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A new species of northeastern Brazilian endemic genus *Harpochilus* (Acanthaceae)

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Abstract

A new species, *Harpochilus paraibanus* (Acanthaceae), is described from the semiarid region of Paraíba State, Brazil. The species is characterized mainly by having cylindrical branches and pale yellow corollas. Only nine individuals of this new species were encountered in the study area, resulting in its classification as endangered (EN) according to IUCN criteria.

Resumo

A nova espécie, *Harpochilus paraibanus* (Acanthaceae) é descrita para a região semiárida do Estado da Paraíba, Brasil. A espécie caracteriza-se, principalmente, por ter ramos cilíndricos e corola amarelo-pálida. Somente nove indivíduos desta nova espécie foram encontrados na área de estudo, resultando na sua classificação como em perigo (EN) de acordo com os critérios da IUCN.

Introduction

The genus *Harpochilus* Nees (1847: 9) belongs to the family Acanthaceae and it is endemic to the states of Paraíba, Pernambuco, and Bahia in northeast Brazil (Profice *et al.* 2017). Two species, *H. neesianus* Martius ex Nees (1847: 9) and *H. phaeocarpus* Nees (1847: 9), were described by Nees when it published and are associated with Caatinga and Atlantic Forest vegetation's respectively (Profice *et al.* 2017). A third species, *H. trimerocalyx* Rizzini (1948: 359), was described from northeastern Brazil, and later was subsequently synonymized under *Anisacanthus trilobus* Lindau (1914: 6).

Morphologically, the genus *Harpochilus* is quite similar to *Clistax* Martius (1829: 3) and *Justicia* Linnaeus (1753: 15). However, *Harpochilus* differs from *Clistax* by its canescent branches, leaves petiolate or sessile and calyx with (3 or) 5 lacinia, unequal to each other and from *Justicia* by shrub habit, inflorescence in thyrsus or spikes, corolla greenish-yellow or cream-colored, upper lobe without rugula, bithecae anthers and capsules parallel or oblique (Côrtes & Rapini 2013).

However, according to Kiel *et al.* (2017), *Harpochilus* Nees (1847: 9) belongs to the New World justicioid lineage together with all New World *Justicia* as well as *Cephalacanthus* Lindau (1905: 158), *Clistax*, *Megaskepasma* Lindau (1897: 666) and *Poikilacanthus* Lindau (1895: 342) and the monophyly of *Harpochilus* cannot be rejected.

While undertaking a floristic inventory within the Caatinga domain, we encountered a peculiar new species of the family Acanthaceae. This species have as characters the shrub habit, corolla strongly bilabiate, androecium with 2 exserted stamens, and annular nectary at the base of the ovary, and 4 orbicular seeds, being therefore positioned in the tribe Justicieae, more specifically in the genus *Harpochilus*. We present illustrations of the diagnostic characters of the new species, as well as data of geographic distribution, flowering and fruiting and conservation status. We also present an update key to the species of *Harpochilus* and a comparative table of the main diagnostic features of the new species and its relatives.

Material and Methods

Study area

The Aba Farm ($7^{\circ}05'47''$ S, $37^{\circ}01'57''$ W) is located 4.6 km from the municipality of Passagem in Paraíba State, northeastern Brazil (Figure 1), within the Caatinga domain, characterized by deciduous, thorny, shrub/arboreal vegetation.

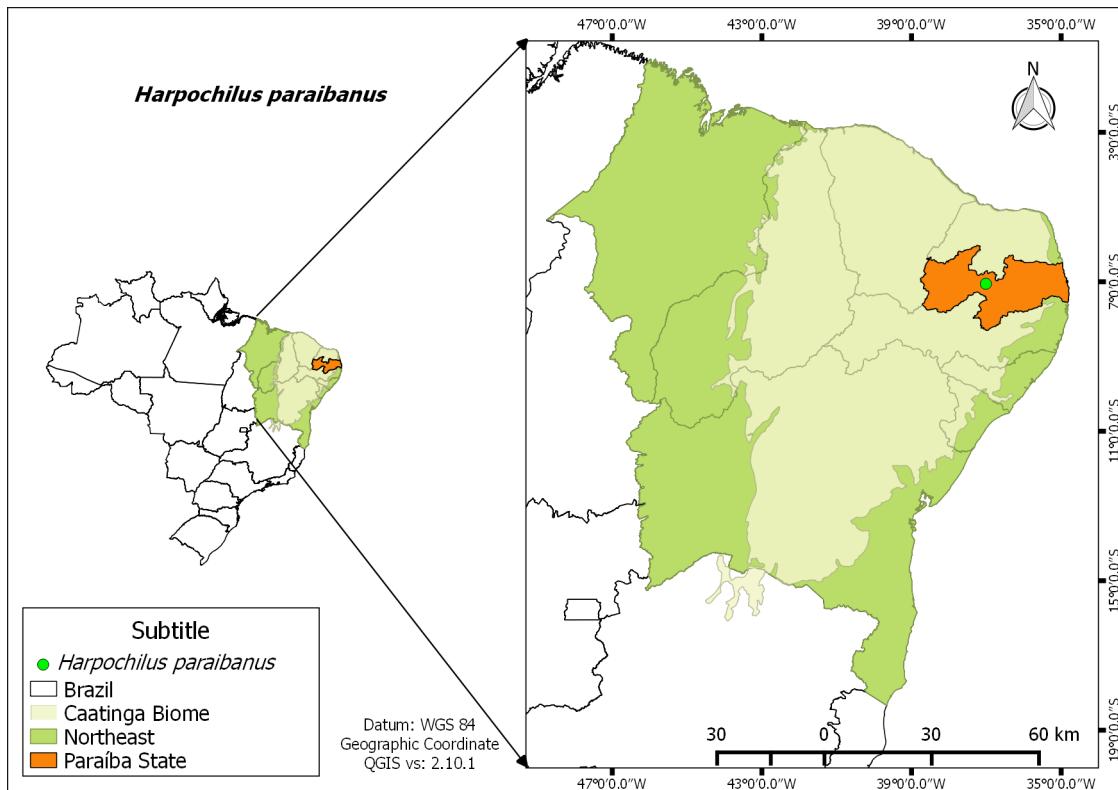


FIGURE 1. Location of the Aba farm, municipality of Passagem, Paraíba State, Brazil (IBGE 2016 adapted from D.M. Anjos).

Data collection

Morphological studies were carried out according to the usual methods for the taxonomy of higher plants, with the analysis of vegetative and reproductive structures. Only nine individuals of the new species were found in the site. The specialized literature was consulted in the laboratory (Côrtes & Rapini 2013) to aid in the identification of the species.

Data on the geographical distribution were obtained from labels and from literature. The conservation status assessments follow IUCN (2001) version 3.1, can be classified in one of seven categories: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) or Data Deficient (DD).

Pollen grains were collected from one plant specimen. The contents of the anther were removed and placed on aluminum stubs covered by double-sided conductive tape. The stubs were sputter coated with gold and examined using a FEI Quanta 450 Scanning Electron Microscope (SEM) at the Technology of New Materials Laboratory, Center of Technologies of the Federal University of Paraíba (UFPB), Brazil.

Key to the species of *Harpochilus*

1. Scandent shrub; corolla with broad lobes..... *H. phaeocarpus*
- Erect shrub; corolla with narrow lobes..... 2
2. Bracts lanceolate ca. $2.3\text{--}3.4 \times 0.3\text{--}0.5$ cm; calyx ca. 2.1 cm long; corolla pale yellow, tube ca. 0.6 cm long..... *H. paraibanus*
- Bracts oblanceolate ca. $0.1\text{--}0.7 \times 0.1\text{--}0.2$ cm; calyx ca. 1.1 cm long; corolla greenish, tube 1.8–2 cm long..... *H. neesianus*

Description

Harpochilus paraibanus F.K.S. Monteiro, J.I.M. Melo & E.M.P. Fernando, *sp. nov.* (Fig. 2 A–M, Fig. 3A–D)

Type:—Brazil. Paraíba:Passagem, Serra do Aba, 17 April 2016, Fernando 392 (holotype ACAM 1897!; isotypes ACAM!, CSTR!, RB!).

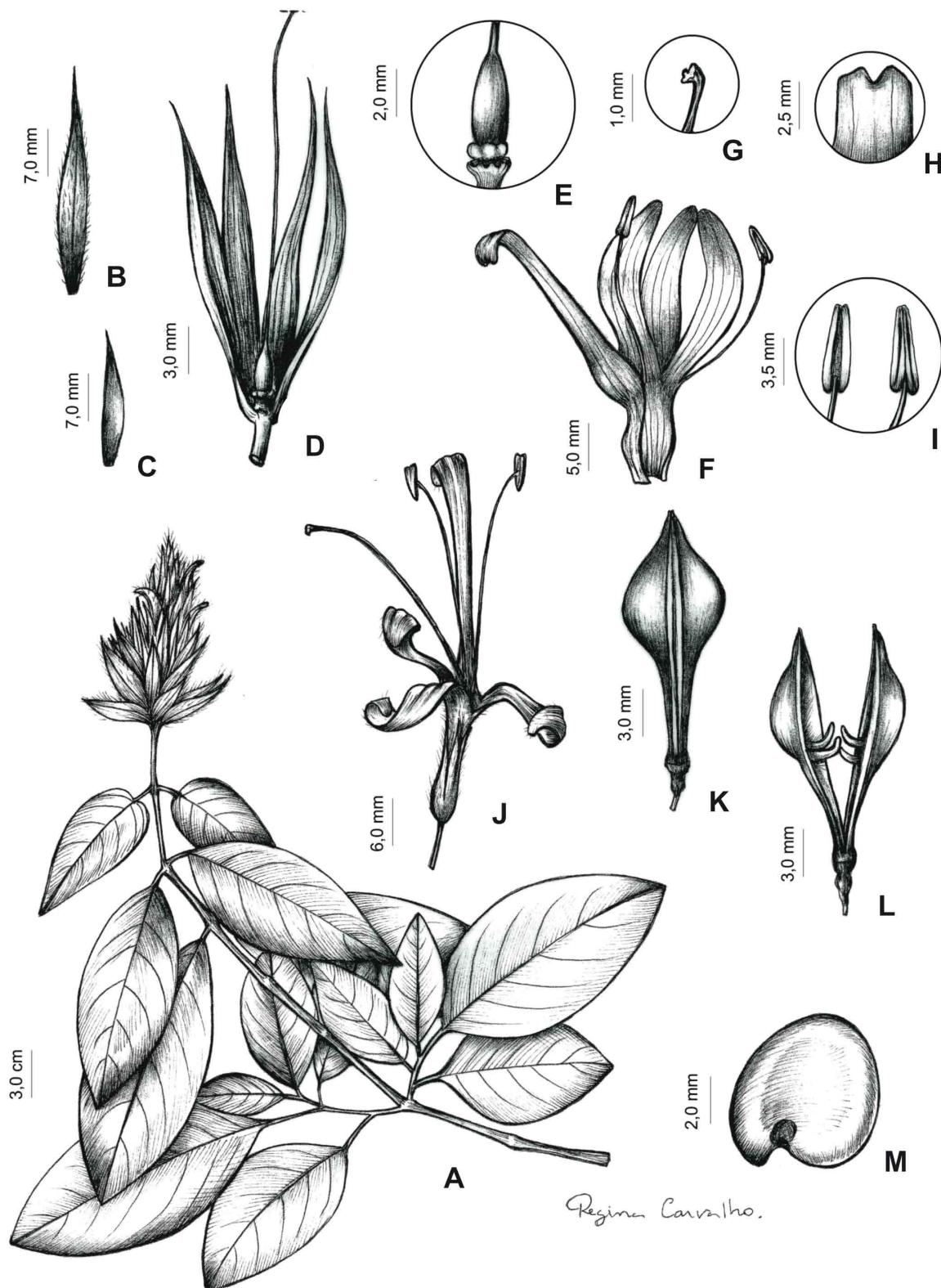


FIGURE 2. *Harpochilus paraibanus* sp. nov. A. Inflorescence branch. B. Bract. C. Bracteole. D. Calyx detaching the pistil. E. Ovary and nectariferous disk. F. Flower. G. Stigma. H. Apex of the superior corolla lobe. I. Stamens. J. Flower detaching the stamens. K. Capsule. L. Open fruit with retinaculum. M. Seed. (Illustrations by R. Carvalho).

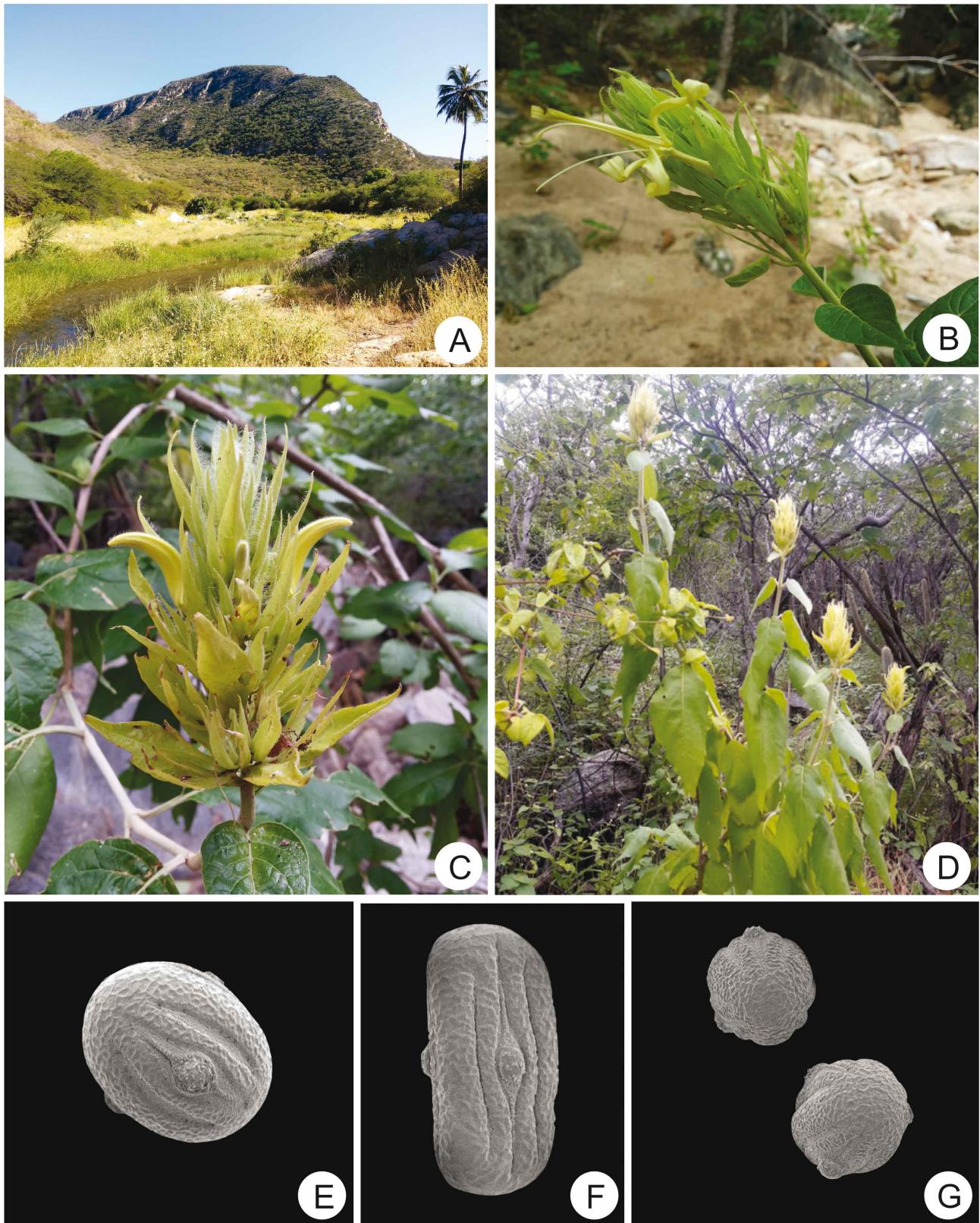


FIGURE 3. *Harpochilus paraibanus* sp. nov. A. Habitat. B. Habit. C. Inflorescence. D. Reproductive branches. E–G. Pollen grains, detaching the ornamentation of the exine surface. E–F. Equatorial view of pollen grain. G. Polar view of pollen grains. (Photographs: A, B, and D of E.M.P. Fernando; C and E–G of F.K.S. Monteiro).

Species nova *Harpochilus neesianus* Mart. ex Nees et *Harpochilus phaeocarpus* Nees habens cylindrica (versus *ramorum subquadrangulares quadrata*), *spiculis inflorescentiae terminales* (versus *inflorescentiis tirbos axillaribus et in spicis unifloras*) et *corolla flavo-album* (versus *corolla viridi et cremor cum lobis medium purpurum*), facile distinguenda.

Shrubs 2–3 m tall; branches cylindrical, tomentose, with inconspicuous stripes. Leaves petiolate; petiole ca. 0.5 × 2.3 cm; blade 5–13.1 × 2.3–7.1 cm, ovate, velvety, chartaceous, with sparse trichomes on upper surface and pubescent on inner surface, apex acute, base slightly decurrent, margin entire. Spikes terminal, 1–11.1 cm long. Bracts 2, 2.3–3.4 × 0.3–0.5 cm, foliaceous, lanceolate, and pubescent; bracteoles 2, 1.8–2.3 × 0.4–0.7 cm, similar to the bracts. Calyx ca. 2.1 cm long; lobes 5, 1.6–1.8 × 0.2–0.3 cm, unequal, foliaceous, lanceolate, acute apex, internally glabrous, externally pubescent. Corolla pale yellow, ca. 4.5 cm long, with glandular trichomes internally and externally tector trichomes; tube ca. 6 mm long, erect; upper lip ca. 3.9 × 0.3 cm, bilobate at apex, lower lip ca. 2.7 × 0.5 cm, deeply trilobed, curved, narrow; stamens 2, filaments ca. 2.5 cm long, anthers ca. 7 mm long, oblong-sagittate, mutic, theca parallel; ovary ca. 4 mm long, ovate, annular nectariferous disk at base; style ca. 4.6 cm long, base pubescent; stigma bilobate, 1 mm long. Capsule ca. 1.9 × 0.4 cm, clavate, glabrous, stipitate, presence of retinaculum; 4–seeds, ca. 4.5 mm in diam., orbicular, flat, smooth, margins entire, yellowish.

Phytogeographic domain:—Caatinga.

Distribution and ecology:—*Harpochilus paraibanus* was encountered in only a single conservation area at the Aba farm, Aba Hill, municipality of Passagem, Paraíba State, northeastern Brazil. The plants grow on sandy and rocky neosols in gallery forests along watercourses at up to 500 m a.s.l. within the Caatinga domain. According to Vogel *et al.* (2004), *H. neesianus* is pollinated by bats while *H. phaeocarpus* is often pollinated by bees or wasps.

Phenology:—Flowering in April, fruiting in June to November.

Etymology:—The species is named after the Brazilian state of Paraíba, where it occurs.

Conservation status:—Only one population of nine individuals of *H. paraibanus* was found at the Aba Farm, as well as a small population of five individuals in the municipality of Mâe D'Água, during two years of expeditions. According to IUCN criteria (IUCN 2001), this species should be classified as endangered (EN) as its area of distribution is estimated to be less than 500 km² and the populations comprise very few individuals.

Notes:—The new species described here demonstrates a number of exclusive characteristics, such as corolla pale yellow (greenish or cream-colored in the other species of the genus) and branches cylindrical (not sub-quadrangular or quadrangular). Comparisons of the morphologic characteristics of *Harpochilus* species are summarized in Table 1. According to Côrtes & Rapini (2013), *H. neesianus* is associated with semiarid environments and is frequently encountered in arboreal-shrub dryland Caatinga vegetation, campos rupestres (open, rocky field, altitudinal vegetation), and Cerrado (Neotropical savanna), growing on rocky soils and rock outcrops. They also noted that *H. phaeocarpus* is exclusive to the Atlantic Forest of southern Bahia State (inclusive based on recent records), casting doubt on its occurrence in Caatinga sites.

TABLE 1. Comparisons between the morphological characters of *Harpochilus paraibanus* and the other *Harpochilus* species.

Characters	<i>H. paraibanus</i>	<i>H. neesianus</i>	<i>H. phaeocarpus</i>
Branches	Cylindrical, tomentose, with inconspicuous stripes	Subquadrangular, tomentose, with thin and inconspicuous stripes	Subquadrangular to quadrangular, velvety to tomentose
Leaf blade	Ovate, velvety, apex acute	Oblong to elliptic or ovate to obovate, villous to tomentose, apex obtuse to acute	Elliptic to narrowly elliptic, with sparse trichomes, glandular points, apex obtuse
Bracts	2.3–3.4 × 0.3–0.5 cm, foliaceous, lanceolate, pubescent	0.1–0.7 × 0.1–0.2 cm, linear to oblanceolate, villous	0.9–2.2 × 0.2–0.5 mm, oblanceolate, pubescent with sessile glandular trichomes
Inflorescences	Terminal spikes	Axillary thyrsus, dichasia pedunculate	Unifloral spikes
Calyx	ca. 2.1 cm long	ca. 1.1 cm long	ca. 0.9 cm long
Corolla lobes	Upper lip ca. 3.9 × 0.3 cm, lower lip ca. 2.7 × 0.5 cm, curved, narrow	Upper lip 5.5–7.5 × ca. 0.5 cm, lower lip 4.5–6 × ca. 0.3 cm, narrow	Upper lip ca. 1 × 1.1 cm, lower lip ca. 1 × 2 cm, large
Corolla tube	ca. 0.6 cm long	1.8–2 cm long	ca. 0.7 cm long
Corolla color	Pale yellow	Greenish	Cream colored, with central lobe light purple

Additional examined specimen (paratypes):—BRAZIL. Paraíba: Mâe D'Água, 13 April 2017, E.M.P. Fernando 560 (CSTR); Passagem, Serra do Aba, 28 July 2014, E.M.P. Fernando 138 (CSTR); Passagem, Serra do Aba, 28 November 2015, E.M.P. Fernando 469 (CSTR); Passagem, Serra do Aba, 15 June 2016, F.K.S. Monteiro *et al.* 35 (ACAM, IPA); Passagem, Serra do Aba, 06 April 2017, F.K.S. Monteiro 38 (ACAM).

Palynology:—The pollen grains of *Harpochilus paraibanus* are three aperture sets, colporate and pseudocolporate, and the exine reticulate (Figure 3E–F). According to Côrtes & Rapini (2013), this palynological feature is a synapomorphy of the Justicieae tribe, sustaining the position of this species in that tribe. However, according to Kiel *et al.* (2017) the genus *Harpochilus* belongs to New World justicioid lineage.

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