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Cryptocentrum beckendorfii (Orchidaceae: Maxillariinae), an extraordinary new species from Andean Peru

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Abstract

Cryptocentrum beckendorfii is described and illustrated from a single cultivated plant reputedly from the Amazonian slopes in the Cuzco region of Andean Peru. This species is similar to *C. pseudobulbosum*, also from the Amazonian slopes of the Andes, with which it shares sympodial habit with pseudobulbs unlike most species of the genus, which are monopodial and lack pseudobulbs. It differs from *C. pseudobulbosum* in its larger pseudobulbs, which are totally naked upon maturity, thinly coriaceous, conduplicate foliar blades, sheaths enveloping the pseudobulbs lacking foliar blades and the much longer inflorescences with thin peduncles, among other characters. The putative phylogenetic position of this species is discussed. An identification key and a map of the species of *Cryptocentrum* present in Peru are provided. The conservation category of the species according to IUCN criteria was assessed as data deficient (D).

Key words: Amazonian Andes, Cuzco state, IUCN, Machu Picchu, Neotropical orchids

Introduction

Cryptocentrum Bentham (1881: 325) is one of the most clearly distinct aggregations within subtribe Maxillariinae. The genus includes 20 species and three subspecies, ranging from Costa Rica through Panama and from western Colombia to northeastern Bolivia along both sides of the Andes, with two disjunct species in the Guayana region, one endemic there (Carnevali 1996, 2001, Carnevali *et al.* 2012). The genus was last revised in its entirety in 1996 (Carnevali 1996), and several accounts of the genus have appeared in recent taxonomic and phylogenetic (Carnevali 2001, Blanco *et al*. 2007, Whitten *et al*. 2007, Carnevali *et al.* 2009) or floristic treatments (Dressler 1993, 2003, Carnevali 1999, 2005).

The spurred flowers of the genus are unique in Maxillariinae. Sixteen of the known species are further characterized by a phylogenetically derived monopodial habit. Of these, three species (one with three subspecies) have spiral phyllotaxy, which is unusual among the advanced Epidendroideae. Until recently, only two species were known with a sympodial, pseudobulbous habit. The recent discovery of this extraordinary species on the Amazonian slopes of Andean Peru raises this number to three.

The description was prepared using the terminology of Carnevali (1996, 2001) and Carnevali *et al.* (2009). Flowers from herbarium specimens were soaked in concentrated ammonium hydroxide for about one minute and then rinsed in water until soft and ready for study under a dissecting microscope. Thus pretreated, they were then temporarily preserved in a 70:25:5 ethanol:water:glycerine solution for further study and eventually returned to their herbarium sheets. Maps for Peruvian *Cryptocentrum* species were produced by plotting known locality data extracted from available herbarium specimens and relevant literature (Carnevali

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2001, Carnevali *et al.* in prep.). Cartography was produced on a DIVA-GIS base map (Hijmans *et al.* 2004) using ArcView 3.2 (ESRI 1999). Both maps and illustrations were later edited with Adobe Photoshop 6.0.1. (Adobe Systems Inc, San Jose, California). The conservation category of the new species was determined using the IUCN Red List Criteria (IUCN 2010).

Taxonomy

Cryptocentrum beckendorfii Carnevali, *sp. nov.* (Figs. 1, 2)

Species haec Cryptocentrum pseudobulbosum similis sed differt planta et floribus majoribus, pseudobulbis suborbicularibus vel late ellipsoideis vel late ovatis, dorsoventraliter paulo depressis, vaginis escariosis elaminatis obtectis, foliis planis non trigonis nec teretibus; inflorescentia proportione multo longiore, calcare latiore proportione multo breviore vaginis floralis incluso recedit.

Type:—PERU. Cultivated material; originally in the collection of FL Stevenson, later cultivated by Steven Beckendorf; reportedly collected in Peru in the vicinity of Machu Picchu, *Beckendorf s.n.* (holotype USM!, isotypes, CICY!, FLAS!).

Lithophytic and presumably also epiphytic herbs, 5–10 cm tall, sympodial, densely caespitose; rhizomes abbreviate. Pseudobulbs 5–12(–15) mm tall and wide, variable in shape even within the same plant, ranging from subspherical to subconical, broadly ellipsoid or broadly ovoid, slightly depressed dorsoventrally, apically 1-leaved, when young clothed by several dark castaneous sheaths, which are longer than the pseudobulb and enclose the pseudopetiole of the leaf, the sheaths lacking a blade, eventually becoming scarious and disintegrating into grayish fibers; the pseudobulb surface green, smooth when young, somewhat wrinkled when old. Leaves 4.0–9.0 × 0.25–0.35 cm, linear-elliptic, acute, straight to slightly recurved in natural position, conduplicate, thinly coriaceous. Inflorescences borne singly or in pairs at the base of the newer pseudobulbs, 1-flowered, 4–6 cm long, erect or ascending, peduncle pale green, filiform, 0.6–1.0 mm thick, composed of 4 internodes, the first (basal) 8–12 mm long, the second 15–20 mm long, the third and fourth 12–18; the peduncular bracts about half the length of internodes, tubulose to somewhat inflated in the apical half, open in the apical 1/3–1/4; uppermost non-floral bract 9–15 × 2–3 mm when spread, elliptic or elliptic-oblanceolate; floral bract 9–12 × 5–7 mm when spread, somewhat inflated, open only at the apical 1/5–1/6, oblanceolate, obtuse, dorsally very obscurely keeled at the apex, enclosing the lower 4/5 of the pedicellate ovary as well as the spur. Flowers resupinate, patent or suberect, with widely spreading sepals, yellow-green to greenish brown; pedicellate ovary 9.5–11.0 × 0.9–1.1 mm, longer than the spur, subterete, smooth. Sepals fleshy, 5-nerved, subapically mucronulate to conspicuously mucronate, margins revolute, more so on the lateral sepals, the three sepals fused basally into a tube 2.5–4.0 × 1.8–2.0 mm, cylindrical to broadly cylindrical-obconic, laterally flattened; dorsal sepal 11.5–12.5 × 3.0–3.3 mm, the free portion elliptic, obtuse, apiculate, erect on the tube and connivent with the laterals for 2.5 mm; lateral sepals 12.0–13.0 × 3.0–3.5 mm, elliptic, erect on the tube and connivent with each other and the dorsal for 3.5–4.0 mm, the free portion 8.0–8.5 mm long. Petals 8.5–9.5 × 2.0–2.1 mm, subfleshy, 3-nerved, elliptic, obtuse to broadly acute, the apical cushion 2.1 mm long, the concave basal section included in the sepaline cup, the apical half of the petal spreading from the tube opening. Labellum 9.5–10.5 × 3.0–3.5 mm when forcefully expanded (excluding the spur), 3-nerved, subsigmoid in profile, lanceolate in outline upon flattening, vaguely divided into a 8.5–9.0 mm long, 2.5–3.0 mm deep hypochile and an 1.0–1.5 mm long epichile, 1.5–2.0 mm wide at base, triangular to triangular-oblong, obtuse, the adaxial surface covered with straight hairs 0.5–0.7 mm long; spur 9.0–9.5 × 1.0 mm, cylindrical, acute, somewhat thicker just after the middle. Column 3.0–3.5 × 2.5 mm, straight, flanked by dolabriform wings ca. 1 mm long for about half of its length; rostellum emarginate; anther 1.2 × 0.8 mm; pollinia 4, the longer pair ellipsoid, 0.5–0.6 mm long, the shorter pair ovoid, 0.5 mm long. Fruit unknown.

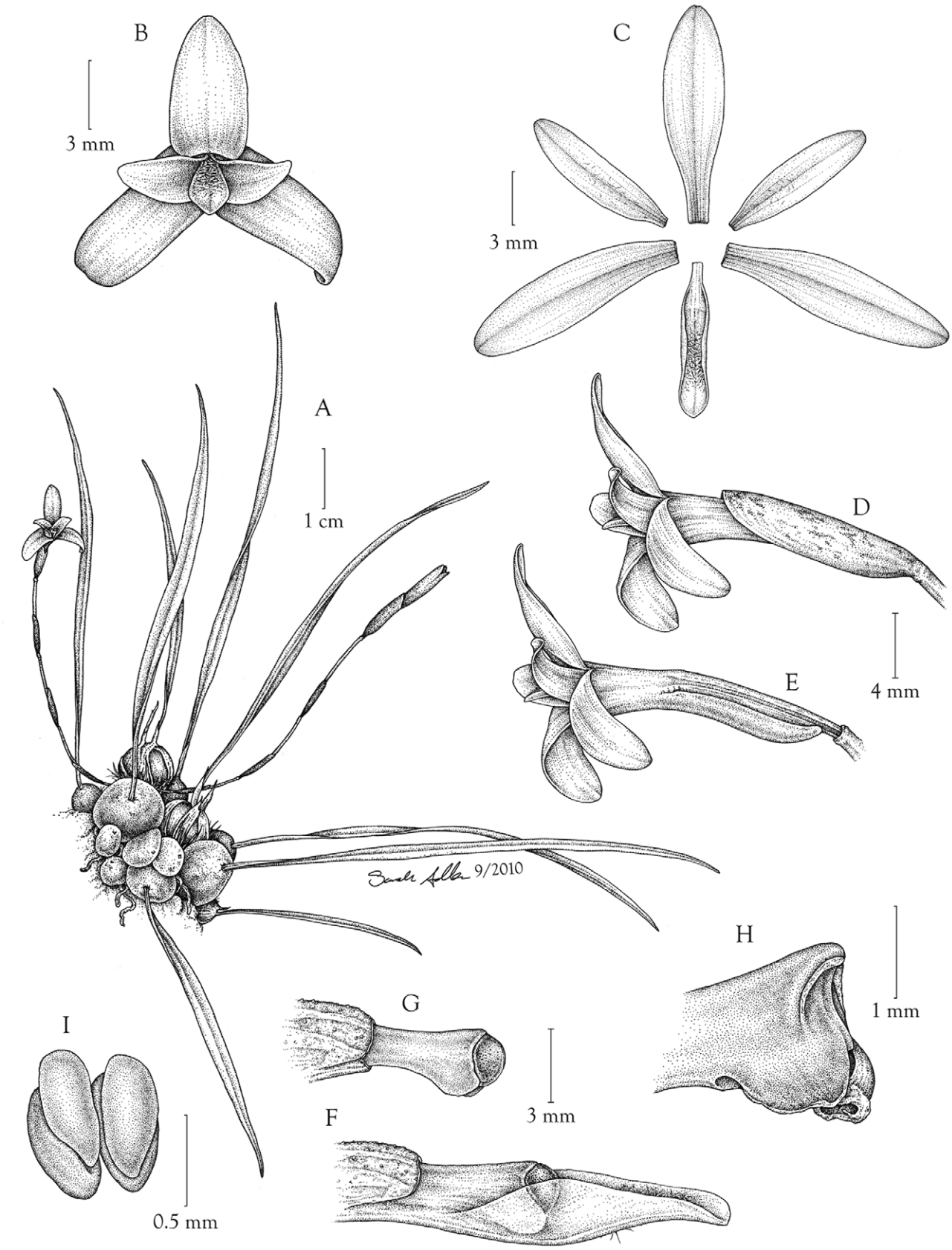

FIGURE 1. *Cryptocentrum beckendorfii*. A. Habit with inflorescences. B. Flower, front view. C. Sepals, petals, and labellum. D. Flower, lateral view. E. Flower, lateral view, with floral bract removed to show spur and pedicellate ovary. F. Column and labellum, lateral view. G. Column, lateral view. H. Apex of column with anther removed, lateral view. I. Pollinia. Based on *Beckendorf s.n.* (USM, CICY, FLAS). Drawn by Sarah Adler.

FIGURE 2. *Cryptocentrum beckendorfii*. A. Habit with inflorescences. B. Flower, front view. C. Flower, lateral view. Photos by S. Beckendorf.

Distribution and ecology:—*Cryptocentrum beckendorfii* is known only from a single cultivated plant. This plant purportedly originated from near Machu Picchu (Cusco region, Urubamba, Peru). Since the species is known from a single collection with little additional information, little can be said about its ecology and distribution.

Eponymy:—Named after Steven Beckendorf, Professor Emeritus of Genetics, Genomics, and Development, University of California, Berkeley, who cultivated the plant for decades until it flowered recently. Beckendorf grows it in a cool-intermediate greenhouse mounted on a cork slab.

Beckendorf originally obtained this plant as an unidentified *Maxillaria* Ruiz López & Pavón (1794: 116, t 24) from the collection of FL (Steve) Stevenson, who had a large orchid collection, consisting mainly of species, in Chamblee, Georgia, USA. Stevenson was an orchid horticulturalist and a past president of the American Orchid Society who died in 1994. In the decades between 1960 and 1980, he traveled extensively in Central and South America with several orchid biologists, including Calaway H. Dodson and Robert L. Dressler. He collected many orchids on these trips (prior to the advent of CITES) and cultivated thousands of orchids in his greenhouses; many orchid species were described by Carl L. Luer and Dodson from specimens cultivated in Stevenson's greenhouses. After his death, his orchid collection was dispersed among orchid growers, and it is probable that additional undescribed species might still exist among his collections.

Notes:—Among species of *Cryptocentrum*, *C. beckendorfii* can readily be recognized by its relatively large, suborbicular to broadly ellipsoid or broadly ovoid pseudobulbs, which are totally naked upon maturity. However, when young, they are enveloped in tightly appressed, brown papery sheaths that are eventually scarious and disintegrate into grayish fibers. These sheaths, coupled with pseudobulb shape and narrow leaves, which are more or less petiolate, lend the plant a superficial similarity to the unrelated genus *Teuscheria* Garay (1958: 820), which is easily differentiated, among other features, by plicate leaves. It is further distinguished from other *Cryptocentrum* species by the thinly textured, linear conduplicate leaves. Flowers of *C. beckendorfii* resemble those of *C. pseudobulbosum* Schweinfurth (1946: 186) but are larger (dorsal sepal 11.5–12.5 vs. 7.0–7.5 mm long, respectively) and held on a longer, thinner peduncle [40–60 vs. (15–)30–45 mm long, respectively].

Because of the pseudobulbous, sympodial habit we would hypothesize this species to be related to *Cryptocentrum pseudobulbosum* of subgenus *Pseudobulbosa* Carnevali (2001: 470) or to *C. roseans* (Schlechter 1920: 183) Hawkes (1953: 379) of subgenus *Anthosiphon* (Schlechter 1920: 183) Carnevali (in Blanco *et al.* 2007: 523). The thin conduplicate leaves of this species suggest a relationship with *C. roseans*, whereas the overall floral structure and biogeography support a closer relationship with *C. pseudobulbosum*. The status of these two subgenera needs to be assessed in light of the novel combination of characters present in *C. beckendorfii*. A combined evidence phylogenetic analysis of *Cryptocentrum* is currently underway to test these hypotheses (Carnevali *et al*. in prep.).

It might be hypothesized that the intermediate features of this plant could be explained if it is a horticultural hybrid between *Cryptocentrum* and *Maxillaria*. We sequenced both nrITS and plastid DNA regions from this plant (Carnevali *et al*., in prep.); the nuclear region produced clean sequences with no evidence of polymorphism expected in a first generation hybrid whereas preliminary phylogenetic analysis of plastid and nrITS failed to yield any topological incongruence sometimes obtained in hybrids.

IUCN conservation category:—DD. This taxon is only known from the type specimen, thus according to the IUCN (2010) it should be listed as DD (data deficient). The publication of this extraordinary new species will hopefully prompt searches for additional plants of *Cryptocentrum beckendorfii*, after which it will be possible to better assess the rarity and conservations status of the species.

***Cryptocentrum* in Peru:**—With this new addition, there are now four species (one with two subspecies) of *Cryptocentrum* known from Peru. All of them occur on the Amazonian slopes of the Andes at elevations of 750–2000 m in montane rain to cloud forest. Three of the four subgenera recognized by Carnevali *et al.* (2009) occur in the country. *Cryptocentrum pseudobulbosum* is the sole representative of subgenus *Pseudobulbosa*, *C. inaequisepalum* Schweinfurth (1946: 186) represents subgenus *Cryptocentrum* whereas *C. peruvianum* (Cogniaux, 1903: 331) Schweinfurth (1946:188) is referred to subgenus *Caulescentes* Senghas

(1994: 1798). *Cryptocentrum beckendorfii* cannot as yet be assigned to any of the described subgenera. Below we provide a key to the genus in Peru.

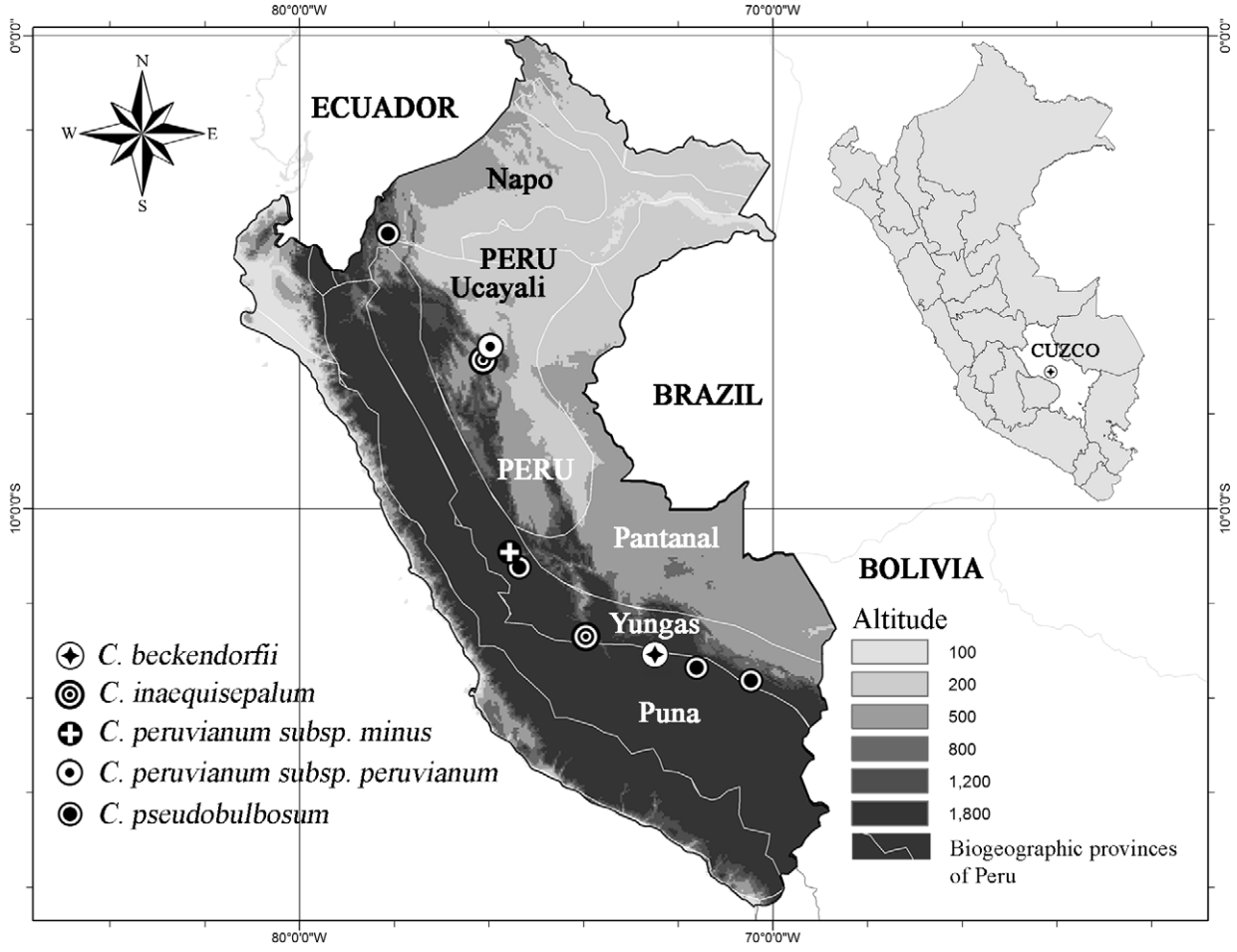

FIGURE 3. Distribution of Peruvian species of *Cryptocentrum.* Outlines of biogeographic provinces from Morrone (2001).

Key to the species of *Cryptocentrum* from Peru

1. Pseudobulbs present, plants with sympodial habit 2
– Pseudobulbs absent, plants with monopodial habit 3
2. Pseudobulbs ellipsoid, totally or partially hidden by the sheaths, these with foliar blades; leaves 15–37 mm long, hemicylindric or subtriquetrous; inflorescences thickly peduncled, (15–)30–45 mm long; internodes of the inflorescence subequal in length to the subtending bracts; floral bract 11–12 mm long ..... *C. pseudobulbosum*
– Pseudobulbs subspherical to subconical, broadly ellipsoid or broadly ovoid, when young clothed by several dark castaneous sheaths without blades that disintegrate into grayish fibers with age, totally naked when old; leaves 40–90 mm long, conduplicate, thinly coriaceous; inflorescences thinly peduncled, 40–60 mm long, internodes of the inflorescence twice as long as the subtending bracts..... *C. beckendorfii*
3. Leaves distichous; blades (3–)7–20(–30) cm long, conduplicate, coriaceous; inflorescences (2–)3–10 cm long; floral bract totally enclosing the spur; spur (16–)18–28(–32) mm long..... *C. inaequisepalum*
– Leaves spiral; blades (1.0–)1.2–1.8(–2.5) cm long, hemicylindric to subtriquetrous; inflorescences 0.4–0.7 cm long; floral bract enclosing only 1/10 to 1/2 of the spur; spur (4.0–)4.5–7.0(–11.0) mm long 4
4. Petals 7.5–10.0 mm long, ca. 2 mm wide, 3-nerved; spur 9–11 mm long; plants from elevations usually above 1500 m .....*C. peruvianum* ssp. *minus* (Schlechter 1912: 389) Carnevali (2001: 482)
– Petals 3.5–6.0 mm long, <1.5 mm wide, 1-nerved or very faintly 3-nerved; spur 4.5–7.0(–8.0) mm long; plants from elevations usually below 1500 m .... *C. peruvianum* ssp. *peruvianum* (Cogniaux 1906: 331) Schweinfurth (1946: 188)

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