



A new species of *Miconia* (Melastomataceae) endemic to western Jalisco, Mexico

ALEJANDRO ZABALGOITIA¹, DANTE S. FIGUEROA¹ & MIGUEL Á. MUÑIZ-CASTRO^{2*}

¹Departamento de Botánica y Zoología, Centro Universitario de Ciencias Biológicas y Agropecuarias (CUCBA), Universidad de Guadalajara, Camino Ramón Padilla 2100, Las Agujas, Nextipac, Zapopan, Jalisco, Mexico.

²Herbario IBUG (“Luz María Villarreal de Puga”), Laboratorio de Ecosistemática, Instituto de Botánica, Departamento de Botánica y Zoología, Universidad de Guadalajara, Camino Ramón Padilla 2100, Las Agujas, Nextipac, Zapopan, Jalisco, Mexico:

*author for correspondence. E-mail: miguel.muniz@academicos.udg.mx

Abstract

Miconia vallartensis is a new species endemic to the western mountains of Jalisco, south of Puerto Vallarta, Mexico. Here we describe, illustrate and provide a key to *Miconia vallartensis* and morphologically similar species based on vegetative and reproductive characters. This species is easily differentiated from other species by its compact inflorescences, long trichomes and glabrescent pink to dark red flowering hypanthia with reflexed calyx teeth.

Resumen

Miconia vallartensis es una nueva especie endémica de las montañas occidentales de Jalisco, al sur de Puerto Vallarta, México. Aquí la describimos, ilustramos y proveemos una clave dicotómica basada en caracteres morfológicos vegetativos y reproductivos. Puede ser fácilmente diferenciada de otras especies por sus inflorescencias compactas, sus largos tricomas y su hipanto glabrescente de color rosado a rojo oscuro con dientes reflexos.

Keywords: *Clidemia*, Eudicots, melastome, *Miconieae*, Sierra Madre del Sur

Introduction

The Neotropical tribe *Miconieae* (Melastomataceae) has been traditionally shaped by the huge genus *Miconia* Ruiz & Pav. (1794: 60) and other 16–19 genera with baccate fruits (Cogniaux 1891, Michelangeli *et al.* 2004, Goldenberg *et al.* 2008). The delimitations of the genera in the traditional *Miconieae* were based on some ambiguous characters such as the shape of the petals or the position of the inflorescences, inter alia (Cogniaux 1891, Michelangeli 2019). These characters have been used repeatedly in arbitrary fashion by Cogniaux (1891), Macbride (1941), and other students of the family. Based on phylogenetic analyses of DNA sequence data, Michelangeli *et al.* (2019) have shown that the genera circumscribed using these morphological characters are clearly non-monophyletic (Michelangeli *et al.* 2004, Goldenberg *et al.* 2008, Martin *et al.* 2008, Michelangeli *et al.* 2008, Reginato *et al.* 2010, Reginato & Michelangeli 2016). Under this scenario, Michelangeli *et al.* (2016) proposed to expand the genus *Miconia* to include all other genera that have been placed in this tribe. Based on a consensus of many specialists, 583 taxa formerly belonging to at least 16 genera of *Miconieae* were transferred to the genus *Miconia* (Michelangeli *et al.* 2019).

Recently, mountains south and southeast of Puerto Vallarta, in the state of Jalisco, Mexico, have been a focus for the discovery of the following new endemic species to western Jalisco region: *Magnolia vallartensis* A.Vázquez & Muñoz-Castro (2012: 124), *Hyptis cualensis* J.G. González & Art. Castro (2014: 154), *Pinus vallartensis* Pérez de la Rosa & Gernandt (2017: 234), *Manfreda occidentalis* Art.Castro & Aarón Rodr. (2017: 64), *Manfreda santanamichelii* Art.Castro, Aarón Rodr. & P. Carrillo (2018: 497), *Hechtia ibugana* Flores-Argüelles, Espejo & López-Ferr. (2019: 106). This region, known as Sierra de Cuale-Tuito, is characterized by a steep mountainous complex that rises on one side of the sea (Bahía de Banderas), with tropical subperennial and subdeciduous forests in the lowlands and Nearctic communities that can be found in unusually low elevations for this latitude (Vázquez-García *et al.* 2012, Pérez de la Rosa & Gernandt 2017).

Material and methods

During fieldwork in July of 2013, the third author was exploring the populations of the recently described *Magnolia vallartensis* in the mountainous areas near Mismaloya town (about 8.5 km south-southeast of Puerto Vallarta's downtown). It was on that occasion when the species described here was first collected. During the period from 2016 to 2019, additional expeditions to the locality were carried out with the intention to better understand the habitat, phenology, and distribution of this species.

An exhaustive review of the specialized literature was carried out (Gleason 1939, Standley & Williams 1963, Almeda 1993, 2009, Ramírez-Delgado *et al.* 2010, Santiago Gómez, 1997, 2010, 2012, Santiago Gómez & Michelangeli 2016, Villaseñor 2016). Specimens from the herbaria at CIIDIR, GUADA, MEXU, IBUG, XAL and ZEA (acronyms according to Thiers 2019) were also reviewed as well as the digitized type specimens available in Global Plants Initiative Project (GPI) (<http://plants.jstor.org>). The description of the species is based on material dissected of the type and other specimens here cited (see additional specimens examined), as well as field observations. Measurements of all floral parts were obtained from field collected material preserved in 70% alcohol. A geographic distribution map for *Miconia vallartensis* and related species in western Mexico (Figure 3) was constructed with a vector file of georeferenced records and a digital elevation model INEGI v. 3 (INEGI 2013). The geographic coordinate reference system used was WGS 1984 UTM Zone 13. The GIS work was done using the software ArcMap (ArcGIS) v. 10.2 (ESRI 2014). The IUCN Red List Criteria (IUCN Standards and Petitions Committee 2019) and the Geospatial Conservation Assessment Tool (GeoCAT) of the Kew Royal Botanic Gardens website (IUCN-Kew-VIBRANT 2019) were used to evaluate if *Miconia vallartensis* belongs to a threatened category.

Taxonomy

Miconia vallartensis Zabalgaitia, Figueroa & Muñiz-Castro *sp. nov.* (Figs. 1, 2).

Diagnosis:—Subshrub differentiated from other species in the genus with elongate, linear-subulate and glabrous anthers by its large, flexuous glandular trichomes up to 11 mm on young branchlets and petioles, pseudolateral congested dichasial inflorescences, 5-merous flowers, and pink to dark red flowering hypanthia with reflexed calyx teeth.

Type:—MEXICO. Jalisco: Puerto Vallarta, por vereda entre las juntas del Arroyo Palo María y A. Chupalodo y la cerca del “Vacatón”, a 200 m al WNW de las juntas, ecotono de bosque mesófilo de montaña con bosque tropical subperennifolio, con presencia de *Calliandra grandiflora*, *Zamia paucijuga*, *Coccocypselum sp.*, *Pedilanthus sp.*, *Sommeria grandis*, *Calophyllum brasiliense*, *Costus pictus*, *Magnolia vallartensis*, *Podocarpus matudae*, 20°31'58.30"N, 105°14'50.70"W, alt. 390 m, 4 julio 2013, Miguel Muñiz-Castro, Jesús Padilla-Lepe, Gerardo Hernández, Neil Gerlowski, Miguel Cházaro, Ricardo Díaz-Borioli 1216 (holotype IBUG!; isotypes ZEA!, MEXU!, CIIDIR!).

Perennial subshrub 0.3–1 [–1.3] m tall; young branchlets and petioles slightly pulverulent, reddish-green in color, sparingly covered with simple smooth spreading slightly flexuous trichomes 3–11 mm long with a translucent gland at the apex, white to wine red, sometimes the trichome cover denser at the nodes and forming a dense trichome ring just above the base of the petioles. Leaves opposite, isophyllous; petioles [1.9–] 5–10 [–11.1] cm long; blades [4.5–] 8–14 [–21] × [3.5–] 4.5–10 [–12] cm, widely elliptic to elliptic or ovate, with 5 nerves diverging from the same point at the base of the leaf, or if 5-plinerved then the innermost pair diverging at a maximum of 5 mm above the base of the blade, rarely with a third pair of inconspicuous veins very close to the blade margin, margins toothed, ciliate, base rounded to slightly cordate, sometimes cuneate or oblique, apex acuminate, adaxial face lustrous, smooth, deep green when fresh, covered with spreading smooth trichomes 3–5 [–6] mm long that are adnate to the surface and broader towards the base, abaxial face papillose, sometimes foveolate, grayish-green to deep purplish-red with a metallic brightness, sparingly covered with trichomes [2–] 4–6 [–8] mm long, these denser on the veins. Inflorescence a shortly branched, congested pseudolateral dichasium 2–5 cm long with [1–] 2–15 [–20] flowers; axes of the inflorescence reddish, sparingly covered with glandular trichomes 3–8 mm long, nodes densely covered with trichomes up to 1.5 mm long; bracteoles didymous, subulate to narrowly triangular 0.5 × 1.8 mm. Flowers 5-merous, shortly pedicellate. Hypanthium [2–] 4–5 [–6] × 1.5–2.5 mm, urceolate, pink to dark red, glabrescent. Sepals 5, the inner laminar portions rounded, 0.5 × 1 mm wide, the external teeth 0.8 × 1.0 mm, triangular, reflexed, beset with an apical trichome up to 2 mm long. Petals oblanceolate to spatulate [1.1–] 1.2– 1.3 [–1.4] × 0.4–0.5 cm, the apex rounded to obtuse, pale pink

to white. Stamens diplostemonous, isomorphic, slightly geniculated near the union of the filament and the anther, exerted, filaments 5–6 mm long, white to pale yellow, glabrous; anthers [3–] 4–5.5 × 0.3–0.4 mm, basifixed, oblong, attenuating towards the apex, dehiscent through an apical pore ca. 0.14 mm diam., glabrous, white; connective as long as the thecae but 0.2–0.4 wide, ventrally sagittate, dorsally gibbous, yellow. Ovary 1.2–1.9 × 1.1–1.6 mm, half inferior, 5-locular, umbonate, smooth, glabrous; style bacilliform [9–]10–12[–13] mm long, white to pinkish; stigma inconspicuously capitated, white to pinkish. Berries 0.7–1.1 × 0.5–1.0 mm, ovoid to spherical, turning dark purple when mature. Seeds 0.4–0.5 × 0.4–0.6 mm, numerous, triangular-ovate, testa rough to slightly fluted.

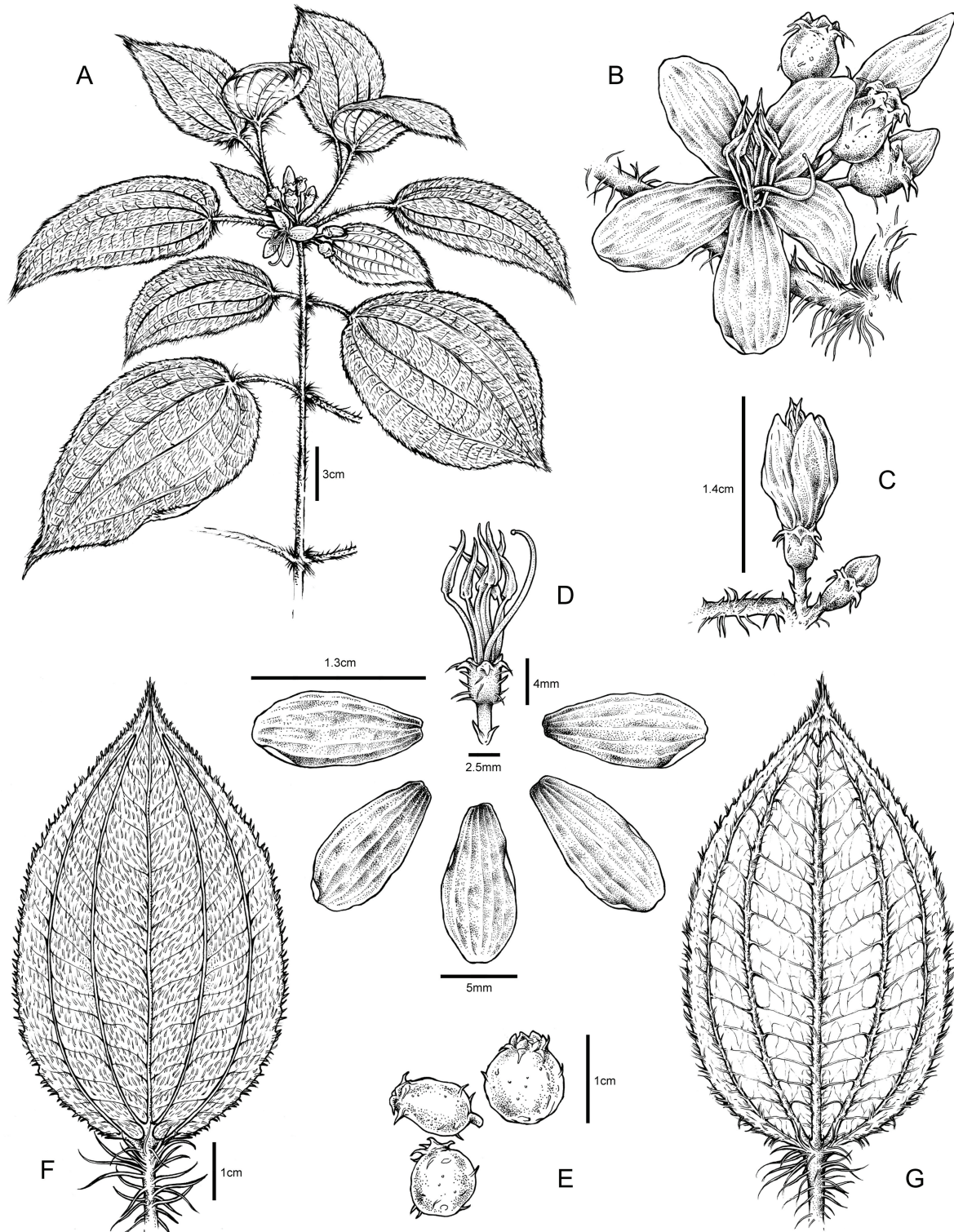


FIGURE 1. *Miconia vallartensis*. A. Habit. B. Flower at anthesis and detail of the inflorescence C. Flowers in bud. D. Flower dissection showing petals, hypanthium, stamens, and pistil. E. Mature fruits. F. Adaxial surface of leaf. G. Abaxial surface of leaf. Illustrations from *Zabalgotia*, Muñiz-Castro, *Figueroa* 528, 531 and 532. Drawing by René Tapia.

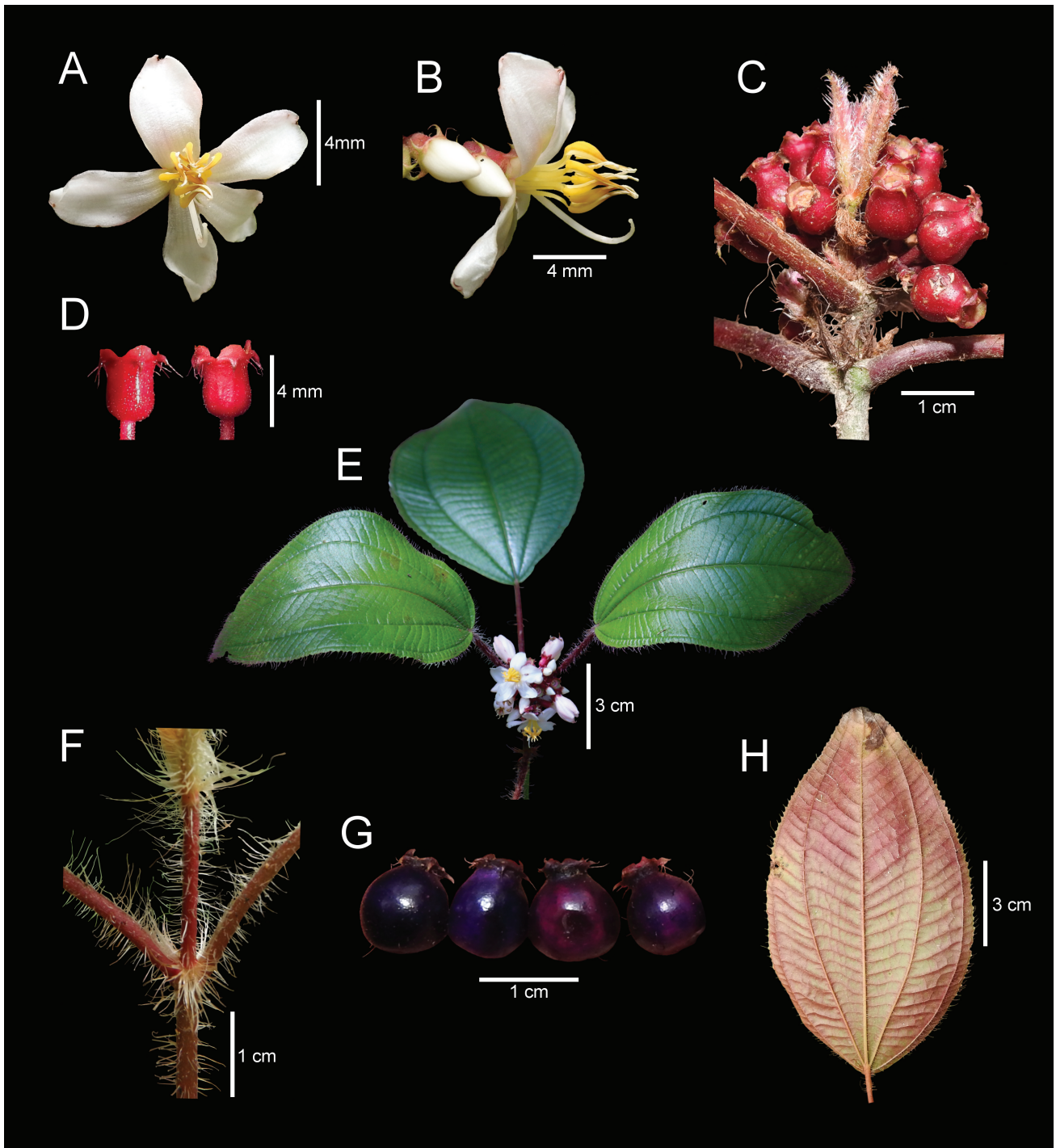


FIGURE 2. *Miconia vallartensis*. A. Flower, frontal view. B. Flower, lateral view. C. Inflorescence with immature fruits. D. Hypanthium at anthesis. E. Branchlet with leaves and inflorescence. F. Detail of the trichomes on the stem and petioles. G. Mature fruits. H. Leaf, abaxial surface. Photos by M. Muñiz-Castro (A, B, C, D, G), D. Figueroa (F, H.) and A. Zabalgoitia (E).

Additional specimens examined (paratypes):—MEXICO. Jalisco: Cabo Corrientes, en las inmediaciones de “La Antena”, por el camino Cuapinole-Los Alacranes, al este de Las Juntas y Los Veranos, en ladera norte, 20°28′39.4″N, 105°15′40.7″W, alt. 600 m, 2 septiembre 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 540* (IBUG!); 3.8 km al este de Las Juntas y Los Veranos, bosque tropical subcaducifolio con elementos de bosque de pino y encino, 20°28′24.7″N, 105°15′24.2″W, alt. 702 m, 2 septiembre 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 546* (CH!, MEX!); 4 km al este de Las Juntas y Los Veranos, bosque de encino y pino, 20°28′16.5″N, 105°15′27.7″W, alt. 682 m, *Zabalgoitia, Muñiz-Castro, Figueroa 547* (IBUG!, CIIDIR!); en las inmediaciones de La Antena, por el camino hacia “Los Alacranes”, bosque de encino-pino con elementos tropicales, 20°28′17.0″N, 105°15′33.5″W, alt. 692 m, 2 septiembre de 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 552* (IBUG!). Puerto Vallarta, 50 m al oeste de la

unión de los arroyos Palo María y Chupalodo, bosque tropical subperennifolio con elementos de bosque mesófilo de montaña, 20°31'59.7"N, 105°14'47.4"W, alt. 379 m, 2 septiembre 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 531* (IBUG!); *ibidem*, 2 septiembre 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 530* (ZEA!, CIIDIR!); aproximadamente 400 m al este-sureste de la confluencia de los arroyos Palo María y Chupalodo, bosque tropical subperennifolio con elementos mesofíticos, 20°31'46.7"N, 105°14'15.1"W, alt. 460 m, 2 septiembre 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 536* (CIIDIR!, CHAPA!); 4.7 km al sur de la desviación de los caminos de El Jorullo y Vallejo, bosque de encino-pino con elementos tropicales, 20°32'15.1"N, 105°12'37.6"W, alt. 505 m, 9 noviembre de 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 580* (IBUG!); juntas de Arroyo Palo María y Arroyo Agua Zarca (A. Chupalodo), sub-arbusto de 1.3 m de alto, frecuente, 20°31'55.50"N, 105°14'44.80"W, alt. 340 m, 26 de junio de 2014, *Muñiz-Castro, Hernández, Nuño, Vázquez 1342* (IBUG!, ZEA!, MEXU!); cerca de las juntas de Arroyo Palo María y Arroyo Agua Zarca (A. Chupalodo), sub-arbusto de 1 m de alto, frecuente, creciendo con *Conostegia xalapensis, Miconia albicans, Calophyllum brasiliense, Magnolia vallartensis, Podocarpus matudae*, 20°31'55.52"N, 105°14'44.97"W, alt. 345 m, 2 septiembre de 2018 *Zabalgoitia, Muñiz-Castro, Figueroa 528* (ZEA!); *ibidem*, 2 septiembre de 2018, *Zabalgoitia, Muñiz-Castro, Figueroa 532* (MEXU!).

Distribution:—*Miconia vallartensis* is only known from a restricted area between the Horcones and Cuale rivers in the mountains south and southeast of Puerto Vallarta (Fig. 3). From a biogeographical point of view, the populations of *M. vallartensis* known to date are located within the limits of the Sierra Madre del Sur and Pacific Lowlands provinces (Morrone 2018). Otherwise, according to Cuanalo de la Cerda *et al.* (1989), these occur in the Sierra Madre del Sur terrestrial province.

Habitat and Ecology:—The species grows in areas with an interesting flora composed of tropical elements such as *Cupania* L. (1753: 200), *Couepia* Aubl. (1775: 519) and *Calophyllum* L. (1753: 513) mixed with elements associated with oak-pine forests of *Quercus* L. (1753: 994), *Pinus* L. (1753: 1000), *Clethra* L. (1753: 396) and mesophytic forest with *Magnolia* L. (1753: 535), *Podocarpus* L'Hér. ex Pers. (1807: 580), *Clusia* L. (1753: 509) and *Cyathea* Sm. (1793: 416).

The species can be found in semi-open and well-illuminated sites, in steep ravines or in the edge of climax forests. The predominant soils are acid Pellic Vertisols, Vitric Andosols, Chromic Luvisols, and Eutric Nitosols. The elevational range of the populations known to date is between 300 and 750 m a.s.l. with annual average temperatures of 23–24°C and precipitations of 1620–1700 mm per year (Ruiz-Corral *et al.* 2018).

Phenology:—The specimens with flowers were collected between June and September, during the rainy season. Mature berries were found between July and November.

Etymology:—The epithet highlights the biodiverse territory of Puerto Vallarta, in which municipality this plant was first seen.

Ethnobotany:—Berries are consumed by the local people, who call them “pedorrilla” or “chachalaguilla”; this names are also given to the entire plant. The colorful foliage and the big flowers make this species potentially ornamental.

Conservation status:—*Miconia vallartensis* is only known from three localities. Because of the restricted area of its populations, coupled with the fact that it grows just a few kilometers from the rapidly growing tourist city of Puerto Vallarta, the populations are at risk. The primary risk factors are the pressures exerted on these habitats by the introduction of livestock, forest fires, global warming, suburban developments and infrastructure works. Both federal and state governments plan to start the construction of a freeway bypass around the city of Puerto Vallarta by the year 2020. This highway and its negative impacts would be located among the only three known locations of *Miconia vallartensis* (BANOBRES 2019). Based on IUCN Red List guidelines and criteria we recommend a conservation assessment of Critically Endangered for *Miconia vallartensis*. It has an Extent of Occurrence (EOO) of 14.78 km² (<100 km², B1 criterion), in addition to its severely fragmented population structure [condition (a)] and an estimated continuing decline of area of occupancy [condition (b)(ii)] and quality of habitat [(b)(iii)]. The estimated Area of Occupancy (AOO) for this species was 16 km².

Discussion:—The genus *Clidemia* D. Don (1823: 284), whose members have been recently transferred to *Miconia*, has traditionally comprised plants with baccate fruits, pseudolateral or pseudoterminal inflorescences and non-acute petals (Cogniaux 1891), being all these characters present in *M. vallartensis*; however, species that share this characters do not belong to a monophyletic group (Michelangeli *et al.* 2004, 2008, Martin *et al.* 2008, Goldenberg *et al.* 2008), so new comprehensive works that include recently transferred species from other baccate fruits genera to *Miconia* are needed for the assignment of its species to infrageneric categories. On the other hand, based on Cogniaux's (1891) sections of the genus *Miconia*, this new species could be placed in the *Miconia* section *Octomeris* (Naudin) Triana ex Hook.f. (1867: 764) by the elongate, linear-subulate, not glandulose anthers with one minute pore. Nevertheless,

a phylogenetic analysis (Goldenberg *et al.* 2008) has shown that the members traditionally assigned to this section are placed in different clades within other sections, thus, due to the convergence of some diagnostic characters, the infrageneric position of this new species is now uncertain.

Miconia vallartensis is morphologically similar to *M. submontana* (Rose ex Gleason) Michelang. (2019: 115) [= *Clidemia submontana* Rose ex Gleason (1939: 127)], a species that has not yet been assigned to a section, and *Miconia obconica* Gleason & Wurdack (1968: 172), traditionally assigned to Sect. *Octomeris* (Goldenberg *et al.* 2013). Like *M. vallartensis*, both species have glabrous stamens with subulate anthers with a dorsally gibbous connective, but they differ from our species in some floral and vegetative characters, such as the shape and indumentum on the hypanthium, the size and shape of the calyx teeth, the type of inflorescence, the number of nerves in the leaves and the indumentum on branches and petioles (Table 1).

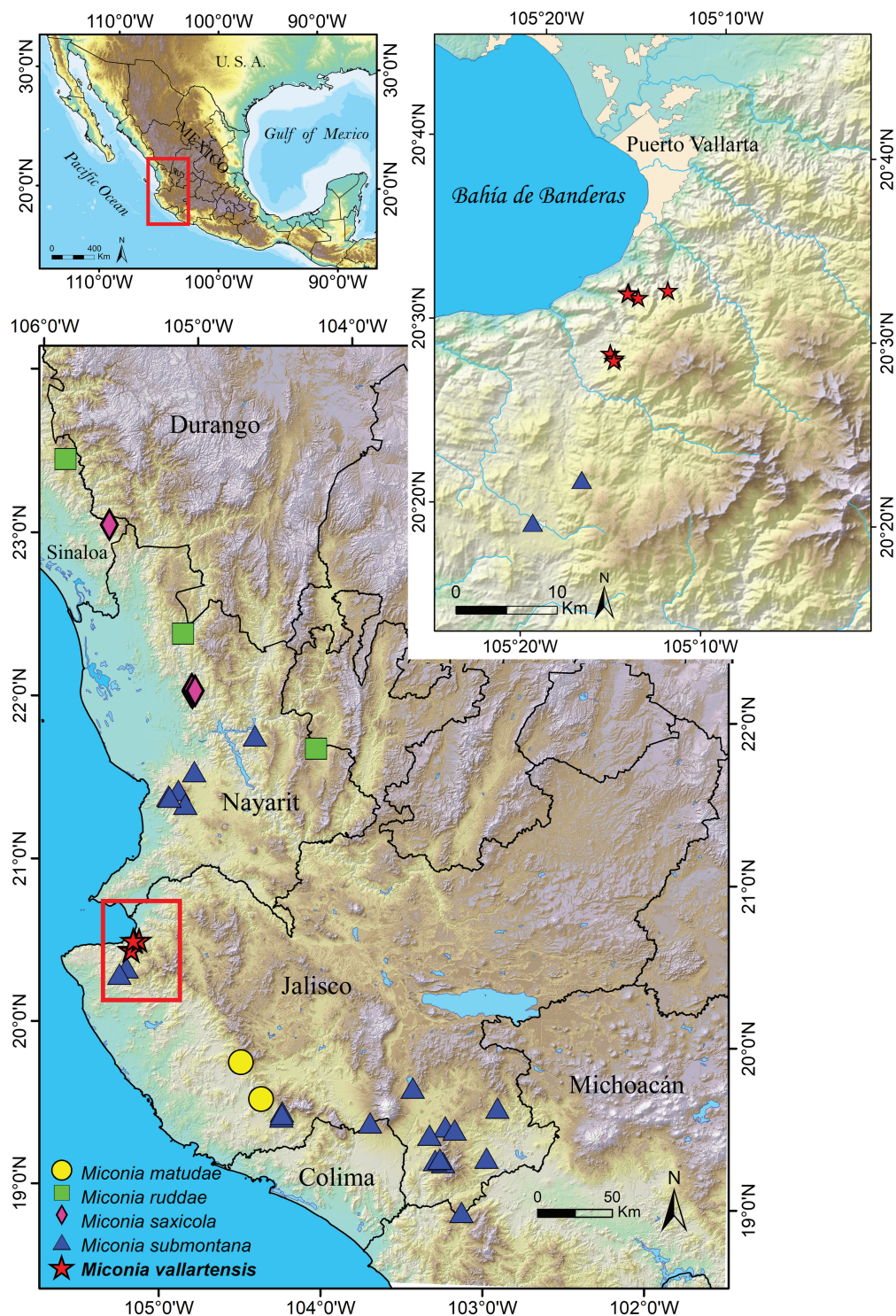


FIGURE 3. Geographic distribution of *Miconia vallartensis* and other related species.

In addition to this new species, four other species of *Miconia* with non-terminal inflorescences can be found in central-western Mexico: *M. saxicola* Brandegee (1905: 215), *M. matudae* (L.O. Williams) Michelang. (2019: 104) [= *C. matudae* L.O. Williams (1963: 556)], *M. ruddae* (Wurdack) Michelang. (2019: 112) [= *C. ruddae* Wurdack (1970: 388)] and *M. submontana* (Rose ex Gleason) Michelang. (2019: 115) [= *C. submontana* Rose ex Gleason (1939: 127)]. These species can be distinguished from *M. vallartensis* by the following key:

Key to the species of *Miconia* found in central-western Mexico (including the states of Colima, Jalisco, and Nayarit) with non-terminal inflorescences

- 1. Stamens more than 3 times the number of petals *M. matudae*
- Stamens 2 times the number of petals 2
- 2. Flowers 6 merous, stamens 12 *M. saxicola*
- Flowers 5-merous, stamens 10 3
- 3. Branchlets and petioles with trichomes > 8 mm long; compact inflorescences; exterior calyx teeth reflexed *M. vallartensis*
- Branchlets and petioles with trichomes < 3 mm long; lax inflorescences; exterior calyx teeth erect 4
- 4. Branchlets and petioles with trichomes 2–3 mm long; pedicels <1 mm long or absent; exterior calyx teeth up to 0.5 mm long *M. ruddae*
- Branchlets and petioles with trichomes 1–1.5 mm long; pedicels 2–4 mm long; exterior calyx teeth 2.5–5 mm long *M. submontana*

According to Villaseñor (2016), *M. petiolaris* (Schltdl. & Cham.) Michelang. (2019: 108) [= *C. petiolaris* (Schltdl. & Cham.) Schltdl. ex Triana (1872: 135)] and *M. dentata* (D. Don) Michelang. (2019: 93) [= *C. dentata* D. Don (1823: 308)] are present in the states of central-western Mexico, but we have not yet found specimens to confirm their occurrence in this region.

TABLE 1. Diagnostic characters for *Miconia vallartensis* and closely related species.

Characters	<i>M. vallartensis</i>	<i>M. submontana</i>	<i>M. obconica</i>
Hypanthium shape	urceolate	urceolate	obconic
Hypanthium indumentum	glabrescent	with stout, roughened hairs	with scattered conic trichomes
Calyx teeth length	0.8 mm	2.5–5 mm	absent, or if present then up to 0.6 mm
Calyx teeth shape	triangular, reflexed	triangular, the tip linear	conical
Inflorescence type	congested dichasium	racemose cluster of terminal cymes	panicle
Branches and petioles indument	covered with flexuous trichomes up to 11 mm	covered with flexuous or straight trichomes up to 2.5 mm	moderate to densely covered by pinoid trichomes, sometimes with barbelate or glandular pinoid trichomes
Nerves	5	5	5–7

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