



A new nothospecies of *Prosthechea* (Orchidaceae: Laeliinae) from the Diamantina Plateau, Minas Gerais, Brazil

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Abstract

Based on morphological evidence found in some specimens recently collected in the Diamantina Plateau region, Minas Gerais State, Brazil, a new natural hybrid between *Prosthechea calamaria* and *P. faresiana* is described and illustrated as *P. ×riopretensis*. Both putative parental species are known for the region and their flowering period overlaps. The new nothospecies carries most of the morphological features of *P. calamaria*, such as short plants (≤ 19 cm height) and inflorescences (≤ 7 cm long), and flowers with a small ovate lip (≤ 1 cm long), but the floral color pattern are remarkably like *P. faresiana* – sepals and petals covered by longitudinal vinaceous stripes. In addition to a digital composite plate of the taxonomic novelty, further images and a distribution map of the new nothospecies and its putative parents are provided, as well as notes on morphology, phenology, and ecology.

Key words: Espinhaço Range, hybridization, natural hybrid, Serra do Espinhaço, taxonomy.

Introduction

Prosthechea Knowles & Westcott (1838: 11) is a Neotropical genus of Orchidaceae comprising ca. 120 species and a member of the subtribe Laeliinae (Higgins 2005, POWO 2024). Some of the diagnostic features of the genus are the terminal inflorescences, racemose, simple, generally subtended by a conspicuous spathe; flowers non-resupinate, the lip adnate to the column only on the extension of the claw; column presenting a 3-toothed clinandrium, with the midtooth usually bearing a fleshy, knob-like, dorsal appendix (Higgins 1998, 2005).

In Brazil, there are 36 recognized species to date, 28 of them (78%) endemic to the country (Vieira & van den Berg 2024), and one natural hybrid formally recognized, *P. ×intermedia* (Campacci 2016: 458) Shaw (2016: 54). The genus is remarkably diverse in the state of Minas Gerais, where more than a third of the species known to Brazil occurs [16 spp. (six endemic to the state) and the natural hybrid aforementioned]. This is due to the presence of ecosystems of both the Atlantic Forest and Cerrado domains, with the particularity of having the highly floristic diverse and endemic Espinhaço mountain range within the state, ranging from its central portion toward north to the state of Bahia, mostly within the Cerrado domain but with the southernmost portion of the mountain range on an ecotone region between the Atlantic Forest and Cerrado. Therefore, Minas Gerais encompasses the two types of vegetation that concentrates most of *Prosthechea* diversity in Brazil: montane forests and *campos rupestres*.

Throughout the *campos rupestres* of the Espinhaço range, it is common to find some *Prosthechea* spp. occurring in sympatry, such as different combinations including *P. allemanii* (Barbosa Rodrigues 1877: 54) Higgins (1998: 376), *P. calamaria* (Lindley 1838: 88) Higgins (1998: 377), *P. faresiana* (Bicalho 1973: 91) Higgins (1998: 377), *P. pachysepala* (Klotzsch 1855: 274) Chiron & Castro-Neto (2003: 174), and *P. widgrenii* (Lindley 1853: 39) Higgins (1998: 381) depending on the site. Furthermore, their flowering periods may overlap throughout the year, which opens the possibility of interspecific breeding in case of pollinator compatibility between species, potentially leading

to natural hybrids as offspring. The orchid family is known for its capability of easily generating hybrids, either artificially or naturally, figuring among the flowering plant families with higher rates of natural hybrids even across genera (Adams & Anderson 1958, Withney 2010), which has been suggested as a process inherently related to the evolution and diversification of some lineages (van den Berg 2014, Fiorini *et al.* 2023). Unfortunately, studies of pollination and reproductive biology in *Prosthechea* are scarce and the literature mostly compiles field observations, mentioning wasps (Scolidae) and solitary bees (Apidae) as floral visitors (Ackerman *et al.* 2023), but no further information about how specific the pollination systems might be within the genus has been presented to date.

Although there is only one natural hybrid of the genus formally published to Brazil, *Prosthechea* × *intermedia*, from Serra do Pitengo, municipality of Itabirinha, Minas Gerais, which is potentially a cross between *P. cf. allemanoides* (Hoehne 1933: 616) Higgins (1998: 376) and *P. itabirinhensis* (Campacci 2009: 210) Shaw (2014: 17), some taxa of the genus that have been published as species may represent cases of local hybrids based on molecular (Vieira *et al.* 2024) and/or morphological evidence (Vieira & van den Berg 2024). Some examples are *P. caetensis* (Bicalho 1972: 26) Higgins (1998: 377), endemic to Serra da Piedade, Caeté, Minas Gerais, a potential hybrid between *P. pachysepala* and *P. widgrenii*; *P. suzanensis* (Hoehne 1938: 18) Higgins (1998: 381), endemic to the higher portion of Serra do Mar in the state of São Paulo, potentially an hybrid between *P. bulbosa* (Vellozo 1831: t. 11) Higgins (1998: 377) and *P. pachysepala*; and *P. terassaniana* (Campacci & Harding 2008: 13) Higgins (2008: 214), a potential hybrid between *P. aemula* (Lindley 1836: t. 1898) Higgins (1998: 376) and another unknown parental species, also described from the state of São Paulo, but from the lower slopes of Serra do Mar in the municipality of Juquiá. Noteworthy, these taxa are only known from type collections or very few materials from the type locality area.

During recent fieldwork activities in the region of the Diamantina Plateau on the meridional portion of the Espinhaço range, state of Minas Gerais, at the municipality of São Gonçalo do Rio Preto, some specimens of *Prosthechea* representing a quite distinct morphotype were found. The general morphological aspect of the plants is related to the *P. calamaria* group, but with floral color pattern resembling *P. faresiana* and never seen before in specimens of the former (Figure 1). Both species are known for the Serra do Espinhaço region and throughout some mountains in the Diamantina Plateau region. Herein, relying on morphological evidence, we present it as a new nothospecies, including a complete morphological description, a composite digital plate illustrating morphological details of the material, and a distribution map highlighting the nothospecies type locality and the parental species distribution, in addition to discussing morphological and taxonomic aspects of the novelty.

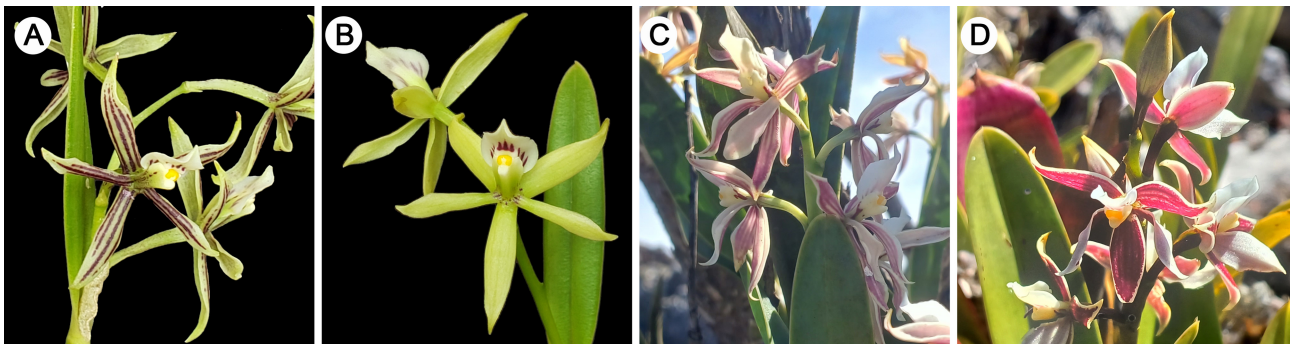


FIGURE 1. Flowers of the proposed new nothospecies and its putative parents. **A.** *Prosthechea* × *riopretensis* (material from São Gonçalo do Rio Preto, MG). **B.** *P. calamaria* (material from Serra da Bicha, Serro, MG). **C.** and **D.** Floral color variation in *P. faresiana* (both materials from São Gonçalo do Rio Preto, MG).

Material and methods

The site where the novelty was found is in the surroundings of Rio Preto State Park (Parque Estadual do Rio Preto), right on the border between the municipalities of São Gonçalo do Rio Preto and Felício dos Santos, state of Minas Gerais, Brazil (Figure 2). It is within the Diamantina Plateau region, which is a portion of the meridional subdivision of the Espinhaço mountain range situated northern of the Serra do Cipó and southern of the mountain complexes on the region of Itacambira, Botumirim and Grão Mogol, representing a region with high levels of floristic endemism (Rapini *et al.* 2002). The region is a mosaic of *campos rupestres* (rocky outcrops), seasonally dry tropical forests, and gallery forests, configuring the watershed of the São Francisco (west) and Jequitinhonha (east) River Basins (Saadi

1995). The climate on the Diamantina Plateau region is classified as warm temperate with dry winter (Cw) according to Kottek *et al.* (2006).

The type of vegetation where the new nothospecies was found is called “Capão de Mata”, which consists of small forest patches throughout the *campos rupestres* landscape on sites that can accumulate deeper soils, usually associated with terrain drainage but not configuring an actual gallery forest, and harbors a community with not very high trees, also treelets, shrubs, vines, climbers, and herbaceous species with preference for more shaded conditions when compared to the highly exposed areas on the quartzitic outcrops of the *campos rupestres* (Rizzini 1997, Coelho *et al.* 2017).

Relevant herbarium collections for the Espinhaço range and the Brazilian orchid flora were revised, including ALCB, AMES, BHCB, BM, BR, CEN, CEPEC, CESJ*, CVRD*, DIAM, ESA, F, FLOR*, FURB*, G*, HB, HDJF, HRB, HUEFS, IAN, INPA, K, MBM*, MBML*, MG, MO, NY, OUPR, P, R, RB, S*, SP, SPF, UB*, UEC, UPCB*, and W (acronyms according to Thiers 2024; those marked with “*” represent collections studied using high-resolution images available online). Our taxonomic decision of recognizing the novelty presented herein was based on the study of collections, protologues and field work observations. The morphological description was based on fresh material and was carried out using a stereomicroscope for analysis of morphological details, while measurement data was collected using caliper and ruler. Morphological terminology followed Radford *et al.* (1974), Dressler (1993), and Beentje (2016).

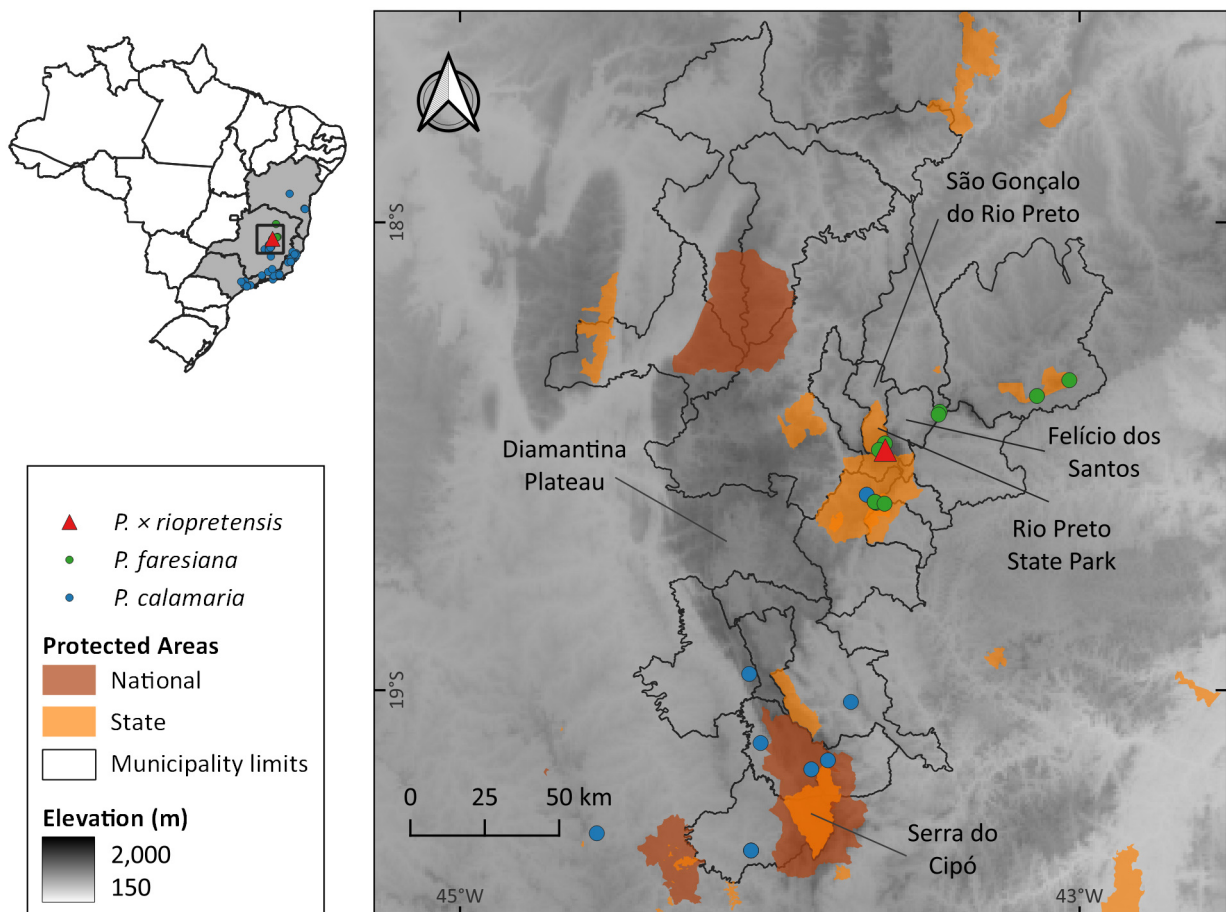


FIGURE 2. Map indicating the type locality of *Prosthechea xriopretensis* and known distribution of the putative parental species, *P. calamaria* and *P. faresiana*, highlighting the Diamantina Plateau region, in Minas Gerais, Brazil.

Taxonomy

Prosthechea xriopretensis T.L.Vieira & E.L.F.Menezes, *nothosp. nov.* (Figures 3–4)

Type:—BRAZIL. Minas Gerais: São Gonçalo do Rio Preto, capão na beira do parque, 1549 m a.s.l., 28 July 2023, fl., *E.L.F. Menezes 935* (holotype: HDJF [barcode 00010667]; isotypes: BHCB, BHZB, HUEFS).

A putative natural hybrid between *Prosthechea calamaria* and *P. faresiana* combining features of both parents, with shape and dimensions of both vegetative and floral traits reflecting the former, such as short plants (≤ 19 cm height) and inflorescences (≤ 7 cm long), and flowers with small ovate lips (blade ≤ 1 cm long), whereas the color of sepals and petals remarkably match with the latter, where the internal surface of sepals and petals are covered with vinaceous longitudinal stripes, representing a color pattern never seen within the floral variation of *P. calamaria*.

Description:—Epiphytic herb, rhizomatous, 11–19 cm height. *Rhizome* conspicuous, $2\text{--}2.5 \times 0.3\text{--}0.4$ cm. Roots white, glabrous, flexuous, ca. 2 mm diameter. *Pseudobulbs* green, heteroblastic, fusiform, smooth, stipitate, the base covered by scarious sheaths, $5.0\text{--}6.5 \times 0.6\text{--}0.8$ cm, 2-leaved. *Leaves* green, subcoriaceous, lanceolate or narrowly oblong, $6.5\text{--}12.0 \times 1.0\text{--}1.5$ cm, acute. *Spathe* conduplicate, elliptic, $1.0\text{--}1.2 \times 0.4\text{--}0.8$ cm, obtuse. *Inflorescence* erect, 6.0–7.0 cm long, 4–6-flowered; *bracts* deltoid or triangular, embracing the rachis and pedicel. *Flowers* non-resupinate, delicate, greenish white to yellowish, covered by vinaceous longitudinal stripes; *pedicel* + ovary greenish, narrowly oblong, $1.0\text{--}1.2 \times 0.3\text{--}0.4$ cm. *Sepals* greenish white to yellowish, covered by blurry longitudinal vinaceous stripes on internal surface; *dorsal sepal* lanceolate, $1.2\text{--}1.7 \times 0.3\text{--}0.5$ cm, acute or acuminate; *lateral sepals* oblong-lanceolate, slightly falcate, $1.2\text{--}1.7 \times 0.3\text{--}0.5$ cm, acuminate. *Petals* greenish white to yellowish, covered by blurry longitudinal vinaceous stripes on adaxial internal surface, oblanceolate, $1.0\text{--}1.5 \times 0.2\text{--}0.3$ cm, acuminate. *Lip* entire, clawed, white with vinaceous maculae surrounding the callus, the blade ovate, $0.7\text{--}1.0 \times 0.4\text{--}0.6$ cm, shortly acuminate; callus white, elevated, pad-like, pubescent at the base, ca. 4.5×2.2 mm. *Column* greenish at the base becoming whitish towards the apex, with some faint vinaceous dots and stripes on the dorsal side, shortly claviform, gibbous, $0.6\text{--}0.7 \times 0.3\text{--}0.4$ cm; *stigmatic cavity* obcordiform; *clinandrium* 3-toothed, all teeth acute, the midtooth eventually lacinate, and bearing a fleshy, knob-like, dorsal appendix. *Anther* yellow, obloid, ca. 1.1×0.9 mm; *pollinia* 4, yellow, discoid, laterally flattened. *Capsule* not seen in mature state, but green and triquetrous, as typical for the genus, while still on development.

Distribution and ecology:—*Prosthechea ×riopretensis* is known only from the type locality in the surroundings of Rio Preto State Park (Parque Estadual do Rio Preto), municipality of São Gonçalo do Rio Preto, Minas Gerais, Brazil. It was found in a forest patch (capão de mata) associated to *campos rupestres* formations, at an elevation of ~ 1500 m a.s.l., occurring as epiphyte. Regarding the putative parents, *Prosthechea calamaria* occurs in the Espinhaço Range inhabiting both forests and *campos rupestres* formations, with records concentrated in the Serra do Cipó region. Although there are no herbarium records of the species from Rio Preto State Park or surroundings, a field observation at Serra da Bicha, within the Diamantina Plateau at the municipality of Serro, is confirmed by one of the authors (ELFM). *Prosthechea faresiana* is usually found only on the exposed quartzitic outcrops of the *campos rupestres*, generally as a litophyte, and seems to be endemic to the Diamantina Plateau region (Figure 2). We could just find one hybridization zone, which corresponds to the forest patch (capão de mata) of the type locality. Unfortunately, there is no available information about pollinators for either the new nothospecies or its putative parents.

Prosthechea ×riopretensis was found flowering *in situ* in July, whereas in cultivation it flowered from April to July with some plants starting to develop fruits in May. Regarding the putative parents, herbarium records of *P. calamaria* in the Espinhaço Range indicate flowering period ranging from May to September, with fruits in September as well, whereas in *P. faresiana* the flowering goes from April to October, with no herbarium specimens presenting fruits among the examined material.

Etymology:—The epithet “*riopretensis*” refers to the municipality of the type locality, São Gonçalo do Rio Preto.

Taxonomic discussion:—We are proposing the taxon as a natural hybrid considering its morphological features, matching with two other species of the genus that occur in the region: *Prosthechea calamaria* and *P. faresiana*. The shape and dimensions of both vegetative and floral traits of the new nothospecies overlap with the former, whereas its floral color pattern remarkably match with the latter. Noteworthy, this floral color pattern has never been seen in *P. calamaria* across its distribution. *Prosthechea ×riopretensis* can be distinguished from *P. calamaria* by the color of the flowers (sepals and petals covered by vinaceous stripes on the internal surface vs. entirely white or creamish white, eventually vinaceous maculate at the base), and from *P. faresiana* mostly by plant size (≤ 18 vs. ≥ 20 cm height), pseudobulb diameter ($0.6\text{--}0.8$ vs. $1.8\text{--}2.3$ cm), leaf width (≤ 1.5 vs. ≥ 2.0 cm), inflorescence length (≤ 7.0 vs. ≥ 12.5 cm), petal width (≤ 3 vs. ≥ 5 mm), and lip’s blade shape and width (ovate, $0.4\text{--}0.6$ cm width vs. widely obovate or subcircular, $0.8\text{--}1.0$ cm width). A full comparison of the main vegetative and floral traits in *P. ×riopretensis* and its putative parents is presented on Table 1.

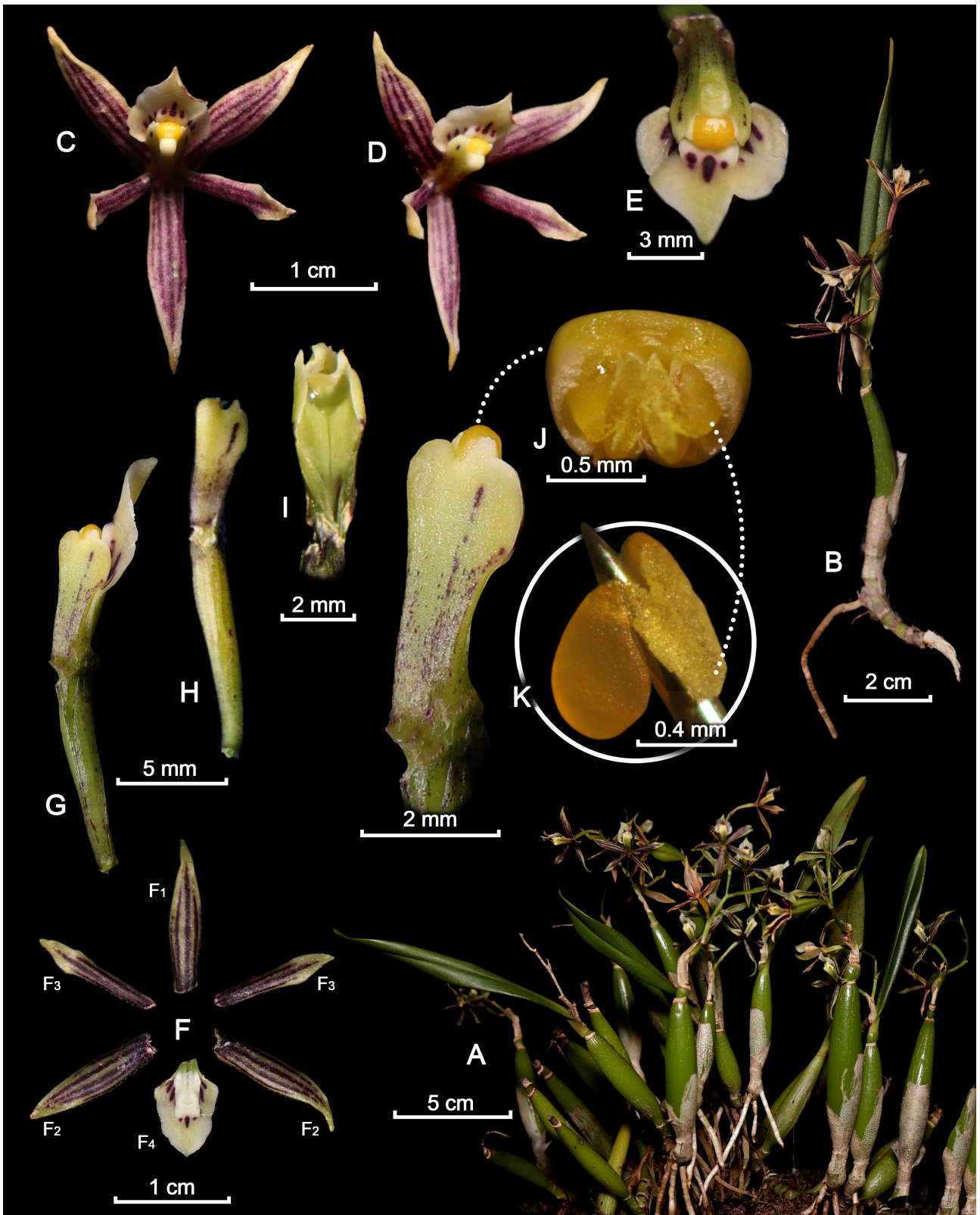


FIGURE 3. Composite Digital Plate of *Prosthechea xriopretensis*. **A.** Habit. **B.** Detail of a sympodium bearing an inflorescence. **C.** Flower, frontal view. **D.** Flower in $\frac{3}{4}$ view. **E.** Detail of the column and lip in front view. **F.** Floral dissection: F1. Dorsal sepal; F2. Lateral sepals; F3. Petals; F4. Lip. **G** and **H.** Lateral view of the pedicel+ovary and column with and without lip attached, respectively. **J.** Detail of the anther cap. **K.** Detail of the pollinia. (Designed by JV).



FIGURE 4. Holotype sheet of *Prosthechea xriopretensis*. Courtesy of the herbarium HDJF.

Additional specimens examined:—*Prosthechea calamaria*—BRAZIL. Minas Gerais: *sine loco acurato*, 1934, fl., *s. leg.* (RB, barcode 00259528); Conceição do Mato Dentro, Parque Natural Municipal do Ribeirão do Campo, 23 April 2003, fl., *R.C. Mota et al. 2560* (BHCN); Jaboticatubas, Serra do Cipó, 3 May 2005, fl., *A.P.P. Barbero 32* (SP); *ibid.*, 5 July 2006, fl., *A.P.P. Barbero 45* (SP); *ibid.*, 5 July 2006, fl., *A.P.P. Barbero 44* (SP); *ibid.*, 12 July 1940, fl., *M. Foster & R. Foster 619* (AMES); *ibid.*, fl. in cult., July 2018, fl., *T.L. Vieira 467* (HUEFS); Santana de Pirapama, Serra do Cipó, acesso pela Faz. Inhame, trilha da senhorinha, 28 February 2009, fl., *D.C. Zappi et al. 1672* (RB, SPF);

Juiz de Fora, 1879, fl., *R.F.H. Wawra 173a* (W); Ouro Preto, Campo Grande, *s.d.*, fl., *s. leg.* (OUPR 8736); Rio Preto, Serra Negra, trilha para o Burro de Ouro, 21 May 2006, fl., *A.L. Santiago 3* (CESJ); Santana do Riacho, Serra do Cipó, 10 April 1980, fl., *F. de Barros 224* (SP); Serra do Cipó, estrada MG-010 ca. 400 m antes da bifurcação entre o Morro do Pilar e Conceição do Mato Dentro, 22 September 1993, fr., *M.T.V.A. Campos & E.D.P. de Souza CFSC13396* (SP, SPF); PARNA Serra do Cipó, próximo à estrada do Juquinha, 13 June 2009, fl., *J.E.Q. Faria et al. 543* (UB); Sete Lagoas, Serra do Cipó, *s.d.*, st., *s. leg.* (RB); Serra do Cipó, 20 June, fl., *L. Damazio s.n.* (RB).

TABLE 1. Main vegetative and floral features of *Prosthechea ×riopretensis* and its putative parents: *P. calamaria* and *P. faresiana*.

	<i>Prosthechea ×riopretensis</i>	<i>P. calamaria</i>	<i>P. faresiana</i>
Life form	Epiphytic	Predominantly epiphytic	Predominantly litophytic
Growth	Predominantly rhizomatous	Predominantly rhizomatous	Predominantly caespitose
Plant height	11–19.0 cm	10–18.4 cm	20–40 cm
Pseudobulb shape	Fusiform	Fusiform	Ovoid or pyriform
Pseudobulb's surface	Smooth	Smooth	Generally rugose, striate
Pseudobulb dimensions	5–6.5 × 0.6–0.8 cm	3–6.5 × 0.4–0.8 cm	5–10 × 1.8–2.3 cm
Leaf shape	Lanceolate or narrowly oblong	Lanceolate or linear	Narrowly elliptic or narrowly oblong
Leaf dimensions	6.5–12 × 1–1.5 cm	5.4–13 × 0.5–1.1 cm	8.4–19.7 × 2–2.7 cm
Spathe length	1–1.2 cm	1.3–1.8 cm	3–4.1 cm
Inflorescence length	6–7 cm	3.2–5 cm	12.5–25.4 cm
Number of flowers per inflorescence	4–6	3–5	3–6
Sepals and petals color	Greenish-white to yellowish, covered by blurry longitudinal vinaceous stripes on the internal surface	White to greenish-white or cream, eventually maculate with vinaceous at the base	White to cream, densely covered by longitudinal vinaceous stripes on the internal surface, or eventually fully covered
Sepals shape	Lanceolate or oblong-lanceolate, apex acute or acuminate	Lanceolate, apex acute or acuminate	Lanceolate or narrowly elliptic, apex acuminate
Sepals' dimensions	1.2–1.7 × 0.3–0.5 cm	1.1–1.3 × 0.2–0.3 cm	1.7–2.1 × 0.5–0.7 cm
Petals shape	Oblanceolate	Oblanceolate or narrowly oblong	Narrowly elliptic or obovate
Petal's dimensions	1–1.5 × 0.2–0.3 cm	1–1.1 × 0.2 cm	1.4–2 × 0.5–0.8 cm
Lip color	White with vinaceous macules surrounding the callus	White to cream, with vinaceous stripes surrounding the callus or concentrated at the apex of the callus	White with vinaceous spots and macules surrounding the callus
Lip's blade shape	Ovate	Ovate or lanceolate	Widely obovate or subcircular
Lip's blade dimensions	0.7–1 × 0.4–0.6 cm	0.7–0.8 × 0.3–0.6 cm	1–1.1 × 0.8–1 cm
Pedicel+ovary length	1–1.2 cm	0.7–1.4 cm	1.4–1.6 cm
Column dimensions	0.6–0.7 × 0.3–0.4 cm	0.5–0.6 × 0.2–0.3 cm	0.8–0.9 × 0.4 cm

Prosthechea faresiana—BRAZIL. *Sine loco acurato*, ex hort, *s.d.*, *J.L.S. Mayer s.n.* (UEC); Minas Gerais: Grão Mogol, Parque Estadual Grão Mogol, Trilha do Barão, 16 January 2018, fl., *M. Bocayuva & H. Rocha 279* (RB); Itamarandiba, Parque Estadual da Serra Negra, 13 September 2006, fl., *R.C. da Mota et al. 3088* (BHCB); trilha de subida para as torres de transmissão, 1490 m, 22 March 2007, fl., *J.A.N. Batista et al. 2039* (BHCB, CEN); Rio Vermelho, Pedra Menina, platô, 9 September 1986, fl., *R. Mello-Silva et al. CFGR10271* (HUEFS, SPF); Santo Antônio do Itambé, Pico do Itambé, 10 July 1973, fl., *A. Fares s.n.* (HB52485 [HT]); *ibid.*, 1850 m, October 1972, fl., *A. Fares s.n.* (HB 58325); *ibid.*, 1600 m, 5 October 1974, fl., *A. Ghillany s.n.* (HB 61108); *ibid.*, 7 April 1998, fl., *V.C. Souza et al. 21087* (ESA); São Gonçalo do Rio Preto, Lapa do Alirio, 1526 m, 29 July 2023, fl., *E.L.F. Menezes 940* (HDJF); P.E. do Rio Preto, 10 May 2004, fl., *P.L. Viana et al. 1794* (BHCB).

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