



Ceratostema gualaquizensis (Ericaceae: Vaccinieae), a new species from Ecuador known from previously misidentified specimens and new insights on *Ceratostema louciana*

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Abstract

A species of *Ceratostema* new to science from southern Ecuador, is described and illustrated as part of ongoing research on biodiversity in the Cordillera Real de Los Andes. *Ceratostema gualaquizensis* is distinguished by the convex leaves with folded margins at the base, and the axillary, solitary, and tubular flowers with a slightly 5-ribbed corolla that is magenta with apically black lobes. Furthermore, we provide additional information on the newly described *Ceratostema louciana*. The taxonomic similarities of these two species are discussed and information about their distribution, habitat, and conservation status are provided. Both species are being sold and cultivated with erroneous/fictitious names by nurseries and private collections, information of which is provided in this paper.

Key words: Cordillera Real de Los Andes, Morona Santiago, Zamora Chinchipe, southeastern Ecuador

Introduction

The Andean genus *Ceratostema* Jussieu (1789: 159) (Ericaceae: Vaccinieae) is distributed from Venezuela and Guyana to northern Peru, having its greatest diversity in Ecuador (Luteyn 2005). Of the 35 recognized species, two are known from Colombia, three from Peru, one from Venezuela-Guayana, and 32 in Ecuador (Luteyn 2005, 2021), of which 26 are considered endemic. The species are mostly restricted to the eastern montane forests of the Ecuadorian Andes (Luteyn 1996, Jiménez *et al.* 2021).

Ceratostema species are either terrestrial or epiphytic, but sometimes they also grow as scandent shrubs and often exhibit lignotubers. In addition to its habit, the genus is characterized by having mostly articulated-to-the-calyx pedicels; flowers with large, thick corollas and relatively elongate lobes; stamens that are equally long as the corollas; coarsely papillate anther thecae, and elongate tubules that are about half the diameter of the thecae (Luteyn 1996, 2005). *Ceratostema* is currently circumscribed as being foremostly paraphyletic together with *Macleania* Hooker (1837: t. 109), and *Psammisia* Klotzsch (1851: 42) (Pedraza *et al.* 2015).

The eastern foothills of Ecuador are part of the Tropical Andes Hotspot which is recognized as one of the most biodiverse regions on Earth (Myers *et al.* 2000). Several studies have been carried out on the diversity of flora in the Cordillera del Cóndor, in the southeast of Ecuador (Schulenberg & Awbrey 1997, Neill 2007, Quizhpe *et al.* 2019). However, there is little systematic information available on the biodiversity of the forests in neighboring areas such as the Cordillera Real de Los Andes, some of which have been designated priority conservation areas (Cuesta *et al.* 2017). To elucidate this importance, several new species of plants have been described from these neighboring regions over the last 20 years, such as *Gasteranthus diverticularis* Clark (2012: 2), *Pearcea lutea* Clark & Garzón (2022: 399) (Gesneriaceae), *Byrsonima homeieri* Anderson (2007: 97) (Malpighiaceae), *Graffenrieda penneysii* Michelangeli & Ulloa (2013: 44) (Melastomataceae) and *Vanilla andina* Damian & Garzón (2022: 64) (Orchidaceae), among many others. Continuing botanical studies throughout this area have found yet more species new to science belonging to the genus *Cerastostema*, one of which *C. gualaquizensis* *sp. nov.* is being formally described and illustrated here, and the recently described *C. louciana*e Cornejo, Tello & Luteyn (2024: 88) for which we provide additional information on its morphology, distribution, and conservation status.

Materials and methods

The original descriptions of similar species and *C. louciana*e (Sleumer 1941, Luteyn 1992, 1996, 2005, Cornejo *et al.* 2024) were reviewed and compared. Digital images of the original material of *C. pendens* Luteyn (2005: 1272) were obtained through the Global Plants on JSTOR database (<https://plants.jstor.org/>) stored at CAS, NY, QCA and US (acronyms by Thiers, 2024). The new species was described using the botanical terminology of Beentje (2016).

The measurements of the vegetative and floral parts were made from living material. The fresh flowers were stored in 70% ethanol and glycerol to ensure their preservation. Digital images were taken with a Nikon® D3100 and Panasonic® FZ300 camera. The extent of occurrence (EOO) and area of occupancy (AOO) for the studied species were calculated using the GeoCAT tool (Bachman *et al.* 2011), and the IUCN criteria were evaluated to determine the conservation status (IUCN 2024). The herbarium specimens used here as acting holotypes and specimens examined of the new species were collected under permit No. MAATE-DBI-CM-2022-0248, granted by the Ministerio del Ambiente y Transición Ecológica de Ecuador (MAATE).

The geographic coordinates of the specimens were omitted for conservation reasons; however, detailed data on the specimens examined can be consulted in the herbarium vouchers.

Taxonomic Treatment

Cerastostema gualaquizensis M.M.Jiménez & H.Garzón, *sp. nov.* (Figs. 1, 3–4).

Type:—ECUADOR. Morona-Santiago: Gualaquiza, Nueva Tarqui, sector de Campo Paraíso, 1350 m, 17 May 2023, *H. Garzón 198* (holotype: HUTPL 14828!).

Cerastostema gualaquizensis is distinguished from other members of the genus by the elliptic leaves which are convex with involute margins at the base, the axillary, solitary flowers with the turbinate hypanthium, and the magenta corolla with the apices of the lobes being black, spreading, narrowly linear-triangular, and acuminate.

Description. Pendant epiphytic *shrubs*; indumentum consisting of short, white, almost persistent, eglandular trichomes of 0.2–0.9 mm long, trichomes arranged unevenly, sparsely to densely on younger branches, petioles, leaf blades, inflorescences and flowers excluding stamens and style; axonomorphous roots with well-developed lignotubers, lignotubers subspherical. *Stems* terete to subterete, glabrous, slightly arching, arising from the lignotuber, the older stems dark brown, cracking longitudinally and exfoliating, younger branches pendant, terete to complanate, filiform, tomentose to puberulous, striate after exfoliation, dark brown, ca. 120 cm long (keeps growing continuously); axillary buds emerging up to 1 mm above the leaf node. *Leaves* spirally arranged, descending, petioles very short, puberulous, pale pink, 0.7–1.8 × 0.8–1.7 mm; blades coriaceous, elliptic, 3.9–6.0 × 2.2–2.5 cm, dark or pale green and somewhat lustrous adaxially, paler abaxially, slightly convex with margins partially revolute in older or throughout the younger branches, convex with margins involute at the base so to conceal flowers and fruits, base obtuse, apex acuminate, puberulent adaxially and abaxially, glabrate in the adaxial side, weakly 5–7 plinerved from near the base, the midrib

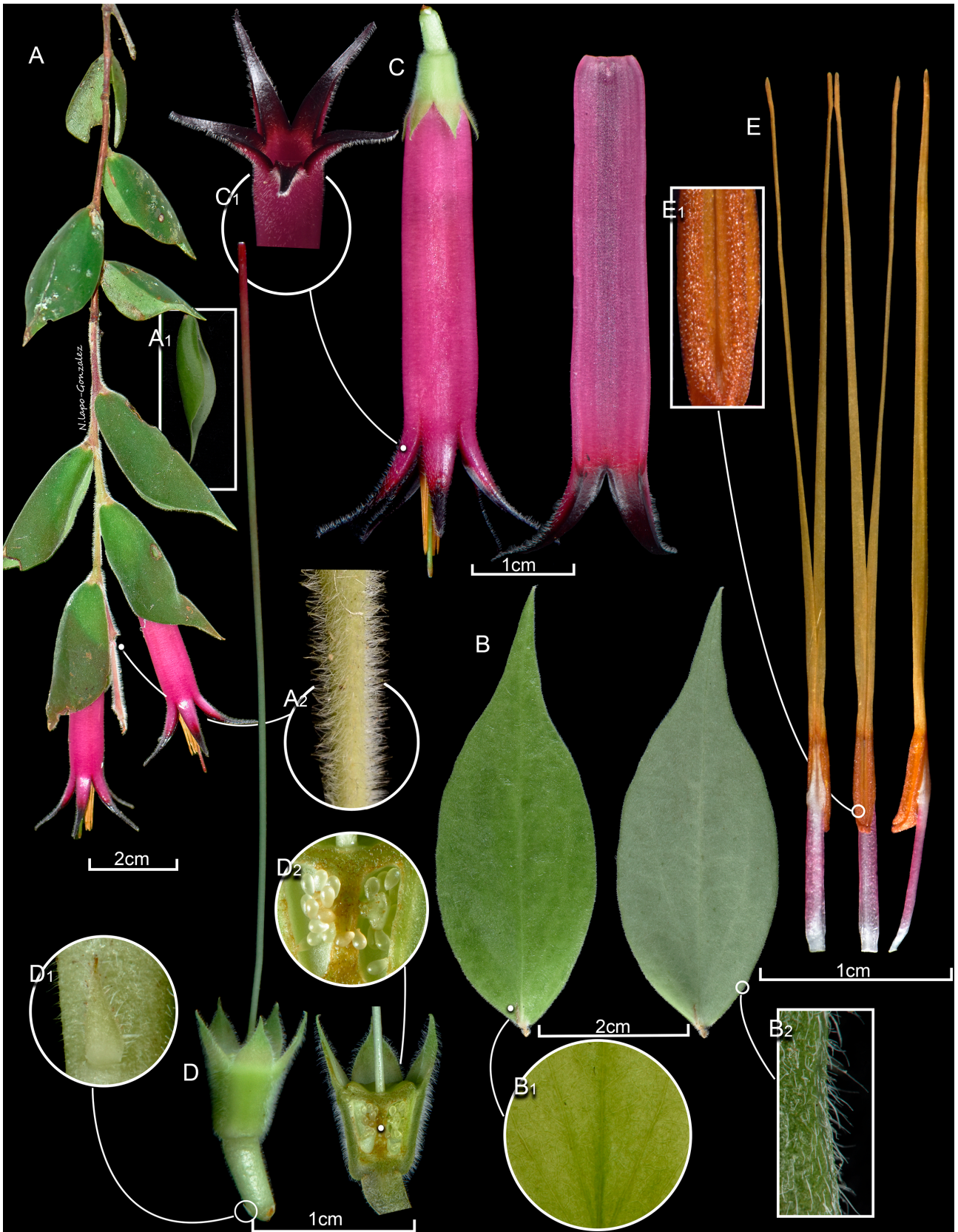


FIGURE 1. Lankester Composite Dissection Plate (LCDP) of *Ceratostema gualaquizensis*. A. Fertile branch with lateral view of a leaf (A1) and a close-up of the trichomes (A2). B. Adaxial (left) and abaxial (right) views of the leaves with a close-up of the basal leaf venation (B1) and trichomes (B2). C. Complete flower (left) with a ventral view of the corolla lobes (C1) and longitudinal section of the corolla without stamens (right). D. Calyx, pedicel and style with a close-up of the bracteole (D₁) and its longitudinal section with a close-up of the ovary and ovules (D₂). E. Stamens with a close-up of the thecae (E1). Elaborated by Nadia Lapo-González based on photographs of the type.

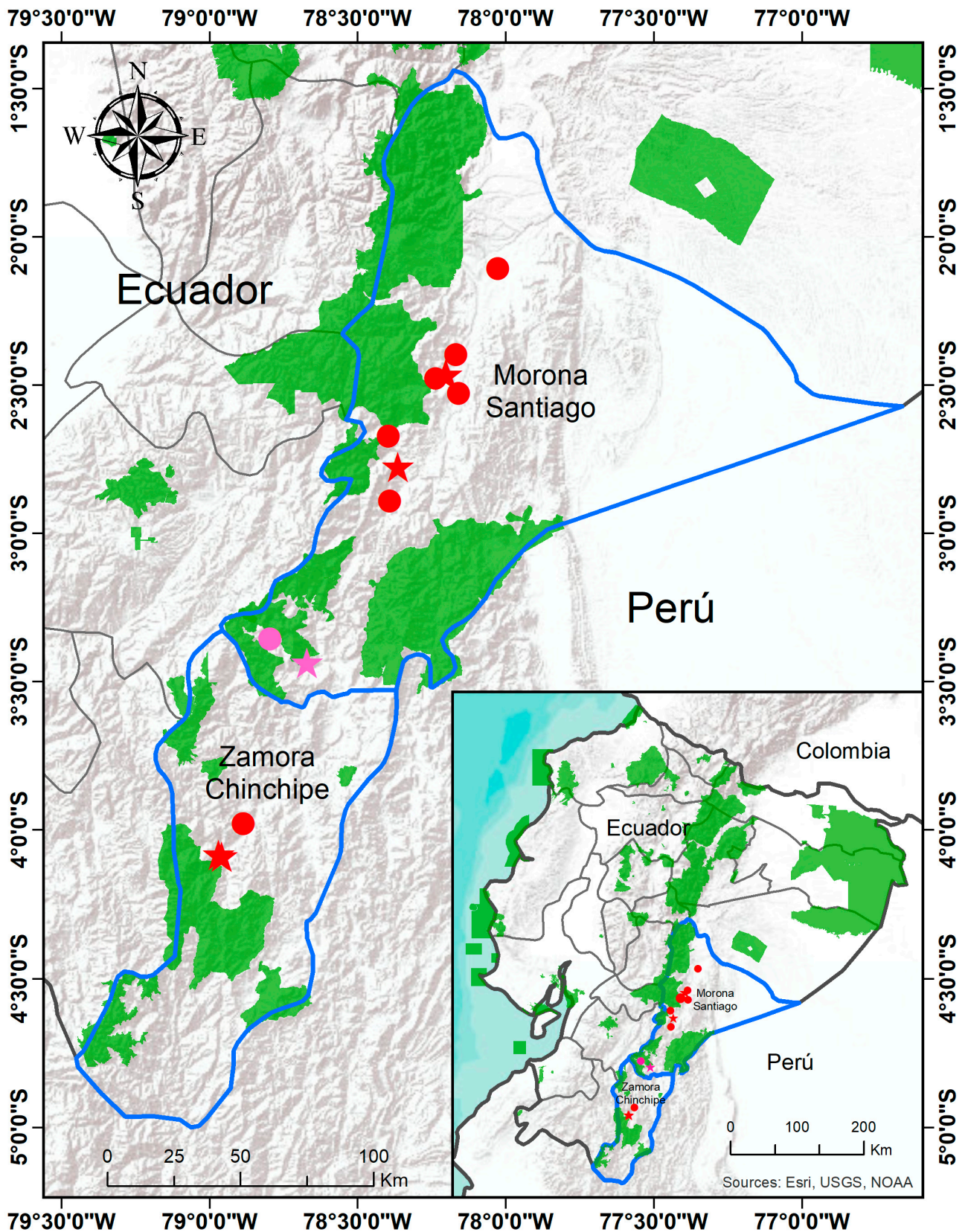


FIGURE 2. Distribution of *Ceratostema gualaquizensis* and *C. louciana* in the southeastern region of Ecuador. *C. gualaquizensis* (pink), *C. louciana* (red), collected specimens (stars), and observed specimens (circles). Map prepared using ArcGIS by Henry X. Garzón-Suárez.



FIGURE 3. *Ceratostema gualaquizensis* in situ. Photos by Henry X. Garzón-Suárez.

impressed in the proximal 4 mm adaxially, raised and conspicuous abaxially, the lateral veins branching, weakly impressed adaxially and slightly raised abaxially, veinlets raised slightly, anastomose adaxially. *Inflorescence* axillary, solitary, sessile, bracts persistent; rachis very short, obconic, 1 mm long, 1.4 mm thick; floral bracts minute, pale green, puberulous, ovate-triangular to broadly ovate, subacute, $1.0\text{--}1.5 \times 1.1\text{--}1.2$ mm, long-ciliate along the margin; pedicel slightly recurved, pale green, puberulous, striate, subterete, 0.5–0.6 cm long, ca. 2.4 mm thick, articulate with the calyx; bracteoles 2, minute, located near the base and opposite in orientation, pale green, slightly convex, ovate-triangular, $1.7\text{--}1.8 \times$ ca. 0.6 mm, apex acuminate, long-ciliate along the margin. *Flowers* pentamerous, descending; calyx $7.8\text{--}8.7 \times 5.4\text{--}8.4$ mm, tomentose, pale green with white hairs; hypanthium turbinate, truncate, obscurely 5-winged, $3.9\text{--}4.2 \times$ ca. 4.4 mm; limb open, campanulate, spreading, $4.0\text{--}5.0 \times 5.4\text{--}8.4$ mm; lobes 5, small, deltate, acuminate at the apex, tomentose, $3.4\text{--}4.7 \times 2.4\text{--}3.0$ mm, the sinuses acute. *Corolla* thick-carnose, bistratose, tubular, sparsely puberulous in the apical half, with white hairs, obscurely to bluntly 5-angled, cylindrical to the base, expanding slightly distally, 4.5–4.7 cm long, ca. 7 mm in diameter at the base and ca. 7 mm in diameter at the throat, magenta or rarely garnet, lustrous; lobes 5, $12.1\text{--}17.0 \times 3.7\text{--}4.0$ mm, spreading, magenta or garnet with black apices, puberulous, narrowly linear-triangular, acuminate, recurved; internally black, puberulous, lustrous, papillose. *Stamens* 10, as long as the corolla in overall length, each pair unequal with each other, longer stamens 4.6–4.7 cm long, shorter stamens 4.4–4.5 cm long; filaments equal, connate, glabrous externally, white to the base and apex, magenta around the middle, 7.6–8.2 mm long; anthers 3.8–4.0 cm long overall, thecae ca. 5.1 mm long, conspicuously papillose, tubules distinct, flattened, but seemingly connate near the proximal half, glabrous, 3.4–3.5 cm long, dehiscing by terminal pores ca. 0.7 mm long; style slightly exerted, 4.8–5.1 cm long, glabrous, pale green, brownish red to the apex; stigma truncated. *Fruits* not seen.

Distribution and habitat:—*Ceratostema gualaquizensis* is known only from two localities near Gualaquiza in southern Morona-Santiago Province, Ecuador. The type locality of the new species is located near Nueva Tarqui and another individual was observed 15 km northwest of the mentioned locality (Figure 2). The new species is found growing epiphytically on trees of *Celtis iguanaea* (Jacquin 1760: 16) Sargent (1895: 64) (Cannabaceae), *Protium* sp. (Burseraceae), *Piptocoma discolor* (Kunth 1818: 35–36) Pruski (1996: 97) (Asteraceae) and *Tachigali* sp. (Fabaceae). It grows in the branches near the tree canopy in primary forests and relict trees near pastures (Figure 3).

Conservation status and illegal export from Ecuador:—At the moment, the new species has not been found in any protected area, but rather it has been registered only in the buffer zone of the Runahurco Municipal Conservation Ecological Area (AECMR) (Figure 2). The habitat of *Ceratostema gualaquizensis* is threatened by deforestation for livestock activities.

This species is presently known only from two localities near the town of Gualaquiza in south-eastern Ecuador. The Extent of Occurrence (EOO) calculated for the new species resulted in an area of 15 km² with an area of occupancy (AOO) of 20 km². This scales *Ceratostema gualaquizensis* as CR (Critically Endangered) following IUCN (2022) criteria B2ab(i,ii) and C, evidenced by its very restricted distribution and very few specimens known to represent this species. In addition, the close vicinity to the town of Gualaquiza and its urban expansion means great uncertainty to the longevity of the habitats, especially given the stress imposed by the discovery of mining in the area.

This species is sold by nurseries in Ecuador and is known in private collections and commercial nurseries in the United States, Europe and Asia under the erroneous name “*Ceratostema pendens*”. What appears to be an “honest mistake” due to the complicated taxonomy of this group of plants is addressed by several authors as a conscious and predetermined practice (Parra-Sánchez *et al.* 2004, Yeager *et al.* 2020). These practices are not limited to just one plant family and have been most commonly reported in plants of the Orchidaceae family illegally exported during the last decades using permits, including CITES, of other species. Such is the case of *Dracula trigonopetala* Meyer & Baquero ex Doucette in Doucette (2012: 59), *Scaphosepalum luanneae* Baquero (2019: 272), *Scaphosepalum tarantula* Baquero & Hirtz in Baquero *et al.* (2018: 231) and *Trisetella pachycaudata* Mogrovejo-Herrera & Baquero in Baquero & Mogrovejo (2021: 272) where the authors already mention the illegal export of new species from Ecuador as a common practice. By having these ornamental plants at a certain price on the market for ornamental purposes, illegal collections put the natural populations of these species at risk.

Etymology:—This new species is named after Gualaquiza, the name of the township and municipality where the new species was found.

Taxonomic discussion:—*Ceratostema gualaquizensis* is most similar to *C. pendens* by sharing its long-pendent branches; the spirally arranged leaves with very short petioles; the convex blades, of which the sides are involute at the base; the sessile inflorescences and the axillary flowers with corollas expanding slightly distally. The new species can be distinguished from the latter by the smaller, non-amplexicaul leaves, measuring $3.9\text{--}6.0 \times 2.2\text{--}2.5$ cm (*vs.* amplexicaul, $7.0\text{--}10.0 \times 4.0\text{--}7.0$ cm); the leaf base obtuse (*vs.* deeply cordate and auriculate); the inflorescence

exclusively 1-flowered (*vs.* 1–4-flowered); the ovate-triangular and acuminate bracteoles (*vs.* ovate and acute); the calyx with a longer turbinate hypanthium, 3.9–4.2 mm long (*vs.* obconic, 2.7–3.5 mm long), the magenta and tubular corolla that is sparsely puberulous in the apical half (*vs.* dark maroon, cylindrical and short-pilose throughout) with narrowly linear-triangular and acuminate, recurved lobes (*vs.* narrowly-triangular, long-acuminate and straight lobes) having black (*vs.* dark maroon) apices and the shorter thecae (up to 5.1 mm long *vs.* ca. 7.0 mm long) (Luteyn 2005). Another relevant feature observed in *C. gualaquizensis* is the leaves abaxially green (*vs.* suffused with purple) and the glabrous style (*vs.* pilose) in *C. pendens* (Figure 4).

Additional information on *Ceratostema loucianae*

Ceratostema loucianae was only known from the type locality near San Isidro, Morona Santiago Province, southeastern Ecuador (Cornejo *et al.* 2024). In our fieldwork carried out nearby, we found more specimens, extending its known geographic range by approximately 235 km southwest of the type locality (Figure 2). Here we provide an expanded description, a Lankester composite dissection plate (LCDP) and additional information and photographs of the species.

***Ceratostema loucianae* Cornejo, G. Tello & Luteyn (Figs. 5–7).**

Type—ECUADOR. Morona-Santiago: Macas, 0.2 km N of San Isidro, lower Sangay National Park, eastern Andean slopes, 2°12'33.51"S, 78°10'1.94"W, ca. 1165 m, montane wet forest, 29 Dec 2023 (fl), *X. Cornejo & G. Tello 10152* [holotype: GUAY (mounted and spirit); isotype: QCA].

Description. Pendant epiphytic *shrubs*; axonomorphous roots with well-developed lignotubers, lignotubers broadly fusiform to globose, 10.0–23.0 × 10.0–24.0 cm in circumference. *Stems* terete to subterete, up to 44.5–50 cm long arising from the lignotuber, glabrous, slightly arching, the older stems maroon, cracking longitudinally and exfoliating; branches pendant, terete to complanate, filiform, up to 200 cm long (and keeps growing continuously), green, striate after exfoliation, villose, trichomes eglandular, 1.8–2.8 mm long, light brown, deciduous; axillary buds compressed, emerging up to 1 mm above the leaf node; bracts 2–3, villose. *Leaves* alternate, spirally arranged, subpendulous, minutely glandular, new leaves salmon in color; petioles subterete, 1.2–1.5 × 2.0–2.5 mm, pale green sometimes suffused with pink, rugose, villose, trichomes to 0.4 mm long; blades ovate to lanceolate, 2.5–6.0 × 1.5–3.3 cm, dark green adaxially, paler abaxially, somewhat lustrous adaxially, pilose and glabrescent adaxially, villose and scabrid abaxially, canaliculate, thinly-coriaceous, base subcordate to truncate, apex attenuate to long-attenuate, margins slightly revolute, trichomes 0.4–1.8 mm long; weakly 5–7 plinerved near the base, the midrib impressed in the proximal 15 mm adaxially, raised and conspicuous abaxially, the lateral nerves branching, weakly impressed adaxially and plane abaxially, veinlets slightly raised, finely anastomose adaxially. *Inflorescence* axillary or supraxillary, congested, 1–2-flowered, very short-pedunculate; peduncle subterete, 1 mm long, pale green, covered by up to 4 persistent bracts, bracts broadly ovate, small, 0.6–1.1 × 0.7–0.9 mm, sparsely villose, apiculate; rachis obconic, very short, 0.1 cm long, 2 mm thick, glabrous; floral bracts ovate-triangular, small, 1.0–1.2 × 1.0 mm, pale green, caducous, subacute, long-ciliate to the margin; pedicel subterete, 0.6–1.1 cm long, 2.6–3.0 mm thick, pale green suffused with magenta to the apex, mostly straight to slightly incurved, striate, articulate with the calyx, sparsely villose, trichomes to 1.9 mm long; bracteoles 2, ovate-triangular, 0.9–1.0 × 0.5–0.6 mm, pale green, flat, minute, located near the base and opposite, apex acuminate, long-ciliate to the margin. *Flowers* pentamerous, divergent to pendulous; calyx 4–5.3 × 5.4–6.1 mm, green or green suffused with red with white hairs, densely villose, trichomes to 1.9 mm long; hypanthium obconic, 2.9–3.5 × ca. 3.9 mm, truncate, subterete to bluntly 10-costate; limb campanulate, 1.6–3.0 × 4.8–5.4 mm, open, spreading; lobes 5, broadly deltoid to hemiorbicular, 0.7–2.0 × 1.6–2.9 mm, minute, short acuminate to apiculate, villose, the sinuses rounded. *Corolla* thick-carnose, bistratose, cylindrical-urceolate to tubular, 1.8–2.8 cm long, 6.0–9.0 mm in diameter at the base and 6–8 mm in diameter at the throat, crimson red or rarely pink cream, somewhat ventricose to the base, slightly narrowing distally, bluntly 5-angled, villose with white hairs, trichomes 0.9–2.4 mm long; lobes 5, narrowly linear-triangular, 11.5–17.8 × 2.6–3.3 mm, spreading, black, acuminate, recurved; internally black, sparsely villose and verruculose, lustrous, papillose. *Stamens* 10, 2.6–3.1 cm long, nearly equaling the corolla in overall length, each pair slightly unequal with each other; filaments equal, 4.7–6.9 mm long, connate in the basal ca. 4.3 mm, white, glabrous; anthers 1.9–2.4 cm long overall, thecae 6–10 mm long, conspicuously papillose; tubules 1.2–1.5 cm long, glabrous, distinct, but seemingly connate near the proximal 1/2, dehiscing by terminal pores 0.5–1.2 mm long; style exerted, 3.0–3.5 cm long, dark green to greenish, glabrous, stigma truncated. *Fruits* a subovoid to subglobose berry, ca. 1.5 × 1.4 cm, white or pearl-white berry when ripe, villose; mesocarp white; seeds cream-colored with embryos deep green.

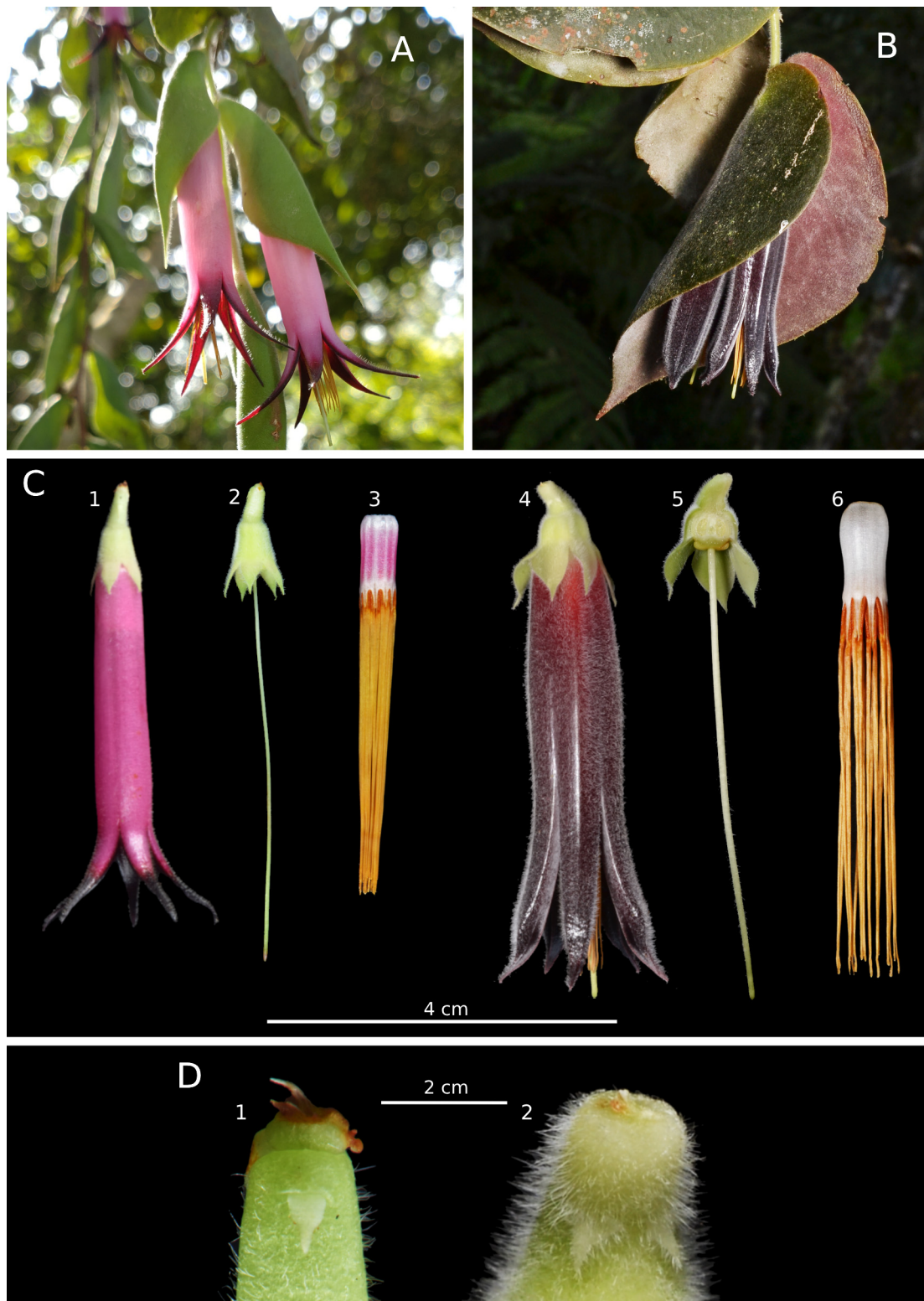


FIGURE 4. Terminal branches with inflorescences. A. *Ceratostema gualaquizensis*. B. *C. pendens*. C1–C3. The entire flower, without corolla and stamens of *C. gualaquizensis*. C4–C6. The entire flower, without corolla and stamens of *C. pendens*. D1. Pedicel with a close-up of the base showing the bracteole of *C. gualaquizensis*. D2. Pedicel with a close-up of the base showing the bracteoles of *C. pendens*. Photos by Henry X. Garzón-Suárez based on the type and M. Jiménez 2282.

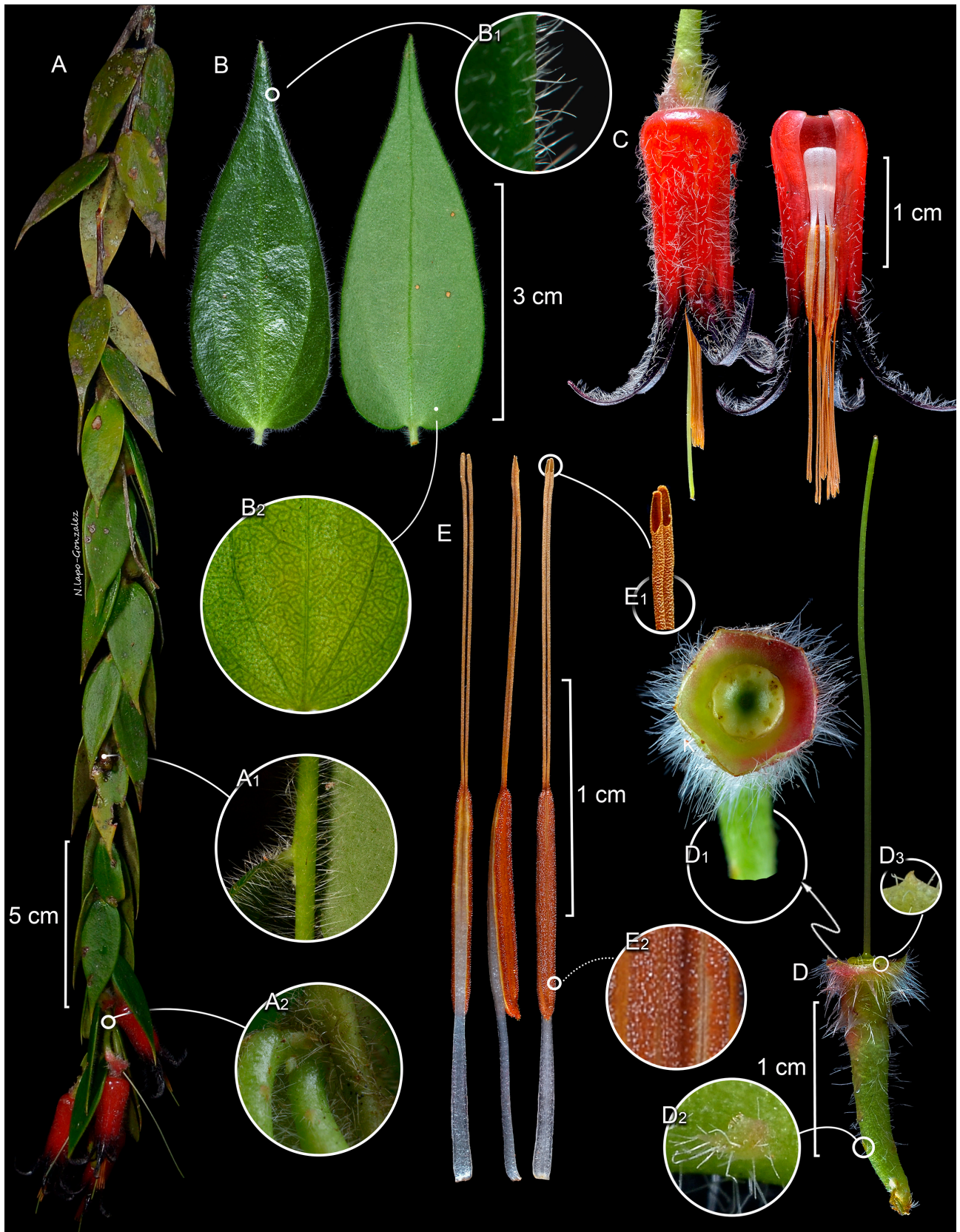


FIGURE 5. Lankester Composite Dissection Plate (LCDP) of *Ceratostema louciana*. A. Fertile branch with a close-up of the trichomes (A1) and base of the inflorescence (A2). B. Adaxial (left) and abaxial (right) views of the leaves with a close-up of the trichomes (B1) and basal leaf venation (B2). C. Flower with part of the pedicel (left) and longitudinal section of the corolla (right). D. Calyx, pedicel, and style with a dorsal view of the limb (D1) and a close-up of the bracteole (D2) and the apex of the calyx lobe (D3). E. Stamens with a close-up of the thecae and pores of the tubule. Elaborated by Nadia Lapo-González based on photographs by Henry X. Garzón-Suárez based on H. Garzón 197.



FIGURE 6. Different populations of *Ceratostema loucianae* in southeastern Ecuador. A–C. Zamora D. Limón. E. Sucúa. F. Santiago de Méndez. Photos by Marco M. Jiménez and Henry X. Garzón-Suárez.

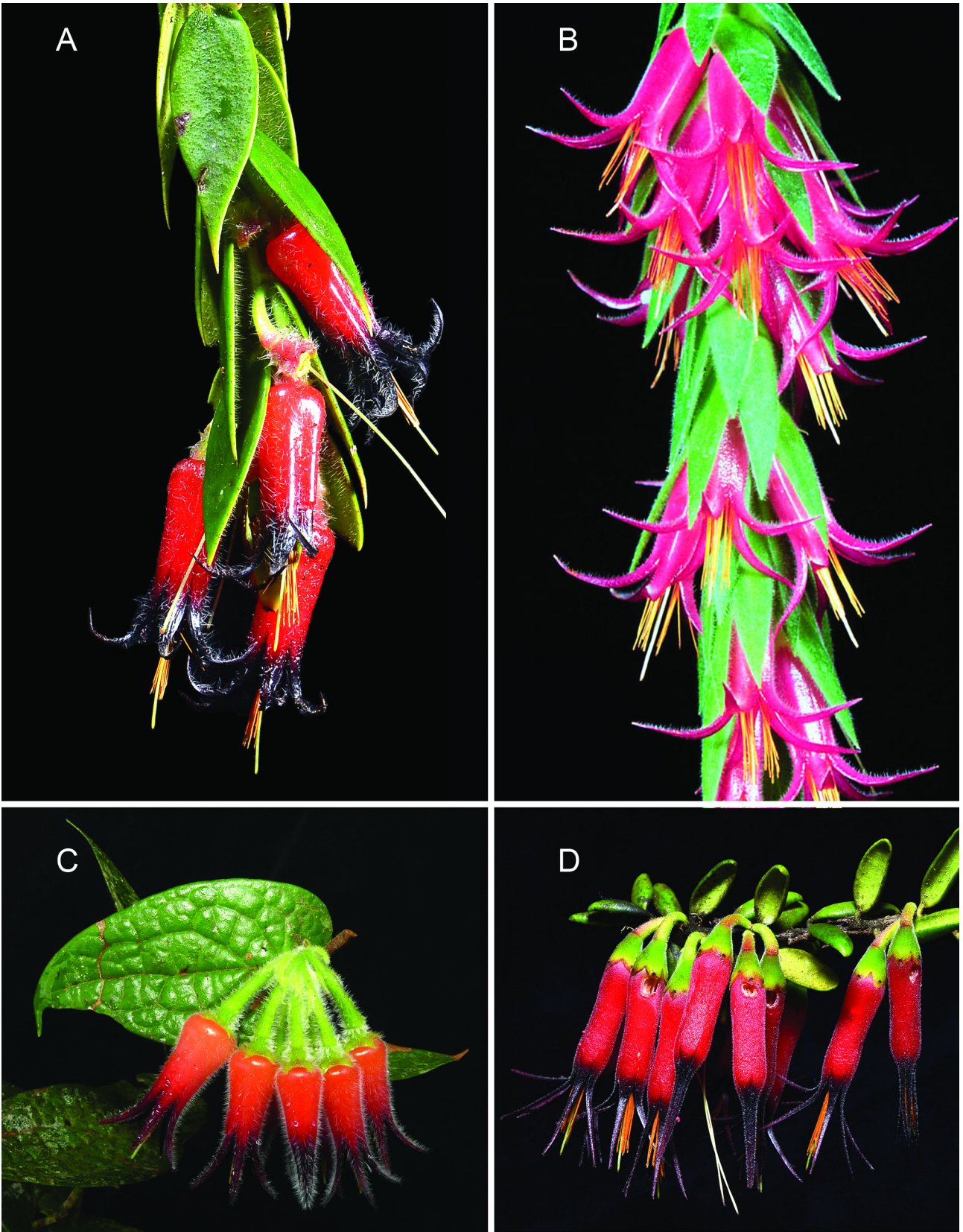


FIGURE 7. Species with similar flowers. A. *Ceratostema loucianae*. B. *C. rauhii*. C. *C. lanigerum*. D. *C. glans*. Photos A, D. by Henry Garzón-Suárez, B. by Werner Rauh, C. by Marco M. Jiménez.

Distribution and habitat:—*Ceratostema loucianae* has been reported in the southeastern Ecuadorian provinces of Morona Santiago and Zamora Chinchipe (Figure 2). The species is known only from the eastern Andean foothills surrounding the towns of Macas (Cornejo *et al.* 2024), Limón, Santiago de Méndez, Sucúa and Zamora at elevations between 1100–1400 m, where it grows both in primary forests and in disturbed secondary areas (Figure 6).

Additional specimens were observed 8.5 km northwest of Macas, 8 km south of Sucúa and 3.6 km northwest of Limón and were vouchered with photographs (Figure 6). In the area of Santiago de Méndez, the species was found in pastures growing epiphytically on relict trees of *Pouteria caimito* (Ruiz & Pavón 1802: 18) Radlkofer (1882: 333) (Sapotaceae) and *Protium* sp. (Burseraceae). Near Zamora it was seen growing on phorophytes of *Alchornea* sp., *Centronia laurifolia* Don (1823: 314), *Graffenrieda* sp. and *Protium* sp. within its natural habitat, it has been seen on tree branches from near the canopy to the understory (up to 2 m aboveground).

Conservation status:—This species is currently known only from 11 localities across south-eastern Ecuador. The Extent of Occurrence (EOO) calculated for the species resulted in an area of 1,650 km² with an area of occupancy (AOO) of 32 km². This scales *C. loucianae* as EN (Endangered) according to IUCN (2022) criteria B2ab(i,ii), focusing on restricted distribution and stability of habitat.

Ceratostema loucianae has been registered only in the lower part of the Sangay National Park (Cornejo *et al.* 2024), the buffer zone of the Podocarpus National Park and the surrounding area of the Río Negro-Sopladora National Park. Nevertheless, the populations outside these areas are highly threatened by deforestation in favor of cattle pastures, slash-and-burn agriculture and infrastructure activities.

Ex situ, the species is being sold by nurseries in Ecuador and is known in private collections and commercial nurseries in the United States, Europe and Asia under incorrect names such as “*Ceratostema villosa*” and “*Ceratostema rauhii* var. *villosa*”.

Notes:—*Ceratostema loucianae* is similar to *C. rauhii* (1992: 314), *C. glans* Luteyn (1996: 54) and *C. lanigera* (Sleumer 1941: 398) Luteyn (1984: 367) by the epiphytic habit, the vegetative and floral parts variously covered with indumentum, the plinerved leaves that are arranged in a spiral manner, the axillary to supraxillary inflorescences that are sessile to short-pedunculate and the red colored corollas with triangular, spreading to slightly recurved, acuminate lobes (being black in *C. loucianae* and the two latter species). A summary of the morphological differences between the aforementioned species is presented in Table 1.

Additional specimens examined:—ECUADOR. Morona-Santiago: Santiago de Méndez, Chupianza, vía a la reserva municipal, 1367 m, 6 May 2023, *H. Garzón 197* (HUTPL 14828!). Zamora Chinchipe: Zamora, vía Zamora-Parque Nacional Podocarpus, 1070 m, 14 May 2023, *M.M. Jiménez & M. Jiménez Villalta 1770* (HUTPL 15001!); Zamora, vía Zamora-Parque Nacional Podocarpus, 1117 m, 9 Jun 2023, *M.M. Jiménez León 1927* (HUTPL 15032!).

TABLE 1. Summary of principal differences among *Ceratostema loucianae*, *C. rauhii*, *C. glans* and *C. lanigera*.

Species	<i>C. loucianae</i>	<i>C. rauhii</i>	<i>C. glans</i>	<i>C. lanigera</i>
Indumentum on vegetative and floral parts	Villose	Puberulous	Puberulous	Hirsute
Glands	Absent	Absent	Present on most vegetative and floral parts	Absent
Branches	Long-filiform	Long-filiform	Lianoid	Lianoid
Petioles length	1.2–1.5 mm	ca. 1 mm	1.5–4 mm	3.0–6.0 mm
Leaves	Ovate, 2.5–6.0 × 1.5–3.3 cm, 5–7 plinerved, apex acuminate, base subcordate to truncate, not amplexicaul	Narrowly ovate to linear-ovate, 1.5–3.5 × 0.5–0.7 cm, 3–5 plinerved, apex long-acuminate, base obtuse, not amplexicaul	Elliptic, 2.0–4.0 × 1.0–1.7 cm, 5-plinerved, apex and base obtuse, base not amplexicaul	Ovate, 4.0–12 × 2.0–5.0 cm, 5–7 plinerved, apex acute to short- or long-acuminate, base cordate-auriculate, amplexicaul
Inflorescence	1–2 flowered	Solitary flowered	4-flowered	3–7 flowered
Pedicel length	0.6–1.1 cm	ca. 0.1–0.2 cm	0.9–1.3 cm	1.5–2.5 cm
Bracteoles shape and length	Ovate-triangular, acuminate, 0.9–1.0 mm	Broadly deltate, acute, 0.5 mm	Ovate, acuminate, 1.3–1.5 mm	Ovate, acute-acuminate, 2–6 mm
Hypanthium	Obconic	Cylindric-obconic	Turbinate	Cylindric-obconic
Calyx lobes shape and length	Broadly triangular, apiculate, 0.7–0.8 mm long, sinuses rounded	Narrowly triangular, acuminate, 3.5–4.5 mm long, sinuses acute	Oblong-ovate, abruptly short-acuminate, 2.0–2.3 mm long, sinuses acute	Broadly triangular, acuminate, 1.0–2.5 mm long, sinuses broadly rounded becoming acute by fissure

...continued on the next page

TABLE 1. (Continued)

Species	<i>C. loucianae</i>	<i>C. rauhii</i>	<i>C. glans</i>	<i>C. lanigera</i>
Corolla	Red and black, cylindrical-urceolate to tubular, bluntly 5-angled	Bright red corollas, cylindrical, obscurely pentagonal	Red and black, tubular, terete	Red and black, ventricose, terete
Corolla lobes	Narrowly linear-triangular, acuminate. 11.5–17.8 mm long	Narrowly triangular, long-acuminate, 3.5–4.5 mm long	Oblong-ovate, abruptly short acuminate, 2.0–2.3 mm long	Broadly triangular, acuminate, 1–2.5 mm long
Stamens	Connate filaments, thecae 8–10 mm long	Connate filaments, thecae ca. 4 mm long	Connate filaments, thecae 8.0–9.5 mm long	Distinct filaments, thecae 7–11 mm long
Style	33–34 mm long	28–30 mm long	32–33 mm long	37 mm long

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