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BIODIVERSITY AND CONSERVATION | ORIGINAL ARTICLE

Philcoxia cachimboensis (Plantaginaceae): a new carnivorous species from Serra do Cachimbo, eastern Amazon, Brazil

Ray Balieiro LOPES-NETO[1,2*], Juni Baia CARDOSO[1,2], André Vito SCATIGNA[3]

[1] Museu Paraense Emílio Goeldi, Avenida Perimetral 1901, Terra Firme, 66077-830, Belém, Pará, , Brazil

[2] Universidade Federal Rural da Amazônia, Avenida Perimetral 2501, Terra Firme, 66077-830, Belém, Pará, Brazil

[3] Universidade Estadual do Maranhão, Herbário Rosa Mochel (SLUI), Cidade Universitária Paulo VI, s/n, 65054-970 São Luís, Maranhão, Brazil

*Corresponding author: rblopesneto@gmail.com; https://orcid.org/0000-0003-4179-2713

ABSTRACT

A new species of *Philcoxia* (Plantaginaceae) in the Serra do Cachimbo, eastern Amazon, Brazil, is described and discussed. *Philcoxia cachimboensis* **sp. nov.** is mainly characterized by the corolla with asymmetrically obovate (liver-shaped) lateral lobes, with truncate to sub-emarginate apex. This is the first record of the genus in the Brazilian Amazon. A morphological description, illustration and photographs, conservation status assessment, an updated identification key for the recognized species of *Philcoxia*, and comparative taxonomic comments are provided.

KEYWORDS: Botany, conservation, ecotone, taxonomy, white-sand vegetation

Philcoxia cachimboensis (Plantaginaceae): uma nova espécie carnívora da Serra do Cachimbo, Amazônia oriental, Brasil

RESUMO

Uma nova espécie de *Philcoxia* (Plantaginaceae) da Serra do Cachimbo (Amazônia oriental, Brasil) é aqui descrita e discutida. *Philcoxia cachimboensis* **sp. nov.** é caracterizada pela corola com lobos laterais assimétricamente obovados (em formato de fígado), com ápice truncado a sub-emarginado. Esse é o primeiro registro do gênero para a Amazônia brasileira. Uma descrição morfológica, ilustrações e fotografias, avaliação do status de conservação, uma chave de identificação atualizada com as espécies de *Philcoxia* reconhecidas, e comentários taxonômicos comparativos são fornecidos.

PALAVRAS-CHAVE: Botânica, conservação, ecótono, taxonomia, vegetação de areia branca

INTRODUCTION

Philcoxia P. Taylor & V.C. Souza is a genus of Plantaginaceae endemic to Brazil (Taylor et al. 2000). All seven species recognized are carnivorous and grow on sandy soils, where their highly specialized leaves, disposed below the surface, trap and digest tiny nematodes (Taylor et al. 2000; Pereira et al. 2012; Carvalho and Queiroz 2014; Scatigna et al. 2015; Scatigna et al. 2017).

The genus was described based on three plants from open sandy areas in rupestrian grasslands (*campos rupestres*) of the Brazilian states of Bahia (*Philcoxia bahiensis* V.C. Souza & Harley), Goiás (*Philcoxia goiasensis* P. Taylor), and Minas Gerais (*Philcoxia minensis* V.C. Souza & Giulietti) (Taylor et al. 2000). They were originally described as belonging to Scrophulariaceae, based on morphological features, and later assigned to Plantaginaceae, based on molecular data (Fritsch et al. 2007), a placement corroborated by Scatigna et al. (2018).

In the last decade, *P. goiasensis* and *P. minensis*, which were previously known only from their type-locality, were recorded, respectively, in two new localities in the state of Goiás, and as a new population in Minas Gerais, increasing their distribution range (Scatigna et al. 2016a; Scatigna et al. 2016b). Also, four new species were described [*Philcoxia tuberosa* M.L.S. Carvalho & L.P. Queiroz (Carvalho and Queiroz 2014), *Philcoxia rhizomatosa* Scatigna & V.C. Souza (Scatigna et al. 2015), *Philcoxia courensis* Scatigna and *Philcoxia maranhensis* Scatigna (Scatigna et al. 2017)], all registered in white-sand patches in the semi-arid Caatinga and savanna Cerrado biomes. Despite the occurrence of areas of open, white-sand vegetation in the Amazon (Adeney et al. 2016), no records of *Philcoxia* existed so far in this biome.

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Recently, efforts of botanical collection in the mountainous range of Serra do Cachimbo (eastern Amazon, Brazil) added more information on the flora of the region, with several records of species previously not cited for the region, including two new species of woody bamboos (Poaceae) (Lopes-Neto and Viana 2022), and a new species of *Philcoxia* (Plantaginaceae), which is here described, illustrated and discussed.

MATERIAL AND METHODS

The description of the new species is based on the analysis of herbarium material collected in 2005 and specimens collected during an expedition in 2021 in Serra do Cachimbo. This region is a mountainous range with an elevation between 300 and 700 m located on the limits of the states of Mato Grosso (MT) and Pará (PA), Brazil. It is an ecotone area between the Amazon and Cerrado biomes, and the predominant soil is composed of whitish quartzite sands (RADAMBRASIL 1980).

The collection expedition was conducted in two protected areas located in the portion of Serra do Cachimbo located in Pará: Campo de Provas Brigadeiro Velloso (CPBV, a base camp of the Brazilian Air Force) and Reserva Biológica Nascentes da Serra do Cachimbo (Nascentes da Serra do Cachimbo Biological Reserve). For a detailed location of the study area, see Lopes-Neto and Viana (2022). The habitat of the new species was classified using RADAMBRASIL (1980) and Lopes-Neto and Viana (2022).

The terminology of the morphological description follows Taylor et al. (2000). The distinction between petioles and stems is difficult in species of *Philcoxia* that present rhizomes (Fritsch et al. 2007; Scatigna et al. 2015), therefore, in our measure estimates, we considered petioles to be the segment of horizontal, wiry and delicate structure between the last branching point and the insertion to the leaf blade. The conservation status was assessed following the guidelines of the IUCN Red List Categories and Criteria (2012).

The distribution map was produced with the QGIS v3.18.2-Zürich program (QGIS Development Team 2009) using species occurrence data compiled from the Specieslink database (https://specieslink.net/). The specific identity of the Specieslink records was verified using the photographs of the specimens available on the website and the aforementioned literature on the genus. The specimens that could not be confirmed as *Philcoxia* were excluded and the specimens used to compose the distribution map are listed in the Supplementary Material, Table S1.

RESULTS

Philcoxia cachimboensis Scatigna & Lopes-Neto **sp. nov.** (Figures 1–3).

Type material: Brazil. Pará. Novo Progresso, Serra do Cachimbo, Campo de Provas Brigadeiro Velloso, BR-163, entrada por área de savana a 73 km a sul do Distrito de Cachoeira da Serra, 09°11'01"S, 54°54'17"W, 560 m, 24.v.2021 (fl., fr.), *R.B. Lopes-Neto, P.L. Viana, A.S.B. Gil and J.B. Cardoso 666* (holotype: MG244553!; isotypes: SLUI8655!, UEC211926!).

Diagnosis: *Philcoxia cachimboensis* **sp. nov**. is characterized by the unique asymmetrically obovate (liver-shaped) lateral corolla lobes. It is similar to *P. minensis* in the presence of slender horizontal rhizomes that give rise to new upright stems, but differs from it in the presence of corm-like, root-borne buds (vs. absence in *P. minensis*), pedicel trichomes ca. 0.25 mm, composed of a multicellular, uniseriate stipe and unicellular head (vs. ca. 0.07 mm long, composed of a unicellular stipe and pluricellular head, in *P. minensis*), sepals ca. 1 mm long, sparsely glandular-pubescent (vs. sepals ca. 0.5 mm long, glabrous to sparsely glandular-puberulent in *P. minensis*), and in the stigma with clearly unequal lobes (vs. equal lobes in *P. minensis*).

Description: Perennial herbs, 7–19 cm tall. Tap root up to 3 cm long, vertical, frequently with slender secondary roots, slightly sinuous and contorted, bearing 0–2(–3) globose root-borne buds. Rhizomes horizontal, white to reddish *in vivo*, slender, emerging from the upright stem, unbranched or rarely branched, frequently giving rise to a new upright stem, nodes inconspicuous. Upright stems globose to cylindrical, corm-like, 2.5–4.5 × 1.5–1.9 mm, sometimes short-branched, then branches ascending. Leaves not arranged in a rosette, frequently peltate, underground; petioles 1.5–29.5 mm long, emerging from the upright stems or from petiole-like rhizomes, subterranean; blade suborbicular when peltate to cordiform, 0.7–2.1 mm diam., adaxial surface glandular-pubescent, abaxial surface glabrous, margin entire, revolute, usually covered by a thin layer of sand. Inflorescences green *in vivo*, simple or branched, 7–19 cm long, ascending to erect, sparsely glandular-pubescent, trichomes composed of a multicellular, uniseriate stipe and unicellular head, ca. 0.25 mm long; pedicels green *in vivo*, 0.8–3 cm long, shortening towards the apex of the inflorescence, sparsely glandular-pubescent, trichomes same as in inflorescence; bracts triangular, conduplicate, patent, ca. 0.4 mm long, basifixed, persistent, glabrous, enclosing an axillary bud that may develop into a secondary inflorescence axis. Flowers solitary, resupinate; sepals lanceolate, subequal, ca. 1 mm long, sparsely glandular-pubescent, with trichomes same as in inflorescences; corolla bilabiate, pale lilac to lilac with darker veins, rarely white, *in vivo*, tube infundibuliform, abruptly widened towards the throat, slightly inflated at base, ca. 3.5–3.9 mm long, externally glabrous, internally glandular-puberulent at middle length, glandular pubescent around filaments insertion, yellow at middle length *in vivo*; throat internally sparsely glandular-pubescent, white to lilac *in vivo*; lower lip. ca. 3.1 mm long, usually bilobed, lobes oblong, ca. 1.5 × 1 mm, apex sub emarginate to round, sometimes a third, smaller, central triangular lobe is present, ca. 1 mm long, upper lip trilobed, central lobe broadly obovate, ca. 2 × 2.5 mm, apex truncate, lateral lobes asymmetrically obovate (liver-shaped), ca. 2 × 2 mm, apex truncate to sub-emarginate. Stamens 2, adaxial, inserted on corolla tube, included, filaments curved,

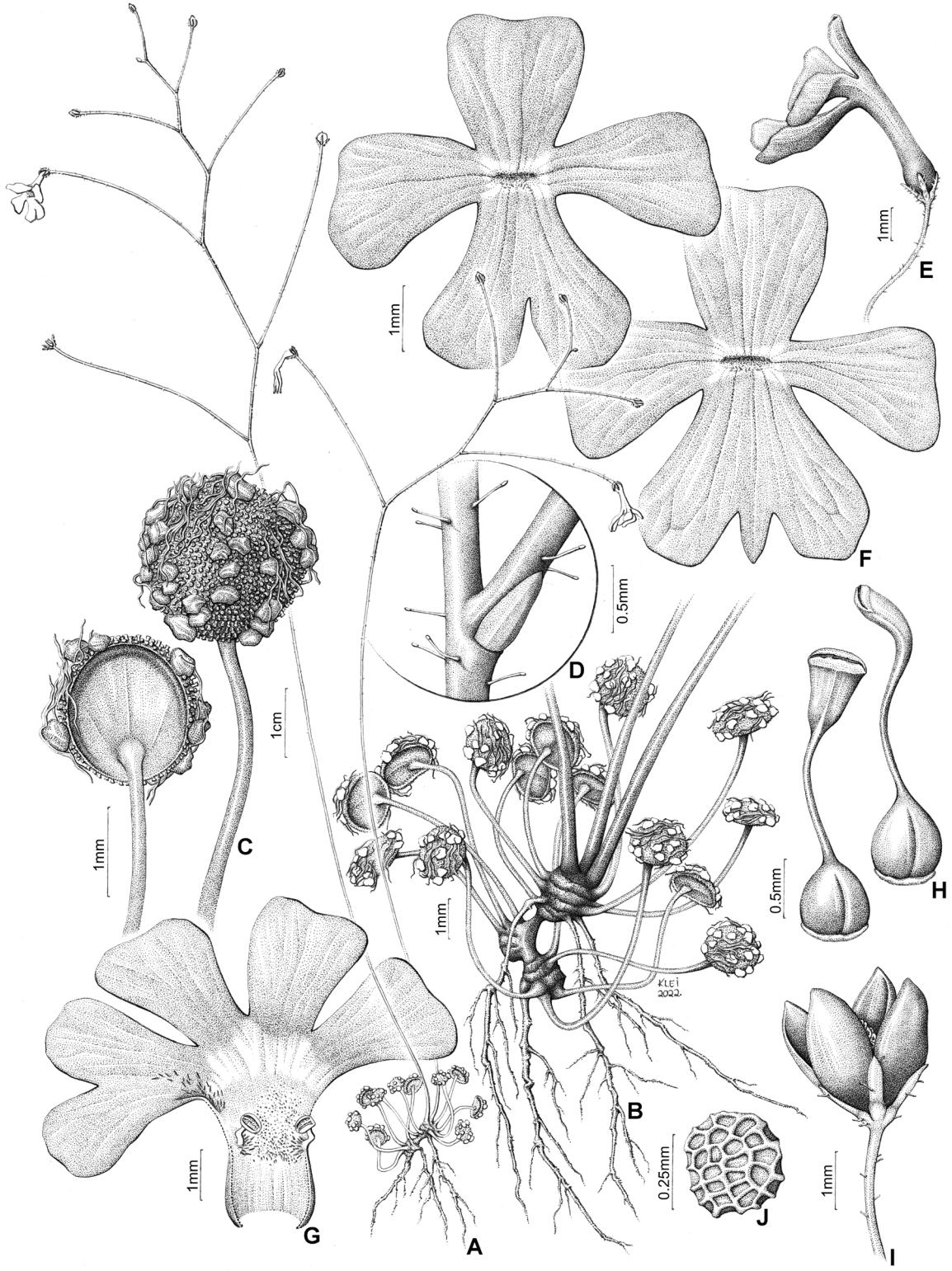

Figure 1. *Philcoxia cachimboensis* **sp. nov.**: A – habit; B – detail of the corm-like stems and peltate leaves; C – leaf in abaxial view (left) and adaxial view (right), with adherent sand grains and nematodes; D – detail of inflorescence with indument sparsely glandular-pubescent and triangular bract subtending the pedicel; E – flower in lateral view; F – corolla in front view; G – artificially opened corolla; H – gynoecium in front view (left) and lateral view (right); I – capsule in lateral view; J – seed. Credit: Klei Sousa, based on the isotype Lopes-Neto et al. 666 (UEC).

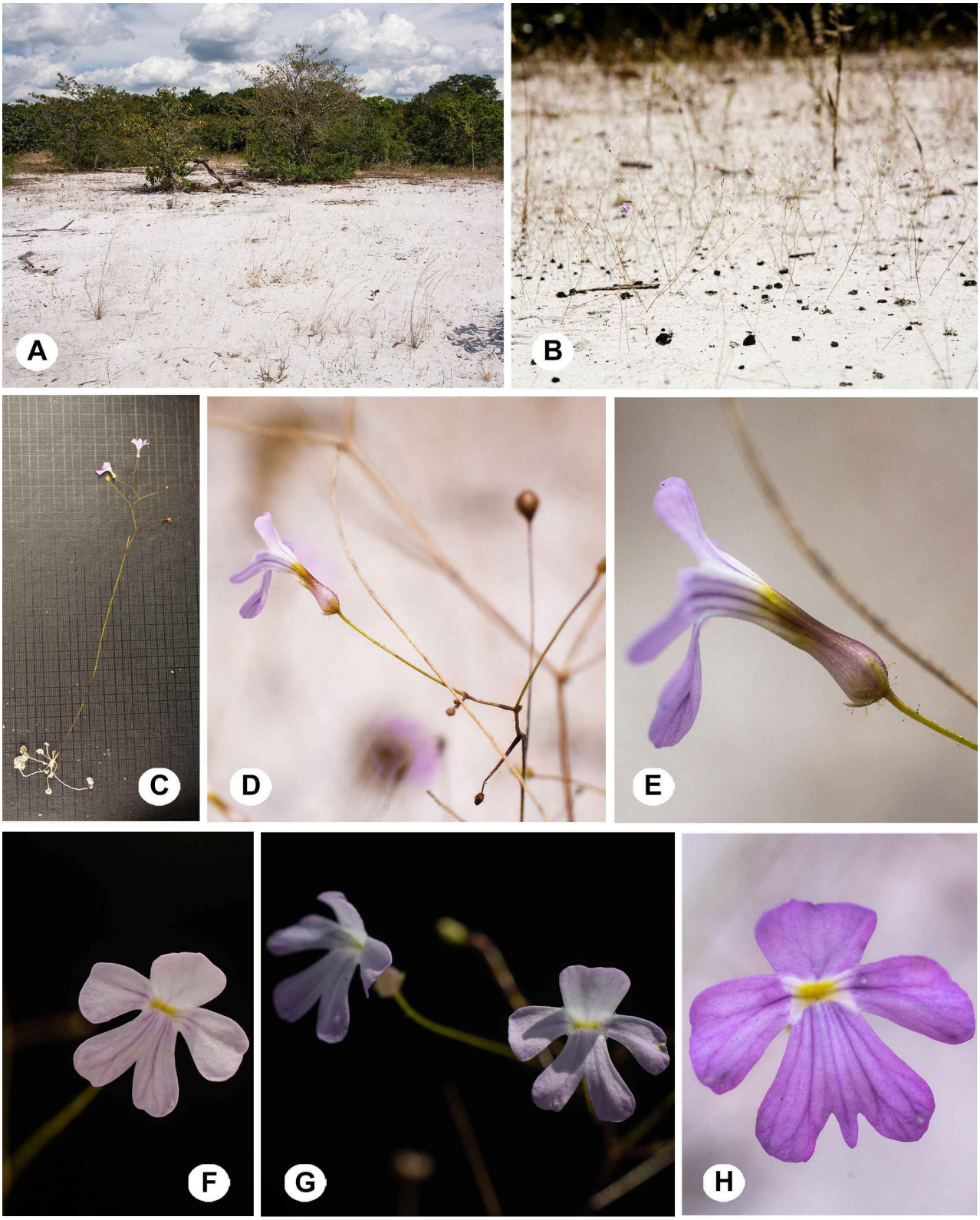

Figure 2. *Philcoxia cachimboensis* **sp. nov.**: A – Habitat; B – Population on natural habitat; C – Habit, showing the leaves below; D – Inflorescence with a lilac flower in lateral view (left) and an immature fruit (right); E – Detail of the flower, lateral view; F – White flower in frontal view, showing lower lib bilobate; G – Inflorescence with white flowers in lateral view (left) and frontal view (right); H – Detail of lilac flower in frontal view, showing lower lip trilobate. Photos by Pedro Lage Viana. This figure is in color in the electronic version.

glabrous. Ovary superior, carpels 2, syncarpous, 2-locular, ovoid, ca. 0.8 × 0.3 mm; placentation axillary, ovules numerous; style terminal, solitary, caducous, base filiform, ca. 1.5 mm long, apex obdeltoid, strongly upcurved, ca. 0.6 mm long; stigma bilobed, clearly unequal lobes, the upper lobe larger. Capsule globose, ca. 2 mm diam, 4-valvate. Seeds trigone, ca. 0.3 × 0.3 mm, black, glossy, reticulate-foveolate.

Additional specimen examined: Brazil. Pará, Altamira, Serra do Cachimbo, xii.2005 (fl), *M. Sobral and A.G. Oliveira 10646* (ESA154280!).

Distribution and habitat: This species is known from two collection sites in Serra do Cachimbo, Pará state, Brazil, in the municipalities of Altamira and Novo Progresso (CPBV). It was found on sandy soil in grassland vegetation (*campo limpo*). *Philcoxia cachimboensis* is the first species of the genus to be recorded in Pará, expanding its occurrence to the Brazilian Amazon (Figure 3).

Phenology: The species was collected with flowers and fruits in May and December.

Etymology: The epithet refers to the type-locality, Serra do Cachimbo.

Conservation status: According to the IUCN Red List Categories and Criteria (2012), *P. cachimboensis* **sp. nov.** should be listed as Data Deficient (DD), because appropriate distribution data of the species are currently lacking. Despite its known occurrence in two distinct municipalities in Serra do Cachimbo (Altamira and Novo Progresso, Pará state, Brazil), the specimen from Altamira [*Sobral and Oliveira 10646* (ESA)] does not have geographical location coordinates, preventing the calculation of area of occupation and extent of occurrence.

A specimen of *Philcoxia* was listed in the floristic checklist in the management plan of REBIONSC (ICMBIO 2009), but without a voucher designation. REBIONSC is located east of the BR-163 highway, and covers the municipalities of Altamira and Novo Progresso. We have not been able to verify whether the specimen listed in the management plan corresponds to the voucher of *Sobral and Oliveira 10646* (see additional material examined) or another voucher. Therefore, new expeditions are needed in both CPBV and REBIONSC to expand the knowledge regarding the distribution of the species in white sand vegetation in the Serra do Cachimbo and adjacent areas to properly estimate its conservation status.

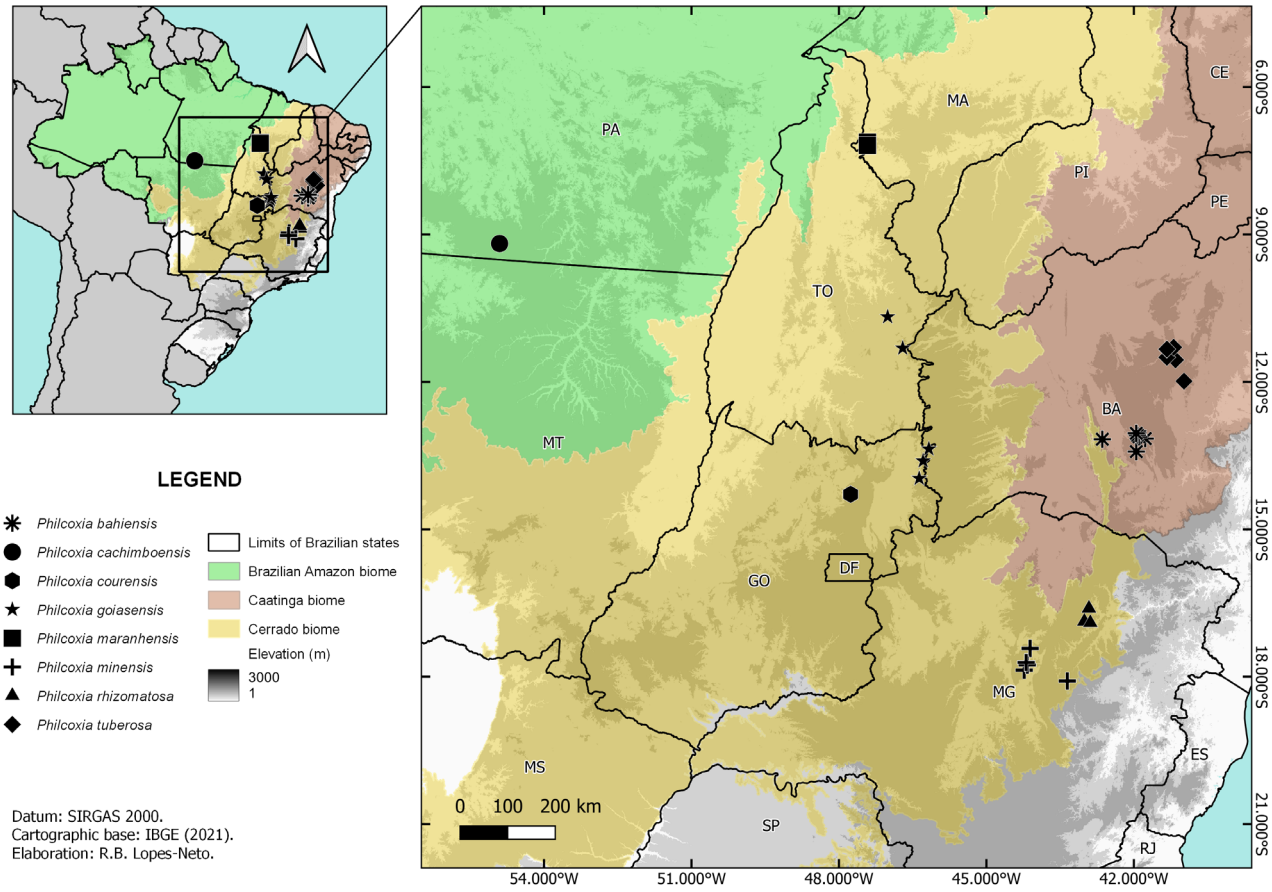

Figure 3. Geographic distribution of *Philcoxia cachimboensis* **sp. nov.** and all known other species of *Philcoxia*.

Updated identification key for the species of *Philcoxia* (adapted from Scatigna et al. 2017)

1. Rhizomes absent; leaves organized in a rosette 2

1'. Rhizomes present, horizontal; leaves not organized in a rosette 5

2. Stem reduced, inconspicuous; root-borne buds slender 3

2'. Stem globose to cylindrical, conspicuous; root-borne buds globose 4

3. Leaf blade cordiform to reniform, never peltate; bracts glandular-pubescent; corolla lower lip slightly bilobed ....*Philcoxia maranhensis*

3'. Leaf blade orbicular to reniform, usually peltate; bracts glabrous; corolla lower lip deeply bilobed ....*Philcoxia goiasensis*

4. Corolla with veins strongly marked; bracts glandular-pubescent, 1.0–1.5 mm long; sepals 1.5–2.0 mm long .... *Philcoxia bahiensis*

4'. Corolla with veins weakly marked; bracts glabrous, 0.5–0.7 mm long; sepals up to 1.3 mm long .....*Philcoxia courensis*

5. Rhizomes yellowish *in vivo*, thickened, nodes conspicuous; leaf blades 2–7 mm diam.; inflorescences, pedicel and calyx entirely glabrous .....*Philcoxia rhizomatosa*

5'. Rhizomes white to reddish *in vivo*, slender, nodes inconspicuous; leaf blades 0.7–2.1(–2.5) mm diam.; inflorescences, pedicel and/or calyx glandular-pubescent 6

6. Underground tubers present; corolla tube dark purple *in vivo* .....*Philcoxia tuberosa*

6'. Underground tubers absent; corolla tube lilac or yellowish *in vivo* 7

7. Corm-like root-borne buds absent; calyx glabrous to sparsely glandular-puberulent; corolla with symmetrical obovate lateral lobes; stigma with equal lobes .....*Philcoxia minensis*

7'. Corm-like root-borne buds present; calyx sparsely glandular-pubescent; corolla with asymmetrical obovate lateral lobes (liver-shaped); stigma with clearly unequal lobes …. ……..……..*Philcoxia cachimboensis* **sp. nov.**

DISCUSSION

Philcoxia cachimboensis **sp. nov.** is the only species of the genus to possess a corolla with asymmetrically obovate (liver-shaped) lateral lobes of approximately 2 × 2 mm and truncate to sub-emarginate apex (Figure 1, f, g. Figure 3, f, g, h). The new species features slender horizontal rhizomes that give rise to new upright stems, resembling *P. minensis*. However, *P. minensis* can be distinguished by the absence of root-borne buds (vs. corm-like root-borne buds in *P. cachimboensis* **sp. nov**.), the pedicel trichomes are approximately 0.07 mm long, composed of a unicellular stipe and pluricellular head (vs. pedicel trichomes approximately 0.25 mm long, composed of a multicellular, uniseriate stipe and unicellular head in *P. cachimboensis* **sp. nov**.), the sepals about 0.5 mm long, glabrous to sparsely glandular-puberulent (vs. sepals about 1 mm long, sparsely glandular-pubescent in *P. cachimboensis* **sp. nov**.), and stigma with equal lobes (vs. stigma with unequal lobes in *P. cachimboensis* **sp. nov**.). We only analyzed the structure of trichomes in the inflorescence of these two species, because they are the morphologically closest species in the genus, but it is likely that this character may be useful to identify other species of the genus. *Philcoxia tuberosa* also exhibits slender rhizomes, but is easily recognized by the unique presence of underground tubers, while *P. rhizomatosa* has thickened rhizomes and conspicuous nodes (vs. slender rhizomes and inconspicuous nodes in *P. cachimboensis* **sp. nov**.) (Table 1). Although *P. bahiensis* and *P. courensis* may present well-developed underground stems, these are usually condensed and in an upright position (Scatigna et al. 2017, pers. obs.), in contrast to the rhizomes of *P. cachimboensis* **sp. nov**., which are generally filamentous and horizontal (Table 1). The complex underground structure of *Philcoxia* has been used as an important diagnostic character (Scatigna et al. 2017), but anatomical and morphological studies are still

Table 1. Main diagnostic characters of *Philcoxia cachimboensis* **sp. nov.** and other *Philcoxia* species with rhizomes (adapted from Carvalho and Queiroz 2014; Scatigna et al. 2015; Scatigna et al. 2016b).

Character	*Philcoxia cachimboensis*	*Philcoxia minensis*	*Philcoxia rhizomatosa*	*Philcoxia tuberosa*
Rhizomes	slender	slender	thickened	slender
Nodes	inconspicuous	inconspicuous	conspicuous	inconspicuous
Underground tubers	absent	absent	absent	present
Pedicel trichome length (mm)	0.25	0.07	absent	unknown
Pedicel trichome structure	multicellular, uniseriate stipe and unicellular head	unicellular stipe and pluricellular head	absent	unknown
Corolla lateral lobes	asymmetrical	symmetrical	symmetrical	symmetrical
Sepal length (mm)	ca. 1	ca. 0.5	0.95–1.1	0.9–1.6
Sepal indument	sparsely glandular-pubescent	glabrous to sparsely glandular-puberulent	glabrous	sparsely glandular-pubescent
Stigma lobes	unequal	equal	equal	equal

required to better understand the true nature of the rhizomes as interpreted by Scatigna et al. (2018).

CONCLUSIONS

The new species described here, *Philcoxia cachimboensis* **sp. nov.** is the first of its genus to be recorded in the Brazilian Amazon. The estimated conservation status of the new species according to IUCN criteria is Data Deficient (DD) due to its being known only from two localities in Serra do Cachimbo, Pará state, Brazil.

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DATA AVAILABILITY: The data that support the findings of this study were published in this article.

SUPPLEMENTARY MATERIAL

Lopes-Neto *et al*. *Philcoxia cachimboensis* (Plantaginaceae): a new carnivorous species from Serra do Cachimbo, eastern Amazon, Brazil

Table S1. List of specimens of *Philcoxia* used in the preparation of the distribution map. Datum: SIRGAS 2000.

Species	Vouchers	Latitude	Longitude
P. bahiensis	Guedes 32418 (ALCB)	-13.4172	-41.9539
P. bahiensis	Scatigna 108 (UEC)	-13.1655	-42.6452
P. bahiensis	Scatigna 115 (UEC)	-13.1655	-42.6452
P. bahiensis	Baleeiro 214 (SPF)	-13.1519	-41.7728
P. bahiensis	Ganev 918 (SPF, HUEFS, K)	-13.1167	-41.9
P. bahiensis	Souza et al. 14425 (ESA, K, RB, SPF)	-13.08	-41.9331
P. bahiensis	Souza et al. 1284A (HURB)	-13.0458	-41.9542
P. bahiensis	Scatigna & Carmo 655 (UEC)	-13.0447	-41.9547
P. cachimboensis	Lopes-Neto et al. 666 (MG, INPA, RB)	-9.18361	-54.9047
P. courensis	Alves & Silva 8962 (UEC, K, R)	-14.285	-47.7647
P. courensis	Alves & Silva 8963 (UEC, R)	-14.285	-47.7647
P. courensis	Scatigna & Carmo 706 (UEC)	-14.285	-47.7647
P. courensis	Scatigna & Carmo 707 (UEC)	-14.285	-47.7647
P. courensis	Scatigna & Carmo 708 (UB, UEC)	-14.285	-47.7647
P. goiasensis	Scatigna & Carmo 736 (UB, UEC)	-13.9625	-46.3689
P. goiasensis	Scatigna & Carmo 737 (UEC)	-13.9625	-46.3689
P. goiasensis	Aparecida da Silva 4907 (CEN, ESA, SPF)	-13.9617	-46.3697
P. goiasensis	Scatigna & Carmo 739 (UB)	-13.6061	-46.2897
P. goiasensis	Amaral et al. 3158 (UB)	-13.3619	-46.1736
P. goiasensis	Simon et al. 4032 (CEN)	-10.673611	-47.011388
P. goiasensis	Schindler et al. 385 (CEN)	-11.311388	-46.705555
P. maranhensis	Scatigna & Mota 768 (UEC, MG, K)	-7.12056	-47.4225
P. maranhensis	Scatigna & Mota 756 (MG, UEC)	-7.18639	-47.4206
P. maranhensis	Barbosa 1100 (HUEFS)	-7.18667	-47.4228
P. minensis	Almeda et al. 8544 (UEC, NY)	-17.7078	-44.1922
P. minensis	Brina s.n. (BHCB202286)	-17.8636	-44.2339
P. minensis	Davis et al. 2413 (UEC)	-17.7574996948242	-44.1721992492676
P. minensis	Gonella 277 (SPF)	-17.7069	-44.1932
P. minensis	Gonella 512 (SPF)	-17.7069	-44.1932
P. minensis	Hatschbach 79368 (SPF)	-17.7574996948242	-44.1721992492676
P. minensis	Lorenzi 4236 (HPL)	-17.7575	-44.1722
P. minensis	Mazine et al. 808 (ESA)	-17.7574996948242	-44.1721992492676
P. minensis	Meireles et al. 1146 (UEC)	-17.7126	-44.1979
P. minensis	Paula-Souza 9515 (NY, SPF)	-17.7071	-44.1921
P. minensis	Rodrigues 117 (ESA)	-17.7574996948242	-44.1721992492676
P. minensis	Scatigna & Carmo 588 (UEC)	-18.0847	-43.3561
P. minensis	Scatigna & Carmo 590 (UEC)	-18.0808	-43.355
P. minensis	Scatigna & Pereira 41 (UEC)	-17.4222	-44.1139
P. minensis	Scatigna & Pereira 42 (UEC)	-17.4222	-44.1139
P. minensis	Scatigna & Pereira 43 (UEC)	-17.4222	-44.1139
P. minensis	Scatigna et al. 482 (UEC)	-18.0839	-43.3564
P. minensis	Scatigna et al. 483 (UEC)	-18.0839	-43.3564
P. minensis	Scatigna et al. 484 (UEC)	-18.0839	-43.3564
P. minensis	Scatigna s.n. (VIC38679)	-17.7574996948242	-44.1721992492676
P. minensis	Souza 30120 (ESA, HPL)	-17.7574996948242	-44.1721992492676
P. minensis	Souza et al. 25444 (ESA)	-17.7574996948242	-44.1721992492676
P. minensis	Teles & Viana 498 (BHCB, RB)	-17.7061	-44.1936

Table S1. Continued.

Species	Vouchers	Latitude	Longitude
P. rhizomatosa	Scatigna & Sartori 319 (UEC, ESA, K)	-16.8722	-43.0108
P. rhizomatosa	Scatigna & Cândido 374 (UEC)	-16.9006	-42.8886
P. rhizomatosa	Scatigna & Carmo 1047 (UEC)	-16.6069	-42.9175
P. rhizomatosa	Scatigna & Carmo 1048 (UEC)	-16.6069	-42.9175
P. tuberosa	Baleeiro 215 (SPF)	-11.55000019	-41.15610123
P. tuberosa	Borba et al. 2045 (ESA, HUEFS)	-11.331389	-41.331389
P. tuberosa	Côrtes et al. 4 (HUEFS)	-11.339444	-41.333611
P. tuberosa	Costa et al. 1447 (HUFSJ)	-11.55000019	-41.15610123
P. tuberosa	França et al. 4088 (HUEFS)	-11.331111	-41.331111
P. tuberosa	Giulietti et al. 2162 (ESA, HUEFS)	-11.331389	-41.331111
P. tuberosa	Melo 11153 (HUEFS)	-11.498056	-41.331111
P. tuberosa	Melo et al. 3420 (ESA, HUEFS, RB, UB)	-11.498056	-41.332778
P. tuberosa	Oliveira 803 (HUEFS)	-11.497778	-41.332222
P. tuberosa	Queiroz 12133 (ESA, HUEFS)	-11.331111	-41.331111
P. tuberosa	Queiroz 13178 (ESA, HUEFS)	-11.983333	-40.983333
P. tuberosa	Queiroz 15952 (HUEFS)	-11.498333	-41.330833
P. tuberosa	Queiroz 7723 (HUEFS, ESA)	-11.331111	-41.330556
P. tuberosa	Scatigna 121 (UEC)	-11.295278	-41.195
P. tuberosa	Scatigna 122 (ESA, UEC)	-11.55000019	-41.15610123