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Cremosperma verticillatum (Gesneriaceae), a new species from northwestern Ecuador.

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CREMOSPERMA VERTICILLATUM (GESNERIACEAE), A NEW SPECIES FROM NORTHWESTERN ECUADOR

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ABSTRACT

Recent expeditions to the northwestern slopes of the Ecuadorian Andes and preliminary work on a revision of *Cremosperma* (Gesneriaceae) have resulted in the discovery of a new species. The new species, **Cremosperma verticillatum,** is distinguished from other congeners by the presence of evenly spaced leaves in a whorled arrangement on elongate erect shoots, decumbent stems, and elongate petioles.

RESUMEN

Expediciones recientes a la vertiente noroccidental de los Andes Ecuatorianos, y el trabajo preliminar de revisión del género *Cremosperma* (Gesneriaceae) han llevado a descubrir una nueva especie: *Cremosperma verticillatum*. La nueva especie se distingue de sus congéneres por hojas en posición verticilada, uniformemente espaciadas a lo largo de ramas erectas, de tallos decumbentes, y de pecíolos elongados.

KEY WORDS: *Cremosperma*, Gesneriaceae, Taxonomy, Flora of Ecuador, Mindo Loma

INTRODUCTION

Cremosperma is a genus of small terrestrial or saxicolous herbs ranging from Costa Rica to Peru. Kvist and Skog (1988) provided a thorough treatment of the *Cremosperma* species known from Ecuador and estimated the genus to comprise 24 species. Two *Cremosperma* species were recently published from Colombia (Fernández-Alonso 2006) and Ecuador (Clark & Skog 2011). The description of *Cremosperma verticillatum* brings the total diversity of the genus to 27 species. The monophyly of *Cremosperma* and its placement in the tribe Beslerieae is strongly supported by molecular data from the nrDNA ITS region (Roalson & Clark 2006); a combined analysis of ITS and cpDNA *trnL-F* (Clark et al. 2010); and cpDNA *ndhF* (Smith 2000). Morphological features that distinguish *Cremosperma* from other genera in the Beslerieae include the presence of terminally clustered flowers on a well-developed peduncle and filaments of the stamens adnate to the corolla tube for half of their length.

TAXONOMIC TREATMENT

Cremosperma verticillatum J.L. Clark & B.R. Keener, sp. nov. (**Fig. 1**). TYPE: ECUADOR. PROVINCIA PICHINCHA: cantón San Miguel de los Bancos, Sendero Cascada, Mindo Loma Cloud Forest Reserve, km 73.5 via Calacali-La Independencia (3 km past the entrance to the village of Mindo), 0°0'44"S, 78°44'29"W, 1800 m, 27 May 2007, *J.L. Clark 9775* (HOLOTYPE: US; ISOTYPES: BRIT, CAS, K, MO, NY, QCNE, SEL, UNA).

A aliis speciebus *Cremospermatis* differt aequaliter dispositis foliis insidentibus elongato erecto cauli, foliis verticillatis et pedicellis elongatis.

Cremosperma pusillum C.V. Morton var. *ecuadorense* C.V. Morton, J. Wash. Acad. Sci. 25:284–291. 1935. TYPE: ECUADOR. Provincia PICHINCHA, Mt. Pichincha, 1800 m, 21 Jan 1856, *W. Jameson* (HOLOTYPE: K; ISOTYPES: E, K-2 sheets, P, W).

Terrestrial herb; stems 20–40 cm tall, decumbent at base, arched and ascending to erect distally, rarely branched, terete to slightly angled, sulcate in distal ½, tomentose with septate trichomes, densely tomentose in distal ⅓, also scurfy with small amber colored protuberances. **Leaves** bullate when fresh, membranaceous when dry, usually with 3 leaves per node, often opposite at proximal first and second node, equal to subequal at each node (rarely unequal); petioles terete, 0.4–5.0 cm long, tomentose; blade elliptic to ovate, 2.5–5.5 × 1.5–3.7 cm, base obtuse and asymmetrical, apex obtuse to rounded, margin crenate to serrate, tomentose,

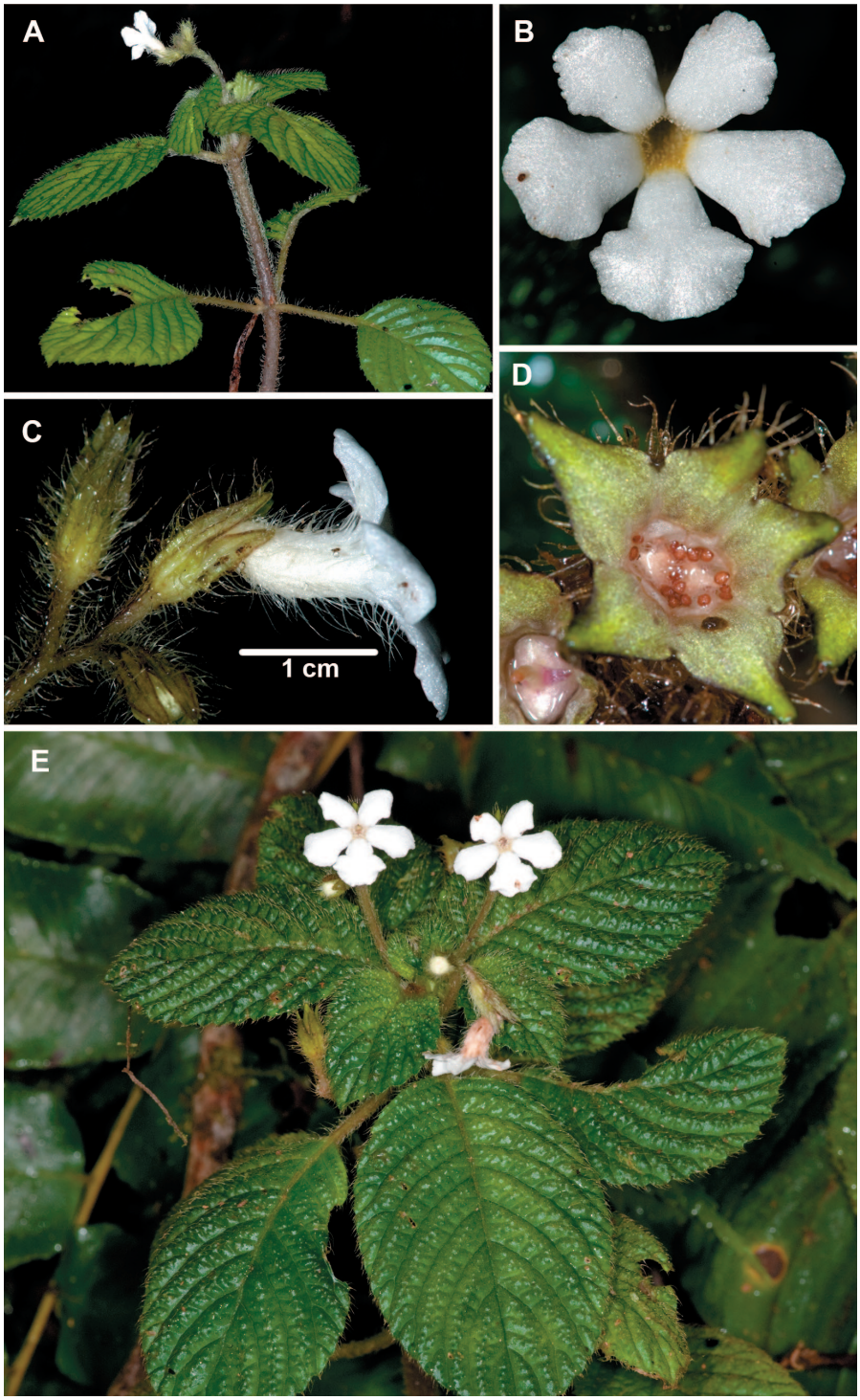

Fig. 1. *Cremosperma verticillatum*. **A.** Elongate shoot showing whorled leaves. **B.** Face view of corolla. **C.** Lateral view of flower. **D.** Splash fruit with 4-valved capsule and persistent calyx lobes. **E.** Habit. (Photos by J.L. Clark; A & D. *J.L. Clark & P. Herrera 10912*; B , C. & E. *J.L. Clark & C. Aulestia 12200*).

abaxially pale green, pilose on veins, adaxially dark green, midvein strigose on proximal ⅓–¾, area between lateral veins glabrous at base then becoming strigose in distal ⅔ with trichomes arranged linearly. **Inflorescence** a reduced pair-flowered cyme, appearing clustered and pseudoumbellate, in upper leaf axils, peduncle 1–4 cm long, (1-) 2–5 mature flowers/inflorescence, often with remnant pedicel scars appearing gland-like; bracts absent. **Flowers** pedicellate, pedicels 1–5 mm long, pilose; calyx 6–7 mm long, lobes 5, fused for ½ of their length, equal, lobes erect during anthesis, persistent and spreading in fruit to form a splash cup to 11 mm wide, apex obtuse, uniformly green, outside pilose, inside glabrous; corolla posture oblique relative to calyx, to 1.5 cm long, tubular, base to mid-region 2 mm in diameter, becoming apically ventricose on lower side to 4 mm wide at apex, white with yellowish upper region of throat, outer surface of tube pilose, throat and corolla lobes abaxially pilose, inner surface of tube glabrous, throat and base of corolla lobes with clustered gland-tipped trichomes, corolla lobes glabrous distally, limb bilaterally symmetrical, lobes reflexed and unequal, lower three lobes oblanceolate, ca. 6 × 2 mm, upper two lobes rotund, 5 × 2 mm, margins entire, slightly undulate; stamens 4, didynamous, included; filaments adnate to base of corolla for 1–2 mm and free for 1.5–2 mm, glabrous; anthers broader than long, ca. 0.4 × 0.9 mm; staminode absent; nectary annular, forming a ring around base of ovary, glabrous; ovary superior, glabrous, ca. 1.7 × 0.6 mm, style and stigma glabrous. **Fruit** a dry 4-valved capsule, globose, ca. 2.5 mm in diameter, calyx lobes persistent and spreading in fruit with potential to act as a splash cup mechanism to spread seeds; seeds numerous, elliptic to ovoid, ca. 0.5 × 0.2 mm, reddish brown, surface alveolate, with ridges of alveoli often forming tubercles.

Cremosperma verticillatum is differentiated from other congeners by elongate erect shoots with leaves that are isophyllous and whorled (Fig. 1A). Most species of *Cremosperma* have opposite leaves that are equal or nearly in size (isophyllous), while other species are strongly anisophyllous (e.g., *Cremosperma anisophyhllum* J.L. Clark & L.E. Skog, *C. reldioides* L.P. Kvist & L.E. Skog, and *C. veraguanum* Wiehler). Upper- and mid-leaves tend to differ in relative petiole length with the latter being longer and the former being shorter. The variable petiole length can be attributed to the maturity of development with the younger leaves having shorter petioles relative to leaf blade and mid- and lower-leaves with longer petioles relative to leaf blade size. The petioles of the mid-leaves of *Cremosperma verticillatum* are relatively elongate (> 5 cm in length) and exceed the length of the leaf blade. Most *Cremosperma* species have petioles that are shorter than the length of the leaf blade. In species that are strongly anisophyllous the petioles are nearly sessile. *Cremosperma verticillatum* is also distinguished from other congners by the presence of gland-like pedicel scars. Other species of *Cremosperma* that have been observed with gland-like pedicel scars are *Cremosperma reldioides* and *C. anisophyllum*. The presence of gland-like pedicel scars may be more common than indicated in the *Cremosperma* treatment by Kvist and Skog (1988).

The presence of whorled leaves was a defining character for *Cremosperma pusillum* C.V. Morton. In addition to the typical variety, Morton (1934) described *C. pusillum* var. *ecuadorense* C.V. Morton. *Cremosperma pusillum* var. *typica* [*pusillum*] was discussed by Morton (1934) as being collected by E.F. André from "Tambo de Savanilla" in Nariño, Colombia in which he wrote, "This agrees in all particulars with the André specimens." André collected in Colombia and Ecuador in 1876 (Smith 1965), but the locality Sabanilla is along the eastern Andean slopes in the southern Ecuadorian province of Zamora-Chinchipe and not in Colombia as indicated by Morton (1934). The Sabanilla Range is located 75 km south of the city of Loja and is currently part of the Tapichalaca Nature Reserve that is managed by Fundación de Conservación Jocotoco. There are at least three other species (*Bomarea longipes* Baker, *Centropogon heteropilis* E. Wimm. and *Centropogon quebradanus* E. Wimm.) collected by André with Sabanilla Range being the type locality. The treatment of *Cremosperma* by Kvist and Skog (1988) repeated Morton's error (1934) by citing the holotype of *Cremosperma pusillum* as being originally collected in Colombia instead of Sabanilla in southern Ecuador. A paper by Fernández-Alonso (2006) documents recent collections of *Cremospserma pusillum* from Colombia (Antioquia and Cauca) that are deposited at COL and JAUM. The authors of this paper did not study the Colombian collections, but images in Fernández-Alonso (2006) of field collections (*J.R.I Wood 5371*) are consistent with material from southern Ecuador.

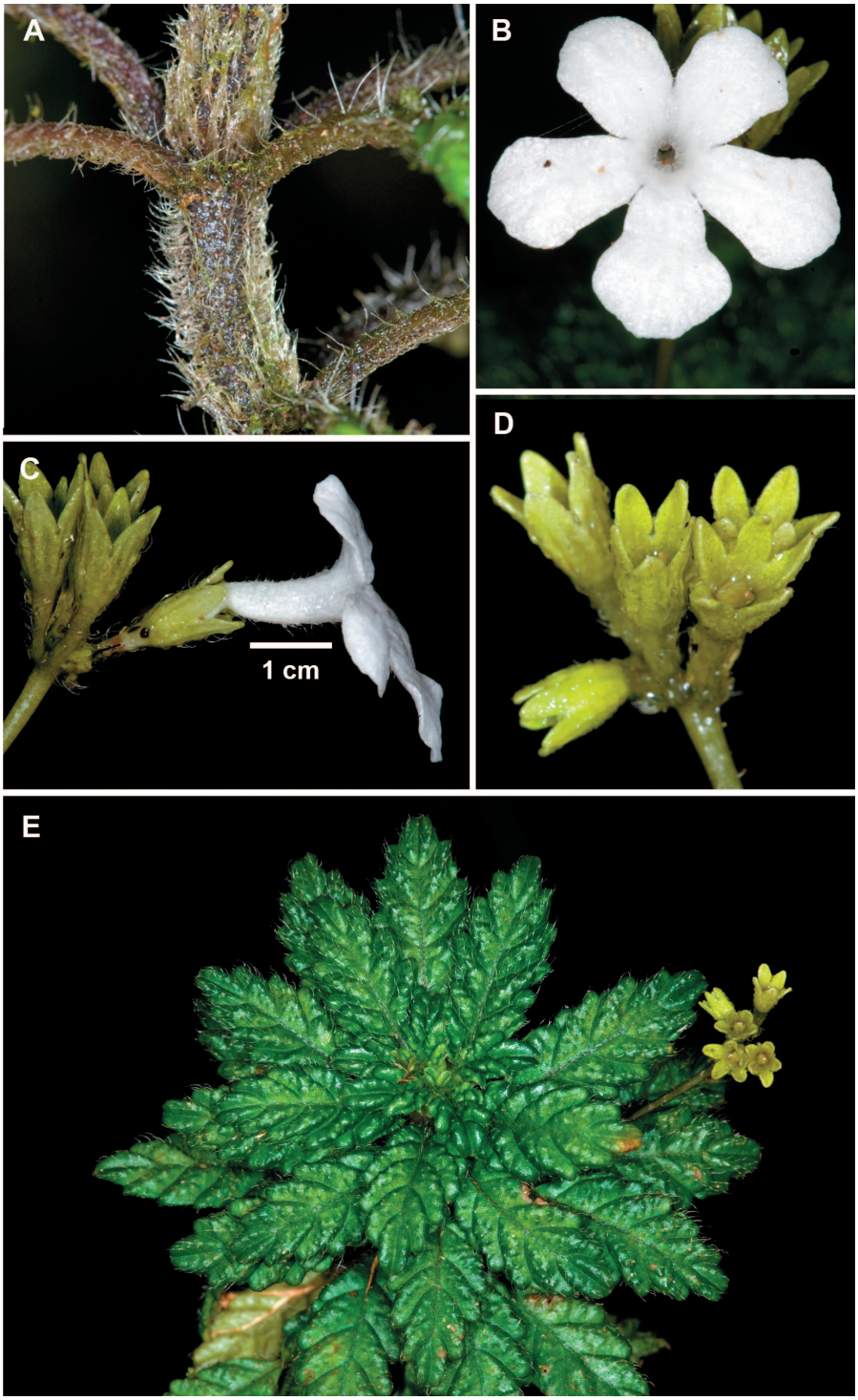

Fig. 2. *Cremosperma pusillum*. **A.** Shoot showing whorled leaves. **B.** Face view of corolla. **C.** Lateral view of flower. **D.** Calyx lobes. **E.** Habit. (Photos by J.L. Clark of *J.L. Clark & Gesneriad Research Expediton Participants 12400*).

Cremosperma pusillum var. *ecuadorense* was described from a single collection by W. Jameson from Mt. Pichincha, Ecuador. Morton was probably inclined to recognize two varieties of one species instead of two separate species because both species have whorled leaves and he was under the impression that the type localities by André and Jameson were from geographically similar areas (e.g., Nariño in southern Colombia and adjacent Mt. Pichincha in northern Ecuador). We now know that the type localities are geographically distinct with Pichincha in northeastern Ecuador and Sabanilla in southeastern Ecuador.

It is not possible to elevate Morton's variety to the rank of species even though *Cremosperma verticillatum* is identifiable with *Cremosperma pusillum* var. *ecuadorense*. There already exists a species with a specific epithet honoring Ecuador (*Cremosperma ecuadoranum* L.P. Kvist & L.E. Skog). It should be noted that Kvist and Skog (1988) treated Morton's variety as a heterotypic synonym of *Cremosperma hirsutissimum* Benth. var. *hirsutissimum*. The other three varieties of *Cremosperma hirsutissimum* have strictly opposite leaves. It is clear based on herbarium work, field observations, and multiple expeditions to both type localities that whorled leaves is a consistent character that differentiates these two species from all other *Cremosperma* species in Ecuador.

Cremosperma pusillum is a small terrestrial herb that rarely reaches 20 cm in height and often appears with leaves in a basal rosette or in apical clusters (Fig. 2E) on short erect shoots that are embedded in moss-covered areas. The leaves of *C. pusillum* are 0.5 to 1.5 cm long and the adaxial surface is dark green and often variegated (Fig. 2). *Cremosperma verticillatum* is 20-40 cm tall and the leaves are longer (2.5–3.7 cm). In addition to the distinguishing vegetative characters, the corolla of *Cremosperma pusillum* is nearly salverform with an erect posture relative to the calyx (Fig. 2C). The corolla of *Cremosperma verticillatum* has a distinct throat rendering it infundibular with an oblique posture relative to the calyx (Fig. 1C).

Distribution and habitat.—*Cremosperma verticillatum* is currently only known from one population from the Mindo Loma Cloud Forest Bird Lodge that is owned by the Herrera family. The 7.5-hectare reserve was established by the late Ing. (=Ingeniero or Civil Engineer) Hernan Boris Herrera J. (1945–2009) and is currently run by his two sons (Patricio and Boris), daughter (Gabriela) and wife (Martha Vallejo G.). The collection by Jameson in 1856 could be from the same area as the type locality for *Cremosperma verticillatum*. Many 19th century collections from the Pichincha province were simply listed as Mt. Pichincha.

Etymology.—The new species is named in reference to the presence of whorled leaves (Fig. 1A).

Conservation and IUCN Red List category.—*Cremosperma verticillatum* has not been found in any formally protected area in Ecuador and it is not known from neighboring protected areas where the first author has done extensive fieldwork (e.g., Maquipacuna, Pahuma, Los Cedros, and the environs of Mindo). According to the IUCN Red List criteria (IUCN 2001) the limited geographic range (B2a, less than 10 km^2 and known to exist at only a single location) and the small size (7.5 hectares) of the privately owned Mindo Loma Cloud Forest Bird Lodge, qualify *Cremosperma verticillatum* for being listed in the category CR (Critically Endangered).

Additional Specimens Examined. **ECUADOR. Provincia Pichincha:** canton San Miguel de los Bancos, Sendero Cascada, Mindo Loma Cloud Forest Reserve, km 73.5 via Calacali-La Independencia (3 km past the entrance to the village of Mindo), 0°0'44"S, 78°44'29"W, 1800 m, 25 May 2009, *J.L. Clark & P. Herrera 10912* (BRIT, CAS, K, MO, NY, QCNE, SEL, UNA, US); 23 May 2011 *J.L. Clark & C. Aulestia 12200* (BRIT, CAS, K, MO, NY, QCNE, SEL, UNA, US).

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It should be noted that the founder of the Mindo Loma Cloud Forest Bird Lodge, Ingeniero Hernan Boris Herrera J., was an important advocate for the conservation of Ecuador's biodiversity, and he was the Advisor for the Development Secretary of Ecuador's Ministry of Defense. He was present on the landing strip and made a last-minute decision to recuse himself from joining the 1993 fatal plane crash that ended the lives of Alwyn Gentry, Theodore A. Parker, and Eduardo Aspiazu. Together these three biologists were pioneers in the conservation of Ecuador's biodiversity. Hernan Herrera's legacy is the Mindo Loma Cloud Forest Bird Lodge. Thanks are due to the Herrera family for their conservation efforts in preserving the only currently known extant population of *Cremosperma verticillatum* inside the boundaries of the Mindo Loma Cloud Forest Bird Lodge.

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