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***Agave garciaruizii* (Asparagaceae) a new species from the Chorros del Varal State Reserve in western Mexico**

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Abstract

A new species named *Agave garciaruizii* is described and illustrated here. *A. garciaruizii* is endemic to tropical dry forest in the Itzícuaro and Apupátero river canyons in the Chorros del Varal State Reserve, at the southern border of the states of Jalisco and Michoacán, México. It belongs to the subgenus *Littaea* and to the *Marginatae* species group and is morphologically related to *A. angustiarum* and *A. impressa*, but differs from these species in some features of leaves, inflorescences and infructescences. Its conservation status was assessed as Endangered (EN). Additionally, morphological evidence was provided in support of *A. arcedianoensis* as a species distinct from *A. angustiarum*. A key to morphologically and geographically closely related species in the *Marginatae* group is presented.

Resumen

Se describe e ilustra una especie nueva llamada *Agave garciaruizii*. *A. garciaruizii* es endémica del bosque seco tropical en los cañones de los ríos Itzícuaro y Apupátero en la Reserva Estatal Chorros del Varal, en el límite sur de los estados de Jalisco y Michoacán, México. Pertenece al subgénero *Littaea* y al grupo de especies *Marginatae*. La especie propuesta está relacionada morfológicamente con *A. angustiarum* y *A. impressa*, pero difiere de estas especies en algunas características de las hojas, inflorescencias e infructescencias. Su estado de conservación fue evaluado como En Peligro (EN). Además, se proporcionó evidencia morfológica en apoyo de *A. arcedianoensis* como una especie distinta de *A. angustiarum*. Se presenta una clave para las especies relacionadas morfológicamente y geográficamente en el grupo *Marginatae*.

Keywords: Agavoideae, Agavaceae, Nueva Galicia, Los Reyes de Salgado, Santa María del Oro

Introduction

The genus *Agave* Linnaeus (1753: 323) includes ca. 276 accepted taxa (Smith & Figueiredo 2014), 200 species according to García-Mendoza (2007), ranging from the U.S.A. to the Andes of Venezuela, Colombia and Ecuador, with México as the major center of species diversity with ca. 165 species (Espinosa-Barrera 2015) and nearly 50 species in western México. With 37 species of *Agave*, the state of Oaxaca has the highest diversity in México, followed by Jalisco (33), Puebla (31), Sonora (30), Durango (28), and Chiapas and Michoacán with ca. 20 species each (McVaugh 1989, Thiede 2001, Hernández-Vera 2003, Hernández-Vera *et al.* 2007a, 2007b; Vázquez-García *et al.* 2007a, 2007b, 2007c, 2016).

Several phylogenetic studies based on morphological and molecular characters have been carried out on the Agavoideae with a broad agreement on the main lineages recovered and their phylogenetic relationships (Eguiarte *et al.* 1994, 2000, Hernández 1995, Bogler & Simpson 1995, 1996, Smith *et al.* 2007, Flores-Abreu *et al.* 2019). However, phylogenetic relationships within most of the genera, including *Agave*, have been very difficult to elucidate, mostly due to the very low levels of genetic variation (Eguiarte 1995, Eguiarte *et al.* 2000). This could be the result of both gene flow among taxa and retention of ancestral polymorphisms, since the group has a relatively recent origin (ca. 3–10 My) (Good-Ávila *et al.* 2006, Smith *et al.* 2007, McKain *et al.* 2016, Flores-Abreu *et al.* 2019). Using AFLP molecular markers, Hernández-Vera (2003) found genetic similarities among species of *Agave* from western Mexico,

which broadly correspond to the groups proposed by Gentry (1982), including agaves from the *Marginatae* group. According to Gil-Vega *et al.* (2007), the *Marginatae* group is polyphyletic, with 10 species forming a well-supported clade and six dispersed among other taxa of subgenus *Littaea* (Tagliabue 1816: 106) Baker (1888: 164). However, further studies are necessary to elucidate these relationships.

The subgenus *Littaea* is subdivided into eight informal unranked groups, characterized by having pairs or clusters of flowers on a spike-like inflorescence or rarely as racemose-like in distinct clusters (Gentry 1982). The *Marginatae* species group (*sensu* Gentry 1982) comprises 24 species, including the new one proposed here, which are confined to tropical arid to semiarid climates with few taxa occurring in moist mountainous areas. This species group is characterized by having subcaulescent, single to surculose rosettes, stiff leaves usually with continuous corneous margins from the decurrent terminal spine to near the base, frequently armed with small to large teeth, flowers with short open tubes and proportionally long tepals embracing the filaments (Gentry 1982).

This group includes five allopatric species mostly distributed in western Mexico: *Agave impressa* Gentry (1982: 146) is endemic to the states of Sinaloa (E of Escuinapa, and NNE of Concordia) (González-Elizondo *et al.* 2009) and Nayarit (SW of Mesa el Nayar and Presa Aguamilpa, near Tepic), where the species was collected earlier by Charles Glass (Etter & Kristen 2011); *Agave chazaroi* A.Vázquez & O.M.Valencia in Vázquez-García *et al.* (2007b: 48) is endemic to the Santiago Canyon (E of Tequila, Jalisco); *Agave arcedianoensis* Cházaro, O.M.Valencia & A.Vázquez in Vázquez-García *et al.* (2007b: 45) is endemic to the Santiago Canyon (Barranca, N of Guadalajara, Jalisco); *Agave angustiarum* Trelease in Standley (1920: 139) occurring in the states of Michoacán (S of Uruapan), Guerrero (Iguala and Chilpancingo), Mexico (Temascaltepec), Morelos (Chalcatzingo and Cuernavaca), Puebla (Molcaxac, San Gabriel Chilac, San Juan Miahuatlán and Tehuitzengo), and Oaxaca (Juxtlahuaca, San Juan Mixtepec, Santiago Lachiguiri, Yosondúa and Zapotitlán Palmas); and the new species here described, endemic to the Itzícuaro-Apupátoro Canyon, with half of its distribution range in Jalisco (at the border with Michoacán, Puente Iturrya) and the other half in Michoacán (Los Reyes), within the Chorros del Varal Canyon.

For over a decade, populations from the Apupátoro-Itzícuaro river in the border of the states of Jalisco and Michoacán have been treated by several authors as *Agave angustiarum* (Hernández-Vera 2003, Cházaro-Basáñez *et al.* 2007, Hernández-Vera *et al.* 2007a, 2007b, and Vázquez-García *et al.* 2007b, Greulich 2012, Etter & Kristen 2019) however, they are here proposed as a new species. Greulich (2012) argues that the recently described *Agave arcedianoensis* differs from *A. angustiarum* by the sole character of flower color. Here we reassess the morphological differences among these three taxa.

The Barranca Chorros del Varal, where the new proposed species grows, was established as a State Natural Reserve in 2007. Despite being the main tourist attraction in the Los Reyes region with several beautiful waterfalls, its biodiversity has received little attention; unfortunately, there is no management plan and no staff is currently administering the natural protected area (García-Ruiz & Lott 2015). Four vegetation types occur in the area: tropical deciduous forest, tropical sub-deciduous forest, mountain mesophilic forest and a community of shrubby grasses locally called *varal*, composed mainly of the *otatillo* bamboo (*Otatea acuminata* (Munro) C. E. Calderón & Soderstr.) and other grasses (García-Ruiz *et al.* 2014). The proposed new species of *Agave* augments the list of species of conservation concern in the reserve, which currently includes three narrow endemics: *Graptopetalum pentandrum* Moran (1971: 255), endemic to Chorros del Varal and nearby Aguililla (Etter & Kristen 2006), *Hechtia purhepecha* García-Ruiz *et al.* (2014: 10), endemic to Peribán and Los Reyes, and *Tillandsia guenther-nollerii* Ehlers (1995: 13), endemic to Colima, Jalisco and Michoacán (García-Ruiz *et al.* 2014).

Material & Methods

The proposed species was first collected without inflorescences by Ignacio García Ruiz in 1994 in the Chorros del Varal Canyon, Los Reyes, Michoacán. In August–September 2002, Gerardo Hernández-Vera and collaborators obtained and measured rosette and leaves of this species from both the Michoacán and the Jaliscan side of the canyon (Fig. 1). Subsequently it was treated as *Agave angustiarum* by Hernández-Vera *et al.* (2007) and by Vázquez-García *et al.* (2007a). After numerous visits to the area over a span of fifteen years, we could not find any flowering plant until we interacted with Dr. Ignacio García Ruiz, who had taken a photograph of the plant in flower back in March 2003. We decided to visit the area in March 2017 despite a month earlier we did not succeed in finding any sign of flowering. The Jaliscan side had no flowering stems, therefore, we headed to the Michoacán side at Chorros del Varal, in the Apupátoro river canyon, also known as Palo Verde river; there, we found only two flowering individuals among hundreds of

rosettes. After examining the morphological variability of these plants in their range and confronting them with all the published species in the *Marginatae* group—including the type material of *Agave angustiarum* at MO, and additional material of the latter species from Michoacán, Guerrero and Oaxaca available at ASU, CIMI and MEXU—we could not place it in any of the currently recognized species, and thus it is herein described as a new one.

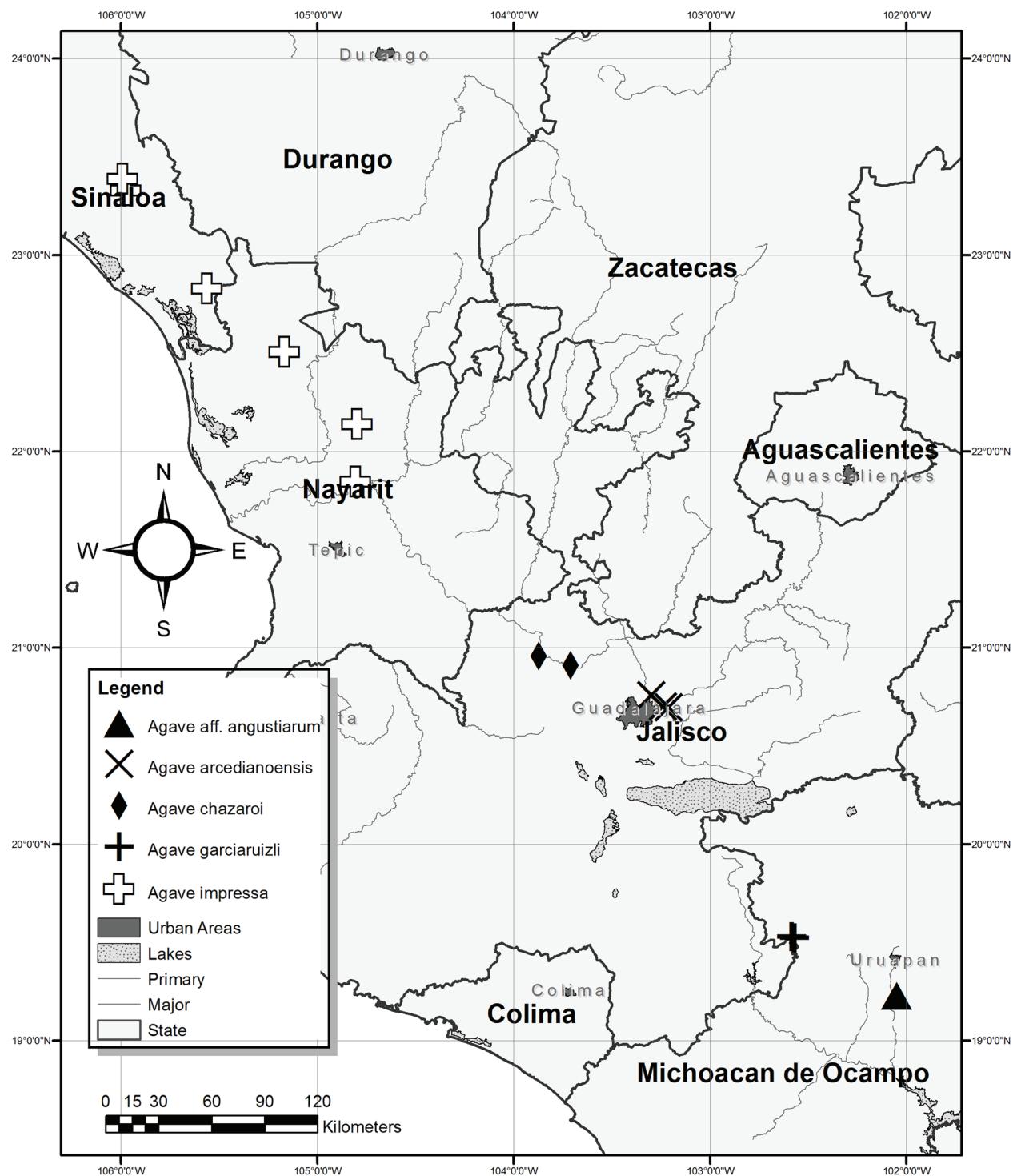


FIGURE 1. Distribution map of *Agave garciaruizii* and other species of the *Marginatae* group in western México.

We compared our species to *A. angustiarum* taking as reference the work of Gentry 1982 extended with additional information from digital material available for this species at ASU and MEXU; *A. arcedianoensis* was included in the comparison in order to reassess its morphological relationship to *A. angustiarum*, reviewing the features proposed by Greulich (2012). *A. impressa* was also included given its similarity to the proposed species in terms of its fruiting morphology.

Studied material of *Agave arcedianoensis* included the following specimens: MEXICO. Ixtlahuacán del Río, Mascuala, filo de la Barranca al sureste de la Hacienda El Mexicano, 1510 m, 20°45'N, 103°17'O, 3 June 2011 (last year fr), J. A. Vázquez-García 9167b w J. Padilla-Lepe (IBUG!). Jalisco: [Municipio] Tonalá, 1250 m, [12 June 2002 (fl)], J. A. Vázquez-García s.n. with M. Cházaro-B. (holotype IBUG!, flowers lost); same locality as the previous one, 5 February 2001 [2002] (sterile), M. Cházaro-B. 8102 (IBUG!, XAL!); Barranca de Colimilla, M. Cházaro-B. 8707 (IEB). Zapotlanejo, Barranca de Colimilla, al sur de El Aguacate, 1 May 2003 (fl), 1440 m, G. López-Damián et al. 48 (IBUG!); same locality as the previous one, 20°41'33.00"N, 103°13'11.00"O, 24 June 2007 (fl, immature fr), J. A. Vázquez-García et al. 8820 (IBUG!). It is locally known as "jabón de caballo" (horse soap), the base of leaves are used to wash and brush the horse's skin with just adding water.

The herbarium acronyms follow Thiers (2017). For accepted names of *Agave*, we used Govaerts et al. (2017). Authors and names of plants follow the International Plant Name Index, IPNI (2018). The TROPICOS website (<http://www.tropicos.org>) was used to find pertinent literature sources. The conservation status was assessed based on the criteria of IUCN (2012).

Results

Agave garciaruizii A. Vázquez, Hernández-Vera & Padilla-Lepe sp. nov. (Figs. 2–5).

Type:—MEXICO. Michoacán: Municipio Los Reyes de Salgado, 17 km al O de la cabecera municipal, ladera de exposición sur, frente a cascada del Río Palo Verde, tributario del río Apupátoro, a 500 m al oriente de la entrada al área natural protegida Chorros del Varal, 941 m, 19°31'22.37" N, 102°34'10.34" O, en bosque tropical caducifolio, sobre cantiles y afloramientos basálticos, 25 March 2017 (fl), J. Antonio Vázquez-García 10140, w/ Ignacio García-Ruiz and Jesús Padilla-Lepe (holotype IBUG; isotypes, CIMI and MEXU).

Diagnosis:—*Agave garciaruizii* differs from *A. angustiarum* in having leaves without or with an inconspicuous mid-linear color stripe vs. conspicuous stripe, greater teeth density at mid-blade per 10 cm (8–14 vs. 3–7); panicles racemose-like vs. spike-like, thicker (15.0–18.0 vs. 13.0–14.0 cm), shorter flowering stalk segment (33–40 vs. 50–60 %); larger anthers (1.6–2.1 vs. 1.4–1.5 cm); infrutescence thicker (10.0–14.0 vs. 5.0–6.5 cm), longer fruiting pedicels (1.8–2.0 vs. 0.4–0.5 cm), longer capsules (2.4–2.6 vs. 0.8–2.0 cm) and fruit valves curved outward and with acute apex vs. straight and with rounded apex.

Description:—Solitary, subcaulescent open rosettes, 0.9–1.1 m in diam. Leaves 20–34, 50.0–80.0 × 6.0–10.6 cm, linear to lanceolate, long acuminate, firm, straight, thick, green to dark green, pale green mid-linear band inconspicuous or lacking, flat to concave on the upper face, with whitish grey serrate margins, margins continuous and toothless in the apical 5–10%. Marginal teeth 0.4–0.7 cm long, 8–14 teeth per 10 cm, (0.3–)1.0–3.0 cm apart, straight or inclined in the lower part of the leaf, but curved upward or bent in the upper part, flattened, the largest somewhat scattered, dark brown to gray. Terminal spine 3.0–4.0 cm long, needle-like, with thin groove above. Panicles 3.0–4.2 m high, 15.0–18.0 cm in diameter, racemose-like, flexible, with a flowering stalk length of 33–40%. Peduncle with triangular peduncular bracts, 10.5–13.5 × 3.5–4.0 cm, lacking teeth at the margins. Flower buds 1.4–1.5 × 0.3–0.4 cm. Peduncle 0.4–0.5 cm long, pedicels 0.8–1.0 cm long. Flowers pale yellow to yellowish green, 5.7–6.4 cm long. Ovary 1.6–1.7 cm long, with thin neck. Tube 0.2–0.3 × 0.6–0.7 cm. Tepals 1.7–1.8 × 0.4–0.5, glaucous greenish in bud and pale yellow to yellow at anthesis; filaments 3.8–4.4 cm long, yellow; anthers 1.6–2.1 cm long, yellow; styles 2–3 cm long, whitish; stigma simple, yellowish. Infructescence 10.0–14.0 cm in diameter, with capsules in congested inflorescences. Capsules 2.4–2.6 × 1.0–1.2 cm, pedicels 1.8–2.0 cm long, fruiting valves curved outward. Seeds 0.2–0.3 × 0.3–0.5, lunulate, flat, black.

Discussion:—Our data support the view that *Agave garciaruizii* (Figs. 2–5) and *A. arcedianoensis* (Figs. 6–8) are both morphologically distinct from *A. angustiarum* (Table 1), in contrast to the conclusions by Greulich (2012) which were hindered by the lack of infructescences and capsules available for his study at that time. Cházaro-Basáñez & Valencia-P. (2003) misidentified *Agave arcedianoensis* as *Agave impressa* (Cházaro-Basáñez et al. 2009), due to an inconspicuous and incomplete bud printing present in the former species. Our study also revealed an unexpected morphological similarity between *A. angustiarum* and *A. impressa*, in terms of their long pedicels and the shape of their capsule valves.

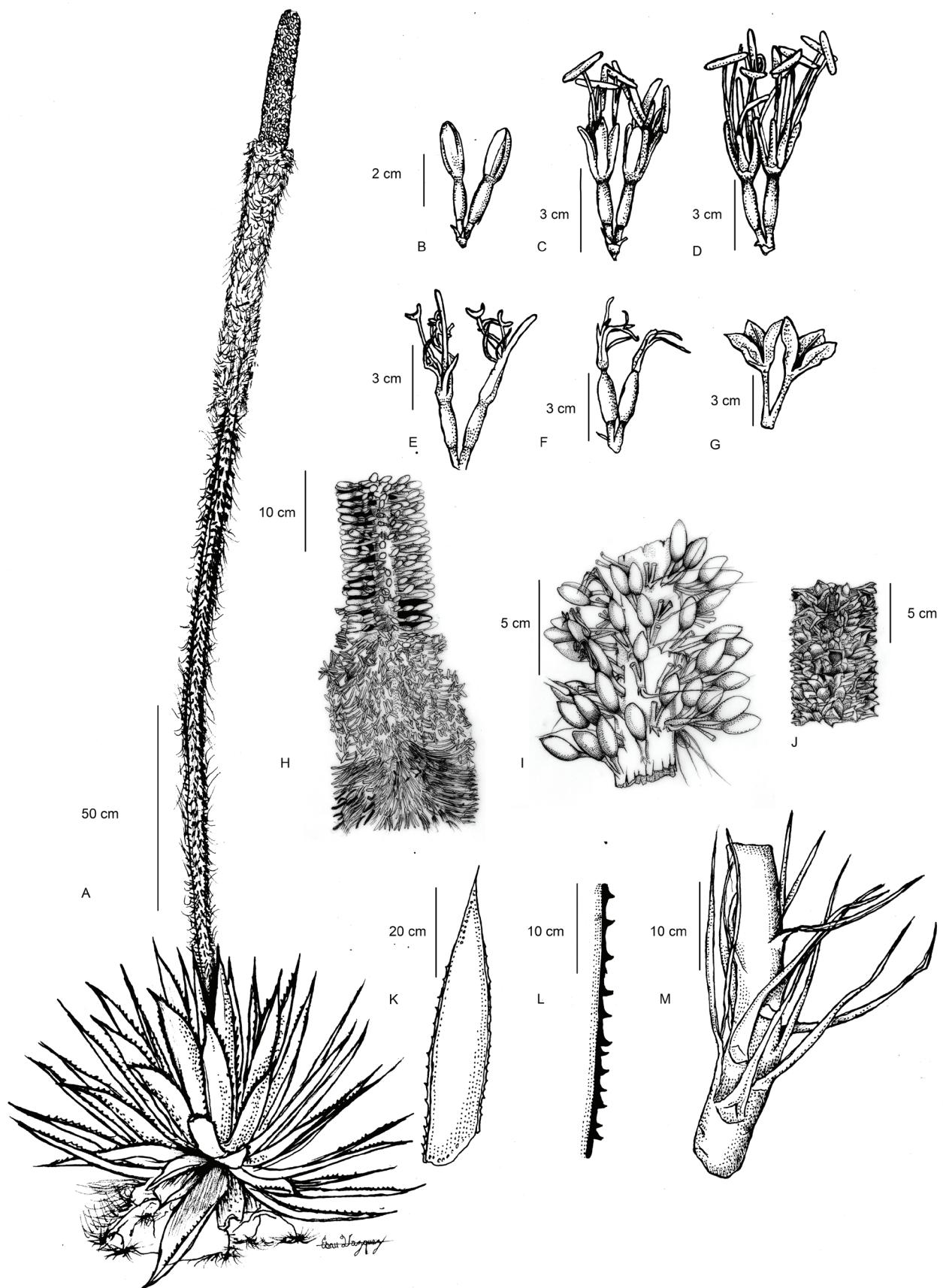


FIGURE 2. *Agave garciaruijii*. A. Habit. B. Flower buds. C. Developing flower. D. Fully grown flower. E. Withered flower. F. Developing gynoecium. G. Capsules. H. Portion of flowering stem. I. Nearly mature capsules. J. Dehisced capsules. K. Leaves. L. Leaf with marginal teeth. M. Basal peduncular bracts. A–F, H, K and L–M from the type material. J from Vázquez-García 10140b. Drawing by Esau Vázquez Verdejo.



FIGURE 3. *Agave garciaruijii* in the Itzícuaro River canyon, Manuel M. Diéguez, near the southern border between Jalisco and Michoacán. A–B, Rosette, C–D Leaves. E. Spine, F. Gerardo Hernández near a small rosette. G–H. Leaf margin and teeth variability. A, C & H from Hernández-Vera 72 (field labeled: p29-3); B, D–E & G from Hernández-Vera 69 (field labeled; p28-1). Photographs A–E and G–H by Gerardo Hernández-Vera, Sep. 2002; and F by M. Cházaro, September 2002.



FIGURE 4. *Agave garciaruizii* in the Río Apupátero (also known as Palo Verde) canyon. A. Flowers. B. Flower buds. C. Flower bud, D. Opening flower. E. Flower fully extended. F. Habit in flower, hold by Ignacio García-Ruiz, with a waterfall of the Río Apupátero in the background and *Bursera* in the front. G. Jesús Padilla-Lepe holding the flowering segment of the inflorescence. All pictures from the type material. Photographs: A–E, G. by J. A. Vázquez-García, March 2017; F by J. Padilla-Lepe, March 2017.



FIGURE 5. *Agave garciaruizii* A. Developing fruits, B. Dehisced fruits, C. Flower after anthesis, D. Initial development of fruits, E. Opened capsules. F. Rosettes in their habitat. G. Past flowering, coexisting with *Senecio* sp. B–E from Vázquez-García 10140b. C–D from the type material. Photograph A & G. by Ignacio García-Ruiz, March 2017; B–F by J. A. Vázquez-García, March 2017.



FIGURE 6. *Agave arcedianoensis* in Mascuala, Ixtlahuacán del Río, Jalisco, SW of Hacienda El Mexicano. Photograph by J. A. Vázquez-García, June 2011.

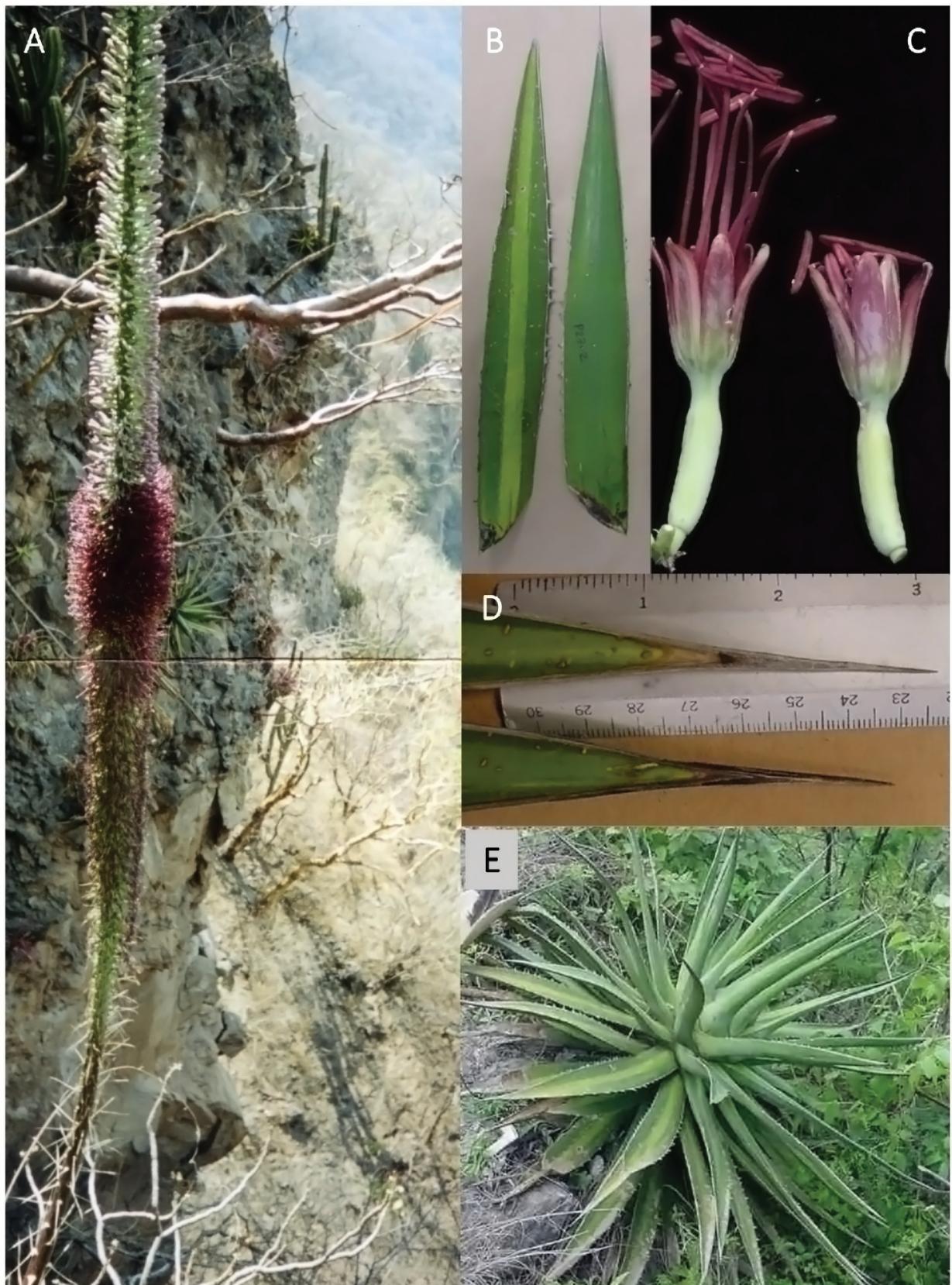


FIGURE 7. *Agave arcedianoensis* A. Reddish-purple spike-like panicle at El Ahuacate, Zapotlanejo, Jalisco. B. Leaves. C. Flowers. D. Spine. E. Rosette. Photographs: A by A Galván, May 2005; B–D by G. Hernández-V., from *Hernández-Vera P27-2* (IBUG), September 2002; C by J. Etter & M. Kristen, April 2006; E by M. Cházaro-Basáñez, November 2005.



FIGURE 8. *Agave arcedianoensis* in Mascuala, Ixtlahuacán del Río, Jalisco. A. Spike-like panicle blooming in 1917 at Botanical Institute of University of Guadalajara (IBUG). B. Immature fruits. C. Vázquez's daughter Erika holding an infructescence. D. Pedicels. E. Linear bracts and immature fruits. F. Basal bracts. G. Vázquez's daughter Brenda and a rosette, just before transplanted to IBUG in 2011. A and G. from Vázquez-García 9167a with Padilla-Lepe. B and D-F from Vázquez-García et al. 8820. C from Vázquez-García 9167b with Padilla-Lepe. All photographs by J. A. Vázquez-García; A (1917), B & D-F (June 2007) and C & G (June 2011).

TABLE 1. Differences between *A. garciaruizii*, *A. angustiarum*, *A. arcedianoensis* and *A. impressa*.

	<i>A. garciaruizii</i>	<i>A. angustiarum</i>	<i>A. arcedianoensis</i>	<i>A. impressa</i>
Leaves				
Mid-linear band color	Lacking or inconspicuous pale green	Conspicuous, yellowish green	Conspicuous, yellowish green	Absent
Color	Green to dark Green	Glaucous-green to olive green	Dark green	Pale yellowish green
	Lacking			Conspicuous
White bud printing		Lacking		Inconspicuous
Teeth				
Density at mid-blade /10 cm	8–14	3–7	4–5	6–10
Panicles				
Diameter (cm)	15.0–18.0	13.0–14.0	15.0–18.0	13.0–14.0
Flowering segment (%)	33–40	50–60	70–80	70–80
Flower				
Pedicel length (cm)	0.8–1.0	0.9–1.1	0.3–0.6	2.0–2.5
Ovary length (cm)	1.6–1.7	1.5–1.6	1.7–1.8	1.7–2.0
Color	pale yellow to yellowish green	“Glaucous greenish white” (from the protologue), creamy yellow, yellow, yellowish green or reddish	Reddish purple	Yellow
		1.4–1.5, yellow or reddish		
Anthers size (cm) and color	1.6–2.1, yellow		1.4–1.5, reddish purple	1.5–1.6, yellow
Infructescence				
Diameter (cm)	10.0–14.0	5.0–6.5	18–25	10–12
Pedicel length (cm)	1.8–2.0	0.4–0.5	0.4–0.6	2.0–2.5
Capsules (cm)	2.4–2.6 x 1.0–1.2	0.8–2.0 x 0.5–1.5	3.0–4.0 x 1.6–2.2	1.5–1.8 x 0.8–1.0
Fruit valves	Curved outward, apically acute	Straight, apically rounded	Spreading, apically beaked	Curved outward, sharply beaked
Habitat				
	Volcanic soils in dry forest with <i>Heteropteris</i> & <i>Pterocarpus</i> .	Limestone in dry forest	Volcanic ridges with <i>Bursera</i> . <i>Cephalocereus</i> , <i>Pitocaulon</i> and <i>Stenocereus</i> .	Volcanic ridges
Distribution				
	Jalisco: Santa María del Oro (formerly Manuel M. Diéguez) and Michoacán: Los Reyes de Salgado.	Guerrero (Chilpancingo and Iguala); Michoacán: Uruapan; Mexico; Morelos, Puebla and Oaxaca	Jalisco: Ixtlahuacán del Río, Tonalá and Zapotlanejo,	Sinaloa and Nayarit

Distribution, habitat and phenology:—*Agave garciaruizii* is only known from the cliffs of the Itzícuaro-Apupátero watershed, at the border between the states of Jalisco and Michoacán (Fig. 1). It grows in rocky areas, in tropical deciduous forest, from 900 to 1000 m a.s.l. The forest includes several endemic species such as *Hechtia purhepecha*, *Graptopetalum pentandrum* and *Tillandsia guenther-nollerii* (Cházaro-Basáñez *et al.* 2004; García-Ruiz *et al.* 2014; García-Ruiz & Lott 2015). Flowering occurs in March and fruiting in June.

Eponymy:—The species is named after Ignacio García-Ruiz, distinguished botanist who advocated the study of the flora of Michoacán and senior author of the flora of the Chorros del Varal State Reserve, where this species was discovered.

Conservation status:—The species was assessed as Endangered (EN) meeting the following criteria: A2, B1, EOO <100 km²; B2, AOO <10 km² (0.95 km²); a (number of locations = 1), biii, v; and D (IUCN 2010). *Agave garciaruizii* is only known from the Itzícuaro-Apupátero watershed, where the species is abundant largely on cliffs, but with few mature individuals that rarely come into flower, skipping one to several years without blooming. Many individuals, especially mature ones, were found dead with a bud perforation presumably caused by the damage of curculionid larvae, some others had white spots, possibly caused by bug damage, and few others had black spots, a possible sign of canker. Habitat deterioration occurs by agricultural expansion, cattle grazing and various negative impacts of tourists visiting the Chorros del Varal waterfalls. Local inhabitants extract *Otatea acuminata* (known as *otatillo* or *varal*), from the tropical forest habitat of *Agave garciaruizii* in order to craft brooms and bamboo walking sticks called *burritas* or *mulitas*, with the handler usually being part of the rhizome, which are sold to visitors for their hiking in the steep slopes on their way to the spectacular waterfalls (Chorros del Varal).

Additional specimens examined:—MÉXICO. Jalisco: Manuel M. Diéguez [Santa María del Oro], Río Itzícuaro, 01 September 2002 (sterile specimen) *Hernández-Vera* *et al.* 72 (IBUG); Santa María del Oro, Cañada del Río Itzícuaro, puente Iturrya, entre los Reyes y Manuel M. Diéguez, 31 August 2002 (sterile), *López-Damian* *et al.* 18 (IEB). Michoacán: Los Reyes de Salgado, Río Itzícuaro, ca. 2–3 km al noroeste de Chorros del Varal, mpio. Los Reyes, 29 November 1994 (sterile), *García Ruiz* 3863 (CIMI); Chorros del Varal, al oeste de Los Reyes, 31 August 2002 (sterile specimen) *Hernández-Vera* *et al.* 69 (IBUG); Parte alta Cañón de Itzícuaro al W de Chorros del Varal, 30 April 2004 (sterile), *I. García Ruiz & A. Linares* 6177 (CIMI); Parte alta (vista hacia El Salto), al Noreste de Chorros del Varal, mpio. Los Reyes, 25 March 2017 (fl), *I. García Ruiz et al.* 9158 (CIMI); 17 km al O de la cabecera municipal, ladera de exposición sur, frente a cascada del Río Palo Verde, tributario del río Apupátero, a 500 m al oriente de la entrada al área natural protegida Chorros del Varal, 941 m, 19°31'22.37" N, 102°34'10.34" O, 25 March 2017 (fr), *J. Antonio Vázquez-García* 10140b, w/ *Ignacio García-Ruiz and Jesús Padilla-Lepe* (IBUG).

Key to morphologically or geographically close species of the *Marginatae* group

- | | | |
|---|---|---------------------------|
| 1 | Leaves with white bud-printing..... | 2. |
| - | Leaves without bud-printing..... | 3. |
| 2 | Flowers green in bud, yellow at anthesis, on pedicels 2.0–2.5 cm long, leaves with conspicuous white bud-printing, Sinaloa and Nayarit | <i>A. impressa</i> |
| - | Flowers and anthers reddish-purple, on pedicels <1.0 cm long; leaves with inconspicuous white bud-printing, Central Jalisco..... | <i>A. arcedianoensis</i> |
| 3 | Leaves with corneous sharp margins, lacking teeth, Central Jalisco..... | <i>A. chazaroi</i> |
| - | Leaves usually with teeth at least in lower and middle part of the margins..... | 4. |
| 4 | Fruits with pedicels 1.8–2.0 cm long, capsules 2.4–2.6 cm long, tepals pale yellow to yellow; from Santa María del Oro, Jalisco to Los Reyes, Michoacán..... | <i>Agave garciaruizii</i> |
| - | Fruits with pedicels <0.5 cm long, capsules 0.8–2.0 cm long, tepals glaucous greenish white (from the protologue) or reddish purple, from Michoacán (S of Uruapan), Guerrero, México, Morelos, Puebla and Oaxaca..... | <i>A. angustiarum</i> |

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