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Phenotypic delimitation supports a new rupicolous species of *Cattleya* (Orchidaceae: Laeliinae) from the Diamantina Plateau, Minas Gerais, Brazil

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Abstract

Cattleya ramosii sp. nov. is described here from the campo rupestre vegetation of the Diamantina Plateau, Minas Gerais State, Brazil. The new species is a small rupicolous taxon of *Cattleya* ser. *Parviflorae* that is morphologically close to *C. haroldoi*, *C. porphyrascens*, and *C. vandenbergii*. We compiled a multi-categorical dataset from cultivated specimens and quantified dissimilarity using coincidence frequency, followed by Ward clustering and Principal Coordinate Analysis, to validate phenotypic discontinuity among the four taxa. The analyses recovered four coherent clusters consistent with species boundaries, with floral characters most contributing to their separation. The species is currently known from a single locality, where it grows in rock fissures on cliffs; it flowers mainly in October–November. Given its limited distribution, the low number of individuals recorded, and evidence of anthropogenic fires affecting nearby outcrops, *C. ramosii* is provisionally assessed as Data Deficient (DD). An identification key and comparative notes are provided to facilitate recognition of the new taxon and its similar congeners.

Key words: endemism, Espinhaço Range, multivariate analyses, taxonomy

Introduction

Orchidaceae is among the largest angiosperm families worldwide, comprising ca. 28,000–31,000 species. In Brazil, it is the second most diverse family, with 2,515 currently accepted species, and its taxonomy continues to expand through discoveries and refined species delimitations, particularly in naturally fragmented montane habitats (Pessoa *et al*. 2025). Accurate species circumscriptions in such systems are crucial, as narrowly distributed orchids tend to occur in only a few localities, and taxonomic uncertainty can misdirect conservation decisions (Pizzardo *et al*. 2024).

The campo rupestre vegetation of the Espinhaço Mountain Range is a key setting for this problem. The vegetation there is widely recognized as hyperdiverse within a high-turnover mosaic structured by isolated rock outcrops and strong fine-scale environmental contrasts, favoring local differentiation and microendemism (Silveira *et al*. 2016, Neves *et al*. 2018). These conditions may promote diversification across different plant groups, such as rupicolous

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orchids. They are particularly informative because many species are associated with specific rocky substrates and geographically isolated outcrops, where restricted dispersal across suitable habitats and strong microhabitat contrasts can enhance phenotypic and evolutionary differentiation, making them especially suitable for integrative taxonomic approaches that combine morphological diagnosis with explicit evidence of phenotypic discontinuity (Fiorini *et al*. 2023, Lima *et al*. 2024).

Within Laeliinae Benth. (1881: 287), species delimitation in the genus *Cattleya* Lindley (1824: t. 33) remains challenging because morphological convergence, narrow distributions, and frequent mismatches between morphological patterns and molecular signals obscure taxonomic boundaries (van den Berg *et al*. 2000, Chase *et al*. 2015, Menezes *et al*. 2022, Menezes *et al*. 2024). The reclassification proposed by van den Berg (2014) provided an essential phylogenetic framework for the genus, while also emphasizing that species limits can be difficult to define where introgression and conflicting markers occur. Continuing systematic work since then, including nomenclatural stabilization and phylogenetic–taxonomic synthesis (van den Berg 2018), has supported renewed species-level revisions and descriptions in rupicolous complexes.

A particularly intricate arena occurs with *Cattleya* ser. *Parviflorae* (Lindley 1842: sub t. 62) van den Berg (2014: 82), which includes many small rupicolous taxa. Traditional qualitative diagnoses of this group have been reinforced by quantitative phenotypic approaches that highlight how sets of characters form coherent and discontinuous groupings among otherwise very similar taxa (Menezes 2023, Lima *et al*. 2024, Menezes *et al*. 2025). This is especially relevant in campo rupestre landscapes, where geographic discontinuity among rock outcrops can restrict connectivity and reinforce divergence even over modest distances (Leles *et al*. 2015, Fiorini *et al*. 2023).

Here we: (i) describe *Cattleya ramosii*, a new species of *Cattleya* ser. *Parviflorae*; (ii) provide a detailed morphological diagnosis of the new taxon as well as comparisons with phenotypically similar taxa, *Cattleya haroldoi* (V.P. Castro & E.L.F. Menezes) van den Berg (2018: 2), *Cattleya porphyrascens* E.L.F. Menezes (2023: 62), and *Cattleya vandenbergii* Fraga & Borges (2008: 21); (iii) quantify patterns of phenotypic differentiation using multivariate analyses; and (iv) document the distribution and habitat context of the new taxon within the geoenvironmental mosaic of the Diamantina Plateau to support interpretations of divergence and provide conservation assessments.

Material and methods

Study area and climate

The Diamantina Plateau (Figure 1) is characterized by pronounced geoenvironmental heterogeneity (Machado & Gonzaga 2021), with the four orchid taxa treated here occurring in distinct lithostratigraphic settings within the same Proterozoic folded metamorphic domain (SGB/CPRM & SEMAD 2018). Importantly, both the Galho do Miguel geological unit and the Sopa–Brumadinho unit recur across contrasting geomorphological contexts, including plateau surfaces and mountainous terrain, and escarpments with marked variations in both slope and relief amplitudes (Lacerda & Saadi 2017).

Thus, beyond differences in lithology *stricto sensu*, these units encompass a mosaic of landscape positions that translate into strong variation in exposure, soil development, hydrological behavior, and microhabitat availability for rupicolous plants (Ruchkys *et al*. 2025). The Galho do Miguel formation is dominated by fine to medium-grained metarenites, commonly quartzitic, whereas the Sopa–Brumadinho formation is mainly composed of quartzite and metaconglomerate, but includes phyllitic/metapelitic components that potentially increase fine-material inputs and micro-edaphic heterogeneity (SGB/CPRM & SEMAD 2018, Mucida *et al*. 2019, Gomes *et al*. 2021, Loiola *et al*. 2023).

By contrast, the Itambé do Mato Dentro unit (Figure 1) exhibits a pronounced geoedaphic mosaic, with predominant metarenites and quartzites interlayered with irregular silty–clayey metasediments with local iron or manganese-rich horizons that can produce sharp, small-scale variations in soil texture and chemistry (SGB/CPRM & SEMAD 2018). These combined lithological and geomorphological heterogeneities can impose strong environmental filtering and may promote localized ecological differentiation across outcrops (Vasconcelos *et al*. 2020, Rapini *et al*. 2021, Costa *et al*. 2023).

We conducted two field expeditions to the southeastern Diamantina Plateau in Minas Gerais State, Brazil, in October/2020 and November/2025. During the first visit, we collected living plants (Figures 2 and 3) and subsequently cultivated them in the HDJF herbarium greenhouse (acronyms follow Thiers 2025), where they were individually labeled and identified. The study site has a mean annual temperature of 19.4 °C, a mean annual precipitation of 1489 mm (Fick & Hijmans 2017), with a Cwb climate characterized by cool, dry winters and mild to warm and wet summers (Köppen & Geiger 1936).

Habitat and conservation assessment

We recorded habitat, geographic, and phenological data during the fieldwork phase, and plotted the georeferenced occurrences onto a shaded-relief base map using the free, open-source QGIS software, version 3.28 (QGIS Software Team 2025) (Figure 1). We assessed the taxon's conservation status according to the IUCN Red List Categories and Criteria, version 16 (IUCN 2024).

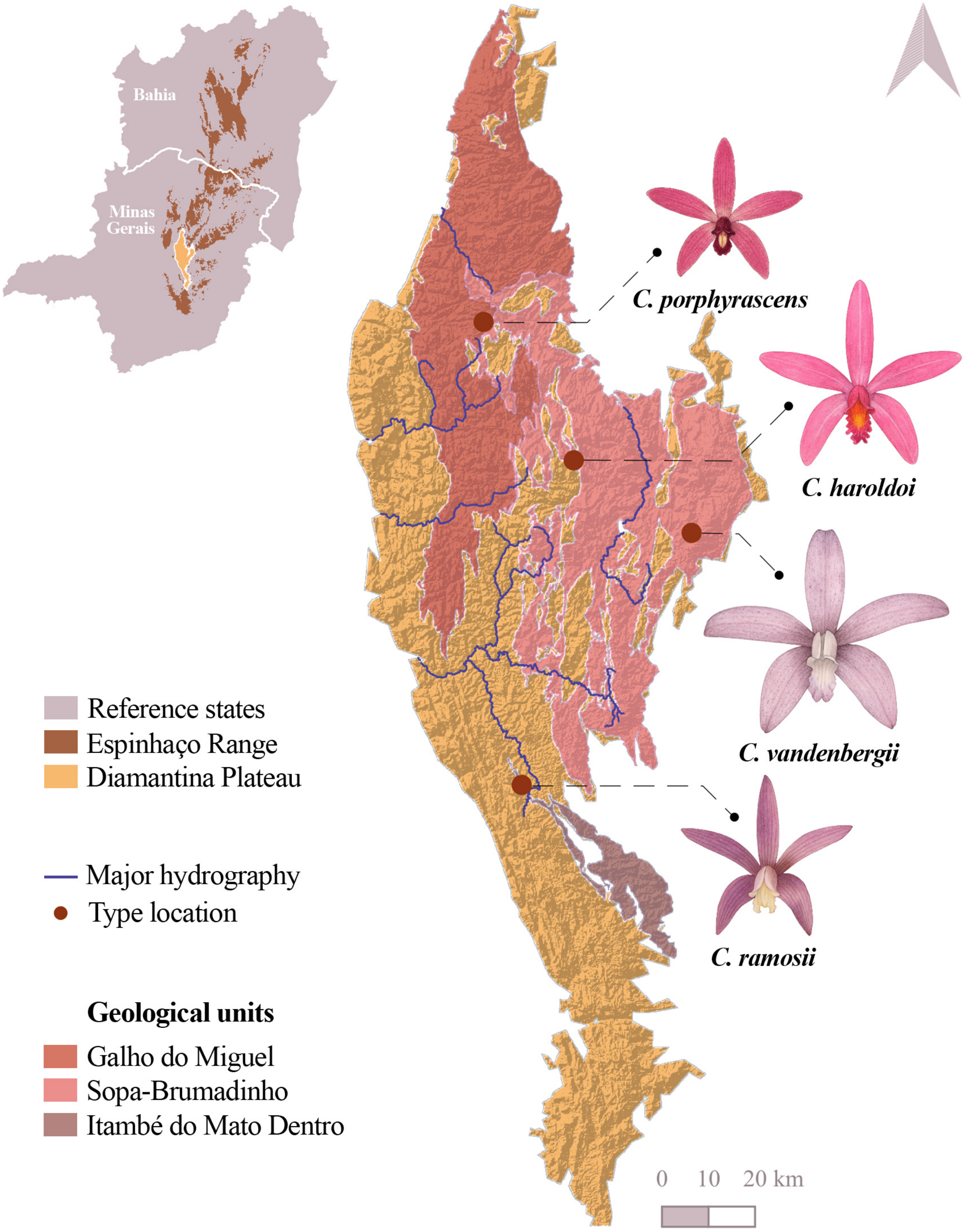

FIGURE 1. Geographical location of *Cattleya ramosii* and similar species on the Diamantina Plateau, Espinhaço Range, Brazil.

Specimen preparation and analysis

Voucher specimens were prepared from the collected plants, and we deposited the holotype in HDJF and the isotype in DIAM. We supported the comparative analyses with photographs of related species under cultivation. The living plants and prepared herbarium specimens were examined using standard herbarium procedures (Peixoto & Maia 2013). Our field visits, together with observations of cultivated specimens, confirmed that flowering peaks in October.

FIGURE 2. *Cattleya ramosii* in its natural habitat.

We compared the collected specimens using illustrations and descriptions of previously published species (Pabst 1973, 1975a, 1975b, Castro & Menezes 2015, 2018, Menezes *et al*. 2022, Menezes 2023). The morphological descriptions of the characters were based on Dressler (1993), supplemented by Radford *et al*. (1974). The floral structures were measured using a Piveta pachymeter, and the vegetative structures, inflorescences, and flowers were photographed using a Canon EOS REBEL XTi camera equipped with an 18–55 mm lens. The photographic plates were prepared in GIMP - GNU Image Manipulation Program.

We estimated the distances between species having similar phenotypes (i.e., *Cattleya haroldoi*, *Cattleya porphyrascens*, and *Cattleya vandenbergii*) using coincidence frequency to quantify morphological variations. The patterns of morphological variation were explored using clustering analysis, employing Ward's minimum-variance method. Clustering was applied to the sum of the squared deviations of Euclidean distances as calculated using a multi-categorical dataset comprising the phenotypic attributes presented here in Table 1.

The multi-categorical dataset was constructed considering data from six cultivated specimens per species to address intraspecific variability. We also conducted a Principal Coordinate Analysis (PCoA) to visualize the species' distributions based on phenotypic dissimilarity. We performed all numerical and graphical analyses in the R 4.2.1 environment (R Core Team 2019).

TABLE 1. Comparisons between *Cattleya ramosii* and similar species.

Character/Species	*C. ramosii*	*C. haroldoi*	*C. porphyrascens*	*C. vandenbergii*
Pseudobulb	Pyriform, 1.5–2.3 cm long, 1 internode	Pyriform, 2.0–3.0 cm long, 2 internodes	Obclavate, elongated, 4.5–5.0 cm long, 2 internodes	Obclavate, elongated, 2.5–3.0 cm long, 2 internodes
Leaf	Elliptic-lanceolate, retroflexed, 3.0–4.7 cm long	Elliptic-lanceolate, retroflexed, 3.0–4.0 cm long	Elliptic-lanceolate, retroflexed, 3.0–7.0 cm long	Elliptic-lanceolate, aligned with pseudobulb, 5.0–6.0 cm long
Dorsal sepal	Elliptic, 1.5–1.7 cm long	Elliptic, 1.5–1.8 cm long	Elliptic, 1.0–2.0 cm long	Elliptic, 1.5–2.0 cm long

...continued on the next page

TABLE 1. (continued)

Character/Species	***C. ramosii***	***C. haroldoi***	***C. porphyrascens***	***C. vandenbergii***
Lateral sepal	Oblong-lanceolate, 1.5–1.6 cm long	Oblong-lanceolate, 1.3–1.5 cm long	Oblong-lanceolate, 1.5–2.0 cm long	Oblong-lanceolate, 1.5–1.8 cm long
Labellum (flattened)	Semi-oval	Oval	Circular	Circular
Disc lamella	4, low, white to yellowish	4, narrow, orange	4, wide, white, purple at base	4, narrow, the 2 innermost extending more apically, white, purple at base
Column–Color and Profile	Yellowish-green tinged with lilac, rectangular	Magenta, rectangular	Purple-violet, truncated triangular	White, rectangular-falcate
Floral stem	4.0–9.0 cm long, slender, extends slightly above the leaf	5.0–8.0 cm long slender, extends far above the leaf	7.0–13 cm long, slender, extends far above the leaf	5.0–7.0 cm long, robust, extends slightly above the leaf
Floral pedicel	Wine-colored	Wine-colored	Green	Green
Flowering	October–November	August–September	September–October	April–May

Results

We found that the phenotypic dissimilarities derived from coincidence frequencies were lowest for *C. haroldoi–C. ramosii* (0.5799), followed by *C. porphyrascens–C. vandenbergii* (0.6267), and *C. haroldoi–C. porphyrascens* (0.7066). We recorded the highest dissimilarities in comparisons involving *C. vandenbergii* and *C. ramosii*: *C. porphyrascens* and *C. ramosii* (0.8351), *C. ramosii–C. vandenbergii* (0.8403), and *C. haroldoi–C. vandenbergii* (0.8490) (Figure 4).

The cophenetic correlation of 0.90 and the Mantel test p-value of 0.17 indicated good agreement between the phenotypic dissimilarity matrix and Ward's dendrogram (Figure 4). According to the conservative distance cutoff of 0.35, the phenotypic differences between the species are sufficient to create four distinct clusters (Menezes *et al*. 2025).

The phenotypic distributions of the specimens, based on coincidence distances via PCoA, showed clear interspecific structures (Figure 5), with significant differences in specimen scores among species along the main axes (PCoA1: $p = 8.89e^{-20}$; PCoA2: $p = 3.97e^{-16}$; PCoA3: $p = 3.14e^{-07}$). The first principal coordinate accounted for 45.2% of the observed phenotypic variation, while PCoA2 and PCoA3 accounted for 21.7% and 10.6%, respectively.

The computed species centroids of the specimens showed negative projections for *C. ramosii* and *C. haroldoi*, but positive projections for *C. porphyrascens* and *C. vandenbergii* along PCoA1. We could identify the traits driving the clustering by computing, for each character, the mean interspecific dissimilarity under the same coincidence-frequency approach, with continuous variables discretized into ordered classes.

The traits that most strongly indicated phenotypic separation were floral characteristics, especially column color (mean interspecific dissimilarity = 1.00), labellum shape, column profile, and disc lamella color (0.83), along with size characteristics such as pseudobulb length (0.89), lateral sepal length and leaf length (0.81), and floral stem length (0.79). Similar results have been reported in other orchid studies, in which floral and other morphometric characters were among the most informative variables for taxon delimitation and phenotypic divergence (Borba *et al*. 2002, Leles *et al*. 2015, Cruz-Lustre *et al*. 2020, Lima *et al*. 2024).

As such, the traits that most strongly explained phenotypic separation in the PCoA ($p \leq 0.005$) were primarily floral characters, especially column color ($R^2 = 0.98$) and column profile (0.86), together with labellum shape and disc lamella color (0.78) and floral pedicel color (0.66). Among size/architectural traits, the main contributors were pseudobulb length (0.87), internode number and flowers per stem (0.66), and leaf length (0.58), followed by lateral sepal length (0.45) and floral stem length (0.42). Additional structural traits, such as pseudobulb shape (0.66), leaf position and stem thickness (0.42), and stem exsertion (0.31), further reinforced the separation pattern observed in the ordination space.

These characters likewise explained the structure recovered by Ward's clustering: *C. haroldoi–C. ramosii* formed the closest pair by sharing multiple vegetative and structural states, including pseudobulb shape, leaf position, column profile, stem thickness, and pedicel color (Figures 4, 5 and 6); they differed by consistent floral and architectural traits such as pseudobulb internode number, labellum shape, disc-lamella color, column color, and stem exsertion.

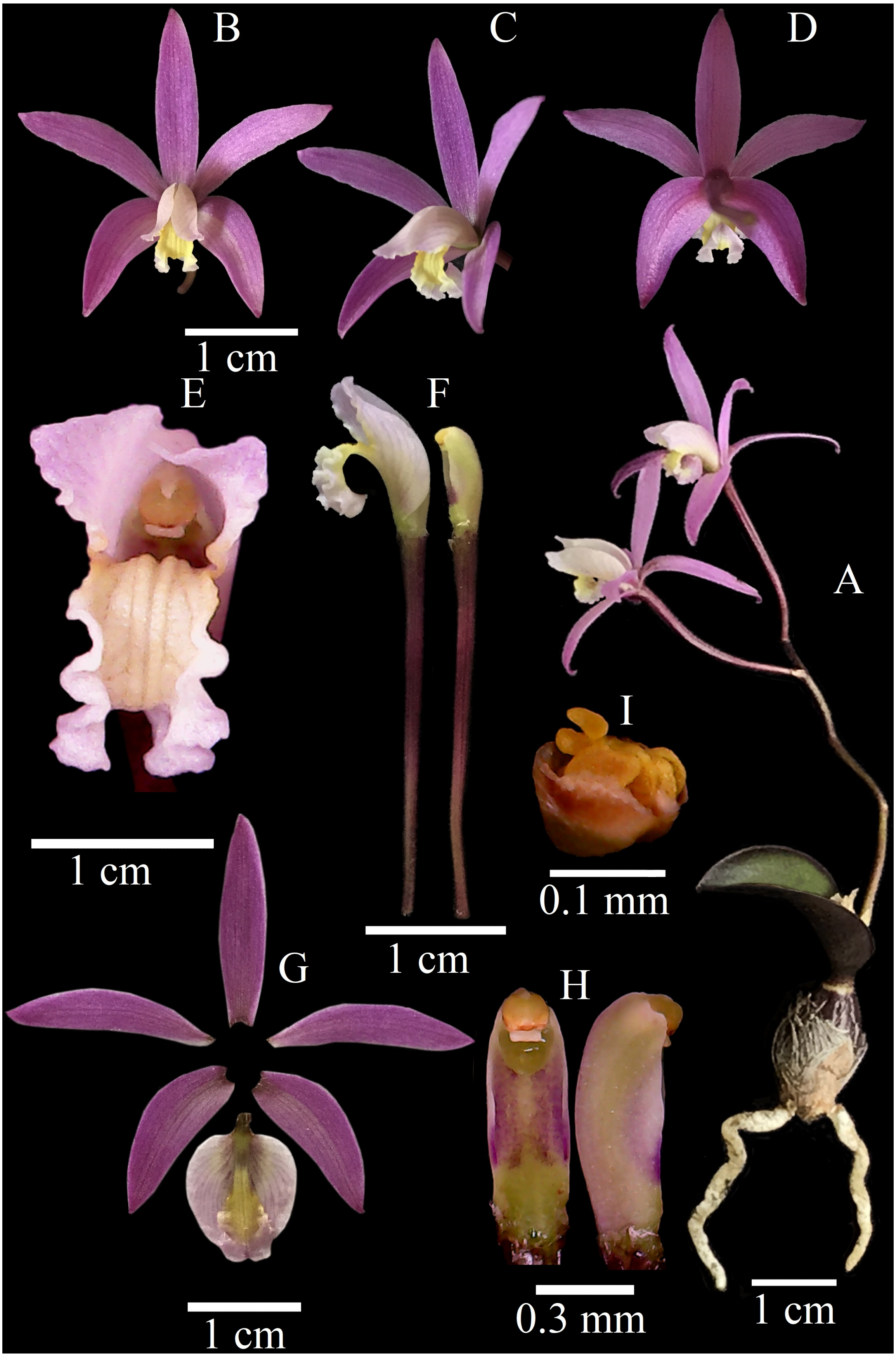

FIGURE 3. *Cattleya ramosii* **A.** Habit; **B.** Flower, front view; **C.** Flower, lateral view; **D.** Flower, posterior view; **E.** Labellum in adaxial view; **F.** Pedicellate ovary + column, with labellum (left); **G.** Dissected perianth; **H.** Column, ventral and lateral views; **I.** Anther cap and pollinarium (Photos and plate design by Mauro Sérgio Rosim).

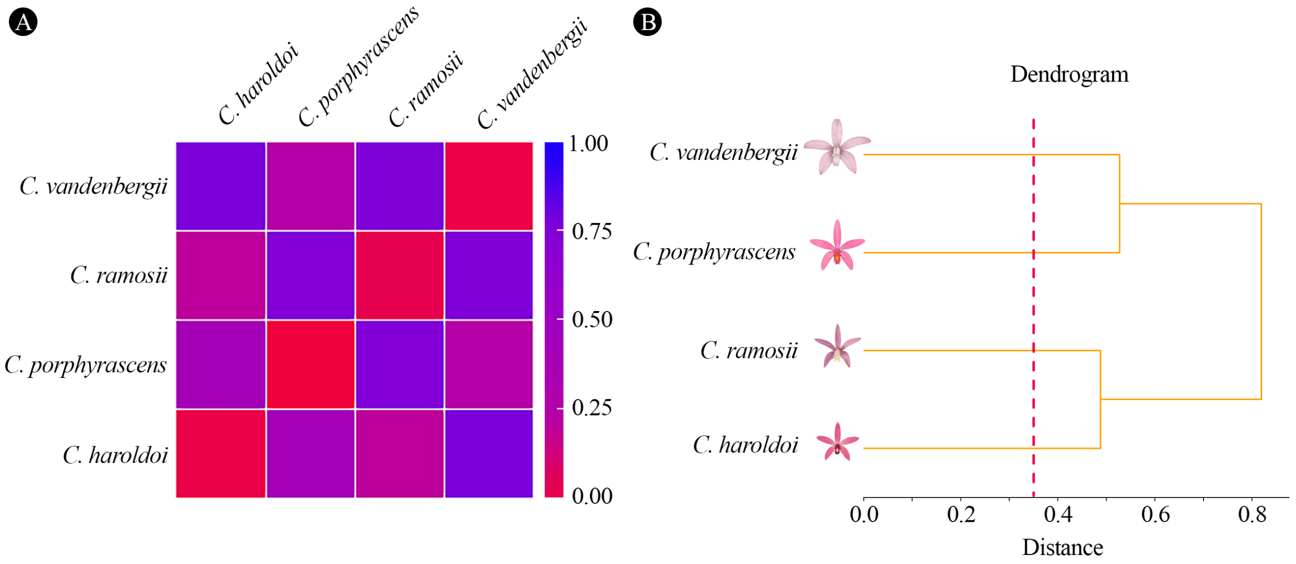

FIGURE 4. Frequency distribution of coincidence among campo rupestre species. **A.** Correlation heatmap and **B.** dendrogram obtained using Ward's method, based on dissimilarity measures among *Cattleya ramosii*, *Cattleya haroldoi*, *Cattleya porphyrascens*, and *Cattleya vandenbergii*. We estimated the cophenetic correlation coefficient to be 0.90 using the Mantel test (p-value = 0.17).

C. porphyrascens–*C. vandenbergii* formed the second closest pair by sharing internode number, pseudobulb shape, and labellum/disc-lamella states, while diverging by column traits and stem/leaf architecture. Leaf, dorsal sepal, and lateral sepal shapes were invariant among the taxa and did not contribute to their discrimination.

Discussion

Previous studies indicated that several *Cattleya* species are pollinator-dependent and may be pollinated through generalized food deception, with naïve bee visitors playing a major role in reproduction (Smidt *et al*. 2006, Caballero-Villalobos *et al*. 2017). More broadly, deceptive pollination and strong flower–pollinator interactions have long been recognized as central features of orchid reproductive biology, often promoting floral isolation through both pollinator behavior and mechanical fit (van der Pijl & Dodson 1966, Schiestl & Schlüter 2009).

In our dataset, the characters that contributed most strongly to interspecific separation were associated with the floral module (column color and profile, labellum shape, and disc-lamella traits) and with floral display (stem exsertion). Although our analyses do not directly test pollination mechanisms, this pattern is consistent with the orchid literature, in which floral isolation commonly involves both pollinator behavior and mechanical fit, and floral traits such as size and column morphology are often especially important (van der Pijl & Dodson 1966, Cozzolino & Widmer 2005, Schiestl & Schlüter 2009). In this context, the strong contribution of these variables is biologically plausible, as they are among the traits most likely to influence visitor approach, handling, and contact with the pollinarium (Pramanik *et al*. 2020, Ackerman 2023, Kobayashi & Arditti 2024).

In addition to morphological analyses, the consideration of geoenvironmental differentiation is particularly important, given that species limits in *Cattleya* can be blurred by pervasive hybridization and introgression, as well as discordant molecular signals (van den Berg 2014). Understanding how distinct geoenvironmental units and geological barriers structure habitats and restrict connectivity can be decisive for interpreting whether divergent populations are better treated as independently evolving taxa or as hybrid derivatives.

Such an integrative framework is especially relevant on the Diamantina Plateau, where geoenvironmental heterogeneity and major landscape features may reduce gene flow and promote localized differentiation (Zappi *et al*. 2017, Colli-Silva *et al*. 2019). *Cattleya ramosii* and similar taxa occur in different geological formations (with the exceptions of *C. vandenbergii* and *C. haroldoi*, which are nonetheless separated by the Jequitinhonha River valley) (Figure 1). Genetic differentiation in *C. liliputana* was, in fact, found to be associated with the disjunct distribution of populations across different types of rocky terrain (Leles *et al*. 2015).

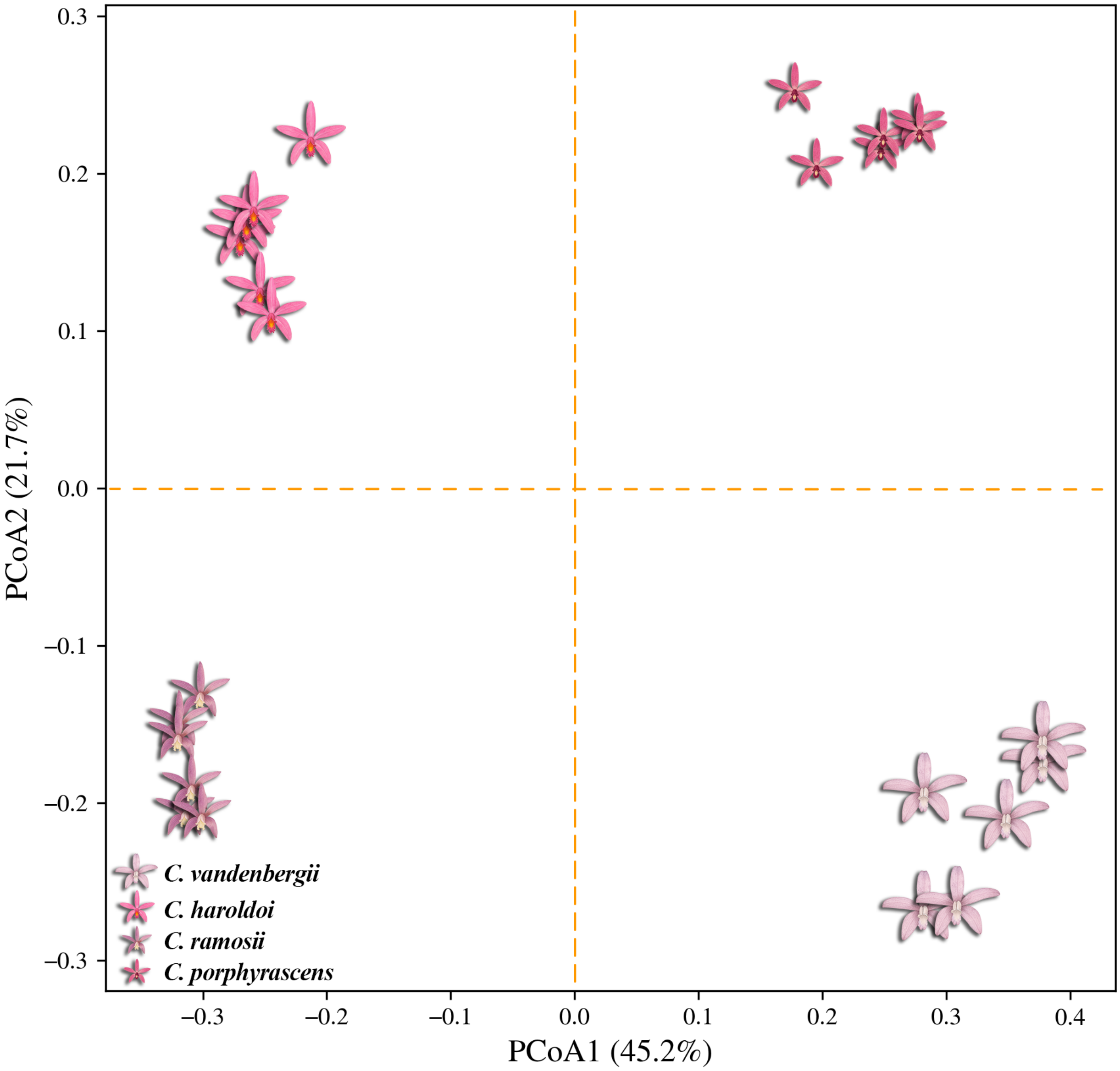

FIGURE 5. Principal Coordinate Analysis (PCoA) of phenotypic distances between *Cattleya ramosii*, *Cattleya haroldoi*, *Cattleya porphyrascens*, and *Cattleya vandenbergii.*

This study demonstrates that *Cattleya ramosii* can be distinguished from *C. haroldoi*, *C. porphyrascens*, and *C. vandenbergii* based on a set of habitat, vegetative, floral, and phenological differences. Although its only known population occurs in the Serra Talhada Municipal Environmental Protection Area (Área de Proteção Ambiental Municipal, APAM), threats associated with permitted land uses there and anthropogenic fires must be considered in future assessments.

Taxonomy

Cattleya ramosii E. L. F. Menezes, Giordani & Corrêa, *sp. nov*. (Figures 2–3).

Type:—BRAZIL. Minas Gerais: Congonhas do Norte, Serra do Cipó, Capão de Congonhas, 1,053 m a.s.l, October 10, 2020, saxicolous, growing in rock crevices, *E.L.F. Menezes* 382 (holotype: HDJF 8026!; isotype: DIAM!)

Cattleya ramosii is similar to *C. haroldoi*, *C. porphyrascens,* and *C. vandenbergii*, but differs from them by: its reddish-purple pseudobulb color (*vs.* green in *C. haroldoi*, *C. porphyrascens,* and *C. vandenbergii*); pseudobulb length of 1.5–2.3 cm (*vs.* 2.0–3.0 cm in *C. haroldoi*, 4.5–5.5 cm in *C. porphyrascens*, and 2.5–3.5 cm in *C. vandenbergii*); leaf length of 3.0–4.7 cm (*vs.* 3.0–4.0 cm in *C. haroldoi*, 6.0–8.0 cm in *C. porphyrascens*, and 5.0–6.0 cm in *C. vandenbergii*);

its lilac flower color (*vs.* pale pink in *C. haroldoi*, purple-violet in *C. porphyrascens,* and pale pink to deep pink in *C. vandenbergii*); the 2–3 flowers on the stem (*vs.* 2–4 in *C. haroldoi*, 5–10 in *C. porphyrascens*, and 1–2 in *C. vandenbergii*); the semi-oval shape of the flattened labellum (*vs.* oval in *C. haroldoi*, and circular in *C. porphyrascens* and *C. vandenbergii*); the 4, straight, white to yellowish keels of the labellum that are fully conspicuous throughout (*vs.* 4, orange, straight to the mid-lobed junction, where they branch and diverge in *C. haroldoi*; 4, straight and white, purple at the base in *C. porphyrascens*; and 4, with the two innermost white, purple at the base, partially fused with the outer ones and nearly inconspicuous from the labellum base to the mid-lobe junction in *C. vandenbergii*); and its 4.0–9.0 cm floral stem length (*vs.* 5.0–8.0 cm in *C. haroldoi*, 7.0–13.0 cm in *C. porphyrascens*, and 5.0–7.0 cm in *C. vandenbergii*). Flowering in *C. ramosii* occurs from October to November (*vs.* August–September in *C. haroldoi*, September–October in *C. porphyrascens*, and April–May in *C. vandenbergii*).

Description:—*Plant* saxicolous, caespitose, 4.0–8.0 cm tall. *Rhizome* short. *Roots* white, glabrous, flexuous, 0.2 mm diameter. *Pseudobulbs* pyriform, articulated, 1 internode near the base, smooth, reddish-purple, 1.5–2.3 × 0.8–1.0 cm, with scarious amplexicaul sheaths that disintegrate with time, unifoliate. *Leaves* elliptic, lanceolate, slightly retroflexed, coriaceous, fleshy, naviculate, apex acute, green with a thin purple margin on the adaxial surface, green mottled with purple on the abaxial surface, 3.0–4.7 × 0.3 cm. *Spathe* linear, apex oblique, 1.5–1.7 × 0.3 cm. *Inflorescence* semi-recurved from the apex of the pseudobulbs, from within the spathe, 4.0–9.0 cm long; floral bracts triangular, enclosing an internode near the apex of the floral spathe and the bases of the floral pedicels, with 2–3 flowers in an alternate-opposite pattern. *Flowers* lilac, 2.4–2.7 cm natural diameter; tepals lilac; labellum pale pink to white, inner perianth cream-colored; mid-lobe pale pink to white with a light pink, sinuous margin; lateral lobes pale pink to white, traversed by slightly darker lilac lines. *Sepals* dorsal sepal elliptic, slightly naviculate, apex acute, 1.0–1.5 × 0.4–0.5 cm; lateral sepals oblong-lanceolate, slightly falcate, naviculate, 1.5–1.6 × 0.4–0.5 cm. *Petals* elliptic, slightly falcate, 1.7–1.9 × 0.3 cm. *Labellum* trilobed, semi-oval when flattened, 1.0–1.2 × 1.0–1.1 cm, isthmus obscure, 4 low, longitudinal lamellae pale yellow to white, arising from the base of the labellum, the two external lamellae entire to the junction of the lateral lobes, then branching and diverging, and the two central lamellae extending nearly to the apex of the median lobe. *Lobes* lateral lobes white, lunate, 1.0–1.1 × 0.4 cm; median lobe crisped in natural position, margins sinuous, oblong-rectangular when flattened, 0.5–0.6 × 0.4–0.5 cm. *Pedicel* wine-colored, 2.6–3.1 × 0.1–0.2 cm; ovary dark purplish. *Column* semi-cylindrical, curved dorsally, 0.7 × 0.3 cm. *Stigmatic cavity* cordiform, 0.17 cm diameter. *Anther* galeate, yellowish, 0.1 cm length. *Pollinia* 8, irregularly shaped, 4 larger and 4 smaller; the larger ones 0.4 mm long, yellow, typical of the genus.

Distribution and ecology:—The proposed species occurs in the Diamantina Plateau, in the sector corresponding to the Itambé do Mato Dentro geological unit (Figure 1), near the city of Congonhas do Norte, Minas Gerais State, Brazil, near a community known as Capão de Congonhas. The orchid population there comprises approximately 50 individuals in open areas that were observed in flower *in situ* from mid-October to November; we recorded no capsules. The plants were small, ranging in height from 4.0 to 8.0 cm, and grew in fissures on rocky cliffs, occasionally among Poaceae and other plant families. Floral stems were semi-recurved, bearing 2–3 flowers with generally uniform lilac tones and, at times, with a lilac-whitish labellum. Figure 2 illustrates an individual with one flower detached.

Etymology:—The specific epithet honors Adjarme Ramos de Oliveira Neto, who brought the species to our attention during the fieldwork.

Conservation status:—Because its distribution remains poorly documented, we assess the new species as Data Deficient (DD), following the IUCN Red List criteria (IUCN 2024). Although we recorded the population within the Serra Talhada Municipal Environmental Protection Area, this protection category corresponds to a sustainable-use area rather than a full protection reserve.

During our last visit to the study site, we observed that nearby rock outcrops had been impacted by the passage of anthropogenic fires; this observation, together with the low number of individuals encountered at the locality, and potential threats associated with permitted land uses, should be considered in future conservation status assessments of the species.

Taxonomic discussion:—*Cattleya ramosii* is a saxicolous species that reaches heights between 4–8 cm, grows in rock fissures, and typically grows in positions that avoid prolonged exposures to direct sunlight. It is similar to *C. haroldoi*, *C. porphyrascens,* and *C. vandenbergii*, but can be distinguished from them by its reddish-purple pseudobulbs and generally smaller vegetative dimensions.

It further differs by its inflorescences bearing up to three lilac flowers, a semi-oval labellum when flattened, and its keel configuration (four straight, white to yellowish keels that remain fully conspicuous throughout), contrasting with the orange keels that branch at the mid-lobe junction in *C. haroldoi*, the white keels, purple at their base, of *C. porphyrascens*, and the partially fused, basally inconspicuous keels of *C. vandenbergii* (Figure 7). Finally, *C. ramosii* exhibits a distinct flowering period (October–November), which differs from the seasonal patterns reported for similar species and reinforces its recognition as a distinct taxon.

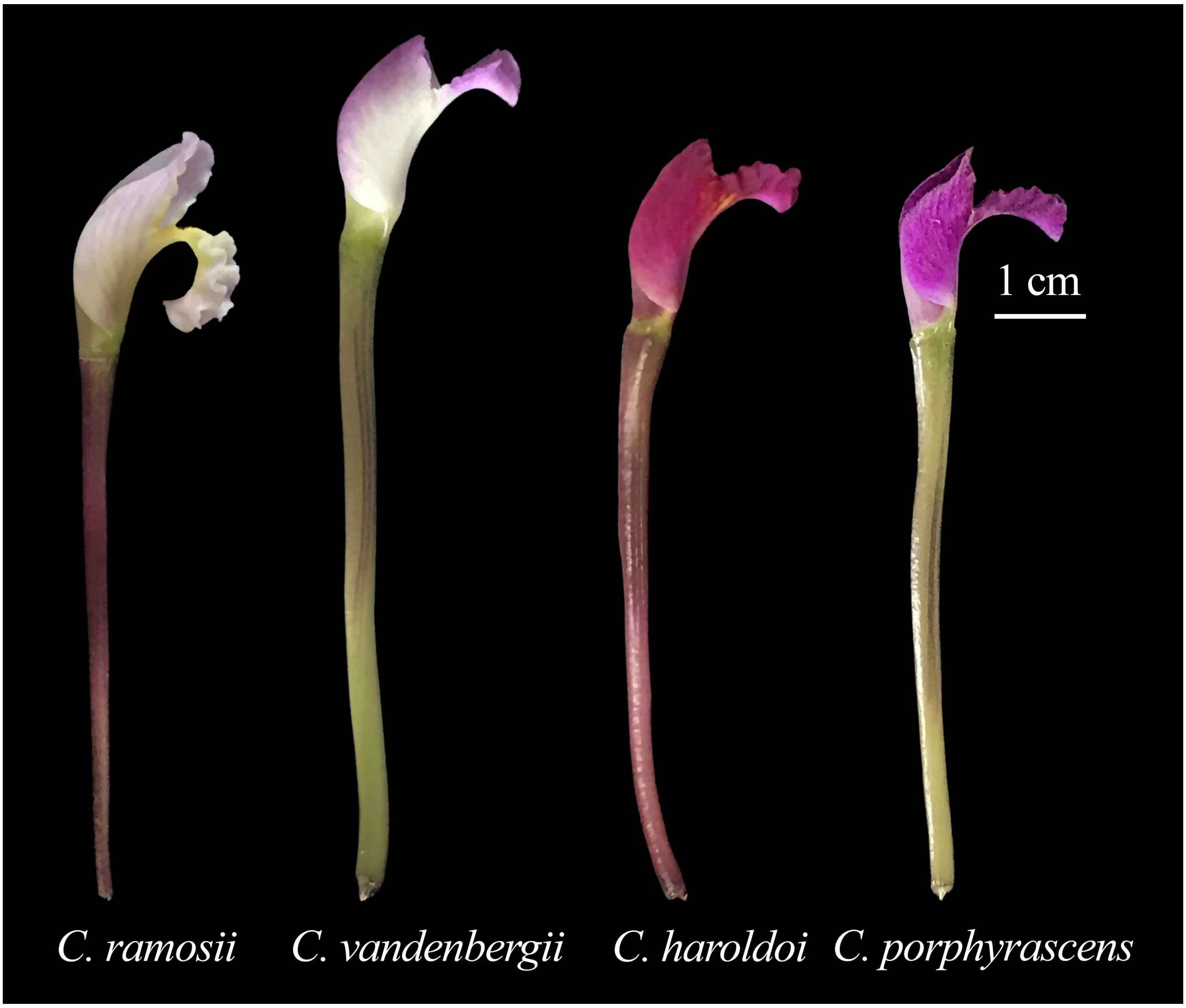

FIGURE 6. Comparison of the floral pedicel. Species: *Cattleya ramosii*, *Cattleya vandenbergii*, *Cattleya haroldoi*, and *Cattleya porphyrascens* (Photos and plate design by Mauro Sérgio Rosim).

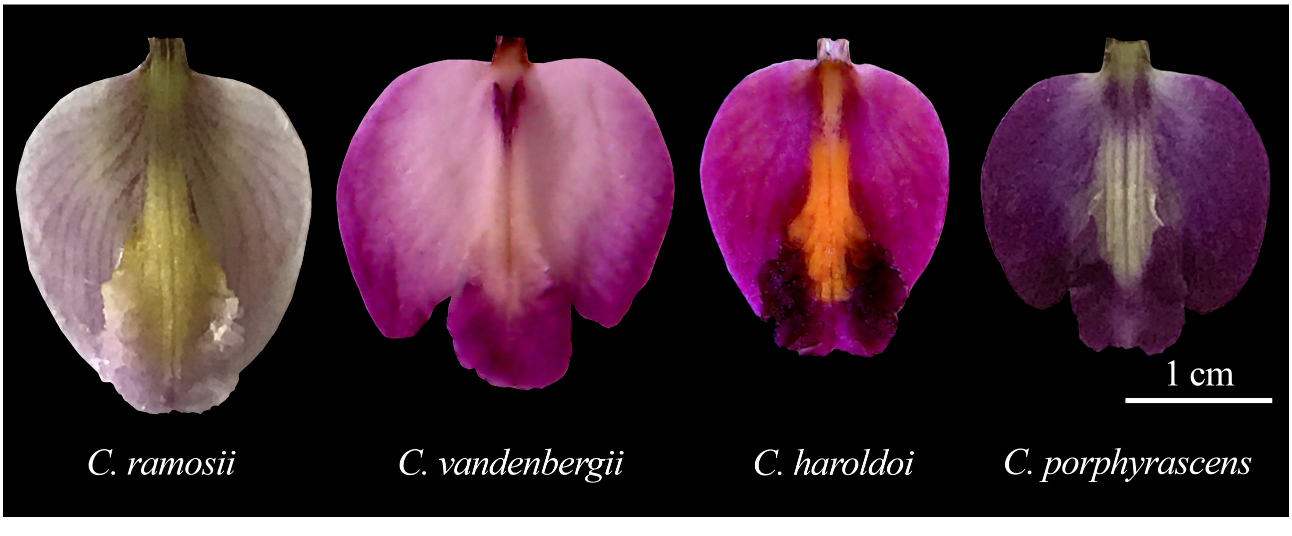

FIGURE 7. Morphology of the labella. Species: *Cattleya ramosii*, *Cattleya vandenbergii*, *Cattleya haroldoi*, and *Cattleya porphyrascens* (Photos and plate design by Mauro Sérgio Rosim).

Additional specimens examined:—*Cattleya porphyrascens*—BRAZIL. Minas Gerais: Diamantina, Córrego do Santo Antônio, 15 August 2010, fl., *E.L.F. Menezes 173* (DIAM 9044); Diamantina, Parque Nacional das Sempre-Vivas, 5 October 2018, fl., *E.L.F. Menezes 69* (DIAM 9015); Diamantina, proximidades da comunidade de Macacos, distrito de São João da Chapada, 5 October 2018, fl., *E.L.F. Menezes 408* (HDJF 8051); Diamantina, Parque Nacional das Sempre-Vivas, Apertado de Pedra, 5 October 2018, fl., *E.L.F. Menezes 408* (DIAM 8259).

Cattleya vandenbergii—BRAZIL. Minas Gerais: Serro, Capivari, Parque Estadual do Pico do Itambé, 21 April 2010, fl., *A.S. Quaresma, M.M.T. Cota, I.M. Franco, I.M. Araújo & F.N. Costa 73* (DIAM 2708, HUEFS 288972).

Identification key for *Cattleya ramosii* and similar species

1.	Pseudobulbs with 1 internode	*Cattleya ramosii*
-	Pseudobulbs with 2 internodes	2
2.	Pseudobulbs pyriform	*Cattleya haroldoi*
-	Pseudobulbs obclavate, elongated	3
3.	Column profile truncated triangular	*Cattleya porphyrascens*
-	Column profile rectangular-falcate	*Cattleya vandenbergii*

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