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Taxonomic notes on *Catasetum meeae* (Orchidaceae: Catasetinae)

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Abstract

In this study we propose to treat *Catasetum meeae* and *C. lendarium* as conspecific based on distinctive features identified in the protologues of both species. We emphasize that *C. meeae* was never collected again after its description in the 1960s. Here we also invalidate the name *C. lendarium* because its original description is not in accordance with the Shenzhen Code. We provide a brief taxonomic discussion for the taxon, as well as photographs and information related to distribution and ecology. At this stage the species is evaluated as belonging to the Endangered (EN) category according to IUCN criteria.

Key words: Amazon basin, Amazonas, Içana River, orchid, taxonomy

Introduction

Catasetum Richard ex Kunth (1822: 330) is a genus belonging to the subtribe Catasetinae and has high species richness (Chase *et al.* 2015). To date, it comprises 189 accepted species (Krahl *et al.* 2022a, b, Govaerts *et al.* 2023, Krahl *et al.* 2023a, b) and 35 natural hybrids (Krahl *et al.* 2020, Cantuária *et al.* 2021, Govaerts *et al.* 2023, Krahl *et al.* 2023). However, we think that these estimations will change with a better analysis and taxonomic evaluation of the taxa (see Krahl *et al.* 2023). The genus is Neotropical, occurring from Mexico up to southern Brazil and northern Argentina (Romero & Jenny 1993, Romero & Carnevali 2009). The Amazonian basin is the diversification center of the genus (Romero & Carnevali 2009) and many species occur in the Brazilian Amazon (Silva & Silva 1998, Petini-Benelli 2023).

The genus includes several interesting species among which *Catasetum meeae* Pabst (1967: 64), which stands out for being a rare species of the Brazilian Amazon, collected by the great botanical illustrator Margaret Mee, to whom Guido F. J. Pabst paid homage when he described the species in the 1960s (Pabst 1967). After its collection at the Içana River in the Northeast of the state of Amazonas (Brazil, near the border with Colombia) and its following description, the species was never again collected or recorded. The only available material is the holotype deposited in the herbarium HB (acronym according to Thiers 2023), the Pabst's protologue and the watercolor made in the 1960s and deposited together with the holotype (Figure 1). We analysed all this material during the preparation of an updated list of Orchidaceae in the state of Amazonas (project "Flora do Amazonas: Orchidaceae").

FIGURE 1. Photograph of the watercolor of *C. meeae* made by Margaret Mee in the 1960s, which is deposited together with the holotype in the HB herbarium at the Universidade do Estado do Rio de Janeiro (UERJ). Photograph by G.A. de Queiroz.

After having analyzed Blind's study (2020), we compared the original description, illustration, photos and live specimens of *C. lendarium* Blind (2020: 135) from the municipality of Presidente Figueiredo (exact location unknown) to the original material of *C. meeae* and we concluded that they are conspecific. Therefore, in this work we propose the synonymization of the two taxa, in addition to invalidating the name *C. lendarium* due to the fact that its description is not in accordance with the International code of nomenclature for algae, fungi, and plants (Shenzhen Code) (Turland *et al.* 2018).

Material and methods

The holotype of *C. meeae* was analyzed using photographs provided by our partners who visited and consulted the material in the HB herbarium (acronym according to Thiers 2023) at the "Universidade do Estado do Rio de Janeiro" (UERJ). With regard to *C. lendarium*, Blind (2020) confusingly and erroneously mentions two materials as holotypes from different locations according to the mentioned coordinates. One, according to him, is deposited in the HUAM herbarium (acronym according to Thiers 2023), however this material was not located by our team and neither by the responsible curator, in addition to there being no entry data for the material. The second material, according to him, was deposited in a non-indexed herbarium called "Herbário Horticultural OE" whose acronym would be "HOE" (not indexed in Thiers 2023, nor in the Catalog of the Brazilian Herbarium Network available in https://www.botanica.org.br/catalogo-da-rede-brasileira-de-herbarios/ and accessed on 15 july 2023). However, despite our exhaustive attempts, this herbarium was not located and all our consulted partners are unaware of its existence and location. Furthermore, Blind (2020) listed isotypes of *C. lendarium*—which should have been paratypes—without mentioning the herbarium where they would have been deposited. We were unable to find these materials and suppose that they have not been herborized. Consequently, it was not possible to analyze any of the materials cited by Blind (2020).

We also analyzed the protologues and illustrations of both taxa, as well as two live specimens of *C. lendarium* from the municipality of Presidente Figueiredo (exact location unknown). We emphasize that of the two live specimens, only one is being cultivated by us in a private greenhouse, while the other individual was lost due to pathogen attack. Digital images were made with a CANON T5 camera equipped with a CANON EFS 18–55mm lens and the geographic distribution map was created using the QGis 3.28 Firenze program (Datum: SIRGAS 2000 / EPSG: 4674). The Extent of Occurrence (EOO) and the Area of Occupancy (AOO), two parameters used in the process of evaluating the conservation status, were calculated using the on-line platform Geospatial Conservation Assessment Tool (GeoCAT—http://geocat.kew.org/). The AOO was scaled using 2 × 2 km grid cells (Bachman *et al.* 2011). The conservation status was evaluated in accordance with the criteria of IUCN (2022).

We propose here to synonymize *C. lendarium* under *C. meeae* since both taxa share the same diagnostic characters, such as, for example, a conical lip with a ridge of calluses running from the base to the bottom of the lip cone, among others. Moreover, the name *C. lendarium* is invalid because the author did not provide a Latin or English diagnosis, nor a reference to a previously and effectively published description, which violates the articles 38 and 39 of the Shenzhen Code (Turland *et al.* 2018).

Taxonomy

Catasetum meeae Pabst (1967: 64) (Figure 2)

Type:—BRAZIL. Amazonas: Baixo Rio Içana, Floruit in cult., July 1965, *Margareth Mee 105* (holotype: HB000041439, photograph!).

= *Catasetum lendarium* Blind (2020: 135), *nom. inval.*, ***syn. nov.***

Type:—BRAZIL. Amazonas: Presidente Figueiredo, rural area, near the lake of the Balbina hydroelectric, 173 m a.s.l., 23 december 2014, 1°45'27"S, 60°37'24"W, *A.D. Blind HOE0201A*; 03 Jan 2018, *E.J. Blind HOE0302B* (syntypes: HUAM and HOE—not located).

Distribution and ecology:—*Catasetum meeae* is restricted to the state of Amazonas, occurring along the banks of the Içana in the municipality of São Gabriel da Cachoeira (according to Pabst 1967), and in the municipality of Presidente Figueiredo (according to Blind 2020), where it was found along the lake of Balbina and in an area of dense forest located at a few kilometers to the north of Presidente Figueiredo (in rural area) and at the right side of the highway BR-174, which connects the municipalities of Manaus and Boa Vista (Figure 3). According to Pabst (1967) the species was in flowers in July. Blind (2020) stated that the species blooms between January and April. This period coincides

with the rainy season of the region (Braga 1977, 1982). From our personal observations, an individual bloomed in ex situ cultivation between April and May. This individual was cultivated by us in a private greenhouse.

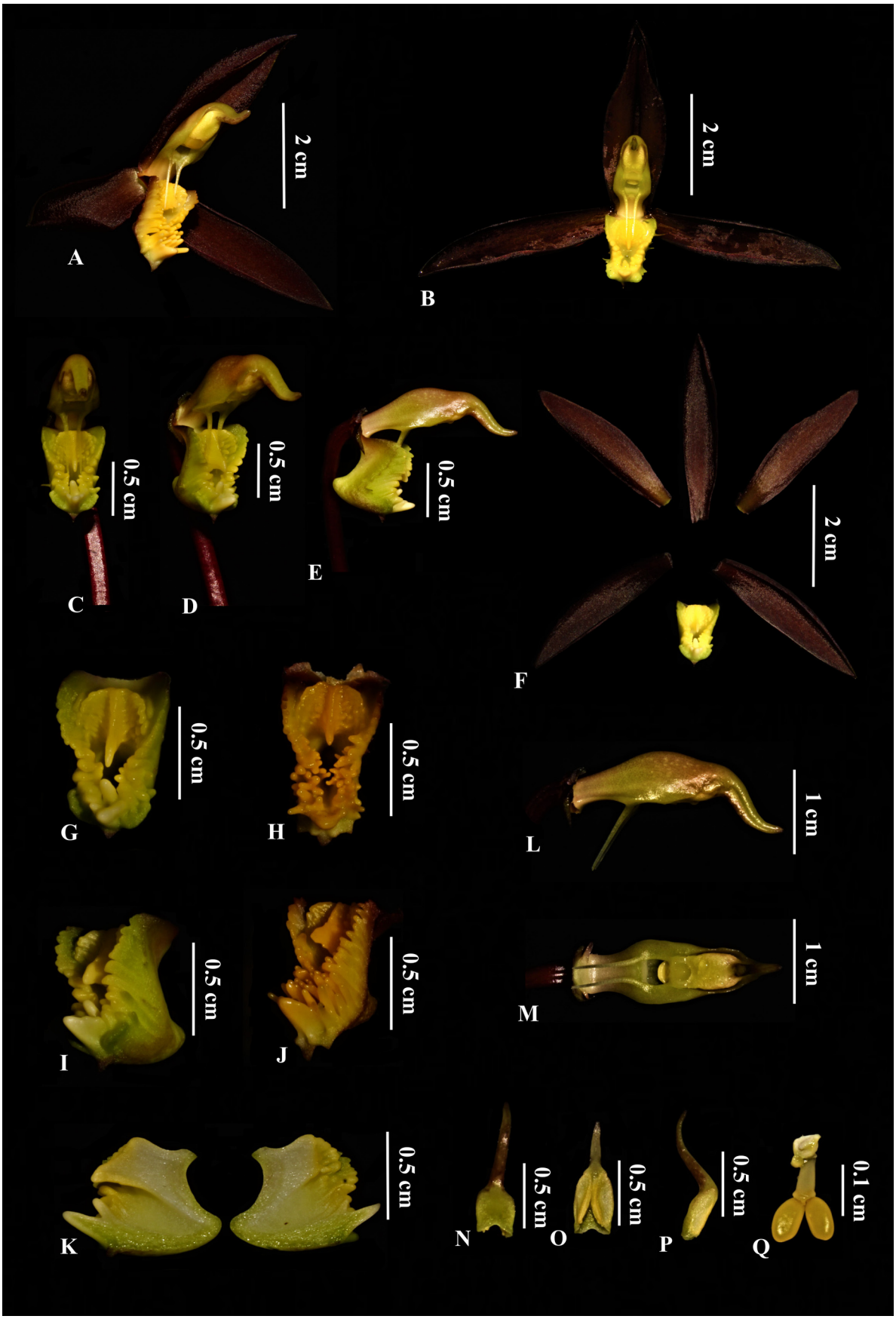

FIGURE 2. *Catasetum meeae*. **A–B.** Flower. **C–E.** Pedicel, column and lip. **F.** Floral segments. **G–J.** Lip. **K.** Longitudinal section of the lip. **L–M.** Column. **N–P.** Anther cap. **Q.** Pollinarium. Photographs by A.H. Krahl.

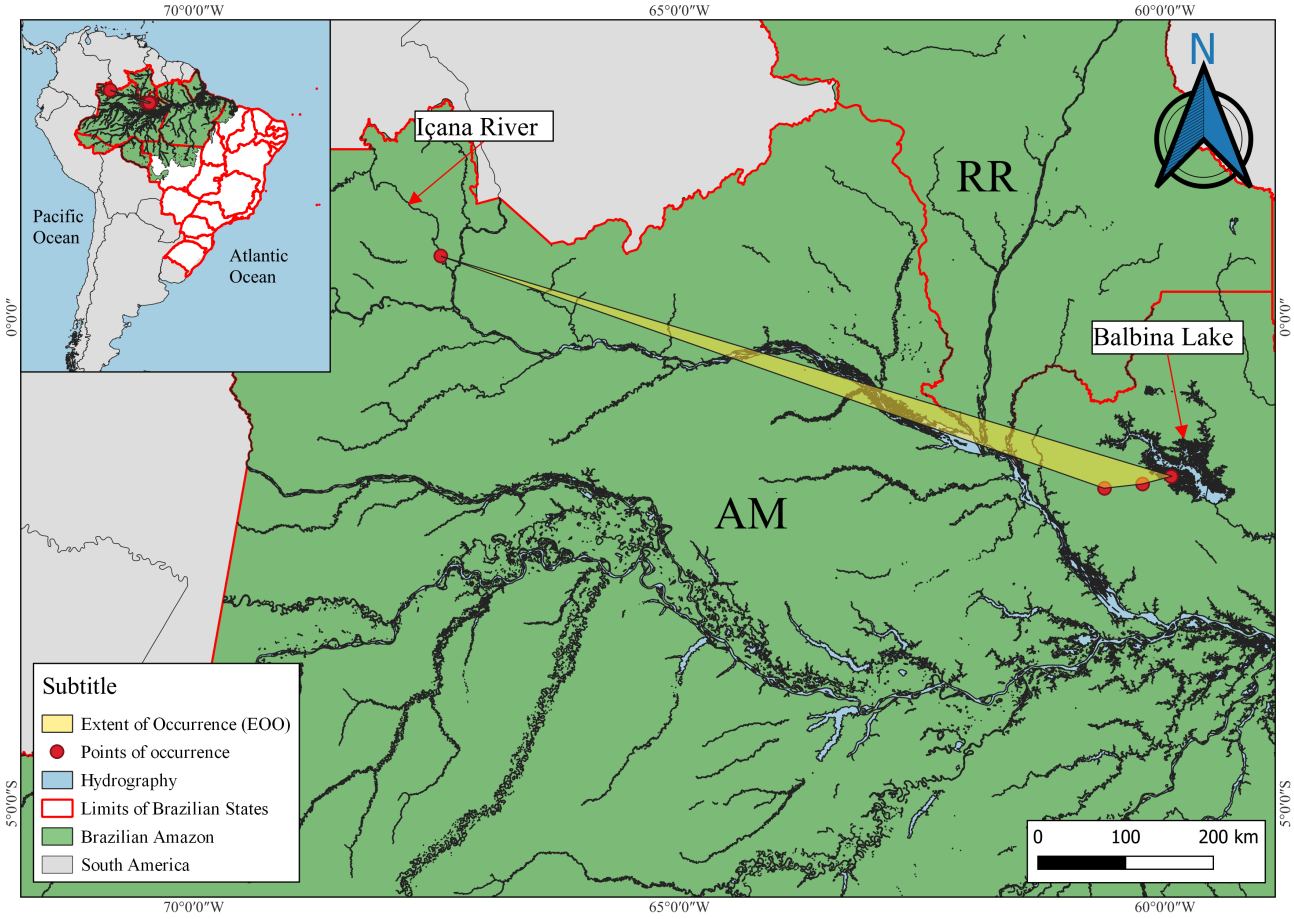

FIGURE 3. Geographic distribution map of *Catasetum meeae*. Map made by A.H. Krahl.

Conservation status:—The Extent of Occurrence (EOO) was estimated at 15,458.916 km² and the Area of Occupancy (AOO) at 16.000 km². According to the criteria defined in IUCN Guidelines (IUCN 2022), the threshold for Endangered category (EN) is met in terms of AOO. Besides (1) the species is known only from 4 locations (EN category—criterion Ba) and (2) continuing deforestation leads to a continuing decline observed and projected in AOO (criterion Bb[ii]) whereas illegal trade of plants and even illegal predatory collection by orchid lovers for cultivation purposes together with deforestation allow us to infer continuing decline in the total number of individuals (criterion Bb[v]). Finally the taxon may be treated as Endangered (EN category—criterion B2ab[ii, v]. The global population (as defined in IUCN Guidelines art. 4.1) is evaluated at less than 50 mature individuals, which corresponds to the Critically Endangered (CR) category (criterion D). However, this estimation should be confirmed before the category of threat is increased.

Taxonomic Discussion:—Pabst (1967) stresses that the distinctive character of *C. meeae* compared to the other related species is the conical lip furnished with a ridge of callosities running from the base to the bottom of the lip cone, character also present in *C. lendarium* (see Figure 2). In addition, other characteristics shared by both taxa can be mentioned, such as erect or slightly arched few-flowered (4–5 flowers) inflorescence, lanceolate floral bracts, straight or slightly sinuous pedicel, oblong-lanceolate dark purple sepals, lanceolate petals with the same color as the sepals, yellowish lip with an apiculate apex and margin endowed with ornamentation.

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of *C. meeae* that is deposited together with the holotype of the species in the HB herbarium at the "Universidade do Estado do Rio de Janeiro" (UERJ). We are also grateful to the "Mineração Rio do Norte" (MRN) for support and logistics offered to J.B.F. da Silva.

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