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# *Megacorax gracielanus* (Onagraceae), a New Genus and Species from Durango, Mexico

*M. Socorro González Elizondo, I. Lorena López Enriquez*

CIIDIR–Instituto Politécnico Nacional, Apdo. Postal 738, Durango, Dgo., 34000, Mexico.  
sgonzalez@omanet.com.mx

*Warren L. Wagner*

United States National Herbarium, Department of Systematic Biology, Botany, MRC-166,  
P.O. Box 37012, Smithsonian Institution, Washington, D.C. 20013-7012, U.S.A.  
wagner.warren@nmnh.si.edu

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**ABSTRACT.** *Megacorax gracielanus*, a distinctive new genus and species from the Sierra de Coneto in central Durango, Mexico, is described and illustrated. Its distinctive characters include: leaves linear, petals presented to one side of the flower, and capsule wall thin and distended by the seeds. It appears to be most closely related to *Lopezia* Cavailles based on possession of 4-merous flowers, deciduous sepals, a capitate stigma, stipules, and a tendency toward the structural zygomorphy in the flowers found in *Lopezia*. In addition, the capsules of *Megacorax gracielanus* are very similar in shape and structure to the capsules of certain species of *Lopezia*. Because *Megacorax* has distinctive morphological characters and does not have the unique synapomorphies of *Lopezia* (2 fertile stamens or 1 fertile stamen and 1 staminode, and petals unequal), it is here described as a related genus.

**RESUMEN.** *Megacorax gracielanus*, un nuevo género y especie notoriamente diferente, se describe e ilustra a partir de material colectado en la Sierra de Coneto, en el centro de Durango, México. Sus caracteres distintivos incluyen hojas lineares, pétalos orientados hacia un lado de la flor, y pared de la cápsula delgada y distendida por las semillas. El nuevo taxón parece estar más cercanamente relacionado a *Lopezia*, género con el que comparte los caracteres de flores tetrámeras, sépalos deciduos, estigma capitado, y estípulas. Manifiesta una tendencia hacia la zigomorfia estructural de las flores que se presenta en *Lopezia*, y sus cápsulas son muy similares en forma y estructura a las cápsulas de algunas especies de ese género. Debido a que *Megacorax* tiene caracteres morfológicos distintivos y no presenta las sinapomorfias únicas de *Lopezia* (2 estambres fértiles o 1 estambre fértil y un estaminodio, y pétalos desiguales o iguales) se describe aquí como un género relacionado.

**Key words:** *Megacorax*, Mexico, Onagraceae.

The family Onagraceae in the order Myrtales comprises some 650 species in 16 genera. The family is distributed worldwide, but it is most species-rich in the New World (Raven, 1988). Raven (1964, 1979, 1988) divided the Onagraceae into seven tribes; only tribe Onagreae, with nine genera, contains more than two genera. A recent molecular phylogenetic study (Levin et al., in press) suggests that *Gongylocarpus* should be moved to a unigeneric tribe, Gongylocarpeae, bringing the total to eight tribes for the family. Systematic revisions are available for virtually the entire family (see references cited in Munz, 1965; Raven, 1979, 1988). Surveys are essentially complete for many aspects of the biology of the family, including chromosome numbers and morphology (e.g., Raven & Tai, 1979; Raven & Gregory, 1972; Hoch et al., 1993), floral, leaf, and wood anatomy (e.g., Eyde, 1981; Carlquist, 1982), as well as morphology, embryology, palynology (e.g., Skvarla et al., 1978; Pragłowski et al., 1987), reproductive biology including pollination systems and extent/mechanism of self-incompatibility (summarized in Raven, 1979), chemosystematics (e.g., Averett et al., 1988), and, most recently, molecular systematics (e.g., Levin et al., in press), providing a wealth of characters of evolutionary interest (summarized in Raven, 1988; Hoch et al., 1993; Conti et al., 1993).

Because of intense scrutiny of the family for many decades, it was unexpected to discover an unknown Onagraceae subshrub during recent floristic research in the Sierra de Coneto in Durango, Mexico. The morphological characters of this plant show that it does not fit in any of the 16 currently recognized genera or, with current understanding, readily in any of the eight tribes. We here describe

it as a new genus and species, but do not assign it to a tribe pending further studies.

**Megacorax** S. González & W. L. Wagner, gen. nov.

TYPE: *Megacorax graciellanus* S. González & W. L. Wagner, sp. nov. Figures 1, 2.

Genus novum, *Lopeziae* affine a qua habito suffruticoso, foliis alternatis subfasciculatis, floribus tri-tetrameris uterque chasmogamis vel cleistogamis, tubo floris brevi nectario apicali, petalis unilateralibus, parietibus tenuibus capsulae differt.

Weakly woody shrubs; stems profusely branched; bark thin, gray brown, exfoliating on older stems; younger stems red. Stipules present, in pairs, subulate, persistent. Leaves cauline, alternate, those on short lateral branches with arrested internodes crowded and appearing fasciculate, linear to linear-lanceolate. Flowers numerous, in the axils of the upper leaves, on long pedicels, diurnal, perfect, but with both chasmogamous and cleistogamous ones present on same branch. Floral tube minute with enlarged nectary disk at mouth. Sepals (3)4, regular and equal, valvate in aestivation, reflexed in anthesis. Petals (3)4, contorted in aestivation, white, entire, appearing radially arranged in dry specimens, but displaced to one side of the flower in anthesis. Stamens (6)8 in two unequal series, all fertile, the antisepalous ones longer; anthers versatile, pale yellow. Style filiform, exceeding or slightly shorter than the stamens; stigma entire, capitate. Ovary pluriovulate, turbinate or cylindrical. Fruit a loculicidal, thin-walled capsule, locules 3 or 4, ellipsoid-cylindrical to oblong-cylindrical, dehiscing 1/8 to nearly 1/2 the length, the dehisced valves spreading, locule partitions thin, persisting to maturity. Seeds small, in 1 irregular row in each locule, distending the capsule walls.

Morphologically, *Megacorax* does not fit into any of the other genera of the Onagraceae. It is unique in its combination of the following characters: presence of stipules, flowers 3- or 4-merous, presence of chasmogamous and cleistogamous flowers, petals presented to one side of the flower, (6)8 stamens in two whorls, and thin-walled capsules that dehisce 1/8 to 1/2 their length. It shares some characters with several other genera but it does not fit into any of them. Presence of stipules excludes it from the tribes Epilobieae and Onagreae. The capsule structure excludes it from the tribes Hauyaeae, Fuchsiaeae, and Circaeaeae. The deciduous sepals and presence of a floral tube exclude it from tribe Jusisiaeae. This leaves only the tribe Lopeziaeae (only genus *Lopezia* Cavanilles), with which it shares the presence of stipules, 4-merous flowers, a capitate

“dry” stigma, and slight floral zygomorphy that approaches the structural zygomorphy found in *Lopezia* flowers. However, *Lopezia* is clearly marked in Onagraceae by having in 4-merous flowers only two stamens (one species) or one stamen and a staminode (Plitmann et al., 1973), unlike *Megacorax* and all other Onagraceae, which have twice as many stamens as sepals. The capsules of *Megacorax* are similar in shape and structure to those of some *Lopezia*, such as *L. riesenbachia* Plitmann, P. H. Raven & Breedlove. The stipules of most species of *Lopezia* are generally caducous, but are persistent in the shrubby species, similar to the persistent stipules in *Megacorax*. *Megacorax* has a nectary disk (Fig. 2D) unlike those in *Lopezia*, but possibly similar to nectaries in *Gongylocarpus* (Gongylocarpeae). Overall, the morphology of *Megacorax* places it closest to *Lopezia*, but it clearly lacks the synapomorphies of that genus, and deserves separate generic status. In fact, a recent *rbcL* and *ndhF* cpDNA analysis (Levin et al., in press) confirms the placement of *Megacorax* in a strongly supported clade sister to *Lopezia*.

*Etymology.* The generic name is based on the combination of the Greek words *mega*, large or great, and *korax*, raven, to honor Peter H. Raven, who has studied the Onagraceae for nearly half a century and has published numerous papers and monographs on many aspects of the family. He also has inspired many others to contribute to the scientific knowledge of Onagraceae, and has been one of our foremost advocates for conservation and sustainable use of the environment.

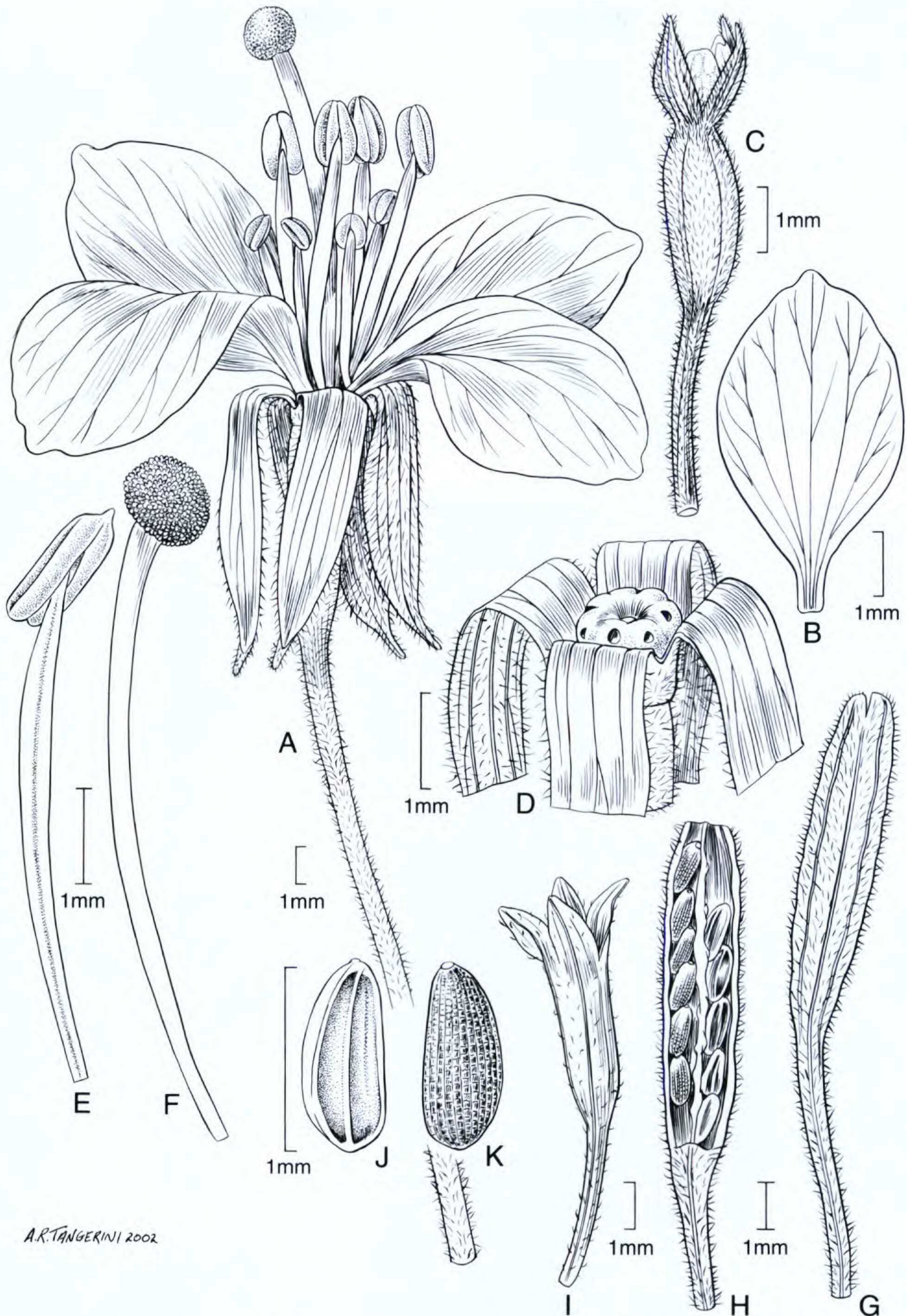
**Megacorax graciellanus** S. González & W. L. Wagner, sp. nov. TYPE: Mexico. Durango: Nuevo Ideal, Sierra de Coneto, al N de Dr. Castillo del Valle, por el camino a Ignacio Zaragoza, 25°5'11"N, 104°57'10"W, 2210 m, 5 Nov. 2001, S. Acevedo, L. López & S. González 1352 (holotype, US 3376228; isotypes, ANSM, CAS, CHAPA, CIIDIR, ENCB, IEB, IIZD, MEXU, MO, TEX, UAMIZ). Figures 1, 2.

Ex speciebus generum affinium, foliis linearibus ad lineari-oblongata 8–12 × 0.8–1.3 mm, tubo florali 0.2–0.6 mm longo et disco annulari, parietibus capsulae seminibus distentis differt.

Xeromorphic, rhizomatous, weakly woody shrub from a branched, ascending caudex up to 1.4 cm thick. Stems profusely branched, ascending, (15–)25–60 cm high, covered with thin gray bark and exfoliating in longitudinal strips on the lowermost stems, becoming pale brown to yellow and shredding or flaky on stems further up, the bark of main stem and pri-



Figure 1. *Megacorax graciellanus* S. González & W. L. Wagner. —A. Habit, showing primary stem from near the base. —B. Leaf. —C. Stem with lower portion of a leaf and associated stipule. —D. Upper portion of stem with both chasmogamous and cleistogamous flowers on the same branch. —E. Seedling showing cotyledons and first pair of leaves.



A.R. TANGERINI 2002

Figure 2. *Megacorax graciolanus*. —A. Chasmogamous flower, showing slight zygomorphy of petal presentation. —B. Petal of chasmogamous flower. —C. Cleistogamous flower, slightly open showing small petals. —D. Flower with petals, stamens, and style removed, showing fleshy disk. —E. Stamen. —F. Style and capitate stigma. —G. Immature capsule with pedicel, showing slightly distended capsule walls from seeds. —H. Longitudinal view of capsule, showing arrangement of seeds. —I. Mature dehiscing capsule. —J. Adaxial (raphial) surface of seed. —K. Abaxial surface of seed.

mary branches smooth and pale brown, upper branches terete or angled, yellow to purple or red tinged, puberulent with patent or ascending, translucent hairs 0.07–0.2(–0.3) mm long. Stipules 0.2–1 mm long, linear to subulate, puberulent to glabrate, pale yellow, persistent at least briefly after the leaf falls. Leaves alternate, usually reduced and crowded on short lateral branches and thus appearing fasciculate, young ones thick and somewhat fleshy, 8–12 × 0.8–1.3 mm, linear to linear-lanceolate, green to reddish or purple, minutely papillate, often with minute white dots on the upper surface, the midrib broad and evident on the lower surface except toward the apex, narrow and impressed on the upper surface, otherwise the veins indistinct, puberulent with translucent hairs ca. 0.1–0.2 mm long, becoming glabrate, margin entire to shallowly sinuate-denticulate, whole leaf revolute or sometimes just the margins revolute, apex obtuse to subacute, base gradually attenuate, sessile on a thickened base that persists as a protuberant scar. Flowers in the axils of the upper leaves, the branches resembling leafy, many-flowered racemes, both chasmogamous and cleistogamous flowers present on the same branch, the floral parts variable in size, especially of cleistogamous ones; pedicels up to 14 mm long, filiform, ascending to erect, purple, puberulent with white hairs 0.1–0.25 mm long, or sometimes glabrate. Floral tube inconspicuous, 0.2–0.6 mm long, enlarged by annular disk in upper 2/3, puberulent. Buds up to 6.2 mm long, narrowly elliptic, the free tips 0.4–0.5 mm long, linear. Sepals regular and equal, valvate in aestivation, reflexed in anthesis, rarely two of the sepals coherent, (1.2–)3.4–6.2 × 0.3–0.8 mm, oblong-lanceolate, deep red or reddish purple, sparsely appressed to spreading puberulent on adaxial surface, especially toward the apex, puberulent on abaxial surface, abruptly narrowed at the apex. Petals white, (1.3–)3.8–6.2 × 1.2–2.6 mm, narrowly obovate, rarely with inconspicuous purple veins, shorter than or equaling the sepals, rounded to acute at apex, tapering to the base, in chasmogamous flowers appearing radially arranged in dry specimens, but displaced to one side of the flower in anthesis. Stamens all fertile, (6)8, in two unequal series, the antisepalous ones longer; filaments pink to purple at least toward the proximal half, the longer set 1.2–4 mm long, the shorter set 0.9–2.4 mm long, with smaller anthers; anthers of longer stamens 0.6–0.7 mm long, those of shorter ones 0.4–0.5 mm long, broadly oblong, cream-colored, aging to yellow. Ovary 1.9–4.1 × 0.9–1.1 mm, turbinate or cylindric, gradually tapering to the base, puberulent. Style filiform, 1.8–8 mm long, pink to purple; stigma entire, capitate, ca. 0.4–0.6 mm diam., whitish, held above the stamens or surrounded by stamens. Capsule (3–)4.4–5.8(–6.7) × 1.3–1.8 mm, thin-

walled, ellipsoid-cylindrical, oblong-cylindrical, nearly terete or walls slightly distended by seeds, tapering at base, truncate at summit, pink to purple, puberulent to glabrescent, 3- or 4-celled and 3- or 4-valved, the valves dehiscent 1/8 to nearly 1/2, spreading in maturity, the thin partitions between the locules persisting to maturity, with several seeds in 1 irregular row in each cell. Seeds 1–1.2 × 0.4–0.55 mm, narrowly obovoid or narrowly oblong, pale brown, glossy, the abaxial side convex, the raphal surface (adaxial) side slightly depressed with margins slightly incurved, with raphe visible as a longitudinal ridge, the testa appearing nearly smooth, but in fact minutely pitted-reticulate (> 50×). Apparently self-compatible judging from the presence of cleistogamous flowers.

*Etymology.* The specific epithet honors Graciela Calderón Díaz-Barriga, who has written revisions of about half of the families for the *Flora del Valle de México* (the only complete flora published until now in Mexico, in which she is the editor along with her husband, J. Rzedowski). She is also writing many of the revisions for the *Flora del Bajío*, and she has greatly contributed to the mentoring of several generations of students. We are very pleased to dedicate this species to such an inspiring botanist and friend.

*Distribution and habitat.* *Megacorax gracielanus* is known only from two localities in the Sierra de Coneto, a volcanic mountain located in central Durango, Mexico, on the western boundaries of the Chihuahuan Desert. Sierra de Coneto constitutes the southeastern extreme of the Sierra de Promontorio and the eastern limit of an endorrheic (closed) basin (Laguna de Santiaguillo). The climate in the area is temperate semi-dry. The predominant substratum is formed by ignimbrites (igneous extrusive rocks of acidic pH). *Megacorax gracielanus* has been collected between 24°55'49" to 25°5'11"N and 104°47'5" to 104°57'10"W, at 2210 and 2360 m. It occurs in colonies and is scarce to abundant in patches on rocky areas with acidic soils. The dominant vegetation is open xerophytic woodland of *Pinus cembroides* Zuccarini (pinyon pine) with *Quercus emoryi* Torrey and sclerophyllous shrubs, mainly *Arctostaphylos pungens* Kunth and *Quercus depressipes* Trelease. The two known populations are about 18 km apart (air distance). Based on a survey in June 2002 (SG and LL), it is likely that *Megacorax gracielanus* grows in much of the intervening area as well as in other parts of the Sierra de Coneto. It has not been possible to survey these areas because there are no roads. The new survey showed that at the type locality *Megacorax gracielanus* is much more abundant than originally

thought, and in some areas it is one of the dominant elements in the lower stratum. It grows along an open canyon about 1 km long (at least) and 150 m wide. In some places there are 4 to 5 plants/m<sup>2</sup>. In the other collection site (southernmost) *Megacorax graciolanus* is scarce and infrequent with only a few plants found (< 20). It is interesting that in both areas it grows not only under shrubs and trees, but also in open areas along recently open roads, on fragmented rocks. It is much more abundant and well developed under the shrubs, but it seems to adapt well to colonizing disturbed areas, which raises the question of why this unique plant is not much more widely distributed. The Sierra de Coneto is also the only known locality for *Mammillaria theresae* Cutak, and perhaps the perceived localized nature of their distribution is due to the lack of thorough collecting in this region of Mexico.

**Phenology.** Some plants were found flowering and fruiting after the rainy season, in early November, but by then most of the plants were finished fruiting, suggesting that *Megacorax graciolanus* flowers primarily earlier in the year. The paratype collection made at the higher elevation was even more mature and senescing for the winter. Plants in the population had indications of foraging by domestic or wild animals.

**Paratypes.** MEXICO. **Durango:** Nuevo Ideal, Sierra de Coneto, al NE de Once de Marzo por el camino a Coneto, ladera con exposición al N, 24°55'49"N, 104°47'5"W, 2360 m, matorral esclerófilo (*Arctostaphylos pungens* y *Quercus depressipes*) con *Pinus cembroides*, *Quercus emoryi* y *Arbutus arizonica*, suelo somero, 6 Nov. 2001, S. González et al. 6532 (CIIDIR, IEB, MEXU, US).

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#### Literature Cited

- Averett, J. E., S. Huang & W. L. Wagner. 1988. Flavonoid survey of *Oenothera* (Onagraceae): Sects. *Gauropsis*, *Hartmannia*, *Kneiffia*, *Paradoxus* and *Xylopleurum*. *Amer. J. Bot.* 75: 476–483.
- Carlquist, S. 1982. Wood anatomy of Onagraceae: Further species; root anatomy; significance of vestured pits and allied structures in dicotyledons. *Ann. Missouri Bot. Gard.* 69: 755–769.
- Conti, E., A. Fischbach & K. J. Sytsma. 1993. Tribal relationships in Onagraceae: Implications from *rbcL* sequence data. *Ann. Missouri Bot. Gard.* 80: 672–685.
- Eyde, R. H. 1981. Reproductive structures and evolution in *Ludwigia* (Onagraceae). III. Vasculature, nectaries, conclusions. *Ann. Missouri Bot. Gard.* 68: 470–503.
- Hoch, P. C., J. V. Crisci, H. Tobe & P. E. Berry. 1993. A cladistic analysis of the plant family Onagraceae. *Syst. Bot.* 18: 31–47.
- Levin, R. A., W. L. Wagner, P. Hoch, M. Nepokroeff, J. C. Pires, E. A. Zimmer & K. J. Sytsma. In press. Family-level relationships of Onagraceae based on chloroplast *rbcL* and *ndhF* data. *Amer. J. Bot.*
- Munz, P. A. 1965. Onagraceae. *North Amer. Fl. II.* 5: 1–278.
- Plitmann, U., P. H. Raven & D. E. Breedlove. 1973. The systematics of *Lopeziae* (Onagraceae). *Ann. Missouri Bot. Gard.* 60: 478–563.
- Pragowski, J., J. Nowicke, P. Raven, J. Skvarla & W. L. Wagner. 1987. Onagraceae Juss.: Onagreae R. Raimann pro parte. *World Pollen & Spore Flora* 15: 1–55.
- Raven, P. H. 1964. The generic subdivision of Onagraceae, tribe Onagreae. *Brittonia* 16: 276–288.
- . 1979. A survey of reproductive biology in Onagraceae. *New Zealand J. Bot.* 17: 575–593.
- . 1988. Onagraceae as a model of plant evolution. Pp. 85–107 in L. D. Gottlieb & S. K. Jain (editors), *Plant Evolutionary Biology: A Symposium Honoring G. Ledyard Stebbins*. Chapman and Hall, London.
- & D. P. Gregory. 1972. Observations of meiotic chromosomes in *Gaura* (Onagraceae). *Brittonia* 24: 71–86.
- & W. Tai. 1979. Observations of chromosomes in *Ludwigia* (Onagraceae). *Ann. Missouri Bot. Gard.* 66: 862–879.
- Skvarla, J. J., P. H. Raven, W. F. Chissoe & M. Sharp. 1978. An ultrastructural study of viscin threads in Onagraceae pollen. *Pollen & Spores* 20: 5–143.