



First occurrence of *Mitostemma glaziovii* Mast. (Passifloraceae) in Pará state, Brazil

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Abstract. We report the first occurrence record of *Mitostemma glaziovii* Mast. from Pará state, Brazil. We collected specimens of this species in Oriximiná city, at the Estação Ecológica do Grão-Pará. This new record is an important contribution to understanding the geographic distribution of *M. glaziovii* in Brazil.

Key words. Amazon, biodiversity, new record, Oriximiná, protected areas

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INTRODUCTION

Passifloraceae Juss. ex Roussel (sensu stricto) is a family of flowering plants in the order Malpighiales, rosid clade (APG IV 2016). Recent classifications (e.g. APG III 2009, APG IV 2016) have united Passifloraceae s.s., Turneraceae, and Malesherbiaceae to form a single family, Passifloraceae (sensu lato). The family comprises 17 genera and about 700–750 species, and it has a pantropical distribution in the tropics and subtropics, especially in the Americas and Africa (Feuillel and MacDougal 2007). Four genera occur in Brazil: *Ancistrothyrus* Harms, *Dilkea* Mast., *Mitostemma* Mast., and *Passiflora* L. (Cervi 2005; Feuillel and MacDougal 2007; Bernacci et al. 2020). *Passiflora* is the most representative and diverse among the Brazilian angiosperm genera (BFG 2015).

Mitostemma has only three species, and its occurrence is restricted to South America (Killip 1938, speciesLink 2023). *Mitostemma jenmanii* Mast. is native to Guyana (POWO 2023; Boggan et al. (1997). *Mitostemma brevifilis* Gontsch. and *Mitostemma glaziovii* Mast. are endemic to Brazil, where it is known from nine Brazilian states (Tocantins [TO], Bahia [BA], Piauí [PI], Goiás [GO], Mato Grosso do Sul [MS], Mato Grosso [MG], Espírito Santo [ES], Minas Gerais [MG], and Rio de Janeiro [RJ]) (Imig et al. 2018; Flora e Funga do Brasil 2023). *Mitostemma brevifilis* occurs in five states (TO, PI, GO, MS, and MT), and *M. glaziovii* is restricted to the Atlantic Forest, occurring in four states (MG, BA, RJ, and ES).

Representatives of Passifloraceae (s.s.) are erect, woody, non-creeping, and subwoody to herbaceous climbers, shrubs, and small trees; axillary tendrils are present in most species (Bernacci et al. 2003; Feuillel and MacDougal 2007). The family has several species of an economic importance, such as Passion Fruit (*Passiflora edulis* Sims), a widely cultivated species of great commercial value (Killip 1938; Cervi 1997; Bernacci et al. 2003; Borges et al. 2020), and species with ornamental and medicinal potential (Killip 1938; Bernacci et al. 2003; Faleiro et al. 2019).

The taxonomy of genus has not been recently reviewed, hence the importance of studies that allow for a better understanding of this group. Here, we report the first record of *M. glaziovii* from Pará state, Brazil. We contribute taxonomic knowledge and expand the known distribution of the geographic distribution of *M. glaziovii* in Brazil.

METHODS

We collected specimens of *Mitostemma jenmanii* in Oriximiná city, Pará state, during a scientific expedition from 16 September to 4 October 2021 to the Estação Ecológica do Grão-Pará (ESEC do Grão-Pará) promoted by the Third Regional Management, Instituto de Desenvolvimento Florestal e da Biodiversidade do Estado do Pará (in English, Institute for Forest Development and Biodiversity of Pará State). The ESEC do Grão-Pará is a protected area created in 2006 by the Government of Pará State through State Decree



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No. 2609 of 4 December 2006. This protected area is in the western Pará in the mesoregion of the Lower Amazon and has an area of 4,245,819 ha, and is within the cities of Oriximiná, Óbidos, Alenquer, and Monte Alegre (SEMA 2011).

We carried out the collections in an igapó forest on the left bank of the Jauari River, a tributary of the Mapuera River, which is characterized as a clear-water river. The predominant climate types in the ESEC do Grão-Pará is subtype tropical monsoon climate (Am) and equatorial climate (Af), according to the Köppen classification (SEMA 2011). Fertile samples of *M. jenmanii* were collected and herborized following Mori et al. (2011). We identified our material through consultations with physical and virtual herbaria databases (e.g. Re flora – Herbário Virtual 2023; speciesLink 2023). We also consulted with specialists and accessed specialized bibliography. The classification of the family is according to the system of Angiosperm Phylogeny Group IV (APG 2016). We deposited the collected materials in the Herbarium of the Universidade Federal do Oeste do Pará (Santarém, Pará; HSTM).

We mapped the distribution of *M. jenmanii* using QGIS software v. 3.16 (QGIS 2022) and included using occurrence records of from speciesLink (2023). The Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using the GeoCAT tool (<http://geocat.kew.org>). The AOO was based on the standard 2 × 2 km grid. A conservation status is proposed following International Union of the Conservation of Nature criteria (IUCN 2017).

RESULTS

Here we present the new geographical distribution record for species *M. glaziovii*, recorded for the first time for Pará state in the bordering region of the ESEC do Grão-Pará map (Fig. 1).

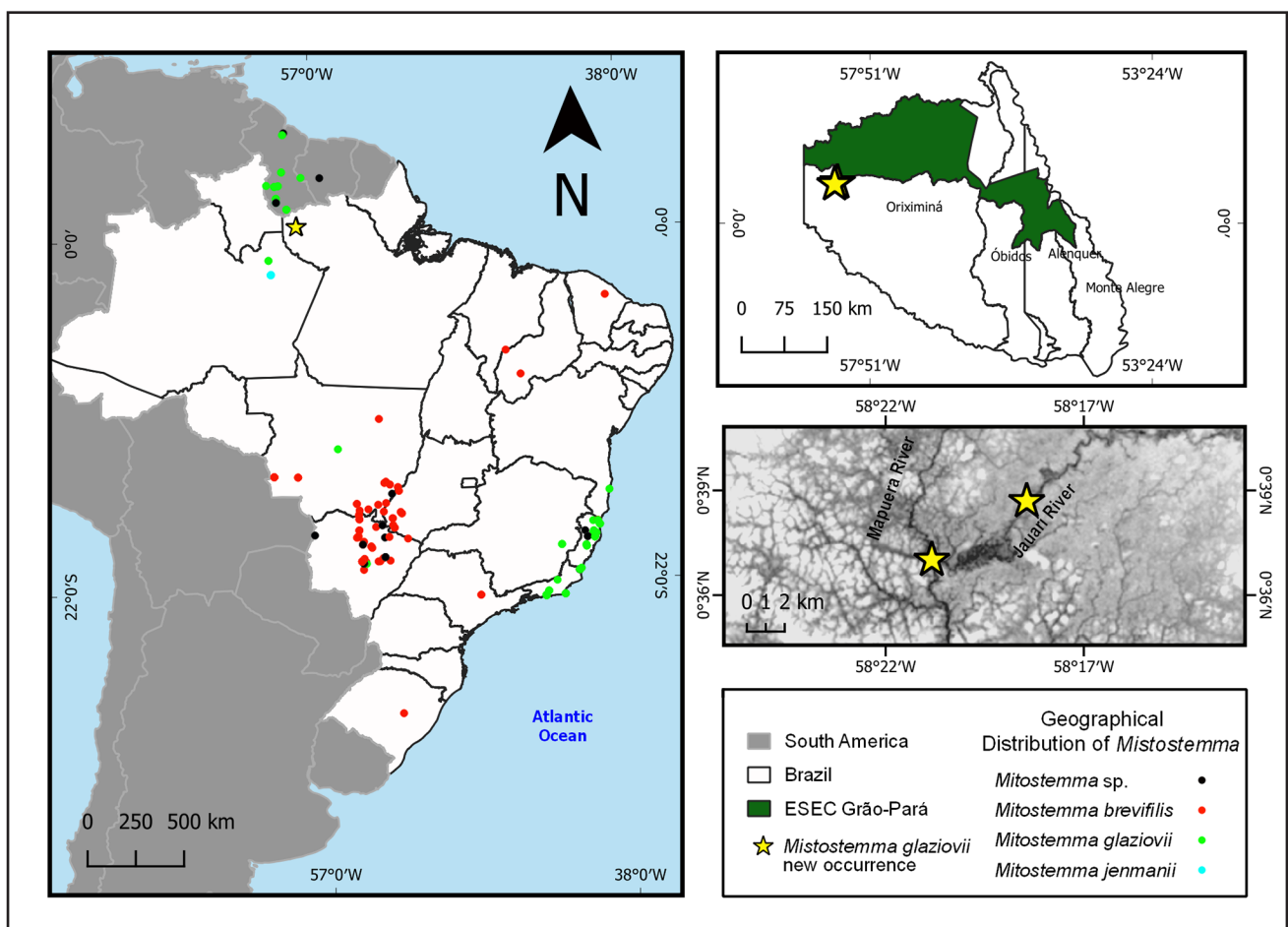


Figure 1. Geographical distribution map of the three *Mitostemma* species. The new records of *M. glaziovii* from the Estação Ecológica do Grão-Pará are indicated by a star. (Map produced by Ana Sofia S. Holanda.)

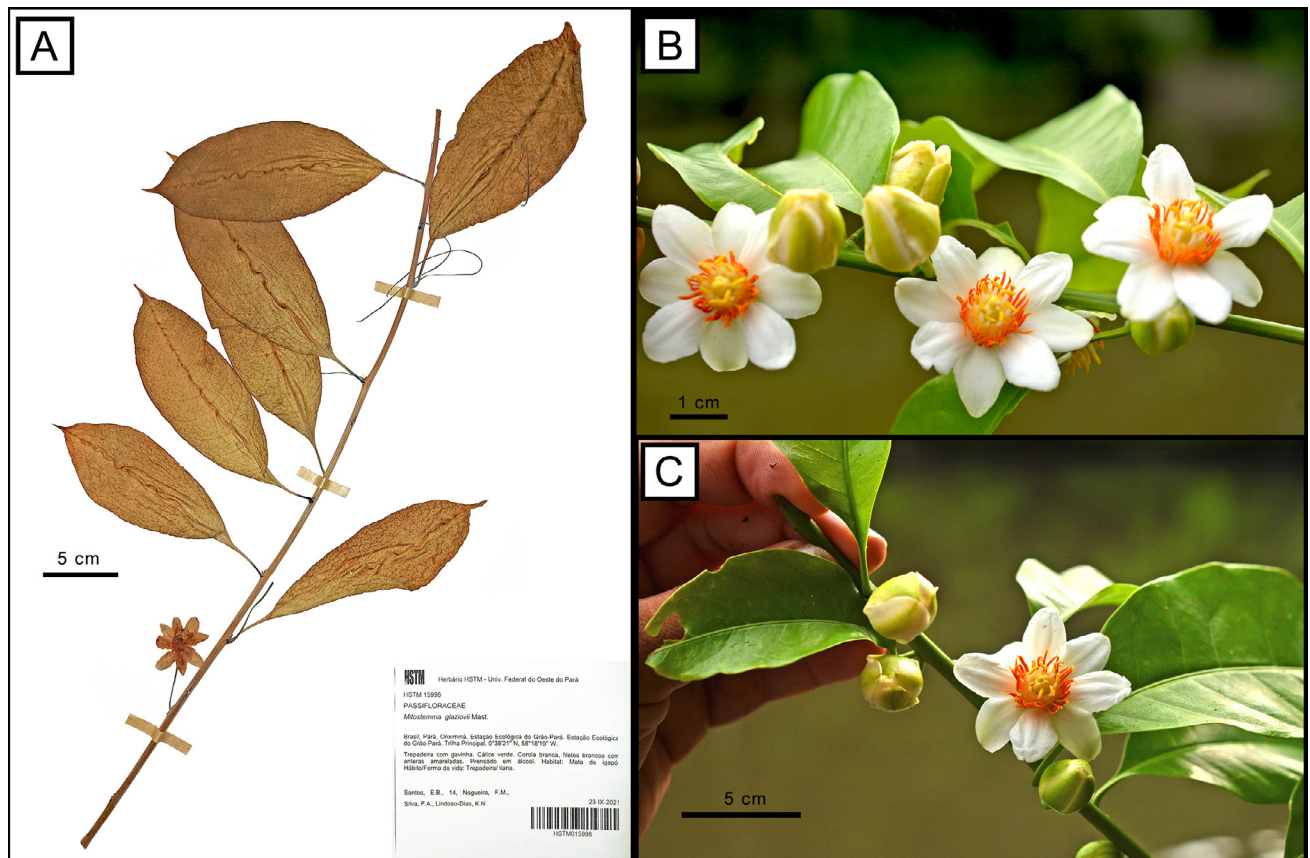


Figure 2. *Mitostemma glaziovii* Mast. **A.** Image of specimen deposited in the HSTM herbarium (HSTM 15998). **B, C.** Field images of the specimen.

***Mitostemma glaziovii* Mast.** Journal of Botany 21: 34 (Masters 1883)

Figures 1, 2

New records (Figure 1). BRAZIL – PARÁ • Oriximiná, Estação Ecológica do Grão-Pará, igapó forest; 00°38' 21"N, 058°18'19"W; 23.IX.2021 EB Santos, FM Nogueira., FA Silva, KN Lindoso-Dias leg.; 14 HSTM 15998 • same locality; 00°36'41"N, 058°21'01"W; 25.IX.2023/ FA Silva, KN Lindoso-Dias, FM Nogueira, EB Santos leg.; 896 HSTM 015983.

Additional examined materials. BRAZIL – AMAZONAS • Itapiranga, Rio Uatumã, right bank, above confluence of Uatumã and Pitinga Rivers, riverbank forest, clay soil; 01.5157°S, 059.8472°W; 26.VIII.1979; CAC Ferreira, WR Buck, BW, Nelson, F Almeida, CDA Mota, J Lima leg.; 812 INPA 87323, NY00483850 – ESPÍRITO SANTO • Santa Teresa, estrada para o 25 de Julho; 08.VIII.2001; RL Kollmann, E Bausen; 4270, UPCB00022754.

Identification. A liana. Branch cylindrical. Leaves obovate-oblong, glabrous; apex acuminate; entire margin; base cuneate-attenuate; petiole 0.9–1.0 cm long, ca. 0.1 cm in diameter; leaf blade 11.0–11.8 cm long, 5.0–5.4 cm wide. Flowers axillary, solitary, tetramerous. Calyx green; sepals oblong with rounded apex, 1.1–1.3 cm long, 0.4–0.6 cm wide. Corolla with white petals, oblong, with apex rounded and narrowing towards the base, 1.2–1.3 cm long, 0.6–0.8 cm wide. Stamens with white threads; anthers yellow, dorsifixed, 0.7–0.9 cm long. Corona with reddish-orange outer series of filaments, showy, 0.2–0.4 cm long. Gynoecium cream-colored, ca. 0.6 cm long, 0.3 cm in diameter; ovary longer than style; stigma 5-discoidal or discoid. Fruit not observed.

Comments. The characteristics of habit, leaf, and flower morphology are important in differentiating *M. glaziovii* from the other species of the genus, as noted by Killip (1938) and Flora e Funga do Brasil (2023). *Mitostemma brevifilis*, for example, is an upright shrub, and its leaves usually have an obtusely acuminate, obtuse or emarginate apex. On the other hand, *M. glaziovii* is a scandent liana with leaves that have a generally acuminate apex. *Mitostemma jenmanii* is distinguished mainly by having a style that is longer than the ovary, measuring approximately 0.6–0.8 cm long (vs. shorter than the ovary in *M. brevifilis* and *M. glaziovii*).

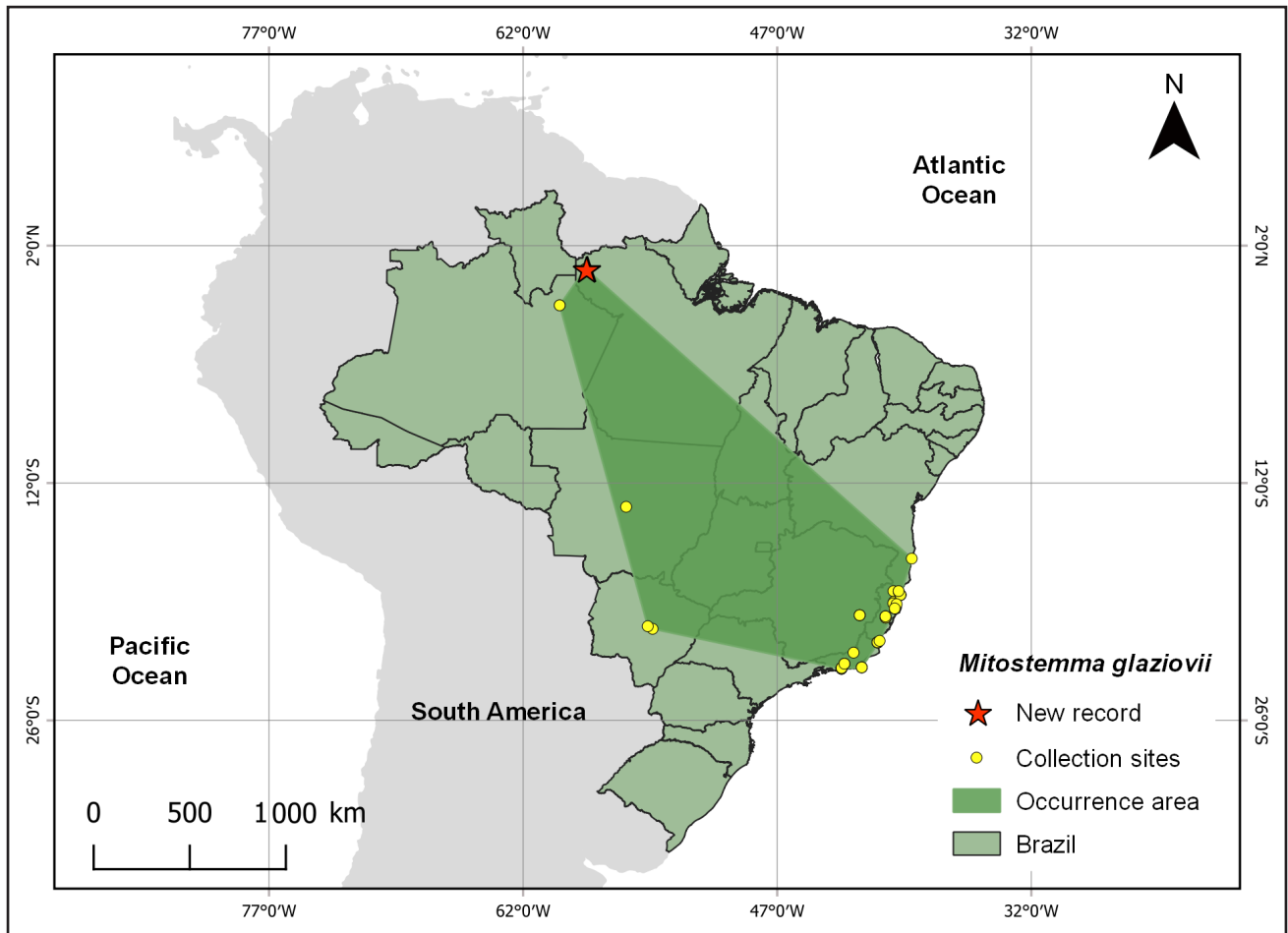


Figure 3. Area of occurrence (AOO) of *Mitostemma glaziovii*. (Map produced by Ana Sofia S. Holanda.)

Key to species from *Mitostemma* Mast.

(Modified from Killip 1938 and Flora e Funga do Brasil 2023)

- | | | | |
|----|---|-------|----------------------|
| 1 | Ovary ca. 0.4–0.6 cm long; styles longer than ovary, ca. 0.6–0.8 cm long | | <i>M. jenmanii</i> |
| 1' | Ovary ca. 0.4–0.6 cm long; styles shorter than ovary, ca. 0.2–0.3 cm long | | 2 |
| 2 | Erect stem, ovary elliptic-oblong, white-villous; leaves obtuse or obtusely acuminate at apex | | |
| | | | <i>M. brevifilis</i> |
| 2' | Scandent stem, ovary ellipsoidal, glabrous; leaves sharply acuminate at apex | | <i>M. glaziovii</i> |

Incorporating 74 collections of *M. glaziovii* from eight Brazilian states and including our new records, we calculated the extent of occurrence (EOO) as 2,856,518 km² and an area of occupancy (AOO) of 124 km² was obtained (Fig. 3).

DISCUSSION

Mitostemma glaziovii is endemic to Brazil where it is restricted to the Atlantic Forest. There are confirmed occurrences in the states of Bahia, Minas Gerais, Rio de Janeiro, and Espírito Santo (Imig et al. 2018; Borges et al. 2020; Flora and Funga of Brazil 2023), and here we report the first occurrence records of this species from Pará. Our new data extend this species' geographic distribution to the Amazon domain.

Based on IUCN (2023) criteria, *M. glaziovii* is not threatened with extinction. However, it is worth noting that the Atlantic Forest and the Amazon suffer from deforestation and fires. Ferreira et al. (2017) reported that Atlantic Forest habitats are severely fragmented and may in decline, which likely would affect the survival of this and other species, especially those that are endemic or endangered.

We emphasize the importance of floristic inventories in improving knowledge of the plant biodiversity of the Amazon biome. We also note the need for taxonomic revision of the genus. The region where we found our new records has insufficient botanical knowledge (Hopkins 2007). It is expected to have high plant biodiversity and undescribed species are highly probability. Hopkins (2019) highlighted that one means to discover and learn about undiscovered biodiversity is through intensive collection efforts, especially in

areas far from cities. According to Albert et al. (2023), surveys of this type must be done with urgency since the Amazon has is undergoing critical levels of degradation from industrial and agricultural activities that are destroying habitats at an accelerated pace and putting at risk its vast biodiversity and globally important ecosystem services. We emphasize the importance of correctly identifying specimens in herbaria and online databases; it is likely that most tropical plants have taxonomic errors, according to Goodwin et al. (2015), and this problem can seriously affect the quality of data from these sources and hinder the progress in cataloging biodiversity from the Amazon region and other Brazilian biomes.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Author contributions

Investigation: EBSA, DMT. Resources: EBSA, DMT. Map making: ASSH. Visualization: ASSH. Writing – original manuscript: EBSA, ASSH, DMT. Writing – review and editing: EBSA, ASSH, DMT.

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Data availability

All data that support the findings of this study are available in the main text.

REFERENCES

- Albert JS, Carnaval AC, Flantua SGA, Lohmann LG, Ribas CC, Riff D, Carrillo JD, Fan Y, Figueiredo JJP, Guayasa-min JM, Hoorn C, de Melo, GH, Nascimento N, Quesada CA, Ulloa Ulloa C, Val P, Arieira J, Encalada AC, Nobre CA (2023) Human impacts outpace natural processes in the Amazon. *Science* 379: eabo5003. <https://doi.org/10.1126/science.abo5003>
- APG III (2009) An update of the angiosperm phylogeny group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society* 161: 105–121.
- APG IV (2016) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181 (1): 1–20. <https://doi.org/10.1111/boj.12385>
- Bernacci LC, Vitta FA, Bakker YV (2003) Passifloraceae. In: Wanderley MGL, Shepperd GJ, Giulietti AM, Kirizawa, M (eds.) *Flora Fanerogâmica do estado de São Paulo*. Instituto de Botânica, São Paulo 3: 247–274.
- BFG (2015) Growing knowledge: an overview of seed plant diversity in Brazil. *Rodriguésia* 64 (4): 1085–1113. <https://doi.org/10.1590/2175-7860201566411>
- Boggan J, Funck V, Kelloff C (1997) Checklist of the plants of the Guianas (Guyana, Surinam, French Guiana), 2nd edition. University of Guyana, Georgetown, Guyana, 1–238. https://horizon.documentation.ird.fr/exl-doc/pleins_textes/divers20-10/010012214.pdf. Accessed on: 2024-1-31.
- Borges KF, Lorenzoni RM, Fontes MMP, Milward-de-Azevedo MA (2020) A família Passifloraceae *sensu stricto* do Espírito Santo, Brasil. *Rodriguésia* 71: e03212018. <https://doi.org/10.1590/2175-7860202071084>
- Cervi AC (1997) Passifloraceae do Brasil. Estudo do gênero *Passiflora* L., subgênero *Passiflora*. *Fontqueria* 45: 1–92.
- Cervi AC (2005) Espécies de *Passiflora* L. (Passifloraceae) publicadas e descritas nos últimos 55 anos (1950–2005) na América do sul e principais publicações brasileiras. *Estudos de Biologia* 27 (61): 19–24.

- Faleiro GF, Junqueira NTV, Junghans TG, Jesus ON, Miranda D, Otoni WC** (2019) Advances in passion fruit (*Passiflora* spp.) propagation. *Revista Brasileira de Fruticultura* 41 (2): e-155. <https://doi.org/10.1590/0100-29452019155>
- Ferreira AWC, Oliveira MS de, Silva EO, Campos DS, Pansarin ER, Guarçoni EAE** (2017) *Vanilla bahiana* Hoehne and *Vanilla pompona* Schiede (Orchidaceae, Vanilloideae): two new records from Maranhão state, Brazil. *Check List* 13 (6): 1131. <https://doi.org/10.15560/13.6.1131>
- Feuillet C, MacDougal J** (2007) Passifloraceae. In: Kubitzki K (Ed.) *The families and genera of vascular plants, volume IX: flowering plants: eudicots – Berberidopsidales, Buxales, Crossosomatales, Fabales p.p., Geraniales, Gunnerales, Myrtales p.p., Proteales, Saxifragales, Vitales, Zygophyllales, Clusiaceae Alliance, Passifloraceae Alliance, Dilleniaceae, Huaceae, Picramni*. Berlin, Springer-Verlag, Berlin, Germany, 270–280.
- Flora e Funga do Brasil** (2023) Jardim Botânico do Rio de Janeiro. <https://floradobrasil.jbrj.gov.br/FB12504>. Accessed on: 2023-12-30.
- Goodwin ZA, Harris DJ, Filer D, Wood JRI, Scotland RW** (2015) Widespread mistaken identity in tropical plant collections. *Current Biology* 25: R1066–R1067. <https://doi.org/10.1016/j.cub.2015.10.002>
- Hopkins MJG** (2007) Modelling the known and unknown plant biodiversity of the Amazon Basin. *Journal of Biogeography* 34: 1400–1411. <https://doi.org/10.1111/j.1365-2699.2007.01737.x>
- Hopkins MJG** (2019) Are we close to knowing the plant diversity of the Amazon? *Anais da Academia Brasileira de Ciências* 91 (3): e20190396. <http://dx.doi.org/10.1590/0001-3765201920190396>
- Imig DC, Milward-de-Azevedo MA, Cervi AC** (2018) Passifloraceae sensu stricto de Minas Gerais, Brasil. *Rodriguésia* 69 (4): 1701–1735. <https://doi.org/10.1590/2175-7860201869415>
- IUCN** (International Union for the Conservation of Nature) (2023) IUCN Red List categories and criteria: version 3.1. IUCN Species Survival Commission, Gland, Switzerland. <http://www.iucnredlist.org/>. Accessed on: 2023-12-31.
- Killip EP** (1938) The American species of Passifloraceae. *Field Museum of Natural History, Botanical Series* 19 (1–2): 1–613.
- Masters MT** (1883) New Passifloraceae. *Journal of Botany, British and Foreign* 21: 34.
- Mezzonato-Pires AC, Silveira M, Oliveira MH** (2023) *Passiflora acreana*, a new species of *Passiflora* subgenus *Passiflora* (Passifloraceae sensu stricto) from Acre, Brazil. *Phytotaxa* 579 (1): 39–46. <https://doi.org/10.11646/phytotaxa.579.1.4>
- Mori AS, Berkov A, Gracie CA, Hecklau EF** (2011) *Tropical plant collecting: from the field to the internet*. TECC Editora, Florianópolis, Brazil, 332 pp.
- POWO** (Plants of the World Online) (2023) Facilitated by the Royal Botanic Gardens, Kew. <http://www.plantsoftheworldonline.org/>. Accessed on: 2023-12-30.
- QGIS** (2022) QGIS Geographic Information System. Open Source Geospatial Foundation Project. <http://qgis.osgeo.org>. Accessed on: 2022-12-30.
- Reflora** (2023) Reflora – Herbário Virtual. <http://reflora.jbrj.gov.br/reflora/herbarioVirtual/>. Accessed on: 2023-05-12.
- SEMA** (Secretaria Estadual de Meio Ambiente) (2011) Plano de manejo da estação ecológica do Grão – Pará: capítulos I, II e III: cinco reinos, pesquisas e serviços ambientais. Secretaria de Estado de Meio Ambiente, Belém, Brazil, 206 pp.
- speciesLink** (2023) speciesLink network. <https://specieslink.net/search/>. Accessed on: 2023-05-12.