



## *Echeveria cerrograndensis* (Crassulaceae) a new species from eastern calcareous Sierra de Manantlán, Colima, Mexico

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### Abstract

*Echeveria cerrograndensis*, a new species from eastern Sierra de Manantlán, in the Jalisco-Colima border, Western Mexico, is described and illustrated. This species belongs to series Gibbiflorae, it is morphologically related to *E. fulgens* but it differs from the latter in having smaller habit, margin straight to slightly undulate; glaucous to pale green or reddish leaves; lower number of flowers per branch and lower total number of flowers; shorter inflorescences, none bicolored corolla, and dark red thecae and nectaries. A key for the species of the *E. fulgens* complex is provided.

**Key words:** *Echeveria fulgens*, endemic, Tolimán, rock flower (“flor de piedra”)

### Resumen

*Echeveria cerrograndensis* se describe e ilustra como especie nueva de la porción oriental de la Sierra de Manantlán, Jalisco-Colima, México. Esta especie pertenece a la serie Gibbiflorae, se asemeja a *E. fulgens*, pero difiere de esta última en su hábito más pequeño, hojas glaucas a verde pálido o rojizas con margen recto a ligeramente ondulado, menor número de flores por rama, menor número total de flores, inflorescencias más cortas, corola de un solo color, y en sus tecas y nectarios de color rojo oscuro. Se incluye un clave de identificación para las especies del complejo *E. fulgens*.

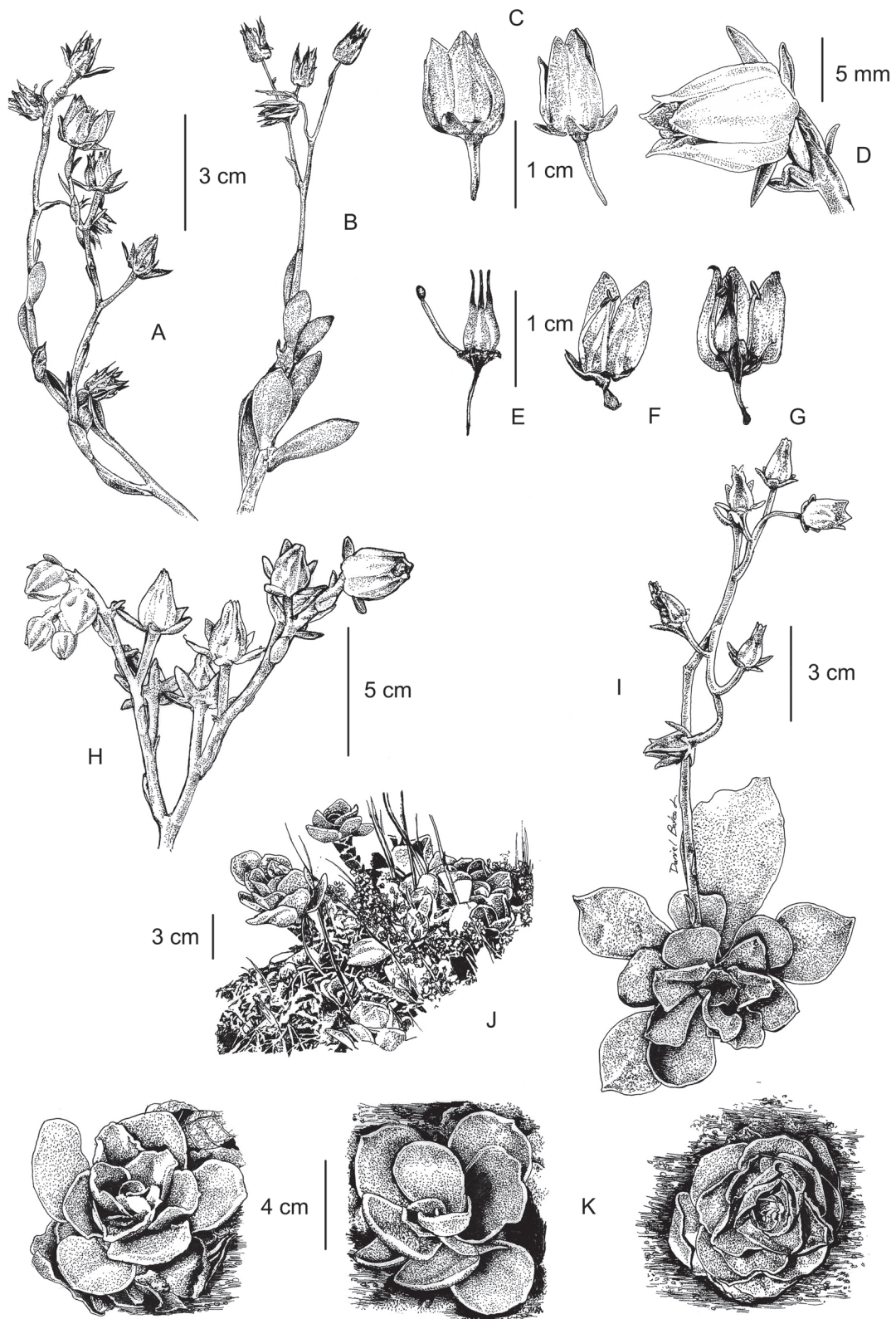
### Introduction

*Echeveria* DC. (Candolle 1828: 401) comprises some 140 known species, and 95% of these are found in Mexico, the center of diversity and endemism of the genus (Uhl 1992, Thiede 1995, Meyrán-García & López-Chávez 2003, Etter & Kristen 2013). There are nearly 20 species of *Echeveria* in western Mexico, including the one described here, 15 of which occur in the State of Jalisco, Mexico (Pilbeam 2008), mostly distributed in temperate mountainous rocky areas, with four of them strictly occurring in tropical forests and only two of them inhabiting on calcareous rocks: 1) the ivory-white flowered *Echeveria yalmanantlanensis* A. Vázquez & Cházaro (Vázquez-García *et al.* 2013) and 2) the pink flowered *Echeveria* here described here as new. As expected by Uhl (2002) and Pilbeam (2008), several new species have been described recently out of the *Echeveria fulgens* Lem. (Lemaire 1845: 8) complex, including *E. roseiflora* J. Reyes & O. González (Reyes-Santiago & González-Zorzano 2010: 22), *E. perezcalixii* Jimeno-Sevilla & P. Carrillo (Jimeno-Sevilla & Carrillo-Reyes 2010: 303), and *E. purhepecha* I. García (García-Ruiz 2011: 63) and *E. munizii* Padilla Lepe & A. Vázquez (Vázquez-García *et al.*, in press).

Here we describe *Echeveria cerrograndensis*, another new species out of the *E. fulgens* complex, a rupicolous species in karstic topography of the Cerro Grande massif in the Sierra de Manantlán Biosphere Reserve, Jalisco-Colima, Mexico, a species that despite its abundance remained unnoticed to many botanists undertaking intensive explorations in the natural area (Vázquez *et al.* 1995). *Echeveria cerrograndensis* was first discovered in 2002, when Miguel Cházaro, Ignacio Contreras and Antonio Machuca visited Cerro Grande, Minatitlán, Colima, México. Living specimens were obtained on a second trip in July 2004, that later bloomed at home of Antonio Vázquez in January 19, 2005.

**Taxonomic Treatment**

*Echeveria cerrograndensis* A. Vázquez & G. Nieves *sp. nov.* (Figures 1–4).



**FIGURE 1.** *Echeveria cerrograndensis*. A. Inflorescence with last fresh flower. B. Inflorescence with developing fruits and shaft leaves. C–D. Flower variability. E–G. Dissected flower showing corolla, one sepal (some sepals missing) pistils, stamens, pedicel, and dark nectaries. H. Panicle. I. Habit J. Habitat and stemmed rosettes. K. Rosette variability. Drawing by Daniel Barba.

**Type:**—MEXICO. Colima: Municipio Minatitlán, Lagunitas-El Terrero, 19°25'8.79"N, 103°55'7.07"W, 2200 m, 19 February 2005 (fl, fr), *G. Nieves Hernández, Miguel Cházaro, Julia Etter, Raúl López, Ignacio Contreras s.n.* (holotype IBUG).

**Diagnosis:**—*Echeveria cerrograndensis* is morphologically close to *E. fulgens* in having an evident stem, obovate leaves, erect pedicels and reniform nectaries, but it differs from the latter in having smaller habit, margin straight vs undulate; glaucous to pale green vs yellowish green to dark red; lower number of flowers per branch (1–)3–5(–6) vs 12 or more; smaller total number of flowers (4–11 vs up to 24); inflorescence 10–15 vs up to 90 cm long; corolla none bicolored vs bicolored; thecae and nectaries dark red vs yellow; and base of carpels mostly white vs yellow.



**FIGURE 2.** *Echeveria cerrograndensis*. Habit variability. Photographs A and B by Gregorio Nieves; D and E by Rodolfo Sánchez.

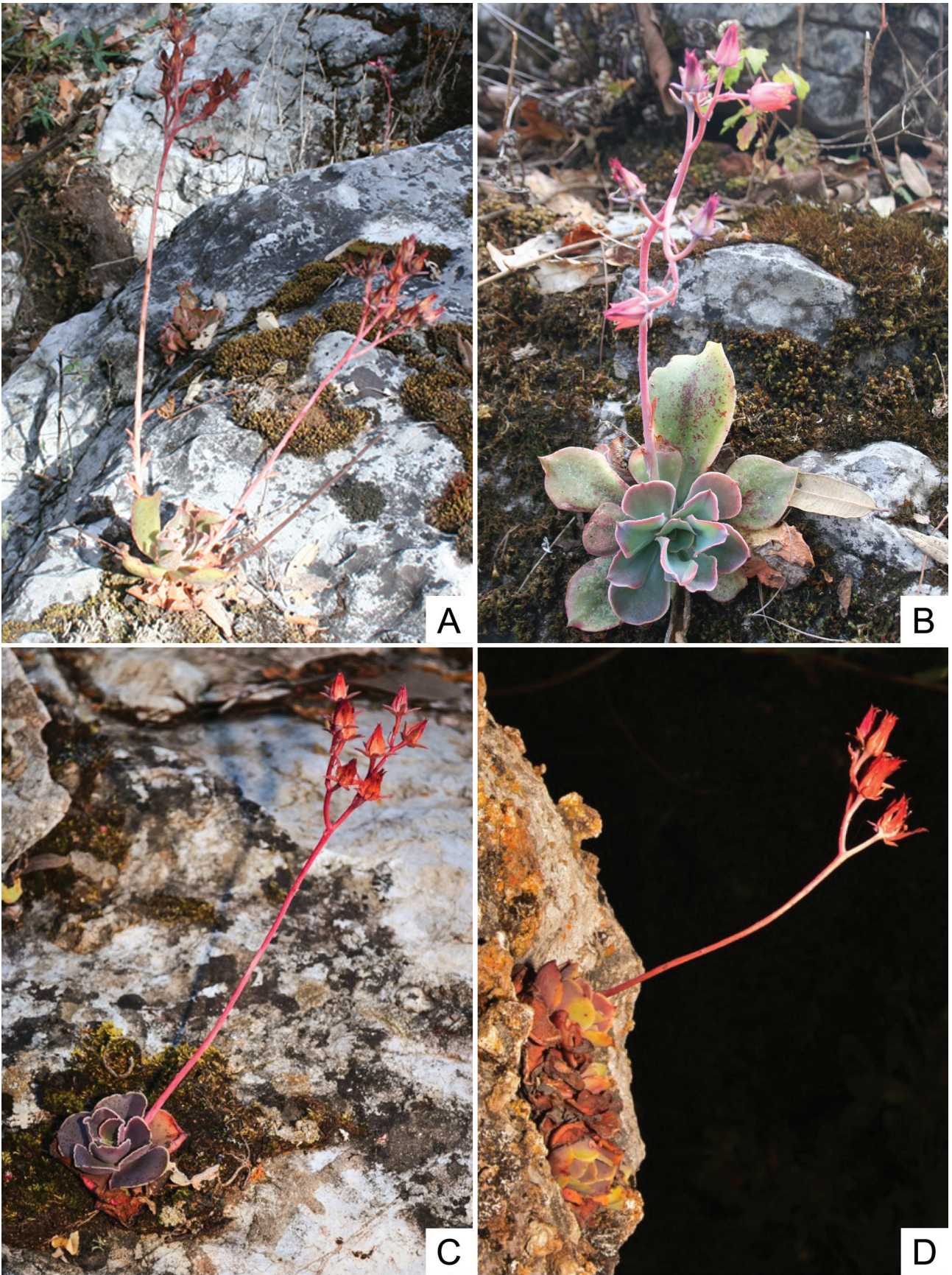
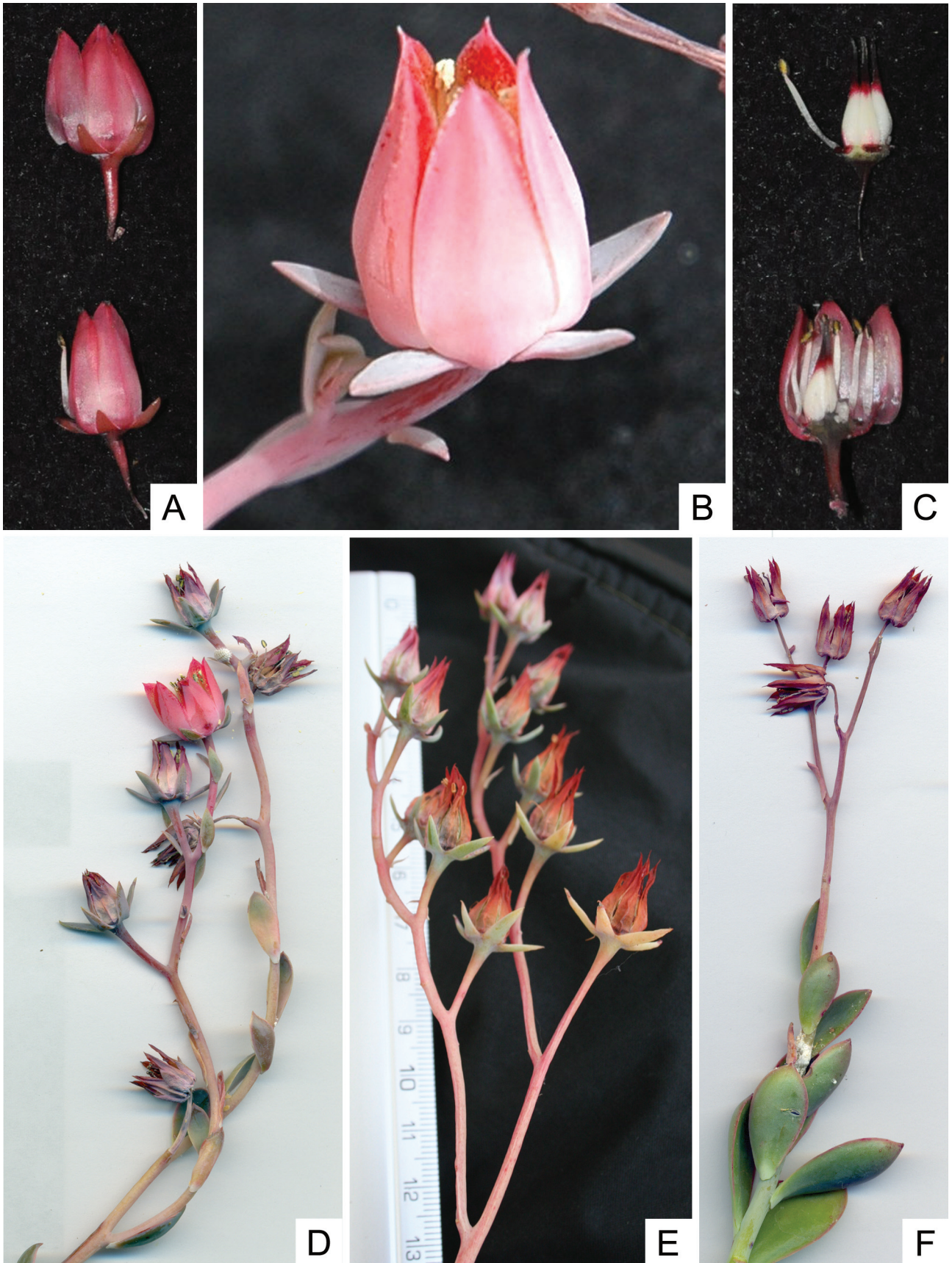


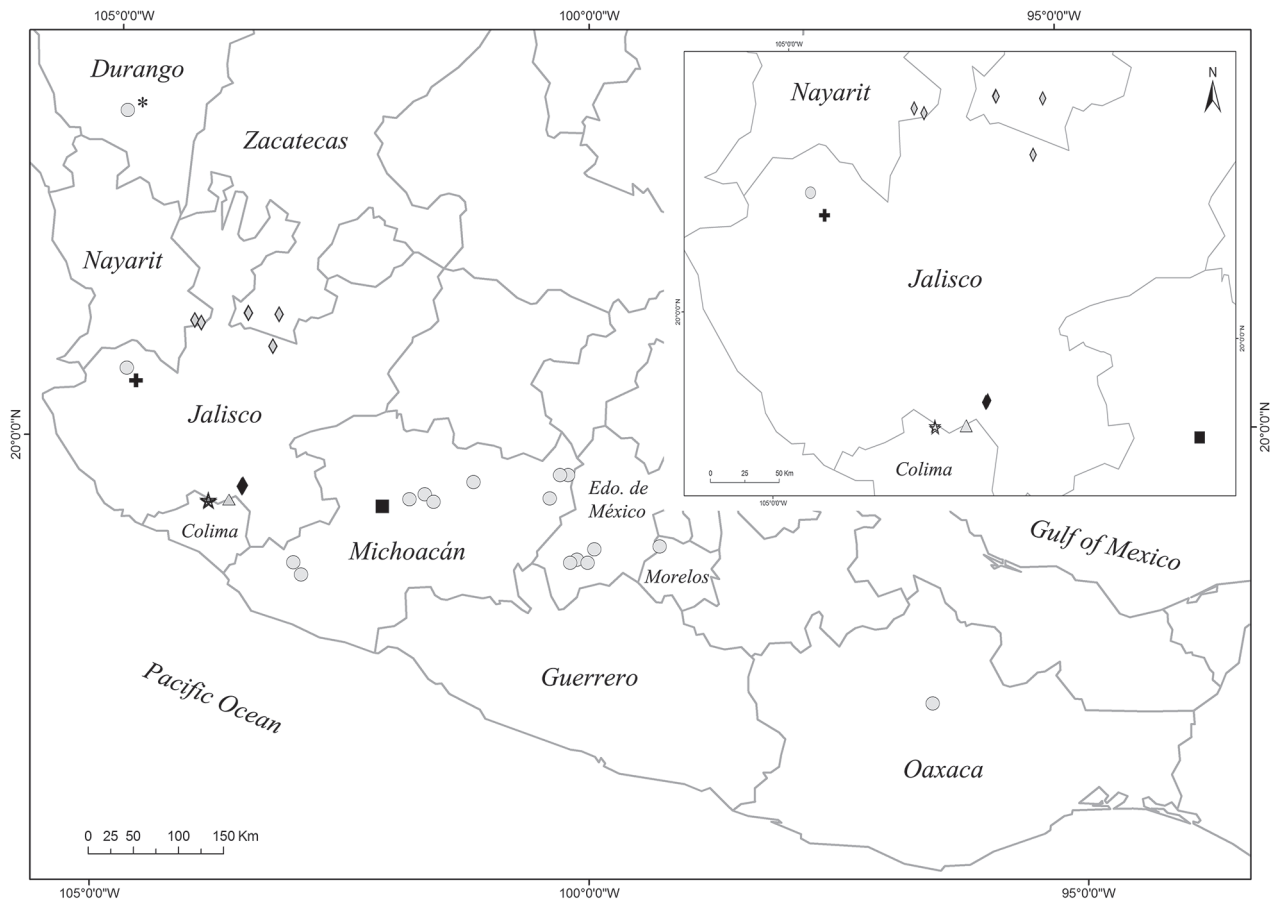
FIGURE 3. *Echeveria cerrograndensis*. Rosette variability. Photographs A and B by Rodolfo Sánchez; C by Gregorio Nieves; and D by Antonio Vázquez.



**FIGURE 4.** *Echeveria cerrograndensis*. A–B. Flower variability. C. Dissected flower showing corolla, one sepal, pistils, stamens and dark red nectaries at the base of the ovary. D–F. Panicle variability. Photographs A–D and F by Antonio Vázquez; E by Gregorio Nieves.

Rupicolous perennial rosette; stem single, erect to decumbent, 2–5 cm long, 1.5 cm diam., pale brown with darker leaf scars (Figure 2). Rosettes 8–11 cm in diam., lax, closed in winter (Figure 3). Leaves (3–)4–6 × 2.5–3.5 cm, basally 1.2–1.5 cm wide, 2 mm thick in the middle, broadly obovate, cuneate at the base, apiculate at the apex, concave, glaucous to pale green, margin straight, entire, pinkish. Floral stem 1–2, erect, 11–22(–35) cm long, including the panicle, 2.5 mm thick in the base, pinkish green; shaft leaves 1.5–3.5 × 0.8–1.3 cm, obovate, pinkish at the margin; panicle, 4–11 flowers, usually two branched, (1–)3–5(–6) flowers per branch (Figures 2 & 4); pedicels straight 8–16 mm long; bracteoles lanceolate, 0.5–1.3 × 0.2–0.5 cm, green to with age; sepals subequal, lanceolate, straight, 0.8 × 0.3 cm; corolla urceolate pentagonal at the base, 1.2 × 1.1 cm; petals 5, 1.2 × 0.5 cm, ovate, concave, acute at the apex, pink throughout, darkened at the tip with age; pinkish white inside; nectaries reniform, dark red 0.2 × 0.1 cm; stamens with white filaments, 5 epipetals 0.9 × 0.1 cm and 5 antisepals, 1 × 0.1 cm; thecae dark red before opening, 0.2 cm long; gynoecium 1.1 × 0.6 cm, white at the base; pistils 1.1 × 0.3 cm, pinkish white at the base and red to dark red toward the apex; stigma black (Figure 4).

**Distribution, habitat and phenology:**—Apparently endemic to the Cerro Grande massif in the eastern Sierra de Manantlán, in Colima state, in Western Mexico (is likely to also be in the Jalisco part of the Cerro Grande) (Figure 5), growing on karstic topography at 2200 m in elevation, in montane cloud forest including *Ferocactus reppenhagenii* G.Unger (Unger 1974: 50), *Sedum* sp., and *Salvia vazquezii* Iltis & González (Iltis *et al.* 2012: 343). Flowering from January to February and fruiting from February to March.



**FIGURE 5.** Species distribution of the *Echeveria fulgens* complex. *Echeveria cerrograndensis* ( , star), *E. fulgens* (○, circle), *E. roseiflora* (+, plus sign), *E. perezcalixii* ( , gray rhombus), *E. purhepecha* ( , square), *E. munizii* ( , triangle), *E. sp.* ( , black rhombus). Unknown locality of *E. fulgens* collected in Durango by Palmer [06/635-812 (NY), the same flowered at New York, 09/25951 (US)] (○\*, circle and asterisk).

**Eponymy:**—The specific epithet refers to Cerro Grande, the type locality, a 30 km long calcareous massif in the eastern portion of the Sierra de Manantlán, Jalisco-Colima, Mexico.

**Ethnobotany:**— It is occasionally used as ornamental by the local people, and known as “flor de piedra” and “flor de peña” (rock flower); like most succulent species, it has a potential as an ornamental species.

**Conservation status:**—*E. cerrograndensis* is locally abundant nearby the El Terrero village, but its known extent of occurrence is less than 140 km<sup>2</sup>. Fortunately, is under protection at the Reserva de la Biosfera Sierra de Manantlán.

**Additional specimens examined:**—MEXICO. Colima: Municipio Minatitlán, Lagunitas-El Terrero, 19°25'47.22"N, 103°55'18.59"W, 2200 m, 19 February 2005 (fl, fr) *Vázquez et al. s.n.* (photographs-IBUG). Minatitlán, Colima, Lagunitas-El Terrero, 19°25'8.79"N, 103°55'7.07"W, 2200 m, 24 February 2013 (fl, fr) *Cházaro et al. 10600* (IBUG, ENCB, XAL).

**Discussion:**—*Echeveria cerrograndensis* belongs to series Gibbiflorae (Baker) A. Berger (1930: 474), sensu Moran (1974), a group consisting of medium to large size stemmed plants, lacking pubescence, with a cymose paniculated inflorescence with cincinnate lateral branches (Uhl 2002, Kimmach 2003, Meyrán-García & López-Chávez 2003, Carrillo-Reyes *et al.* 2009). However, *E. cerrograndensis* is a rather small plant. The caulescent habit with cymose-paniculate inflorescence and lateral cincinnate branches suggested a close morphological relationship to *Echeveria fulgens*, of series Gibbiflorae (Moran 1974), actually a complex that might contain several species (Uhl 2002, Pilbeam 2008). A close examination of the flowers allowed us to conclude that we were dealing with an undescribed taxon here described as a new species. *Echeveria cerrograndensis* is also morphologically close to *E. roseiflora* sharing with the latter the non bicolored corolla, red thecae, red nectaries and length of pedicels. However, it differs from the latter in having shorter leaves 3–6 vs. 6–10 cm; broadly obovate vs. oblanceolate-spatulate, leaf margin straight and pinkish vs. crenulated and reddish; shorter inflorescence 11–22(–35) vs. 50–54 cm; smaller total number of flowers 4–11 vs. 18–20; shorter corolla 11–12 vs. 14–16 cm, pedicels straight vs. recurved (Table 1). The following key can be used to determine the species of the *Echeveria fulgens* complex.

**TABLE 1.** Differences between *Echeveria cerrograndensis*, *E. fulgens* and *E. roseiflora*.

Characters	<i>E. cerrograndensis</i>	<i>E. fulgens</i>	<i>E. roseiflora</i>
Stem length (cm)	2–5	Up to 30	Not evident
Leaves			
Shape	Broadly obovate, apiculate	Obovate spatulate, rarely apiculate	Oblanceolate-spatulate
Margin	Straight, pinkish-		Crenulated, reddish
Size (cm)	(3–)4–6 × 2.5–3.5	Undulated, reddish	6–10 × 3.5–5.5
Colour	Glaucous to pale green	8–15 × 4–7 Green yellowish, somewhat glaucous, to dark red	Grayish or olive green to light pink or reddish
Inflorescence			
Size (cm)	11–22 (–35)	50–90	50–54
Flowers per branch	(1–)3–5(–6)	12 or more	1–6
Total number of flowers	4–11	>24	18–20
Corolla			
Length (mm)	11–12	up to 15	14–16
Colour	None bicolored, pink throughout, darkened at the tip with age; pinkish white inside.	Bicolored, dark pink to red with yellow base, orange inside	None bicolored, light pink,
Thecae colour	Dark red	Yellow	Red
Nectaries	Dark red	Yellow	Red
Carpel colour	Mostly white at the base, red to dark red toward the apex, black at the tips	Yellow at the base, red carmine or brown toward the apex	Slightly yellow at the base, red to dark red toward the apex
Pedicels			
Size of pedicels (mm)	8–16	2–6	10–20
Form	Straight	Straight	Recurved

## Key to species of the *Echeveria fulgens* complex

1. Nectaries red to dark red.....2.
- Nectaries yellow to pale yellow .....3.
2. Stems not evident; leaves 6–10 × 3.5–5.5 cm, margin crenulated and reddish; floral stems 2–3, 50–54 cm, total number of flowers (12–)18–20, nectaries red .....*E. roseiflora*
- Stems 2–5 cm; leaves (3–)4–6 × 2.5–3.5 cm, margin straight and pinkish; floral stems 1–2, 11–22 (–35) cm, total number of flowers 4–11; nectaries dark red .....*E. cerrograndensis*
3. Stems 1–11 cm; corolla not bicolored..... 4.
- Stems 15–40 cm; corolla bicolored..... 5.
4. Stems 1–1.5 cm long, leaves broadly obovate, pale to olive green, grayish green or purple; total number of flowers 7–28; corolla orange pinkish to pink .....*E. perezcalixii*
- Stems 8–11 cm long, leaves oblong-obovate, pale to dark green; total number of flowers 5–7; corolla scarlet red to coral red.....  
.....*E. purhepecha*
5. Bracteoles absent; leaves green yellowish, somewhat glaucous, to dark red, the margin undulated reddish, not hyaline; inflorescence 50–90 cm; total number of flowers ca. 20–24, flowers per branch 12 or more, pedicels 2–6 mm; corolla 12–15 cm long.....  
.....*E. fulgens*
- Bracteoles present; leaves green or olive to brownish green, the margin straight green, hyaline; inflorescence 30–40, total number of flowers 10–11, flowers per branch (1–)3–5, pedicels 7–8 mm; corolla 10–11 cm long..... *E. murizii* (in press)

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