



Original Paper

Cryptanthus euglossinii (Bromeliaceae: Bromelioideae), a new species from Chapada Diamantina, Bahia

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Abstract

A new species of *Cryptanthus*, known exclusively from Chapada Diamantina, in the municipalities of Miguel Calmon and Jacobina, state of Bahia, Northeast Brazil, is described and illustrated. *Cryptanthus euglossinii* is characterized by having leaves that are reddish in the marginal region, white-scaly near the base and glabrous adaxially towards the apex, with the abaxial surface covered by trichomes that obscure the color of the leaf. Comparisons are made with two similar species, *C. reisii* and *C. bibrarrensii*, that are considered closely related. Euglossinii bees were observed visiting the flowers of *C. euglossinii* and collecting floral essences on petals, a relationship that is the basis of the epithet of the new species. *Cryptanthus euglossinii* is considered Endangered (EN) based on an extent of occurrence of 860 km², an area of occupancy of 1,000 km², and criteria established by the IUCN.

Key words: Cryptanthoid complex, morphology, Seasonal Semideciduous Forest, taxonomy.

Resumo

Uma nova espécie de *Cryptanthus*, conhecida exclusivamente da Chapada Diamantina, nos municípios de Miguel Calmon e Jacobina, estado da Bahia, Nordeste do Brasil, é descrita e ilustrada. *Cryptanthus euglossinii* é caracterizado por apresentar folhas avermelhadas na região marginal, branco-escamosas próximo à base e glabras adaxialmente ao ápice, com a face abaxial coberta por tricomas que obscurecem a cor da folha. Comparações são feitas com duas espécies semelhantes, *C. reisii* e *C. bibrarrensii*, que são consideradas intimamente relacionadas. Abelhas Euglossinii foram observadas visitando as flores de *C. euglossinii* e coletando essências florais nas pétalas, relação que está na base do epíteto da nova espécie. *Cryptanthus euglossinii* é considerado em perigo de extinção (EN) com base em uma extensão de ocorrência de 860 km², uma área de ocupação de 1.000 km², e critérios estabelecidos pela IUCN.

Palavras-chave: complexo Cryptanthoid, morfologia, Floresta Estacional Semidecidual, taxonomia.

Introduction

The genus *Cryptanthus* Otto & A. Dietr. possesses 60 endemic species of Brazil (Gouda *et al.*, continuously updated), of which four occur in the Caatinga domain (Maciel 2020). Species of *Cryptanthus* generally occur up to 400 meters in elevation, and rarely exceed 700 meters, in phytophysiognomies associated with Atlantic Forest, Cerrado and Caatinga, such as

ombrophilous forest, seasonal forest, restinga, campos de altitude and campos rupestres (Leme *et al.* 2017).

Ecotones favor the occurrence of species of *Cryptanthus* within the Caatinga phytogeographical domain because of the high humidity of higher altitudes. These places possess Seasonal Semideciduous Forest (Funch *et al.* 2005) and are situated between the Caatinga and the Atlantic

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Forest. They may also occur as patches of moist vegetation surrounded by a drier matrix in the mountainous parts of Chapada Diamantina.

Located at altitudes above 500 meters, Chapada Diamantina includes the highest areas of the Caatinga. It possesses a predominance of lithic soils and has suffered intense exploitation of its mineral resources due to its rich geological composition. The climate varies from tropical to semi-arid, with precipitation ranging from 500 to 1,000 mm, depending on altitude (Velloso *et al.* 2002).

This paper describes and illustrates a new species of *Cryptanthus* (Bromeliaceae) from Seasonal Semideciduous Forest in the state of Bahia, Brazil.

Material and Methods

Botanical material was collected at sites that were selected with the specific objective of finding areas of *Cryptanthus* diversity for the study of their ecology and taxonomy. Field surveys were conducted with the purpose of expanding knowledge about the genus *Cryptanthus* in the Caatinga and its ecotones. The second author found the first populations of the new species described herein near the village of Itaitu in the municipality of Jacobina, state of Bahia, Brazil. Subsequently, in 2010, Fontana *et al.* documented the same species in the region (Fontana *et al.* 6385), after which the species was not collected again until 2017 (Bezerra *et al.* 23). Due to these records, field studies were intensified in the region, with deepening taxonomic investigation revealing the taxon to be a new species for the genus.

The descriptions and illustrations presented here are based on the examination of live and fertile specimens, which included the use of stereomicroscopes for observing characters (flower, sepals, petals, filaments, anthers, stigma, ovary, ovules, fruits and seeds) and performing dissections prior to the preparation of herborized specimens. Descriptive terminology follows Smith & Downs (1979), with adaptations suggested by Scharf & Gouda (2008). Definitions for the genera of the “Cryptanthoid” complex follow Leme *et al.* (2017)

Specimens were herborized according to Fidalgo & Bononi (1989), and deposited in herbaria HVASF and HUEFS. Live specimens were introduced for cultivation at the Coleção de Plantas Vivas do Vale do São Francisco (Vivasf) in Petrolina, state of Pernambuco, and in Refúgio dos Gravatás, in Teresópolis, state of Rio de

Janeiro, following guidelines recommended by the Convention on Biological Diversity (1992). The following herbaria were visited to investigate other records of the species: ALCB, HUEFS, HVASF and UFP (acronyms according to Index Herbariorum; Thiers, continuously updated).

The species of bees that visit the flowers in anthesis were registered by *in situ* observation. The total area of occupation of the species was obtained using Geospatial Conservation Assessment Tool (GeoCAT®; Bachman *et al.* 2011), in order to classify its conservation *status*.

Results

Taxonomy treatment

Cryptanthus euglossinii E.D.S. Almeida & Leme, sp. nov.

Type: BRAZIL. BAHIA: Miguel Calmon, trail to the waterfall Vêu de Noiva, 11°20'05.6”S, 40°30'12.9”W, 669 m elevation, 12.VI.2017, fl. and fr., E.D.S. Almeida 101 (Holotype: HVASF!; isotype: RB!).

Figs. 1-2

Plant stemless, terrestrial or saxicolous, propagating by basal shoots. Leaves 13–15 in number, recurvate, forming an open rosette. Leaf sheath trapeziform to sub-reniform, 1.5–2 × 2.5–3 cm, hyaline. Leaf blade linear-lanceolate, slightly narrowed toward the base, 27–45 × 1.8–2.5 cm, reddish adaxially with green or red margins, white-lepidote near the base, glabrous toward the apex, abaxially densely lepidote with the trichomes obscuring the blade color, margins slightly undulate, subdensely spinose, spines 1–1.5 mm long, antrorse, 4–8 mm apart, apex acuminate. Inflorescence sessile, corymbose. Primary bracts foliaceous; Fascicles 6–8 in number, the basal ones ca. 38 × 17 mm (excluding the petals), with 5–6 flowers. Floral bracts narrowly triangular to lanceolate, 26–27 × 10–15 mm (at the base), brown-lepidote toward the apex, inconspicuously spinulose at the apex, equaling the midpoint of the sepals, apex acuminate. Flower sessile, 42–46 mm long (with extended petals). Sepals 18–21 mm long, hyaline at the base, greenish toward the apex. Sepals lobe ovate-lanceolate, 8–9 × 3–3.5 mm, sparsely brown-lepidote, entire to remotely spinulose, apex acuminate. Petals subspathulate, bearing lateral callosities, 30 × 6–6.5 mm, white, glabrous, connate at the base for ca. 5 mm, apex rounded. Filaments adnate to the petals for ca. 5 mm. Anthers dorsifixed near the middle, 5–7 mm long, white. Stigma conduplicate-patent, lobes ca. 5 mm long, margins crenulate. Ovary trigonous,



Figure 1 – a-e. General aspects of *Cryptanthus euglossinii* – a. habit; b. male flowers; c. hermaphrodite flower in the foreground and male flower in the background; d. *Euglossa melanotricha* (Euglossini, Apidae) visiting a flower of *C. euglossinii*; e. individuals of *C. euglossinii* blooming. (a, d, e. Almeida; b-c. Siqueira Filho).

subclavate, 11–12 mm long, ca. 6 mm in diameter, glabrous. Ovules obtuse. Fruits 3–10 in number, baccate, 6–7 × 3–4 mm. Seeds ca. 3 × 2 mm.

Supplementary material examined (paratypes): Jacobina, Itaitu village, near the Vêu de Noiva waterfall, 11°05'50.8"S, 40°39'05.8"W, 610 m elevation, 13.VI.2017, fl. and fr., *E.D.S. Almeida 115* (HUEFS!); 26.I.2010, fl., *A.P. Fontana et al. 6385* (HVASF!); 26.VIII.2016, fl., *T.T. Bezerra et al. 23* (HVASF!).

The new species has morphological affinity with *C. reisia* Leme from the Atlantic Forest in the municipality of Itapetinga of southern Bahia State. However, *C. euglossinii* differs by having the following: greater number of leaves (13–15 vs. ca. 8 for *C. reisia* Leme); leaf blade with reddish adaxial face with a green or completely reddish marginal region (vs. completely green), narrower leaf blade (1.8–2.5 cm vs. 2.7–4.2 cm) with larger marginal spines (1–1.5 mm vs. 0.5 mm); basal fascicles with a greater number of flowers (5–6 vs. 3), sub-squamous brown floral bracts (vs. squamous-lepidote) and larger floral bracts (26–27 × 10–15 mm vs. 16 × 8–10 mm); larger sepals (18–21 × 6 mm vs. 15 × 10 mm), longer sepal lobe (8–9 × 3–3.5 mm vs. 5 × 4 mm) and oval-lanceolate sepal lobe (vs. sub-orbicular); petals with lateral callosities (vs. absent callosities) and longer anthers (5–7 mm vs. 2–3 mm).

The morphological characteristics of *C. euglossinii* also approximate those of *C. bibrarrensii* Leme. However, *C. euglossinii* differs by having the following: acaulescent habit (vs. caulescent habit of *C. bibrarrensii* Leme); rosette with fewer leaves (13–15 vs. ca. 20); leaf blade with reddish adaxial face, with green or completely reddish marginal region (vs. leaf completely green) and sparsely distributed spines on leaf margins (4–8 mm vs. 2–5 mm); basal floral fascicles with greater number of flowers (5–6 vs. ca. 3) and wider floral bracts (10–15 mm vs. 16 × 9 mm); longer and narrower sepal lobe (8–9 × 3–3.5 mm vs. 6 × 5 mm) and oval-lanceolate sepal lobe (vs. largely elliptic to sub-orbicular).

It should be noted that *C. reisia* and *C. bibrarrensii* are sympatric species, with the type locality of both being in Seasonal Semideciduous Forest in the municipality of Itapetinga, Bahia (Leme 2002).

The epithet *euglossinii* refers to the observed phenomenon of male euglossine bees (Euglossini) visiting the flowers of the new species and collecting floral essences on petals, a relationship that remains poorly known for the family Bromeliaceae (Siqueira Filho & Machado 2008).

Cryptanthus euglossinii occurs in areas of Seasonal Semideciduous Forest in the municipalities of Miguel Calmon and Jacobina of Bahia state, close to small perennial streams under forest shade between 400 and 600 meters of elevation. Due to its natural beauty, the region receives visitors throughout the year as disorganized ecotourism. In contrast to the drier Caatinga, and especially during the long droughts of recent years (2011–2017) in the Brazilian semi-arid region, farmers take their animals to pastures in the mountains where forage supply is greater due to the amount of vegetation and high humidity. Such animals are known to trample sites of occurrence of *C. euglossinii*, thus increasing the risk of its local extinction.

Flowering of *C. euglossinii* occurs between May and June, during the dry season, with each individual flowering for up to 42 days, with up to three flowers per day. Anthesis is diurnal and lasts for 7 to 16 hours. Euglossine bees (Euglossini, Apidae, Hymenoptera), namely of the species *Euglossa* (*Euglossa melanotricha* Moure, 1967, *Eulaema* (*Apeulaema*) *nigrita* Lepelletier, 1841, and *Eulaema* (*Apeulaema*) *cingulata* (Fabricius, 1804), were observed visiting the flowers of *C. euglossinii*. During their visits these bees collected floral perfumes directly from the surface of petals. This Euglossini-*Cryptanthus* relationship was described by Siqueira Filho & Machado (2008), who reported bees of the genera *Euglossa* and *Eulaema* visiting flowers of *Cryptanthus diana* Leme of the Atlantic Forest in the state of Pernambuco and performing similar behaviors of scraping the petals to collect floral perfumes.

An extent of occurrence of 860 km² and an area of occupancy of 1,000 km² were obtained based on areas of occurrence. Thus, the species is considered Endangered (EN) by criteria B1B2abi of the International Union for the Conservation of Nature (IUCN 2012).

Discussion

Within the Bromeliaceae family, the subfamily Bromelioideae has raised several questions about the monophyly of the genera that make up the clade, where molecular data has suggested that genera with high diversity are, in fact, polyphyletic, thus turning their attention to the morphological innovations of these groups (Schulte *et al.* 2009; Silvestro *et al.* 2014). *Cryptanthus*, in molecular analyzes, presents itself as a monophyletic genus, closely related to *Orthophytum*, forming a monophyletic group (Evans *et al.* 2015).

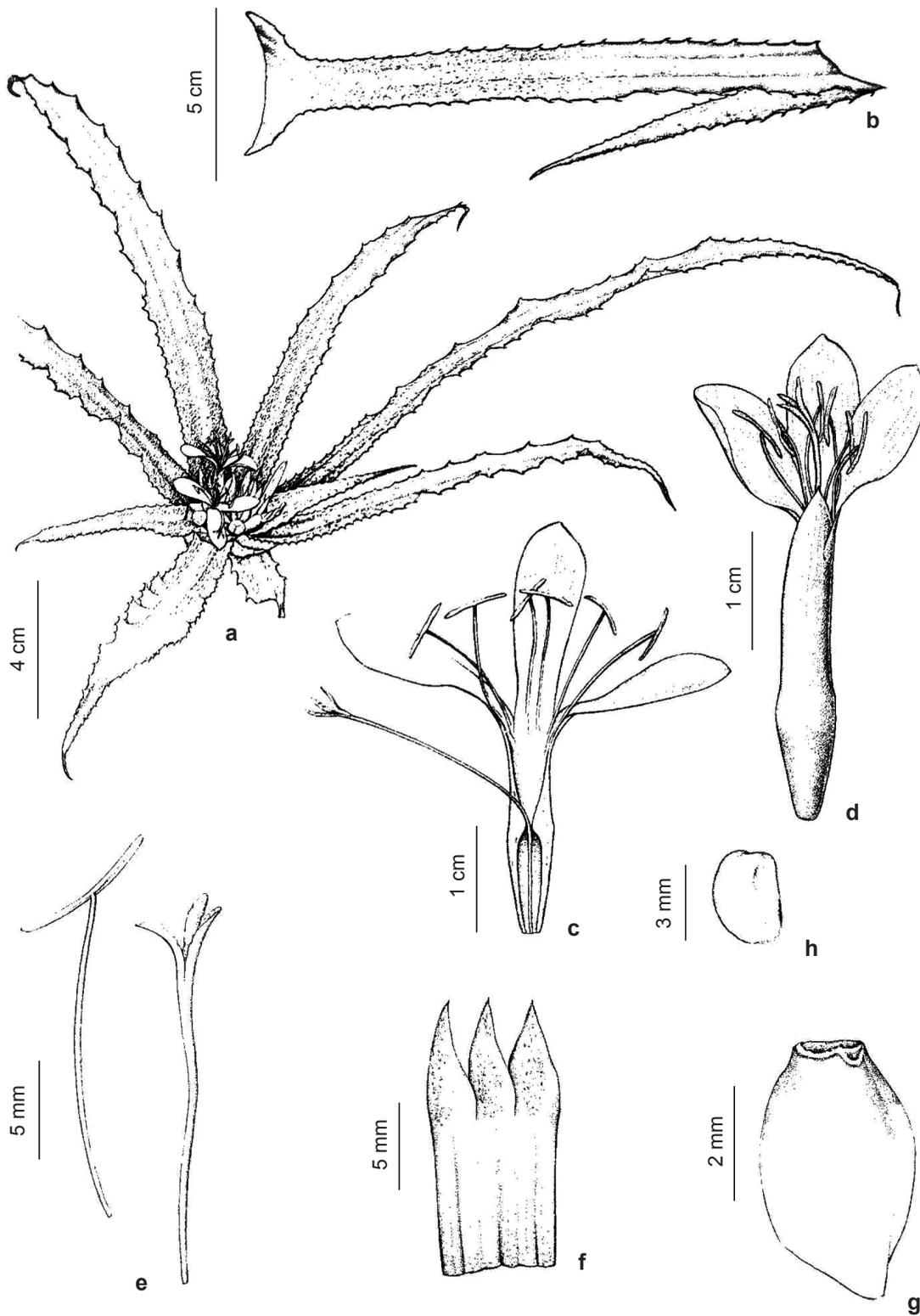


Figure 2 – a-h. Illustration of *Cryptanthus euglossinii* – a. habit; b. leaf; c. longitudinal section of hermaphrodite flower; d. flower in lateral view; e. anther and stigma conduplicate-patent; f. calyx; g. fruit; h. seed. (E.D.S. Almeida 101).

The so-called “Cryptanthoid” complex contains the genera *Cryptanthus* Otto & A. Dietr.; *Forzzaea* Leme, S. Heller & Zizka; *Hoplocryptanthus* Leme, S. Heller & Zizka; *Lapanthus* Louzada & Versieux; *Orthophytum* Beer; *Rokautskyia* Leme, S. Heller & Zizka; and *Sincoraea* Ule, being the characteristics of *Cryptanthus* andromonoecious plants with compound or rarely pseudosimple, sessile, and shortly corymbose inflorescences (Leme *et al.* 2017). *Cryptanthus euglossinii*, which conforms to the new strict concept of the genus, occurs in areas of Seasonal Semideciduous Forest in association with moist environments in the Caatinga phytogeographic domain, unlike *C. bahianus* L.B.Sm. and *C. warren-loosei* Leme, which occur in Caatinga *sensu stricto*. The evolutionary history of the genus includes rare biome shifts, with the reconstruction of the ancestral biome indicating a high degree of niche conservatism (Cruz *et al.* 2017).

There are, in general, little field data for *Cryptanthus* species, and their populations suffer mainly from drastic reductions to their habitats, with most newly described species already being at high risk of extinction (Leme *et al.* 2020). The area of occurrence of *C. euglossinii* is one kilometer from Parque Estadual Sete Passagens, an integral conservation unit located in the municipality of Miguel Calmon (BA). Intense land speculation, disorderly tourism and extensive agricultural activities occur in the surroundings of the park, all of which can have negative impacts on populations of *C. euglossinii*. A large contingent of species of this genus are exposed to similar negative impacts. Some species of *Cryptanthus* are Endangered exclusively in the Atlantic Forest and Cerrado, whereas other species are Data Deficient or Near Endangered (Martinelli & Moraes 2013). Faced with this reality, and considering the threats to *C. euglossinii*, it is suggested that the species be included in the list of endangered species of Centro Nacional de Conservação da Flora.

Acknowledgements

The authors thank G.A.R. da Silva, for help in field works; A.C.R. Andrade-Silva, for help with the species identification of the collected bees; G. Surlo, for botanical illustration; and CNPq, for the scholarship granted to the first author during the period of preparation of this study.

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Area Editor: Dr. Luiz Menini Neto

Received in November 13, 2020. Accepted in September 06, 2021.



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