



<https://doi.org/10.11646/phytotaxa.579.1.4>

Passiflora acreana, a new species of *Passiflora* subgenus *Passiflora* (Passifloraceae *sensu stricto*) from Acre, Brazil

ANA CAROLINA MEZZONATO-PIRES^{1,3*}, MARCOS SILVEIRA^{2,4} & MAYK HONÓRIO DE OLIVEIRA^{2,5}

¹ Universidade Federal de Juiz de Fora, Departamento de Botânica, R. José Lourenço Kelmer s.n., São Pedro, Juiz de Fora, Minas Gerais, 36033-900, Brazil.

² Universidade Federal do Acre, Centro de Ciências Biológicas e da Natureza, BR 364, km 4, Distrito Industrial, CEP 69.920-900, Rio Branco, Acre, Brazil.

³ carolina.mezzonato@gmail.com; <https://orcid.org/0000-0001-8987-1213>

⁴ silveira.marcos66@gmail.com; <https://orcid.org/0000-0003-0485-7872>

⁵ mayk.br@hotmail.com; <https://orcid.org/0000-0002-3999-5741>

*Correspondence: carolina.mezzonato@gmail.com

Abstract

The new species described here was collected during expeditions carried out in the Lago do Amapá Environmental Protection Area, located in Acre State, Brazil. Morphological analysis and comparisons with close species confirmed that the collected specimens are a new species for science. *Passiflora acreana* was placed in *P.* subg. *Passiflora*, sect. *Granadillastrum* Triana & Planch., and can be distinguished by the presence of foliaceous, reniform, awned stipules, 4–8 pedunculate petiolar glands, with apex concave, and corona with 10 series of filaments. Descriptions, illustrations, distribution map, and conservation status are presented.

Keywords: Amazon rainforest, biodiversity, section *Granadillastrum*

Introduction

Passifloraceae *sensu stricto* has 700–750 species distributed in the Pantropical region (Feuillet & MacDougal 2007). *Passiflora* Linnaeus (1753: 955) is the richest genus, with about 500 species, 162 of which are found in Brazil (Bernacci *et al.* 2022, Mezzonato-Pires *et al.* 2021a, b, c, Parteka *et al.* 2021). This number is expected to increase because of the intense interest in this attractive and exuberant group. In the past 11 years, 21 new *Passiflora* species were described from Brazil (pers. obs.), such as *Passiflora bernaccii* Mezzonato (2018: 230), recorded in Acre State, where at least 28 species of *Passiflora* have been found so far (Bernacci *et al.* 2020).

Passiflora is divided into six subgenera, with *Passiflora* L. subg. *Passiflora* being the largest and best represented in the World. According to Feuillet & MacDougal (2003), this subgenus contains about 236 species, subdivided into six supersections. *Passiflora* supersect. *Stipulata* Feuillet & J.M.MacDougal (2003: 37) is subdivided into six sections, the richest of which is *P.* sect. *Granadillastrum* Triana & Planch. (1873: 127), with about 65 species.

According to Bernacci *et al.* (2020), *P.* subg. *Passiflora* is represented in Brazil by 97 species, whereas *P.* sect. *Granadillastrum* is represented by 30 species (Bernacci *et al.* 2020, Mezzonato-Pires *et al.* 2021b) distributed throughout all Brazilian regions.

Species belonging to *P.* supersect. *Stipulata* sect. *Granadillastrum* can be identified by the presence of reniform stipules, 3-lobed leaves, free bracts (Feuillet & MacDougal 2003), and flowers with a conspicuous corona (Ulmer & MacDougal 2004).

In this study, we describe and compare a newly identified *Passiflora* species with morphologically similar species. We also provide detailed photographs, a distribution map, and the conservation status of this new species.

Material and methods

We collected the new species in the Lago do Amapá Environmental Protection Area (10°00'0"S–10°04'30"S 67°52'30"W–67°48'00"W), a 5,208 ha conservation unit located in Rio Branco, Acre State, Brazil.

The collected specimens were deposited in the UFACPZ and CESJ herbaria (acronyms according to Thiers, 2022). Floral and vegetative characters were described according to Cervi (1997), Killip (1938), and Radford *et al.* (1974).

The distribution map was prepared with the Geographic Information System (GIS) software ArcGIS 9.8. The methods of the IUCN Red List categories and criteria version 3.1 (IUCN 2022) were employed and the values of Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using the conservation assessment tool GEOCAT (<http://geocat.kew.org/>).

Taxonomic treatment

Passiflora acreana Mezzonato & Silveira, *sp. nov.* (Figs. 1 and 2).

Type:—BRAZIL. Acre: Rio Branco, APA Lago do Amapá. Bacia do rio Acre, margem direita do rio Acre, 10°03'18.0"S, 67°51'30.7"W, 147 m.a.s.l., 25 January 2020, *M. Oliveira, M. Silveira, I. Oliveira, C. Gonçalves, L. Guimarães & M. Caniso 105* (holotype CESJ!, isotype UFACPZ!)

Passiflora acreana differs from the similar *P. garckeii* by stipules with awns 2.8–3.1 mm long (vs. absent) and petiolar pedunculate glands with the apex concave (vs. patelliform); from *P. gardneri* it differs by having ten (vs. five) series of corona filaments 29.4–38.5 (vs. 20–25) mm long; and from *P. eichleriana* by the corona filaments whitish to basally purple, followed by a white band, which may be absent, and lilac to purple-bluish in the remaining 2/3 (vs. completely white), and arranged in ten (vs. six) series.

Liana with tendrils. Branches 0.7–2.8 mm diam., brown, brown-greenish, cylindrical, striate, pilose. **Stipules** 9.4–20.4 × 4.6–7.4 mm, awns 2.8–3.1 mm long, foliaceous, reniform. **Petiole** 15–52.6 × 0.4–1 mm, pilose; glands (3)4–8, 0.6–0.8 × 0.5–0.8 mm, pedunculate, the apex concave, spaced or in pairs, distributed along the petiole. **Leaf blade** 3-lobed, 2.7–13.9 × 3.7–11.5 cm, united portion 1.3–5 cm long, lateral lobes 1.3–3.6 × 1.4–4.5 cm, ovate, central lobe 1.1–6.1 × 1.1–5 cm, ovate, ovate-lanceolate, apex acute to obtuse, mucronate, base slightly truncate to truncate, abaxial surface pilose, adaxial surface glabrous, except in the midrib, secondary veins and margin; margin entire, with 3–6 circular glands, slightly pedunculate, in the sinus of leaf blade, 0.2–0.4 × 0.3–0.5 mm, and 0–2 glands in the base of leaf blade. **Inflorescence** 1-flowered. Peduncle 17.6–32.4 mm long. Bracts 3, 11.6–29.9 × 4.4–15.6 mm, verticillate, pilose, oblong, ovate to ovate-lanceolate, margin entire, glandular at the base. Pedicel 0.8–5.1 mm long. **Flowers** ca. 63.6 mm diam., hypanthium campanulate, glabrous; sepals 24.6–36 × 8.2–8.4 mm, oblong-lanceolate, apex obtuse, carinate-cucullate with awn 3–3.6 mm long, abaxial surface centrally green, white on the lateral and adaxial surface, glabrous, with few trichomes on the midrib abaxially; petals 24.8–35.1 × ca. 8 mm, linear-oblong, apex obtuse, white to lilac, glabrous; **corona** with 10 filament series, two outer series 29.4–38.5 mm long, filiform, whitish to purple at the base, followed by a white band, which may be absent, and lilac to purple-bluish on the remaining 2/3 of filaments length; other inner series 2.2–5.5 mm long, capitate, rarely bifid, purplish, innermost filaments near the androgynophore purplish, with white to light pink apex; operculum 7.7–11.8 mm long, united portion 2.3–3.1 mm long, membranaceous at the base, free portion 5.4–8.7 mm long, filamentous at the apex, exerted, pinkish; nectar ring present; limen ca. 4 mm long, membranaceous, adnate to androgynophore, apex slightly wavy; androgynophore ca. 17.2 mm long, trochlea absent; stamen filaments 8.7–9.4 × 1–1.4 mm, glabrous; anthers 11–11.2 × 2.4–3.1 mm; ovary 5.8 × 2.6 mm, elliptic, glabrous; style 10.7–14.3 long, 0.5–1 mm diam. **Fruit** 5.8–8 × 3.7–7 cm, globose, glabrous, immature green immature, mature yellow; seed 4.8–5.5 mm long, 2.9–3 mm larg., 1.1–1.3 mm thick, obovate, reticulate.

Paratypes:—BRAZIL. Acre: Rio Branco, APA Lago do Amapá. Bacia do rio Acre, margem direita do rio Acre, 10°03'18.0"S, 67°51'30.7"W, 147 m.a.s.l., 17 November 2018, *M. Oliveira et al. 14* (CESJ, UFACPZ); Rio Branco, APA Lago do Amapá. Bacia do rio Acre, margem direita do rio Acre, 10°03'18.0"S, 67°51'30.7"W, 147 m.a.s.l., 26 April 2019, *M. Oliveira et al. 66* (CESJ, UFACPZ); Rio Branco, APA Lago do Amapá. Bacia do rio Acre, Bacia do rio Acre, margem direita do rio Acre, 10°02'35.1"S 67°52'24.1"W, 137 m.a.s.l., 29 January 2022, *M. Oliveira et al. 418* (UFACPZ); Rio Branco, APA Lago do Amapá. Bacia do rio Acre, Bacia do rio Acre, margem direita do rio Acre, 10°02'38.0"S 67°52'27.8"W, 135 m.a.s.l., 01 February 2022, *M. Oliveira et al. 422* (UFACPZ); Rio Branco,

Estrada da Floresta, BR 364, Via Verde, margem esquerda do rio Acre, 10°00'11.9"S 67°50'57.4"W, 171 m.a.s.l., 30 November 2020, *M. Oliveira et al.* 202 (UFACPZ).

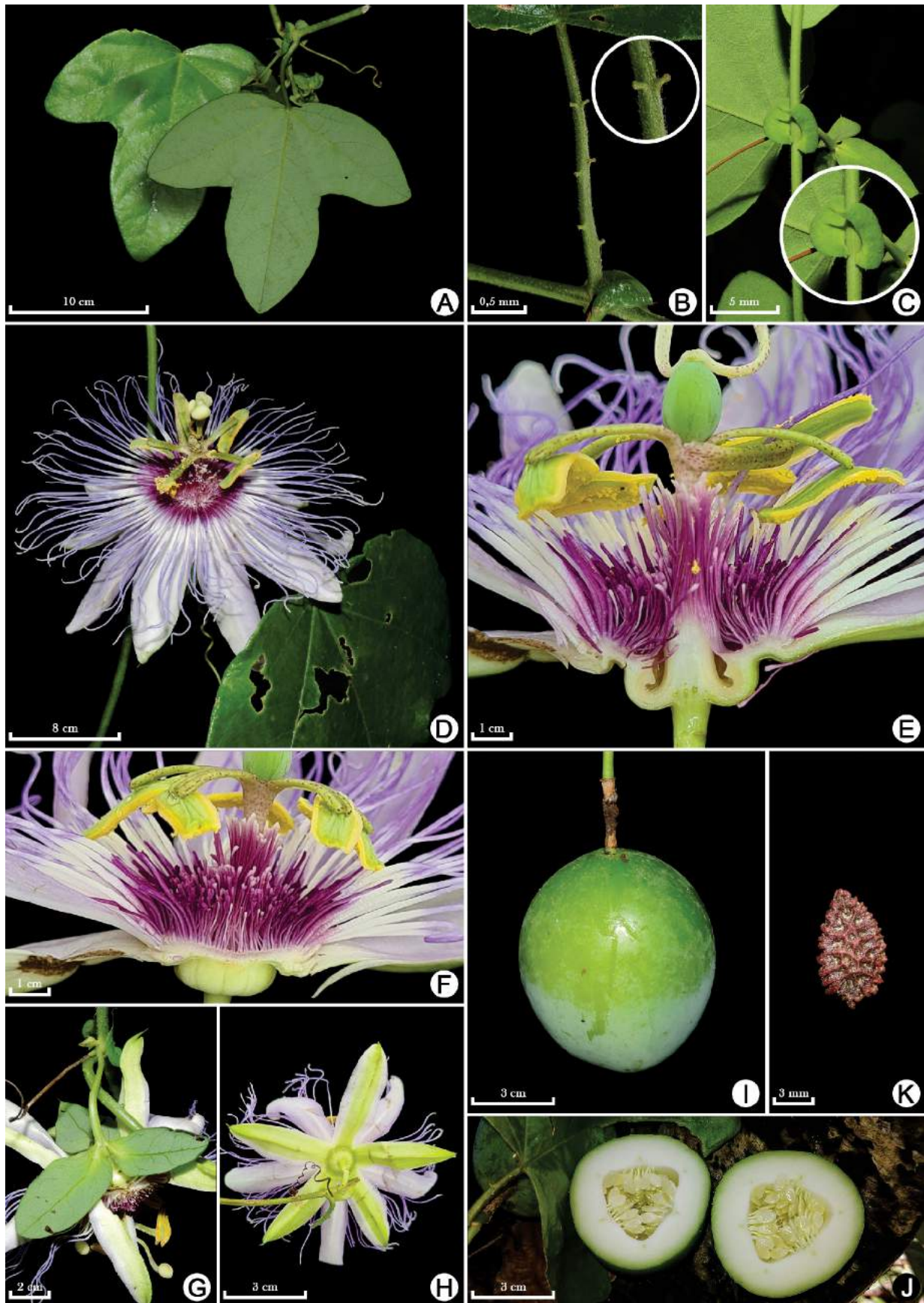


FIGURE 1. *Passiflora acreana* Mezzonato & Silveira. A. leaf blade. B. pedunculate glands. C. stipules. D. flower. E. longitudinal section of flower. F. inner filaments. G. bracts. H. abaxial surface of sepals. I. fruit. J. longitudinal section of fruit. K. seeds.

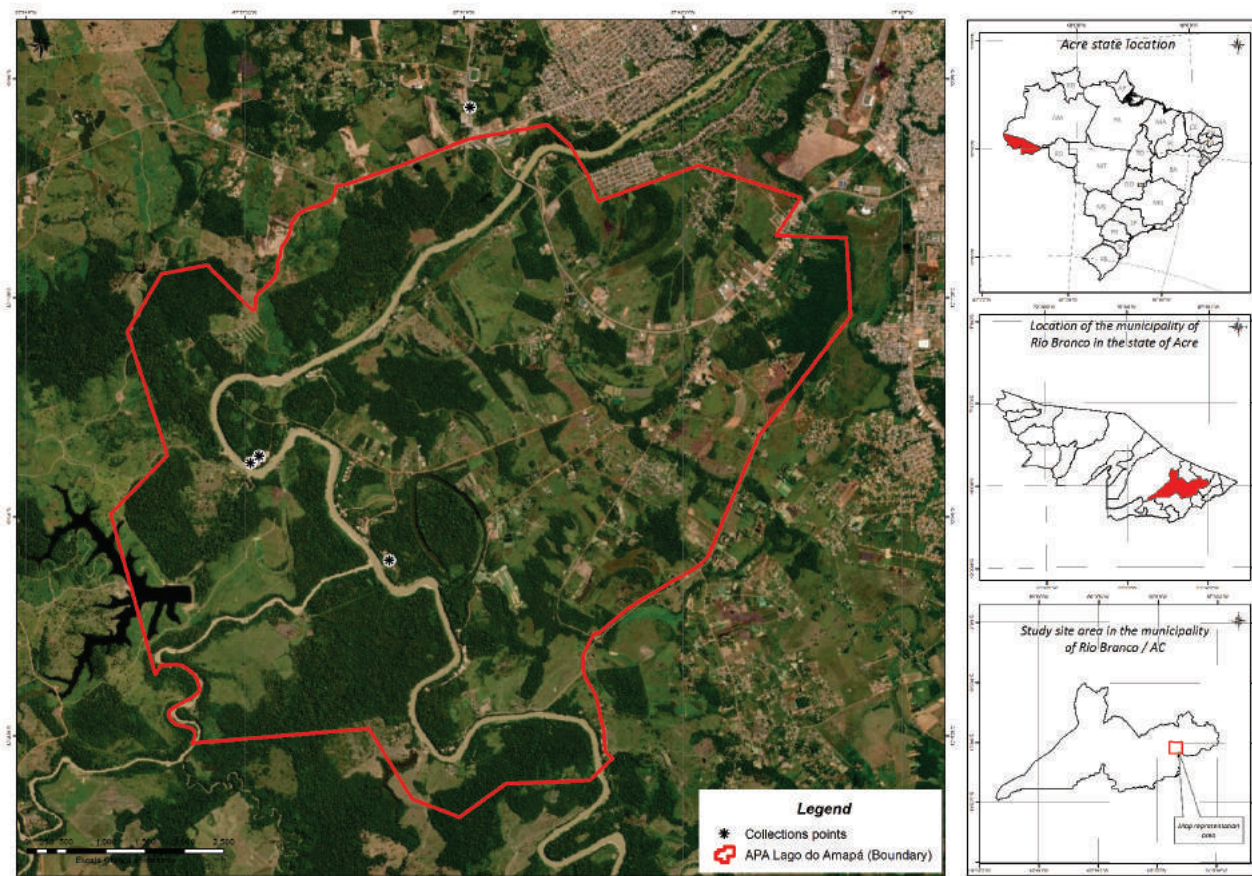


FIGURE 2. Distribution of *Passiflora acreana* Mezzonato & Silveira in the Lago do Amapá Environmental Protection Area, Acre, Brazil. Source of image: Google Earth. Map data ©2022 Google. Images courtesy of ©2022 CNES Airbus via Google Earth.

Distribution and habitat:—The species is not abundant in the area, occurring predominantly on the edges of an alluvial open forest with palm trees and bamboos of the genus *Guadua* Kunth (1822: 252) in an intermediate alluvial terrace.

Phenology:—*Passiflora acreana* was collected with flowers in November, January and February, and with fruits in April.

Etymology:—The specific epithet “*acreana*” is a tribute to Acre, the state where this new species was found.

Conservation status:—Thus far, only four populations of *P. acreana* have been found (Fig. 2). Three populations occur in the Lago do Amapá Environmental Protection Area, Rio Branco, Acre State, and the fourth occurs in the surrounding areas of the conservation unit. The species has an estimated extent of occurrence of 7,585 km² and an estimated area of occupancy of 16,000 km², being therefore categorized as critically endangered (CR), B1ab (i,ii,iii) + 2ab (i,ii,iii) following the IUCN Red List criteria (IUCN 2022). Although three of its populations are located in the conservation unit, *P. acreana* generally occurs on the edges of small forest fragments threatened by their close proximity to residential buildings and anthropogenic activities, such as burning and clearing.

Features and affinities:—*Passiflora acreana* is placed in *P.* subg. *Passiflora*, supersect. *Stipulata* sect. *Granadillastrum*.

The species can be easily distinguished from morphologically similar species by the presence of pilose indumentum throughout the plant surface, except on the leaves adaxial surface and ovary; foliaceous reniform stipules with awns and (3)4–8 petiolar pedunculate glands, with the apex concave, spaced or in pairs; corona with ten series of filaments, whitish to purple at the base, followed by a white band, which may be absent, and lilac to purple-bluish on the remaining 2/3 of filaments length, innermost filaments (near the androgynophore) purplish with apex whitish to light pink.

Passiflora acreana is similar to *P. eichleriana* Masters (1872: 568), *P. gardneri* Masters (1872: 566), and *P. garckeii* Masters (1871: 639) (Fig. 4). The main comparative features among these species are described in Table 1. Only *P. garckeii* occurs exclusively in the Amazon domain (Bernacci *et al.* 2020). *Passiflora acreana* can be differentiated

from *P. garckeii* for being pilose (vs. glabrous), with pedunculate glands with the apex concave (vs. sessile, patelliform glands), stipules with (vs. without) awns. *Passiflora acreana* can be distinguished from *P. eichleriana* for having stipules with (vs. without) awns and with pedunculate glands with the apex concave (vs. ligulate glands); furthermore, while *P. eichleriana* flowers are white, *P. acreana* bears flowers with corona whitish to purple at the base, followed by a white band, which may be absent, and lilac to purple-bluish in the remaining 2/3 of filaments length. *Passiflora acreana* differs from *P. gardneri* by its reniform (vs. semi-ovate) stipules, with smaller awns (2.8–3.1 mm vs. ca. 5 mm long), and corona with 10 (vs. 5) series of filaments.

TABLE 1. Distribution (according to Bernacci *et al.* 2020 and Koch *et al.* 2014, 2019) and morphological traits in *Passiflora acreana* and closely related taxa (according to Killip 1938, Cervi 1997 and Koch *et al.* 2014). Brazilian states acronyms: AC—Acre; MG—Minas Gerais; GO—Goiás; MS—Mato Grosso do Sul; MT—Mato Grosso; PA—Pará; RS—Rio Grande do Sul; SC—Santa Catarina; SP—São Paulo.

	<i>P. acreana</i>	<i>P. eichleriana</i>	<i>P. gardneri</i>	<i>P. garckeii</i>
Distribution	AC	MG, MS, MT, PR, RS, SC, SP	GO, MG, MT	MT, PA
Plant indumentum	pilose, glabrous only in adaxial surface (except veins) and ovary	glabrous	villose, except ovary glabrous.	glabrous
Stipules shape	foliaceous, reniform	foliaceous, oblong-lanceolate	semi-ovate	subovate, slightly falcate
Stipules size	9.4–20.4 x 4.6–7.4 mm	15–35 x 10–18 mm	6–10 x 4–5 mm	21–32 x 12–17 mm
Awn length	2.8–3.1 mm	absent	ca. 5 mm	absent
Number of glands in the petiole	(3) 4–8	6–8	2–6	5–6
Petiolar glands shape	pedunculate, with the apex concave	ligulate	orbicular	patelliform
Glands sinus	present	present	absent	present
Bracts shape	oblong, ovate to ovate-lanceolate	ovate	lanceolate	oblong-lanceolate
Bracts size	11.6–29.9 x 4.4–15.6 mm	10–15 x 10–13 mm	18–20 x 5–7 mm	ca. 60 x 30 mm
Number of corona filament series	10	6	5	multiseriate (do not specify the number)
Number of outer corona filament series	2	2	2	2 or 3
Length of outer corona filament series	29.4–38.5 mm	18–20 mm	20–25 mm	30–35 mm
Operculum	membranaceous at the base and filamentous at the apex	membranaceous at the base and filamentous at the apex	entirely filamentous	entirely membranaceous

Illustrations and/or photographs of these similar species can be found in Cervi (1997, Fig. 12), Koch *et al.* (2014, Figs. 1b and 2a), and Koch *et al.* (2019, Figs. 1 and 2).

With this new species, the state of Acre now harbors 29 species (Bernacci *et al.* 2020), two of which (*P. bernaccii*

and *P. kikiana* Cervi & Linsingen (2010: 1062)) were described in the last 11 years. Among these species, *Passiflora jussieui* Feuillet (2010: 611) and *P. ovata* Joseph Martin ex De Candolle (1828: 322) were recently recorded for the first time in Brazil (Mezzonato-Pires *et al.* 2018), whereas *P. costata* Masters (1872: 573), previously recorded in other Brazilian states, was for the first cited for Acre in 2017 (Mezzonato-Pires *et al.* 2017). These records, added to the description of the new species *P. acreana*, reveal the importance of expeditions in Acre for enhancing the knowledge of the Brazilian flora, particularly with regard to Passifloraceae taxonomy, and the relevance of conservation units for biodiversity conservation.

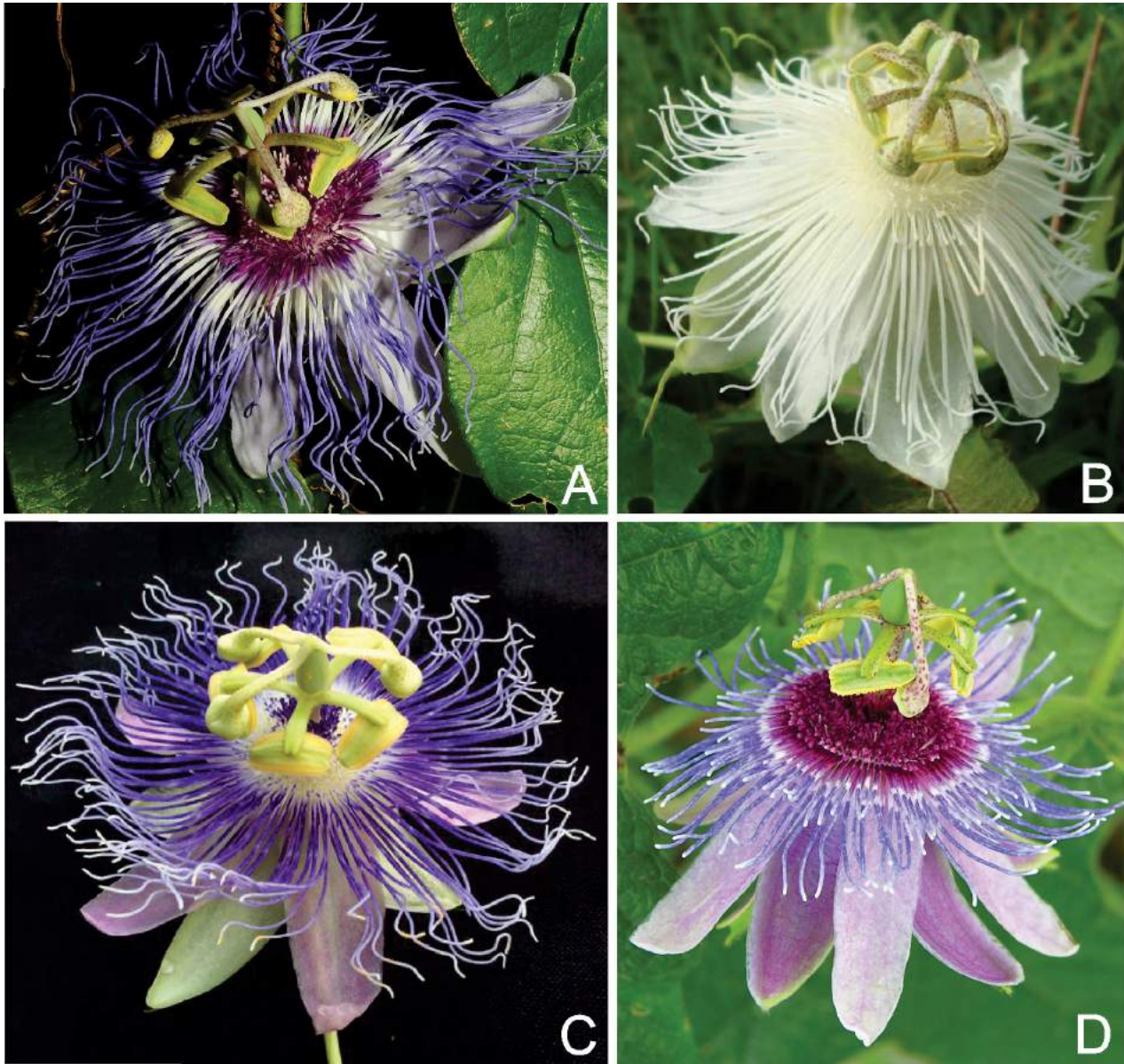


FIGURE 3. Comparison to morphologically similar species. A. *Passiflora acreana* Mezzonato & Silveira. B. *Passiflora eichleriana* Mast., C. *Passiflora garckeii* Mast., D. *Passiflora gardneri* Mast. Photos: M. Silveira (A), D. Imig (B), L.O.A. Teixeira (C), M. Peixoto (D).

Acknowledgements

We acknowledge the Secretary of State for the Environment of Acre; Mirna Caniso, manager of the Lago do Amapá Environmental Protection Area; UFAC and UFJF for assistance with the analysis of the vegetative and floral structures in the stereomicroscope. We also thank Igor Agapejev de Andrade, who helped us with the elaboration of the maps.

References

- Bernacci, L.C., Nunes, T.S., Mezzonato, A.C., Milward-de-Azevedo, M.A., Imig, D.C. & Cervi, A.C. (2020) *Passifloraceae* in Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available from: <https://floradobrasil.jbrj.gov.br/FB182> (accessed 15 Apr 2022).
- Cervi, A.C. (1997) Passifloraceae do Brasil. Estudos do gênero *Passiflora* L., subgênero *Passiflora*. *Fontqueria* 45: 1–92.
- Cervi, A.C. & Linsingen, L. von (2010) *Passiflora kikiana*, a new species of Passifloraceae from the Brazilian Amazon. *Acta Botanica Brasilica* 24: 1062–1064.
<https://doi.org/10.1590/S0102-33062010000400021>
- De Candolle, A.P. (1828) Passifloraceae. In: De Candolle, A.P. (ed.) *Prodromus Systematis Naturalis Regni Vegetabilis*. Treuttel & Würtz, Paris, pp. 321–338.
- Feuillet, C. (2010) Folia taxonomica 18. The status of *Passiflora citrifolia* and a new species in subgenus *Astrophea* (Passifloraceae), *Passiflora jussieui*. *Journal of the Botanical Research Institute of Texas* 4: 609–614.
- Feuillet, C. & MacDougal, J.M. (2003) A new infrageneric classification of *Passiflora* L. (Passifloraceae). *Passiflora: The Journal & Newsletter of Passiflora Society International* 13: 34–38.
<https://doi.org/10.2307/3393379>
- Feuillet, C. & MacDougal, J.M. (2007) Passifloraceae. In: Kubitzki, K. (ed.) *The families and genera of vascular plants*. Springer-Verlag, Berlin, pp. 270–280.
https://doi.org/10.1007/978-3-540-32219-1_35
- IUCN—International Union for Conservation of Nature. (2022) Guidelines for using the IUCN redlist categories and criteria. Version 15. Prepared by the standards and petitions sub-committee. Available from: <https://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 12 January 2023)
- Killip, E.P. (1938) The American Species of Passifloraceae. *Publication Field Museum of Natural History - Botanical Series* 19 (1–2): 1–613.
<https://doi.org/10.5962/bhl.title.2269>
- Koch, A.N., Cardoso, A.L.R. & Ilkiu-Borges, A.L. (2014) Novelties in Passifloraceae from the Brazilian Amazon. *Check List* 10: 453–456.
<https://doi.org/10.15560/10.2.453>
- Koch, A.N., Engels, M.E., Reis, N.N.V. & Soares-Lopes, C.R.A. (2019) A new subspecies and taxonomic notes on *Passiflora* L. (Passifloraceae) in Brazilian Amazon, Mato Grosso, Brazil. *Phytotaxa* 402: 13–20.
<https://doi.org/10.11646/phytotaxa.402.1.2>
- Kunth, K.S. (1822) Sur Le Genre Bambusa. In: Blainville, D. (ed.) *Journal de Physique, de Chimie, d'Histoire Naturelle et des Arts* 95: 1–400.
- Linnaeus, C. (1753) *Species Plantarum*. Impensis Laurentii Salvii, Stockholm, 1200 pp.
- Masters, M.T. (1871) Contributions to the Natural History of the Passifloraceae. *Transactions of the Linnean Society of London* 27: 593–645.
<https://doi.org/10.1111/j.1096-3642.1871.tb00221.x>
- Masters, M.T. (1872) Passifloraceae. In: Martius, C.P.F., Eichler, A.G. & Urban, I. (Eds.) *Flora Brasiliensis*. Frid. Fleischer, Lipsiae, pp. 527–628.
- Mezzonato-Pires, A.C., Mendonça, C.B.F., Milward-de-Azevedo, M.A. & Gonçalves-Esteves, V. (2017) Distribution extensions for species of the *Passiflora* subgenus *Astrophea* (DC.) Masters from Brazil (Passifloraceae s.s.). *Check List* 13: 467–473.
<https://doi.org/10.15560/13.5.467>
- Mezzonato-Pires, A.C. (2018) *Passiflora bernaccii* (Passifloraceae s.s.), a new species from Acre, Brazil. *Phytotaxa* 372: 229–235.
<https://doi.org/10.11646/phytotaxa.372.2>
- Mezzonato-Pires, A.C., Milward-de-Azevedo, M.A., Mendonça, C.B.F. & Gonçalves-Esteves, V. (2018) Taxonomy, palynology and distribution notes of seven species of *Passiflora* L. (Passifloraceae s.s.) newly recorded from Brazil. *Phytokeys* 95: 1–14.
<https://doi.org/10.3897/phytokeys.95.22342>
- Mezzonato-Pires, A.C., Calazans, L.S.B. & Valadares, R.T. (2021a) *Passiflora jorgeana*, a New Species of *Passiflora* (Passifloraceae) from Bahia, Brazil. *Novon* 29: 1–8.
<https://doi.org/10.3417/2020630>
- Mezzonato-Pires, A.C., Ribeiro, R.S. & Gonella, P.M. (2021b) Maracujá on the rocks: a new *Passiflora* species (Passifloraceae *sensu stricto*) from the rupicolous ecosystems of the Brazilian Atlantic rainforest. *Willdenowia* 51: 371–381.
<https://doi.org/10.3372/wi.51.51305>

- Mezzonato-Pires, A.C., Silva, E.O. & Oliveira, E.A. (2021c) *Passiflora bacabensis* (Passifloraceae *sensu stricto*), a new species from Mato Grosso, central-west region of Brazil. *Nordic Journal of Botany* 39 (8)-e03279: 2
<https://doi.org/10.1111/njb.03279>
- Parteka, L.M., Mattos, L., Richardo, J. Fagundes, B.S. & Silvério, A. (2021) *Passiflora coelestis*, a new species of *Passiflora* section *Dysosmia* (Passifloraceae *sensu stricto*) from Southern Brazil. *Phytotaxa* 516: 140–158.
<https://doi.org/10.11646/phytotaxa.516.2.2>
- Radford, A.E., Dickison, W.C., Massey, J.R. & Bell, C.R. (1974) *Vascular Plant Systematics*. New York, Harper & Row Publishers, 891 pp.
- Thiers, B. (2022 [continuously updated]) *Index herbariorum: a global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: <http://sweetgum.nybg.org/ih/> (accessed 15 Apr 2022).
- Triana, J.J. & Planchon, J.E. (1873) Passifloraceae. *Annales des Sciences Naturelles Botanique* 5: 121–186.
- Umer, T. & MacDougal, J.M. (2004) *Passiflora: Passionflowers of the World*. Timber Press, Cambridge, 430 pp.