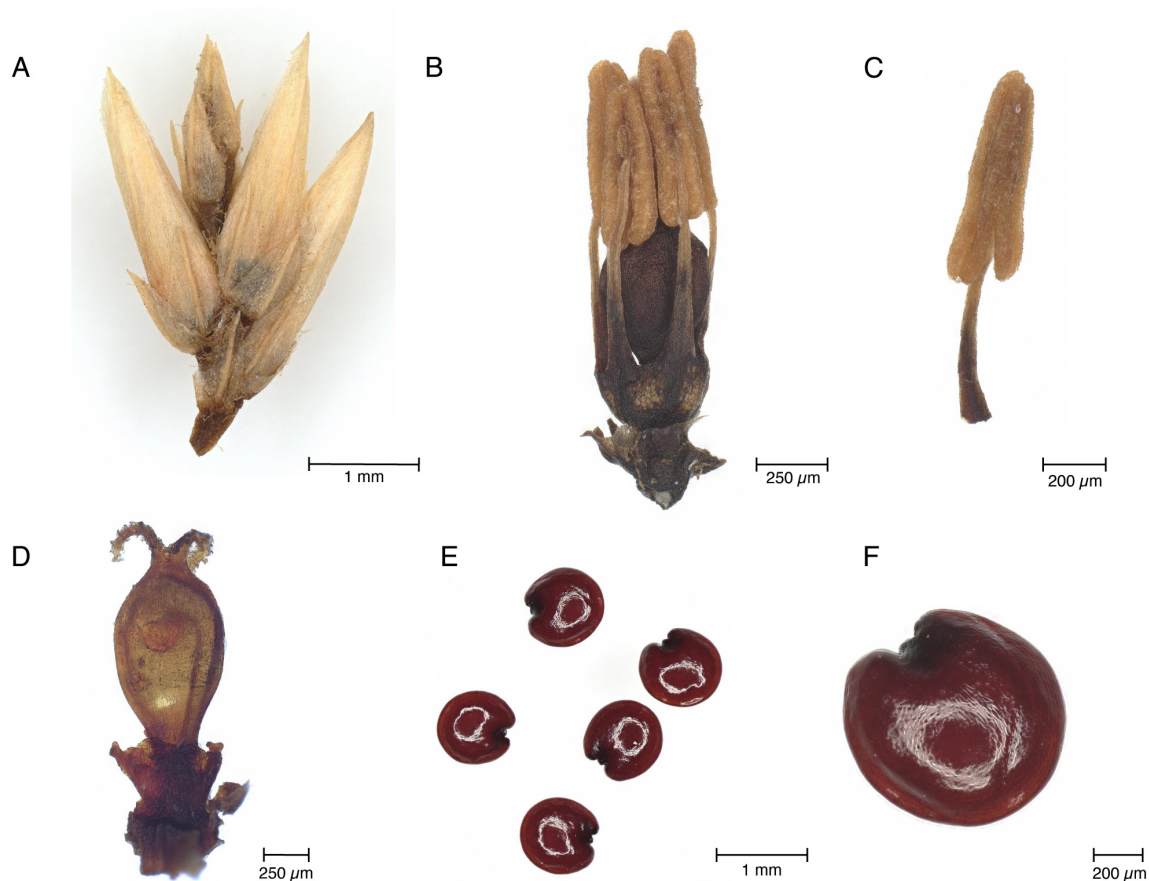


FIGURE 3. Floral and seed morphology of *Amphoria monosperma*. A. Tip of spike showing three mature flowers, each subtended by one bract and two bracteoles (J. Arturo S. Magallanes 3399 [NY02496830]); B. Androecium with five stamens fused into a short androecial cup (Misael Elorsa C. 7427 [NY03189777]); C. Filament with dorsifixed anther (Misael Elorsa C. 7427 [NY03189777]); D. Ovary (J. Arturo S. Magallanes 3399 [NY02496830]); E. Five seeds (Edward Palmer 460, [NY02496836]); F. Seed surface and close-up (Edward Palmer 460, [NY02496836]).

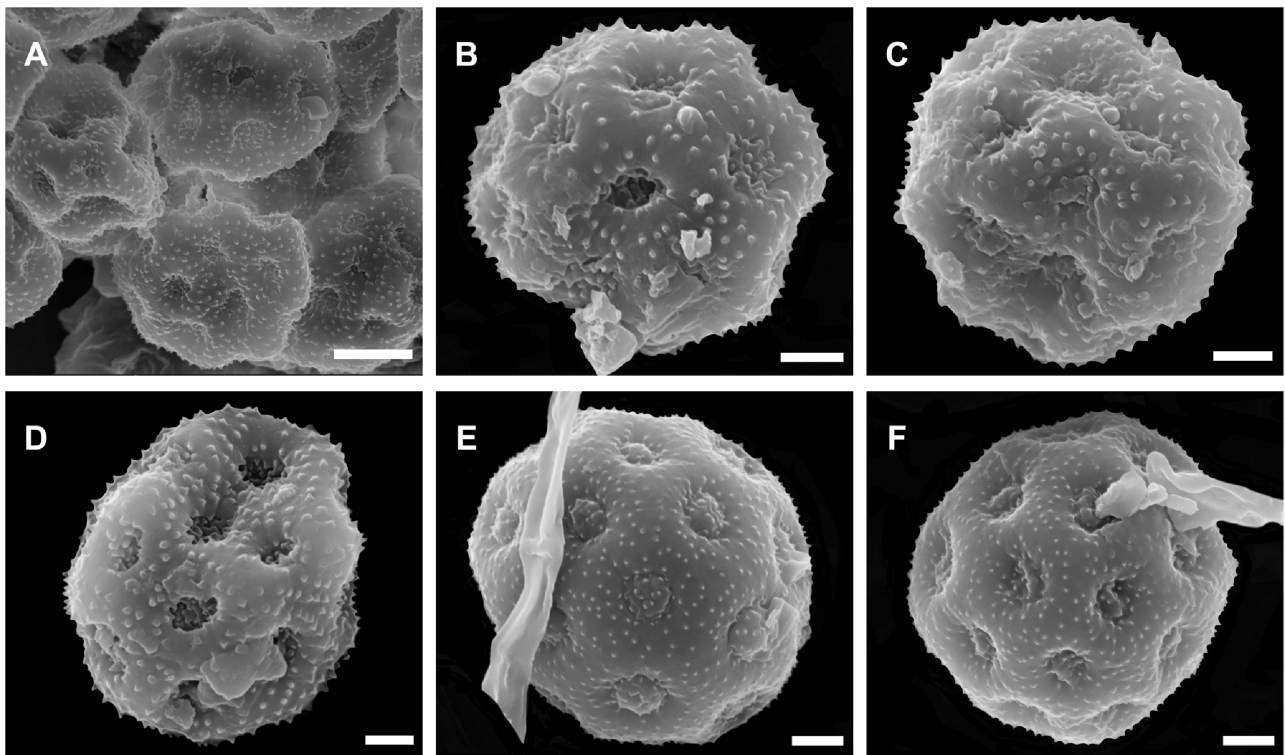


FIGURE 4. SEM images of pollen from herbarium material. A-D. *Amphoria monosperma* (J. Arturo S. Magallanes 3399 [NY02496830]). E-F. *Celosia virgata* (G. F. Gaumer, M.D. 458 [M0404669]). Scalebar corresponds to 5 µm in A and 2 µm in B-F.

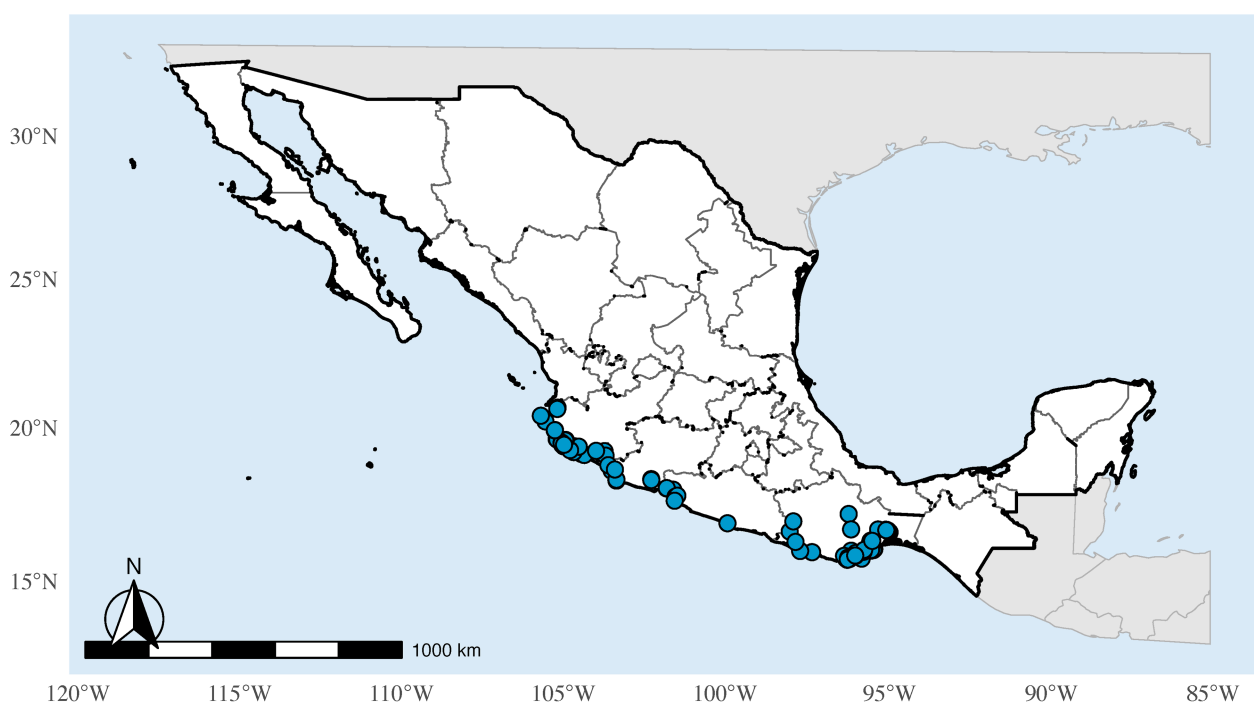


FIGURE 5. Distribution map of *Amphoria monosperma* based on 357 herbarium specimens with verified geographic coordinates from the herbaria BM, C, COLO, GH, K, MEXU, MICH, MO, NY, P, RSA, UC, and US.

Additional Specimens examined:—MEXICO. Colima, Mpio. Coquimatlán: La Sidra, 15 Km al NW de Pueblo Juárez, 12 November 1984, *Santana 926* (MEXU611836). Mpio. Manzanillo: Wooded hill west of town. Vicinity of Manzanillo, 27 November 1925, *Ferris 6060* (US1491698); Near km. 293, about 15 miles southeast of Manzanillo, 9 December 1959, *McVaugh & Koelz 1627* (MICH1498102); 7 miles north of Santiago, on the road to Durazno, Jalisco, 10 December 1959, *McVaugh & Koelz 1669* (MICH1498101, US2452161). Guerrero, Mpio. Acapulco de Juárez: Parque Nacional El Veladero, 13 November 1984, *Noriega Acosta 284* (MEXU540300); Acapulco and vicinity, October 1894–March 1895, *Palmer 460*, (K005475587, NY02496836). Mpio. La Unión de Isidoro Montes de Oca: Camino a terracería que lleva a Corral Falso, 4 km al N. de la Unión, 21 December 1995, *Guízar Nolasco 3507* (MEXU738200); Vallecitos, 18 December 1937, *Hinton 11689* (KK005475588, NY02496835, US1893649). Mpio. Petatlán: Laguna San Valentín, 4 January 1990, *N. Diego 5715* (MEXU670201). Mpio. Zihuatanejo de Azueta: Zihuatanejo, Camino al faro. 20 December 1970, *Boege 1647* (MEXU195032, 195036); Aprox. 11 km al NE de El Camalote y a 31 km al SO de Vallecitos de Zaragoza, carr. Cd. Altamirano-Ziguatanejo, 18 January 2013, *Soto Núñez 20488* (MEXU1368187). Jalisco, Mpio. Cabo Corrientes: Cabo Corrientes, 23 December 1968, *Estrada Faudón s.n.* (MEXU961419). Mpio. Cihuatlán: Stream-valley crossing the highway to Autlán, 9 miles north of the road-junction at the west end of Bahía de Navidad, 1213 December 1959, *McVaugh 1764* (MICH1498103, NYNY02496833, US2452162); Coastal plain near the highway to Autlán, 5 miles north of Bahía Navidad, 9 November 1960, *McVaugh 20885* (US2451677). Mpio. La Huerta: Estación de Biología, Chamela, (UNAM), 9 December 1981, *Bullock 1040* (MEXU345506); *Bullock 1041* (MEXU321614); *Bullock 1042* (MEXU321613); *Bullock 1043* (MEXU321612); A 2 km de las oficinas de la Fundación Ecológica Cuixmala, rumbo a El Mirador, sobre el camino, 15 November 1997, *Calónico Soto 5584* (MEXU1045214); A 3 km de las oficinas de la Fundación Ecológica Cuixmala, rumbo a El Mirador, sobre el camino, 15 November 1997, *Calónico Soto 5666* (MEXU1049727); A 5 km de las oficinas de la Fundación Cuixmala, rumbo al mirador, sobre el camino, 15 November 1997, *Calónico Soto 5721* (MEXU1038618); A 6 km de las oficinas de la Fundación Cuixmala, rumbo al mirador, sobre el camino, 15 November 1997, *Calónico Soto 5767* (MEXU1038519); *Calónico Soto 5803* (MEXU1049775); A 3.11 Km de las oficinas de la Fundación Ecológica Cuixmala, rumbo a la represa antes de El Mirador, 18 November 1997, *Calónico Soto 5895* (MEXU1324444); Cauce del Arroyo Careyes, a ca. 2 Km al Sur de la represa que está en el Km 11 del camino de terracería hacia El Mirador, 18 November 1997, *Calónico Soto 5937* (MEXU1053821); Arroyo Colorado, Estación de Biología Chamela,

UNAM, 12 February 1998, *Calónico Soto 7701* (MEXU1087236); *Calónico Soto 7711* (MEXU1087178); *Calónico Soto 7714* (MEXU1086978); *Calónico Soto 7724* (MEXU1087112); *Calónico Soto 7727* (MEXU1045151); *Calónico Soto 7733* (MEXU1044795); Cruce del lindero SE de la Estación de Biología Chamela y el arroyo el Colorado, 14 February 1998, *Calónico Soto 7813* (MEXU1046214); Sobre el lindero NE de la Estación de Biología Chamela UNAM, 15 February 1998, *Calónico Soto 7837* (MEXU1046207); Sobre el arroyo Colorado al E de la Estación de Biología Chamela, 16 February 1998, *Calónico Soto 7883b* (MEXU1086983); Sobre el arroyo Colorado, Pozo viejo al E de la Estación de Biología Chamela UNAM, 16 February 1998, *Calónico Soto 7931* (MEXU1087085), *7934* (MEXU1048039); Terrenos de fraccionamiento Careyes, km 35.5 carr Mex 200, 16 February 2009, *Castro-Castro 1694* (MEXU1391256); 2 km al N del Rincón, 3 December 1984, *Cuevas Guzmán 512* (MEXU805718, MEXU805826); Camino antiguo a Nacastillo, cerca del limite No de la Estación de Biología Chamela UNAM, 19 February 1998, *Domínguez M. 1121* (MEXU1036762); Sobre el lindero NO, cerca del camino antiguo a Nacastillo, Estación de Biología Chamela, UNAM, 19 February 19998, *Domínguez M. 1152* (MEXU1064878); Camino Antiguo Norte, Estación de Biología Chamela UNAM, 20 February 1998, *Domínguez M. 1188* (MEXU1065002); Sobre el camino Eje Central, Estación de Biología Chamela UNAM, 20 February 1998, *Domínguez M. 1208* (MEXU1157792); Exactamente en la Unión del Eje Central con el sendero Calandria, Estación de Biología Chamela UNAM, 21 February 1998, *Domínguez M. 1222* (MEXU1157793); Camino Eje central en el cruce con el sendero El Tejón, Estación de Biología Chamela UNAM, 21 February 1998, *Domínguez M. 1229* (MEXU1155126); Sendero Tejón m 3200, Estación de Biología Chamela UNAM, 23 February 1998, *Domínguez M.1243* (MEXU1157659); Chamela Bay Region, Rancho Cuixmala, 28 October 1991, *Guadalupe Ayala 1268* (COLO01871557); Cuixmala-Chamela region, Arroyo Careyes, 12 February 1991, *Guadalupe Ayala 91-22* (MEXU609519); Estación de Biología Chamela UNAM, 18 March 2011, *Hernández Esquivel 51 A* (MEXU1425685); *Hernández Esquivel 52 A* (MEXU1425675); Cruce vereda Antiguo Camino Norte y Vereda tejón, Estación de Biología Chamela, 21 November 2016, *Ibarra Manríquez 6996* (MEXU1468342); Estación de Biología CHAMELA (UNAM) Arroyo Las Maderas, antiguo camino a Nacastillo Un poco antes de llegar a Maderas, 8 December 1982, *Lott 1664* (MEXU364271); Rancho Cuixmala, Cumbres 1, Arroyo Cajones, 14 January 1991, *Lott 3267* (KK005846481); Estación de Investigación, Experimentación y Difusión Chamela, UNAM, 5 December 1981, *Magallanes 3399* (MEXU382986); *Magallanes 3400* (MEXU382846); *Magallanes 3400* (MEXU385544); Chamela, 7 November 1975, *Mario H. L. 24* (MEXU617251); Estación de Biología de Chamela, 8 December 1970, *Pérez J. 266* (MEXU385223); *Pérez J. 268* (MEXU385177); Estación de Biología de Chamela, 18 January 1976, *Pérez J.1236* (MEXU378386); Estacion Biologica Chamela, Densely forested floodplain to more open hillside, 20-27 April 1992, *Quigley 574* (LSULSU00202239, MEXU645489, NY02496828); Sobre el Camino Antiguo Sur de la Estación de Biología Chamela, 7 December 2024, *Quintanar Castillo 330* (MEXU1585545); Rancho Cuixmala, N of the Rio Cuixmala, W of Hwy. 200, North end of Cerro La Alborada between main gate of ranch and Casa Pochelle, 10 November 1990, *Rothschild 060* (KK005846480; US3639737); Las Alamandas area, 3 km W of intersection with Hwy 200, 21 November 1990, *Rothschild & Ayala 97* (KK005846479, MEXU642926, NY02496829); Estación de Investigación, Experimentación y Difusión Chamela, 5 December 1981, *Solis Magallanes 3399* (US3729625); *Solis Magallanes 3400* (NY02496831, US3729612); La Manzanilla-Tamarindo, 3 November 1974, *V. de Puga 7145* (MEXU745523). Mpio. Puerto Vallarta: Río Pitillal, tramo la Pedrera a Playa Grande, 19 December 2008, *Cházaro B. 9220* (MEXU1386738); 5 km al NE de Pitillal, 15 November 1963, *Rzedowski 17813* (MEXU94855, US2449963). Mpio. Tomatlán: 1 km al SW de Tomatlán, 13 November 1963, *Rzedowski 17778* (MEXU94856). **Michoacán**, [unknown municipality] T[J]imalcota, 28 November 1898, *Langlassé 684* (KK005475589, US386119). Mpio. Aquila: Huizontla, 10 December 1941, *Hinton 16200* (KK005475590, NY02496834, US1840213); 9 Km al NW de Maroata, 28 December 1981, *Soto Núñez 3773* (MEXU678308); Maruata, 20 December 1984, *Soto Núñez 7084* (MEXU429613); 4 Km al NE Maroata, camino a Pómaro, 2 February 2003, *Soto Núñez 14878* (MEXU1254178). Mpio. Arteaga: 12 Km al SE de Arteaga, carr. a Playa Azul, 25 December 1981, *Soto Núñez 3732* (MEXU682520, 683137); Carr. Nueva Italia-Playa Azul, aprox. a 9 km al S de Arteaga, 8 May 2009, *Soto Núñez 15604* (MEXU1368266). **Oaxaca**, Mpio. Asunción Ixtaltepec: A 1 km al N de Nizanda, 19 December 1995, *Gallardo Hernández 1637* (MEXU737407, 1280780); A 1 km al N de Nizanda, 20 December 1995, *Gallardo Hernández 1651* (MEXU751636); Pedrera vía del tren Transistmico, a 1.75 km en línea recta al NO (345°) de Nizanda, 21 December 1995, *Gallardo Hernández 1689* (MEXU742836, 1280778); A 1 km al N de Nizanda, 22 December 1995, *Gallardo Hernández 1700* (MEXU751654, 1280681); Ruta 185 Matias Romero a La Ventosa, ca 20 km al S de Matias Romero, 12 December 1980, *Lorence 3079* (COLO01871565, MEXU347482); al S de Mazahua, hacia el cerro Ounta, la entrada se encuentra 13 km al NE de la Ventosa, carr. Juchitan-Matias Romero, 2 February, 1988, *Martínez Ramírez 1257* (MEXU1163863); Nizanda, 18 October 1988, *Martínez Ramírez 2002* (MEXU1221625); Cercano a Nizanda, 1 December 1995, Pérez G. 820 (MEXU743141); A 1.0 km en línea recta al NE (32°) de Nizanda, 8 December 1995,

Pérez G. 890 (MEXU751638). Mpio. Ciudad Ixtepec: Nizanda por la línea de ferrocarril Ixtepec-Chivela, después de la Mata, 27 October 1987, *Martínez Ramírez 1121* (MEXU502842); A 1.75 km en línea recta al NO (345°) de Nizanda, 24 October 1995, *Pérez G. 746* (MEXU737409, 1280281). Mpio. Heroica Ciudad de Juchitán de Zaragoza: Istmo de Tehuantepec, La Ventosa, En el interior de la caseta de ta Betu, 19 May 2014, *Sánchez 827* (US3677840); La Padraera Mazahua, 15 km al NE de la Ventosa, carr. Juchitán-Matías Romero, 22 January 1988, *Torres Colín 11244* (MEXU494946, 1163874). Mpio. Salina Cruz: Rincón Bamba, al O de Salina Cruz, carr. a Pochutla, 5 December 1986, *Martínez Ramírez 780* (MEXU494944). Mpio. San Miguel del Puerto: Sobre la brecha a Finca Monte Carlo, a 8 km al N de Xadame, entrando por Zimatán en carretera Pochutla-Salina Cruz, 4 October 1988, *Campos V. 2548* (MEXU1186881); Arroyo La Escalera, camino a Santa María Xadani, 18 November 1999, *Castrejón R 582* (MEXU1190550); Zimatán, 2 km N del Puente, terracería a Xadani, 21 September 1998, *Elorsa C. 762* (MEXU1190452); Zimatán, 0.5 km N del puente, 17 November 1998, *Elorsa C. 1092* (MEXU1190545); San Isidro Chacalapa, 1.8 km W de la brecha, por la vareda hacia Petatengo, 2 November 1998, *Rivera H. 1027* (MEXU1190574); Zimatán, 8.5 km N del puente, por la brecha a Xadani, 4 November 1998, *Rivera H. 1052* (MEXU1221020); Puente Zimatán, 12.8 km de la desviación, por la brecha hacia Xadani, 21 October 1999, *Salas M. 2443* (MEXU1173811, NY03296761). Mpio. San Pedro Huamelula: El Naipu, 1200 m al norte del puente Santa María sobre el río, 17 October 2001, *Elorsa C. 5314* (MEXU1190456); Dársena de Chahué, 2 km al SE de la Crucesita, 23 December 2003, *Elorsa C. 7751* (MEXU1173856); Cascalote, Río Seco, 10 November 2010, *García Sosa 518* (MEXU1374274); San Pedro Huamelula, km 80 al O de Salina Cruz, 29 April 1980, *González Olivares 269* (MEXU497667); Aguaje de Chito, 3 November 2010, *Molina Bende 703* (MEXU1356426); Arroyo las Cotorras, 24 January 2011, *Molina Bende 1038* (MEXU1358447); Playa Grande 2.5 km N, sobre la brecha, 21 January 2000, *Rivera H. 2089* (MEXU1190454); San Isidro Chacalapa, 0.8 km N de la desviación de la carretera costera, 19 October 1997, *Salas M. 1500* (MEXU1190548); San Isidro Chacalapa, 2 km N de la desviación de la carretera costera, 29 March 1999, *Salas M. 2017* (MEXU119045); Playa Grande, 2.7 km N siguiendo la brecha, ó 1.5 km S de la desviación de la carretera costera, 4 December 1999, *Salas M. 2540* (MEXU1190575); Desviación a Guadalupe Victoria, 5.8 km al N por la brecha, 31 October 2000, *Salas M. 3473* (MEXU1190451). Mpio. San Pedro Totolápan: Cam. a Agua Canoa, 23 October 1987, *Flores M. 1253* (MEXU481427). Mpio. Santa María Huatulco: Al noroeste de playa de Cacaluta, 3 November 1992, *Castillo C. 9328* (MEXU708314); Laguna de Chahue, 7 November 1992, *Castillo C. 9617* (MEXU691599); 50 m al norte del entronque de las Bahías de Huatulco, 22 September 2003, *Elorsa C. 7317* (MEXU1213351); Carretera a La Entrega, punto denominado El Apostadero Naval, 20 October 2003, *Elorsa C. 7424* (NY03189777); Carretera a La Entrega, punto denominado El Apostadero Naval, 20 October 2003, *Elorsa C. 7427* (MEXU1177887); Bahía Tangolunda, 11 October 1984, *Lopez G. 147* (NY02496827); A orilla de playa. Cerca del campamento tortuguero en la playa "Cacaluta", 3 December 2004, *Nava Zafra 786* (MEXU1221142); Tincuichero, 27 February 2001, *Ortega Lavariega 446* (MEXU1340354); Bahías de Huatulco, detras de la Playa Chachacual, 20 January 1999, *Reyes García 2882* (MEXU933537); Hacia el lado sur de la entrada a la Ranchería La Jabalina, sobre carretera. México 200, junto al Río Tangolunda, 17 March 1999, *Reyes García 3030* (MEXU933539); 3.49 km en línea recta 308 grados de la entrada de la Bahía Chachacual, 18 February 2005, *Saynes V. 5445* (MEXU1212674); Orilla de la playa el Maguey, 5 October 2004, *Sánchez Martínez 143* (MEXU1210583); 500 m al norte después de la entrada al Parque Nacional Huatulco, por el Hotel Binninguenda, 2 November 2004, *Sánchez Martínez 318* (HUAP29538; MEXU1210571); 200 m (l. r.) 200 grados del puente del río Cacaluta, 6 October 2004, *Saynes V. 5114* (MEXU1210579); 630 m (l. r.) 144 grados del puente del río Cacaluta, 7 October 2004, *Saynes V. 5143* (MEXU1210567, MEXU1210575); Playa Grande, a 0.5 km del entronque con la carr. a Salina Cruz, hacia el mar, 30 October 2009, *Torres Colín 16876* (MEXU1354375); 15 Km al EN de Santa Cruz Huatulco, 19 November 1992, *Trejo 2807* (MEXU1243687); Relleno Sanitario, Santa María Huatulco, 24 October 2001, *Vásquez H.J. 875* (MEXU1340358); Cerro Piedra, 9 November 2000, *Vásquez Hernández 133* (MEXU1340357); Sobre el Río Cacalutilla hacia El Faisan, a 56 km al LR de donde cruza el camino viejo a Santa Cruz y el Río Cacalutilla, 13 January 2005, *Velásco Gutiérrez 661* (MEXU1221149). Mpio. Santiago Jamiltepec: De Río Verde a Jamiltepec, 4 December 1921, *Conzatti 4393* (MEXU525824, US1169528). Mpio. Santiago Laollaga: Recorrido hacia y por el Arroyo de Hierba Santa, al E de Guichixu, brecha Laollaga-Guevea de Humboldt, 4 December 1991, *Campos V. 4121* (MEXU556991). Mpio. Santiago Astata: Tapanalá, 1 km E, por el Guayacán, 3 December 1999, *Castrejón R. 1010* (MEXU1190453); Barra de la Cruz, playa, 9 April 1998, *Elorsa C. 137* (MEXU1193351); Barra de la Cruz, 2.2 km NE LR, arroyo Agua Grande, 29 September 1998, *Elorsa C. 801* (MEXU1250898); Barra de la Cruz, 1 km E, por El Zapotal, 27 October 1998, *Elorsa C. 990* (MEXU1190552); Barra de la Cruz, 1 km S, por el camino hacia la laguna y la playa, 16 November 1998, *Elorsa C. 1073* (MEXU1180112); Barra de la Cruz, 2 km al SW por la torre de Telmex, 15 November 2000, *Elorsa C. 3883* (MEXU1190546); Laguna el Potrerón, 1 km al W de Barra de la Cruz, 14 March 2001, *Elorsa C. 4366* (PP02291369); Carretera nueva a Zimatán, 3 Km al sureste de Barra de la Cruz, 14 November 2001, *Elorsa C. 5419*

(MEXU1242415); 150 m al suroeste de la laguna El Potrerón, 21 November 2001, *Elorsa C. 5441* (MEXU1190465); Vereda viaja a Zimatán, 2 km al noreste de Barra de la Cruz, 12 November 2003, *Elorsa C. 7595* (MEXU1173813); La Tortolita, 24 October 2009, *Gopar Vásquez 258* (MEXU1372098); Las Pulgas, 12 November 2009, *Gopar Vásquez 482* (MEXU1386447); Los Guayacanes, 700 m el E de la Brecha a Chacalapa. 2.3 Km al N de la desv. A San Isidro Chacalapa, 26 October 2001, *Salas M. 4218* (MEXU1193276); 5.3 km (LR) al este del Rancho Zimatán, 29 November 2001, *Saynes V. 2782* (MEXU1190547). Mpio. Santo Domingo Tehuantepec: Cerro El Arenal, al O de Buenos Aires, carr. a Sn Miguel Tenango, 31 August 1991, *Campos V. 3962* (MEXU575413); Barra del Cruz, 1 km S, por el camino hacia la laguna y la playa, 16 November 1998, *Elorsa C. 1073* (MEXU1221063); Carrizal, 6 km al O de Morro Mzatan, Carr. a Pochutla, 20 November 1988, *Martínez Ramírez 2112* (MEXU1000576); Concepción Bamba, al N de Rincón Bamba camino a Carnero, 22 December 1988, *Martínez Ramírez 2193* (MEXU1000575); Ejido El Limón, 6 December 1998, *Reyes García B011/17* (MEXU985881); “El Manguito” al sur de El Limón, el cual está a 11.1 km. al SW de la entrada a Buenos Aires. Distr. Tehuantepec, 25 November 1983, *Torres Colín 4152* (MEXU385987); 4.5 km al SO de Buenos Aires, camino a San Miguel Tenango, entrando por Hierba Santa, 3 November 1987, *Torres Colín 10491* (MEXU497663). Mpio. Villa de Tututepec de Melchor Ocampo: Los Salinilas, Lag. Chacahua, 15 December 1921, *Conzatti 4467* (MEXU525825, US1169587). Mpio. Villa Hidalgo: Villa Hidalgo Yalálag, 22 October 1986, *Alatorre F. 12* (MEXU474190).

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