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TWO NEW SPECIES OF *OCTOMERIA* (PLEUROTHALLIDINAE) FROM CORDILLERA DEL CÓNDOR, ZAMORA CHINCHIPE, ECUADOR

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ABSTRACT. Two new species of orchids, *Octomeria pacii*, and *O. panguiensis* are described and illustrated from Cordillera del Cóndor, Ecuador; likewise, information is provided on their distribution, habitat, and conservation status. These species differ from other species in the genus by their floral and vegetative characteristics and their apparent reproductive strategy of cleistogamy. *Octomeria pacii* is similar to *Octomeria deceptrix*, but differs in the caespitose habit, the ramicauls compressed along their entire length, the narrowly elliptical leaves, the autogamous flowers, the translucent white sepals suffused with magenta and the obovate, white lip, marked with magenta. *Octomeria panguiensis* is similar to *O. weneri*, but differs by the larger, shortly repent plants with lanceolate leaves, the cleistogamous flowers, the translucent white-colored sepals, the 5-veined lateral sepals and the oblong-trilobed lip with the apical lobe tridentate.

RESUMEN. Dos nuevas especies de orquídeas, *Octomeria pacii* y *O. panguiensis*, se describen e ilustran de la Cordillera del Cóndor, Ecuador; así mismo, se brinda información sobre su distribución, hábitat y estado de conservación. Estas especies difieren de otras en el género por las características florales y vegetativas y por la aparente estrategia reproductiva de cleistogamia. *Octomeria pacii* es similar a *Octomeria deceptrix*, pero difiere en el hábito cespitoso, los ramicales comprimidos en toda su longitud, las hojas estrechamente elípticas, las flores autóгамas, los sépalos blancos translúcidos y teñidos de magenta y el labio blanco obovado, manchado con magenta. *Octomeria panguiensis* es similar a *O. weneri* pero se diferencia por las plantas más grandes y repent, con hojas lanceoladas, las flores cleistógamas, los sépalos translúcidos de color blanco, los sépalos laterales con 5 nervaduras y el labelo oblongo trilobulado con el lóbulo apical tridentado.

KEYWORDS/PALABRAS CLAVE: Autocompatibilidad, self-compatibility, autopolinización, self-pollination, cleistogamia, cleistogamy, *Octomeria deceptrix*, *Octomeria weneri*

Introduction. *Octomeria* R.Br. includes around 160 species distributed from Belize to northern Argentina and the Antilles, with the center of diversity being from the Guianas to southern Brazil (Forster 2007, Forster *et al.* 2012, Karremans *et al.* 2019). Twenty-seven species are described from Ecuador, *Octomeria candidae* Vélez-Abarca, M.M.Jiménez & Baquero, being the most recent (Vélez-Abarca *et al.* 2020).

Plants of the genus are epiphytic, rupicolous, and more rarely, terricolous (Forster 2007); as well, repent to caespitose. The flowers are fasciculate to solitary, emerging from the apex of the ramicaul. The sepals and petals are generally similar in shape and color, but unequal in size, and the lateral sepals are free or occasionally connate. The column is semiterete, usually with a sub-apical anther and stigma, and the pol-

linarium is generally made up of eight pollinia, hence the generic name, except for one species (*O. splendida* Garay & Dunst.), which has six pollinia (Luer 2010).

Orchid species have evolved several floral characteristics that commonly ensure cross-pollination (Johnson & Steiner 2000). Based on some studies of the pollination systems in Pleurothallidinae, it has been possible to determine that the orchid species within the subtribe are generally self-incompatible (Borba *et al.* 2001). According to the recent phylogenetic studies of Pleurothallidinae, *Octomeria* together with *Atopoglossum*, *Brachionidium*, and *Sansonia* form an early diverging group called *Octomeria* affinity (Karremans 2016) and is believed to be mostly self-incompatible and myophilic (Karremans & Díaz-Morales 2019, dos Santos *et al.* 2020).

In a study carried out in *Octomeria grandiflora* Lindl. and *O. crassifolia* Lindl., self-incompatibility was confirmed. Also, these species are pollinated by flies of the Sciaridae family (Diptera), which are attracted by the nectar at the base of the lip (Barbosa *et al.* 2009). However, not all orchid species possess adaptations that ensure cross-pollination. Some have structural modifications in the flowers that ensure self-pollination, like a reduced or vestigial rostellum and a perianth which never opens (Catling 1990). Some examples of cleistogamy in Pleurothallidinae are: *Masdevallia cleistogama* Luer, some plants of *Pabstiella tripterantha* (Rchb.f.) F.Barros, *Pleurothallis cleistogama* Luer, and *Restrepiella lueri* Pupulin & Bogarín (Luer 1998, 2001, 2006, Pupulin & Bogarín 2007). Here, we described two new species of *Octomeria* recently discovered in the southeast of Ecuador with the adaptation to self-pollination, one of them exhibits cleistogamy.

Material and methods. Specimens were collected during a comparative study on the orchids of the Cordillera del Cóndor. Some of these were grown and photographed at the Orquideario la Paphinia in Zamora, Ecuador. The measurements of the vegetative and floral parts were made from living material. Photographs were taken using a Panasonic® FZ300 or Canon® EOS 1100D camera and Raynox DCR-150 50 mm, EFS 18-58 mm, and +10 Kernel Pro Optics 58 mm close-up lenses. The new species were compared to those previously described (Luer 2010, Luer 2011).

TAXONOMIC TREATMENT

Octomeria pacii Vélez-Abarca, M.M.Jiménez & Baquero, *sp. nov.* (Fig. 1, 2A, 3A, 4).

TYPE: Ecuador. Zamora: Chinchipe, Cordillera del Cóndor flank, 1010 m, 12 Oct. 2020, L. Vélez. LV0020 (holotype: ECUAMZ!).

DIAGNOSIS: Similar to *Octomeria deceptrix* Luer, but differs in the caespitose habit (*vs.* shortly repent), the ramicauls compressed along their entire length (*vs.* ramicauls terete below, compressed above) with narrowly elliptical leaves (1.5–2.5 cm wide *vs.* elliptical-ovate, 1.5–3.0 cm wide), the translucent white suffused with magenta sepals (*vs.* white to yellow, often suffused with rose), the obovate, white, marked with magenta lip, (*vs.* yellow, suffused with red-purple, oblong) and the laterally ribbed column (*vs.* smooth). *Octomeria pacii* is also distinguished by the autogamous flowers (*vs.* allogamous).

Plant medium in size, up to 23 cm tall, epiphytic, caespitose. *Roots* slender, undulated, 1 mm in diameter. *Ramicauls* stout, erect, 8–14 cm long, ancipitous below, with 3–5 internodes enclosed by imbricating, tubular sheaths, the lower sheath shorter than the rest. *Leaf* erect, coriaceous, narrowly elliptical 8–15 × 1.5–2.5 cm, sulcate adaxially and slightly carinate abaxially, margin entire, apex acute, cuneate below into a 0.5–1.5 cm long petiole. *Inflorescence* single-flowered, produced from a fascicle at the apex of the ramicaul, *peduncle* cylindrical 1 mm long; *floral bract* tubular, 3 mm long; *pedicel* cylindrical, 2 mm long; *ovary* 3.5–4.0 mm long, terete, longitudinally sulcate. *Sepals* translucent white suffused with magenta, free, glabrous. *Dorsal sepal* ovate, subacute 9–11 × 5–6 mm, 5-veined. *Laterals sepals* free, ovate, acute, 9–11 × 3–4 mm, 5-veined, oblique. *Petals* translucent white with suffused with magenta, elliptical-ovate, acute, 10–11 × 3–4 mm, 3-veined. *Lip* white, marked centrally with magenta, glabrous, panduriform, trilobated, with erose apical margins, the apex minutely cuspidate, 6.0 × 3.5 mm; the lateral lobes erect, oblique, subacute, antrorse, below the middle, the disc with a pair longitudinal, slightly crooked calli emerging at the middle; the base broadly truncate, hinged to the column-foot.

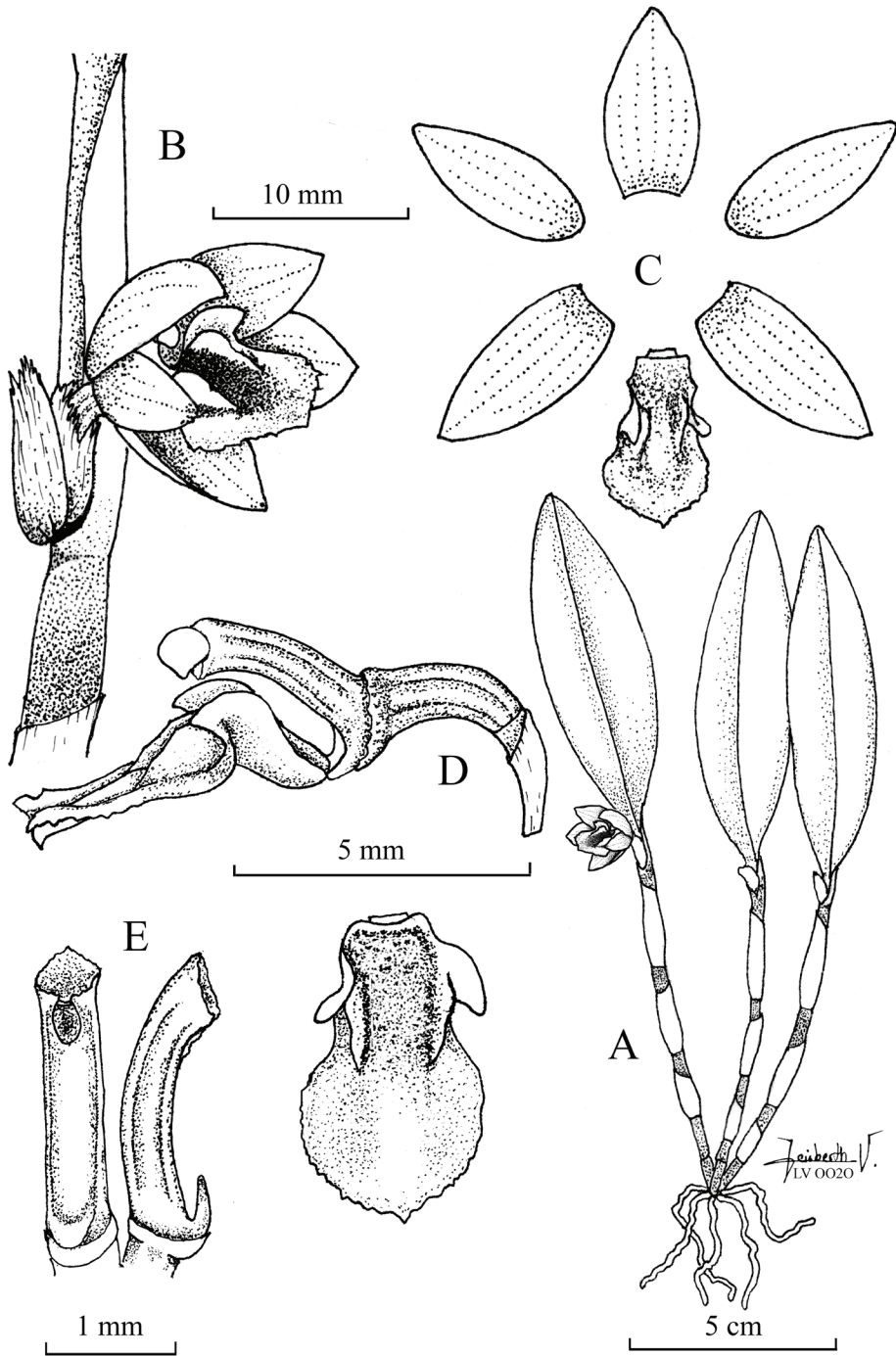


FIGURE 1. *Octomeria pacii* Vélez-Abarca, M.M.Jiménez & Baquero. **A.** Habit. **B.** Flower in 3/4 view. **C.** Dissected perianth. **D.** Part of the pedicel, ovary, column and lip in lateral view and lip adaxial view. **E.** Column in ventral and lateral view. Illustration by Leisberth Vélez, based on the holotype, *Vélez-Abarca LV-0020* (ECUAMZ).

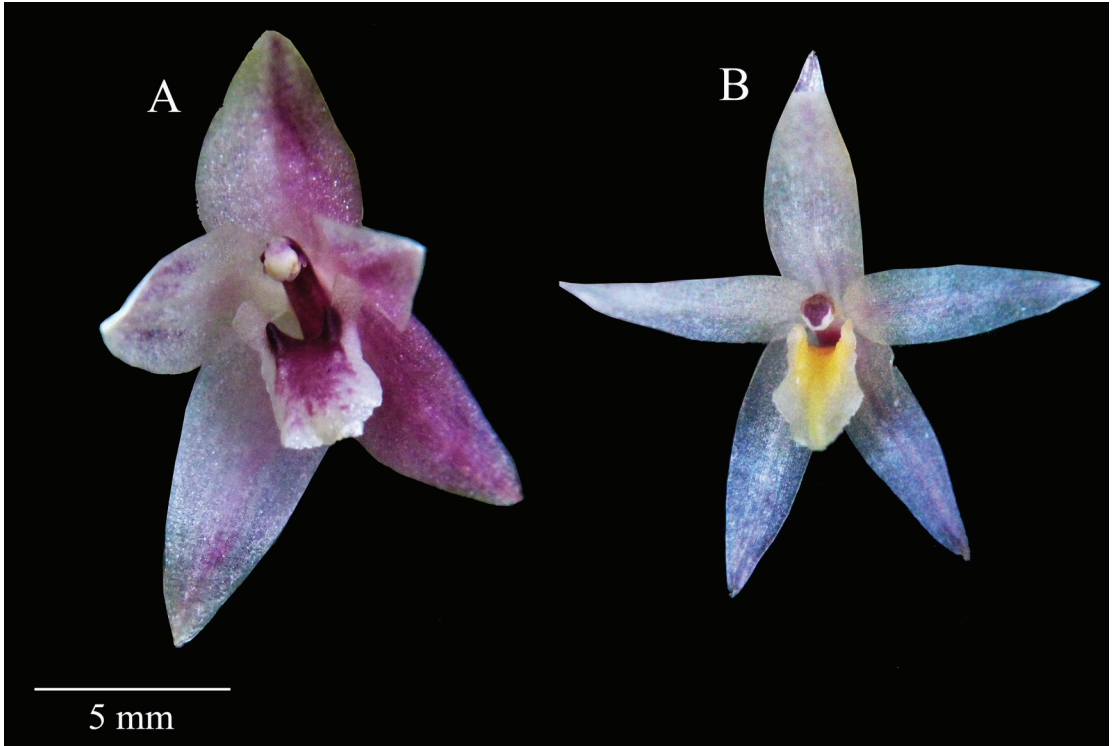


FIGURE 2. Comparison of flowers. **A.** *Octomeria pacii* Véllez-Abarca, M.M.Jiménez & Baquero, *in situ*. **B.** *Octomeria deceptrix* Luer, *in situ*. Photos by Leisberth Véllez.



FIGURE 3. Comparison of the ovary, column and lip in lateral view. **A.** *Octomeria pacii* Véllez-Abarca, M.M.Jiménez & Baquero. **B.** *Octomeria deceptrix* Luer. Photos by Marco M. Jiménez.



FIGURE 4. Comparison of the rostellum. **A.** Column of *Octomeria pacii* Vélez-Abarca, M.M.Jiménez & Baquero, with vestigial rostellum. **B.** The pollinia reaching the stigma in *O. pacii*. **C.** Column of *O. deceptrix* Luer with pronounced rostellum indicated by an arrow. Photos by Marco M. Jiménez.

Column red-purple, semiterete, ribbed longitudinally at each side, 3.0–3.5 mm long; the anther subapical and a ventral stigma, clinandrium slightly irregular, rostellum vestigial, foot 0.2–0.3 mm long. *Anther cap* white. *Pollinia* yellow, 8, in 2 sets of 4.

PARATYPE: Ecuador. Zamora-Chinchipe: near Zamora, 1278 m, 13 December 2019, M. Jiménez 843 (HUTPL!).

EPONYMY: Named after Patrick Paci, passionate lover of the forests and slipper orchids of Ecuador and generous donor and supporter of this research.

DISTRIBUTION AND HABITAT: *Octomeria pacii* grows as an epiphyte under the shade of small trees covered by mosses and lichens in premontane and lower montane forests over a sandstone plateau of the Cordillera del Cóndor. Plants generally grow in windy areas at elevations of 1000 m. This species has also been found growing in steep slopes of the eastern Andes of Ecuador, near Zamora, at an elevation of 1300 m.

Octomeria pacii is very similar to *O. deceptrix* (Fig. 2B, 3B, 4C), but it differs in the caespitose habit with an inconspicuous rhizome (*vs.* shortly repent rhizome), the compressed ramicauls (*vs.* ramicauls terete below, slightly compressed above), leaf narrowly elliptical, 8–15 × 1.5–2.5 cm (*vs.* elliptical-ovate, 5–7 × 1.5–3.0 cm), the longer ovary, 3.5–4.0 mm long (*vs.* 2.5–3.0 mm long). The flowers have translucent white sepals suffused with magenta (*vs.* white to yellow, often suffused with rose), the dorsal sepal is ovate and wider, 0.9–1.1 × 0.5–0.6 cm, 5-veined (*vs.* the elliptical-obovate dorsal sepal, 0.6–0.9 × 0.2–0.3 cm, 3-veined) and the petals are wider, 3–4 mm wide (*vs.* 2–2.5 mm wide). The lip is white, marked with magenta, glabrous, obovate, 3.5–4.0 × 6.0–6.5 mm (*vs.* the lip yellow, suffused with red-purple, oblong, 4.7–5.0 × 2.0 mm), the midlobe suborbicular with a slightly cuspidate apex, (*vs.* subpentagonal with the apex subtruncate or obtuse,) and the disc with prominent calli (*vs.* low). It is also distinguished by the laterally ribbed column (*vs.* smooth) and the autogamous flowers (*vs.* allogamous). *Octomeria pacii* shows a unique floral feature: the presence of two longitudinal ribs, one at each side of the column compared to the smooth and terete column of the rest of the species in the genus.

About one year ago, we tracked the species, and

we observed capsule production in all flowers that caught our attention. Therefore, four specimens were cultivated for eight months, and the same seed pod production was observed without withering of any flower. While dissecting the flower of the species for the line drawing, it was noted repeatedly that the pollinia easily entered the stigma (Fig. 4B). This because flowers lack a prominent rostellum that prevents self-pollination (Catling 1991) as in other *Octomeria* species (Fig. 4). *Octomeria pacii* has a vestigial rostellum (Fig. 4A) and we assume that it could influence the successful production of capsules in each flower. In the future, it should be demonstrated if the species is self-pollinated and if the seed are viable.

CONSERVATION STATUS: This species has been only recorded in the province of Zamora Chinchipe. Populations of this species grow in poorly managed and disturbed forests, where mining is practiced. Although numerous individuals have been found, the species is at risk due to its occurrence outside protected areas where habitat destruction is rampant.

Octomeria panguiensis Vélez-Abarca, M.M.Jiménez & Baquero, *sp. nov.* (Fig. 5–7A).

TYPE: Ecuador. Zamora: Chinchipe, Cordillera del Cóndor flank, 890 m, 17 Aug. 2020, L. Vélez LV 0012 (holotype: ECUAMZ!).

DIAGNOSIS: Similar to *Octomeria weneri* Luer & Thorerle in the cleistogamous flowers, but differs by the larger plants (up to 33.0 cm tall *vs.* 10.5 cm), shortly repent (*vs.* caespitose) with lanceolate leaves (*vs.* narrowly elliptical), the translucent white-colored sepals (*vs.* light rose-colored), the 5-veined lateral sepals (*vs.* 4-veined), and the oblong-trilobed lip with the apical lobe tridentate (*vs.* panduriform with subretuse apical lobe).

Plant large, up to 33 cm tall, epiphytic, shortly repent. *Rhizome* stout, 6–8 mm thick, 6–12 mm long between ramicauls. *Roots* slender, flexuous, 1 mm in diameter. *Ramicauls* stout, suffused with purple, erect, 12–20 cm long, compressed, ancipitous below, with 4–5 internodes enclosed by imbricating, tubular sheaths, the lower one shorter than the others, which tear with age. *Leaf* erect, coriaceous, narrowly elliptical to lanceolate, 15–22 × 2.5–3.5 cm,

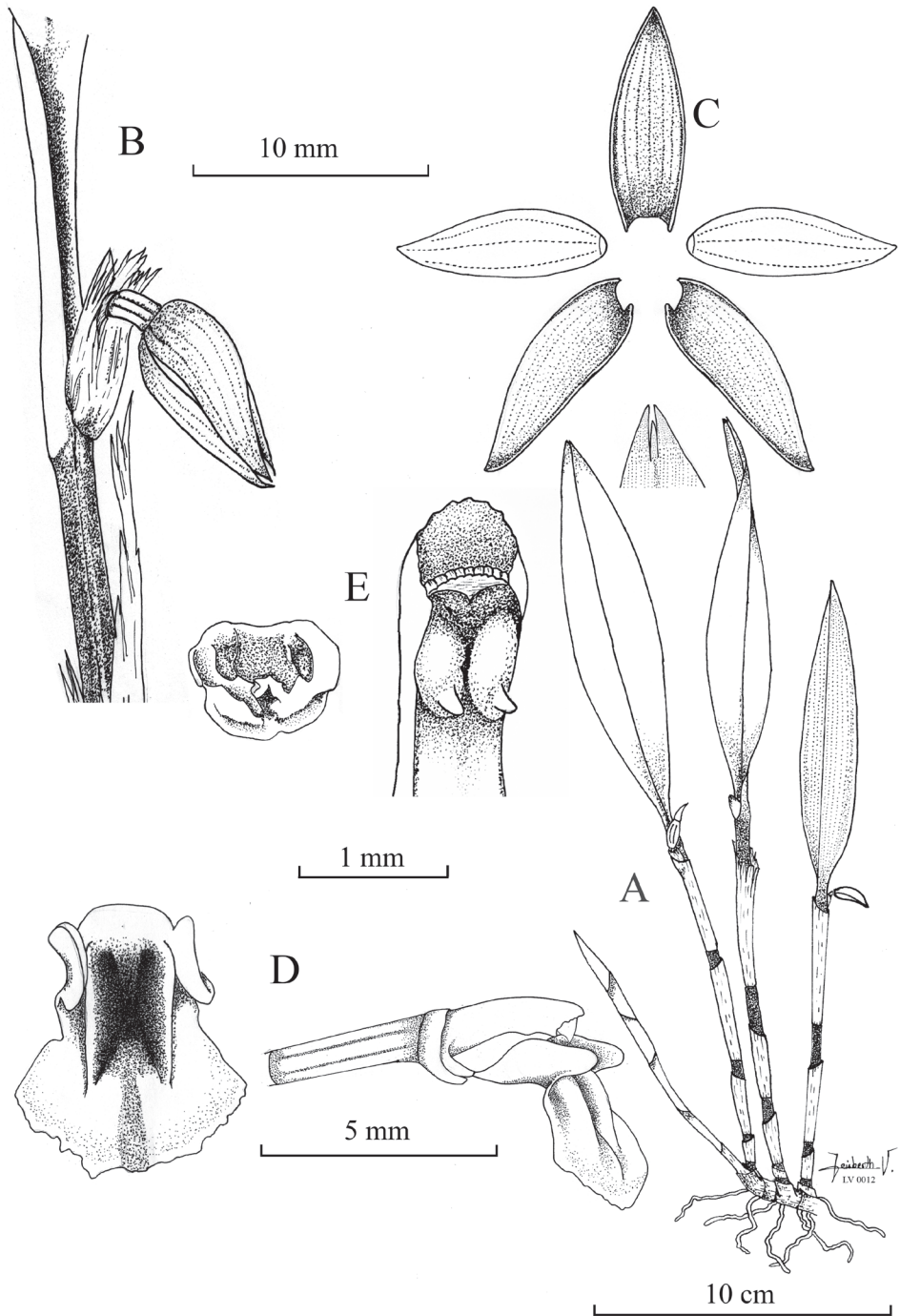


FIGURE 5. *Octomeria panguiensis* Vélez-Abarca, M.M.Jiménez & Baquero. A. Habit. B. Autogamous flower in 3/4 view. C. Dissected perianth. D. Lip in adaxial view and part of the pedicel, ovary, column and lip in lateral view. E. Anther cap in abaxial view and column in abaxial view and apex of the column in ventral view. Illustration by Leisberth Vélez, based on the holotype, *Vélez-Abarca LV-0012* (ECUAMZ).

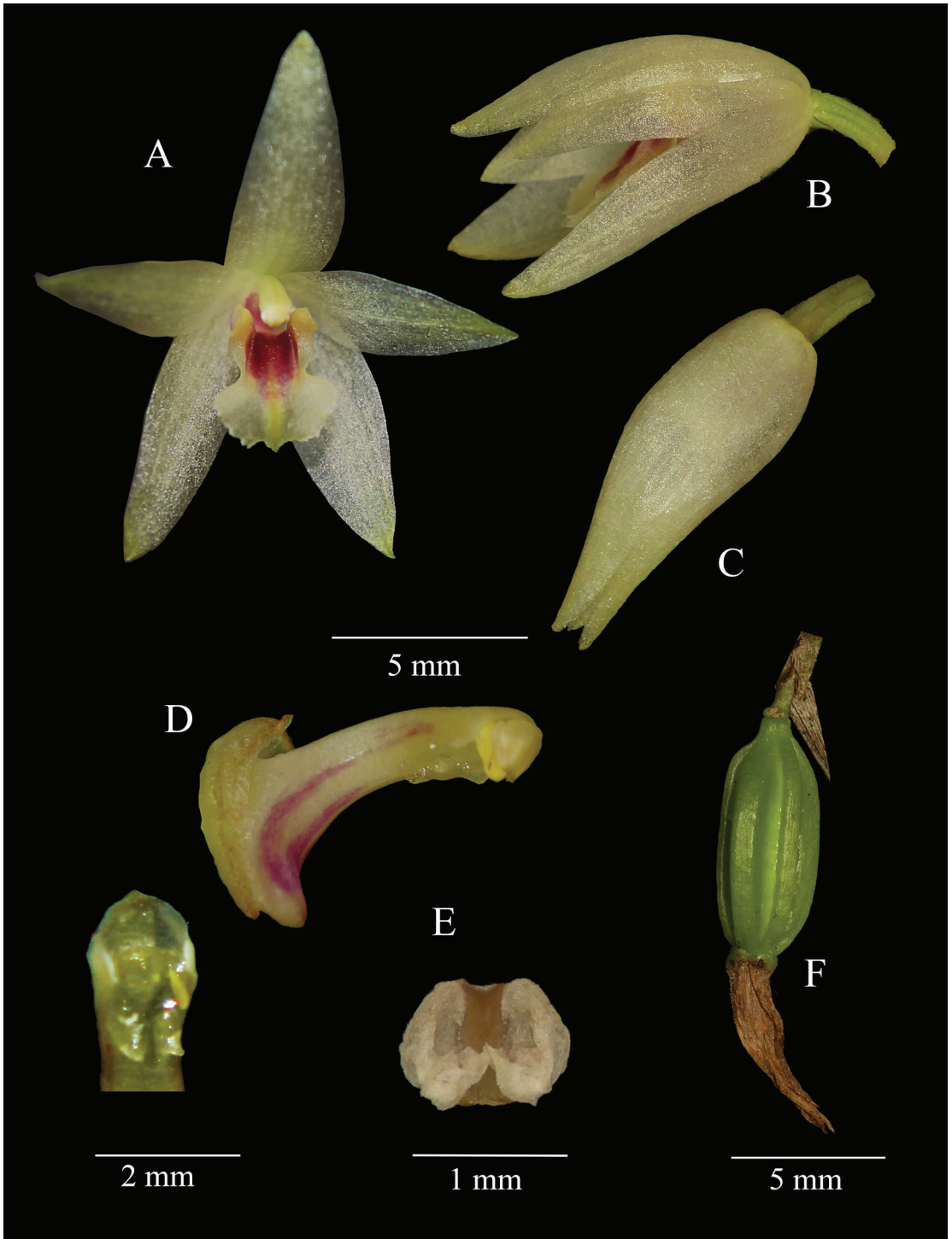


FIGURE 6. Flower parts and fruit of *Octomeria pangiensis* Vélez-Abarca, M.M.Jiménez & Baquero. **A.** Flower fully open. **B.** Flower in partially open state. **C.** Flower fully closed. **D.** Column viewed laterally. **E.** Anther cap seen abaxially. **F.** Capsule. Figure by Leisberth Vélez from photos by Lesiberth Vélez and Marco M. Jiménez.

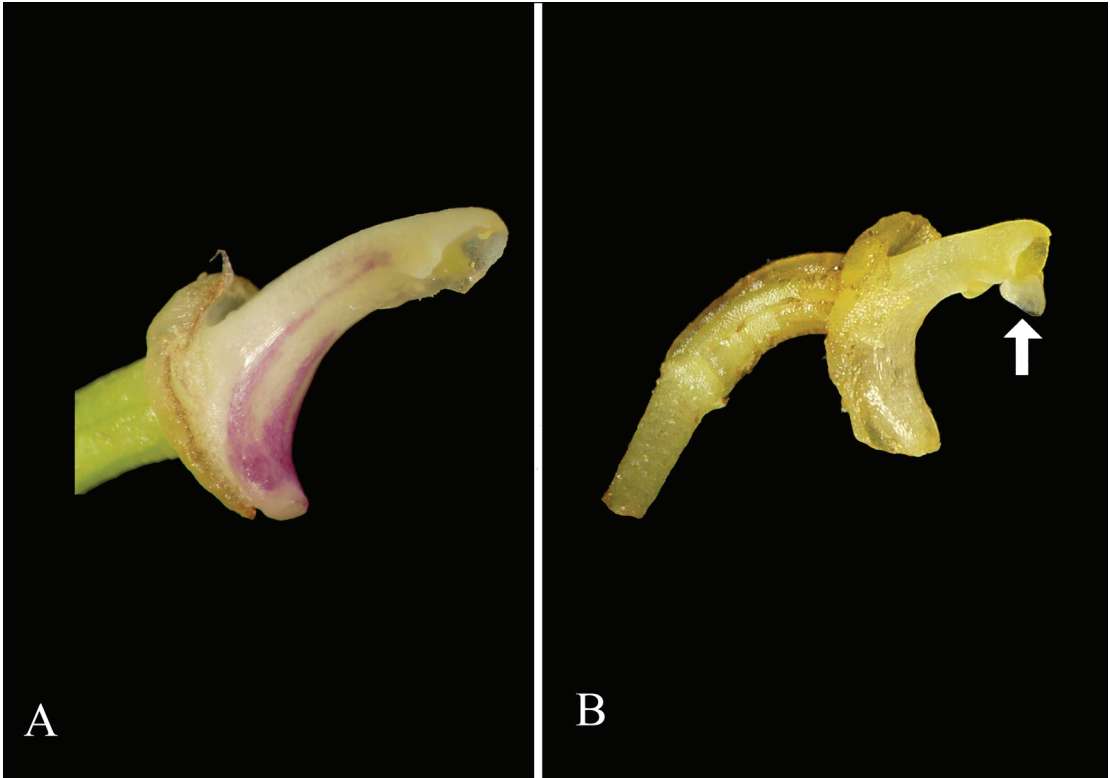


FIGURE 7. Comparison of the rostellum. **A.** *Octomeria panguiensis* Vélez-Abarca, M.M.Jiménez & Baquero, with vestigial rostellum. **B.** *Octomeria doucetteana* Doucette ex L.E.Matthews, with pronounced well-developed rostellum. Photos by Marco M. Jiménez.

cuneate below into a 1.0–1.5 cm long petiole, the mid-vein sulcate adaxially and slightly carinate abaxially, margin entire, involute, apex tridentate, and slightly acuminate. *Inflorescence* 1–3 single simultaneous flowers in a fascicle from the apex of the ramicaul, cleistogamous, rarely partially opened, peduncle cylindrical, 1.0–1.5 mm long; *floral bract* tubular, 3 mm long; *pedicel* cylindrical, 4 mm long; *ovary* 5–6 mm long, terete, longitudinally sulcate. *Sepals* translucent white-colored, with yellowish-green apex, free, glabrous, slightly concave. *Dorsal sepal* elliptical, acute 1.0–1.2 × 0.3–0.4 cm, 5-veined. *Lateral sepals*, elliptical, acute, slightly oblique, 1.0–1.2 × 0.3–0.4 cm, 5-veined. *Petals* translucent white, elliptic to ovate, apex yellowish green, acute, 0.8–0.9 × 0.3–0.4 cm, 3-veined. *Lip* whitish yellow, the disc marked with red-purple, glabrous, oblong-trilobed, erose margins towards the apex, 5–6 × 3–4 mm, the lateral lobes erect, oblique, rounded at the tip, antrorse; the middle lobe, broadly

spatulate, broadly tridentate at the apex, the margins minutely erose, the disc with a pair of longitudinal calli born close to the base which extend up to the second third of the lip; the base broadly truncate, hinged to the tip of the column foot. *Column* white semiterete, 3.5–4.0 mm long, stigma ventral, with two short, fang-like structures at the lower side of the stigma, clinandrium slightly irregular, rostellum vestigial. *Anther cap* subapical 1.0 × 0.8 mm, white. *Pollinia* 8, in 2 sets of 4, yellow. *Fruit* cylindrical to fusiform with three longitudinal keels, 6 × 3 mm.

Eponymy: Named after El Pangui canton, in southeast Ecuador, where the species was discovered.

Distribution and Habitat: *Octomeria panguiensis* is known only from the Shagmi mountain range in the Cordillera del Cóndor region, Zamora Chinchipe province, southern Ecuador. It grows as an epiphyte, forming dense populations at the bases of trees on the slopes of a sandstone plateau. The elevation range of

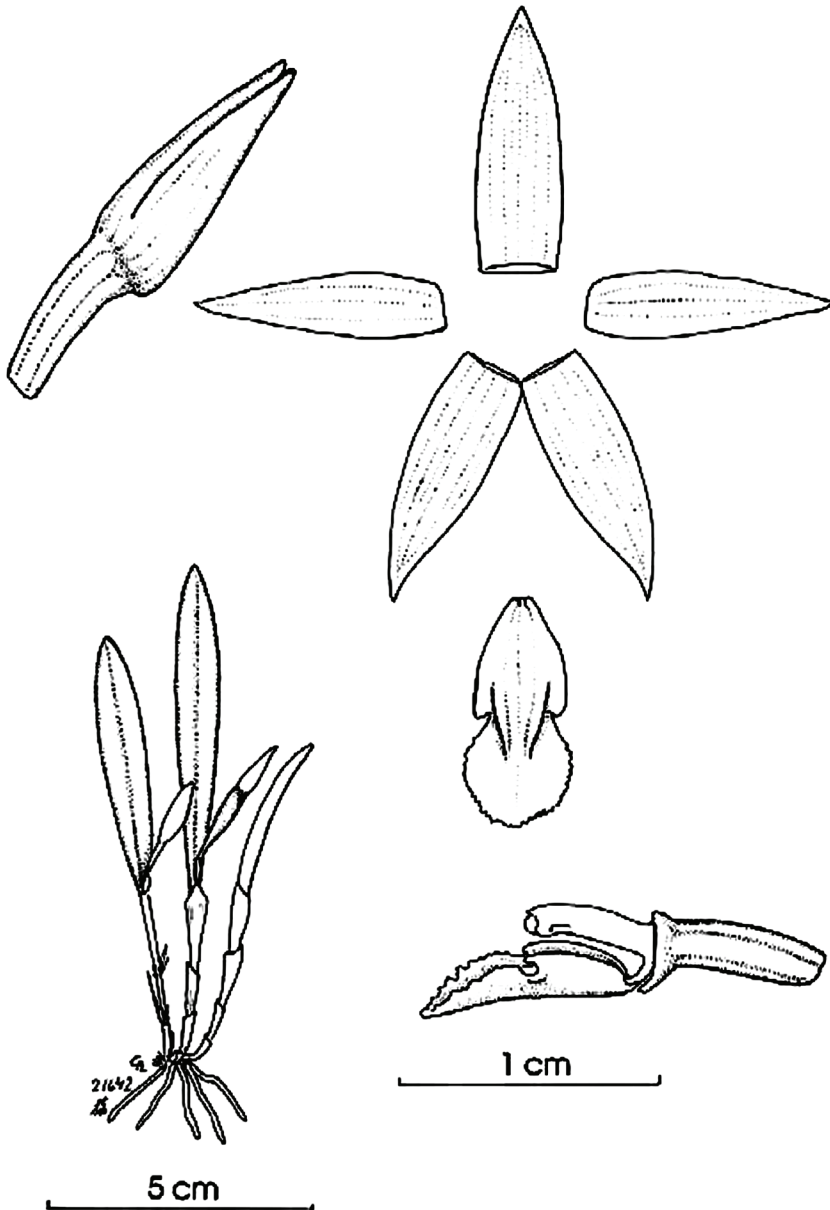


FIGURE 8. Drawing of *Octomeria weneri* Luer & Thoele. Original drawings by Carlyle Luer, Courtesy of the Harvard University Herbaria.

this species goes from 890 to 1000 m of elevation. It is not selective in its host.

The most similar species to *Octomeria panguiensis* is *O. weneri* (Fig. 8); both species are found in south-eastern Ecuador and are cleistogamous. The main feature that distinguishes them is the size of the plants and flowers, *O. panguiensis* triples in size to *O. weneri*. Also, the leaf-ramicaul ratio is different, *O. panguiensis* has shorter leaves than the ramicauls; in contrast, *O. weneri* has longer leaves than the ramicauls.

Octomeria is mainly characterized by being self-incompatible (dos Santos *et al.* 2020). Luer (2011) published the first cleistogamous species of the genus from Ecuador, naming it *O. weneri*. *Octomeria panguiensis* is the second Ecuadorian species that bears cleistogamous flowers (Fig. 6C) and is self-pollinated. Ordinarily, the rostellum acts as a mechanical barrier that prevents contact between the pollinarium and the stigmatic cavity of the flower, avoiding self-pollination (Catling 1991, Arditti 1992), for example, *Octomeria doucetteana* Doucette ex L.E. Matthews, has a fairly developed rostellum (Fig. 7B). In *O. panguiensis*, cleistogamy happens because most of the flowers never open (except for two observed flowers since it was discovered) and due to the presence of a vestigial rostellum (Fig. 6D, 7A) that would malfunction as a mechanical barrier between the pollinarium and the stigma, thus allowing autogamy. It has been possible to observe the flowers of *O. panguiensis* in three states: from about 100 observed flowers *in situ* belonging to 40 specimens, the most common state was with completely closed flowers. In contrast, partially open and completely open has been observed only once for each case (Figs. 6A–B). No partially open to open flowers have been observed *in situ*.

CONSERVATION STATUS: The primary forests of the El Pangui canton are characterized by severe human im-

pact due to timber and mineral extraction, which leads to the modification and loss of the native vegetation. *Octomeria panguiensis* is known from a single population in the Cordillera del Cóndor. Considering the high endemism of several taxa in the Pleurothallidinae (for example *Octomeria condorensis* Luer & Hirtz, *Masdevallia condorensis* Luer & Hirtz, *Porroglossum dactylum* Luer, *Pleurothallis paquishae* to) at the Cordillera del Cóndor and one year long *in situ* research, *O. panguiensis* is not expected to grow elsewhere. Adding that the site where *O. panguiensis* is known from and other potential areas are under mining activities (both legal concessions by the Ecuadorian government and illegal mining), the species described here is considered under threat. Based in the IUCN categorization by applying the B1 criteria (extent of occurrence) and the conditions bi, ii, and iii (continuing decline observed, estimated, inferred or projected in any of (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals) and ci, ii and iii (extreme fluctuations in any of (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals) *O. panguiensis* is recommended as an endangered species.

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