



Echeveria munizii (Crassulaceae) a new species of epiphyte from tropical Volcán de Colima, Mexico

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Abstract

Echeveria munizii, a new species from the southwestern slopes of Volcán de Colima on the Colima-Jalisco border in western Mexico is described and illustrated. This species belongs to series *Gibbiflorae* and is most similar to *E. fulgens* from which it differs in having adaxially sulcate leaves with straight and hyaline margins, olive green to brownish green surface, a fewer flowered inflorescence with fewer flowers per branch, a pink / orange bicolored corolla with the inner surface pale pink to orange, the base of the carpels white, and longer pedicels. A species conservation assessment, undertaken using IUCN criteria, determines *Echeveria munizii* to be Critically Endangered (CR).

Keywords: *Echeveria fulgens*, endemic, Comala, tropical moist forest.

Resumen

Echeveria munizii se describe e ilustra como especie nueva de la vertiente suroeste del Volcán de Colima, cerca de los límites de los estados de Colima y Jalisco en el occidente de México. Esta especie pertenece a la serie *Gibbiflorae*, difiere de *E. fulgens* por tener hojas sulcadas adaxialmente, margen hialino y recto, superficie verde-olivo a café-verdosa, un menor número de flores por rama, un menor número total de flores, corola bicolora de rosa a naranja en el exterior y de blanco-rosada a naranja en el interior, los carpelos blancos en la base y pedicelos más largos. Un asesoría del estado de conservación de *Echeveria munizii* le clasifica como en Peligro Crítico (CR)

Introduction

Echeveria DC. (1828: 401) comprises about 140 known species, 95 % of which are found in Mexico, the center of species diversity and endemism for the genus (Uhl 1992, Thiede 1995, Meyrán-García & López-Chávez 2003, Etter & Kristen 2013). Currently 12 species of *Echeveria* are recorded from Jalisco State (Pilbeam 2008). These are found mostly in temperate mountainous rocky areas. Four of the species known from Jalisco occur in tropical forest: *E. pringlei* (S. Watson) Rose (Britton & Rose 1903: 6), *E. elegans* var. *tuxpanensis* Walther (1972: 101), *E. yalmanantlanensis* A. Vázquez & Cházaro (Vázquez-García et al. 2013: 274), and the species here described. As anticipated by Uhl (2002) and Pilbeam (2008) several new species have been described recently from the *E. fulgens* Lem. (1845: 8) complex. These include *E. roseiflora* J. Reyes & O. González (Reyes-Santiago & González-Zorzano 2010: 22), *E. perezcalixii* Jimeno-Sevilla & P.Carrillo (Jimeno-Sevilla & Carrillo-Reyes 2010: 303), *E. purhepecha* I. García (García-Ruiz 2011: 63) and *E. aurantiaca* Reyes, González-Zorzano & Brachet (Reyes-Santiago et al. 2011: 70).

Here we describe a new species from the *E. fulgens* complex, *Echeveria munizii*. *E. munizii* is an epiphyte occurring in the high canopy of tropical moist forest on the southwestern slopes of Volcán de Colima, Mexico.

Materials and Methods

Fifteen qualitative and quantitative morphological characters were used to delimit species boundaries. Of these four (see diagnosis) were shared between *Echeveria fulgens* and *E. munizii*, and they differ in eleven characters (Table 1). We examined herbarium material at IBUG and digital images provided by Julia Etter and Martin Kristen. Fieldwork was conducted in August 2012 by Miguel A. Muñiz-Castro, Jesús Padilla-Lepe and Ana T. Nuño-Rubio during which a high canopy epiphytic *Echeveria* was spotted that was beginning to bloom in the north of Comala, Colima, México (near Hacienda San Antonio). The plant was growing in an unusually species-rich epiphytic community of tropical moist forests confined to ravines. The caulescent habit with cymose-paniculate inflorescences and lateral circinate branches suggested a close morphological relationship to *Echeveria fulgens* (series *Gibbiflorae* (Morán 1974)), a complex that likely contains several species (Uhl 2002, Pilbeam 2008). A few months later the species was found in full bloom and on close examination of the fresh flowers (with a 20x hand-lens) we concluded that this was an undescribed species. We used current IUCN criteria to assess a conservation category for the proposed new species.

TABLE 1. Differences between *Echeveria munizii* and *E. fulgens*.

Characters	<i>E. fulgens</i>	<i>E. munizii</i>
Leaves		
Shape	obovate spatulate, concave	oblanceolate to obovate, adaxially sulcate along the axis
Margin	undulate, not hyaline, reddish	straight, hyaline, green
Size (cm)	8–15 × 4–7	(9–)12–13 × 3–4.5
Color	yellowish green to dark red (Lemaire, 1845); green (Jimeno-Sevilla & Carrillo-Reyes, 2010), green to dark red (Reyes-Santiago & González-Zorzano, 2010).	green or olive to brownish green
Inflorescence		
Length (cm)	≤90	30–57
Flowers per branch	≥12	(1–)3–5
Total number of flowers	>24	10–11
Corolla		
Diameter (cm)	≤1.5	1.0–1.1
Color	bicolored, dark pink to red with yellow base, orange inside	bicolored, pink at the base (lower 1/3) to orange (upper 2/3). Pinkish white inside to orange
Carpel color	yellow at the base, red carmine or brown toward the apex	white at the base, red carmine to dark red toward the apex
Pedicels		
Length (cm)	0.2–0.6	0.7–0.8

Description of the new species

Echeveria munizii Padilla Lepe & A. Vázquez, *sp. nov.* (Figs. 1 & 2)

Type:—MEXICO. Colima: Carretera de Comala a la Hacienda San Antonio, 2 km antes de la Hacienda de San Antonio, tropical gallery forest, 1325 m, 19°26'21.1"N, 103°42'32.4"W, 12 October 2012 (fl), Miguel A. Muñiz-Castro, J. Antonio Vázquez-García, Jesús Padilla-Lepe 1137 (holotype IBUG; isotypes MEXU, IEB).

Diagnosis:—*Echeveria munizii* is morphologically most similar to *E. fulgens* in having an evident stem, obovate leaves, erect pedicels and reniform yellow nectaries. It differs, however, in having adaxially sulcate leaves vs. concave leaves; leaf margins straight and hyaline and green vs. undulate, not hyaline and reddish; surface green or olive green to brownish green vs. yellowish green to dark red; inflorescences with a smaller number of flowers (10–11 vs. >24) and inflorescence branches bearing fewer flowers (1–)3–5 vs.

12 or more; a corolla bicolored for its entire length (pink to orange vs. yellowish to reddish); the inner surface of the corolla pinkish white to orange vs. orange; the base of the carpels white vs. yellow and the pedicels 7–8 mm vs. 2–6 mm long (Table 1).

Epiphytic perennial with lax rosette; stem solitary, erect to decumbent, 25–40 cm, 1.5 cm diam., pale brown with darker leaf scars. Rosettes 15–27.5 cm in diam., lax. Leaves (9–)12–13 × 3–4.5 cm, basally 1–1.3 cm wide, 0.4 cm thick at the midpoint, oblanceolate to obovate, cuneate at the base, concave throughout the mid vein, adaxially sulcate along the leaf axis, with evident hyaline margin when young, adaxially green to olive or brownish green, abaxially glaucous to greyish green, with a central keel, margin straight, entire, occasionally brownish dark. Floral stem solitary, erect, 30–57 cm, (including the panicle), 1 cm thick at the base, grayish green; stem leaves 1.5–5.9 × 1.5–1.6 cm, margin entire brownish green; Inflorescence cymose with 10–11 flowers in lateral circinate branches, pedicels 0.7–0.8 cm; bracteoles linear, deflexed, 0.9–2 × 0.2–0.5 cm, pinkish; sepals equal, lanceolate, straight, 1 × 0.7 cm; corolla urceolate, pentagonal at the base, 1.5 × 1.0–1.1 cm, grading from pink at the base to orange at the apex; petals 5, 1.5 × 0.6 cm, ovate, concave, acute at the apex, from pinkish at the base to orange at the apex; nectaries reniform, yellowish 0.2 × 0.1 cm; stamens with pale yellow filaments, 5 epipetalous 1 × 0.1 cm and 5 antepetalous, 1.1 × 0.1 cm; anthers yellowish, 0.2 cm long; gynoecium 1.3 × 0.6 cm, white at the base; pistils 1.8 × 0.3 cm, pinkish white at the base and red carmine to dark red toward the apex; stigma green to black.

Distribution:—*Echeveria munizii* is only known from the type locality and is endemic to a southwestern slope of the Volcán de Colima complex at 1325 m, Comala municipality, Colima, Mexico.

Habitat:—*E. munizii* grows in tropical moist forest in a small ravine together with *Aphananthe monoica* (Hemsl.) J. F. Leroy (1961: 74), *Lysiloma acapulcense* (Kunth) Benth. (1844: 83), *Ficus* L. (1753: 1059) sp., *Trema micrantha* (L.) Blume (1856: 58), *Calypotropidium sartorianum* (O.Berg) Krug & Urb. (Urban 1894: 571), *Otatea* (McClure & E.W. Sm.) C.E. Calderón & Soderstr. (1980: 21) sp., *Croton* L. (1753: 1004) sp., *Stemmadenia tomentosa* Greenm. (1900: 310), *Coffea arabica* L. (1753: 172), *Piper hispidum* Sw. (1788: 15), growing epiphytically on tall *Aphananthe monoica* trees in an epiphytic community of mosses, lichens, ferns, orchids, *Alsobia* sp., *Lycopodium* L. (1753: 1100) sp., *Hylocereus* (A. Berger) Britton & Rose (1909: 428) sp., *Opuntia* Mill. (1754: no page is given) sp., *Tillandsia usneoides* (L.) L. (1762: 411), *Fuchsia decidua* Standl. (1929: 248), and *Manfreda* Salisb. (1866: no page is given) sp..

Phenology:—Flowering from late August to October and fruiting from October to November.

Etymology:—The specific epithet honors Dr. Miguel Angel Muñoz Castro of the Universidad de Guadalajara, Jalisco, Mexico; explorer and professional devoted to the study of the ecology and conservation of cloud forests and endangered tree species of western Mexico.

Ethnobotany:—There is no available information on the use of the species, however like any other succulent it has potential as an ornamental.

Species conservation assessment:—*E. munizii* is only known from the type locality, one little ravine on a hill of the southwestern slope of Volcán de Colima complex. The habitat of *E. munizii*, tropical moist forest, is quickly and continuously being transformed for coffee plantations or pasture where only a few tall trees remain as shade. Its habitat is therefore small, highly fragmented and is surrounded by deforested land. The area of the forested ravines where *E. munizii* grows is estimated in less than 80 km² and the known area of occupancy less than 0.4 km². We believe that this species is in urgent need of protection, so *E. munizii* should be included in the IUCN Red List of Threatened Species as Critically Endangered under criteria B1,2(a,b) of the IUCN Red List Categories and Criteria (IUCN 2012): The estimated geographical range of *E. munizii* in the form of extent of occurrence (EOO) is <100 km² (B1), in the form of area of occupancy (AOO) is < 10 km² (B2); its habitat is severely fragmented by deforested land used for pasture for cattle, there is only one known location for this species [B(a)]; and there is a continuing decline observed in the extent and quality of its habitat and an estimated reduction in its area of occupancy [B(b)]. It 'is recommended to do more exploration work to define more precisely whether this species can occur in other ravines of the southern slopes of the Volcán de Colima, so far, in this failed search to locate additional populations of this species we have found nearby another two distinct and gigantic undescribed species of *Echeveria*, one in the lowlands and one in the highlands of the same volcanic complex.

Additional specimens examined:—MEXICO: Colima, Municipio Comala, Colima–Comala–San Antonio, curve to the left between km 19–20, 19°26'21"N, 103°42'40"W, 1220 m, 31 January 2003 (sterile) *Etter and Kristen 945* (digital image, IBUG); Carretera de Comala a la Hacienda San Antonio, 2 km antes de la Hacienda de San Antonio, tropical gallery forest, 1325 m, 19°26'21.27"N, 103°42'31.14"W, 24 August 2012 (sterile), *Muñoz-IrangCastro et al. 1130b* (IBUG); same type location 19°26'21.1"N, 103°42'32.4"W, 12 October 2012 (fl) *Muñoz-Castro, et al. 1139a, 1139b* (IBUG).

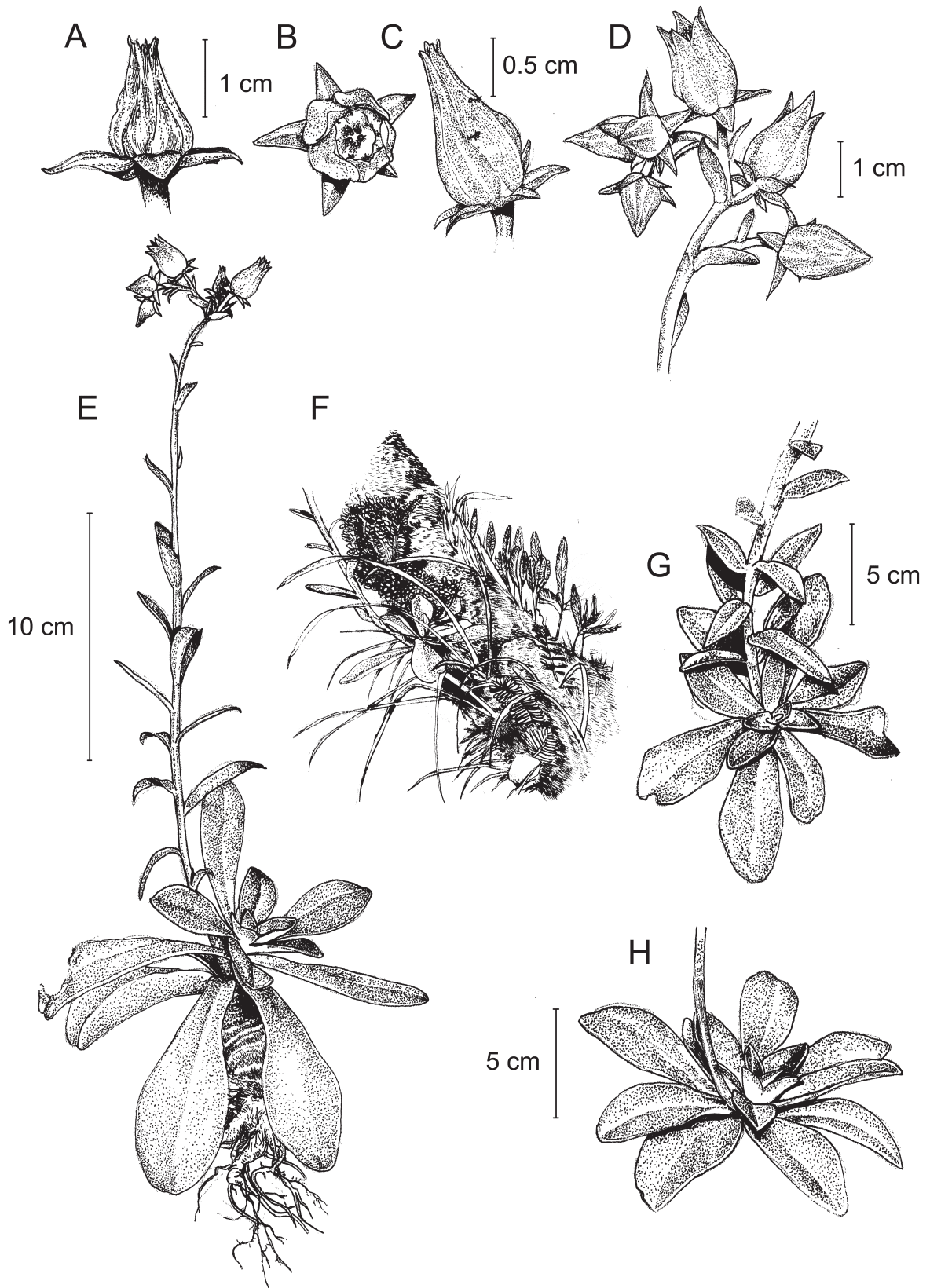


FIGURE 1. A–C. flowers, D. Panicle. E. habit. F. habitat. G–H rosette variability. Drawings by Daniel Barba.



FIGURE 2. *Echeveria munizii*. A. Dissected flower, showing outer corolla (left), stamens and pistils (center), and nectaries (right). B. terminal flowers. C. habit. D. habitat. Photographers: J. Antonio Vázquez-García (A), Miguel A. Muñiz-Castro (B, C, D) and Adolfo Sánchez García (E).

Discussion:—*Echeveria munizii* belongs to series *Gibbiflorae* (Baker) A. Berger, sensu Moran (1974), a group consisting of medium to large sized stem-forming plants lacking pubescence and that have cymose-paniculate inflorescence with circinate lateral branches (Uhl 2002, Kimmach 2003, Meyrán-García & López-Chávez 2003, Carrillo-Reyes *et al.* 2009). This species was perhaps discovered back in 1880 by the famous plant collector Benedict Roezl, who reported in his “Ascent of the Volcán de Colima”, an epiphytic *Echeveria* from the SW slopes of Volcán de Colima which might correspond to *E. munizii*. Roezl, however, hardly ever collected specimens and so this cannot be confirmed (Roezl 1880, Roezl 1882, Hemsley 1883). After more than a century and independent of our work, Etter & Kristen collected *E. munizii* specimens in August 2003, but these were identified as *Echeveria* aff. *fulgens* (Etter & Kristen 2013).

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