

## *Epidendrum luizae* (Orchidaceae, Laeliinae), a new species from Brazilian Amazon of the *Nocturnum* group

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### Abstract

In the present work, a new *Epidendrum* species, belonging to the *Nocturnum* group and native to the Brazilian Amazon, more precisely of the state of Amazonas, is proposed. A detailed morphological description is given as well as a composite photographic plate and comments on the habitat, distribution and phenology of the species. The new entity is also compared to its closest relatives, *E. bahiense*, *E. dayseae*, *E. krukoffii* and *E. longicolle*.

### Résumé

Dans cette étude nous proposons une nouvelle espèce d'*Epidendrum* du groupe *Nocturnum* d'Amazonie brésilienne, et plus précisément, de l'état d'Amazonas. Une description morphologique détaillée, accompagnée d'une planche photographique, en est donnée. Des commentaires sur l'habitat, la distribution et la phénologie sont également fournis. Le taxon est en outre comparé aux espèces voisines : *E. bahiense*, *E. dayseae*, *E. krukoffii* et *E. longicolle*.

## Resumo

Este estudo propõe uma nova espécie de *Epidendrum* do grupo Nocturnum para a Amazônia brasileira, mais especificamente para o Estado do Amazonas. É fornecida uma descrição detalhada da nova espécie, bem como uma prancha fotográfica, além de comentários referentes ao habitat, distribuição e fenologia. É feita também uma comparação com as espécies relacionadas, sendo elas, *E. bahiense*, *E. dayseae*, *E. krukoffii* e *E. longicolle*.

**Key words:** Amazon basin, biodiversity, orchid, epiphyte, taxonomy.

**Mots clés:** Bassin amazonien, biodiversité, orchidée, épiphyte, taxonomie.

**Palavras-chave:** Bacia amazônica, biodiversidade, orquídea, epífita, taxonomia.

## Introduction

*Epidendrum* Linnaeus (1763: 1347), belonging to the subtribe Laeliinae, is one of the larger genera (in species number) in Orchidaceae (Hágsater & Soto-Arenas, 2005; Chase *et al.*, 2015). *Epidendrum* is widely distributed in the Neotropics, from USA (North Carolina) south to northern Argentina in South America (Hágsater & Soto-Arenas, 2005). It comprises over 1800 species and nine natural hybrids (according to Govaerts *et al.*, 2021), but the first figure could reach ca. 2400 (Hágsater *et al.*, 2016).

*Epidendrum* members grow in a wide range of habitats and are mostly epiphytic however terrestrial and lithophytic species are also observed (Dodson, 2001; Hágsater & Soto-Arenas, 2005; Chase *et al.*, 2015). The species have a sympodial growth mode, sometimes monopodial, a stem usually cane-like, sometimes thickened into a pseudobulb. The inflorescence can be apical, lateral or, rarely, basal, racemose or paniculate, rarely 1-flowered; a new inflorescence can be produced from an old one, producing with time a pluri-racemose structure. Flowers are resupinate or not. Lip base is fused to the column (or gynostemium) in most members, although it can be entirely free in some species. With this joining of lip and column we can observe the formation of a tube parallel to the ovary, so-called cuniculus, that can be nectar-bearing or not. The lip can be entire or divided into 3 or 4 lobules and present various kinds of callosities, or not, most commonly made of two basal globose calli with or without a mid-rib. The column can occasionally

be winged; the anther is dorsal and contains a pollinarium with usually 4 pollinia, rarely 2 or 8. The stigma is ventral, and the rostellum usually slot-shaped (Dodson, 2001; Hágsater & Soto-Arenas, 2005).

The genus is considered as monophyletic (Hágsater & Soto-Arenas, 2005), however it is divided into different informal groups on the basis of vegetative characters (Hágsater, 1984; Hágsater & Salazar, 1990; 1993; Hágsater *et al.*, 1999; Hágsater & Sánchez-Saldaña, 2001; 2004; 2006; 2007; 2008; 2009; 2010; 2013; 2015; 2016; Hágsater & Santiago, 2018a; 2018b; 2019; 2020a; 2020b; 2021). Among these informal groups proposed by Hágsater (1984), the *Nocturnum* group (Hágsater *et al.*, 1999) is characterized by presenting star-shaped flowers usually pollinated by moths, the inflorescences being apical, racemose, producing one flower at a time with new racemes usually produced from the same peduncle in successive years (Hágsater & Soto-Arenas, 2005; Moosburg *et al.*, 2014).

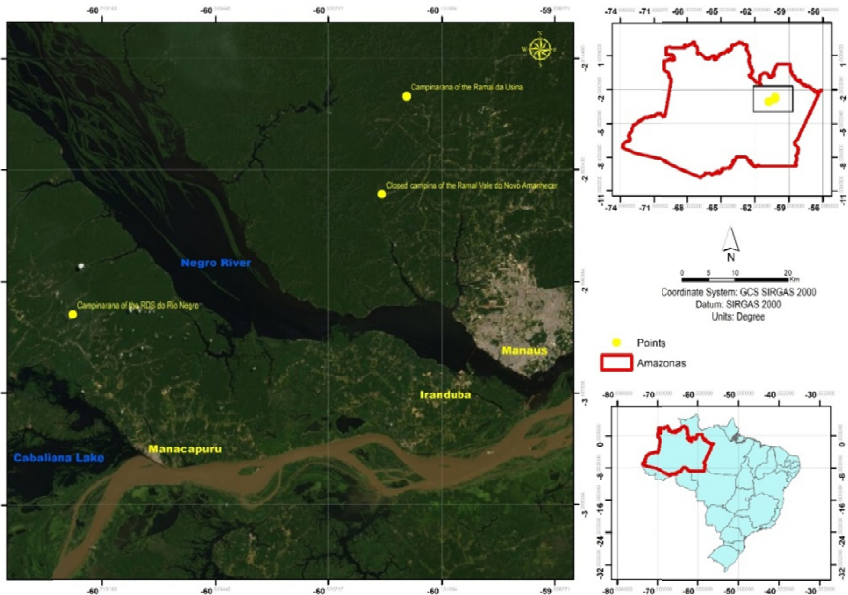
The *Nocturnum* group is widespread from Florida to Brazil and Bolivia (Hágsater & Soto-Arenas, 2005). It produces sympodial, cespitose plants with stems cane-like; the flowers are borne in succession by short racemes on the same stem during several years, new racemes are produced from the internodes of earlier racemes with time (Hágsater *et al.*, 1999; Krahl *et al.*, 2022).

According to Pessoa (2020), 131 species of *Epidendrum* (of which 65 are endemic taxa) have been recorded in Brazil whereas 56 are present in the Brazilian Amazon Basin. The state of Amazonas records only 41 species (Pessoa, 2020). Recently the Amazonian orchid richness increased with the discovery of an undescribed *Epidendrum* species of the *Nocturnum* group from the Amazonas state. In this context, the present work aims to propose a new taxon at the specific rank, to describe it and to compare it to its close sympatric relatives.

## Material and methods

The specimens have been found during expeditions in different environments composed of *campina* and *campinarana* (sandy soil environments – see Anderson, 1891), in the municipalities of Manaus and Iranduba, Amazonas (2°40'46.90"S, 60°11'32.03"W / 2°50'51.41"S, 60°14'03.90"W / 3°03'10.46"S, 60°45'43.91"W). Fig. 1. Material was collected and pressed according to the usual process described

in Mori *et al.* (1989), and later included in the collections of INPA (all acronyms cited in this section according to Thiers, 2021).



**Fig. 1:** Map with the occurrence points of *Epidendrum luizae*.

The specimens were compared to illustrations and descriptions available in literature (e.g. Schweinfurth, 1959; Dunsterville & Garay, 1959; 1961; 1965; 1966; 1972; 1976;; Hågsater & Salazar 1990; 1993; Hågsater *et al.*, 1999; Hågsater & Sánchez-Saldaña, 2001; 2004; 2006; 2007; 2008; 2009; 2010; 2013; 2015;- 2016; Carnevali *et al.* 2003; Hågsater & Santiago, 2018a; 2018b; 2019; 2020a; 2020b;- 2021). AMO Database (AMO-DATA) has also been used for specimens preserved at AMES, AMO, B, BM, C, CEN, CESJ, EAN, F, G, GH, HB, HBR, IAN, IBGE, INPA, K, L, LE, LL, M, MEXU, MG, MO, NY, P, RB, RENZ, S, SP, U, UB, UC, UFP, US, VEN, W, WU and Z. We also consulted virtual herbaria available on the Internet at <https://www.gbif.org/> (retrieved on 17/07/2021). Terminology used here follows Dressler (1993) and Harris & Harris (2001). The new taxon was compared with species of long cane-like stems and rather narrow leaves, especially *Epidendrum bahiense* Reichenbach f. (1859: 53), *Epidendrum dayseae* Krahl & Hågsater (in Krahl *et al.* 2022: 97), *Epidendrum kruckoffii* Hågsater, Cordeiro &

Krahl (in Hágsater & Santiago, 2021: pl. 1877) and *Epidendrum longicolle* Lindley (1838: 34) as described in Hágsater & Sánchez (2010, pl. 1350).

The Extent of Occurrence (EOO) and 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/>). AOO was scaled using  $2 \times 2$  km grid cells as recommended by the International Union for Conservation of Nature (IUCN) (IUCN, 2019; Bachman *et al.*, 2011). The conservation status was evaluated in accordance with the criteria of IUCN (2019).

## Taxonomic treatment

*Epidendrum luizae* Krahl, Hágsater & Chiron, *sp. nov.*

Types: Brazil, Amazonas, Manaus, Ramal da Usina, km 7, campinarana, 62 m a.s.l., 09/VII/2021, *A.H. Krahl 1603* (holotype INPA; Composite plate voucher); Ramal Vale do Novo Amanhecer, ao lado do Sítio Toca da Onça, campina fechada, 44 m a.s.l., 26/III/2018, *A.H. Krahl 602* (paratype INPA); *Iran duba*, Reserva de Desenvolvimento Sustentável do Rio Negro, Rodovia AM-352, km 33, Ramal do Mineiro, campinarana, 61 m a.s.l., 23/III/2019, *A.H. Krahl & D.R.P. Krahl 1152* (paratype INPA); *ibid.*, 16/VII/2019, *D.R.P. Krahl & A.H. Krahl 563* (paratype INPA).

*Herba ad Epidendrum gregem Nocturnum pertinens caule longo multifoliato, foliis angustis ellipticis, floribus medianis vel grandis, sepalis petalisque lineare-lanceolatis acuminatis, labello trilobato, lobis lateralibus hemi-ovatis acuminatis, lobo mediano quam lobis lateralibus majore, lineare acuminato, columnae dorso roseo, divergens. Epidendrum bahiense similis est sed caulis longioribus, foliis longioribus latioribusque, ovario longiore, floribus majoribus, differt.*

**Description:** Epiphytic, sympodial, cespitose, erect herb, 20–40 cm high excluding flowers. Roots basal, 0.2–0.4 cm in diameter, white. Stem simple, terete at base then slightly compressed towards apex,  $15.5\text{--}32.5 \times 0.3\text{--}0.4$  cm, covered by green leaf sheaths. Leaves 7–11, distichous distributed along apical 2/3 of stem, basal ones shorter than apical ones; leaf sheaths  $1.5\text{--}3.0 \times 0.3\text{--}0.4$  cm, tubular; leaf blade  $6.2\text{--}12.5 \times 1.0\text{--}1.6$  cm, narrowly elliptic, acute, sub-coriaceous, medium green on both sides, margins entire, spreading. Spathe absent. Inflorescence apical, pluri-racemose, short, 8.5–9 cm long including the flowers, 1–3-flowered, with one flower at a time,

flowering from same inflorescence during several years, so that it becomes pluriracemose; peduncle and rachis visible; peduncle ca. 1.7 cm long, terete; rachis ca. 1 cm long. Floral bracts deltoid, 0.5-0.8 × 0.3-0.5 cm, much shorter than ovary, visible, acute. Ovary 4.8-5.9 cm long, longer than sepals, not inflated, unornamented, slightly sulcate. Flower successive, resupinate, sepals and petals pale yellow-green, lip creamy white, calli deep yellow, column dorsally pink to wine-red and ventrally cream colored; nocturnally fragrant; autogamy not frequent. Dorsal sepal 3.6-4.1 × 0.4-0.5 cm, spreading, linear-lanceolate, acuminate, symmetrical, 6-veined with additional secondary veins, margin entire revolute. Lateral sepals 3.6-4.0 × 0.6-0.7 cm, spreading, linear-lanceolate, acuminate, asymmetrical, slightly recurved at apex, 7-veined with additional secondary veins, margin entire, revolute. Petals, 3.5-3.9 × 0.2 cm, spreading, linear-lanceolate, acuminate, symmetrical, straight, 5-veined, margin entire, slightly revolute. Lip 2.9-3.6 × 1.1-1.8 cm, fused to the column, trilobed, base truncate to rounded, disc bicallose, calli blade-like, 0.4-0.5 cm long, rounded, prominent, divergent; lateral lobes 1.1-1.8 × 0.5-0.7 cm, hemi-ovate, acuminate, asymmetrical, inner margin straight; mid-lobe 1.9-2.2 × 0.2 cm, linear-lanceolate, acuminate, symmetrical, straight, not fused to the lateral ones. Column 1.7-1.9 cm long, slightly arched, dilated towards apex, apex oblique; clinandrium-hood deeply emarginate, proximal margin spicate, distal margin undulate; anther trapezoid with convex sides, the upper and lower sides sinuate, 4-celled; pollinia 4, semi-orbicular, the inner margins straight, strongly laterally compressed; caudicles soft and granulose, in 2 pairs, longer than pollinia, viscidium semi-liquid; rostellum apical, slot-shaped; lateral lobes of stigma very short; nectary 2.3-2.5 cm long penetrating 1/2 to 2/3 of ovary, unornamented. Fruit 4-5 × 1.5-2.0 cm; pedicel 1.5-0.2 cm, thin, body 1.5 × 1.2-2.0 cm, ellipsoid, centered, occupying about 1/3 the length; apical neck 1.2 × 0.3 cm. Fig. 2.

**Distribution and habitat:** this new species is not frequent, and is presently known in *campina* and *campinarana* vegetation (white sand vegetation), associated with the Rio Negro basin, particularly in the municipalities of Manaus and Iranduba, in the state of Amazonas, Brazil. It grows principally on scleromorphic trees (Macucu – *Aldina heterophylla* Spruce ex Benth (1870:13) / Fabaceae).

**Phenology:** *Epidendrum luizae* flowers from March to July, the period when a rainfall reduction occurs in the region announcing the dry period, which goes from August to October (see Luizão, 1995).

**Etymology:** The specific epithet is in honor of Luíza Passos Krahl, daughter of the first two authors and a young woman fascinated by orchids.

**Recognition:** *Epidendrum luizae* belongs to the *Nocturnum* group, having star-shaped flowers with their similar petals and sepals, making the mostly indistinguishable (Hágsater & Sánchez-Saldaña, 2010). The new species can be recognized by the rather long erect stems 15.5-32.5 × 0.3-0.4 cm, the 7-11 leaves 6.2-12.5 × 1.0-1.6 cm, narrowly elliptic, the ovaries 4.8-5.9 cm long, longer than the sepals, the sepals 3.6-4.1 cm long, the sepals and petals yellow-green, lip creamy white, calli deep yellow, and the column dorsally pink to wine red, the lateral lobes of the lip 1.1-1.8 × 0.5-0.7 cm, hemi-ovate, acuminate, asymmetrical, inner margin straight, the mid-lobe 1.9-2.2 × 0.2 cm, linear-lanceolate, acuminate, and the column 17-19 mm long. It resembles most closely the four species cited in Introduction.

*Epidendrum dayseae* which has shorter arching-pendulous stems 16-22 cm long, longer and narrower leaves 7.6-16.6 × 0.5-1 cm, most often longer ovaries, at least 5.4 cm long, similar sized sepals 3.4-3.6 cm long, overall similar lateral lobes of the lip however acute at the apex, a similar midlobe and a shorter column 1.2 cm long and green (vs. dorsally pink to wine red). *Epidendrum bahiense* based solely on the type is smaller overall, with much shorter stems 10-10.5 cm, more compressed above, leaves slightly shorter and much narrower 4.2-8.5 × 0.5-0.8 cm, with a length/width ratio of 10:1 (vs. ~ 7:1), an ovary significantly shorter 2.6 cm long, sepals also much shorter 2.2 cm long, a smaller lip 1.24 × 0.86 cm and smaller column 1.04 cm long. *Epidendrum krukoffii* is slightly smaller with stems 12-28 × 0.15-0.35 cm, shorter leaves 2.8-12 cm long, a distinctly shorter ovary 2.2-3 cm long, sepals distinctly smaller 1.8-2.6 × 0.4-0.5 cm, beige to brown, a lip with lateral lobes longer and somewhat narrower 0.75-1 × 0.3-0.7 cm and mid-lobe distinctly shorter 1.2-1.3 × 0.2-0.25 cm, and a column almost twice shorter 0.7-1.1 cm long. Finally, *Epidendrum longicolle*, which is found further up the Amazon Basin with no confirmed specimen from the state of Amazonas, has narrower stems

0.13-0.24 cm wide, much narrower (with a length/width ratio of 10-20:1) leaves 5-15 × 0.4-0.8 cm, a shorter ovary 3-4 cm long, sepals somewhat shorter 3-3.8 cm long, a lip with distinctly smaller lateral lobes 1.9-2.1 × 0.5-0.8 cm united up to half their length to the mid-lobe and a shorter and wider mid-lobe 1.2-1.7 × 0.2-0.3 cm in its free part and a much shorter column 1-1.2 cm long.

**Conservation status:** As for any new taxon, it is not possible to evaluate some of the IUCN criteria (IUCN 2019), such as criterion A (population size reduction). However, based on our field observations, we may estimate: (I) number of known sub-populations = 3; (II) extent of occupancy (EOO) = 540 km<sup>2</sup>; (III) area of occupancy (AOO) = 40-50 km<sup>2</sup>; (IV) total number of mature plants = ca. 500.

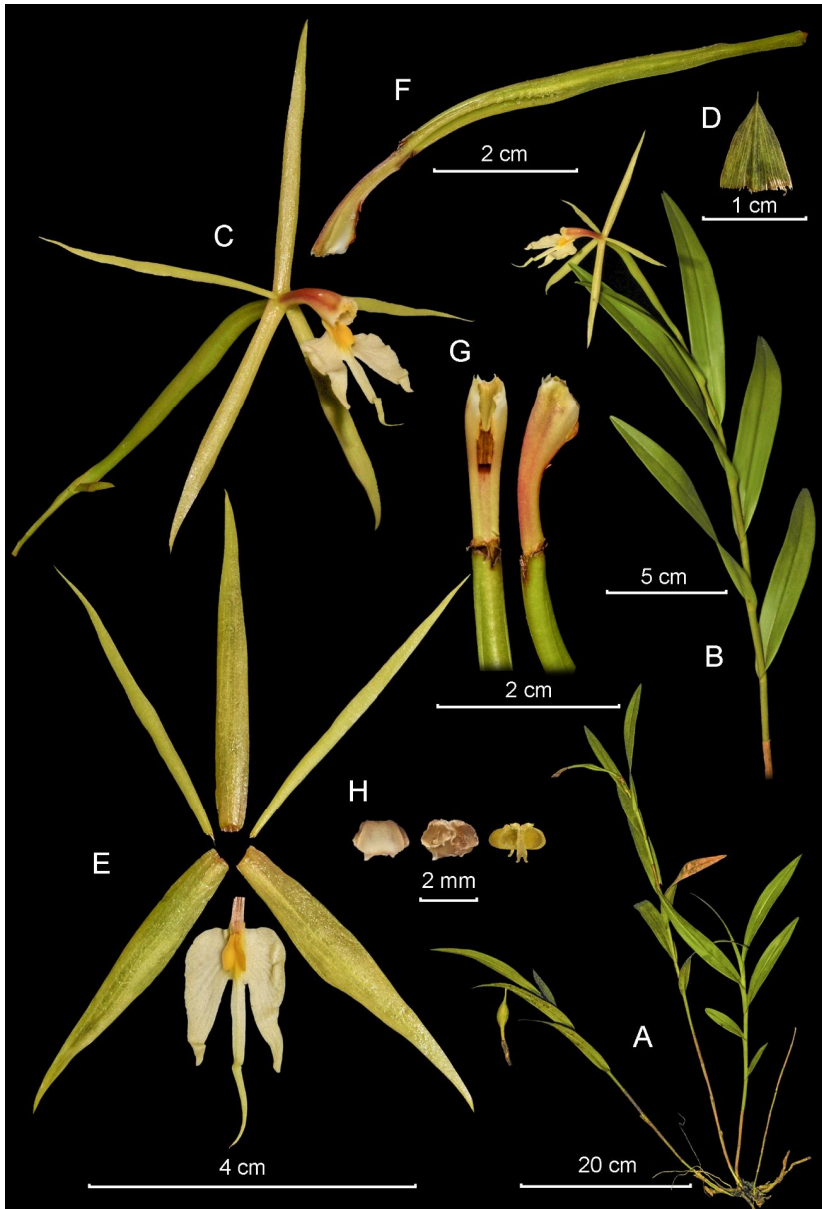
In addition, the region where this species grows is suffering two threats: strong plant gathering by orchid lovers and strong deforestation due to human activities, leading to future decline of both the EOO and the population size. It is worth noting that only one of the three subpopulations are in a conservation area.

According to criteria D (number of mature plants < 1000) and D2 (number of locations < 5), the species could be assessed as Vulnerable (VU). However, considering the criteria B1 (EOO < 5000 km<sup>2</sup>), B2 (AOO < 500 km<sup>2</sup>), Ba (number of locations < 5) and Bbi + Bbv (projected decline of EOO and of number of mature plants), we could also propose the Endangered (EN) status. Similarly, the criteria C (number of mature plants < 2500) and C1 (projected continuing decline of over 20% in the five next years) lead to the EN status. Finally, as a precautionary measure, we propose to classify the species into the EN category (based on B1, B2, Ba, Bbi, Bbv, C, C1).

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**Fig. 2:** *Epidendrum luizae*. A. Habit, plant in fruit, B. flowering stem, C. Flower, D. Floral bracts, spread, E. Floral segments, spread, F. Longitudinal section of column and pedicel showing nectary, G. Column, ventral and side views, H. Anther, front and posterior view, pollinarium.  
 [Photos by A.H. Krahl.; Composite plate by Anais Cisneros]

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